S. 296.

TRANSACTIONS

OF THE

NORFOLK & NORWICH

NATURALISTS' SOCIETY.

[Edited by W. A. Nicholson, Hon. Sec.]

The Norfolk and Norwich Naturalists' Society has for its objects:—

1. The Practical Study of Natural Science.

2. The protection, by its influence with landowners and others, of indigenous species requiring protection, and the circulation of information which may dispel prejudices leading to their destruction.

3. The discouragement of the practice of destroying the rarer species of birds that occasionally visit the County, and of exterminating rare plants in their native localities.

4. The record of facts and traditions connected with the habits, distribution, and former abundance or otherwise of animals and plants which have become extinct in the County; and the use of all legitimate means to prevent the extermination of existing species, more especially those known to be diminishing in numbers.

5. The publication of Papers on Natural History, contributed to the Society, especially such as relate to the County of Norfolk.

6. The facilitating a friendly intercourse between local Naturalists, by means of Meetings for the reading and discussion of papers and for the exhibition of specimens, supplemented by Field-meetings and Excursions, with a view to extend the study of Natural Science on a sound and systematic basis.

TRANSACTIONS

OF THE

NORFOLK AND NORWICH

NATURALISTS' SOCIETY.

VOL. V.

1889—90 TO 1893—94.

Norwich:
PRINTED BY FLETCHER AND SON.
1894.

CONTENTS.

ALPHABETICAL LIST OF CONTRIBUTORS.

LIST OF ILLUSTRATIONS.

ALPHABETICAL LIST OF SUBJECTS.

Lists of Officers and Members, Statements of Accounts, and Catalogues of Publications received, to be bound at the end of Volume.

TRANSACTIONS

OF THE

Norfolk and Norwich

NATURALISTS' SOCIETY;

PRESENTED TO THE MEMBERS FOR

1889—90.

VOL. V.—Part 1.

NORWICH:
PRINTED BY FLETCHER AND SON.
1890.

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The Treasurer in Account with the Norfolk and Norwich Naturalists' Society.

Year ending 25th March, 1890.

Dr.	£	s.	d.	£	s.	d.
To Balance from last year				17	7	10
,, Subscriptions :—	£	s.	d.			
1 for 1887—88	0	5	0			
5 ,, 1888—89	1	5	0			
182 ,, 1889—90	45	10	0			
1 ,, 1889—90	0	10	0			
13 ,, 1890—91	3	5	0			
1 ,, 1891—92	0	5	0			
1 ,, 1892—93	0	5	0			
1 ,, 1893—94	0	5	0			
				51	10	0
,, Additional payments for monthly notices				0	14	0
,, Sale of *Transactions*				3	1	0
,, Donation :—J. H. Gurney, Esq.				2	15	0
,, Interest				0	16	6
				£76	4	4

Cr.	£	s.	d.
By Fletcher and Son, for Printing *Transactions*, 1888—89	50	13	6
,, Norfolk Chronicle Company, for Printing	0	14	6
,, Jarrold and Sons, for ditto	1	0	5
,, A. H. Goose, Stationery	0	3	6
,, Advertisements	0	2	0
,, Insurance	0	3	0
,, Postage and Carriage	5	8	0
,, Gratuity to Doorkeeper	0	10	0
,, Rent of Room	1	1	0
,, Museum Subscription	2	2	0
,, Assistant Secretary's Salary	5	0	0
,, Balance at Messrs. Gurney's	9	6	5
	£76	4	4

LIFE MEMBERSHIP FUND.

	£	s.	d.
To Balance from last year	91	2	11
,, Interest	2	2	6
	£93	5	5

By Balance in Post Office Savings Bank £93 5 5

Norwich, 24th March, 1890.

Examined and found correct,

STEPHEN WM. UTTING, *Auditor.*

List of the Publications received by the Society as Donations or Exchanges from March, 1889 to March, 1890.

ABBEVILLE. Mémoires de la Société d'Émulation d'Abbeville. 4e Série, tome 1, partie 1. 8vo. *From the Society*

——— Bulletin de la Société d'Émulation d'Abbeville. 1888 Nos. 1—4; 1889 Nos. 1—4. 8vo. *From the Society*

ADAMSON (Major C. H. E.). Catalogue of Butterflies collected in Burmah. 8vo. Newcastle, 1889. *From the Author*

BATH Natural History and Antiquarian Field Club. Proceedings, vol. vi. no. 3. 1889. 8vo. *From the Club*

BELGIUM. Annales de la Société Belge de Microscopie. Tome 12, 13 fasc. 1—3. 1889. *From the Society*

——— Annales de la Société Géoligique de Belgique. Tome 14, 2e livraison, Tome 16, 1re livraison. 1889. 8vo. *From the Society*

——— Annales de la Société Royale Malacologique de Belgique. Tome 23. Année 1888. Royal 8vo. *From the Society*

BENNETT (Arthur, F.L.S.). Records of Scottish Plants for the year 1888. (From the Scottish Naturalist for July 1889.) pp. 15. 8vo. *From the Author*

BERWICKSHIRE Naturalists' Club. Proceedings, vol. xii. Nos. 1 and 2. 1888. 8vo. *From the Club*

BOTANICAL Exchange Club of the British Isles. Report for 1888. 8vo. *From Mr. A. Bennett, F.L.S.*

BOVALLIUS (Carl). Amphipoda Synopidea. pp. 36, with 3 plates. 4to. Upsala, 1886. *From Professor Newton, F.R.S.*

BRISTOL Naturalists' Society. Proceedings, new series, vol vi. part 1. 1888—89. 8vo. *From the Society*

BROECK (Ernest Van Den). Introduction au Mémoire de M. P.—H. Nyst sur la Conchyliologie des Terrains Tertiaires de la Belgique. pp. 55. folio. Bruxelles, 1882. *From Mr. W. Whitaker, F.G.S.*

CARDIFF Naturalists' Society. Report and Transactions, vol. xx. part 2, and vol. xxi. part 1. 1888—9. 8vo. *From the Society*

CUMBERLAND and Westmorland Association for the advancement of Literature and Science. Transactions, no. xiv., 1888—9. 8vo. *From the Association*

Cutter (Ephraim, M.D.). Food versus Bacilli in Consumption. (From the Virginia Medical Monthly, December 1888.) 8vo.
From the Author

Darwin (Charles). On the Origin of Species by means of Natural Selection. 8vo. Lond. 1860.
From Mr. J. H. Gurney, Jun., F.Z.S.

Eastbourne Natural History Society. Transactions, new series, vol. 2, part 2. 1887—8. 8vo. *From the Society*

Edinburgh Royal Physical Society. Proceedings, vol. ix. part 3, and vol. x. part 1. 1887—9. 8vo. *From the Society*

Essex. The Essex Naturalist: being the Journal of the Essex Field Club. Vol. ii. nos. 11—12; vol. iii. nos. 1—12; vol. iv. nos. 1—3. 1888—90. 8vo. *From the Club*

Feilden (Col. H. W.). On the Breeding of Puffinus auduboni in the Island of Barbados. (From the 'Ibis' for January 1889.) pp. 4. 8vo. *From the Author*

Glasgow Natural History Society. Proceedings and Transactions, new series, vol. ii. part 2, and vol. iii. part 1. 1887—89. 8vo.
From the Society

——— Geological Society. Transactions, vol. viii. part 2. 1886—88. 8vo. *From the Society*

Gurney (J. H., Jun., F.L.S.). On the Misdeeds of the House-Sparrow (Passer domesticus). pp. 9. 8vo. *From the Author*

——— The Status of the Fireerest as a British Bird. (From the 'Zoologist' for May, 1889.) pp. 3. 8vo. *From the Author*

——— The Bearded Titmouse. (From the 'Zoologist' for August, 1889.) pp. 4. 8vo. *From the Author*

Hampshire Field Club. Papers and Proceedings, no. iii. 1889. 8vo. *From the Club*

Hertfordshire Natural History Society and Field Club. Transactions, vol. v. parts 4—8. 1889—90. 8vo. *From the Society*

Ibis (The), a Quarterly Journal of Ornithology. Edited by Philip Lutley Sclater, F.R.S. Sixth Series, vol. i. nos. 2—6. 8vo. 1889—90. *From Mr. G. F. Buxton, F.Z.S.*

Knapp (J. L.). The Journal of a Naturalist. Third Edition. Sm. 8vo. Lond. 1830. *From Mr. J. H. Gurney, Jun., F.Z.S.*

Liverpool Geological Association. Journal, vols. viii. and ix. 1887—9. 8vo. *From the Association*

——— Geological Society. Proceedings, vol. vi. part 1. 1888—9. 8vo. *From the Society*

London Geological Society. Quarterly Journal. Nos. 172—178. November 1887 to May 1889. 8vo. *From Col. Feilden, F.G.S.*

London Geologists' Association. Proceedings, vol. x. no. 9, and vol. xi. nos. 1—5. 8vo. *From the Association*

——— Linnean Society. Journal, Botany, nos. 155—157, 162—171, 173, 1888—9; Zoology, nos. 119—122, 130—135, 137—144, 1887—9. 8vo. *From Mr. J. H. Gurney, Jun., F.Z.S.*

——— Meteorological Office. Contributions to our knowledge of the Meteorology of the Arctic Regions. Parts 1, 2, 4, 5. 4to. Lond. 1879—88. *From Col. Feilden, F.G.S.*

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ADDRESS.

Read by the President, Shephard T. Taylor, M.B., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Twenty-first Annual Meeting, held at the Norfolk and Norwich Museum, March 25th, 1890.*

Ladies and Gentlemen,—When it was proposed a twelvemonth since to elect me your President for the year, I felt a very great reluctance to accept the cares of office, and that, not because I failed to appreciate the honour and dignity of the position, but because, being no naturalist, it seemed to me, I should be placing myself in a false position, if I occupied a chair that has hitherto had for its occupants gentlemen whose fame as naturalists extends far beyond the limits of our Eastern Counties. However, the powers that be insisted, and recollecting how many pleasant and instructive evenings I had spent within these walls, thanks to the labours of the numerous working members of this Society, I did not wish to appear to be guilty of the sin of ingratitude by consulting, exclusively, my own private feelings in the matter. On these grounds I claim the indulgence of my hearers, if my address should reveal the fact, as it most certainly will, that its unfortunate composer has no practical acquaintance with the subjects he handles.

It is gratifying to remark that there has been no lack of good papers and animated discussions during the past year, as you all know very well. If anything, the evenings have been too short, rather than too long, for the papers that had to be read and discussed. The Secretary has had to remind me almost every

evening that we must be getting on, or Old Time would leave us in the lurch. This plethora of papers is the best possible proof that our Society is full of vitality, and not at all likely to die of inanition, of which lingering malady learned societies do sometimes die, even in old Norwich itself, sad to say. To do justice to all these various papers in my short annual address, time will not permit, even if I had the ability to do so. I can but briefly allude to the more important of them, recalling each of them to your mind, and thus, perhaps, enabling you to form some general conception of the annual labours of the Society as a whole. In doing so, it will be more convenient, if, instead of delineating the papers in their chronological order, I arrange them in groups corresponding to their subject matter.

In the month of January Mr. Geoffrey F. Buxton exhibited two splendid heads of the Wild Sheep of Sardinia, *Ovis musimon*, or Moufflon, which he shot last year on that island. It appears the ignorant natives are doing their best to exterminate these fine animals; but as they have been successfully introduced into Hungary, where their economic virtues are more appreciated than in their island home, Mr. Buxton thinks their complete extinction will probably be averted.

The papers on Ornithology were, naturally, the most numerous, and provoked the most animated discussions. Regrets have sometimes been expressed that ornithology should monopolise so large a portion of the time and attention of the Society; but this is more or less inevitable in a maritime county like ours, with its numerous inland lakes. So far from being a source of regret, it appears to me, we ought to congratulate ourselves upon having so many zealous and eminent ornithologists in our midst, ever ready to avail themselves of the local advantages they enjoy. After all, too, there is a certain fascination about the study of these feathered songsters, which will always make ornithology the most popular branch of natural history. As in past years, so in the present year, we are indebted to Mr. J. H. Gurney, Jun., for several interesting papers on birds. His narrative of a visit to the Farne Islands, hired by Mr. Barclay for the protection of the birds that

breed there, gave us a graphic description of bird-life on that romantic spot. So crowded are the Guillemots on the basaltic pillars, that it seems wonderful their eggs do not roll into the sea; from this, their tapering shape preserves them. The marvellous elasticity of the down used by the Eider Ducks in the construction of their nests is also alluded to. At the October meeting Mr. Gurney exhibited a Dabchick, which had been choked by trying to swallow a Miller's Thumb. In the month of November he gave us a very interesting account of the habits of the Night-jar, accompanied by illustrations. The bristles on the bill of this bird, popularly supposed to aid it in catching insects, are more probably to assist the bird in the utterance of its familiar note, the bristles producing the prolonged jarring sound. An American species, which has no bristles, produces no "jarring." The old bird has a habit of feigning being wounded, to attract intruders from its young and eggs. At the final meeting Mr. Gurney exhibited a specimen of the Tawny Pipit (*Anthus campestris*), netted near Lowestoft.

Colonel Feilden, in the month of May, sent us an admirable paper on the Diablotin of the West Indies, supposed to be identical with the Capped Petrel (*Œstrelata hasitata*), the only British example of which was captured in Norfolk in 1852. Colonel Feilden, after citing various extracts from the old writers on the West Indies, gave an interesting account of his ascent of Morne au Diable, a mountain on which the Diablotin formerly bred. It appears they are now quite extinct there, chiefly in consequence of the ravages of a species of Opossum, inadvertently introduced into Dominica some fifty years ago.

The paper of Mr. Candler and his brother, on Bird-life in the Skellig Islands, two rugged and precipitous rocks off the coast of Kerry, was full of interest, both from the romantic character of the spot, and the remarkable tameness of the Gannets and other sea-birds nesting on these lone islands, one of which is uninhabitable.

Mr. Southwell, at the September meeting, exhibited a young male King Duck, shot at Hunstanton in December, 1888, now at

the Norwich Museum, and a new addition to the avi-fauna of Norfolk.

In October the Rev. E. W. Dowell exhibited a variety of the Brent Goose, known to shore-gunners as the "Stranger Brent," and which he considers a distinct species. At the same meeting Mr. Theobald Cozens-Hardy sent some notes on a Robin and Pied Wagtail, the former of which took possession of the Wagtail's nest and hatched some of its eggs as well as her own.

Mr. W. W. Spelman, in the month of January, exhibited five somewhat rare birds recently shot in the Eastern Counties.

Mr. Patterson's paper on Gulls and Terns, read in the month of November, was the first of a series of very interesting and graphic descriptions of bird and fish life in Great Yarmouth. The clever, and often amusing, pen-and-ink sketches, with which they were embellished rendered them all the more acceptable, and it is much to be desired, in the interests of the Society, that Mr. Patterson's indefatigable zeal as a naturalist may produce the same good fruits in the future as it has in the past.

Lastly, in the month of February Mr. Ogilvie contributed a paper on the Diurnal Habits of the Manx Shearwater, as seen by him in the neighbourhood of St. David's.

Fishes rank next to birds in popularity among our working members, which is only natural considering the locality in which we live.

Mr. Southwell's paper on the Herring Fishery is an annual event to which we all look forward, and as it will doubtless be printed *in extenso*, I need make but few remarks upon it. The burden of Mr. Southwell's song is that there has been an extraordinary glut of fish this year, with a consequent ruinous depreciation in the value of the commodity. It would be only logical to assume the public at large gained some advantage from this remarkable plethora of Herrings; but judging from the discussion that ensued, this does not appear to have been the case. In the month of May Mr. Southwell reported the occurrence of two fishes, new to the county, both of which had been found by Mr. Arthur Patterson, of Yarmouth, in the refuse left by the draw-netters on the beach, viz.,

Scopelus mulleri and the Four-bearded Rockling. Mr. Southwell exhibited also, at the October meeting, what is known as a "Double Turbot," sent also by Mr. Patterson.

Mr. Patterson's interesting notes on fishes observed by him in his beach rambles at Great Yarmouth have already been referred to under the head of ornithology.

Only two communications were devoted to the Mollusca. Lord Walsingham's paper on an abnormal species of *Pholas candida*, one of the Bivalve Mollusks, was read in the month of January. Some letters of Dr. Goodall, Provost of Eton, to Lady Walsingham, written as long ago as 1822, on this variety, were appended to the paper, and though more than half-a-century old, were highly instructive, Dr. Goodall having been one of the best conchologists of his day.

Mr. Edwards, in the month of April, exhibited three species of Mollusca, new to the English list, viz., a Physa and two Vertigos.

Mr. Geldart's eloquent and truly scientific lecture on the Pycnogonidæ, illustrated by diagrams on the black-board, gave us a very clear and lucid insight into the minute anatomy and physiology of these tiny Arachnidians. Notwithstanding the difficulty and abstruseness of the subject, Mr. Geldart's remarks were listened to with rapt attention by his hearers.

There were only two contributions in Entomology. Mr. Bridgman, however, is a host in himself, so that his admirable paper on Hymenoptera atones in no small measure for the meagre number of communications on this highly important branch of natural history. Still it seems a pity more attention is not bestowed upon the subject, considering how deleterious to the material interests of mankind are not a few members of the class Insecta.

In September Mr. Bidwell exhibited a specimen of *Bombyx pernyi*, a caterpillar used in China for producing silk. They are described as being very beautiful, and not difficult to rear, feeding freely on the English Oak.

Our botanical members have, with one or two exceptions, been resting on their oars during the past year. Let us hope the

memory of Smith, Lindley, Hooker, and other Norfolk worthies, may revive their flagging energies during the present year, and induce them to try their best to outdo their zoologieal rivals.

At the Oetober meeting Mr. C. Plowright sent some notes on *Schæleria delastrina*, a parasitie fungus found on the *Veronica arvensis*.

At the final meeting in February Mr. Bidwell exhibited a sample of the Taro Powder of the Sandwieh Islands, a starehy substanee prepared from the root of an araeeous plant, *Colocaria esculenta*, and whieh makes very good puddings when baked with eggs and sugar; the aerid properties peeuliar to the roots of all plants of this order being destroyed under the influenee of heat. The root of our eommon Arum is also edible when suffieiently roasted.

At the same meeting Mr. O. Corder sent some notes on the Hellebores, with eut speeimens of several speeies. He exhibited, also, a pot of *Narcissus cyclamineus*, a native of Portugal, that had been lost sight of for two hundred and fifty years until its re-diseovery by Mr. Tait of Oporto.

Mr. Foord's paper on Amber, illustrated by means of several beautiful speeimens, was heard with mueh interest.

The only geologieal paper was one by Mr. R. E. Leaeh on the Crag Formation at Yarn Hill, near Southwold, illustrated by about eighty-five speeies of shells. A eolleetion of fossil seeds from Pakefield was also exhibited on the same oeeasion.

Mr. Plowright read a paper on the Damage done by the Rime Frost in January, 1889, in the neighbourhood of King's Lynn. Under the ponderous weight of innumerable little ieieles, large branehes of trees were broken off in every direetion. A series of exeellent photographs of trees thus mutilated, aptly illustrated the destruetive influenee of the rime.

In the month of May some twenty or thirty members of the Soeiety made an exeursion to Ringland under the most favourable auspiees, as regards the weather, and that genial hospitality so often bestowed npon us by our eountry friends. What with the natural beauties of the seenery, the art treasures of Morton Hall, and

the kind hospitality of the Rev. J. L. and Mrs. Le Pelley, a most enjoyable day seems to have been spent by all those who were fortunate enough to have time and leisure to participate in the excursion. I entirely agree with my predecessor in this chair, that it would be a thousand pities if these summer outings were discontinued on account of an apparent lack of interest on the part of the members at large. It has occurred to me that increased interest might be given to these excursions if it were made an invariable rule, that some able botanist, well acquainted with the locality, should accompany the party on each occasion, and point out to them the chief floral treasures of the district. Under the inspiriting influence of such a pioneer, some real work might be done, whilst botany would be very likely to acquire a number of fresh recruits. Botanical zeal is a highly contagious quality, and to use the words of Thomas Carlyle, I have in my mind's eye a certain author, or rather individual, who twenty-five or thirty years ago was the most enthusiastic and indefatigable of botanists, and who derived his botanical ardour, exclusively, from the botanical proclivities of a school chum.

In the late Surgeon-General Francis Day, who died on the 10th of July, 1889, our Society has lost a distinguished member. Dr. Day visited Norwich at the Fisheries' Exhibition here in 1881, and then became a member of this Society, and continued to take great interest in its work, contributing a paper to its 'Transactions' in November, 1886, on some remarkable Eels from Saham Mere. Mr. Day also evinced his interest in the Society by presenting us with his magnificent work on the 'Fishes of India.' It is not necessary here to mention all the works which he has left as mementos of his great knowledge of ichthyology; but the one which will be most generally useful will certainly be his 'British Fishes,' finished in 1884, which will long remain the standard work on that subject. Mr. Day was conscious of the fatal nature of the painful malady from which he suffered, and made during his life a judicious disposal of his books and specimens. Only two months before his death, Mr. Southwell received a letter from him, which, although his daughter wrote that he was "too ill to

do more," the important four lines were written by his own hand.

One more gap has occurred in our ranks during the past year, and that of a most amiable and excellent man and naturalist, who, although known to comparatively few of the present generation of naturalists, will, indeed, be missed by those who had the privilege of his friendship. Mr. Frederick Bond died at his residence at Fairfield Avenue, Staines, on the 10th of August, 1889, at the advanced age of seventy-nine years. Mr. Bond was not much given to writing, but was a constant correspondent to the 'Zoologist,' of which journal he was one of the founders, his first communication appearing in 1843, and his last in 1889. But if he published little, his vast experience was at the service of all who sought his help; and how great his store of information was may be readily imagined, when it is remembered that he was blessed with ample means to enable him freely to indulge the keen love of out-door observation which was his greatest delight. Mr. Bond possessed rich collections of birds and eggs. The latter, simply invaluable, as representing many British localities in which the species have long ceased to breed, was unfortunately disposed of some years ago, and has been removed to France.

As the reader of the annual address is expected, at the close of his review of the current events of the year, to enlarge on some topic with which he is more or less familiar, I fear I cannot escape obtruding upon you some rather crude notions of my own on a branch of natural history, somewhat recondite it is true, and yet inferior to none in the important relations it bears to the material interests of mankind. Many of my hearers will doubtless remember the very eloquent address on Pathogenic Bacteria, delivered in this room a few years since by one of my predecessors in this chair, Sir Peter Eade. It has occurred to me I might profitably follow in the footsteps of my distinguished colleague, as although I cannot hope to emulate his eloquence and scientific acumen, I have at least this advantage over him, viz., that our knowledge of these baneful micro-organisms has very materially increased since the date of his address. The fierce light of science

has been beating uninterruptedly about these microscopic vegetables, and many important discoveries have been made, although we are still, as it were, merely on the borders of the dark continent, if I may so call it. Some idea may be formed of the importance of the subject, when I say that not less than 160,000 persons die annually in the United Kingdom of bacterial disease, nearly 90,000 of whom succumb to the attack of a single one of these tiny organisms, viz., the Tubercle Bacillus. It is not surprising, then, that bacteriological laboratories have sprung up in all parts of Europe, so that even England has been obliged at last to follow the example of France, Germany, and semi-barbarous Russia—as she is often called, I know not why. The work done in this country has, up to the present, been infinitesimal compared with that achieved abroad. Whether it is that English doctors feel few attractions for a study that must be considered an unprofitable one from an £ s. d. point of view, or that the stringent laws in vogue against vivisection have pretty well strangled scientific research in this direction, I know not; but certain it is, that for one line devoted to bacteriology in an English medical journal, at least a hundred are to be found in the medical journals of the Continent. To give a practical illustration of my remarks I may say, that a few weeks since, wishing to obtain some recent English work on this important subject, I was obliged to content myself with a treatise published not less than five years ago.

Premising that many of my hearers have little or no knowledge of the subject, I may say that Pathogenic Bacteria or Microbes, as it would be more correct to call them, have been divided by Cohn into Micrococci, Bacteria, Bacilli, and Spirilla. The micrococci are globular or spherical. When two of them are joined together, dumb-bell fashion, they are called Diplococci. When several are strung together in a row, they are styled Streptococci; and when a number of the microscopic spherules are massed together like a bunch of grapes, they receive the appellation of Staphylococci. Bacteria, in the more limited sense of the term, are short rods, whilst the bacilli are elongated rods. It is thus obvious that the

bacteria are morphologically intermediate between the micrococci and the bacilli. The spirilla have, as their name implies, a spiral form. The micrococci are said to abound in the atmosphere, comparatively few being found in sewer air, whilst the reverse holds good as regards the bacilli. The medical bacteriologist does not, however, rely exclusively upon the morphological characters of the micro-organisms he suspects are the causes of disease, in which case he would be often led into error, as it is self-evident the mere outside form and contour of these lowly organisms must present infinitely less variety than is met with in the higher forms of vegetable life. It seems astonishing, and well-nigh incredible, that these lowly organisms react so differently when subjected to various physical and vital tests. Some are readily stained by this colouring agent, others by that. Some grow freely in this nutrient fluid or solid, others in that. Some liquefy gelatine, others do not. The growth or multiplication of some is slow, that of others rapid. Last, not least, there is the inoculation test. One of the inferior animals is inoculated with a pure cultivation of the microbe under investigation, and, if a specific disease manifest itself, the causal relation between the microbe and the malady in question does not admit of any doubt.

As it would be impracticable to describe all the micrococci and bacilli met with in disease in the short time allotted me for this address, I must limit your attention to those disease-germs which are the cause of constitutional diseases, leaving out of sight those which act only locally on the body, as well as those which, though believed by some, are not yet universally acknowledged as the prime factor in the disease they are supposed to generate.

The micrococcus of Erysipelas is a streptococcus, that is to say, the individual cocci are clustered together after the fashion of grapes on a bunch. There can be little doubt of its causal relationship to erysipelas, and the fact the disease so often springs up spontaneously, as it were, shows that the micrococcus of erysipelas is not an obligative parasite, but is capable of existing outside the bodies of men and animals, on dead organic matters. About 2,400 persons die annually of this disease in the United Kingdom.

The diplococcus of Croupous Pneumonia was discovered by Friedländer, and is often called the Micrococcus of Pneumonia, or, more shortly, Pneumococcus. In the last year or two another diplococcus has been observed by Fraenkel in the expectoration of pneumonic patients, which he and some others consider the specific cause of the malady. In England Friedländer's diplococcus still holds its ground, but on the Continent that of Fraenkel is beginning to find more favour in the eyes of bacteriologists. The diplococcus pneumoniæ of Friedländer can be cultivated outside the body. As the disease does not generally show itself infectious, the micro-organism is clearly saprophytic. Every now and then, however, pneumonia appears endemic in certain localities, whereby its infectious character is clearly demonstrated.

The micrococcus of Gonorrhœa, called also Gonococcus, is an obligate parasitic microbe, and cannot exist for an indefinite period of time outside the body, although it may be readily cultivated in nutrient media. It does not seem a very unreasonable expectation that this formidable microbe might entirely be banished from our globe, if popular governments were not so excessively sentimental.

Staphylococcus pyogenes and *Streptococcus pyogenes* are very intimately connected with suppuration or the formation of pus. When a wound heals badly, they are generally the cause of the mischief. When a patient, after an operation, is attacked with that terrible malady Pyæmia, one or other of these microbes has almost certainly found its way into his system. Being saprophytic, and apparently omnipresent, mankind are ever liable to their attacks. The immense progress which surgery has made during the last decade or two is mainly due to the rigid exclusion of these two microbes from operation wounds. Operations that in my student days were almost invariably fatal, however skilfully performed, are now carried out with comparative impunity by a vast number of surgeons. The pyogenic streptococcus and staphylococcus can both be artificially cultivated outside the body, and always set up suppuration when inoculated into living animal tissues.

The pathogenic baeilli are, upon the whole, more remarkable and interesting than the mieroeocei.

The *Bacillus anthracis*, the cause of that disease whieh is variously called Anthrax, Charbon, Splenie Fever or Woolsorter's Disease, has, perhaps, been more closely studied and investigated than any other morbid germ. Fortunately for us Englishmen, anthrax, at least in the human subjcct, is an almost unknown disease in this eountry; but as it is pretty eommon in Russia and some other eontinental states with whieh we have eommercial relations, its introduction eannot be considered impossible in view of the extraordinary tenacity of life of this mierobe, at least in the dry statc. Pasteur's researehes seemed to show that not even the interment of animals that have died of anthrax does away with the risk of infection, the germs being brought again to the surfaee of the ground through the intervention of earth-worms. More reeent researehes, however, show that the baeillus of anthrax does not long retain its vitality when buried in the earth; so that it is unnecessary to burn the bodies of animals dead of this disease, as is generally reeommended. On the other hand, the anthrax baeillus ean endure a temperature of 150 degrees below zero without losing its vitality, whilst its spores remain unaffected even when exposed to a dry heat of 253 degrees. It ean be eultivated in artifieial nutrient media, and its virulenee gradually attenuated like that of the virus of hydrophobia by eultivating it at high temperature. Henee the inoculation of cattle with the attenuated virus of anthrax has been proposed and aetually carried out in Russia, where the disease prevails extensively. The general results have been satisfaetory, although in one instance, a large herd of cattle was entirely destroyed through some supposed error in earrying out the proeess of attenuation.

The bacillus of Cholera, ealled also the Comma bacillus, from its resemblanee to a eomma, was diseovered by Koch, the famous Berlin bacteriologist. It is really a spirillum rather than bacillus; and ean be eultivated artificially in nutritive media. Contrary to popular belief, the germs are not introdueed into the system by means of food or drink, as whenever they have been thus introdueed

into the stomach of animals, the gastric juice of that organ has invariably destroyed them. It is highly probable that they are conveyed into the lungs with the inspired air, and find their way from thence into the blood, where, however, they remain but a short time. Koch, and other competent observers, declare that the intestinal canal is the only part of the body in which they can be found, and that they have sought for them in vain elsewhere. If this is actually the case, the task of destroying these germs within the body will be much simplified, as it is obvious that the intestinal canal is more amenable to the direct action of germicides than any other part of the organism. In fact, there is good reason to hope an effectual antidote will be discovered, sooner or later, for this fell disease.

The *Bacillus tuberculosis*, the bacillus of Tubercle or Phthisis, claims, beyond all doubt, more British victims than any other pathogenic micro-organism yet discovered. Bacteriology is sometimes regarded as a kind of modern scientific fad that will have its brief strut upon the stage, and then be gathered to its fathers in the waste-paper basket. But I venture to say he would be a bold man who averred, in the face of the scientific researches of the last decade or so, that a vast army of our countrymen are not done to death every year by this tiny micro-organism, and that every one of these numerous victims might have indefinitely prolonged his or her life, if only society took more cognizance of the fact, that tubercle, in all its various forms, is an infectious disease. The bacillus of tubercle can be cultivated only on stiffened blood-serum or in infusion of meat; and is remarkable for its slowness of growth or multiplication. It is present in a very large proportion of cases in the expectoration of phthisical patients; and as desiccation during a period of one hundred and eighty-six days does not impair its vitality, these dried-up sputa are, no doubt, one of the most fruitful sources of the propagation of phthisis and its congeners. The milk of tuberculous cows often contains these bacilli, and in all probability a great many children imbibe the disease in this way. Boiling the milk is an unfailing prophylactic, or preventive, in such cases. The flesh of tuberculous animals

also abounds in bacilli, but only those parts of the body where the disease is in active progress, hence it is not necessary to condemn the entire carcase of a tuberculous ox. In almost every country in Europe strenuous efforts are being made to find some antidote or germicide capable of destroying the tubercle bacillus within the body of its victim without destroying the victim himself at the same time. Hitherto these efforts have not been crowned with that success which seem their just due. From a theoretical point of view, it does not seem a very difficult task to annihilate the bacillus within the body itself. Outside the body it can be readily destroyed by a slight admixture of carbolic acid with the nutrient medium in which it is being cultivated. A proportionate quantity of carbolic acid introduced into the human system would not injuriously affect it, and ought to be equally destructive to the bacillus as it proves outside the body. But in practice it is quite different. Unfortunately, the carbolic acid is removed so fast from the system, by means of the excreting organs, that the bacilli never get their due share of the germicide. Attempts to destroy the bacilli in the lung itself, by means of local injections into those organs, have been very successfully carried out by one eminent Russian physician, but the general experience of the profession is adverse to the practice. The one great moral to be learned from our acquaintance with the bacillus of tubercle is this, that the disease is an infectious one. Being forewarned, we shall be forearmed, and not come into too close relations with the dried sputa of phthisical patients, and unboiled cows' milk that may be swarming with tubercle bacilli.

The *Bacillus leprœ*, or the bacillus of Leprosy, bears a very close resemblance to that of Tubercle, but happily does not find itself at home in Old England. One of the most hotly disputed points in medicine has been whether leprosy is a contagious or hereditary disease. The discovery of the leprosy bacillus seems to have settled the point in favour of the contagious character of the malady.

The bacillus of Typhoid Fever is one of the more recent bacteriological discoveries. Eberth, and after him Koch, found

this bacillus in the bodies of almost all persons dying of this fever But contrary to what might have been anticipated from clinical experience, the bacillus has not been discovered in the intestinal canal, though present in most of the abdominal organs. The medical profession has always looked upon the excreta of typhoid patients as the chief source of danger; but this can hardly be the case if the typhoid bacillus is invariably absent from them. Strange to say, all attempts to induce typhoid fever in the lower animals, by inoculating them with these germs, have proved ineffectual. It is not a little strange, too, that the typhoid bacillus, although it can be artificially cultivated in nutrient media, does not occur spontaneously outside the body of its victims, either in drinking-water or elsewhere. The fact that the germs perish quickly in clean water, puts an end to the foolish notions everywhere prevalent that impure drinking-water is the chief cause of all our infectious maladies. Having been called upon so often to analyse drinking-water that could not possibly, in the very nature of things, contain any disease germs, I speak rather feelingly on the subject. Let us by all means have the purest drinking-water we can get, but not jump to the irrational conclusion that infinitesimal amounts of dead animal or vegetable matter in the water we drink can produce, at their own sweet will, any one of half-a-dozen or more specific infectious maladies.

The bacillus of Tetanus discovered by Nicolaier is ignored by most English writers on Bacteria. On the Continent it is pretty generally recognized as the *contagium vivum* of Tetanus or Lock-jaw. It has been found outside the body in garden soil and gravel, a fact which explains why persons are attacked with tetanus without having come in contact with patients suffering from the same malady. The risk of tetanus is, therefore, omni-present; and it is impossible to foresee whether a slight wound will heal up in the ordinary way, or be the precursor of this almost invariably fatal malady. When the lower animals are inoculated with Nicolaier's bacillus, tetanus always ensues.

The bacillus of Glanders, discovered by Schütz and Loeffler in 1882, is generally recognized, at present, as the cause of that

disease. When a pure cultivation of this bacillus is inoculated into the nasal cavity of any of the lower animals, it invariably produces typical glanders. Happily for us, this dreadful disease is almost unknown in Great Britain, at least in the human subject.

Two micro-organisms, the *Bacillus malariæ* of Klebs, and the *Plasmodium malariæ*, discovered by Marchiafava in Italy, are looked upon by many as the chief factors in the origin of Ague or Intermittent Fever. The latter of the two micro-organisms is found in the red blood globules of patients affected with malaria; but as pure cultivations of the *Plasmodium* have not yet been obtained, positive proof of their being the prime factor in the disease is still wanting. The *Bacillus malariæ* has been found in the soil of the Pontine Marshes, near Rome, where malaria is very prevalent; but I am not aware that it has ever been found in the bodies of malarial patients.

There are only two pathogenic spirilla of any importance. They are—

The spirillum or *Spirochæte obermeieri* named after its discoverer, Obermeier, which gives rise to Relapsing Fever, one of the Continued Fevers, allied to Typhus Fever. This microbe cannot be cultivated outside the body, and all attempts to inoculate the lower animals with it have been unsuccessful; although the disease is readily conveyed to man and animals when they are inoculated with the blood of a fever patient containing the *Spirochæte*. The microbe disappears from the blood during the febrile remission, and re-appears again during the period of relapse. The disease is unknown in England, but I saw a good deal of it in Berlin during the Franco-German war, and a very formidable and fatal malady it seemed.

The spirillum of Cholera has already been referred to under the head of bacilli.

There are one or two other vegetable micro-organisms on my list, about which I should have liked to say a word or two, but time will not permit me to do so. With regard to the way in which these various disease-germs destroy life, it is not supposed now-a-days that the microbes themselves are the direct cause of

death. It is conjectured that they elaborate some toxic principle in the blood which gradually poisons the whole system. This toxic principle may very possibly be some product of their own decomposition; just as man himself secretes a noxious effete principle, called urea, which, if retained in his blood, speedily brings about his dissolution. It is even supposed this toxic principle may be the ultimate cause of the death of the microbes themselves, and the patient's final recovery. To adopt the trenchant language of Prince Bismarck, nature leaves them to stew in their own juice. It seems to be a neck-and-neck race between the microbes and the patient, which shall hold out the longest. If the microbes sicken and die first, the patient recovers; if the microbes, on the contrary, retain their vitality, the patient succumbs. This is, no doubt, a somewhat crude pathology, but I suspect there is an element of truth in it.

The pathogenic bacteria are still masters of the field, notwithstanding all the efforts of their enemies, the bacteriologists. However, the latter are diligently taking the measure of their adversary, and endeavouring to find out some loop-hole in his defensive armour. If it has cost electricians, such as Edison, years and years of patient study and experiment to perfect the electric light, bacteriologists must not expect to solve their far more complex and difficult problem in a single decade. One thing, at least, is certain, that we stand on far more solid ground than our predecessors did. We, at least, know with what we have to deal. We can put our enemy in a cage, as it were, feed him with the bread and water of affliction, and see what he can and what he cannot stomach. We have no longer to deal with a set of vague symptoms, the mere outward manifestation of the disease, but with the veritable essence of the disease itself. Hitherto the besiegers have limited their offensive operations to the mere outworks of disease, but henceforth the citadel itself will have to bear the brunt of battle.

I.

ON THE RIME-FROST OF JANUARY 1889, WITH SPECIAL REFERENCE TO THE INJURIES CAUSED BY IT TO THE TREES IN THE NEIGHBOURHOOD OF KINGS LYNN.

By Charles B. Plowright, F.L.S., M.R.C.S.

Read 29th April, 1889.

After nine consecutive days of rime-frost in the vicinity of Kings Lynn, the fog, which had been more or less present during the two preceding days, lifted for a few hours on the morning of Sunday, 6th January, 1889. When the sun came out, there was displayed to us such a magnificent spectacle of rime-frost, that the least observant could not fail to admire it. One of the first effects of this, to attract attention, was the fact that the overhead telephone wires, all over the town, were broken down by it. By far the most beautiful objects, however, were the trees. The grand avenue of Horse Chestnuts and Limes, which is the favourite ante-prandial promenade on Sunday mornings, was simply gorgeous with rime—a perfect fairyland of icy crystals.

The rime itself was deposited upon almost every object in a very striking manner. On the trees, for instance, each twig was encircled by crystals; but these were much more pronounced upon one side, so that the twigs appeared to be fringed with rime. This unilateral fringe varied in length from one and a half to two inches. Towards the base this fringe was solid and compact, but towards its free edge the crystals were elongated and distinct

from one another. A piece of wire-netting, stretched along the side of a field at Wolferton, was transformed into a sheet of gigantic honey-comb of hoar-frost, the cells of which were confined to the south side, and were an inch and a half in depth. The telegraph wires were converted into ribbons of icy crystals, not into cables; and so heavy was the deposit upon them that, out of the fourteen which emanate from the Lynn Post Office, only one was in working order on the morning of the 7th.

The fringe of rime upon all the objects pointed either south or south-west, and it was upon this side of the trees that the branches were broken. Those trees which occupied isolated positions, either in fields or by the road-sides, suffered most injury from the breaking of their branches by the weight of the rime deposited upon them. In woods and plantations the trees, for the most part, escaped damage, those only on the south or south-west margins of the woods being injured. The total weight of the rime which the branches of some of the trees sustained must have been enormous. Many persons noticed how the arms were gradually bent down more and more as the rime accumulated, until at last they gave way. This Mr. Herbert G. Ward witnessed on the morning of the 6th, with some Black Poplars, at Terrington St. Clements. At Congham Miss S. A. Pung was struck by the remarkable manner in which the branches of some Oak trees, standing in a hedge on the south side of a narrow lane, were bowed down to such an extent as to touch the hedge on the opposite side of the road, so that travellers along this lane passed beneath an arching canopy of hoar-frost. The boughs began to break off the trees as early as the evening of the 5th. At about 5.20 p.m. on this date, a very large limb broke off one of the fine Elms opposite Middleton Hall. The Honourable Miss M. Milles measured this arm, and found it to be 1 foot 10 inches in diameter. It was, however, not perfectly sound. On the morning of the 6th many persons witnessed the fall of branches from various trees. The morning was perfectly still. Mr. Charles Bristow heard and saw a branch break off a Birch tree on South Wootton Heath at about 11 a.m. Mr. S. N. Marshall, at his house at West Lynn, watched the fall of the branches, one after another, from a number of Black Poplars which surround his garden, at various times during the day. On the following Monday, Mr. Alfred Burlingham

watched the fall of Poplar branches while he was skating at Islington.

To show the extent to which the trees were injured, it may be remarked that after the rime, when Mr. Marshall had the *débris* from his Poplars gathered up and made into fagots, no less than two waggon-loads had to be removed. A party of ladies and gentlemen, driving from North Runcton Hall to Narford Lake on Monday, were considerably inconvenienced by the fallen branches upon the roads, and not a little alarmed when passing under some of the more heavily laden trees. On the Tuesday morning the carriers' carts coming in to Lynn Market found the roads in some places so obstructed by branches, which had fallen during the night, that the passengers had to get out and clear the *débris* away before they could pass.

It is worth while to mention that, although no equally severe rime has occurred in our time, yet, about thirteen years ago, trees were broken to some extent by a rime. This occurred in Marshland. Mr. C. Peek, of Tilney, remembers that, while driving to Terrington St. Clement, he was in considerable jeopardy from falling branches. Mr. S. Egar, of Thorney, also remembers the Black Poplars being broken on that occasion.

The tree-injuries may be taken as a measure of the amount of rime deposited. It is interesting to observe that these injuries did not occur in the neighbourhood of Kings Lynn with anything like uniformity. Of course I have not visited every nook and corner where trees grow, but since the rime I have driven along all the main roads leading from Lynn, and being considerably interested in the subject have kept a look-out for the rime injuries. In Marshland generally the injuries have been pretty uniform in their distribution; the Black Poplars, which are generally grown in this district, showing clearly enough that the deposit upon them was very heavy. But when one comes to the higher lands, the distribution of the injuries varies markedly. For instance, in, and immediately around, the town itself, very few trees were broken; but as soon as we ascend either along the Gaywood, the Middleton, or the Gayton roads, we begin to meet with broken branches. It seems as if the fog, coming out of the low lands, congealed upon the first trees it encountered; but that a few miles farther on, towards the higher ground, the injuries became

Oak Tree on the Shortrees Road, Castle Rising, broken by Rime, January 1889.

From a Photograph by Mr. Herbert Tilson.

gradually less in number, until they almost disappeared. The fog from the valley of the Gaywood river, for instance, settled upon the Elm trees on the Wootton road, so that those near the second milestone were very much broken. Then, again, on the Shortrees Hill, on the road from Rising Lodge to Shortrees, the fog from the low-lying Roydon Fen settled heavily upon them, and for about a mile and a half, on both sides of the road, the Oaks and Elms were shattered by it. So, again, the fog from the low lands of West Winch and Setch drifted towards Middleton, and its effects began to be visible from the hill at North Runcton to the village of Middleton. Beyond these points in the higher lands at Massingham, Harpley, etc., scarcely a broken tree is to be seen.

The particular trees suffered in different degrees, and the injuries were characterised by certain peculiarities that are worth noticing.

Black Poplars. No trees suffered more than these did. The branches broken were, for the most part, large ones, which almost invariably broke off, and fell to the ground. Very rarely did a broken branch remain attached to the tree. One instance of this was observed at Saddlelow, and photographed by Mr. Herbert Tilson, who was kind enough to take a number of photographs for me of broken trees. Sometimes a large branch snapped off short, and was caught at one of its bifurcations upon a lower branch, and hung in an inverted position in the tree, with its broken end pointing towards the sky. (West Lynn. Roydon.)

Oaks. Great numbers of Oak trees of all sizes received injury by the rime. As a general rule, several branches of medium or small size were broken on each tree. These broken twigs and branches remained hanging to the trees for weeks and months, until in fact they were intentionally removed. The fractures occurred either in the continuity of a branch, or where a small bough joined a larger one. The latter were the more frequent, especially with the twigs and smaller branches. This is clearly shown in the specimens sent with this communication, where it is obvious that the branches have given way at their junction with a larger branch, simply because of the weight they had to bear. In other cases, where the weight was not quite sufficient to break off the branch entirely, it gave way partially, the fractures being longitudinal, so that when the thaw came, the injured branch returned to its original position by its inherent elasticity, as soon

as the load of rime was removed. It may be taken that where more than one of the smaller branches are broken upon an Oak tree, and remain attached, but hanging down, that the injuries have been caused by rime rather than by wind. The accompanying photographs, from trees at Middleton and Castle Rising, show very characteristically these rime injuries.

Elms. These trees, too, suffered very considerably. The injuries were of two kinds. The most common consisted in the fracture of a number of small or medium-sized branches, which were broken down, but remained attached to the trees. The attachments, however, were not nearly so firm as was the case with the Oak-boughs, as most of the branches were blown down from the Elms during the month of March. There are, however, still many broken branches hanging upon Elms at South Wootton, Castle Rising, Middleton, West Lynn, and Gayton, at the time of writing (13th April). The other injury to the Elms was less frequent, and consisted in the breaking off of large arms from the trunk of the tree. These fell to the ground, unless they happened to be caught in the tree, as in the photograph which was taken from a tree in Mr. Herbert Garnett's meadow at Middleton.

Birches. These trees suffered in their upper branches principally. The fractures were almost always at the junction of the boughs, as the photographs from South Wootton Heath show. Near Wolferton Station nearly the third of a small tree was thus broken off. This fell to the ground.

Willows. Suffered in their larger limbs almost entirely. These snapped off short, and fell to the ground. The photograph is from Castle Rising, and shows the broken-off arm on the ground.

Weeping Willows. Several of these trees in Mr. Marshall's garden lost large branches, which fell to the ground.

Scotch Firs. Comparatively few were injured at all, although they seemed to be as much loaded with rime, at Wolferton, as any other tree, yet, out of the hundreds at Wolferton and Sandringham, I only saw one which was injured, and that had lost but a single branch. At Hillington, however, Sir William Ffolkes pointed out to me an isolated tree which had lost three large arms. I also saw several trees broken on the south side of the Shortrees plantation.

Alder. One broken tree was observed at Middleton.

Ash. This tree escaped in an extraordinary manner. One lost an arm at Congham, another had a rotten arm broken off at Rising, and a Pollard tree was broken at Setch, but these were exceptions. It was curious to see Oaks and Elms with dangling branches on the road sides; but the Ashes, although many of them were loaded with their still attached fruit, standing intact. The cause of the escape of the Ash trees from injury is that they possess relatively so few small twigs as compared with the Elms and Oaks, so that the collective weight of rime which each Ash tree bore was much less than either of the other two.

The Evergreens, Laurels, Hollies, Yews, and Conifers generally, all escaped injury; the action of rime-frost herein contrasting strongly with that of snow.

No Sycamore, Plane, or Beech, was seen by me to be injured.

II.

THE DESERTED DOMICILE OF THE DIABLOTIN IN DOMINICA.

By Colonel H. W. Feilden, F.G.S., C.M.Z.S.

Read 18th May, 1889.

At first sight, it may appear somewhat incongruous that the time of the meeting should be occupied in reading a paper on a species of bird whose head-quarters appear to have been the West Indies and Caribbean Sea; nevertheless the Diablotin possesses a peculiar interest in connection with the county of Norfolk, for there can be little doubt that the Diablotin of the French Creoles of Guadeloupe and Dominica is identical with the Capped Petrel (*Œstrelata hæsitata*, Kuhl), the only specimen of which ever obtained in Britain was the example captured at Southacre, near Swaffham in Norfolk, during the spring of 1850.

Mr. Howard Saunders in his lately published Manual of British Birds thus refers to the occurrence of the species in Europe :—

"In the Museum at Boulogne there is a Capped Petrel *said* to have been shot near that town many years ago by its donor, a sportsman long since deceased; and Mr. W. Eagle Clarke has identified a specimen in the Buda-Pesth Museum which, according to Dr. Madarász was killed near Zolinki in North Hungary in 1870; but in neither case can the pedigree be considered quite satisfactory. No other occurrences are recorded from Europe, and in fact little is known of the distribution or head-quarters of this species. An example from Hayti is in the British Museum; Paris has three, obtained by L'Herminier in the island of Guadeloupe, where, however, Mr. Ober failed to rediscover the bird: there is a fourth in Paris, and a fifth is in Leiden, from unknown localities; while in the United States a wounded individual was picked up on a salt lagoon on the east side of Florida in 1846, and another was shot on Long Island in July 1850, after a severe storm. It is almost unnecessary to add that we have no information respecting the breeding-habits of this species, but it probably resorts to burrows in the mountains of tropical islands."

The proof that the Diablotin and the Capped Petrel are identical, rests chiefly on the evidence brought to bear on the subject by two French naturalists, L'Herminier, who resided in Guadeloupe fifty years ago, and who corresponded with and sent specimens to De Lafresnaye residing at Falaise in Normandy.

That L'Herminier and Lafresnaye recognised the Diablotin of Père Labat as inhabiting Guadeloupe is evident, for the latter writes in the 'Revue Zoologique' for 1844 (p. 168) as follows :—

"Une espèce de Petrel, le *Petrel Diable*, du père Labbat [*sic*] Diablotin à la Guadeloupe, *Procellaria diabolica* L'Herminier, qui y arrive vers la fin de septembre, y niche en décembre dans les Falaises."

Lafresnaye's collection contained three specimens of this Petrel (Nos. 8000 to 8002 of his lithographed catalogue) received no doubt from L'Herminier, which collection, after the death of Lafresnaye, was sold to the Natural History Society of Boston, Mass. The Museum of the University of Cambridge subsequently obtained in exchange one of these specimens, which, on the authority of Professor Newton, is undoubtedly *Œstrelata hæsitata*, the Capped Petrel.

During my residence in the West Indies, in the years 1888–89, I felt extremely desirous of exploring those localities in the island of Dominica which are known to have been formerly visited by

the Diablotin, for the purpose of reproducing its race; that island, with Guadeloupe, being the only two places yet known to naturalists, which were for a certainty resorted to during the breeding season. The young of various species of Petrels appear to have been considered useful articles of diet by our ancestors. The nestlings of the Manx Puffins are mentioned by Ray, Willughby, and Pennant as such; and the young of the same species are, at the present day, looked on as one of the choicest morsels among all the feathered visitors to the Færoe Islands, and their capture is guarded by laws and local regulations. Hughes, in his history of Barbados, published in 1750, describes the breeding of the colony of birds on a little coral rock off the north-west shore of Barbados, and how greatly the young were, in his day, esteemed for the table. I am happy to say that, though nearly a century and a half has elapsed since Hughes published his work on the natural history of Barbados, its colony of Audubon's Petrel, as I have recently found the species to be, still flourishes on the Bird Rock, apparently in undiminished numbers.* It was the esteem for the flesh of the Diablotin, by the French and Creole inhabitants of Dominica and Guadeloupe, that has been the means of handing down to posterity very exact and minute accounts of this bird, and its habits at their breeding-stations.

The earliest notice of the Diablotin in the French Antilles, with which I am acquainted, is that of the Père du Tertre, "Missionaire Apostolique dans les Antilles," who gives a short account of the Diablotin in his great work on the 'Histoire Generale des Antilles,' published at Paris, 1666—71. It is to be found at page 257 of the second volume, which is devoted to the 'Histoire Naturelle des Antilles habitées par les François.' The good father appears to have had but a very meagre personal acquaintance with the bird, though he resided five or six years in Guadeloupe. He writes as follows :—

"Le Diable est un oyseau nocturne, ainsi nommé par les habitans des Indes, à cause de sa laideur. Il est si rare, que ie n'en ay jamais pû voir un seul, sinon de nuict, & en volant. Tout ce que j'en ay pû apprendre des Chasseurs, est que sa forme approche fort de celle du Canart, qu'il a la veuë affreuse, le plumage meslé de blanc & de noir; qu'il repaire dans les plus

* See 'Ibis,' 1889, pp. 60—63.

hautes montagnes, qu'il se territ comme le lapin dans des trous qu'il fait dans la terre, ou il pond ses œufs, les y couve & y éleve ses petits, ie n'ay pû apprendre de quelle viande il les appâtelle. Quand il paroist de jour, il sort si brusquement qu'il épouvente ceux qui le regardent. Il ne descend jamais de la montagne que de nuict, & en volant, il fait un certain cry fort lugubre & fort effroyable. Sa chair est si délicate, qu'il ne retourne point de Chasseurs de la montagne, qui ne souhaite de bon cœur avoir une douzaine de ces Diables pendus à son col."

Père du Tertre first landed in the West Indies in the year 1640. He returned to France in 1642, on the affairs of his mission, and re-embarked for the West Indies in December of the same year; he certainly remained in the West Indies till 1656. He remained five or six years in Guadeloupe (vol. ii. p. 305).

Next on the list of our informants is the Père Labat, whose 'Nouveau Voyage aux isles de l'Amerique' was first published at Paris, 1722, in ten volumes. It was in the month of March, 1696, that Labat landed in Guadeloupe, and, on the 14th of that month, he was at the base of the Souphriere, and the description (ed. 1, vol. ii. pp. 349—353) of his visit to the breeding places of the Diablotin is so minute and graphic, that I venture to transcribe it.

"Nous étions pour lors dans la saison de la chasse de certains oiseaux qu'on appelle Diables ou Diablotins. Je ne sache pas qu'il s'en rencontre dans les Isles autre part qu'à la Guadeloupe & à la Dominique, où ils viennent en certains tems de l'année s'accoupler, poudre et élever leurs petits.

"Cet oiseau est à peu près de la grosseur d'une poule à fleur; c'est ainsi qu'on appelle aux Isles les jeunes poules qui n'ont pas encore pondu, & qui sont en état de pondre bien-tôt; son plumage est noir, il a les aîles longues & fortes, les jambes assez courtes, les pieds comme ceux des canards, mais garnis de fortes et longues griffes, son bec est long d'un bon pouce & demi, ecurbé, pointu, extrêmement dur & fort: il a de grands yeux à fleur de tête, qui lui servent admirablement bien pendant la nuit, mais qui lui sont tellement inutiles le jour qu'il ne peut supporter la lumiere ny discerner les objets; de sorte que quand il est surpris par le jour hors de sa retraite, il heurte contre tout ce qu'il rencontre et enfin il tombe à terre.

"Ces oiseaux vivent du poisson qu'ils vont prendre la nuit à la mer. Après que leur pêche est achevée, ils s'en retournent à la montagne où ils repairent dans des trous comme les lapins, & ils n'en sortent que quand la nuit est venuë pour retourner à la mer. Ils crient en volant comme s'ils s'appelloient ou se répondoient les uns aux autres.

"Ils commencent à paroître vers la fin du mois de Septembre. On les trouve alors deux à deux dans chaque trou. Ils demeurent ainsi jusqu'à

la fin de Novembre, après quoi ils disparoissent, & on n'en voit ni entend aucun jusqu'au milieu on environ du mois de Janvier, qu'ils paroissent de nouveau. Pour lors on n'en trouve plus qu'un ou qu'une dans chaque trou jusqu' au mois de Mars qu'on trouve la mere avec ses deux petits. Quand on prend les petits diables en ce tems-là ils sont couverts d'un duvet épais & jaune comme les oisons; ils sont comme des pellottons de graisse; on les appelle des cottous [*sic*]. Ils sont en état de voler dans la fin de mai: aussi est-ce en ce tems-là qu'ils s'en retournent, & qu'on cesse entierement de les voir & de les entendre jusqu' au mois de Septembre. Tout ce que je viens de dire du passage & de la demeure des diables à la Guadeloupe & à la Dominique, arrive regulierement & sans avoir jamais manqué toutes les années. La chair de cet oiseau est noirâtre, et sent un peu le poisson; du reste elle est bonne & fort nourrissante. On estime les cottous comme ètant plus délicats, & ils le sont en effet; mais ils sont trop gras, de sorte qu'ils rendent la graisse comme s'ils etoient pleins d'huile. . . . . .

"Malgré les dangers & les incommoditez inseparables de cette chasse, ma curiosité me porta d'accompagner quatre de nos Negres qui y alloient un Dimanche aprés midi, & qui ne devoient retourner que le lendemain au soir. . . . . ."

The good father gives an interesting account of their toilsome journey up the mountain and the extreme difficulty of the ascent, but by sunset they had arrived at the spot on which the chasseurs had fixed to build their shelter for the night. Père Labat congratulates himself on the precautions he had taken in carrying with him a good bottle of Madeira, Eau-de-vie, and meal for the negroes, and his cloak.

Whilst the party were building the cabin, two of the hunters were sent to search for Diablotins, and they quickly returned with fifteen. The party seemed to have thoroughly enjoyed their supper off these birds, and as the night was fine they slept well, though at times the "Diables" made a great noise when leaving their holes on proceeding to the sea, likewise when returning. Père Labat's account of hunting for the Diablotins is so minute, graphic, and interesting, that any attempt at translating it would mar the narrative, so I transcribe from the text (pp. 356—361):—

"Le lendemain dès le point du jour nous nous mîmes à chasser. Chaque chasseur est armé d'une gaule de la grosseur du pouce, longue de sept à huit pieds, assez ployante, & qui a un crochet au bout. Les chiens que nous avions amenez ou apportez quétoient & alloient fleurer tous les trous. Dès qu'ils sentoient qu'il y avoit un diable dans un trou (car cette montagne est toute percé comme une garenne) ils jappoient & se mettoient à gratter:

mais le chasseur a soin de les empêcher de gâter les entrées, parce que les diables ne voudroient pas y rentrer une autre année. On enfonce aussi-tôt la gaulette dans le trou jusqu'à ce qu'on rencontre l'oiseau, qui dès qu'il la sent la prend avec le bec & la serre, & se laisse plûtôt entraîner dehors que de lâcher prise. Quand il est à la bouche du trou, la lumiere l'aveugle, il est ebloüi, il veut retourner à reculons dans son trou, mais le chasseur y a mis le pied. Alors l'oiseau se renverse sur le dos pour se deffendre du bec & des griffes. On le prend alors par la tête, on lui tord le col, & le chasseur l'attache à une corde ou lianne qu'il a autour du corps en guise de ceinture. Il arrive quelque fois que l'oiseau ne veut pas mordre la gaulette; pour lors on la tourne de côté & d'autre en fourgonnant dans le trou jusqu'à ce qu'on l'attrappe au deffaut de l'aile, qui étant fort grande, l'oiseau ne peut l'étendre assez pour se débarrasser et il est ainsi entraîné hors de sa maison. On continue ordinairement la chasse toute la matinée, ce qu'on ne peut faire sans s'eloigner beaucoup de la cabanne, & monter & descendre dans des lieux fort difficiles. J'envoyai les Negres dans les lieux éloignez et je retins le Creolle avec moi pour chasser aux environs de la cabanne. Il entendoit parfaitement bien ce métier, et il avoit un trés-bon chien. Apres deux ou trois heurs de chasse, je retournai avec mon Negre pour me reposer, & pour accomoder des oiseaux pour dîner. Je me remis enfin à chasser seul. Nous nous rassemblâmes sur le midi. Les quatres Negres avoient cent trente-huit diables, Albert en avoit quarante-trois & moi dix-sept. Nous en mangeâmes chacun deux, et partîmes chargez du reste de nôtre gibier. . . . . .

"Ceux qui liront ces Memoires seront sans doute surpris que nous mangeassions des oiseaux en Carême. Mais on sera averti que les Missionnaires qui sont aux Isles, & qui par une concession Apostolique exercent en plusieurs choses le pouvoir des Evêques, après une meure déliberation & une consultation des Medecins, ont déclaré que les lézards & les diables étoient viandes maigres, & que par consequent on en pouvoit manger en tout tems."

A year after Père Labat left Guadeloupe that island was visited by le Sieur Froger, who in the relation of his voyage to the South Sea, Straits of Magellan, Brazil, Cayenne, and the Antilles (Amsterdam: 1715), refers thus (p. 213) to the Diablotin in Guadeloupe :—

"Il y a autour de la Soufriere une espece d'Oiseaux, qui se nomment Diablotins; ils sont aussi gros, et aussi bons que des Poules; ils ne vivent que de Poisson, qu'ils revomissent pour nourrir leurs petits; les habitans envoyent leurs Negres en chercher: mais lorsqu'ils n'y sont pas accoûtumez, soit que le froit ou l'air de la Soufriere les saisisse, ils tombent dans une foiblesse, dont ils ne peuvent revenir qu'avec peine."

Nearly a hundred years subsequent to Père Labat making his observations in Guadeloupe, Mr. Thomas Atwood published a history

of the Island of Dominica (London, 1791), and he briefly alludes (pp. 30—32) to the Diablotin in the following passage :—

"The diablotin, so called by the French, from its uncommonly ugly appearance, is nearly the size of a duck, and is web-footed. It has a big round head, crooked bill like a hawk, and large full eyes like an owl. Its head, part of the neck, chief feathers of the wings and tail, are black; the other parts of its body are covered with a milk-white fine down; and its whole appearance is perfectly singular. They feed on fish, flying in great flocks to the seaside in the night-time; and in their flight make a disagreeable loud noise like owls: which bird they also resemble, by their dislike of making their appearance in the day-time, when they are hid in holes in the mountains, where they are easily caught. This is done by stopping up some of the holes, which lead to their hiding places, and placing empty bags over the rest, which communicate under-ground with those stopped: the birds at their usual time of going forth to seek their food in the night-time, finding their passage impeded, make to the holes covered with the bags; into which entering, they are immediately caught; and great numbers of them taken in that manner in a short time. The flesh of the diablotin is much admired by the French who used formerly to export great quantities of them salted, to Martinique and other French islands; but the traffic was put a stop to by the Legislature of Dominica, who, by an Act made for apprehending runaway negroes, prohibited the taking of those birds: as before that time, the runaways being numerous in the woods, furnished great quantities of them, for which they had in return, from some ill-disposed white people, muskets, powder, and balls; which they made use of in murdering the English inhabitants on the plantations."

Mr. Frederick A. Ober, who visited Dominica in 1876, under the auspices of the Smithsonian Institute, especially with the view of elucidating its ornithology, has in his charmingly written work, 'Camps in the Caribbees' (pp. 140—142, *et* 149), referred to his researches in the old home of the Diablotin as follows :—

"In the afternoon we were painfully scaling the precipitous sides of one of the two peaks which form the double summit of Morne Diablotin. We were now in the region especially appropriated as his home by the *Diablotin* or 'Little Devil;' and anxiously we searched, as we scrambled over the loose rock, for some trace of the hole in which he lived.

"Wherever I had been in the island I had heard of the diablotin, and my curiosity was excited to such a degree that I determined to clear away the mystery which surrounded it. For thirty years it had remained unseen. Many treated as a myth this story of a bird living in the mountains (for it is a bird) so long a period without appearing to human vision. But sufficient proof existed, in my opinion, to warrant a search for it. The older

people of the island had distinct remembrances of seeing it, and attributed its disappearance to the depredations of the 'Manacou,' a marsupial animal like an opossum, which hunted it from its holes and devoured it and its eggs. . . . Though hardly accepting the statement by the mountaineers that a bird so far-flying could be exterminated by a merely local disturber, I was obliged to admit that it no longer inhabited its old homes. For two hours we prolonged the search, cold and wet, but found nothing to reward us. We saw, to be sure, many cracks and crannies in the rocks where a diablotin might have hidden, but no long holes, such as those made by the 'Mother Cary's chickens' in the Bay of Fundy. There, five years previously, I had drawn many a Petrel from the end of a long, winding hole, as it sat quietly upon its single egg; but this other Petrel (for it is a giant petrel, probably the *Prion caribbæa*) was not to be found, and I departed sorrowfully down the mountain to look for shelter. . . . . .

"We stayed there all the succeeding day, and renewed our search, though unsuccessfully, for the *Diablotin*."

I was naturally extremely desirous of investigating for myself the former haunts of the bird in Dominica; for though I could not hope to be more successful than such an energetic and enthusiastic naturalist as Mr. Ober, yet it seemed to me that further details would be of interest. Mr. Ober's book having been written more for the general reader than the specialist, it was not to be expected that he would give in it those minute details that are of great interest to the ornithologist when the disappearance of a species is concerned.

To visit Dominica in the ordinary fashion would entail my staying in that island during the period of a mail service, ten days at least, a space of time I could badly spare from my duties. Further, communication with the north end of that island is not easy from Roseau, the capital. The transport has to be effected by boat, or else by an arduous land journey; supplies would have to be carried; and altogether there seemed to be greater difficulties involved than the results promised to achieve. My perplexities were, however, solved by the arrival of the Training Squadron at Barbados, in January, 1889, under the command of Commodore Markham, A.D.C., who, with that interest which he has always shown in matters in any way connected with scientific research, most kindly offered to take me, after he had visited Trinidad, under his care, land me at Prince Rupert's Bay in Dominica, in close propinquity to the well-known former stronghold of the Diablotin; and he himself offered to make all the arrangements for

the ascent of Morne Diablotin, or Morne au Diable, in that quarter of the island. I naturally placed myself unreservedly in his hands. Commodore Markham being acquainted with Dr. Borne, F.R.G.S., the resident magistrate and colonial surgeon at Prince Rupert's Bay, wrote to that gentleman requesting him to make arrangements for our ascent of Morne Diablotin, on the arrival of the squadron, which might be expected about the 13th of February.

On the 11th of February the squadron was lying at anchor in Gros Islet Bay, in the island of St. Lucia, and I went on board the 'Active,' carrying the broad pennant of Commodore Markham. On the morning of the 12th, the squadron, consisting of 'Active,' 'Rover,' 'Volage,' and 'Calypso,' got under way and left under sail for Dominica. It was a lovely day, with a fair breeze; and we passed sufficiently near the leeward side of Martinique to see the houses and shipping in Port of France and St. Pierre. Early in the morning of the 13th, the squadron hove-to off Dominica; at day-break proceeded, and by mid-day came to anchor in Prince Rupert's Bay. Squalls of rain came down every now and again, but we were fortunate enough to obtain many excellent views of the summit of Morne Diablotin, which rises, clothed to its very apex in the greenest of tropical foliage, to a height of 4747 feet. The beautiful Island of Dominica, rising abruptly from an azure sea, with mountain behind mountain, culminates in its northern part in the double cone of Morne Diablotin. The mountains starting with their base from the very ocean, leave on the eye of the observer a more imposing impression of altitude than an elevation of five thousand feet would otherwise impart. The loveliness of the scene is enhanced by the glorious colouring of the forest, which clothes the mountains in exquisite green from base to summit. Shortly after anchoring, Dr. Borne came on board, and informed us of the steps he had taken. First of all, he had despatched a party to cut a road through the forest to the summit of Morne Diablotin, which had been partially accomplished, so that a track by which we might scramble had been prepared up to the last 2000 feet of the ascent. The men, however, stated that though they had been engaged for three days on the mountain, and had searched carefully in the old haunts of the Diablotin, they could not discover any trace of the birds beyond their ancient and deserted burrows; that there was not the slightest sign of any recent occupation; and they had come

to the conclusion that, as far as the Diablotin was concerned, the mountain was completely deserted. As these men had been promised an ample reward in the event of their discovering the bird, and taking into consideration Mr. Ober's want of success in the same part of the island, we reluctantly decided to abandon our contemplated ascent of Morne Diablotin, and to make that of Morne au Diable, which fifty years ago was an equally famous stronghold of the Diablotin. The time of our visit having been regulated by the dates given by Père Labat, as that of the breeding season, our hopes of finding the bird in its old haunts were almost completely dissipated; but at the same time we considered it advisable to adopt the alternative ascent of Morne au Diable, and by personal examination ascertain the correctness of our informants' statements. Morne au Diable rises from the north end of the Island of Dominica; it is in about N. Lat. 15° 37′ and W. Long. 61° 27′. Its height as given in our Admiralty chart is 2917 feet: it is, according to the same authority, 1830 feet less altitude than Morne Diablotin, the height of which is given as 4747 feet.

Our arrangements were therefore made for the ascent of Morne au Diable the next day. Dr. Borne procured the guides who had in former years been up the mountain in pursuit and capture of the Diablotins, and porters for our outfit. The Commodore gave orders for the commissariat supply; and adopting the precautions of the good old Père Labat, we took with us 'une bonne bouteille de vin de Madere, et du pain, avec l'eau-de-vie et de la farine pour nos Négres;' not forgetting a couple of warm blankets, and other necessaries.

After taking breakfast with Dr. and Mrs. Borne, on the morning of the 14th of February, we started on our attempt. The party consisted of Commodore Markham, Dr. Borne, and myself, two expert woodsmen, three carriers, who bore our goods on their heads; and an old negro, who in former times had frequently been engaged in taking Diablotins from Morne au Diable; and four our dogs, adepts at hunting the Agouti. This old negro estimated his age by having been over twenty in the year of freedom, 1838, so that he must have been seventy years of age at least. He held out little hopes of our procuring the bird. He felt satisfied that they had been extirpated by the Manacon. When he was a young man there was no such animal in the island,

but it now invaded the highest tops of the mountains. He could well recollect, when he was a youth, the French planters having a great predilection for the bird: they were in the habit of sending slaves to the mountains, who sometimes remained away four or five days, returning with a load of birds. He had joined in these hunts; and described how they recognized an inhabited burrow by the beaten down track leading to the hole. The birds alighted, after gliding through the trees, at some distance from their burrows, and always entering by the same route, a well-defined track led to their holes. They pulled them out by means of a fish-hook attached to a pliant wand; the bird as soon as it saw the light of day, threw itself on its back, and cried "Kra kra, kra kra;" the hunter put his foot on the bird and killed it. St. Catharine's Day, 25th of November, was considered the date of arrival of the Diablotin.

The most experienced of our woodsmen, a coloured man, and native of the island, Eugene Valeur by name, told us that the last time he had ascended Morne au Diable was the year prior to the hurricane, which occurred in 1883—this would put the date in 1882—and that it was about the month of November; he fixed the date by St. Catharine's Day. He had a dog with him that smelt the occupied burrows. He smelt at the holes likewise, and recognized the presence of the birds by their peculiar odour. He captured five, pulling them out with a fish-hook attached to a wand. He described them as about the size of a Ramier (*i.e.* pigeon), with a black back, white underparts, and mottled head. We gleaned this information as we trudged along the mountain path, that, always ascending, led us from Dr. Borne's house to the mountains. It was a very hot, but beautiful day, and the air stifling when our path led through bush on either side. The stillness of a tropical forest at mid-day is very noticeable; beyond a few humming birds darting across the path, or hovering with vibrating wing over some bright blossom, no birds were to be seen; a rustling and a scamper among the dead leaves made by some big lizard disturbed in its siesta by our advance, was the only sound heard, except our own voices.

Every now and then, as our path led round the spurs of the mountain, views of the ocean and the shore line were disclosed, and the eye could hardly gaze upon a more lovely prospect. It

is not in my power to give any idea, to those who have not seen it, of the beauty of the tropical vegetation which surrounded us; broad-leaved Plantains, Heliconias, and groves of Tree Ferns rising to a height of thirty to forty feet, not as single plants, but covering the slopes of the mountains. Below us was the broad expanse of the Caribbean Sea, exquisite in its colours, ever varying and changing from the shadows cast upon it, from the great masses of cloud wafted over by the strong breath of the trade-wind. The squadron, at anchor in the bay beneath us, and here and there peeping through the foliage that surrounds them, the houses and buildings of the little town of Portsmouth, straggling along the sea-line, gave just sufficient animation to the scene: it was an ideal picture of repose and beauty. When we turned our glances upwards to the mountains, very different was the aspect of things. Vast masses of lowering cloud and vapour surrounded their summits; but at times the trade-wind, blowing strong at that altitude, dispersed and scattered these, and from out of the mist the tops of the mountains appeared, green and radiant. At an elevation of about 1200 feet our path led us into the high-wood or primeval forest, and there we rested for a few minutes, as the more serious part of our undertaking was about to commence.

Our guides had now brought us to the base of the sharp ridge which forms the water divide of Morne au Diable, between the Atlantic and Caribbean Seas. Apparently the mountain is only accessible by this one route, for on all other sides it seems to rise in precipitous faces, covered with forest. After once entering into the high-wood, it became impossible for us to see many yards on either side, owing to the denseness of the foliage, and the track had to be cut, laboriously and slowly, by the cutlasses of our woodsmen. The ascent was severe: in many places we had to haul ourselves up by the roots of the trees or dependent lianas. In addition to the forest growth, there was a close under-growth of Mountain Cabbage Palms, Ferns, Tree Ferns, and Heliconias, which fell on either side to the slashes of our cutlass-men. They hacked and cut with right good will, but often we had to stop to enable the men to select the route, in doing which they were guided by keeping as much as possible on the very crest of the ridge. The general direction of the ascent seemed to be well

known to them, and we heard them congratulating themselves, in their French patois, when they came across an old blaze or cutlass blow on a tree, which marked the ascent in some prior year. They repeatedly complained that the hurricane of 1883, by prostrating the forest, had rendered the route far more difficult, as the undergrowth had been rendered thicker by the bent-over trees striking root at various points. At 1500 feet we entered into the region of mist, and the forest seemed super-saturated with moisture; from every branch and leaf the water dripped, the roots and boughs were clothed in ferns and mosses, that held water like a sponge, and on grasping them to haul oneself up, a stream of water ran down one's arms. Shortly before sundown we came on to a very narrow portion of the ridge, so narrow, indeed, that the strong wind blowing across it had shorn down the trees, so that, through the rifts in the mist, we could catch glimpses of the two oceans, on our right and left. The descent to the Atlantic side seemed almost precipitous, though densely wooded. We estimated our altitude at about 2000 feet.

Selecting the leeward side of the ridge, we directed some of our people to build an "ajupa," whilst we pushed on with the two woodsmen, to cut as much more of the upward track before night-fall as possible. We got about two hundred feet higher, and darkness coming on, we descended to the camp, Eugene Valeur assuring us that the elevation from where we turned back was right in the midst of the old breeding-grounds of the Diablotin. Had the birds been there, he thought we should have seen or heard something of them when leaving their holes; all, however, was silent, save for the dripping of the water from the trees, and the noise of the wind as it swept through the forest. Our men had constructed a very excellent shelter with some posts and ridge poles, thatched over with leaves of the Mountain Palm; it was a very good camp, and kept out the rain, but the ridge being so steep, we felt like lying on the roof of a house, with a constant inclination to slide down. We could not find any wood sufficiently dry to light, and we were also disappointed in finding water, so that, from the want of these two necessaries, our guides and porters passed a very wretched night. They complained sadly of the cold, and sat shivering, with chattering teeth, all through the long night. The temperature at the sea-shore, when we left, was 80° Fahr. in the

shade: it had sunk to 68° Fahr. by the time we had finished the "ajupa," and toward morning the thermometer registered 66° Fahr. The Commodore, Dr. Borne, and I, felt comfortable in our blankets, but the wind howled most dismally, and that, combined with the groaning of our poor followers, prevented us getting much sleep.

At day-break of the 15th we roused the men, sent the two woodsmen to continue cutting on the upward track, and two men down the mountain to a water hole, which we had scratched out on our way up. We were more fortunate in our attempt to make a fire, and managed to get a cup of cocoa.

Then we started for the top of the mountain. The last 700 feet was very arduous, for we were seldom stepping on the ground, but from root to root or from branch to branch. It was in holes under these roots, that we were assured the Diablotin formerly nested. When we had reached what proved afterwards to be about 80 or 100 feet from the top, our guides told us that we had entirely passed beyond the zone that was formerly occupied by the Diablotin.

I therefore retraced my steps, leaving Commodore Markham and Dr. Borne to reach the summit, which they did; and during the twenty minutes they remained on the top they enjoyed several good views, through rifts in the clouds and mist, of both sides of the island. Hurrying back as rapidly as I could descend, swinging myself from branch to branch, I reached the Diablotin ground with two men and three our dogs. We stooped and crawled along under the roots, and along the steep sides of the mountains, the dogs smelling at every hole. My companions had been experienced Diablotin chasseurs, and they showed me the holes, like disused rabbit burrows, from whence they had extracted these birds in former years.

The ground was not rocky, indeed, I saw no trace of rock exposure. It appeared to be a rich mould, from which the trees were springing, and in many cases the earth had been washed away from their roots; and most of the disused burrows shown me had been worked into the side of the hill, under the protection of the roots. In all probability, the openings to more exposed burrows had been obliterated by the constant rain-fall. It seems very extraordinary that a Petrel should select its breeding haunts in

the midst of a forest with foliage so dense that one could scarce see the sky through it.* I made particular enquiries from my guides as to the manner in which the birds departed and left their burrows. The old negro said, that when they left their burrows at night, they called out; when they returned in the morning they made no noise, but plumped down through the trees on to their stomachs, at some distance from their holes, and crawled to them, so that this beaten-down track was quite sufficient to show an occupied hole. After searching for a couple of hours my guides begged me to desist, as my continuing to do so was useless, for, they said, if there was a bird on the mountain, our dogs, that are trained to hunting the Agouti, would certainly have detected the rank smell of a Diablotin. "See how the dogs go to the holes, and take no notice. I tell you, the 'Manacou' has destroyed them, there is not one left. Years ago the 'Manacou' never came here; now they are common to the tops of the mountains; besides, we have not seen a feather. There is no good looking more." I felt that this was true, so I descended the mountain, and returned to the "ajupa." Being joined there by the Commodore and Dr. Borne, we brewed ourselves a good cup of tea, and had something to eat. Our followers had an ample breakfast, and greatly refreshed thereby, we dashed down the steep descent, swinging ourselves, in some places, rather recklessly from branch to branch, but the Commodore was pressed for time. Saying adieu to Dr. and Mrs. Bornet at their house door, we hurried down to the shore, and were on board the 'Active' by 1.30 p.m. An hour after, the squadron was under sail for Antigua, and I on my way to Roseau to catch the return mail to Barbados. Thus ended our reconnaissance of the haunts of the 'Diablotin' in Dominica, and I am afraid we must also add, the deserted ones.

*I am informed by Sir Edward Newton that the congener of the Diablotin in Jamaica, *Œ. jamaicensis* (Bancroft), selects similar situations for its breeding places in that island. From information I gathered during recent visits to Jamaica, I am led to believe that the "Mongoose," introduced of late years for the purpose of keeping down Rats, has invaded the breeding haunts of the Jamaica Petrel; this, if a fact, will certainly involve the extirpation of the species.

† It is with great regret I have to record that Dr. Borne died at Prince Rupert's Bay very shortly after our visit. He was a young man of excellent promise, and highly respected.

There can be no doubt that the Manicou is a recent introduction into the Island of Dominica, for Atwood most distinctly states :—

"There are no quadrupeds, natives of Dominica, except the Indian Coney, which is nearly the size of a rabbit when full grown. This animal is very singular; its head, ears, eyes, nose, mouth, and teeth, being exactly like those of a rat: and its body and legs like those of a hog; the latter in particular, being hoofed like that animal."*

This description, of course, refers to the Agouti, which still exists in the island of Dominica. Had an animal of such destructive habits as the Manicou been native to the island in Atwood's time, he certainly would have recorded it, for its ravages must have forced its presence on his attention. We must therefore accept as correct, that the Manicou is a recent introduction, and the account given me when in Dominica, that they originated from a pair that escaped from confinement in 1832, may be the correct one. I have not seen a specimen of the Dominica animal, and therefore am not in a position to decide whether it is the Virginian Opossum, as I was informed in Dominica. It seems to me to be far more likely that it is the Grenada Opossum, introduced from that island.

When Père du Tertre made his observations in the West Indies, nearly two centuries and a half ago, the Manicou was evidently confined to the island of Grenada. He describes it with great exactitude, and the geographical position of that island at once points to the surmise, that the Manicou reached Grenada from the mainland of South America by accidental introduction. I should be surprised to learn that the Manicou of Dominica is not the tropical American form of Opossum, *Didelphys cancrivora*. This animal appears to be an inhabitant of St. Vincent, West Indies, from which island an example was sent to the Zoological Gardens, London, in 1880 (*cf.* 'List of Animals,' 1883, p. 194).

* Atwood, pp. 45, 46.

III.

NOTES ON THE BIRD-LIFE OF THE SKELLIG ROCKS.

By Charles and Henry Candler.

Read 24th September, 1889.

If a reference be made to a map of south-west Ireland, it will be seen that a considerable portion of the county of Kerry is comprised in the wild and mountainous peninsula, bounded by Dingle Bay on the north and the deep inlet known as the Kenmare River on the south. A lofty range of Old Red Sandstone hills runs parallel with the northern coast-line of this peninsula, and terminates seaward in a chain of islands, the most remote of which is the Great Skellig, lying eight and a half miles nearly due west of Bolus Head, the nearest point on the mainland. One mile to the north-east of this rock is the Little Skellig; and about midway between the latter and the southern point of Puffin Island, the Lemon Rock, rising a few feet above the waves, shows the direction of the old mountain range.

In the spring of the present year we visited the Skellig Islands, in the course of a fortnight's ramble along the coast-line of Cork and Kerry; and we have drawn up a few rough notes on the bird-life of the rocks, in the hope of interesting the members of a Society which has always given to ornithology a very prominent, if not a leading, place in its work.

Early in the morning of the 25th of May we left the inn at Knight's Town, walked westward four miles along the main road which runs through Valentia Island, and crossed by the ferry to the poor and, at that time, fever-haunted hamlet of Port Magee on the Kerry mainland, our point of departure for the islands. We

had made the necessary arrangements over-night, and we found Tom Trant, the old Skelligs boatman, with his crew of six hands, engaged in launching the thirty-foot whale-boat in which he usually tends the lighthouse. The day was brilliantly fine, with a light northerly breeze, and, unfortunately, a heavy rolling swell, which promised to make landing on the smaller rock a matter of some difficulty.

Our boat was clumsily and somewhat inadequately rigged with two small lugsails; and the men had to pull, with their long sweeps, half the distance of ten miles to the larger island, which consequently we were three hours in making. When we were clear of Bray Head we spoke with the only craft we saw on our voyage, a Peel smack returning to Valentia Harbour from her fishing-grounds. A great number of boats, chiefly Manx and North Irish, resort to these waters for the spring Mackerel fishing; and at Bear Haven in Bantry Bay and, to a less extent, at Knight's Town, where the fish are discharged, we found a scene of life and animation in striking contrast to the wild and lonely character of most of the south-west Irish coast.

We passed a mile to windward of the Lemon, a bare and isolated rock, swept in every gale by the Atlantic surges, and of course untenanted by sea-birds, save as a chance resting-place. The absence of birds as we approached the Little Skellig surprised us considerably. We were within three miles of the rock before we saw a Gannet at all; nor was there afterwards anything to lead us to suspect that we were close to a teeming haunt of sea-fowl in the full activity of the breeding season. The number of Gannets gradually increased as we drew nearer; they flew low over the water, singly, or two or three together. Presently we met with flocks of Puffins, Guillemots, and Razorbills, skimming the water, or settled in compact bodies on the surface, rising and falling with the swell like the undulations of a chequered carpet.

Our plan was to explore the Great Skellig first, and to land, if we could, on the smaller island on our way home. As we passed half-a-mile to the west of the latter, our boatmen pointed out to us the white lines and patches which marked the quarters of the Gannets. Twenty minutes later we were under the precipices of the Great Skellig. It would be difficult to conceive anything more impressive, as seen from a small boat on the sea, than this rock,

which, from a base with an area of no more than forty-five acres, rises to a height of 714 feet. The best landing-place is on the south-eastern side of the island. Here a dark fissure in the cliff goes by the name of "Blind Cave," or "Blind Man's Cave," and into this we brought the boat, and moored her safe from contact with the rocks, between two iron rings socketed into the opposite walls of the chasm. A few rough steps lead up to the lower termination of the road to the lighthouse, a gradually ascending terrace cut out of the cliff, and protected on the seaward side by a low massive wall. Not far from the landing-place, the road passes above a great cavern known as "Seal Cave," the breeding-place of a large colony of Kittiwakes. The birds had not yet begun to lay, but were busy preparing their nests on the narrow ledges of the rocks below, keeping up an incessant and musical clamour. Afterwards, on another part of the island, we saw the birds plucking grass for their nests from a steep slope of turf about which they were fluttering.

Soon after leaving the Kittiwakes, we met, at a turn of the road, the head light-keeper, Mr. James Walshe. The lighthouse being on the west side of the island, the approach of our boat had not been observed, and our visit was unexpected. Mr. Walshe is full of information on the birds of his island, in which he takes a keen interest; and in his company, after inspecting the lighthouse and the homes of himself and his assistant, we undertook a long ramble, or rather climb, round the rock. The lower lighthouse, at present in use, stands with the light-keepers' houses in a small paved yard, the site of which has been excavated in the rock. From the outer wall a stone may be dropped into the sea two hundred feet below. Even at this height the yard and houses are sometimes flooded by the driving spray, and in a gale last winter twenty heavy coping stones were dislodged from the wall. Just below the lighthouse, the ledges near the base of a perpendicular chasm, similar in character to "Seal Cave," are the breeding quarters of another large colony of Kittiwakes. Skirting the brink of this chasm the road is continued to the upper lighthouse; it is now in a bad condition, for in winter storms the broken water driven against the face of the cliff pours down the pathway in a continuous torrent which nothing can withstand. Since the completion of the lighthouse on the Tearaght Rock, eleven miles to the north of the

Great Skellig, the higher light on the latter island has been extinguished, and the buildings dismantled and abandoned. The place had a deserted appearance; and in a small outhouse communicating with the sea, and built on the verge of the cliff, a Puffin had laid her egg.

Leaving the old lighthouse, we worked our way round to the small saddle of comparatively level ground, on either side of which the island rises in two rugged and precipitous cones; the westernmost terminating in a magnificent pinnacle of rock, known as "The Spit," and forming the highest point of the island. Below "The Spit" a pair of Peregrines had their eyrie, and for some time we watched the birds sweeping round in wide circles far overhead. The light-keeper has seen the Falcons strike down the Puffins, upon which they appear chiefly to feed, though rabbits are common enough on the island. For the last two years he has reached the nest, with the help of a rope, and taken the eggs; the market value of which, unhappily for the future of a rare and beautiful species, is considerable. Last spring, however, we hear that a second set of eggs was hatched. In the same mass of rock a single pair of Choughs were nesting, the birds flying at a less elevation than the Peregrines, and occasionally settling on the crags, and showing clearly their red bills and legs. They have taken up a position which is protected by overhanging rocks, and which appears to be inaccessible, unless, perhaps, to the keeper of the Tearaght Light, of whose exploits we heard much, and who has the reputation of being the most daring climber on all the Irish coast. On the eastern cliffs of the island a pair of Hooded Crows have bred for some years, but we did not see the birds. The Meadow Pipit, which is resident on the island, we frequently met with; and we were surprised to hear upon that barren rock, the shrill and familiar song of the Wren, another constant resident.

It would be quite beyond the scope of this paper to do more than allude to the very remarkable monastic ruins, which give so strong a human interest to the Great Skellig. Like the famous island mounts of Cornwall and Normandy, the rock was, in old days, dedicated to the Archangel, and known as Seelig Michil. It was inhabited by a colony of Celtic monks, who built, of unecemented stone, a church, two small oratories, and a group

of beehive cells, which latter exist perfect and entire at the present day. The whole of the buildings are enclosed in a walled space, about one hundred and eighty feet long by eighty to one hundred feet broad, the outer wall rising from the very verge of the precipice. In such a place the monks must have led a life of chronic privation and hardship. It has been conjectured that they were fishermen, for to this day the island is a great resort of fish, and at one time we saw the water discoloured by a shoal of bream. From the high ground above the monastery we enjoyed a wonderful view of many miles of the Irish coast, with all its outlying rocks and islands; to the north, the Great Blasket, Inishnabro, Inishvickillane, and the Tearaght; to the south-east, Scarriff, a lofty and rugged island at the entrance of the Kenmare River, which we had visited two days previously; and, still further south, the chain of islands known as the Durseys, terminating with the Bull Rock.

From its nest in a hole of the wall of one of the "clochauns," the lightkeeper's boy, who, though only nine years old, is a good observer and bold climber, disturbed a Wheatear. We ascertained certainly that six species of land birds breed on the Great Skellig; viz., the Peregrine, Hooded Crow, Chough, Wheatear, Meadow Pipit, and Wren; and to this list may probably be added the Rock Pipit, though we did not clearly identify this bird. It is common, however, on Puffin Island, close to the mainland. In 1885, too, a pair of Oystercatchers bred on the rock, and laid three clutches of eggs. We found, also, the following species of sea birds nesting on the island:—Kittiwake, Guillemot, Razorbill, Puffin, Manx Shearwater, and Stormy Petrel. This list is probably not exhaustive; for an egg, which he believed to be that of the Fork-tailed Petrel, was sent to Mr. R. J. Ussher in 1887 from the Tearaght Rock, and, in the following year, a similar egg was received by him from the Great Skellig.

The Manx Shearwater breeds upon a turfy rock-strewn slope above the lower lighthouse. To reach their nests is a matter of great difficulty, as the burrows twist about at sharp angles between and under the great rocks embedded in the soil. One of our lads, however, who worked very perseveringly, succeeded in digging out two eggs. At the time of our visit the Stormy Petrels had not begun to lay. Later on, Mr. Walshe told us we should have heard

the twittering of the sitting birds, and found their eggs in plenty under the rough steps leading up to the monastery, in the cavities of the old walls, and, indeed, on every part of the island. It is curious that no Gull, except the Kittiwake, nests on the Great Skellig. In the early part of the breeding season the Herring Gull is a great tyrant and robber, and has been seen by the light-keeper to drag away a sitting Guillemot from its station and devour its egg. So precipitous in character is the Great Skellig that, with the exception of the Puffin and the Stormy Petrel, the nests of all the sea-fowl breeding on the rock are very difficult of access, and, for the most part, can only be reached by a skilled climber.

Mr. Walshe has given us some interesting notes on the movements of the birds breeding regularly upon his island. About the end of January the first Guillemots appear. They land very early in the morning, and leave again after a few hours' rest. Each succeeding day they stay a little longer, until they finally take to their nesting stations for the season. The first young are fledged about the 12th of July, and from this time the birds begin to leave the rock. The Razorbills are a month later in their arrival, though both species take their departure together. The Kittiwakes first settle upon the rock about the 15th of March. For some days previously they gather in large flocks out at sea, and, writes Mr. Walshe, "they make a great noise when they come in." They leave in large flocks about the middle of August. The Manx Shearwater ("Mackerel Cock," or "Night Bird," as it is sometimes locally called) is first heard on dark nights in the last week of February, and the birds remain about the island till the end of August. The young Shearwaters and Petrels frequently strike the lantern during nights of drizzling rain, though seldom in foggy weather. Towards the end of March the Puffins arrive. They come ashore in one great flock, generally during a fog or haze, and they go away between the 5th and the 15th of August. The last bird to arrive is the Stormy Petrel, which is not seen till near the end of April, and leaves the rock in October. When the last flock of sea-birds has departed an oppressive silence, says the lightkeeper, settles down upon the island; and through the winter months the solitude of the rock is only broken by the chance visit of some wandering party of Gulls.

The number of migratory birds visiting the Great Skellig is comparatively small, as the rock does not lie in any of the great lines of migration. It is, indeed, rare for any bird (except the Petrels and Shearwaters) to strike the glass of the lighthouse at night. The total number of species which have been observed by the lightkeepers is, however, not inconsiderable, falling only a little short of sixty. We have appended to this paper a table, obtained by an analysis of the reports of the Migration Committee of the British Association for the five years 1882—1887, showing all the species noted during that period, with short particulars of the dates and manner of their occurrence.

We left the Great Skellig about three o'clock, and pulled slowly across the mile of sea which separates the greater from the lesser island. The swell, if anything, had increased, and was breaking heavily along the northern side of the smaller rock where, in smooth water, a landing may be effected without difficulty; and at a point, too, from which it is easy to reach the summit of the island. The outline of the Little Skellig, resulting from the sharp weathering of the rock—a sandstone with calcareous bands of the formation known as *cornstones*—is very striking. The island rises in a range of rugged pyramids with acutely serrated edges; the loftiest cone reaching a height of four hundred and forty feet. The base of the island has an extent of about seventeen acres. The rock appeared, as we neared it, to be crowded with birds. Razorbills and Guillemots sat in regular and closely-ordered ranks along every crest and ledge of the western extension of the island. Our boatmen called them the "Kerry Militia," and their resemblance to bodies of men drawn up, rigid and motionless, in military rank is certainly not fanciful. For some distance we rowed along close under the cliffs, which, on the southern side of the island, rise sheer out of deep water. We passed some favourite haunts of the Seal, which, to judge from the place-names, Celtic* and English, of this coast must, at one time, have been very common in the district, where, indeed, it is still constantly seen. We observed none, however, on the present occasion.

Upon a steep slope of rock, incrusted with limpets and scored with small fissures, we landed; leaping from the boat as she rose

* The old Irish word for a seal is *rón*, and there is, in Bantry Bay, an islet called Roancarrig, which we take to be "the Rock of the Seals."

on the swell, our men keeping her off with their long oars, and shouting to one another in their native Irish, into which they always lapsed in moments of excitement. A short spell of stiff hand-and-foot climbing brought us to the top of the cliff; and we advanced along the steep and slippery slopes of sea-thrift, towards the breeding station of the Gannets, at the east end of the island. No one had landed on the rock since the previous summer, and the birds were tame and unsuspicious of harm—which, indeed, we were very far from intending them. Several times we sat down within a few feet of a Puffin which, turning about its head, would follow our movements with a ridiculously solemn expression of curiosity and interest quite unmixed with fear. The number of Puffins breeding on the island is very great. The turf slopes were honeycombed with their burrows, into which we were constantly breaking, and, as we stumbled along, the birds whizzed out of their holes on all sides of us. Most of the eggs were hard sat on and much discoloured. We noted here several bushes of the Tree Mallow (*Lavatera arborea*), which appears to grow upon all these islands, from the Tearaght to the Bull, but is rare generally on the Irish coast. To the naturalist, however, the interest of the Little Skellig centres in its colony of Gannets. The east end of the island is, in great part, bare of vegetation, presenting considerable surfaces of level rock; and it is here, upon terraces rising one above another, that the nests of the Gannets are placed. As we moved about among the birds they twisted their necks and hissed at us like farmyard geese, and not till we were almost within touch of its nest would any bird take flight. This they did rather awkwardly, uttering three times a hoarse cry, and flapping some feet along the ground before they launched themselves into the air. In this movement they frequently dislodged and sometimes broke their eggs, though the nests were sufficiently cup-shaped. A few of the eggs we saw were fresh laid and nearly white, but many more were deeply stained. We noticed a considerable disparity in the size of those we examined.

Where the nests were most thickly placed there was a space between the centre of each of about four feet. All were substantially built of grass, and the leaves and stems of the various maritime plants growing upon the rock, Sea-cabbage, Thrift, Scurvy-grass, &c.; and those we examined contained little seaweed. The

thickness of the nest-wall was about six or eight inches. For three inches downwards the materials were dry and often fresh and green, but the substratum was always a dark, sodden, and fermenting mass. The nests were all placed upon level, or but slightly inclined, surfaces; and we saw a number of birds sitting on the summit of a table-topped stack isolated from the main island. When we halted on the highest point of the station, the Gannets of the lower terraces had settled on their nests again, and the sight in the clear sunshine of the sitting birds beneath us, and the many hundreds in the air around, was something not soon to be forgotten. On the southern side of the island we found a few young birds, just hatched and helpless, of a dark slate in colour. Among the nests were many disgorged Mackerel; some fresh, some partially digested, and all without heads. We saw no other fish, nor could we find traces of food of any other kind. A prodigious number of fish must be consumed by the Gannets in the course of a single season, for the birds remain about the island from February till late in October.

On the rough and broken brow of the cliffs a number of Guillemots and Razorbills were breeding, and we found their eggs in close proximity to the nests of the Gannets. Leaving this locality we made our way towards the centre of the island, still keeping along the southern side. We found, presently, that we had invaded the territories of a large colony of Gulls, which do not mingle with the Gannets. The Herring Gull was the most numerous species, and we found several nests. The Lesser Black-backed Gull was present in smaller numbers. We noted some six or eight pairs of the Great Black-backed Gull in the same colony, and found as many nests. These were placed generally in lofty positions on the summit of some pillar or wedge-shaped mass of rock, separated by a fissure from the face of the cliff. We had with us a lad named Jerry Trant (a son of the old boatman), a good cliff climber, and familiar with the island and its birds. A pair of Peregines were reported to be breeding in a pile of rocks to the west of the island, but Jerry was unsuccessful in a long search for their eyric.

The descent of the cliffs was no easy matter. Our lads had filled two or three baskets and pails with eggs, and as the carriage of these added to the difficulty of the climb, it was with a feeling

of some relief that we found ourselves once more safely in the boat. In a fissure, near the base of the cliff, we chanced upon a Shag's nest, the only one we saw on the island. Want of time, however, made our survey of the rock very cursory and incomplete. The wind falling we had to row nearly all the way back to Port Magee, which we reached in the dusk of a lovely May evening.

The recent history of the Gannets' station at the Skelligs we believe to be shortly as follows :—

There is some doubt as to whether the bird, at any time, nested on the greater island, the balance of evidence being, perhaps, against the supposition. If, however, any Gannets did breed there previous to 1826, they were driven away by the erection of the Lighthouse in that year. The Little Skellig, on the other hand, has been known as a breeding station for very many years, and Smith in his 'History of Kerry,' published in 1766, says: "Tis remarkable that the Gannet nestles nowhere else on the south coast of Ireland." The colony was apparently for many years a very small one, for in 1880 the island was visited by Mr. R. M. Barrington, who estimated the number of birds then breeding there at less than thirty pairs. He was, however, prevented by a chasm in the rock from reaching their actual quarters.*

Sixteen miles to the south of the Little Skellig lies the Bull Rock, which was tenanted by a colony of Gannets, certainly as early as 1868, and possibly earlier. This was probably at first an offshoot from the older community on the Little Skellig, increasing afterwards at the expense of the latter station; but we have not been able to ascertain definitely when the southern rock was first resorted to. In November, 1881, however, the lighthouse on the neighbouring Calf Rock was destroyed in a gale, and the Commissioners of Irish Lights decided soon afterwards to place a new lighthouse on the Bull. For this purpose blasting operations were commenced in the spring of 1884, and from that time the Gannets began to forsake their new quarters. Messrs. R. M. Barrington and R. J. Ussher visited the Bull Rock in the year last mentioned, soon after the commencement of the works, and found about two thousand pairs still breeding there, though the birds were much harassed by the noise and the falling stones.

* "Irish Breeding Stations of the Gannet." By Messrs. R. M. Barrington and R. J. Ussher (Zool. vol. viii. p. 472, December, 1884).

Messrs. Barrington and Ussher attempted afterwards to reach the Skelligs, but were driven back by bad weather. Old Trant, the boatman, informed them, however, that he had never seen so many Gannets breeding on the Little Skellig as in that year. As the work upon the Bull Rock progressed the birds were gradually driven from the island, and settled in increasing numbers on the Little Skellig. The new lighthouse is now completed, and the Gannets have all deserted the rock and repaired to the Little Skellig, where, in the present year, at least two thousand pairs are breeding. A few birds showed a disposition at one time to settle on the Cow Rock, which is a mile distant from the Bull, and being over two hundred feet high, might have afforded them protection; but we are assured that none nest there now. The Little Skellig is therefore the only breeding station of the Gannet on the Irish coast; the bird not now nesting on the Stags of Broadhaven in county Mayo, if, indeed, it ever did so.

TABLE OF THE BIRDS OBSERVED BY THE LIGHT-KEEPERS ON THE GREAT SKELLIG IN THE YEARS 1882—1887.

(*From the Reports of the Migration Committee of the British Association.*)

Thrush. Appears regularly on the rock from October to January. November 7th, 1887, fifty seen.

Redwing. Occasionally seen in November and December.

Blackbird. Occurs commonly. October to January.

Ring Ouzel. Seen in March and April, and again in September.

Wheatear. Resident from March to September. Migrants also observed in spring and autumn.

Redstart. Four birds spent some weeks on the rock in October, 1883.

Black Redstart. A visitor in October and November. A flight of twenty observed October 19th, 1885; wind, north-east.

Robin. Only twice noted—in November, 1885, and October, 1887.

Golden-crested Wren. Two birds seen, October 10th, 1886.

Hedge Sparrow. One seen, October 13th, 1887.

Wren. A resident, whose numbers are recruited in winter.

Wagtail (sp.). Several times noted in autumn; more rarely in March.

Meadow Pipit. Resident.

Lark. October and November.

Swallow. A visitor from April to June; more frequent in autumn. October 7th, 1887, a large flock flying about the rock all day; wind, north-east.

Siskin. October 24th, a flock arrived; wind, south-east. November 18th, 1887, one found dead.

Goldfinch. October, 1883.

Greenfinch. A few on the rock, December, 1884.

Chaffinch. One found dead, October 22nd, 1887. Eleven seen, November 5th, 1887; wind, south-east.

Brambling. One struck the light, November 8th, 1885. A flock of forty, November 10th, 1887.

Linnet. November 4th, 1884, "A great many Linnets and Finches" (Light-keeper's note).

Yellow Hammer. Three seen, November 15th, 1886.

Snow Bunting. Several seen, September and October, 1884 and 1885.

Starling. Two seen, March, 1885. Frequent in flocks in October and November. A flock of two hundred, November 10th, 1887.

Chough. Resident, April to September. Also a winter visitor.

Hooded Crow. One pair breed on the rock. Frequently seen in autumn and winter.

Rook. December 13th, 1882, twenty flying east. November 2nd to 24th, 1884, flocks passing nearly every day. November 5th, 1887, a single bird on the island. November 9th, light south-east wind, flocks flying north-east passed from 12.30 p.m. to 1 p.m. The birds came from the westward, and were very tired. One hundred in first flock, eighty in second. The second flock rested about ten minutes on the island. November 12th, 1887, sixteen. November 18th, 1887, fourteen.

Jackdaw. Two on the rock, November 2nd, 1884.

Raven. An uncertain visitor; more frequent in autumn and winter. In June, 1884, five birds visited the rock nearly every day, leaving for the shore towards evening.

Cuckoo. One seen, April 19th, 1887.

Eagle (sp.). Two flying about rock, April 4th, 1882.

Sparrow Hawk. One seen, October 15th, 1887.

Greenland Falcon. An old male shot while feeding on a Rabbit September 28th, 1887.

Peregrine. A pair breed on the island.

Kestrel. Two frequented the rock, August to November, 1884.

Cormorant. Rarely seen on the Great Skellig.

Heron.* Noted in March, July, September, November, and December. In September, 1883, "two Cranes stayed about for a fortnight" (Light-keeper's note).

Pigeon (sp.). March 5th, 1885. December 4th, 1886.

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* In the course of our walk we found a few pairs of Herons breeding in some lofty Firs upon a rocky low-tide islet in Glengarriff Bay. Another small heronry we met with in the grounds of Mr. Daniel O'Connell, at Darrynane.

Corncrake. One seen, May 5th, 1883. One flying north, April 27th, 1886; wind, south-east. One found dead, June 16th, 1887.

Lapwing. Eight shot, March, 1887.

Oyster-catcher. A pair bred in 1885. Seen in spring and autumn.

Woodcock. Seen rarely; October to December. November 10th, 1884, one found killed by a Hawk.

Snipe. Has occurred in December and January.

Curlew. Has been observed from August to January.

Herring Gull
Lesser Black-backed Gull
Greater Black-backed Gull
} Flocks and small parties frequent the rock in the winter months.

Kittiwake. Breeds. Often seen in winter.

Storm Petrel. Breeds. May to October.

Manx Shearwater. Breeds. Seen from March to November.

Razorbill. Breeds. Rarely seen from December to March.

Guillemot. Breeds. Rarely seen from December to March.

Puffin. Breeds. Not observed from December to March.

Great Northern Diver. One seen, June 1st, 1882.

IV.

ON THE BIRDS OF THE FARNE ISLANDS (NORTHUMBERLAND).

By J. H. Gurney, Jun., F.L.S.

Read September 24th, 1889.

A desire to see how the birds on the Farne Islands had thriven under the system organised for their protection by Mr. H. G. Barclay, induced me to accompany that gentleman on one of his visits of inspection to this celebrated nursery of sea-fowl, so familiar in name to all lovers of birds. Accordingly, on July 3rd, we visited the islands in Mr. Cuthbertson's boat; finding, on one of them, Mr. H. T. Nelson, long known by letter, though not personally.

The greater part of the Terns and Gulls had already hatched their young, and nestlings were to be seen in every stage of development, from the chick half out of its shell to the already strong swimmer. A broad-brimmed hat is essential for safety, for the Arctic Terns employ their artillery of whitewash; and the enraged Lesser Black-backed Gulls, usually so wild, seem to have laid all fear aside, and swoop fiercely at the daring handler of their young. Hewitson says an old woman had her bonnet almost torn to pieces by them, which I can well believe from the attacks they made on us.

The Eiders have got up their numbers capitally, and a naturalist will find Guillemots and Puffins to his heart's content. All this is a very different state of things from what obtained the last time I put pen to paper about old Farne and its birds, when the incessant shooting which went on was simply revolting (N. H. S. Glasgow, Proc. 1877, p. 268).* Mr. Barclay's efforts to put a stop to indiscriminate egging deserve commendation from every true lover of birds, and the success with which they have been crowned is a good omen for their welfare.

Eider Duck.

The largest number of Eiders nest on Wide-Opens, formerly spelled Wedums, where the watchers think there were ninety nests this summer, as against about seventy-five last. They counted sixteen nests on Big Hasear, seven on Brounsman, eight on the Staples, twelve on North Wamses, and eight on South Wamses.

The down, which in Iceland is stated to fetch nineteen shillings a pound (Crowe's 'Consular Report'), is not collected. I took the liberty of annexing a pocket-full; and you will observe its extraordinary elasticity, and that in colour it is smoky brown with many pale spots. The old Eider Duck plucks it from her body as incubation proceeds. The picked sample, which it has taken me a long time to cleanse of all foreign substances, weighs less

* For the convenience of others, I may here give references to some other papers on the birds of the Farne Islands:—'Century Magazine,' August, 1886; 'Naturalist,' April, 1887, and January, 1881; 'Midland Naturalist,' March, 1884; 'Field,' July 16th, 1881; Croydon N. H. Trans., 1882-3 (p. 159); 'Zoologist,' 1866 (pp. 185, 483), and 1876 (p. 493). In Pennant's 'Tour in Scotland' (vol. i. p. 46) there is an account of his visit to the islands in July, 1769.

than a quarter of an ounce, but could be easily expanded into something like two hundred and fifty cubic inches. The other sample on the table, which is not picked over, weighs about 1 lb. 7 oz., and is compressible into this small box, thirteen inches by eight.

One Eider allowed me to stroke her on her eggs, and even permitted the watcher to try and remove a feather which had stuck in her nostril; but some of the others scuttled off their nests in a great fright; but the down was never disarranged, though, of course, there was no time to pull any over the eggs. Most of the eggs, which were near hatching, were embedded in quite a mass of it. More than one egg was chipping, and a noisy youngster inside was just getting his first sniff of the salt sea, very speedily to be his cradle.

The real nest is made of dead bents of grass and *Silene maritima*, and the ground underneath is often hollowed out. An average nest measures seven inches across inside and eight out. Five eggs, of an olive green colour, appear to be a clutch. I only found one nest with six, and seven nests contained four apiece, and probably all of them incubated. Only one young nestling was found on the islands; but some more were seen in the sea, already quite at home there, though not alone.

Sheld-Duck.

Two Sheld-Ducks, locally termed Scale Ducks, were leading their little fleets of young, consisting only of four and three, out to sea, the little ones swimming just behind their parents; and we did not see any other Ducks; but, in winter, Mergansers, Golden-eyes, Long-tailed Ducks, Pintails, Scoters, and Velvet Scoters, and others are to be met with.

The Sheld-Ducks had hatched their eggs on Wide-Opens, an excellent result from protection, as nine years ago Mr. Bidwell found that only one nest had been known for a long time (see his interesting article in the Croydon N. H. Trans.).

Guillemot.

It is interesting to note how each species has its separate station. The Guillemots lay their eggs on the pinnacles, and so safe do they feel on these pillars of black basalt, that small stones thrown

among them from the other side of the chasm are treated with the utmost indifference. On these rocks they are as thick as they can possibly be; in fact, every new comer has the greatest difficulty in finding standing-room, and the eggs would all be knocked into the sea, if it was not that their tapering shape preserves them. It is extraordinary how upright a Guillemot sits whilst incubating, and the great egg is quite lost to view in the hollow above the legs, the beak being used to help it in getting there, when by accident it is moved. The way they fight and push one another is very absurd, and no Guillemot will budge an inch unless it is forced to. A Guillemot's platform is at no time the cleanest place in the world, and this pushing results in their white breasts being sullied with dirt and yelk and blood. Several may be seen to bring fish, which they show no inclination to eat, and these do not add to the savouriness of the common table.

"Ringed" Guillemot.

The Ringed Guillemot is probably as plentiful as it ever was. I counted twenty-seven on the nearest pinnacle rock to the mainland without taking down the glasses from my eyes, and this was out of, probably, a gross total of two hundred and seventy Guillemots. That their numbers should not diminish is much against the Ringed Guillemot being a distinct species; for, it may be fairly argued, that it would die out in many places before the common kind, as the Roseate Tern and the Chough have done before their more abundant congeners.

There was not a single Razorbill to be seen on the pinnacles, and this species appears to be rather rare at the Farnes. The weight of a Guillemot is 2 lb. 4 oz.; of a Razorbill, 1 lb. 3 oz.; and of a Puffin, 11 oz.

Puffin.

The "Tommy Noddies" come to the islands in April. Selby says about the middle of the month (Brit. Orn. vol. ii. p. 440), but several years ago I remember counting about thirty on the 5th. They nest in the grassy turf, and the young Puffins are generally too far in to be easily reached. Moreover, Puffins' holes, like Shearwaters', sometimes have two or three passages, which run in irregular fashion twelve inches or so below the surface.

In autumn these curious birds shed the horny sheath of the beak; and examples, killed in August, will be sometimes found to have the horny pleat at the base of the upper mandible loose, and eventually it drops off like a collar.

In April, 1866, I shot a young one off Bamborough. The presence of young Puffins of the preceding year in early spring—"Winter Puffins" as they have been termed—is not uncommon. In such birds the beak is less than half the full size, and has none of the resplendent colouring of an adult.

Lesser Black-backed Gull.

The Lesser Black-backed Gull abounds now, and probably always has been very common; but we saw no Greater Black-backs, and only one pair of Herring Gulls. By far the most nests were on Wide-Opens. They prefer the rocks to the grass-covered portions of the island; albeit they use grass liberally in making their nests, some of which were quite substantial structures, eight inches across measured from the outside. Three seems to be the maximum number of eggs; but many of the nests only contained one, or one young bird. The nestlings very soon leave the nest, and squat in the rocky crevices; they have a thick covering of down, and begin to show feathers when they are about as big as a Jackdaw. They are able to see as soon as hatched, at which time they have pink mouths, dark brown eyes, slate-coloured legs, and black beaks, except the tips.

The Gulls are destructive to all the other species which breed on the islands, and large numbers of their earlier eggs are allowed to be taken by the fishermen. Eighteen hundred were gathered by Mr. Barclay's orders in 1889, the gathering ceasing on May 24th. This has done no harm, but, on the contrary, great good, as the Gulls hatch off their later eggs, and there are abundance of them.

Kittiwake.

The Kittiwakes breed on the precipitous sides of the three pinnacles and on the Staples Island, of which they are part; but the eggs can only be reached with a rope, and, indeed, they are all hatched in July. Mr. T. H. Nelson counted one hundred and seventeen nests on the Staples Island, of which fifty-five were on the pinnacles. He considers that they have increased largely since 1881, when there were about sixty or seventy nests.

Sandwich Tern.

The Sandwich Terns only breed on the Knox, where there is a very nice colony indeed. Young "Sandwiches" were running about on the stones, and even taking to the water; and about fifty nests still held eggs, though, in most cases, only one, and none had more than two eggs; but of empty shells, which had very recently held young ones, there were plenty. They breed rather earlier than the Arctic Terns. The oldest young Sandwich found was just beginning to show feather; the little chaps swim like a cork in water.

The nestling when hatched has slate-coloured legs, which become yellower as it gets older, and the dark chin becomes more pronounced, but never so black as in the Arctic Tern. Some of the eggs are simply splendid; the white type seems commonest, but in one nest there were white and yellow eggs side by side. Before any were hatched, Mr. Barclay had the nests counted by the keeper, who reckoned them up, and made the number two hundred and fifty, and all these in a space of little more than one hundred yards, for the Sandwich Terns always keep to a limited area. The old birds were not nearly so tame as the Arctic Terns, but we could see that many of them had already mottled foreheads.

Arctic Tern.

Arctic Terns were in great numbers on Knox and Wide-Opens, which at low tide form one island, so much so that it was very difficult to avoid treading on their eggs, though, by the greatest circumspection, I succeeded in not breaking one. Many of the eggs were on the point of hatching, and many had just hatched, and lively chicks were to be seen escaping over the stones; for these birds are able to see when hatched, and very soon quit their domicile. Mr. Paynter, who knows the islands well, assured Mr. Barclay they were more numerous than he ever remembered them. On the other hand, the Common Tern appears to be decreasing.

Roseate Tern.

Our utmost endeavours failed to find the Roseate Tern, but the keepers all agreed that there were one or two pairs still. I have a couple which were shot by one of the lighthouse-keepers, named Argent, more than twenty years ago, and, strange to say, they retain the beautiful and usually evanescent roseate colour, probably owing to their having been kept for some years in a dark room.

Oyster-catcher.

I caught a young Oyster-catcher in the grass, and saw two nests, one with two eggs and one with three, the former at least sixty feet above the sea, and almost on the edge of the cliff. None of the nests I met with in the Scilly Islands were as high as this, and it certainly seems to be a very exceptional altitude. Oyster-catchers eat the Limpets on the rocks, inserting their wedge-like bills when the shell is raised, which they thus easily detach from the stone, and clean out the contents almost completely.

V.

THE KING EIDER (*SOMATERIA SPECTABILIS*) AS A NORFOLK BIRD.

By Thomas Southwell, F.Z.S.

Read 24th September, 1889.

For many years this species had been included in the Norfolk lists, on the authority of Mr. Lilly Wigg, who stated that a female King Duck was killed on Breydon Broad on the 25th July, 1813. The occurrence is mentioned in a MS. book in the possession of Sir J. D. Hooker, entitled 'Memoranda touching the Natural History of Yarmouth and its environs,' by Sir William Jackson Hooker, Thomas Penrice, Esq., Mr. Lilly Wigg, Rev. Joseph Burrell, Rev. R. B. Francis, and Dawson Turner, Esq., extending from 1807 to 1840. The entry is as follows:—"King Duck. A female shot on Breydon, July 25th, 1813," and is initialled "D. T." Hunt, who was a Norfolk man, and generally referred to any rarity in his native county which came under his notice, does not mention this occurrence in his 'British Ornithology'

(title-page dated 1815), nor does he include the species in his list of Norfolk birds contributed to Stacy's 'History of Norfolk' (1829). Messrs. Sheppard and Whitear do not mention it in their 'Catalogue of Norfolk and Suffolk Birds,' printed in the 'Transactions of the Linnean Society,' and read in 1824 and 1825. The first published notice of the occurrence with which I am acquainted occurs in the 'Sketch of the Natural History of Yarmouth and its Neighbourhood,' by the brothers Paget, published in 1834; and here, strange to say, although the King Eider is mentioned in precisely the words above quoted from the Hooker MS., no mention is made of the Common Eider, which must have been known to the authors of the 'Sketch' as an occasional winter visitant. From that time the King Duck appeared unquestioned in all the lists of Norfolk birds up to, and including, Mr. Stevenson's 'Sketch of the Ornithology of Norfolk,' in White's 'Directory' of the county, published in 1864. In 1879 I edited a new edition of Lubbock's 'Fauna of Norfolk,' and after due consultation with Mr. Stevenson and other authorities on Norfolk birds, I thought it best, although reluctantly, to append a note (foot-note 149, pp. 161—2), calling attention to the extremely unsatisfactory claim of this species to a place in the Norfolk avi-fauna. In addition to the very improbable date (July 25th) of the alleged occurrence, Mr. Stevenson very rightly remarks, "In the days before Yarrell, I question if Wigg, or any one at Yarmouth, would have recognised the female of the King Eider as distinct from the more common species," and with regard to another of Mr. Wigg's rarities, he also calls attention to the fact that "Lilly Wigg was not an ornithologist proper, and yet three of the rarest and most questionable species in the Norfolk list rest almost entirely on his authority—the Red-breasted Goose, the Harlequin Duck, and the King Eider." Mr. Stevenson has retained the Red-breasted Goose for reasons which will be found in the 'Birds of Norfolk' (vol. iii. pp. 39—41), but I had no hesitation in following the authority of his last list in White's 'Norfolk' (edit. 1883), from which both the latter birds are omitted; *Somateria spectabilis* will therefore only be found mentioned in a foot-note at p. 192 of the forthcoming third volume of the 'Birds of Norfolk.' In the autumn of last year the Rev. Julian G. Tuck kindly favoured me with some valuable

notes on the birds observed by him at Hunstanton, and mentioned a young male Eider which he saw in a case at a fish-shop in that town, and which he said appeared to him to differ from other Eiders which he had seen, and especially from a young male Common Eider in his own collection, but as he had no books of reference with him he made a mental note of it as "a rather dark and small Eider," and suggested that it might possibly be an example of the King Eider. I had an opportunity of examining this bird in the last week of July,—unfortunately after my article on the Eider for the 'Birds of Norfolk' had been printed,—and was delighted to find it a young male *Somateria spectabilis*. I lost no time in purchasing the specimen, which I now have the pleasure to exhibit, and have presented to the Norwich Museum, where I trust it will long remain *en évidence*. The bird was shot off Hunstanton about the middle of January, 1888, and was stuffed by Mr. Clark, of Snettisham, for Mr. Osborne, of whom I purchased it. It was seen alive on several occasions by the Hunstanton gunners, among others by Mr. Tuck's correspondent, Mr. B. Bowler (see 'Zoologist,' 1888, p. 148). There can therefore be no question as to its identity, and it gives me great pleasure to restore the species to a place in the Norfolk list on such satisfactory evidence.

VI.

NOTES ON HYMENOPTERA IN THE NEIGHBOURHOOD OF NORWICH; AND ON THE GENUS GLYPTA, GR.

By John B. Bridgman, F.L.S., F.E.S.

Read 29th October, 1889.

I have been requested to give a paper to our Society, and in doing so I am perfectly aware how uninteresting it must be to the great majority of our readers. Although entomology is a favourite pursuit, Coleoptera and Lepidoptera, or Beetles and Butterflies, are the orders generally studied. Hymenoptera, and some others are much neglected in favour of the more popular Orders. During the last few years more interest has been taken in my order, and many lepidopterists now save the Ichneumons they breed, consequently, a great many new species are constantly occurring, and the sexes of many species have been made known, which would otherwise have remained, as formerly, under two distinct names and sometimes in different genera. Marshall's list contained 1186 Ichneumons, and to that list I have added some four hundred species, or an increase of about one-third.

Portions of this order fill an important office in natural economy. For instance, Bees, in their visits to the various flowers for honey and pollen, are important agents in the fertilization of plants. Wasps help to keep down surplus population in the shape of Spiders, Caterpillars, and Flies; all Wasps are carnivorous, and collect these to deposit their eggs on as food for their own larvæ when hatched. Ichneumons, too, destroy an enormous quantity of Spiders and larvæ of every other order of insects, and even the larvæ of other Ichneumons, for it is not at all uncommon to breed Ichneumons from the pupæ of other Ichneumons. It is not however my

intention to give a paper on general entomology, but simply a few notices of occurrences, and to conclude with some notes and a table of the genus *Glypta*, G., one of the genera of Ichneumons belonging to the family of Pimplides.

My collecting this year has been done almost entirely in the neighbourhood of Norwich, because I have not had time to get away, except on the bank holidays, and I am sure I need hardly remind you of the wretched weather we had here on the summer bank holidays. I should think Whit— or, as it might be called, wet—Monday will be long remembered in this county.

When I published my list of Sawflies in our Transactions for 1888, I introduced *Crœsus septentrionalis* with some doubt, because I was not certain where the specimen Mr. F. Norgate gave me came from. I am sorry to say this last summer I have taken the larvæ from the Birch trees on Mousehold. Five males emerged in August, and I have no doubt more of them will come out in the spring. I say I am sorry I met with them, because they often do so much mischief; they are gregarious, and feed on the edge of the leaf, generally very close together. They hold the leaf with their forefeet, and elevate their bodies in the air in the form of an elongated ς; three or four will be at work on one edge of a leaf at a time; and so thoroughly do they do their work, that where they have been nothing is left but the bare twigs and leaf-stalks. I took all I could find of them, to save the trees as much as possible.

I have also bred in numbers *Fenusa ulmi* and *F. pumilio*: the former is abundant in Elm leaves. This genus of Sawflies lay their eggs in the leaves of plants; and the larvæ when hatched live and feed between the tissues of the leaf, leaving the outer cuticle intact. From *F. ulmi* I have not yet succeeded in breeding any parasites. *F. pumilio* lives in the larval state in the leaves of the Raspberry, to which they often do much damage; they are also found in the leaves of the Bramble. I have found that they seem to prefer large rather woolly leaves. I do not know if it is a variety of a distinct species of Bramble. From this Sawfly I have bred a small Ichneumon, *Grypocentrus albipes*, R. I believe this is the first time it has been bred. I also found on the Birch trees, on Mousehold, the larvæ of another of these mining Sawflies. The trees were literally infested with them. They are easily seen, when

fresh, the leaves are pale, blotched, and when old, the greater part of the leaf looks dead and withered. These have not emerged yet, so I cannot say for certain which of the two species that mine the Birch it is, *F. pumila* or *F. betulæ*. They are said to appear in May and June, and again in the autumn. I took these mined leaves in June, but the imago did not emerge as I expected this autumn. Perhaps mine were too late, and it may be the eggs laid by the early flies that come to perfection in the autumn. I also recorded a female of *Tenthredo obsoleta*, a rather common Sawfly, given to me by Mr. Atmore, taken at Lynn. This year I swept a great many females off the Ling on Mousehold in June. It is very singular I should never have met with it before, especially so, because at the time and place I was sweeping for an Ichneumon which I discovered there a few years before, and had named and described (*Glypta trochanterata*), and which I could always find on the Ling in June, and often swept there for it. The larva of this Sawfly is unknown. I had hoped to have gone there later to try and find it, but forgot it. I hope to be more successful next year. With these Sawflies I found two specimens of *Mesoleius filicornis*, and think it not improbable that they are parasitic on this *Tenthredo*.

I think Mousehold will become a good hunting-ground for entomologists when the trees that have been planted grow to a good size. I wish Alders and Sallows would grow in the lower part, as these are favourites with many larvæ. This place has a very great advantage over many other localities. You can go where you like, without being confronted with a black board bearing a notice in white letters that "Trespassers will be prosecuted, by order" of somebody or other.

The early part of the year was very unproductive: there seemed to be no Hymenoptera about. Solitary Bees and Wasps were very scarce, in fact, so were all other divisions of the order. I often did not take half-a-dozen insects in an afternoon. Social Wasps seemed fairly abundant in the autumn, and towards the end of summer there seemed more insect life about, at least, of this order.

At Earlham, on July 30th, I took two females of *Heterogamus dispar*. Rev. T. A. Marshall, in his monograph of the Braconidæ, says it is found in Fir woods in the autumn, but not common. These were taken quite five hundred yards from Mr. Ripley's

plantation—swept off the banks of a lane, not far from each other. This is a handsome insect, and one of the few Bracons which have the antennæ tricolored, *i.e.* red at the base, white in the middle, and black at the apex. In two families the females, as a rule, have the antennæ white-ringed, and now and then the males also. About the same time and place I took a female of another Bracon, *Meteorus albicornis*, R., which has the antennæ tricolored. This I swept also on the bank of the cross lane leading from Earlham to Eaton, off the vegetation at the foot of the old Ash trees which line the lane on one side: this appears to be far from common. In the same lane I swept two females of *Spathius rubidus*, R., which I think are most probably parasitic on the larvæ of some of the Beetles boring in the old trees. It is very singular that certain species of insects should be so plentiful some years, and scarcely, or not at all seen in others. At the end of August and September I took the small *Thersilochus rufipes*, H., hitherto unrecorded as British; I had never met with it before; but this year I took two females, and the males were so plentiful that I often had more than a score in the net at a time.

Some years ago, at the latter end of summer, I found a large number of the cocoons of *Apanteles congestus;* these cocoons are oval masses, like little balls of yellowish-white cotton on grass stems. In that year the Moth *Plusia gamma* was recorded as swarming pretty well all over the country, and I believe this species was parasitic on the larvæ of that Moth. I never saw the cocoons in such profusion before or since, and I think I must have collected a pint of them. I bred two species of Pezomachus, the little apterous *Cryptid*, which I had not taken before or since, but unfortunately only the female sex in either case. Also at Earlham, in July, I took a female of *Hemiteles hadrocerus*, Th. It is new to Britain, and the handsomest British species of the genus I have seen. It is bright red, with a black head, the antennæ are tricolored, and the wings have deep black bands across them. About the same time and at the same place I took a male and female of *Hemiteles melanogaster*, Th., also new to Britain. On July 20th I took a female of *Blacus maculipes*, Wesm. This appears to be scarce. The Rev. T. A. Marshall had not met with it, and had to take his description from that published by other authors. Haliday used to take it in Ireland. It has not been

before recorded as having been taken in England. These small insects are easily overlooked.

One species of *Ichneutes* has been recorded as occurring in Britain (*I. reunitor*). I have taken another very distinct species, which is probably the other European species, *I. leris*, Wesm. It differs from the former species in having the body quite black, base of antennæ reddish, wings dark, the radial cell is much shorter, and the longitudinal grooves on the *mesonotum* are very different. I took this species in the neighbourhood of Norwich.

Haliday in the 'Entomological Magazine' (vol. iv.) included *Rhogas testaceus*, Ns., in his monograph of British *Bracons* and added *R. circumscriptus*, Ns., as a synonym. Marshall in his monograph has omitted *R. testaceus*, Ns., and says: "The occurrence of the latter species (*testaceus*) in this country is merely hypothetical. The name was introduced by Haliday, who, relying upon the descriptions of Spinola and Nees, confused it with *circumscriptus*, and treated that name as a synonym. It is necessary, therefore, to discard *testaceus* until some one can produce an authentic British specimen." At the beginning of September I took a female, which I believe to be *R. testaceus*. The antennæ have only thirty-one joints, and are only a little more than three-quarters the length, and not as long as the body, as is the case with *circumscriptus*. Marshall says, quoting from Reinhard and Spinola, that in the female the first segment of the abdomen is distinctly shorter than the apical width, and the second decidedly transverse. This is not the case with my insect, for although the first segment is certainly shorter than in *circumscriptus*, it is rather longer than wide; the second segment is only just transverse, the apical segments are more retracted, and the head is rather less narrow behind the eyes. I think it must be *testaceus*. There is no other European species that has the antennæ with so few joints, at least, not described in André's Species of 'Hyménoptères d'Europe et d'Algérie.' On July 28th, also at Earlham, I took a male of *Microplites eremita*, Rh. This species is new to Britain, and is the first of those having red legs which has occurred in this country. Reinhard gives three European species in his monograph.

In the latter part of the year I visited the Earlham Lane frequently in the evening, when the weather was fine, which

accounts for most of these notices of captures being recorded from that locality. I found there many specimens of *Glypta*, principally *bifoveolata*, Gr.; and while thinking over what I had taken, the thought struck me I would finish this paper with some remarks on that genus, a table of the British species, and a list of the hosts of such as I have received from several entomologists, who have, fortunately for me, bred them, and to whom I am deeply indebted. Every one of the new species I have described has been thus sent to me.

Glypta is a well-marked genus of the family of Pimplides, and is easily known by its elongated body, sessile abdomen, and long ovipositor. The second, third, and fourth segments of the abdomen have two deep diverging lines on each of the three segments; the ovipositor varies from a little shorter than the abdomen to longer than the body; the general colour of the body is black, and greater part of the legs red. Two species have the head and thorax more or less red—*G. ruficeps* and *lineata*. Two species have the abdomen almost entirely red—*monoceros* and *rufata*. Three have the scutellum and thorax marked with yellow—*G. flavolineata*, *evanescens*, and *cicatricosa*. The majority have the abdomen black, sometimes with the apical margin of the segments more or less red; while two have the middle of the abdomen more or less red—*fronticornis* and *rubicunda*. The legs are generally red; very few have the hind tibiæ and tarsi white, annulated with black. The coxæ may be either red or black; very rarely the first joint of the antennæ is yellow beneath. They are dull or slightly shining, closely punctate. The wings rarely have an areolet, never in the species at present known as British. A few have a short horn on the forehead just above the antennæ, and one has two horns. The segments of the abdomen are generally transverse, wider than long; rarely longer than wide. There is only one British Ichneumon that could by any possibility be put into this genus that does not belong to it, that is *Lycorina triangulifera*. I know of only three specimens of this species which have been taken in Britain: one by Mr. Bignell at Plymouth, another by Mr. Harwood of Colchester; and the third, which I have, was bred from an unknown host by Mr. Atmore of Lynn, who kindly gave it to me.

Curtis, in his 'Catalogue of British Insects,' published in

1837, gave thirteen species, all described by Gravenhorst in his 'Ichneumonologiæ Europeæ;' and of these thirteen, Curtis had marked seven of them as doubtfully British.

Desvignes, in his 'Catalogue of Ichneumons in the British Museum,' published in 1856, gives eighteen species, seven of which were new, and are there described by him; and omits two of the species in Curtis's list—*G. subcornuta* and *G. fronticornis*: *subcornuta* does not appear to have been taken since Gravenhorst described it; and no one, except Curtis, that I know of has ever quoted it. Gravenhorst says it is like *G. mensurator*; and it may possibly have been only a variety of that species.

The Rev. T. A. Marshall, in his 'Catalogue of British Ichneumons,' published in 1872, gives twenty species, still omitting *subcornuta*, and adding to Desvignes' list *G. fronticornis* and *resinanæ*.

I have still further increased the list to thirty-four species, of which seven are Continental; the other seven species were new to science, which I have described and named. *G. fronticornis*, first appeared for certain in the Rev. T. A. Marshall's list, I do not feel at all sure that it has any right to a place in the British list. There is another species, *G. elongata*, H., which is very like *G. fronticornis*, Gr. Both answer very well to Gravenhorst's description, but *elongata* has the sides of head behind the eyes almost parallel, while *fronticornis* has the sides very much converging towards the neck. I have taken *elongata* at Brundall, and have had bred specimens sent to me, and have, I believe, seen it elsewhere; but I have never seen a specimen of the true *fronticornis*. I have retained it in my table, but question its right to be there as a British species.

Three species are here recorded as British for the first time; viz., *G. cicatricosa*, R., sent to me to name by the Rev. E. N. Bloomfield of Guestling Rectory, Hastings; and the others are new species bred, and kindly given to me, by Mr. G. Elisha and Mr. W. H. B. Fletcher—*G. rubicunda*, Ns., and *annulata*, Ns.

Mr. Atmore has bred this year both sexes of *G. flavipes*, the female of which was previously unknown.

Professor Thomsen says that *G. consimilis*, H., is the same as *G. resinanæ*, Rtz. This may be so as far as the female is concerned; but Holmgren says the legs are red, and makes no mention of the black coxæ of the male, which I think he

would have been sure to do if his species had black coxæ. He further says that *G. consimilis*, Tasch., is not the same species as *G. consimilis*, Holm. The former he has named *microcera*. But I think if Holmgren's species is *resinanæ*, and not a good species, then Taschenburg's name ought to be kept for the species he describes under that name. He also says that the female of *G. sculpturata*, Gr. = *bifoveolata*, Gr.; and the next species he describes is *bifoveolata*, Gr., male and female. These two species are evidently very much alike: the main difference appear to be, that the head of *sculpturata* is less narrow behind the eyes than *lugubrina*. He gives the length of the aculeus; but this I find is not constant; sometimes it is as long as the body, and sometimes longer. I have placed an * in front of those species which have occurred in Norfolk. *G. teres*, Gr. ♂ var. 1, Thomsen says is the male of *bifoveolata*.

Besides those given in the list of bred insects at the end, *G. lineata*, *bifoveolata*, and *annulata* have been bred from uncertain hosts by Mr. W. H. B. Fletcher: all these, unfortunately, were females.

Two of Desvignes' species, *G. femorata* and *nigrina*, described in the Museum Catalogue, giving only a description of colour, have kindly been examined for me by Mr. W. F. Kirby of the British Museum. Of *G. nigrina* there are six females; and besides the points given in the table, Mr. Kirby says, the clypeus is bristly rather than pubescent, and the head is not narrow behind the eyes.

Of the other *Glypta* examined by Mr. Kirby, *G. femorata*, Desv., there is only one in the Museum. The head is short, subrotund; and the clypeus is covered with short pubescence. This species, also, should be very easily recognized.

Many years ago Mr. Charles G. Barrett gave me three pairs of a smallish *Glypta*, which I thought might be this species; the hind femora of some were more or less marked with brown, especially the base and apex, and sometimes the upper surface also. These were bred from *Eupœcilia hybridellana*. I sent a pair of them to Professor Thomsen of Sweden, and he said they were the same species as some I sent named *G. lugubrina*. Singularly these latter were bred by Mr. W. H. B. Fletcher from the same host in 1886.

Holmgren gave the name *lugubrina* to an insect which he thought was probably *G. bifoveolata*, Gr., Var. 2, and as a synonym

and variety, gave *G. mensurator*, Gr. I have given the name *lugubrina* to the above-mentioned insects, but I do not feel at all certain that they are the same species that Holmgren described. The middle segments of the abdomen appear to me to be less transverse. The mesopleura and metathorax are much more finely and sparingly punctate. In the table I have put both *mensurator* as representing Gravenhorst's species, and *lugubrina* as Holmgren's.

GLYPTA, GR.

Wings without an areolet.

1. (14.) Forehead cornuted.
2. (3.) Forehead with two small horns above the antennæ. *bicornis*, Desv., ♂ ♀.
3. (2.) Forehead with one small horn.
4. (5.) Sides of head behind the eyes not slanting. **elongata*, H., ♂ ♀.
5. (4.) Sides of head behind the eyes slanting towards the neck.
6. (7.) Claws of tarsi not pectinated; legs and abdomen red, apex of the latter, black. **monoceros*, Gr., ♂ ♀.
7. (6.) Claws of tarsi distinctly but thinly pectinated.
8. (9.) Legs red, apex of hind tibiæ fuscous, coxæ sometimes more or less piceous or black; middle of abdomen more or less red. *fronticornis*, Gr., ♂ ♀.
9. (8.) Hind tibiæ dark towards the base as well as the apex.
10. (11.) Extreme base of hind tibiæ dark. ? *ceratites*, Var., ♂ ♀.
11. (10.) Extreme base of hind tibiæ pale.
12. (13.) Forehead smooth and shining; frontal horn of normal size. **ceratites*, Gr., ♂ ♀.
13. (12.) Forehead distinctly punctate; frontal horn minute. **parvicornuta*, m., ♀.
14. (1.) Forehead not cornuted.
15. (24.) Thorax more or less marked with red or yellow.
16. (19.) Thorax marked with red.
17. (18.) Thorax entirely red on the back; aculeus as long as the body. *ruficeps*, Desv., ♀.
18. (17.) Thorax red above, with three dark dorsal marks; aculeus nearly as long as the abdomen. *lineata*, Desv., ♀.
19. (16.) Thorax and scutellum marked with yellow.
20. (21.) Middle segments of abdomen transverse. *cicatricosa*, Rtz, ♀.
21. (20.) Middle segments of abdomen not transverse.
22. (23.) Middle segments of abdomen longer than wide. *evanescens*, Rtz., ♂ ♀.
23. (22.) Middle segments of abdomen sub-quadrate. **flavolineata*, Rtz., ♂ ♀.

24. (15.) Thorax entirely black.

25. (26.) Cheeks below the eyes one and half times as long as the width of the base of the mandibles; legs red; coxæ, apex of hind tibiæ and tarsi blackish. **genalis*, Möll, ♂ ♀.

26. (25.) Cheeks below the eyes scarcely, if at all, longer than the width of the base of the mandibles.

27. (40.) Clypeus covered with long dense pubescence.

28. (29.) Second and third segments of abdomen longer than wide; middle of abdomen, more or less, and legs red; base black. *rubicunda*, m., ♂ ♀.

29. (28.) Second and third segments wider than long.

30. (33.) Hind coxæ black; hind tibiæ biannulated, *i.e.*, apex and before the base dark.

31. (32.) Hind tarsi black; extreme base pale; aculeus as long as the body. **vulnerator*, Gr., ♂ ♀.

32. (31.) Hind tarsi black; joints white-ringed; aculeus a little shorter than the abdomen. **hæsitator*, Gr., ♂ ♀.

33. (30.) Hind coxæ red; hind tibiæ biannulated.

34. (35.) Hind trochanters black. **trochanterata*, m., ♂ ♀.

35. (34.) Hind trochanters red.

36. (37.) Fourth and fifth joints of hind tarsi of equal length; aculeus rather longer than the abdomen. *similis*, m., ♂ ♀.

37. (36.) Fifth joint of hind tarsi much longer than the fourth.

38. (39.) Keels on the first abdominal segment distinct, extending almost to the apex. *filicornis*, Th., ♂ ♀.

39. (38.) Keels on the first segment less distinct, extending just beyond the middle. *lineata*, Desv., ♂.

40. (27.) Clypeus not covered with long dense pubescence.

41. (48.) Fifth joint of hind tarsi not longer than the fourth.

42. (43.) Second and third segments of abdomen transverse; aculeus rather shorter than the body; legs red; apex and before the base of hind tibiæ dark; coxæ and trochanters of the male black. **resinanæ*, Hart., ♂ ♀.

43. (42.) Second and third segments of the abdomen not transverse.

44. (45.) Coxæ, and apex of hind tibiæ, and tarsi black; aculeus about as long as the abdomen. **teres*, Gr., ♂ ♀.

45. (44.) Coxæ not black.

46. (47.) Legs red; front coxæ and scape beneath, of the male, yellow; aculeus a little shorter than the abdomen. *flavipes*, Desv., ♂ ♀.

47. (46.) All the coxæ of male red; scape beneath not yellow; hind tibiæ biannulated; base and base of tarsal joints pale. Female not known, or undescribed. *punctifrons*, Th., ♂.

48. (41.) Fifth joint of hind tarsi decidedly longer than the fourth, especially of the female.

49. (52.) Hind tibiæ and tarsi white, or whitish, dark ringed.

50. (51.) Middle of hind tibiæ clear white; aculeus rather longer than the abdomen. *pedata*, Desv., ♂ ♀.

51. (50.) Middle of hind tibiæ rather sordid white; aculeus rather shorter than the abdomen. *pictipes*, Tasch., ♂ ♀.

52. (49.) Hind tibiæ not white or whitish in the middle.

53. (56.) Abdomen more or less red in the middle; middle segments transverse.

54. (55.) Abdomen almost entirely red; legs red; hind tibiæ often with two pale fuscous rings; aculeus as long as the abdomen. *rufata*, m., ♂ ♀.

55. (54.) Middle of abdomen more or less red, often black; apex, and before the base of hind tibiæ dark; coxæ, especially the hind ones, often more or less black; aculeus as long as the body or longer. **mensurator*, Gr., ♂ ♀.

56. (53.) Abdomen black, or at the most, some of the segments, with a red margin.

57. (62.) Legs red; hind coxæ sometimes dark.

58. (59.) Middle segments of abdomen decidedly transverse; aculeus as long as the abdomen. **scalaris*, Gr., ♂ ♀.

59. (58.) Middle segments of abdomen as long as wide, or almost so: all the coxæ of the male black; hind coxæ of the female often, more or less, fuscous; aculeus about as long as the body.

60. (61.) Head behind the eyes narrow: stigma pale. **bifoveolata*, Gr., ♂ ♀.

61. (60.) Head behind the eyes scarcely narrow; stigma darker. *sculpturata*, Gr., ♂ ♀.

62. (57.) Legs red; apex, and before the base of the hind tibiæ, fuscous, whitish at the extreme base.

63. (64.) Hind femora black; extreme base fulvous; coxæ black. *femorator*, Desv., ♂.

64. (63.) Greater part of hind femora red, generally entirely red.

65. (70.) Second and third segments of abdomen transverse.

66. (69.) Coxæ red.

67. (68.) Aculeus about three-fourths the length of the abdomen; middle segments of the abdomen of the male sub-transverse. *parvicaudata*, m., ♂ ♀.

68. (67.) Aculeus about as long, or a little longer, than the body: middle segments of the abdomen transverse. *mensurator*, Gr., Var., ♂ ♀.

69. (66.) Coxæ black; aculeus as long as the abdomen. *lugubrina*, H., Var. 1. ♂ ♀.

70. (65.) Second and third segments of abdomen not distinctly transverse. ? = *mensurator*, Var., ♂ ♀.

71. (74.) Coxæ red.

72. (73.) Aculeus shorter than the abdomen; base of hind femora fuscous. *nigrina*, Desv., ♂ ♀.

73. (72.) Aculeus a little longer than the abdomen; hind knees black. **incisa*, Gr., ♂ ♀.

74. (71.) Coxæ black; aculeus about as long as the abdomen. *annulata*, m., ♂ ♀.

Parasites.	Bred from	By
Glypta elongata, H.	Bactra lanceolana	W. H. B. Fletcher
,, ceratites, Gr.	Scricornis conchana	W. H. B. Fletcher
	Diurnea fagella	W. H. B. Fletcher
	Phycis betulae	E. A. Atmore
,, ceratites, Var.	Euchromia flammeana	W. H. B. Fletcher
,, parvicornuta, m.	Acrobasis consociella	E. A. Atmore
,, genalis, Möll.	Tortrix viburnana	E. A. Atmore
,, ,,	,, adjunctana	
,, ,,	,, decretana	
,, rubicunda, m.	Argyrolepia maritiniana	G. Elisha
,, vulnerator, Gr.	Catoptria scopoliana	E. A. Atmore
,, similis, m.	Epphiphora scutellana	W. H. B. Fletcher
,, resinanae, Rtz.	Retinia turionana	E. A. Atmore, C. G. Barrett
,, parvicaudata, m.	Hysipetes ruberata	W. H. B. Fletcher
,, pedata, Desv.	Spilonota ocellana	W. H. B. Fletcher
,, flavipes, Desv.	Antithesia capraeana	E. A. Atmore
,, ,,	Podisca solandriana	
,, rufata, m.	Eupœcilia notulana	W. H. B. Fletcher
,, pictipes, Tasch.	Diurnea fagella	W. H. B. Fletcher
,, filicornis, Th.	Birch catkins	W. H. B. Fletcher
,, punctifrons, Th.	Antithesia dimidiana	W. H. B. Fletcher
,, flavolineata, Gr.	Phycis betulella	G. T. Porritt
,, lugubrina, Holm.	Eupœcilia hybridellana	W. H. B. Fletcher, C. G. Barrett
,, incisa, Gr.	Penthina picana	E. A. Atmore
,, mensurator, Gr.	Catoptria sp.	W. H. B. Fletcher

Since the above was in type Mr. Fletcher has bred *G. parvicaudata* from *Peronea mixtana*.

VII.

THE NIGHTJAR (*CAPRIMULGUS EUROPÆUS*).

By J. H. Gurney, Jun., F.L.S.

Read 28th January, 1890.

The Nightjar is a common bird in Norfolk, and one which lends itself to study. Often will the student of Nature marvel as its weird form silently flits past on a summer's evening, familiar though the sight may be, in chase of the large insects on which this harmless and beneficial bird preys. At such times it is often very heedless of man; indeed, it has been known, probably in a fog, to hover round the electric lamps of a town, or the blast furnaces of iron mines in Staffordshire until shot down by the ignorant pitmen, who, it is on record, once actually killed twenty-one and wounded others ('Land and Water,' September 13th, 1873). Of course such a needless destruction of life is to be deplored, but the congregating of so many together, attracted by the light, is very curious.

Sir Thomas Browne twice alludes to the Nightjar as a Norfolk bird, under the name of the "Dorhauk" (Wilkin's edition, vol. i. p. 397; vol. iv. p. 322), and says that he opened many to see what they fed on. So, in 1663, when he is supposed to have written his list of Norfolk birds, they were evidently as common as now; but it is rather odd that he adds he never found "anything considerable in their maws." I have found as many as thirty Moths, or their remains at any rate, and four great Beetles in

one; and Mr. Gray has seen them cleverly picking the Otter Moth off stems in grass-fields.*

In most works on ornithology it is stated that the bristles† on the Nightjar's bill are to help it in catching moths; but a careful consideration of the matter will convince any one that this agile and wide-mouthed bird wants no such assistance. There is another and more probable use for which they are intended, and that is for assisting in the utterance of its familiar note. It seems highly probable that the prolonged jarring sound is, in part, due to the bristles, which are, doubtless, movable; and, in confirmation of this theory, we find that certain American Nightjars, of the genus *Chordeiles* or *Chordediles*, which have no bristles, make no jarring. Gilbert White observed that the under mandible quivered in the act of jarring, and this must help to produce the sound; and it is said that the head is always held lower than the body, which may further assist it.

Whatever may have been said to the contrary, it is an indubitable fact that the Nightjar only jarrs when at rest. It is very drowsy before sundown, but at night it sounds clear and loud, like the croaking of frogs. It may occasionally be heard jarring long before sundown; and now and then a feeble jarring may be caught as early as four p.m., and it will go on to as late as eight in the morning.

Robert Marsham of Stratton Strawless in Norfolk, writing in 1781, says :—"I counted 1150 whilst a Dawhauk sung, and I am confident that + fifty might have been counted before I began to tell" (Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 33). In 1872, Mr. John Cordeaux, in company with the writer, timed the duration of a Nightjar's jarring, and made it eighty seconds, and

* Many other instances might be quoted, but the following note in the 'Zoologist' by Mr. G. B. Corbin will give a good idea of what the Nightjar's customary food is:—Having shot a pair in Hampshire, he proceeded the next day to skin them, when, on cutting open their crops for examination, out flew two Moths, while several others crawled out after twenty-four hours' confinement, viz., eleven Antler Moths, one Yellow Underwing, three *C. selasellus*, five *C. culmellus*, three common Beetles (*G. stercorarius*).

† The long stiff bristles appear very early, as does the serrated middle claw, the use of which has been so much debated; but the bristles appear first.

sometimes much less; but Professor Newton has known one to go on for five minutes (Yarrell, 'British Birds,' vol. ii. p. 380, fourth edition).

In the stillness of the night the Nightjar often utters a loud note, which Professor Newton compares to the swinging of a whip-thong, and Mr. Sterland to the syllable "*tlok*," which note it only utters on the wing, and which some have thought to emanate from both sexes. I believe the female cannot make this note, nor jarr, but only a chuckling noise, occasionally varied with a hissing sound.

A young one in confinement, which never jarred, but made a loud note very like the "whip-thong" note, proved, when it died, to be a male. It uttered a hissing noise when disturbed but was very quiet in the day-time, never moving an inch from where we placed it, not even to escape the full brightness of the sun when it fell upon it. I once heard a young one in the woods make regular jarring, though in a very minor key.

Besides vocal notes, Nightjars have another way of making a loud sound, and that is by rapping their wings together, as Wood Pigeons do, the two pinions coming together back to back with a clap, and this is more particularly when they have young.

Nightjars have two eggs, and beautifully mottled they are. A Nightjar very seldom lays a bad egg; but, on the other hand, never has more than two young ones, and the pair are seldom the same size, indicating that one is hatched a day or so before the other. It has been doubted if it rears two broods in a season, but, though so late a migrant, there is ample time for it to do this, and I have found eggs as late as August 12th. It never has a vestige of a nest to lay its eggs in.

The young Nightjar can make a faint squeak when one day old; at eight days old the young can run; at thirteen, the serrated claws appear; at fifteen, they make a sound which may be called jarring; and at eighteen, they can fly. The habit of the old hen-bird of feigning to be wounded (Fig. 1) when discovered is well known, and is one of the prettiest of woodland sights. Another curious habit is that of moving the young if too much looked at, generally only a few yards, but sometimes too far to be found again; with such feeble feet and bill, it is wonderful how this operation can be performed; and, judging from the running

powers of a young one in confinement, it is probable that they sometimes move without any help. On one occasion my friend Mr. Norgate saw a Nightjar *apparently* carrying a young one in its mouth. It is said that they also sometimes move their eggs ('Zoologist,' 1884, p. 89), but I never knew one moved though handled again and again; but the experience of others may be different.

A favourite place for the eggs is under a young Silver Fir tree, six or eight feet high; but sometimes they are laid under the shade of tall Bracken; sometimes under an Elder bush, or an

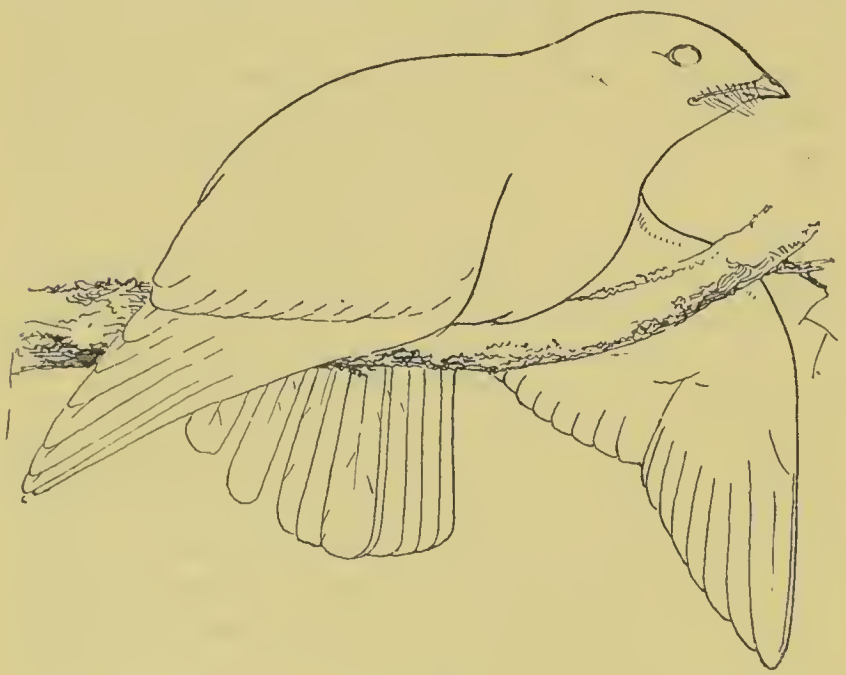

Fig. 1.

Ilex; and sometimes by the side of a path with no shelter; or in an open glade in a Fir-wood, amongst rough herbage or heather.

When the young are hatched, the position of the old Nightjar in covering them is somewhat ungainly, as appears from the annexed cut (Fig. 2). The young are not to be seen, and even after they have become a good size she usually so effectually covers them that they are quite invisible. The cock seldom takes any part in incubation, but is sometimes asleep not far off. Once, in July, an advanced young one was observed to be covered by the cock, and the hen was nowhere visible.

The following is a biography of some young Nightjars at Northrepps, conveniently placed for making observations. On July 26th, 1882, a Nightjar was found at Northrepps sitting on two eggs, one of which she had laid that morning; and the cock was close by. On August 1st, owing to the rain, the hen was very wet, but the eggs were quite dry; they were either almost or quite touching each other. On the 7th, the eggs had been moved further apart. On the 9th, the eggs, the obtuse ends of which had always been towards the Nightjar's tail, were moved a little, and one of them pointed the other way.

Hitherto the hen had always sat facing the east. On the 13th she had turned round, and the young were hatched; but she only covered one of them, the other was quite exposed. The old cock jarred but little, and that principally about 7.30. If the young

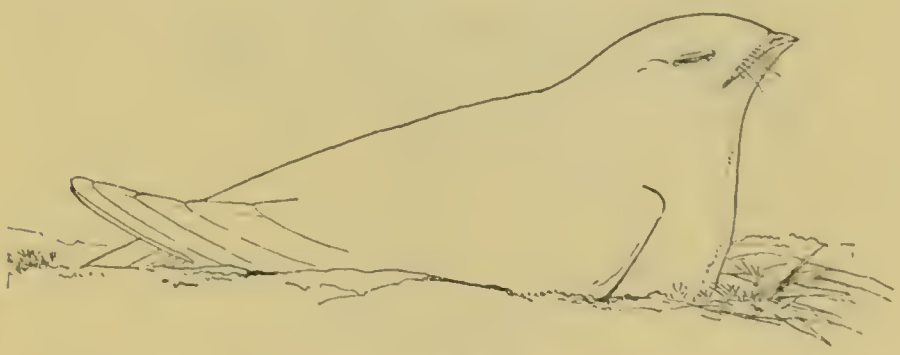

Fig. 2.

were taken up, the cock probably flew round uttering a low cry of alarm, but the hen seemed quite silent. The cock's white spots were just distinguishable at 7.45. On the 14th it was observed that one of the young had a deformed neck, and was smaller than the other. The hen was still on at 7.30; she pretended to be wounded, and then made a hissing noise, sitting crossways upon a bough with tail spread (Fig. 3). The ordinary position is lengthways on a bough as in Fig. 4.

On the 15th one of the young was dead, and the other was moved five feet, a distance which it clearly could not have run, it being only two days old. On the 16th it had again moved two feet, and on the 20th it had moved fourteen feet more. On September 2nd the young one, now seven days old, was back in its old place; to get there it must have passed either under or over a considerable

obstruction of Elders. On the morning of the 22nd it had again moved fourteen feet, and two hours later two feet more. On the

Fig. 3.

Fig. 4.

24th, after some search, it was found moved to a distance of fifty feet. On the 25th it had again moved, and after that could not

be found again. As a nestling it was remarkably flat-headed, and possessed of a disproportionately large gape.

Young Nightjars are very narrow across the head, and looking from above on another pair which were nearly full-grown, it was seen that their eyes projected. Long before they are full-grown they can use their wings well, as any one will find out who tries to chase them. One thing which is noticeable in a young Nightjar is, the bow-like distention of the lower mandible. It does not seem that the young are always fed on insect food; at least, a nestling, accidentally killed and opened for examination, contained nothing but vegetable fibres and seeds resembling buck-wheat seeds. My gardener, who considered them as such, also matched the fibres with the stamens of Honeysuckle, and though Mr. Southwell thinks this doubtful, I must say that the two corresponded precisely. Incubation lasts nineteen days.

VIII.

LETTERS RELATING TO PHOLAS.

By Lord Walsingham, F.R.S.

Read 28th January, 1890.

In looking over the collection of Shells here, I was lately reminded by one of the labels that my father had more than once mentioned to me the finding of a new species of Pholas, which in his youth he had obtained by dredging near Gosport. The specimens were labelled as follows: "These Pholas different from any before discovered, were dredged up, off Hill Head near Gosport."

In turning out some letters from an old cabinet I was fortunate enough to find two letters from Dr. Goodall, then Provost of Eton. He refers in these letters to these specimens, or rather to a similar one, which must have been sent to him for identification.

Dr. Goodall was well known as an enthusiastic conchologist. Several shells have been named after him by different authors.

The letters are interesting in themselves, having been written by a learned and distinguished man, commenting upon the then modern tendency among scientific authorities to modify or depart from the Linnæan system. These letters were written to my grandmother, afterwards Lady Walsingham.

LETTER I.

My dear Madam.

That I acknowledge the receipt of your very kind and interesting present so long after its arrival, would perhaps require an apology, did I not feel convinced that a truly conchological esprit de corps will plead my excuse, when I assure you that a desire to obtain a more satisfactory opinion than my own has been the cause of my delay.

The result of my own opinion and that of an intelligent conchologist, to whose inspection the valuable novelty has been submitted is, that unless it be a most extraordinary variety of Pholas candida, it is an hitherto unknown shell, though to that species its single accesory valve and its general form appear to bring it near. Still we coincide in determining, that it must be considered, as an elegant addition to British conchology. Were I to name it I should think the specific appelation of "costulata" not improper, as it is ribbed from one extremity to the other, but the Oriental species having preoccupied the title of "coslata" and these ribs being certainly more delicate and less strongly marked it may modestly be contented with being designated by the name of "Pholas with the little ribs." The principle character however of your really most acceptable present is, the closeness of the latitudinal lines (conchologically speaking) which decussate the ribs, and I make no doubt but you have observed the strongly imbricated appearance which this decussation produces. My friend an ardent naturalist and as such overlooking such trifles as reasonableness bienseance and delicacy, expresses a sanguine hope "that I shall obtain more specimens of this little beauty," with the same thoughtfulness he would perhaps expect me to obtain half-a-dozen companions to the Pitt diamond. Should it however happen that any brothers or sisters of this little beauty be found alive, or nearly

so, I am sure you will forgive me entreating you to plunge one specimen in spirits of wine, that the animal inhabitant may be submitted to the view of some experienced anatomist as it is always of importance to science that the shell, if possible, should be examined while the animal is attached to it.

I am ashamed to say I have as yet only taken a very cursory view of the British shells with which you so liberally favoured me. My collection purchased in France, arrived just as the hurry of election was over and to unpack, to sort and ultimately prepare these shells for Mrs. Goodall's arrangement occupied for some time the little leisure which I could devote to my hobby horse. Since then I have had the Lodge full of guests, who are absolute Goths, and care no farther for shells than, as they are the envelopes of good materials for fish sauce,—and the arrears of private and official business owing to three months' absence on the continent, have entailed on me such a load of debt to correspondents that not one minute have I been able to bestow on the affairs of the British department (of shells). However large may be your collection, still, as even the most splendid and most perfect which I have seen have a few gaps owing to the want of particular Shells, I shall venture to infer that even you may have a list of desiderata. If you would favour me with such list it would give me great pleasure to be able to diminish it by the spare duplicates of my cabinet, in the arrangement of which on my descent into the valley, (for I am now perched on the top of Windsor Hill in my prebended house) I mean to proceed. I shall venture to hope that a certain pledge given by the Archdeacon and yourself on Election Monday will be redeemed in the course of the spring or summer of 1820, by which time I shall expect to have made such progress as to be less ashamed of the condition of the trays.

I take it for granted that you subscribe to Sowerby's Genera of recent and fossil shells, of all the publications now issuing from the press in general conchology, it appears to me to be the most useful and to contain the most valuable information. With best regards and every good wish to the very Venerable and my young friend in which Mrs. Goodall unites with me. I have the honor to be

My dear madam

Your obliged & faithful servant

J. Goodall.

LETTER II.

My dear Madam.

I fear I must have expressed myself very carelessly, in two instances, in the first by apparently leaving an impression on your mind, that I did not consider your beautiful novelty as an absolute addition to British conchology, which I certainly do, or I should not have ventured to have named it Pholas costulata. In addition to the differences of character which you have accurately noticed, it seems also to gape much more widely than its congener Pholas candida, next to which however I should think that it ought to be arranged.

In the second, I must entreat you to believe that it was not my intention to beg either directly or indirectly for an extension of your bounty and that my request with regard to any future specimen being found alive (that it might be emersed in alcohol) had reference to the Fawley Cabinet, though it might be lent to some conchologist versed in the discrimination of the animal inhabitants of shells, for his inspection, to any knowledge of this kind I cannot presume to lay claim.

It appears to me that Sowerby's and Swainson's works can scarcely interfere with each other. By the by the latter is much more decidedly an anti Linnæan than the former, pages 6 & 8 of his preface will abundantly shew his disapprobation of the Linnæan school. The very title of Swainson's work shews that his object is not to advance conchological knowledge exclusively, as he very properly calls it "Zoological Illustrations" and in point of fact in his first volume are

24	Figures or Plates of	Birds
3		of Fishes
17		of Insects
33		of Shells

so that the preference of either work may be very fairly supposed to be influenced by the taste of the individual. Those who, like the performers at Astley's, ride their three or four horses at once, will prefer Swainson! Those who jog on quietly on a single hobby from their conchological stable, will not act unwisely in preferring Sowerby.—By his work the different Genera of all shells, fossil as

well as recent are illustrated by one or more plates, in most instances only one, and his descriptions or definitions are usually given in plain intelligible language. In most instances he agrees with Lamarck, but by no means servilely adopts his system, and it appears to me that in every number, hitherto published, much valuable information and in general very accurate, is contained. Except in England there exists not in the present day a Linnaan conchologist.

Mrs. Goodall has pouted and grumbled and uttered all lady-like execrations against innovations for the space of four or five years and is now engaged more innocently at least than our democratic politicians in a radical reform. Her cabinets are now in a glorious state of confusion but will I hope be taught to fall into their ranks with tolerable regard to discipline under Corporal Sowerby.

Though I admit most fully the propriety of reorganising my British Cabinet, I dare not, at my advanced state of life, attempt so laborious a task, and therefore, shall I believe, permit my trays, to receive their respective tablets according to Montagu, though I shall add the new names of the new school. Among my correspondents all have gradually severed from their allegiance to Linnaas, save one, and even he talks of accomodating the bad taste of the conchological public by a new distribution of his collection. I have taken it for granted that you referred to Swainsons publication in 8vo. as his quarto work, most eminently beautiful as it is, can only be considered as a work of luxury and embraces only the most rare and expensive shells. You will oblige me by sending at your best convenience your list of desiderata but I will venture to say that your collection is much less deficient than you imagine, so many varieties are split into species, so many young shells of one species have been taken for full grown shells of another, so many foreign shells have been introduced into our catalogues as indigenous, which are really exotic, so many local or accidental deviations from the general form of incorrectly figured species have misled the eager but unscientific amateur, that the number of your deficiencies will, I am confident be reduced to a comparitively small compass. Should my wanderings lead me towards Southampton, most gladly shall I avail myself of your kind invitation to Fawley. Should I visit Weymouth next Autumn, I should certainly be tempted to go thither by Southampton, but

according to my present arrangements I must make my last conchological visit to Tenby at that period, and like birds of passage, I migrate only once in the year. I am in the mean time willing to hope that the daughter, sister, wife and mother of Etonians may be induced in her customary migrations from the country to town, to look in upon us at the Lodge, and I hereby promise the Archdeacon that he shall be at full liberty to wander about the Playing Fields and School Yard and all other places though out of bounds, which may bring back to his recollection his former amusements, while Mrs. Goodall and myself, shall have the pleasure of showing our sister conchologist the fruits of our twenty years labour in our respective cabinets. Mrs. Goodall unites in best regards to yourself and the Archdeacon and in sincere wishes that you are now a perfect convalescnt with

My dear madam

Your obliged & faithful servant

J. Goodall.

If called upon for a defence of the Genera *Bulla*, *Mytilus*, *Ostrea* and *Helix* of Linnæus, what could the most zealous disciple of his school say? He would hardly contend that the *Bulla achatina* and *hydatis*, *Mytilus hirundo* and *anatinus*, *Ostrea malleus* and *pullium*, or the *Helix scarabeus* and *stagnalis* were connected by any ties of visible affinity. I would further say that the divisions of the Linnæan genera (exclusive of the extreme difficulty of reducing certain individuals of anomalous aspect to any of those divisions) lead to more real doubts and puzzles than the present generally prevailing practice of admitting the received extension of genera. Lamarck has himself, however, in his last half volume, corrected himself by expunging some of his distinctions as unnecessary. For instance, he now considers his *Amphibulimus* or *Amphibulina* as a *Succinea*. Sowerby had come to the same conclusion, who also considers the heterostrophe *Bulla fontinalis* and *hypnorum* as belonging to the genus *Limnæa*, and as appears to me very reasonably.

I may add that the specimens have now been submitted to Mr. Smith of the British Museum and to Mr. Sowerby, with the result that, at first sight, both pronounced them to belong to an

undescribed species. Mr. Smith subsequently submitted them to a friend at Torquay whose opinion is given in the following letter, and confirms the more deliberate impression that they are merely abnormal varieties of the well-known *Pholas candida* of Linnæus. I hope that the publication of these letters, as referring to specimens now in a Norfolk collection, may be not wholly without interest to conchologists.

Mr. Smith has sent me some excellent sketches which he has made of the best specimens in the series, the greater part of which are much smaller.

1, 2. Two sketches showing sculpture and variation in form (enlarged).
3. Dorsal view (natural size), accessory plate removed.
4. Interior, showing hinge, characters, &c.

Dear Lord Walsingham.

I have this morning received back the specimens of the Pholas I forwarded to the conchologist at Torquay. He says "The Pholas I take to be a depauperated form of Pholas candida. The five propositions you suggest embrace this opinion and having examined and compared them, I have no doubt about it."

This is practically the conclusion I had independently arrived at.

Nevertheless the shells are very interesting as indicating the peculiar form which this species at times assumes. I have

retained only one specimen for the sake of the habitat, as we have three larger valves in the "Gray Collection," as I mentioned to you yesterday. I return all the other specimens as it seems a pity to part the series which are discussed in Dr. Goodall's letter.

Of course at any time you may wish to part with them, they would form an interesting addition to our British Collection.

The difference between these specimens and typical examples of Pholas candida may thus be summarized,—of smaller and more stunted growth, shorter and more stumpy in form, valves of thicker substance and ornamented with more closely packed concentric sculpture, the radiating series of prickles being not nearly so conspicuous or prickly (hinge, umbous, accessory dorsal plate, internal apophysis &c similar.)

I enclose my sketches which if of no use please destroy.

I remain

Yours respectfully,

Edgar A. Smith.

IX.

NOTES ON THE HERRING FISHERY OF 1889.

By Thomas Southwell, F.Z.S.

Read 25th February, 1890.

It is customary to speak of mining operations as a "venture," and from the doubtful success which too often attends these undertakings the term appears very appropriate. It seldom happens, however, that when metal is found in abundance the "venture" proves unprofitable; in fact, the rule is, the more metal the more money. But even this does not apply in that unfortunate "venture" the Herring Fishery; apparently, the more successful the voyage is in point of returns, the less the profit left to the toilers of the sea.

Over-supply in a perishable commodity sends down the prices to such an extent that the fish positively do not pay for catching. The last season has been a forcible example of this, for with an almost unprecedented return, the autumn voyage has been one of the most disastrous on record to all concerned.

Herrings are now in the market the whole year round; but the spring voyage proper commences at Lowestoft towards the end of February; and this year, as usual, the prices ruled low, in addition to which the catch was only 1864 lasts, or some 200 lasts less than in 1888. Sometimes not more than 4d. per 132 (£1 13s. 4d. per last) was realized; occasionally 6d., or 9d., and 1s. per 132, or £5 per last, but the latter price was very exceptional. In addition to this, the trade was spoken of as in every way bad. At Yarmouth only 213 lasts were landed, against about double that quantity in the previous spring; but, as I have said before, the Yarmouth boats do not prosecute the spring fishery to any extent.

In the midsummer fishery the catches were very unequal, and the prices fluctuated accordingly from 1s. 6d. to 3s. 9d. per 132. As a rule the quality of the fish was very fine; and, on the whole, the voyage is spoken of as having been very satisfactory; but there were some remarkable exceptions to the rule. The catch in June and July at Lowestoft was 994 lasts, and at Yarmouth 378 lasts.

In August and September the vessels are away on the North Sea voyage, and the Yarmouth boats, as a rule, bring their fish home salted, or land them at Yorkshire ports. Very few fish are landed at Lowestoft, owing to the nature of the trade carried on there. The quantity brought into Yarmouth was 3682 lasts, and to Lowestoft 239 lasts; in each case a decrease compared with 1888.

With October the home autumn voyage commenced, and this is, of course, the important event of the year in the fishery. The opening at Lowestoft is described as exceedingly cheering; catches were good, and prices ranged from 3s. to 5s. per 132 (£15 to £25 per last); but towards the middle of October the autumnal gales for a time seriously interfered with the deliveries. This was followed, when the boats again got to sea, by a series of "gluts," which sent the price down to £5, or even half that price per last. Then came more rough weather and short deliveries, the price going up in some instances to £17 per last. November, the harvest month for the Herring-fisher, commenced well, but in the second

week "the arrivals were simply enormous, and the prices ruinous." Some of the Scotch boats made such catches as to spoil their nets, and many nets belonging to our home boats were sunk with the weight of fish. So matters went on through the whole of November, prices being driven down to almost nominal figures, £2, £1 5s., or even less, it is stated, having been paid per last, whilst £6 was realised in very few instances. The month produced 5403 lasts. In December the fishing flagged, and ended with 1390 lasts and disappointed hopes.

From Yarmouth the reports are even more disheartening. In the early part of the month of October some little damage was done to the fishing gear by rough weather, but "prime bloater stuff" realised from £15 to £20 per last, and salt fish £9 to £12. The deliveries were not excessive as a rule, and things looked fairly good; but the month of November commenced with exceedingly heavy catches, which continued to the end of the fishing. Prices fluctuated slightly in accordance as the deliveries were more or less excessive, but, as a rule, were miserably low. In the week ending November 16th the catches were enormous; a writer in the Yarmouth 'Independent' thus describes the scene at the fish-wharf:— "Never before in the memory of man has there been such a long continuance of fine weather during the November moon, nor such a tremendous shoal of Herrings on the fishing ground. Day after day it has been but one thing; from daylight to dark the boats have come streaming up the river, full to the very utmost of their capacity. Words almost fail one to attempt to describe the state of paralysis into which the trade has fallen. Salt is, figuratively speaking, worth its weight in gold. Barrels are at a premium; every available hole and corner has been utilised for storage; men, women, and lasses have been working night and day to try and keep abreast of the work, but all in vain. Night after night lasts of Herrings have been left standing on the wharf and quay unable to be carted away, and yet the cry is, still they come. There has been no cessation whatever, as soon as one boat leaves the wharf another is ready to take its place. Thank goodness, the Scotchmen are just sick of it, the 'home fever' is setting in rapidly. What we really want now is a stiff breeze for a few days to keep all hands in and enable buyers to put their houses in order a bit, and get prepared for a few more. . . . . The price for

salt Herrings after this can never reach a payable figure. . . . . 'Fresh' stuff will in a few days again, no doubt, command a ready sale. It seems almost paradoxical to talk about people starving in the midst of plenty, but that is what these awfully low prices mean to our fishermen."

In the last week in November the fishing was a little steadier, but a number of boats, fearing to incur further loss, were making up. Nearly all the Scotch boats had left, and reached their homes without any casualty; on the whole they are believed to have done very fairly. The Scotch boats are not so large as ours, and do not go so far afield to fish; consequently, if their catch is not so heavy, they, being fast boats, arrive in port sooner than ours, and their fish being invariably fresh and "prime," they secure the pick of the market, and realise prices accordingly; added to this, they are a very sober, thrifty race, and their boats are worked at considerably less expense than the home boats. During November the enormous number of 10,787 lasts of Herring were landed at the Yarmouth fish wharf.

Early in December the fishing was rapidly drawing to a close, notwithstanding the vast shoals of fish. The men seemed to lose heart, and prices were not such as to give them renewed energy. Doubtless many more fish might have been brought in, but "bloater stuff" at from £6 to £7 per last, and salted fish from £3 to £6, offered no inducement to the boats to go out; added to which, about the middle of the month, owing to lack of wind, a good deal of fish arrived in anything but prime condition. By the 21st of December the fishing was over, with a result for the month of 1617 lasts, and for the whole voyage of 19,631 lasts.

The principle features of the voyage may be thus summed up:—

(1) A great glut of fish.

(2) Great serenity of weather, so that practically nothing occurred to keep the boats at home.

(3) Considerable loss, as a rule, to both owners and crews.

The season has certainly been one of the worst, if not the worst, on record; and that notwithstanding the excellent quality of the fish; the weather, too, so fine, that more damage was caused to the fishing-gear by the over-weight of fish (in some cases a portion of the fleet of nets went to the ground and were utterly lost—in others, although recovered by the steam capstan, they were much

injured, and the fish valueless) than by the wear and tear generally experienced through bad weather. The loss to the owners and crews will be readily understood if, as I am informed, the estimated cost of catching a last of Herrings be correctly stated at £6, and the average price produced per last at the autumn fishing did not exceed £5 to £5 5s.

Nor is it at all certain that the merchants and curers will reap a great advantage from the low prices, for a well-informed correspondent tells me, "the returns from the Italian markets are only six to seven shillings a barrel, and many not more than one to two shillings and sixpence a barrel for really good herrings; and I am afraid some will never be sold at all, and that the cost of the freight will have to be sent after them, except, perhaps, in case of the best brands."*

The same correspondent says: "The Scotchmen can catch Herrings for £3 per last; their expenses are not so heavy, and, of course, they are the owners and work economically. The whole fault of the Yarmouth system is too much expense all over. The boats are too costly in building and fitting out; and as the men require so much in the way of provisions, the expenses are terribly heavy, and eat up any chance of profit.

"The question of over-production is an open one. Had there been a severe winter the quantity would have been easily disposed of; a large quantity of our Herrings going to Italy and Germany, and with a cold winter and frost, find their way into South Germany and Northern Austria, where the peasants are very poor; but the mild open winter makes the roads so bad as to stop travelling; and, no doubt, the enormous quantity of fresh fish caught,—with the railway and steamboat facilities for distribution—does to some extent take the place of salt herrings."

I have no doubt the above is strictly correct, so far as the curers are concerned, but it is upon the owners and fishermen, who now

* The above was written in February, 1890, and it will be seen that my friend's prediction has been fully realised; writing after this article was in type, he says: "I send for your perusal an Italian letter, dated 29th April, which you will see states that 'owing to the advanced season some parcels still on hand will have to be thrown away, without obtaining anything at all.' Another letter says: 'Some are placed in ice, hoping to keep them.'"

Of eleven examinations before the Registrar in Bankruptcy at Yarmouth on 11th of March, 1890, seven were of persons engaged in the fishing trade.

work on the "share" system, that the loss of over-production falls so severely. The constant glut in the market depresses prices to such a degree as to render the work unprofitable to the men who have no chance to recoup themselves; whereas, if there be an ordinary demand for salted fish in the ensuing winter, the advantage must accrue to the curer who has purchased his raw material on such advantageous terms. I think the fish-merchants will have a great deal to say when the subject of the carriage of fish comes before the Committee who are now taking evidence on the Railway Rates Commission.

The practice of "kippering" herrings is coming very much into vogue, and I hope it will add a new and remunerative branch to the curing business of the Eastern Counties.

The trawl fishery does not come within the scope of these notes, but I may just say the past season has been a very disastrous one in this business also. Two large companies have collapsed during the year, and many of the fine smacks have been forced into the market. The Norwegians, I am told, with their usual shrewdness, have availed themselves of this favourable opportunity to acquire some thirteen of these vessels of an average of about sixty-five tons, and fitted with steam capstans. It has been stated that they were intended for the Seal, or Bottle-nose fishery, but being constructed of iron they would be unsuitable for navigation where ice is likely to be met with, and are probably destined for the Cod fishery.

I have entered more fully than usual into the progress of the fishery in the past season, as the voyage has been quite an exceptional one, and demanded exceptional treatment.

The number of boats sailing from Yarmouth was about 200 Home, and 205 Scotch, the former carrying ten hands, and the latter seven hands each; and from Lowestoft there were about 130 Home and 98 Scotch boats, each respectively carrying the same number of hands as those sailing from Yarmouth.

I have again to express my thanks to Mr. Nutman, the Corporation Accountant of Yarmouth, and to the Harbour-master of Lowestoft, for their kindness in furnishing me with the official returns from their respective ports. It may be well to mention that some fish are landed by small owners at Caister, and a few, perhaps, on the beach at other places, which do not appear in these returns.

RETURNS OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1889.

		Yarmouth. Lasts (13,200).	Thousands (1320).	Hundreds (132).	Lowestoft. Lasts (13,200).	Thousands (1320).	Hundreds (132).
Spring	January	—	—	—	—	—	—
	February	—	—	—	39	1	1
	March	56	4	9	452	7	2
	April	90	8	2	855	1	2
	May	66	3	1	517	5	8
Mid-Summer	June	62	7	4	265	5	9
	July	315	4	1	678	7	4
North Sea	August	1116	8	4	106	6	4
	September	2566	—	2	133	3	2
Autumn Home Voyage	October	7223	9	1	3256	4	4
	November	10789	6	2	5403	1	3
	December	1617	6	3	1390	5	7
		23,905	7	9	13,098	9	6
		13,098	9	6			
		37,004	7	5			

= to the almost incredible number of 488,462,700 fish, nearly all having been counted.

X.

NOTE ON A COLLECTION OF EAST COAST AMBER BELONGING TO MRS. BURWOOD OF YARMOUTH.

BY ALFRED S. FOORD, F.G.S.

(Communicated by Clement Reid, F.G.S., of the Geological Survey.)

Read 25th February, 1890.

THE present communication does not pretend to throw any new light upon the origin of the Amber of the East Coast of England, a subject which has already been brought before you by my friend Mr. Clement Reid, who is so intimately acquainted with the geology of Norfolk. The observations, therefore, which are here submitted to you, through Mr. Reid's kind intervention, are merely those of an amateur and a draughtsman.

During a visit to Yarmouth last summer my attention was directed to a very fine private collection of East Coast Amber, belonging to Mrs. Burwood of that place; but what attracted my notice even more than the beauty of the Amber itself, was the large number of specimens containing insects and some plant remains, for the most part in a remarkably perfect state of preservation. It occurred to me that such an opportunity of recording a most interesting series of organisms should not be lost; none of the forms having, so far as I am aware, been previously observed in the Amber of this country.* I, therefore, with the kind permission of the owner, at once set to work to figure them. I may here mention that my brother, Mr. Arthur H. Foord, F.G.S., saw the collection and was much struck with it. He submitted my drawings to the inspection of Mr. C. O. Waterhouse, F.Z.S., of the Zoological Department, British Museum, who, at my brother's request, kindly named the genera and species that could be made out.

With regard to the general appearance of the specimens in the collection, those of a rich wine-yellow seemed to predominate; but besides these there were several pieces of a lemon-yellow colour, more or less clouded, and a few quite opaque, looking like ivory. One of these latter was picked up on the beach at Winterton, about nine miles north of Yarmouth. A good many of the specimens, as is often the case elsewhere, were brought in by the fishermen, and purchased from them at various places on the Norfolk and Suffolk coasts. One point that particularly struck me was the unusually large size of most of the pieces, some of which must have exceeded a pound in weight; and in Amber, which is remarkable for its lightness, this of course means a considerable bulk.

I was told that in most cases the insects were not revealed until after the Amber containing them had been polished. This polishing had been done in a very judicious and painstaking manner; the natural contour of each piece being preserved, instead of the pieces being cut away so as to produce flat surfaces, merely for the convenience of the operator, as is the practice of most lapidaries.

* See Mr. Clement Reid's paper, read before this Society, 30th March, 1886, and published in the "Transactions."

A few observations as to the mode of occurrence of the insects may now be made. One piece of Amber was almost entirely occupied by a number of minute creatures which at first sight looked like Ants; but on bringing a Browning lens to bear upon them, their true forms were at once apparent, and they proved to be Beetles (*Platypus*). Another piece was tenanted by a Cockroach (*Blatta orientalis*), with a small Fly for his companion (which was too indistinct to be drawn), the former monopolising the greater portion of their joint habitation. A third piece contained two Bees (*Apis mellifica*) side by side, nearly all the characters of which were clearly visible; the blackish-brown colour of the body, the hair with which the Hive Bee is generally clothed, with the colour bands on the abdomen, could all be distinctly seen. The compound eyes were also well shown.

There were likewise two Spiders, but these were pronounced by Mr. Waterhouse to be undeterminable.

There were also two or three vegetable organisms enclosed; one, a leaf, whose affinities may perhaps be recognized from the figure; another, which is of doubtful character, reminded one of a pollen-mass.

I may here state that a small unpolished specimen of Amber of the opaque kind, in my possession, is encrusted with a polyzoan, proving its marine origin beyond a doubt.

I was informed by Mrs. Burwood that the collection I have briefly described occupied many years in its formation, as might well be imagined from the large number of specimens contained in it. Whatever may be the source whence this remarkably fine collection came, one cannot but admire the industry and judgment of the collector, by whose hands the pieces were fashioned into the beautiful objects they now present.

Though I am unable to exhibit any of the figured specimens to the members of this Society, I have put a few out of my own collection into your Secretary's hands, and these perhaps may serve as examples of the rest, including the specimen referred to by Mr. Reid in his paper of 29th January, 1884, lent by me for that occasion.

The following is a list of the insects figured on the accompanying plate :—

HYMENOPTERA.

Apis mellifica.

COLEOPTERA.

Clerus, sp.
Platypus, sp.
Tomicus, sp.

ORTHOPTERA.

Blatta orientalis.
Psocus, sp.

ARANEIDA.

The dipterous insects and Spiders figured on the plate have not been named, as I have not yet had an opportunity of showing them to any one specially versed in those groups.

Besides these there is a leaf and a vegetable-looking body, the nature of which I must leave to botanists to determine.

EXPLANATION OF PLATE.

Fig. 1. *Apis mellifica*, side view, enlarged.
1*a*, front view of head, enlarged; 1*b*, hind leg, enlarged.
„ 2. *Clerus*, sp.
2*a*, head, enlarged; 2*b*, leg, enlarged.
„ 3. *Platypus*, sp.
Upper surface: 3*a*, under surface. } All magnified.
3*b*, side view; 3*c*, wing; 3*d*, leg. }
„ 4. *Tomicus*, sp.
Upper surface; 4*a*, under surface. } All magnified.
4*b*, head, viewed from above; 4*c*, head, from below. }
„ 5. *Blatta orientalis*, enlarged.
„ 6. *Psocus*, sp. under surface, enlarged.
6*a*, head and thorax, enlarged; 6*b*, wing, enlarged.
6*c*, wing further enlarged to show pattern at its base.
„ 7. Undetermined; 7*a*, head, enlarged; 7*b*, leg, enlarged.
„ 8. Undetermined; 8*a*, posterior segments, enlarged; 8*b*, wing, enlarged.
„ 9. Spider.
„ 10. Spider.
„ 11. Gnat.
„ 12. Leaf, upper surface, natural size.
„ 13. Pollen-mass? natural size.
13*a*, cell, enlarged

XI.

METEOROLOGICAL NOTES, 1889.

(From observations taken at Blofield, Norfolk.)

By Arthur W. Preston, F. R. Met. Soc.

Read 26th February, 1890.

January.

The month entered with severe frost with thick rime. The frost broke up on the 9th, and the remainder of the month was comparatively mild, with occasional morning frosts, and with but little range of temperature. The last four days were very mild, with a somewhat humid atmosphere. The mean temperature of the month was about 2 degrees below the average, and was 35.9 degrees against 35.2 degrees in 1885, 35.3 degrees in 1886, 33.9 degrees in 1887, and 36.8 degrees in 1888; the month was therefore the fifth cold January in succession. Winds were very light, and the rainfall somewhat deficient.

February.

This month was an exceedingly coarse and winterly period, and a direct contrast to the earlier part of the winter. Entering with abnormal mildness, it gave place on the 2nd to several days of bitter gales from the north-west and north-east with heavy snow-storms, that on the night of the 10th being exceptionally heavy, and followed on the nights of the 11th and 12th with excessive frost, readings as low as 14.2 degrees and 11.7 degrees being recorded in the screen on those two nights respectively. A sudden

change ensued, and for two or three days the weather became very mild, the abnormally high reading of 57.7 degrees being the maximum temperature on the 18th. This was the warmest day in February since 1878, whereas, with one exception, the night of the 12th was the coldest recorded in these parts in any winter since 1881. The last nine days of the month were inclement in the extreme, almost incessant light snow falling, and the temperature remaining nearly stationary at about 3 degrees above freezing point by day, and 2 degrees below by night. The penetrating north-east winds accompanying these conditions rendered the weather exceptionally uncomfortable. The mean temperature of the month was about 4 degrees below the average, and was 36 degrees against 40.4 degrees in 1885, 34 degrees in 1886, 38.8 degrees in 1887, and 33.9 degrees in 1888.

March.

Severe frosts occurred during the first week, with frequent snow; the latter part of the month was more genial, but with much cloud at times. The 24th was a milder day than any in March for five years past, a maximum of 63.7 degrees being attained. Thunder occurred on the 20th, followed by a gale from the north-east on the 21st, but during the spring the north-east winds were not so continuous as during the three previous years. The mean temperature of the month was about 2 degrees below the average, and was 40.2 degrees against 39.7 degrees in 1885, 40.3 degrees in 1886, 37.8 degrees in 1887, and 37.1 degrees in 1888. The rainfall of the month was very slight.

April.

The first seventeen days were extremely cold, cloudy, and ungenial, with frequent light rain. The remainder of the month was more seasonable, with some fairly warm days and growing showers, bringing up the month's rainfall to a quarter of an inch above the average. There was a great absence of extremes of temperature, the maximum for the month (60.4 degrees) being the lowest maximum recorded in April for many years past, whereas

the thermometer did not once touch the freezing point. The mean temperature of the month was about 3 degrees below the average, and was 44.1 degrees against 48.3 degrees in 1885, 46.6 degrees in 1886, 43.8 degrees in 1887, and 42.5 degrees in 1888, constituting it the fourth cold April in succession.

May.

This was an exceedingly warm growing month, with heavy rains at times, the month's rainfall having been more than double the average. Eleven years have elapsed since so warm, or so wet, a May has been experienced in these parts. The first and third weeks were the finest, and gave more summer-like days than all the previous year. The 23rd and 24th were exceptionally warm for the season, the thermometer rising to nearly 80 degrees on each of those days. Thunder occurred somewhat frequently with the heavier rains, and was very severe on the nights of the 24th and 27th, 0.80 in. falling on the last mentioned date. It is remarkable that the thermometer did not once fall below the freezing point during the whole of April and May. The mean temperature of the month was 2 degrees above the average, and was 55.2 degrees against 49.9 degrees in 1885, 52.7 degrees in 1886, 48.4 degrees in 1887, and 51.1 degrees in 1888. Altogether the month was more in accord with the popular notion of what May weather ought to be, than the biting winds and sharp frosty nights so prevalent in May during the four previous years. The effect upon vegetation after the cold April was marvellous, and the rapidity of growth, forced on by the heat by day and warm night rains, was such as was hardly ever before remembered.

June.

This month was also exceedingly fine and genial, with considerable heat at times. The only interruptions to the uniform fineness were severe thunderstorms on the night of the 2nd, and a short, cold, wet period from the 7th to the 11th, at the time of the Whitsuntide holidays. The 10th (Whit Monday) was very rainy, 1.01 in. falling during the day and previous night. No rain

whatever was measured after that date, and a fine hay crop was secured under the most favourable circumstances. The mean temperature of the month was 1 degree above the average, and was 59.9 degrees against 58.9 degrees in 1885, 55.7 degrees in 1886, 59.3 degrees in 1887, and 57.3 degrees in 1888.

July.

The long drought which prevailed from June 10th broke up on July 9th: there were twenty-six consecutive days on which no rain whatever fell. From July 9th to 28th the weather was very unsettled and showery, with extremely heavy downpours at times. On the night of the 13th a perfect torrent fell at Blofield, as much as 2.57 in. being found in the gauge next morning, being the largest amount the observer ever registered in twenty-four hours. This fall of rain must have been in the nature of a waterspout, for on examining the returns from other stations in the locality, it was found that the quantities gauged were much less, being 1.59 in. at Postwick, 1.31 in. at Halvergate, and 1.30 in. at Thorpe, 0.88 in. at Norwich (Newmarket Road), and 0.97 in. at Heigham (Alexandra Road). At Dereham less than half an inch was measured. The month as a whole was much cooler and wetter than the average, although somewhat finer than the ungenial July of 1888. But both in 1888 and 1889 there were seventeen consecutive days on which the thermometer did not reach 70 degrees, whereas in 1887 there were but six days throughout the entire month when such reading was not exceeded. The mean temperature of the month was about 3 degrees below the average, and was 59.9 degrees against 61.8 degrees in 1885, 61.3 degrees in 1886, 64.5 degrees in 1887, and 57.5 degrees in 1888.

August.

Although the month opened and closed with fine weather, it rained almost daily from the 2nd to the 26th, and the weather during that period was excessively gloomy and damp with almost continuous low temperature. Some of the falls of rain were very heavy, and much thunder occurred at times. The mean tempera-

ture of the month was about 2 degrees below the average, constituting the fifth cold August in succession, and was 59.9 degrees against 58.4 degrees in 1885, 61.5 degrees in 1886, 60.4 degrees in 1887, and 58.2 degrees in 1888. Harvest commenced in Norfolk about the 6th day, but was much hindered by the damp gloomy weather.

September.

The fine weather which set in at the close of August continued with but little intermission until the middle of September, accompanied by high temperature (thermometer 79.2 degrees on the 11th, and above 70 degrees on several days) and a drying atmosphere, enabling farmers to make great progress with the harvest, and in most cases to complete it. The latter part of the month was a complete contrast to the former, being unusually cold for the season, and heavy rains at times. The mean temperature of the third week was 10½ degrees colder than the previous week, and on the morning of the 22nd the thermometer in the screen fell to 32 degrees, a very unusual occurrence in September. The mean temperature of the entire month was nearly 3 degrees under the average, and was 54.9 degrees against 55.2 degrees in 1885, 58.9 degrees in 1886, 54.2 degrees in 1887, and 56.3 degrees in 1888.

October.

The main features of this month were its great uniformity of temperature, and its proximity to the average, the excess of rain, and the unusual absence of sunshine. The range of temperature was exceedingly small, no day being really warm, and on no night did the screened thermometer fall to the freezing point. The maximum reading of the month (59 degrees on the 15th) was unusually low for October, but, with one exception, there was no day upon which the thermometer did not exceed 50 degrees. The period from the 19th to the 30th was of almost unbroken cloud, with rain daily. A thunderstorm occurred on the 23rd, and

destructive gales on the 7th and 27th, the former from the south-west, and the latter from the north-west. The mean temperature of the month was 49 degrees against 45.2 degrees in 1885, 53 degrees in 1886, 45.9 degrees in 1887, and 46 degrees in 1888.

November.

The first half of this month was unusually fine and dry for the season, with many bright sunny days. An anti-cyclone, extending over the whole of Great Britain from the 6th to the 23rd, was accompanied by extremely high barometric readings, those on the 18th and 19th being as high as 30.75 in. The latter part of this period was attended with clouds of unusual density, the sun being completely obscured from the 13th to the 25th. On the last-named day the barometer fell nearly an inch, and meteorological conditions underwent a complete change, the calm, quiet, mild atmosphere giving place to weather of a decidedly winterly type, accompanied by gales from the north-west, and heavy storms of snow and sleet. The first snow of the season fell on the 26th. There was not much rain, and it may be said to have been the first dry month since the previous June. The mean temperature of the month was about 1 degree above the average, and was 43.9 degrees against 41.4 degrees in 1885, 44.1 degrees in 1886, 40.7 degrees in 1887, and 45.7 degrees in 1888.

December.

This was a changeable month with many mild days alternating with frosty nights, and occasional touches of winter. The rainfall was very light, and snow fell on three days only. There was a great prevalence of cloud, and the air was unusually saturated with humidity. The last week of the month was more decidedly winterly, with a mean temperature of 6 degrees below the average, and the year ended, as it had entered, amid frost and snow. The mean temperature of December was about a degree under the average, and was 37.3 degrees against 37.2 degrees in 1885, 34.9 degrees in 1886, 36 degrees in 1887, and 40.3 degrees in 1888.

The Seasons.

The following tables show the mean temperature and rainfall for the four seasons, together with those of the four previous years, and of a twenty-year approximate average :—

TEMPERATURE.

Seasons.	1885.	1886.	1887.	1888.	1889.	20-year average.	Departure of 1889 from average.
	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.
Winter (Dec. to Feb.)...	38.3	35.5	35.8	35.5	37.4	38.7	— 1.3
Spring (Mar. to May) ...	45.9	46.5	43.3	43.5	46.5	47.5	— 1.0
Summer (June to Aug.)	59.7	59.5	61.4	57.7	59.9	61.3	— 1.4
Autumn (Sept. to Nov.)	47.3	52.0	46.9	49.3	49.2	50.0	— 0.8
Year	47.6	48.2	47.0	46.9	48.0	49.4	— 1.4

RAINFALL.

Seasons.	1885.	1886.	1887.	1888.	1889.	20-year average.	Departure of 1889 from average.
	in.	in.	in.	in.	in.	in.	in.
Winter	6.88	4.18	5.83	4.42	4.14	6.45	— 2.31
Spring	5.95	5.35	5.14	5.83	7.09	5.15	+ 1.94
Summer	2.56	6.70	4.04	8.52	9.57	7.10	+ 2.47
Autumn	14.49	6.23	7.68	7.00	8.94	8.50	+ 0.44
Year	28.60	25.23	20.52	25.65	29.82	27.20	+ 2.62

It will thus be seen that the Winter, although milder than the preceding three, was rather colder than the average, and considerably drier. The spring was warmer than three of the preceding four, but 1 degree under the average, and the wettest of the five. The summer was warmer than in 1885 and 1886, and considerably warmer than in 1888, but colder than in 1887, and about $1\frac{1}{2}$ degrees below the average, and was wetter than in any of the series, even the preceding wet summer, the excess being nearly $2\frac{1}{2}$ in. The autumn was, like the preceding, in close agreement with the average temperature, much warmer than in either 1885 and 1887, but colder than in 1886, and was wetter than the preceding three autumns, but very much drier than the excessively wet autumn of 1885.

Year.

The general meteorological conditions of 1889 were, as a whole, more in agreement with the average than those of the previous two years, although the temperature still showed signs of keeping below rather than above the usual standard. The weather was most perfect in May and June, but at the commencement of July it completely broke down, and there was but little more continued fineness until late in the autumn. The rainfall, as recorded, may perhaps hardly be said to fairly represent the county of Norfolk, as the tremendous fall of July 13th helped largely to swell the total, and at most stations in the county the year's fall was but little in excess of the average. Altogether the recollections of last year's weather are more agreeable than those of 1888, and it is to be hoped that the long-continued spell of cold, which has held sway more or less for the last five years, at length bids fair to give way to more genial conditions.

N.B.—The instruments from which the foregoing observations are taken consist of standard maximum and minimum thermometers, and dry and wet bulb thermometers by Negretti and Zambra, mounted in a Royal Meteorological Society's screen, in a freely exposed situation, and an aneroid barometer. All the above instruments have been verified at Kew Observatory. The rainfall is measured by a Symons' Snowdon rain-gauge, and the observations of the direction of the wind are, for the most part, taken from the vane on the spire of Norwich Cathedral.

1889.

Month.	BAROMETER.					THERMOMETER.					HYGRO-METER.	CLOUD.	RAINFALL.		WIND.								
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Relative Humidity, 9 a.m.	Estimated proportion 9 a.m.	Thorpe Hamlet.		Direction.								Mean estimated force
													Inches.	No. of days.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	
Jan. .	30.74	3	29.36	10	30.153	53.0°	31	19.0°	6	35.9°	96	7.9	1.10	16	1	6	3	4	4	4	5	4	1.7
Feb. .	30.38	18	29.07	3	29.823	57.7	18	11.7	13	36.0	94	6 0	1.91	23	2	6	1	0	1	2	6	10	3.5
March	30.62	15	28.96	20	29.950	63.7	24	20.2	2	40.2	87	7.1	1.23	17	2	4	3	2	3	1	8	8	3.5
April	30.19	19	29.25	4	29.731	60.4	30	33.0	3	44.1	89	8.6	2.06	24	6	0	7	2	5	3	3	4	3.5
May .	30.10	21	29.54	25	29 848	78.8	24	39.0	3	55.2	85	6.7	3.79	16	4	6	1	5	6	6	1	2	2.3
June .	30.42	5	29.67	9	30.056	80.0	2	45.8	1	59.9	79	6.3	1.74	5	2	13	5	2	1	1	2	4	2.4
July .	30.44	2	29.50	25	29.914	77.8	6	45.0	24	59.9	80	6.9	4.11	16	6	1	2	2	4	5	7	4	2.8
Aug. .	30.26	31	29.25	21	29.870	79.2	30	43.0	25	59.9	85	6.3	3.72	21	0	0	1	2	4	10	8	6	2.3
Sept. .	30.50	16	29.51	24	30.059	79.2	11	32.0	22	54.8	89	6 5	3.57	15	3	3	4	1	0	4	4	11	2.8
Oct. .	30.30	25	29.14	8	29.707	59.0	15	33.8	15	49.0	94	7.0	3.82	24	2	7	1	4	7	7	1	2	2.8
Nov. .	30.76	18	29.34	25	30.209	58.8	7	29.2	27	43.9	95	6.9	1.55	15	0	1	1	7	2	6	6	7	2.1
Dec.	30.70	5	29.25	10	30.192	53.0	22	25.2	29	37.3	97	7.8	1.22	16	0	1	7	0	5	8	5	5	2.2
Means					29.959					48.0	89	7.0											2.6
Extremes & Totals	30.76	Nov. 18th	28.96	Mar. 20th		80.0	June 2nd	11.7	Feb. 13th				29.82	208	28	48	36	31	42	57	56	67	

XII.

SOME ADDITIONS TO THE NORFOLK AND NORWICH MUSEUM IN THE YEAR 1889.

By Thomas Southwell, F.Z.S.

Read 25th February, 1890.

It is satisfactory to find that the rare birds which have from time to time been met with in the county of Norfolk continue to find their way to the Norwich Museum, where they are carefully preserved, open to the inspection of all, and free from the risk of neglect, and perhaps of dispersal, which attends every private collection, let its present owner value it ever so highly. There are many unique examples which their owners would do a public service by either giving in their life-time or bequeathing to the central collection in the county which has produced them, so as to make it as representative and complete as possible. During the past year our Museum has been successful in acquiring one valuable example from a well-known county collection, but it is matter for great regret that some of the other rarities from the same collection were dispersed by the auctioneer. I refer to a beautiful Norfolk-killed specimen of White's Thrush (*Oreocincla aurea*), killed at Hickling in 1871, which was purchased by subscription from the collection of the late Rev. S. N. Micklethwait of Hickling. The Museum authorities are indebted to the representatives of that gentleman for allowing them to purchase this bird privately, for had it gone to his auction it would probably have realised a higher price than we should have been able to have offered for it. The bird is also a welcome memento of one who was so long known as an ardent local ornithologist and a sincere well-wisher of the Museum.

Another valuable addition to the local collection was an immature King Duck (*Somateria spectabilis*) killed at Hunstanton in 1888,

and presented to the Museum by the writer: this is the only authentic Norfolk specimen known. For a very good example of the now rare Grey Lag Goose, killed on Breydon in 1886, we are indebted to Colonel Feilden; and for a male and female of the Common Crossbill (*Loxia curvirostra*), shot at Blofield in 1862, the Museum is indebted to Mr. W. H. Tuck. Dr. Hills has presented two examples of a very pretty isabelline variety of the Red-backed Shrike (*Lanius collurio*), both killed at one shot at Thorpe in 1869.

To the birds of prey Mr. J. H. Gurney has, as usual, been the means, both directly and indirectly, of obtaining a large number of additional specimens, including four species new to the collection. These are *Buteo solitarius*, from the island of Hawaii, a Buzzard of very great rarity, which has long been a desideratum in our collection, but which now, thanks to Mr. Charles and Sir Thomas Lucas and Mr. Gurney, is represented by three specimens in distinct states of plumage—an adult and immature male and a melanistic variety. The other new species are *Æsalon suckleyi* from Chilliwack, British Columbia, obtained in exchange; *Baza gurneyi* from Russell Island, in the Solomon Group, presented by Mr. Gurney; and *Bubo abyssinicus*, from Jeddah, a scarce Horned Owl, inhabiting Abyssinia and Arabia, which was recently figured in the 'Ibis' (1886, pl. 6) under the name of *Bubo milesi*. This last was obtained in exchange. In addition to these the collection has been enriched by sixty-three specimens (some of them handsomely mounted), including thirty species, all the gift of the President, Mr. Gurney.

A collection of fifty-seven specimens, some of great interest, and all in excellent condition, collected in the Andaman Islands specially for our Museum, has been presented by Frank Patteson, Esq., of Calcutta.

The Museum is indebted to the liberality of Henry Seebohm, Esq., for the gift of a specimen of *Buteo plumipes* from Peel Island, one of the Bonin group in the North Pacific Ocean, a new and interesting locality for this widely-spread species; and to Sir John B. Lawes, Bart., for a specimen of *Heliotarsus leuconotus*, which lived for about fifteen years in the aviary of the late Edward Fountaine, Esq., of Easton, and is valuable to the collection, not only as a desirable addition, but also as a remembrance of

Mr. Fountaine's long and warm interest in the prosperity of the Museum. To Sir John B. Lawes the Museum is also indebted for three nestlings of the Snowy Owl, hatched on or about June 27th, 1889, in Mr. Fountaine's aviary: one died on August the 5th, one on the 7th, and the third on the 11th of the same month. These also possess a peculiar interest as a memento of that gentleman, and of his great success in inducing this species and the Eagle Owl to breed and rear their young in confinement.

A very handsome specimen of the Albatros (*Diomedea exulans*), taken in latitude 40° 40′ S., longitude 91° 54′ E., has been presented by Mrs. Frances Fielden; and a fine mounted example of the Emu (*Dromæus novæ-hollandiæ*) by C. J. Lucas, Esq.

The Oological collection has been considerably enriched by the addition of thirty specimens, principally from the Transvaal, by Mr. Gurney.

The Conchological collection has received specimens of *Zonites crystallinus* from Costessey, *Helix pygmæa* from Hellesdon, *Helix aculeata* from Heigham, and *Helix virgata* from Drayton—Mr. A. Mayfield; and specimens of *Vertigo edentula* from Costessey —Mr. A. A. Moore.

Mr. Gurney has presented a skeleton of Blakiston's Eagle-Owl, believed to be the only known skeleton of that rare species; and I obtained two skulls of the Hooded Seal from Greenland through Mr. Robert Gray. A very perfect *humerus* and cervical vertebra of *Elephas primigenius*, dredged up off Yarmouth, has also been added to the Geological collection by Mr. J. T. Hotblack.

A very well preserved specimen of the Wild Cat has been presented by Mr. Charles Williams; unfortunately, neither date nor locality are known, but it is certain that it is British killed.

It will be seen that the Museum, during the past year, has received considerable additions to its natural history collections. Antiquities and books do not come within the scope of the present remarks, but in both these and other departments the additions have been most satisfactory.

All are looking forward anxiously to the time when the collections will be removed to their new home in the Castle buildings, where it is hoped they will be housed in a manner worthy of their great and growing interest.

XIII.

BOTANICAL NOTES, 1889.

Caltha palustris var. Guerangerii, Boreau. In July I found at Southrepps a variety of *C. palustris* which seems to approach *Guerangerii* in its remote sepals and longer and more deflexed carpel beaks. If confirmed, this variety will be an addition to our county list.

Viola Curtisii, Forst. Mr. Long sent up a Pansy which he found at Sherringham, and which Mr. Arthur Bennett considers may belong to this sub-species; but as the specimen sent was not very satisfactory, and all the other specimens were accidentally destroyed, it will be well to wait confirmation before publishing this as a Norfolk plant.

Arenaria tenuifolia var. hybrida. In June I found several plants of this variety at Croxton (*Norfolk*). Mr. Newbould, who first found it, recorded it as "near Thetford, *Suffolk*." It is an addition to our county list.

Trifolium agrarium. The upright form of *T. procumbens*, with flowers much darker in colour than the type, occurred sparingly at Sidestrand this summer; but I doubt whether it was not introduced with hay seeds.

Cynoglossum officinale (subglabrum?). About Croxton there are a great many plants of a variety of *Cynoglossum* with the leaves and habit of *C. montanum*; but the nuts have a thickened border. I suppose that this will be near the var. *subglabrum* of Syme (E.B., third edition).

Utricularia intermedia, Hayne. The late Rev. Cufaude Davie sent up specimens of this species this summer from Dubeck in Thirne (it is an addition to our "c." division list), and at the same

time Mr. Davie sent *Liparis loeselii* from the same locality. This latter has been previously recorded from the "e." division, but I have not before seen specimens from north of the Bure.

Juncus lamprocarpus var. nigritellus, Auct. Ang. This pretty little Rush, which Mr. Long finds plentifully near Wells in the "ne." division, occurs near Cromer, and is an addition to the list for the "e." division.

Carex flava var. lepidocarpa. The Rev. Dr. Hind has sent me specimens of this Sedge from Market Weston in Suffolk. I recognise it as a plant which I found this year at Roydon Fen, near Diss, on the Norfolk side of the Waveney. It is an addition to the county list.

Bromus tectorum, L., and B. arvensis, L. Mr. C. B. Plowright sends both of these from Lynn, and I find the former near Thetford. Of course they are both of them "casuals."

Herbert D. Geldart.

XIV.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Mauroliccus pennantii (= *Scopelus mulleri*). A specimen of this rare little fish was sent me for identification by Mr. Patterson of Yarmouth, who found it in the refuse left by some draw-netters on the beach near the mouth of the river Yare, on the 1st April, 1889. Two other examples were also found under similar circumstances by Mr. J. B. Beckett on the 23rd February, 1890. I had the pleasure of exhibiting all three specimens to the Society. Mr. Patterson's was the first known example of this pretty little fish to occur on the Norfolk coast; but I had already exhibited a very perfect specimen taken alive, by Mr. Robert Gray, floating near the surface of the sea in lat. 73° 12′ N., long. 1° 28′ W.

As it is also said to be found in the Mediterranean Sea, it will be seen that this, or closely allied species, are spread over a very considerable range of latitude. It is not unlikely this pretty little fish may be of more frequent occurrence on our coast than is generally supposed; but its small size, and the mutilated state in which, judging from those I have seen, it has been procured, through the shedding of the beautiful and easily detached scales, would sufficiently account for its being overlooked.—T. Southwell.

Four-bearded Rockling (*Motella cimbra*). Mr. Arthur Patterson, of Yarmouth, sent me a sketch and description of a specimen of this rare fish which he found amongst the refuse left by the draw-netters on Yarmouth beach on the 23rd of May, 1889. This species had not been previously recorded for Norfolk, and, I think, not for the east coast of England, and is the second addition made by Mr. Patterson this spring to the list of Norfolk fishes.—T. Southwell.

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CONTENTS.

TRANSACTIONS

OF THE

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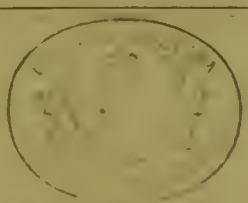
PRESENTED TO THE MEMBERS FOR

1890—91.

VOL. V.—Part 2.



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Fryer Herbert F., *Chatteris*

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I

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Pycraft W., *Town Museum, Leicester*

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Sutton Francis, F.C.S.

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Y

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The Treasurer in Account with the Norfolk and Norwich Naturalists' Society,

Year ending 31st March, 1891.

Dr.	£	s.	d.
To Balance from last year	9	6	5
,, Subscriptions:—			
2 for 1888—89 ... ... £ 0 10 0			
6 ,, 1889—90 ... ... 1 10 0			
178 ,, 1890—91 ... ... 44 10 0			
1 ,, 1890—91 ... ... 0 10 0			
12 ,, 1891—92 ... ... 3 0 0			
	50	0	0
,, Additional payments for monthly notices	0	12	0
,, Sale of *Transactions*	2	6	6
,, Interest	0	13	7
	£62	18	6

Cr.	£	s.	d.
By Fleteher and Son, for Printing *Transactions*, 1889—90	34	18	0
,, Mintern and Co., for Illustrations	3	12	6
,, Norfolk Chroniele Company, for Printing	0	4	6
,, A. H. Goose, for ditto	2	0	0
,, Advertisements	0	10	0
,, Insuraneo	0	3	0
,, Postage and Carriage	5	10	10
,, Year Book of Seientific Societies	0	7	6
,, Gratuity to Doorkeeper	0	10	0
,, Rent of Room	1	1	0
,, Museum Subseription	2	2	0
,, Assistant Seeretary's Salary	5	0	0
,, Balance at Messrs. Gurney's	6	19	2
	£62	18	6

x

LIFE MEMBERSHIP FUND.

	£	s.	d.
To Balance from last year	93	5	5
,, 1 Composition for Membership	3	0	0
,, Interest	2	6	1
	£98	11	6

By Balance in Post Office Savings Bank £98 11 6

Norwich, 28th March, 1891.

Examined and found correct,

STEPHEN WM. UTTING, *Auditor*.

List of the Publications received by the Society as Donations or Exchanges from March, 1890, to March, 1891.

Bath Natural History and Antiquarian Field Club. Proceedings, vol. vi. no. 4; vol. vii. no. 1. 1889—90. *From the Club*

Belgium. Annales de la Société Belge de Microscopie. Tome 14. 1890. *From the Society*

——— Annales de la Société Royale Malacologique de Belgique. Tome 24. Année 1889. Royal 8vo. *From the Society*

Blyth (Edward). Notes upon Three Asiatic Species of Deer. (From the Proceedings of the Zoological Society of London, 1867, pp. 835—42.) 8vo. *From Mr. J. H. Gurney, F.L.S.*

Bristol Naturalists' Society. Proceedings, new series, vol. vi. part 2. 1889—90. 8vo. *From the Society*

British Association. First and Second Reports of the Committee for Exploring Kent's Cavern, Devonshire, 1865—66. 8vo. *From Mr. J. H. Gurney, F.L.S.*

Cardiff Naturalists' Society. Report and Transactions, vol. xxi. part 2; vol. xxii. part 1. 1889—90. 8vo. *From the Society*

Christy (Miller, F.L.S.). The Birds of Essex: a Contribution to the Natural History of the County. (Essex Field Club Special Memoirs, vol. ii.) 8vo. Chelmsford, 1890. *From Mr. J. H. Gurney, F.L.S.*

——— A Catalogue of Local lists of British Birds, arranged under Counties. pp. 42. 8vo. Lond. 1891. *From Mr. J. H. Gurney, F.L.S.*

Collett (General H., C.B., F.L.S.) and Hemsley (W. B., F.R.S.). On a Collection of Plants from Upper Burma and the Shan States. (Extracted from the Linnean Society's Journal—Botany, vol. xxviii.) 8vo. 1890. *From the Rev. J. L. Brown*

Croydon Microscopical and Natural History Club. Proceedings and Transactions. From Feb. 1881 to Jan. 1882, and from Feb. 1887 to Jan. 1890. 3 nos. 8vo. *From the Club*

Cumberland and Westmorland Association for the advancement of Literature and Science. Transactions, no. xv., 1889—90. 8vo. *From the Association*

Degland (C. D.). Ornithologie Européenne, ou Catalogue analytique et raisonné des Oiseaux observés en Europe. 2 vols. 8vo. Paris, 1849. *From Mr. J. H. Gurney, F.L.S.*

Edinburgh Geological Society. Transactions, vol. vi. parts 1 and 2. 1890. 8vo. *From the Society*

——— Royal Society. Proceedings, vols. xv. and xvi. 1887—89. 8vo. Edinburgh, 1889—90. *From the Society*

——— Royal Physical Society. Proceedings, vol. x. part 2. 1889—90. 8vo. *From the Society*

Eggs. Four Catalogues of Eggs collected in Lapland by John Wolley, Jun., Esq., sold by Auction by Mr. J. C. Stevens, 1855—58. 8vo. *From Mr. J. H. Gurney, F.L.S.*

——— Two Catalogues of Eggs collected in Algeria by the Rev. H. B. Tristram, sold by Auction by Mr. J. C. Stevens, 1857—58. 8vo. *From Mr. J. H. Gurney, F.L.S.*

Essex. The Essex Naturalist: being the Journal of the Essex Field Club. Vol. iv. nos. 4—12. 1890. 8vo. *From the Club*

Geikie (Archibald, LL.D. F.R.S.). Text-Book of Geology. 8vo. Lond. 1882. *From Col. Feilden, F.G.S.*

Gooch (W. D., C.E.). The Stone Age of South Africa. (Reprinted from the Journal of the Anthropological Institute, Nov. 1881.) pp. 60. 8vo. *From Col. Feilden, F.G.S.*

Gray (George Robert, F.R.S.). Hand-List of Genera and Species of Birds, distinguishing those contained in the British Museum. Parts I—III. 8vo. Lond. 1869—71. *From Mr. J. H. Gurney, F.L.S.*

Gray (Robert). The Birds of the West of Scotland, including the Outer Hebrides. With occasional records of the occurrence of the rarer species throughout Scotland generally. 8vo. Glasgow. 1871. *From Col. Feilden, F.G.S.*

Gurney (John Henry). On a New Species of Harrier from New Caledonia. (From the Proceedings of the Zoological Society of London, 1865, pp. 823—4.) 8vo. *From Mr. J. H. Gurney, F.L.S.*

——— Notes on Mr. Layard's "Birds of South Africa." (From The Ibis for April and July, 1868.) 8vo. *From Mr. J. H. Gurney, F.L.S.*

——— Memoir of the late John Henry Gurney. (Reprinted from The Zoologist for June, 1890.) 8vo. *From Mr. J. H. Gurney, F.L.S.*

Hampshire Field Club. Papers and Proceedings, no. iv. 1890. 8vo. *From the Club*

Hancock (John). Note on the Greenland and Iceland Falcons. (From the Annals and Magazine of Natural History for Feb. 1854.) pp. 3. 8vo. *From Mr. J. H. Gurney, F.L.S.*

Hart (H. Chichester). A Naturalist's Journey to Sinai, Petra, and South Palestine. (From the Quarterly Statement of the Palestine Exploration Fund, Oct. 1885, pp. 231—86.) 8vo.
From Col. Feilden, F.G.S.

Hastings. The Natural History of Hastings and St. Leonards and the vicinity. Second supplement. pp. 24. sm. 8vo. St. Leonards, 1888. *From the Rev. E. N. Bloomfield, M.A.*

Hertfordshire Natural History Society and Field Club. Transactions, vol. v. part 9; vol. vi. parts 1—3. 8vo. 1890.
From the Society

Hudson (William). Flora Anglica. (Interleaved. With MS. notes by Thomas Woodward.) 2 vols. 8vo. Lond. 1778.
From the Rev. C. R. Manning, M.A.

Hume (Allan). My Scrap Book: or, Rough Notes on Indian Oology and Ornithology. 8vo. Calcutta, 1869.
From Mr. J. H. Gurney, F.L.S.

Ibis (The), a Quarterly Journal of Ornithology. Edited by Philip Lutley Sclater, F.R.S. Sixth Series, nos. 7—10. 8vo. 1890—91.
From Mr. G. F. Buxton, F.Z.S.

Jeffreys (J. Gwyn, F.R.S.), Norman (Rev. A. M., M.A.), M'Intosh (W. C., M.D.), and Waller (Edward). Last Report on Dredging among the Shetland Isles. (From the Report of the British Association for the year 1868, pp. 232—345.) 8vo.
From Col. Feilden, F.G.S.

Layard (Edgar Leopold). The Birds of South Africa. A descriptive catalogue of all the known species occurring south of the 28th parallel of south latitude. 8vo. Cape Town, 1867.
From Mr. J. H. Gurney, F.L.S.

Liverpool Geological Society. Proceedings, vol. vi. part 2. 1889—90. 8vo. *From the Society*

London Geological Society. Quarterly Journal. Nos. 179—183. August 1889 to August 1890. 8vo. *From Col. Feilden, F.G.S.*

——— Geologists' Association. Proceedings, vol. xi. nos. 6—8. 8vo. *From the Association*

——— Royal Geographical Society. Proceedings, April 1890 to February 1891. Royal 8vo. *From Mr. H. G. Barclay, F.R.G.S.*

——— Royal Geographical Society. Supplementary Papers. Published under the Authority of the Council, and Edited by the Assistant Secretary. Vols. i. ii. and iv. Royal 8vo. Lond. 1886—90. *From Mr. H. G. Barclay, F.R.G.S.*

——— Royal Institution of Great Britain. Proceedings, vol. xiii. part 1. 1891. 8vo. *From the Institution*

——— Royal Microscopical Society. Journal. Second Series, April 1890 to February 1891. Royal 8vo. *From the Society*

London Zoological Society. Transactions, vol. xii. parts 9 and 10. 1889—90. 4to. *From Col. Feilden, F.G.S.*

Manchester Geological Society. Transactions, vol. xx. parts 18—21 and vol. xxi. parts 1—5. 1889—91. 8vo. *From the Society*

Markham (Clements R., C.B., F.R.S.). The Threshold of the Unknown Region. Fourth edition, with supplementary chapters. Sm. 8vo. Lond. 1876. *From Col. Feilden, F.G.S.*

Marine Biological Association of the United Kingdom. Journal, new series, vol. i. no 3. 1890. 8vo. *From Professor Newton, F.R.S.*

Newton (Professor Alfred) and Newton (Edward, M.A.). On the Osteology of the Solitaire or Didine Bird of the Island of Rodriguez. (From the Proceedings of the Royal Society, 1868, pp. 428—33.) 8vo. *From Mr. J. H. Gurney, F.L.S.*

New Zealand Institute. Transactions and Proceedings; edited by Sir James Hector, K.C.M.G., M.D., F.R.S. Vol. xxii. 8vo. Wellington, 1890. *From the New Zealand Institute*

Northumberland. Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne. Vol. x. part 2. 1890. 8vo. *From the Society*

Owen (Professor Richard, F.R.S.). A History of British Fossil Reptiles. Parts I—IV. 4to. Lond. 1849—51. *From Mr. C. Williams, F.R.C.S.*

Paris. Feuille des Jeunes Naturalistes. Nos. 234—242. Avril—Decembre. 1890. Royal 8vo. *From the Society*

Pleydell (J. C. Mansel, F.L.S.). The Birds of Dorsetshire: a Contribution to the Natural History of the County. 8vo. Lond. n.d. *From Mr. J. H. Gurney, F.L.S.*

Plymouth Institution and Devon and Cornwall Natural History Society. Annual Report and Transactions. Vol. x. part 3. 1889—90. 8vo. *From the Plymouth Institution*

Pycraft (W. P.). A Contribution to the Pterylography of Birds' Wings. (Reprinted from the Transactions of the Leicester Literary and Philosophical Society, April 1890.) pp. 24. 8vo. *From the Author*

Reid (Clement, F.L.S., F.G.S.). The Pliocene Deposits of Britain. (Memoirs of the Geological Survey of the United Kingdom.) Roy. 8vo. Lond. 1890. *From the Author*

Russia. Bulletin de la Société Impériale des Naturalistes de Moscou. 1889 no. 4, 1890 nos. 1—3. 8vo. *From the Society*

Salvadori (T.). Nuovi Genera di Uccelli. pp. 20. 8vo. Milano, 1866. *From Mr. J. H. Gurney, F.L.S.*

Saxby (H. L., M.D.). The Birds of Shetland, with Observations on their habits, migration, and occasional appearance. By the late Henry L. Saxby, M.D., edited by his brother, Stephen H. Saxby, M.A., Vicar of East Clevedon. 8vo. Edinburgh, 1874.
From Col. Feilden, F.G.S.

Staffordshire (North) Naturalists' Field Club and Archæological Society. Annual Report and Transactions. 1890. 8vo.
From the Society

Stevenson (Henry, F.L.S.). The Birds of Norfolk, with Remarks on their habits, migration, and local distribution. Continued by Thomas Southwell, F.Z.S. Vol. III. 8vo. Norwich, 1890.
From Mr. T. Southwell, F.Z.S.

Strickland (Hugh Edwin, F.R.S.). Ornithological Synonyms. Vol. I. Accipitres. 8vo. Lond. 1855.
From Mr. J. H. Gurney, F.L.S.

Suffolk. The Micro-Lepidoptera of Suffolk, Tortrices and Tineæ. By the Rev. E. N. Bloomfield. pp. 8. Sm. 8vo. St. Leonards, 1888. *From the Author*

——— The Lepidoptera of Suffolk, compiled by E. N. Bloomfield, M.A., F.E.S. 8vo. St. Leonards, 1890.
From the Rev. E. N. Bloomfield

Temminck (C. J.). Manuel d'Ornithologie, ou Tableau systématique des Oiseaux qui se trouvent en Europe. Seconde édition. 2 vols. in 1. Paris, 1820. *From Mr. J. H. Gurney, F.L.S.*

United States of America. American Museum of Natural History. Annual Report for the year 1889—90. 8vo.
From the American Museum

——— Bulletin of the American Museum of Natural History. Vol. iii. no. 1. 1890. 8vo. *From the American Museum*

——— Annual Report of the Smithsonian Institution for the year ending June 30, 1886. Part II. Containing the Report of the U.S. National Museum. 8vo. Washington, 1889.
From the Smithsonian Institution

——— Annual Reports of the Smithsonian Institution for the years ending June 30, 1887 and 1888. 2 vols., each in two parts. Part I. Report of the Smithsonian Institution proper. Part II. Report of the U.S. National Museum. 8vo. Washington, 1889—90. *From the Smithsonian Institution*

——— Proceedings of the United States National Museum. Vol. xii. 1889. 8vo. Washington, 1890.
From the U.S. National Museum

——— Bulletin of the United States National Museum. No. 38. 8vo. Washington, 1890. *From the U.S. National Museum*

No. 38. Contribution toward a monograph of the Insects of the Lepidopterous family Noctuidæ of temperate North America. By John B. Smith, Professor of Entomology.

United States of America. Eighth and Ninth Annual Reports of the United States Geological Survey to the Secretary of the Interior 1886—88. By J. W. Powell, Director. 2 vols. Royal 8vo. Washington, 1889—90.
From the U.S. Geological Survey Office

——— North American Fauna. Nos. 3 and 4. 8vo. Washington, 1890. *From the U.S. Department of Agriculture*

——— Bulletin of the Minnesota Academy of Natural Sciences. Vol. iii. no. 1. 8vo. Minneapolis, 1889. *From the Academy*

Yarrell (William, F.L.S.). First and Second Supplements to the History of British Birds. 8vo. Lond. 1845—56.
From Mr. J. H. Gurney, F.L.S.

Year-Book of the Scientific and Learned Societies of Great Britain and Ireland; comprising lists of the Papers read during 1890. 8vo. Lond. 1891. *Purchased*

Zoological (The) Record for 1870, 1871, 1872. Edited by Alfred Newton, M.A., F.R.S., Professor of Zoology. 3 vols. 8vo. Lond. 1871—74. *From Mr. J. H. Gurney, F.L.S.*

Zoologist (The). A Monthly Journal of Natural History. Edited by J. E. Harting, F.L.S. Third Series. April 1890 to March 1891. 8vo. *From Mr. G. F. Buxton, F.Z.S.*

CORRIGENDA.

On page 63 I recorded *Tenthredo obsoleta*: by some accident I confused this with *Ten. picta*, Kl., which species I had not previously met with in the county.

Page 67, line 33. *G. rubicunda* and *annulata* have Ns. instead of n. sp. after them.

Page 67, line 36, and on following page, Prof. Thomson's name is spelt with an *e* instead of *o*.

JOHN B. BRIDGMAN.

March, 1891.

ADDRESS.

Read by the President, Mr. Henry Seebohm, F.L.S., F.Z.S., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Twenty-second Annual Meeting, held at the Norfolk and Norwich Museum, March 31st, 1891.*

Ladies and Gentlemen,—When you did me the honour of electing me your President for the year now closing, you placed a very busy man in the chair, who had so many irons in the fire that it was impossible for him to be present at your meetings, however deeply he might be interested in the subjects brought forward from time to time for discussion.

The papers read during the past year have, as usual, been to a considerable extent ornithological, which is of course due to that branch of science being so strongly represented amongst our members; with a President devoted to the study of Entomology it is to be hoped that Insects and Plants will claim a larger share of our attention during the coming year. I think, however, that our programme has been sufficiently diversified to be relieved of any monotony, and to this Mr. Patterson's frequent notes on the Fishes and Crustaceans observed by him near Yarmouth have largely contributed; through his watchfulness several species hitherto unrecorded for his immediate neighbourhood, or for the County at large, have been brought to light.

On May 27th Lord Lilford favoured us with a contribution on the Birds in the Lilford Aviaries, giving some very interesting notes on the several species of birds of prey which he has been so successful in retaining in healthy captivity.

At the September meeting Mr. Eldred described a recent visit to Chartley Park, with an interesting account of the Wild Cattle preserved there, a young bull from which herd he said had been presented to the Zoological Society. Mr. Southwell also exhibited an adult male of the Caspian Plover,* which had been shot at Yarmouth: this interesting bird, new to Britain, has been placed in the Norwich Museum.

In October the Honorary Secretary read a paper on Woad, with an account of a visit to the Woad Mill at Parson Drove, near Wisbech, the only remaining spot in England where this plant is cultivated and the ancient industry still pursued almost with its original simplicity.

Mr. Charles Candler, at the November meeting, gave a most interesting account of a holiday trip to Holland, his purpose being to visit Naarder Meer, near Amsterdam, the most northern breeding-place of the Spoonbill in Europe; in this he was quite successful, and saw many of the birds and their nests. Mr. Candler's historical remarks on the breeding of these birds will be read with interest. Extending his trip to the Island of Texel he gives an account of the birds observed, with a list of the species which have been known to breed there.

In January Mr. Southwell contributed some additional information with regard to the late John Dawson Downes and his connection with falconry in Norfolk; and Mr. W. H. Tuck sent some notes on the birds which had visited his garden at Tostock, near Bury St. Edmunds, during the prolonged frost of December and January.

At the February meeting Mr. J. H. Gurney read a critical paper on the occurrences of the Great White Heron in Great Britain; the conclusion arrived at was that out of thirty-three reported occurrences only five could be regarded as authentic. Mr. Southwell made some observations on the rarer birds which had been obtained in Norfolk during the past year;

* *Charadrius asiaticus* (see Proc. Zool. Soc. 1890, p. 461, under the name of *Ægialitis asiaticus*). If the subgenera of Charadrius be elevated to generic rank, the Caspian Plover is probably an Eudromias.

and Mr. Arthur Preston read his annual Meteorological Notes, supplementing them with a valuable contribution on the great frost of 1890—91; a note was also received from the Rev. Julian G. Tuck, on a Great Bustard shot in Mildenhall Fen in February of this year. Several other papers will be found printed in the 'Transactions' which for want of time have been taken as read, and a number of interesting exhibitions have been made and commented upon at the monthly meetings.

As you have just heard, the Treasurer's Report is a satisfactory one, although there has been a slight falling off in the number of members. Death has, I regret to say, robbed us of four, ten have resigned for various reasons, and ten new members have been elected, leaving the total number two hundred and fifty-four against two hundred and fifty-eight last year.

In the death of Mr. John Gunn, M.A., F.G.S., which took place on the 28th May, 1890, the Society has lost one of its original members. Born in the year 1801, Mr. Gunn devoted a long life to the study of the science of Geology, chiefly that of his native county, with which his name will ever be honourably associated. In an address to the members of the Norwich Geological Society, which was founded in 1864, and of which he was the first president, Mr. Gunn said he could never forget, and could never describe the electric effect produced upon him by the discovery of the fossil remains of the Elephant, Rhinoceros, and Hippopotamus in the Forest Bed at Happisburgh, &c. He asked his father (then Rector of Irstead, to which preferment he subsequently himself succeeded) how these creatures, now living in tropical countries, could have existed in this? and he received an answer which was still fresh in his memory, and which constantly recurred to him, "There is much to be done before that can be found out," and with all his energy he set himself to solve the problem. Mr. Gunn was contemporary with Samuel Woodward and Miss Anna Gurney, both of whom were ardent collectors of the fossil mammalia of the Forest Bed, and to the former he acknowledged his indebtedness for his first lessons in geology.

The results of his many years ardent collecting he presented to the Norwich Museum, where a room, specially erected for their reception, is known as the "Gunn Room;" and in 1870 his portrait, painted by public subscription, was placed in the Museum in recognition of his great services to that institution. Mr. Gunn was fitly mated with a daughter of Dawson Turner, F.R.S., and through her he became attracted to the study of archæology, and remained till the last an active member of the Norfolk Archæological Society, but nothing ever diminished his ardour for his original pursuits. Manly in form and simple in mind, Mr. Gunn was pre-eminently the typical courteous English gentleman, always kindly and thoughtful for others. Keen in argument, but careful of the susceptibilities of his opponents, he made many friends but never an enemy. His leading feature was an absolute love of truth, and it thus came about that, after forty years' service in the Church, feeling that he could not conscientiously preach some of the doctrines of the Church of England, he resigned his preferment and eventually left the ministry. How great was the sacrifice to him to quit "the place of his birth, the scenes of childhood, and of a mature and happy life, and a charming spot where almost every tree and shrub was planted by himself," he endeavoured to tell his former parishioners in a letter addressed to them on taking his farewell; but nothing deterred this sturdy apostle of truth from following the dictates of his conscience. All Mr. Gunn's energies were devoted to the furtherance of the objects of the Norwich Geological Society, until its amalgamation with our own Society, so that he was never a contributor to our 'Transactions;' but he frequently joined us in our field work, and his memory will be venerated by all who knew him as one who laboured successfully in a branch of science which has now happily come within our sphere of action.

The Rev. Henry Temple Frere, who died in December last, in the sixty-ninth year of his age, at Burston Rectory, where he had resided many years, was born at Roydon, on the 22nd of November, 1821. He was owner of a choice collection of birds, including two Savi's Warblers, one of them killed on South

Walsham Broad, and the other at Baitsbite, near Cambridge; a Crane, shot at Martham in 1849; and a good series of about thirty Ruffs from Norfolk Fens, and an American Meadow Starling, shot at Thrandeston, in Suffolk. Devoted all his life to the study of zoology, his loss will be much felt by the small band of local naturalists of whom he was one. He was one of the oldest correspondents of the 'Zoologist,' his first communication from Cambridge, where he was at college, being dated 1844, and having reference to the Water Rail. In the natural history of his own county, and more particularly in its ornithology, he always took a great interest, and a bird show or a sale of birds was pretty sure to bring him to Norwich. He was always much interested in the Naturalists' Society and in the Museum, to which his last donation, made not long before his death, was an example of *Spilornis pallidus*.

The Norfolk and Norwich Naturalists' Society has lost one of its oldest and most useful members during the past year. The death of John Henry Gurney, on the 20th of April, 1890, will be profoundly regretted by every ornithologist, not only in Norfolk, but throughout the world, wherever ornithology is studied. A memoir and portrait will be inserted in the 'Transactions.' Gurney was the great authority on the birds of prey, and chiefly owing to his liberality and untiring industry the collection of Diurnal and Nocturnal Birds of Prey in the Norwich Museum is unrivalled. His knowledge of these groups of birds was vastly in excess of that of any other ornithologist of this or any other age or country, and the fact that he knew little or nothing of the morphology of these two great groups scarcely detracts from the relative greatness of his knowledge. The classification of the Raptores and Striges is to all intents and purposes virgin ground. Mines of knowledge on this subject lie buried in the British Museum and elsewhere; but nobody works at them; they lie absolutely idle. The fields are white unto harvest, but the labourers are few.

We have a great many ornithologists in the British Islands, but it is much to be regretted that they do so very little work, and

what little they do is chiefly confined to the ornithology of their own country. In this they are by no means peculiar. Every nation has its peculiarities, and one of the peculiarities of Englishmen is that they are apt to take a narrow, insular view of most questions; their knowledge is insular, their sympathies are insular, and consequently their studies are insular. Gurney was one of the exceptions that prove the rule. By a curious accident his attention was early drawn to the birds of prey found in other countries than our little archipelago, and the birds of prey being a cosmopolitan group, Gurney's ornithological sympathies became more or less cosmopolitan. That they were not confined to foreign birds of prey his interest in South African birds abundantly shows. He edited Andersson's 'Birds of Damara Land,' and wrote many articles in the 'Ibis' on the collections made by Mr. Ayres in Natal and the Transvaal. Further, he presented to the Museum at King's Lynn, which borough he represented in parliament for more than ten years, a fine collection of birds made in the islands of the Malay Archipelago by the celebrated naturalist Wallace.

Gurney's reputation as an ornithologist rests upon a series of articles contributed to the 'Ibis,' entitled "Notes on a Catalogue of the Accipitres in the British Museum by R. Bowdler Sharpe." They form an exhaustive review of the entire work, which deals with 377 species, and they occupy as many pages as the work itself.

These voluminous notes were followed in 1884 by a List of the Diurnal Birds of Prey with References and Annotations, also a Record of specimens preserved in the Norfolk and Norwich Museum, a small volume of about two hundred pages.

It is impossible to glance over all this literature, and to test its value from time to time by reference to various difficult points as they crop up in the investigations of the birds of prey of various countries, without a feeling of astonishment at the vast knowledge which it displays, and the amount of careful, patient, and painstaking labour which must have been expended in its acquirement. It represents an amount of honest hard work, and contrasts very

favourably with the more or less inaccurate, because hurried, character of much of the ornithological literature of the present day. It is impossible to insist too strongly on the fact that no amount of genius will compensate for the absence of work,—hard work,—dogged, determined work,—patient, untiring work, and it is precisely this kind of work which frightens most English country gentlemen. They only play with their favourite pursuit, and consequently our knowledge of ornithology creeps slowly along at a snail's pace, instead of advancing by leaps and bounds as it ought to do. Gurney's great merit was that he *worked* at ornithology.

I do not know whether it ought to be regarded as fortunate or unfortunate that he chose a difficult group upon which to work. The Raptores are a small group, not quite numbering four hundred species, but they are almost cosmopolitan. That the Order should have a large range is an advantage to the student, because the greater the difference of environment the wider is presumably the extent of differentiation, and the more marked the characters by which the species may be diagnosed. But unfortunately for the student who attempts to complete a study of the Raptores in a couple of years, not only the genera have extended areas of distribution, but some of the species range from the Arctic regions of Europe, Asia, and America, to the confines of the tropics, and vary more or less with the variation in the climates where they breed.

The difficulty of discriminating between these numerous local races is greatly increased by the differences attributable to age and sex. In many species the male differs greatly from the female; and the young have quite a different plumage from the adult, and in a few species they take several years to accomplish the change, so that there are several intermediate stages between the young in first plumage and the fully adult. In other species there is great individual variation, which is not local in its distribution, and appears so far as we have been able to discover to be absolutely accidental, like the colour of a Ruff's feathers or a Guillemot's egg. Of course these differences are not accidental, but we have not yet been able to correlate them with any other fact.

An immense amount of work must be done before the history of some of the species of birds of prey which breed in our own little group of islands can be regarded as complete. Anything more hopeless than the sixteen pages devoted to the races of the Sparrow Hawk in Dresser's 'Birds of Europe' it would be impossible to conceive. I admit that it is not an easy task to reduce such a chaos of facts to order, but it will have to be done. The classification and nomenclature of local races or sub-species is a task of so much difficulty that few ornithologists care to grapple with it. I venture to think that the American ornithologists have grappled with it very successfully. Much as I disapprove of their blind adherence to the law of priority, of the fatal mistake which they made in altering the year behind which names were not allowed to be unearthed, of their tendency to cut up genera wherever they can find a crack wide enough to put in a knife, and of the worthless characters upon which many of the genera are made, I cannot help feeling profound admiration for the way in which they have handled the subject of sub-species. I admit that now and then they have got into a muddle, but I am not sure that Nature herself does not now and then make a muddle of her sub-species. I think their system of trinomial nomenclature is the nearest approach to perfection to which we can possibly attain; and I have no hesitation in saying that the reason why it is not more adopted in this country is that English ornithologists (more shame to them) are too lazy to take the trouble to understand the question, and too prejudiced against anything American (for which the vulgarity of the American press may possibly be some excuse) to form an unbiased opinion if they did master the facts of the case.

Be this as it may, there can be little doubt that the local variation of American species of birds is far better understood than the local variation of European birds.

There are two points which have by no means been sufficiently insisted upon by writers on birds. One is the remarkable extent of the variation (which is apparently caused by difference of climate) which may occur within a species having a very wide range, but which cannot be regarded as a specific variation, because

however wide the extreme forms may be apart, they are connected together by a series of intermediate forms, or to use the American technical term, they intergrade. The other point is the extreme narrowness of the line which frequently divides one species from another where the species are isolated on islands, but where the difference, however small, must be regarded as specific, because, however narrow the line, it is a hard and fast one, or again, to use the American technical term, they do not intergrade.

I need not occupy your time in giving details of the many species which illustrate the first point. You will find some of the most interesting explained in my recent book on the Birds of the Japanese Empire. It may however be worth while to dwell at more length on some of the most interesting examples of the second point which have recently come under my notice.

If I were asked to enumerate the five most important factors in the origin of species, I should say that the first was the tendency of species to vary; the second, the hereditary character of the variations; the third, the preservation of each hereditary variation by preventing the species possessing it from mixing with those that do not possess it, or to express it in a single word—Isolation; the fourth, Isolation; and the fifth, Isolation.

I am at present engaged upon a work on the Birds of Polynesia, than which there is no part of the world more adapted to the study of the effects of isolation. Polynesia consists of a dozen or more Archipelagoes, most of them of volcanic origin, but some composed partly of older rocks which may have been above the level of the sea for ages. It is not known that there is any evidence of the remains of a larger continent. There are no mammals on any of the Polynesian Islands, except Rats, Cats, and Pigs, which have been recently introduced by man. It is true that there are also no mammals in New Zealand; but in that country the remains of large birds which have only recently become extinct, seem to suggest a former much greater extent of land where such species could have lived, and have become differentiated into several species.

There are no archaic birds to be found in Polynesia, or perhaps

one ought to say scarcely any, and those not very archaic. It has been said that the curious Pigeon found in the Samoan Archipelago, *Didunculus strigirostris*, is an archaic form allied to the extinct Dodo. In the 'Zoological Record' for 1880 the genus *Didunculus* is referred to the Dididæ. Beyond a superficial resemblance in the shape of the bill, which is absolutely destitute of any taxonomic value, I do not know of a scrap of evidence to warrant such an extraordinary conclusion. The shape of the bill is largely relied on as a generic character, but in most cases it would be difficult to find a character of less value. The shape of the bill is correlated with the nature of the food. It does not matter whether the change be directly produced by the accumulated effects of use or disuse during many generations, or indirectly by the constant weeding out of those individuals the shape of whose bills are unsuited, or least suited, to the available food, the fact remains that a change of locality is most likely to produce a change of food, and the change of food to produce a change of bill.

To place the genus *Didunculus* in the Dididæ is tantamount to placing the Swallows with the Swifts: to regard it as a sub-genus of *Carpophaga* might possibly be going farther in the opposite direction than the facts justify.

There is, however, an archaic species found in New Caledonia, which has not only a genus but a family to itself. *Rhinochetes jubatus* belongs to the Schizorhinal Grallæ, a remarkably generalised sub-order of birds consisting of half a dozen families, the two smallest containing only a single species each, and the largest not containing a score species. Its nearest relations have probably been comparatively recently exterminated in Australia.

The Avifauna of the Pacific Islands apparently consists of a number of waifs and strays from Eastern Asia, New Guinea, and Australia. It is, however, more probable that the genera which are common to Polynesia, New Guinea, and Australia, are the descendants of species which emigrated *en masse* from North-East Asia more or less simultaneously, in much the same way that Pallas's Sand Grouse has twice within this century invaded Europe.

No one imagines that the various nearly allied species of *Merula*

which inhabit the Malay Archipelago and Polynesia were specially created on the islands where they are now found. There are no fewer than seventeen of these species. As no species of *Merula* has ever been found in Australia, New Zealand, or any part of the Ethiopian region, the presumption is that they came from Eastern Asia. The fact that of these seventeen species no island ever contains more than one is strong presumptive evidence that they are all descended from one original species, or from two or three species so imperfectly segregated that when more than one arrived on an island they were fertile *inter se*, like the Colchican and Siberian Pheasants, and soon produced a homogeneous race by interbreeding.

A second conclusion may also be drawn from this fact,—they were probably driven from their original homes by some great catastrophe which has never occurred since, otherwise it is most extraordinary that the descendants of birds which emigrated from Eastern Asia to the Fijis and Samoa are now never known to pass from one island to another though some of them are within sight.

Eight of these island forms are dark-headed, five of them are pale-headed, whilst four are more uniform in colour. It is therefore not an extravagant assumption to suppose that the ancestors were two nearly allied species, one with a dark head and one with a light head; and we must also assume that the original home, and presumably the centre of their present distribution, were and probably continue to be sufficiently far apart to isolate them from each other, otherwise they would either have blended in their continental home, or have been too widely differentiated from each other to have been able to blend in their island home.

The question is, can we find amongst the *Merulas* of East Asia two species that satisfy all our requirements? It seems to me that in *Merula gouldi* and *Merula kessleri* we have two very closely allied continental descendants of the dark-headed ancestor, and in *Merula castanea* and *Merula albicincta* two still more closely allied continental descendants of the pale-headed ancestor.

The two first-mentioned species breed amongst the Rhododendrons and the Pines of Eastern Mongolia and Thibet, at an elevation of

13,000 feet. Of the two latter, one is known to breed at similar elevations in the Himalayas, and the other is supposed to do so. It is difficult to avoid jumping to the conclusion that the catastrophe which caused the emigration of so many of these birds to the oceanic islands was a period of perennial snow, such as must have occurred during the glacial epoch when bird life at these high elevations became for the time being an impossibility.

The seventeen species of *Merula* in the islands of the Oriental and Australian regions are distributed as follows :—

MERULA KINISSI ...	...	Ceylon
,, ALBICEPS ...	...	Formosa
,, CELŒNOPS ...	...	Seven Islands
,, SEEBOHMI ...	...	Borneo
,, JAVANICA ...	...	Java and Timor
,, ERYTHROPLEURA	...	Christmas Island
,, PAPUENSIS ...	...	New Guinea
,, XANTHOPUS ...	...	New Caledonia
,, VINITINCTA ...	...	Lord Howe Island
,, POLIOCEPHALA	...	Norfolk Island
,, PRITZBUERI ...	...	Lifu } Loyalty
,, MAREENSIS ...	...	Maré } Islands
,, RUFICEPS ...	...	Kandavu }
,, LAYARDI ...	...	Viti-Levu } Fiji
,, VANUAENSIS...	...	Vanua-Levu } Islands
,, TEMPESTI ...	...	Taviuni }
,, SAMOENSIS ...	...	Samoa Islands

Of these seventeen species no two are known to occur on the same island.

One of the most curious instances of sexual variation is to be found in three species of Fruit Pigeon which inhabit the Fiji Islands.

Chrysœna viridis is only known from the island of Kandavu in the south : *Chrysœna victor* is found on the island of Taviuni, and on one or two of the adjacent smaller islands in the north : and *Chrysœna luteovirens* inhabits Viti-Levu, Ovalau, and one or two of the smaller islands in the centre of the group.

The females of these three species resemble each other so closely that it requires an expert to distinguish them. The males also resemble each other in having more or less olive-green heads and necks, but here the resemblance absolutely ceases. *Chrysæna victor* and *Chrysæna luteovirens* resemble each other in the structure of their feathers, which are much disintegrated, but the colour of the latter species, like that of the females of all three of them, is as green as the greenest grass, whilst that of the former is as vermilion as the ripest Seville orange. But this is not all the difference. In the male of *Chrysæna luteovirens* the structure of the feathers is quite different from that of the other two species, or from that of its own female. The feathers are compact, not disintegrated, they are narrow, like the feathers on the throat of a Raven, and strange to say, those on the mantle and breast are bifid at the ends. The genus was originally established upon this character, by Reichenbach and Bonaparte, in the dark ages of ornithology, when structure was allowed to ride rough-shod over colour as a foundation for a genus. Now I suppose that no one would be rash enough to deny that these three birds are more nearly related to each other than they are to any other Pigeon, in spite of the abnormal structure of the feathers of the male of one of them. In all three species the immature males resemble the females both in colour and structure, so that we may fairly assume that the common ancestors of the three species were green birds with normally constructed feathers.

Darwin would doubtless have attributed the brilliancy of the males' attire to the accumulated results of many generations of sexual selection, aided possibly by the direct influence of some peculiar favourite food, whilst the uniformity of the females might be ascribed to the necessity of being as little conspicuous as possible whilst engaged in the duties of incubation. The new theory of Wallace, that it is an advantage to nearly allied species to differ in colour in order easily to recognise a stranger or a friend, completely breaks down on islands where each species is isolated from its near allies, and never comes into contact with them.

There is no doubt that these Pigeons have enemies. Although there are no mammals in the Fiji Islands, they are visited by an Australian Peregrine Falcon and an Australian Harrier, to say nothing of a Fijian Goshawk, which is probably the worst enemy of the three.

It is very difficult to know how to select examples from the many genera which are represented in the Polynesian sub-region of the Australian region without trespassing too long upon your time and attention. Amongst the Parrots the genus *Cyanorhamphus* is specially interesting, as showing a great number of closely allied species, each with a definite circumscribed locality. The Fly-catchers are also very remarkable in this respect, especially those belonging to the two genera *Rhipidura* and *Myiagra*, which are largely represented in Polynesia.

The Kingfishers of Polynesia have also a most interesting distribution. They are all closely allied, and all belong to the genus *Halcyon*. Three species have indeed been removed to a genus which has been called *Todirhamphus* by Lesson, Reichenbach, Bonaparte, and some other pre-Darwinian ornithologists, on the ground of their somewhat flattened bills; but there can be no doubt that the flattened bills have been independently acquired, and therefore denote analogy, whilst the similarity of colour to other species has been inherited from common ancestors, and therefore denotes affinity. No blame attaches to these old writers; they constructed their genera according to their lights; they placed a much higher value on the similarity of the shape of the bill than on the similarity of a complicated pattern of colour. They knew no better; Darwin had not convinced the scientific world of the truth of the theory of evolution; they were still working upon the antiquated lines of Linnæus, and had only the vaguest conception of the difference between analogy and affinity. How could they have had any notion of the idea, which is now accepted as an axiom by all scientific men, that classification cannot be merely morphological but must be genetic? There are no genera in nature. Genera may be divided and sub-divided to suit the convenience of the student, but they can only be divided in

natural lines of cleavage. It is forbidden to cut them across the grain.

There is no great harm in the curator of a museum amusing himself with inventing pseudo-genera, so long as he uses them only as an artificial index to his species, like the Linnean order of plants; and there is no great harm in his chopping his big genera into little bits, so as to make them as easy to diagnose as a species; but the scientific ornithologist is obliged to construct his genera upon different lines, even if he has to spend ten times the labour in the process. He knows full well that no interest of any kind attaches to the geographical distribution of pseudo-genera, and that their recognition stands in the way of the interest which is felt in the geographical distribution of natural groups. He also knows that great interest attaches to the geographical distribution of genera apart from that of species.

Genera are to a large extent matters of convenience, but they ought to be made subject to certain laws, of which one at least is imperative. No species can under any circumstances be placed in a genus unless there be some species in the genus to which it is more nearly related than it is to any and every other known bird.

Probably the species with red mandibles ought to be removed from the genus *Halcyon*, certainly the species with flattened mandibles ought not.

Some of the species of the genus *Halcyon* have very wide ranges. The range of *Halcyon chloris* extends from the shores of the Red Sea to the Pelew Islands and the Solomon Islands, though it is not known to have occurred between the shores of the Gulf of Aden and those of the Gulf of Bengal. Eastwards its range appears to be continuous from the Andaman Islands along both coasts of the Burma peninsula and the islands of the Malay Archipelago to the Philippine Islands, the Pelew Islands, New Guinea, New Ireland, and the Solomon Islands.

The range of *Halcyon sancta* extends further south, but not so far west. It embraces Borneo, Malabar, the Moluccas, New Guinea, and New Ireland, extending to the Solomon Islands as far south

as San Christoval, and across Australia to Norfolk Island, New Caledonia, and the Loyalties.

One other Polynesian species of *Halcyon* may be regarded as a continental species, *Halcyon vagans*, which inhabits New Zealand and Lord Howe Island: the rest are all island forms with very restricted ranges which do not overlap each other.

Halcyon sacra extends from the New Hebrides across the Fiji groups to the Friendly Islands.

Halcyon platyrostra is only known from Upolu and Savai, the two largest islands of the Samoan group.

Halcyon pealii is supposed to be confined to the island of Tutuila, one of the little islands belonging to the Samoan group.

Halcyon veneratus is found on Tahiti, and *Halcyon albifrons* on Huaheine, another of the Society Islands.

Halcyon tristrami is confined to New Britain and *Halcyon cinnamomina* is only known with certainty to occur on the Marianne Islands.

The most interesting point in this distribution is the difference between continental species with their large areas of distribution which frequently overlap those of allied species, and island species with their small areas of distribution which very rarely overlap those of allied species.

A second and equally interesting point is that the Malay Archipelago (like the British Islands) must be regarded as a part of the adjacent continent. They have obviously only become islands since the introduction of their present avifauna; they are rarely separated from the continent by sea deeper than one hundred fathoms; and the fact that mammals are found upon them seems to prove that they have been elevated at least one hundred fathoms higher than they now are, since the development of mammals.

On the other hand the Polynesian Islands contain no indigenous mammals, and their avifauna consists of the waifs and strays which have been fortunate enough to find in them a home when forced to emigrate by some great catastrophe. They are modern islands (with the possible exception of the Sandwich Islands) and have

never been joined to a great continent, or if they have been so they have been subsequently submerged, and all their mammals and most of their birds destroyed.

The difference between these fundamentally different kinds of islands has been most ably treated of by Wallace in his 'Island Life,' but so many new facts have been discovered since its publication, now more than ten years ago, that the book is somewhat out of date. Mr. Wallace is however at present engaged in writing a new edition corrected up to date, and I strongly advise every zoologist to buy a copy and study it well. It discusses problems of the most profound interest, inasmuch as without some knowledge of them modern zoological science is absolutely unintelligible.

I.

NOTES ON BIRDS IN THE LILFORD AVIARIES.

By The Right Honourable Lord Lilford.

Read 27th May, 1890.

I gladly comply with the request of my friend Mr. J. H. Gurney for a continuation of the notes on the former and present denizens of my Aviaries.

I wish it to be understood that as I have not visited the native haunts of *any* of the northern Falcons, I only write of them from my acquaintance with them in captivity, or on the authority of others.

Of that beautiful bird, the Greenland Falcon, *Falco candicans*, I have at various times possessed five or six, obtained through dealers in London and Liverpool; these were, with one exception, females in the plumage of the second or third year. The only Tiercel of this species that ever came to my hands alive was, I think, an older bird when he arrived at Lilford than any of the females, and was the only one that ever reached me with wing- and tail-feathers in sufficiently good order to allow of his being put into training at once; in common with all the other Greenlanders of my acquaintance, this bird was most docile and tractable, and turned out a magnificent flyer and stooper; but he would never "bind to" the many Rooks that he generally "put in" at the first stoop; with anything like a chance he was above his quarry in a very few minutes, but never made a short stoop; mounting to a very high pitch he came down like a dart, but apparently never even attempted to clutch his birds, several

of which he drove into covered drains, sheep-folds, sheds, and ditches; for this reason he was practically useless from a falconer's point of view, but to see him fly was a "joy for ever" to any one capable of appreciating the perfections of a Falcon. Although we put several of the females on wing, I had never any opportunity of flying them at winged quarry, as our only available field near Lilford for Rook-hawking was several miles distant, and has now been for many years past enclosed; but as, from the miserable condition of their plumage on arrival, we had to keep them idle till they had moulted, I do not think that even if we had a good hawking country close at hand, we should ever have done much good with them. I never attempted to fly these noble birds at ground-game, as I considered it beneath their hereditary dignity to employ them on Goshawk's work. The Greenlander is not an easy bird to keep in good condition, at least such has been my personal experience with them; but it is more than probable that the digestive powers of the birds of this species that reach this country may have been severely tried by improper food and want of care during their voyages; be this as it may, I have found them especially liable to cramp, swelled feet, and that scourge known to falconers as "the frounce:" beef must only be given occasionally and in small quantity; my birds always seemed to thrive better upon Rooks, Waterhens, and Ducks' heads than upon more delicate food; but about four years is the longest period for which I have ever succeeded in keeping a Greenlander. An old Perthshire gamekeeper, formerly in my service in the neighbouring county of Inverness, told me that he had frequently seen, and on several occasions shot or trapped, great white Falcons in the winter months in the neighbourhood of Rannoch and Loch Tummel; one of these birds shot near Foss on this latter loch, in the early spring of 1862, by this informant whilst in the service of my brother-in-law, was sent by its destroyer to Mr. Paton, the well-known gunmaker, in whose shop at Perth I discovered it in the following year; it was a young male, fairly well stuffed, and mounted in a case with a female of the same species stuffed, as Mr. Paton informed me, from a foreign skin.

I had the pleasure of presenting the case containing these birds to my excellent friend and teacher in falconry, the late E. Clough Newcome, of Feltwell, the first practical falconer

of his day, and, as you are probably well aware, a very acute field ornithologist. Old John Campbell, the gamekeeper to whom I have alluded, said that these Falcons, during their visits to the Perthshire loch-sides, devoted their attention principally to Rooks, that they made the wild-fowl very "uneasy," and that he once saw one of them "put in" an old Blackcock, but never noticed them in pursuit of Red Grouse; on the whole, from his professional point of view, he did not seem to consider these strangers "such a bad vermin"! as the native "Hunting Hawks," *i.e.* Peregrines.

Of the Iceland Falcon, *Falco islandus*, I have had a few and found them generally intractable and sulky; they are hardier in constitution than the Greenlander, but require more care than Peregrines. I have seen one or two of these birds well broken to the hood and lure, but although I am well aware that the species has been successfully flown at Herons, other winged quarry and Hares, I have never yet seen one on wing that gave me the impression of being a really "good Hawk" from a falconer's point of view. I never attempted to fly one of my own birds at wild quarry, as our district at Lilford is eminently unfavourable for falconry.

Of the Norwegian Gyrfalcon, *Falco gyrfalco*, I have had five; the first of them presented to me by the Rev. W. Newcome, of Hockwold, who caught it in Norway under a cliff upon which it had no doubt been bred; the second was taken on the autumnal passage near Valkenswaard, and I subsequently received three out of sixteen caught on the Norwegian fjelds by the late John Barr. We did not attempt to do more with these birds than break them to the hood and lure; they are somewhat stubborn and savage-tempered; but I am inclined to consider this species as superior in constitution and quality for field purposes to the Icelanders, though it has certainly not the "turn of speed" in flight of the Greenlander. The bird presented to me by Mr. Newcome was a female, and after the moult was a most beautiful and well-shaped bird; during my absence from home she was suddenly alarmed by the fall of a large branch near her block, and her gear having been shamefully neglected, she broke her leash and was never, to my knowledge, heard of again. I am aware that many ornithologists consider this bird and the Icelander as local races of the same species, and it is certainly very difficult to distinguish them

from each other in immature plumage; but when seen alive, there is a difference of make and general character of appearance that inclines me to hold them as of two distinct species.

After what I have already written in connection with the noble art of falconry, it seems barely necessary to state that I have been the happy possessor of many of my favourite amongst flying creatures—the Peregrine, *Falco peregrinus*. I first tried my hand at training on a pair of Eyesses sent to me in my school-days by an uncle on whose property in the south of Scotland there had been an eyry from time immemorial; in fact his direct ancestors had been hereditary grand falconers to the Scottish kings for many generations, and held the manor on which these birds bred by the annual presentation of a cast of Hawks to the Sovereign.

From want of knowledge, time, and good country, my training came to nothing; but I made my birds perfectly tame and obedient, and my early acquaintance with this species inspired me with a love and admiration which succeeding years and experience have maintained and intensified. To you, Gentlemen of Norfolk, it is quite unnecessary that I should dilate upon the attractions of falconry, as your county is one of the best adapted for that finest of sports, and is the birth-place of some of the most eminent of British falconers, whose traditions I trust still live and are cherished amongst you; but having said this much, I cannot forget that Norfolk is the most famous game-preserving county in England, and on this account I make bold to urge a plea against the destruction of the Peregrine. I will not pretend to deny that the Falcon destroys game-birds, but I would beg you to remember that it is only in autumn and winter that the Falcons visit your county, that they generally take their prey on wing, and that the natural instinct of Partridges and Pheasants leads them to conceal themselves as closely as possible when a winged enemy is in sight. I have no doubt that many of you have seen a Falcon stoop at and take one of a covey of Partridges on wing, but you will probably remember that the covey was flushed by human agency, and thus exposed to an attack that it would in other circumstances have escaped. I can tell you that I have been, and still am, as ardent a preserver of Partridges as any one can well be, that our valley of the Nene in Northamptonshire is annually visited by several Peregrines, that I never allow them to be shot

at or trapped, and that our average bag of Partridges, in by no means a particularly favourable district, varies from 800 to 1500 brace annually. The Falcons, finding themselves unmolested, remain with us throughout the winter, occasionally till late into the spring, and devote their attention principally to Wood-Pigeons and Wildfowl. I can honestly say that I do not think that, taking one year with another, we lose ten Partridges annually by Falcons; but I cannot expect that many will join me in saying that they are most heartily welcome to as many of these birds as give them a chance upon my shootings, and that even in the days when I was able to walk and enjoy keenly a good day's shooting, I would rather see a fine stoop and kill by a wild Falcon than shoot fifty brace of Partridges to my own gun. I have imported several Falcons taken on passage at Valkenswaard, and amongst them have had two or three most excellent birds, but I leave the comparative merits of Passage-Hawks and Eyesses to be discussed by those whose opportunities of judging in the field have been greater than my own. Personally, I am inclined in favour of Passage-Hawks, for the obvious reason that they already know their business when taken, and only require to be reclaimed to our uses, whilst the Eyess has to be taught by an instructor, who at the very best is inferior to the parent birds; there is, however, such infinite variety in the temper and disposition of individual Falcons, that it is very difficult to lay down a hard-and-fast line of merit as between the two classes, and I have had the good fortune to see many excellent birds of both. The Old Hawking Club still flourishes, and shows fine sport at Rooks and game in various parts of the country, and there is still a small, but, as I hope, increasing band of private falconers who cling to the ancient science with devotion and very considerable success. Although, as I have already stated, I never allow *traps* to be set for Peregrines upon my own shootings, we have taken four of these birds at Lilford alive and uninjured in the recognised Dutch fashion with bow-net and decoy pigeons, and the almost indispensable assistance of a Great Grey Shrike as sentinel. Two Falcons have been found to my knowledge in the neighbourhood of Lilford slightly wounded in the wing, and another was injured in the same way as she was carrying off a Wood-Pigeon that had just fallen to the first barrel of a sporting farmer; these three

birds came into my possession, and two of them recovered sufficiently from their wounds to fly and take Rooks fairly well. I have kept a Peregrine Falcon "at hack," that is to say in complete liberty, for many months at Lilford; this bird lived principally upon the top of the house, and came regularly to the lure, or to my whistle, as often as I chose to call her. It is curious that this bird was the only one of her species that I ever knew to pursue and take a Jackdaw; she was playing high in the air over the house at Lilford, when she suddenly came down with a rush at a few Rooks and Daws in the deer-park; they all took refuge in two or three old ash-trees, and the Hawk, mounting like a rocket to a high pitch after her first stoop, came down through the top branches of one of these trees, and brought a vociferous Daw to the ground with her: this is the only instance in which I ever saw a Peregrine, wild or trained, take any bird from a tree; but a frequent exception to their general habit of capturing their prey in the air is the Waterhen, whose dress no doubt renders it especially conspicuous on the water meadows. When the Falcon is bent upon this quarry, she glides along the fence-sides at a few feet from the ground like a Sparrow Hawk, and the Waterhens, wary enough of attacks from above, fall easy victims to these sudden and unexpected assaults. We always reckon that the first appearance of the Peregrine at Lilford in August or September is a certain indication of the arrival of the Teal, which does not breed to my knowledge in our neighbourhood; but the wandering flocks of Peewits are also no doubt an attraction to these travelling Hawks. During my wildfowling expeditions from Corfu, on the mainland of Epirus, I was continually very efficiently aided by an old female Peregrine; on first stepping ashore I almost invariably saw her at her favourite "stand" on the top of a high black poplar tree, whence she had an uninterrupted view over a swampy, wooded, and generally more or less flooded valley; the temporary lakes or splashes formed by the flood always held "fowl" of some sort, and on seeing me attempting to stalk up to them, my winged ally would mount high into the air and thereby make the Ducks "keep small" or try to conceal themselves, thus enabling me to put in many a right and left. This Hawk always went at Teal in preference to Mallards, Gadwalls, Shovellers, Pintails, or Wigeon, and her first stoop was almost always successful; if not, I generally

threw up one of my birds into the air on an open spot in her sight, and after a good look round she would come down upon it, and after filling her crop return to her original post of observation. She very soon discovered that I meant her no harm, and allowed me to pass continually within easy distance without taking wing. You will admit that I have good reason to love the Falcon, and, I trust, pardon this long rhapsody to her honour. In the Mediterranean, a small race of Peregrine is the prevalent resident form; this race has been, in my opinion, most correctly referred by the late Mr. J. H. Gurney to *Falco punicus* of Levaillant jeune, 'Exploration de l'Algéric'; and in the 'Ibis' for 1882, Mr. Gurney has gone with so much accurate detail into the differences between this and allied races or species, that it is quite unnecessary that I should detain you with my private views on the subject; I will only say that they agree, as far as my knowledge extends, entirely with those of the eminent ornithologist to whom I refer. I have met with this race, which for convenience I will call the Mediterranean Peregrine, throughout the shores of that sea from Gibraltar to Cyprus; it is especially abundant in the islands of the Italian Archipelago and on the coasts of Sardinia. In the early summer of 1882, whilst yachting in Italian waters, we discovered no less than nine breeding-places of this race of Falcon, and obtained two fine young birds from a nest on the island of Maddalena (*cf.* 'Ibis,' 1887, pp. 276, 277, pl. viii.); these birds I sent home with my yacht from Nice, and they reached Southampton alive, but in most miserable condition. However, under the able care of John Frost, falconer to the Old Hawking Club, they both recovered: the male, very docile and a beautiful flyer, was destroyed by another Hawk during a railway journey; the female lived for seven years at Lilford, but could never fly really well; she was during the first two or three years of her existence quite the most spiteful and "cranky" tempered Falcon of the many with whom I have been acquainted. These Falcons in their native haunts seemed to me to live exclusively upon Rock-Doves, but no doubt their diet is varied by wildfowl and waders in the winter season. I found this race breeding on the islands of Menorca and Iviza, and, curiously enough, obtained a fine adult male in the mountains of Asturias in May, 1876; *this* is, as far as I know, the only recorded

occurrence of this species to the north of the Mediterranean. Birds of this race of Peregrine often come into the London market alive, in first year's plumage, from Mogador. The typical Peregrine, *F. peregrinus*, is common enough during the autumn, winter, and early spring in all parts of the Mediterranean shores that afford quarry, but does not, to the best of my knowledge and belief, breed upon any of the coasts of that sea. If the trinomial system should ever come into general European use, I should certainly be inclined to designate this bird thus:—*Falco peregrinus*, sub-species 1, *marinus*. Hab. Mediterranean.

This race is easily distinguishable from *Falco barbarus* in adult plumage, but before the first moult it is almost impossible to separate it, except by measurement, from that, in my opinion, perfectly distinct species, although, as I have before stated (*cf.* 'Ibis,' *loc. supr. cit.*), I am convinced that in many cases this Mediterranean Peregrine is the "Barbary Falcon" of old writers on falconry.

Of the true Barbary Falcon, *Falco barbarus* of O. Salvin ('Ibis,' 1859), I know but very little in its wild state, having only met with it on two occasions in the south of Sardinia, but I have purchased many young and two or three moulted birds of this species from Mr. Castang of Leadenhall market, who assured me that they were all shipped at Mogador. In the adult plumage this bird is always to be distinguished from *Falco punicus* by the greyer colour of the upper parts, the constant bright rufous nape, and general reddish ground-colour of under parts, but is, in my opinion, specifically inseparable from *Falco babylonicus*, the Red-naped Shahîn of Indian falconers. The present bird is very considerably smaller than the typical *F. babylonicus*, but may, I think, fairly be considered as a small western race of that species. I have been singularly unfortunate with my Barbary Falcons, and in a majority of cases have failed to keep the young birds through their first moult. To the eye of a falconer this little Hawk is the model of perfection in shape, and it is pre-eminent for courage and speed; but I greatly fear that our country is too cold, or more probably too damp, for the full display of the capabilities of these birds in a trained state.

Of the Red-naped Shahîn, *Falco babylonicus* I have only had one alive in captivity; this bird, a very beautiful adult female,

which had done good work in India, was presented to me by my friend Lieut.-Colonel E. Delmé Radcliffe, formerly of the 88th Connaught Rangers, whose prowess and skill in falconry was only less widely known than the gallantry of his old regiment on the battle-field. This Falcon lived in apparently good health at Lilford for several years, but I did not attempt to fly her at any quarry on account of the unfavourable nature of our surroundings; she eventually died from the ravages of parasitic worms in the heart. In the autumn of last year, 1889, Captain Stephen Biddulph, of the Bengal Lancers, brought a very fine trained female of this species with him to Lilford, where I had the pleasure of seeing her fly to the lure; her speed and turning-power were wonderful, and a more docile and altogether perfect picture of a Hawk it would be hard to find. Captain Biddulph had himself trained this bird and flown her with brilliant success in India, but has I think been somewhat disappointed with her performance in this country, for which I am convinced that our native Peregrine cannot be surpassed. I am indebted to the kindness of Captain Biddulph for the gift of a so-called Black Shahîn, or Sultan Falcon, *Falco peregrinator*, which he had brought with him from India. This is the only bird of this species that I ever possessed alive; it was in moult when it reached my falconer's hands, and although it fed and bathed well, never gave me the impression of being thoroughly sound and healthy; it only lived at Lilford from the middle of April to the end of July, 1889; the cause of death was a large tumour on the breast-bone; the skin of this bird is now in your county Museum. As I am on the subject of Indian Falcons, it occurs to me that the following record of quarry taken by the Hawks of Captain Biddulph and a brother falconer in N.-W. India between the beginning of November, 1888 and February 15th, 1889, may not be without interest to those of you who care to know what can be done by good Hawks in a good hawking country. The record stands thus:—24 Herons, 17 Houbara Bustards, 13 Glossy Ibis, 7 Egrets, 1 White-necked Stork, 1 Bar-headed Goose, 4 Ruddy Sheld-Ducks, 33 Mallard, 12 Spotted-billed Ducks, 3 Red-crested Pochards, 16 Pintails, 24 Gadwalls, 4 Shovellers, 4 White-eyed Pochards, 1 Tufted Duck, 68 Teal, 72 Red-wattled Lapwings, 12 Rollers, 7 various: 322 head in all. My memory does not serve me exactly as to the

number of Hawks—Peregrines and Shahîns—employed in making up this aggregate, but I am pretty certain that it did not exceed four or five, and I believe that the record is unique.

The Lanner, *Falco feldeggii*, I have met with occasionally in Andalucia, and, as I now believe, in European Turkey, and we found a pair of these birds nesting on the little island of Standia off the north coast of Crete. In the wild forest country on the proper right of the Guadalquivir, below Seville, a few pairs of this species used to breed annually, and I have received skins, eggs, and young birds from that district; the eggs, generally three in number, are laid in abandoned nests of Kites, Ravens, and other raptorial birds, in pine-trees towards the end of April. I have reason to believe that this species feeds principally upon aquatic birds; but in Spain I never noticed a Lanner in pursuit of quarry. In Tunis, however, a beautiful grey adult with very brilliant rufous crown crossed the horse-track upon which I was travelling within a very few yards of me, in hot pursuit of a Kestrel. I have purchased many of this species sent to the London market from the ports of Morocco, in which country the bird is apparently abundant. The young Lanners thus obtained present two very distinct types of plumage, the majority more or less resembling on the upper parts young Peregrines, but with light-coloured heads and greenish-grey feet. All the young birds that I have received from Andalucia belong to this type, but amongst those from Morocco I have several times received Lanners of the year whose crowns were as brightly rufous as those of the adult, and their backs and breast-stripes were very much darker than those of the majority: however these dark-coloured birds on moulting assumed what we may call the normal plumage of their age. In the second or third year the feet of the Lanner become yellow, and in really adult healthy birds are brighter than those of the Peregrine. Many of the ancient authors on falconry write in high praise of the Lanner, but I cannot discover that any of our modern falconers hold it in much estimation, and I am inclined to think that as the ancients speak of it as especially good "for the river," and as I know that this Hawk is a high flyer, in all probability the Lanners used in England were trained to wait on over the marshes and streams in August and September, and the terrified young water-fowl were taken by spaniels and pole-bearers under

the Hawk; at all events my own experience with this species is to the effect that although it is a high and rapid flyer and very docile, it is by no means a couragcous bird, and that this country is by no means well-suited to its natural constitution; in fact, although it is a very handsome bird in appearance, there is an indescribable softness about it which does not commend it to the falconer. With great care, we have managed to keep some of these Hawks at Lilford for four or five years, but they are particularly subject to attacks of the fatal "frounce," and cannot stand any exposure to rough or wet weather. The first specimen of the Saker, *Falco sacer*, that ever came alive into my possession was purchased from the French Society of Acclimatization through my friend Mr. E. Cavendish Taylor, who discovered the bird, a fine adult female, in a cage in a part of the said Society's gardens in Paris not open to the public, in the spring of 1862. He was informed that the bird in question had been sent from Persia, and the box in which I received it in London was ornamented with a card which set forth that the Falcon had been and was to be solely nourished on bread and butter, of which refection some fragments remained in its travelling-carriage. This Saker had evidently been trained, as it sat quietly unhooded on my fist as I carried it across Hyde Park a day or two after its arrival; but it had an injury to one of the pinions which prevented its flying; it lived for more than eight years at Lilford, dying, as I firmly believe, simply of old age. With me this Hawk was perfectly tame and gentle, but she would boldly attack any other human being or dog who came within reach of her leash. Rough weather did not seem to affect her in any way, and she much enjoyed a drenching summer shower.

I have had several other Sakers, male and female; one of the latter my falconer tried to train at Hares, but failed signally in the attempt. The Saker seems to me to be naturally fierce and vicious; but once reclaimed, becomes as tame as any Hawk can be with its master, though always shy and distrustful of strangers. As I have never, except possibly on one doubtful occasion, seen one of this species in a wild state, I can say of course nothing of its habits in that condition from personal observation; but I think that the following notes kindly communicated to me by Captain Charles Thompson of the 7th Dragoon Guards, who has considerable

experience of falconry in India, may be of interest. He informs me that the Saker, or "Cherrug," as this species is called by Indian falconers, is supposed to nest in the Punjâb and Afghanistan, but only visits the plains of India during the cold weather. This bird is very rarely to be seen perched or anywhere near the ground, but has to be looked for high up in the sky. On perceiving a Saker, the native Hawk-catchers let go a "Luggur," *Falco jugger*, with its eyelids sewn together or otherwise blinded; to the feet of this Hawk they attach a bunch of large feathers to deceive the Saker into the idea that the Luggur is making off with its quarry, the former bird having a special dislike for the latter; to the bunch of feathers are attached a number of horse-hair nooses. The Luggur being temporarily deprived of sight, on being thrown off, rings feebly up into the air; the Saker hardly ever fails to come down with a fierce stoop to rob the other bird, and so gets taken.

This species is trained to fly at Gazelles, Hares, Houbara, Bustards, and Kites, for which last flight it was held in very high estimation by European falconers of the 15th and 16th centuries. Several of these ancient authors agree as to the high courage, perseverance, and ferocity of the Saker. I am not aware that this Falcon breeds in any part of Europe except the Danubian provinces, where it is said to lay in the abandoned nests of Vultures and Kites in high trees. To my eyes the Saker in external appearance and shape is a gigantic Kestrel, and is quite as promiscuous as that well-known bird in its choice of food. I have kept many Hobbies, *Falco subbuteo*, mostly obtained in the midland counties from old nests of the Carrion-Crow in high oak trees. With us at Lilford the Hobby is a regular summer visitor, appearing about the middle of May and leaving the neighbourhood early in October. The normal complement of eggs is three, and I feel sure that in some of the many reported cases of four or five eggs having been found in Hobbies' nests, one or two were laid by a Kestrel, and remained addled in the nest after the others of that bird's sitting had been hatched and the young birds fledged and flown. The Hobby does not, I think, pair till after its arrival in this country; at all events, I have known of many instances of the finding of fresh eggs in July, and the young birds are seldom fit to take before the last week of that month. During the interval that occurs between the

arrival of the bird in England and the laying of its eggs, the Hobby constantly uses the old nests of Crows, Rooks, and Magpies as resting and basking places; and in one case with which I am acquainted, a brood of Carrion Crows had taken wing in the end of April, and a brood of young Kestrels were taken in early June from a nest which contained three young Hobbies on July 28th. I have generally put my young Hobbies out "to hack" in the park at Lilford and allowed them to leave us at their own will; they seldom linger beyond the third week of September, but in the meantime their aerial evolutions are a daily delight to me. I may as well say that although the Hobby is perhaps the most easy of all Hawks to tame, I consider the birds of the year to be quite useless in falconry, as though their flight is wonderfully swift and their stooping and turning powers exceptional, they are extremely bad footers, and always more inclined to toy in the air than stick to business. Many of our old authors on falconry tell us that many Skylarks and other birds were formerly taken by a system that they call "daring," with the Hobby. I quote the following description of this diversion from 'The Book of Falconrie or Hawking by George Turberville, Gentleman, An. Dom. 1611," p. 56:—"The doggs they range the field to spring the fowle, and the Hobbies they accustome to flee aloft over them, soaring in the aire, whome the silly birdes espying at that advantage and fearing this conspiracy (as it were) betwixt the dogs and hawkes, for their undoing and confusion, dare in no wise commit themselves to their wings, but do lie as close and flat as they possibly may do, and so are taken in the nets, which with us in England is called Daring, a sport of all others most proper to the Hobbie." As neither I or any falconer of the present day has to my knowledge ever succeeded in indueing a young Hobby to "wait on" steadily, I am inclined to think that this "Daring" must have been effected by means of old wild-caught Hobbies, as these birds in August and September, when their summer insect prey begins to fail, certainly have a special predilection for moulting Larks and an open field. I am persuaded that during the months of May, June, and July, till the young are hatched, the chief food of the Hobby consists of flying insects, especially chafers and large moths, taken on the wing in the evening, bats are also often frequently taken. I have found it difficult, as a rule, to keep Hobbies in health through an English

winter, but this has often been done, and I am glad to say that my falconer has kept six of these very beautiful birds in good condition through the past winter of 1889—90; five of these birds were taken from old nests of the Black Kite in Andalucia in July last, and are the first of their species that I ever received alive from Spain, they have been, to a certain extent, allowed the use of their wings, and principally fed upon warm bird's flesh in an artificial heat of from 65° to 75° Fahr. We were often waited upon by wild Hobbies in September whilst Partridge-shooting in Northamptonshire; but I never saw one of these little Falcons fly even at a "squeaker," or indeed at any bird larger than a Lark, with the solitary exception of a very young Turtle Dove.

The young Hobbies haunt the neighbourhood of their nursery for some weeks after they are able to fly, and follow their parents with a continual outcry that somewhat resembles that of the Wryneck, and is very distinct from the harsher call of the Kestrel. A gamekeeper formerly in my father's employment in Lancashire shot a young Hobby that kept persistently stooping at a pointer as she ranged a field of clover, and I know of many instances in which persons climbing to nests occupied by this species have been savagely assailed by the old birds. The Hobby, when nesting, will attack any large bird that may pass in the neighbourhood; and in Spain I have seen a pair of Hobbies fiercely attack a Short-toed Eagle and a Goshawk.

The few specimens of that remarkable and beautiful species, La Marmora's Falcon, *Falco eleanoræ*, that I have received alive, have been without exception obtained from London dealers, and all shipped from Mogador. In character, shape, and flight they very closely resemble their close congener, the Hobby, but are less able, as may well be supposed, to resist our English climate than that summer visitor to our country. I had the good fortune, in May, 1874, to visit the islets of Toro and Vacca upon which La Marmora discovered this species; these rocks, for they are little more, lie off the south-western point of the island of Sardinia. At the time of our visit they were tenanted by very large numbers of these Falcons, who had not commenced to lay, in fact we were assured by some Neapolitan coral-fishers that no young birds were to be found till September, at which season these fishermen annually take them in great numbers as food. This statement is in some

degree corroborated by the fact that I received three young birds from Mogador in October, 1869, only just able to fly, and with a good deal of the nestling down still attached.

As I have gone into lengthy detail regarding our visit to these rocks in the 'Ibis' of January, 1875, I will spare you a repetition of my notes, and merely say that from what I saw of this species on this occasion and subsequently on the south coast of Cyprus, as well as on a previous occasion in Central Spain, I am convinced that their diet consists principally of insects. It is somewhat remarkable that the crops of the birds obtained by us in the dark-coloured phase of plumage were crammed with the remains of small black beetles, whilst those of what I may call the Hobby-coloured specimens generally contained a variety of insect remains besides these beetles; in only one instance out of seventeen specimens preserved did we discover any remains of a bird in one of these Falcons, this relic was the leg of some species of *Saxicola*. In captivity these Falcons become quite as tame as the Hobby, and may safely be trusted out "at hack" as long as the weather is fair, but they are of no value from the falconer's point of view. La Marmora named this species in honour of the Pisan Duchess Eleanora, who passed a decree for the special protection of certain Falcons in Sardinia, but although the lady is certainly entitled to all honour for this edict, I cannot but believe that she probably was fond of falconry, and wished to protect some species that was serviceable for that sport; on this account I have given the Falcon the name of the distinguished naturalist who first described it scientifically, preserving the name of the sporting Duchess as a systematic distinction.

I need not go into any details with regard to the Common Kestrel, *Falco tinnunculus*, of which I have kept many, except perhaps to protest against the destruction of this most ornamental and useful species; and the habits of the Lesser Kestrel, *Falco cenchris*, of which I have never kept but one, so closely resemble those of our own species that I could hardly tell you anything new concerning it. I may almost say the same of the Orange-legged Falcon, *Falco vespertinus*: the only specimen that I ever possessed alive of this species reached me in a very sickly condition from a London dealer, and only lived for a few weeks. I do not know why this species should ever have been called "Hobby," as in all

its habits, especially in flight, it so closely resembles the Kestrels. Both the Hobbies and Kestrels are more or less crepuscular, this Orange-legged Falcon especially so; but I have seen La Marmora's Falcon and both species of Kestrel also on wing by moonlight. The present species is mainly insectivorous, but as far as I have had opportunities of observation, generally takes its prey upon the ground about sunset. With the solitary exception of the Honey-Buzzard, this is by far the most active on the ground of all the raptorial birds of my acquaintance. I have met with it in some abundance in the Ionian Islands and in Cyprus on the vernal migration, but have no evidence of its breeding in the former locality, as it certainly does occasionally in the latter. I have kept many Merlins, *Falco æsalon*, but never had any success worthy of mention with them in the field, though, as you are probably aware, they are trained by several English falconers to a high degree of perfection, principally at Skylarks; and I have witnessed a few beautiful flights at these birds in your county in the neighbourhood of Feltwell. I may here mention that I have two well authenticated ancient records of the nesting of the Merlin in Northamptonshire, and another recent one of the taking of young Merlins from a nest in a wood in our neighbouring county of Hunts. In both of the ancient instances the nest was on the ground.

A good many Merlins pass along the valley of the Nene, our principal Northamptonshire river, on their southward migration in September and October, generally in close attendance on the flights of travelling Pipits and Finches which take that route towards their winter-quarters. These little Falcons always show a remarkable interest and curiosity about the proceedings of our trained Peregrines, and I have seen a good Tiercel fairly bothered by two Merlins whilst he was "waiting on" at a good pitch over a turnip-field. I must conclude with the record of having once purchased in London a very ragged specimen of the American Kestrel, *Falco sparverius*, which only lived with us for a few days. As I have never crossed the Atlantic, I am, of course, unable to describe the habits of this pretty little Hawk from personal observation.

II.

ON THE CULTURE AND PREPARATION OF WOAD AT PARSON DROVE.

By Edward Corder, *Hon. Sec.*

Read 28th October, 1890.

At first sight the subject of this paper may seem hardly to merit more than a passing notice; but there are still men in the Eastern Counties who call themselves Woad Merchants, and as this ancient industry continues to form one of the manufactures of this country, though to an insignificant extent compared with its importance in times past, it should be of interest to us especially, seeing that the only Woad Mill left in England worked on the old system, that is with horse power, is located in the east of England,* within a short distance of the borders of our own county. Parson Drove, near Wisbech, is one of the last of the Fen villages in which Woad or Wad, as the fenmen call it, is cultivated, and it is quite the last where it is manufactured in the same primitive way that it was in the last century in many localities in Cambridgeshire and Lincolnshire.

The cultivation of this plant, which was so largely carried on in the Fens and other districts in England before the introduction of indigo, and by which, until within a comparatively recent period, many considerable fortunes were made, owes its decline to the increase in production and decrease in price of indigo; the only use for Woad here at the present time being as a setter or mordant for indigo and other vegetable dyes; it also tends to make these dyes

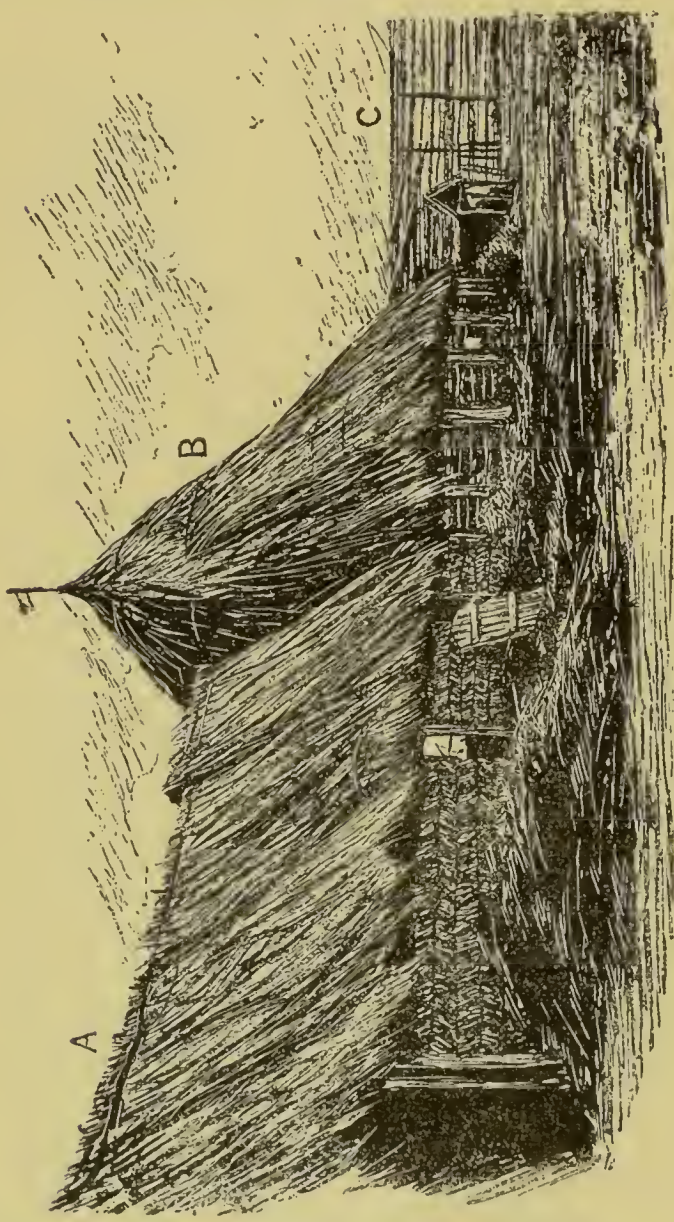
* There are three mills still in existence in Lincolnshire, but they are all worked by steam.

"spend" more and cover a greater surface of cloth. Guaranteed woaded cloth is still produced by many Yorkshire cloth merchants. It is largely used for fixing the dye in army cloths, that used for railway officials, and the constabulary, the principal markets being Leeds, Huddersfield, and other Yorkshire towns, Devonshire and Scotland; it is also exported to India and America.

Woad (*Isatis tinctoria*) is almost the only plant growing in temperate regions which produces a dye similar to indigo: it is one of several Cruciferous and Leguminous plants which contain a blue pigment, all of which colouring matters are developed by oxidation and fermentation, and all most probably have exactly the same natural formula as indigo. The colour in these indigo-bearing plants exists as a white substance, soluble in water: this on exposure to the air absorbs oxygen and is converted into indigotin, which is commercial indigo and is quite insoluble in water.

The plant is a biennial, growing in a natural state four or five feet high. The annual plant which alone is used for producing Woad, seldom exceeds twelve inches, though under favourable circumstances it may reach eighteen inches. It bears a striking resemblance to several other of the Cruciferæ. When mature in its first year the leaf is rather long and narrow, those nearest the crown being almost sessile; the outer leaves, which are stalked, are ready for picking when they commence to droop and the glossy-green colour gives place to a yellow tinge; the flower-head is a loose panicle of yellow blooms, a patch of Woad in flower looking very like Mustard. Sufficient of the annual plants are allowed to run to seed to produce fruit for future crops. The panicles are cut before the fruit is ripe and spread out in the sun to dry: they require to be just in the right condition, since if the fruit is too ripe the valves are liable to open and shed the seed. The fruit is a flat pod, shading from yellow to purple, containing one seed; this is not separated, the fruit being sown whole. The natural habitat of Woad is doubtful, it is most probably native to south-eastern Europe, whence it has spread by cultivation north and west and into Asia; though well known to the Gauls and Britons in the time of Cæsar, it is not indigenous to this country. Hungary produces considerable quantities, used in the Buda Pesth cotton mills and elsewhere; it is also cultivated in Germany, France, and Italy, the plants in the two latter countries yielding

nine and even ten pickings of the leaves, whereas in England and Germany they rarely exceed three. It is an extremely exhaustive crop, the finest bullock pasture land being useless for its cultivation after six successive crops, unless artificially manured; indeed many



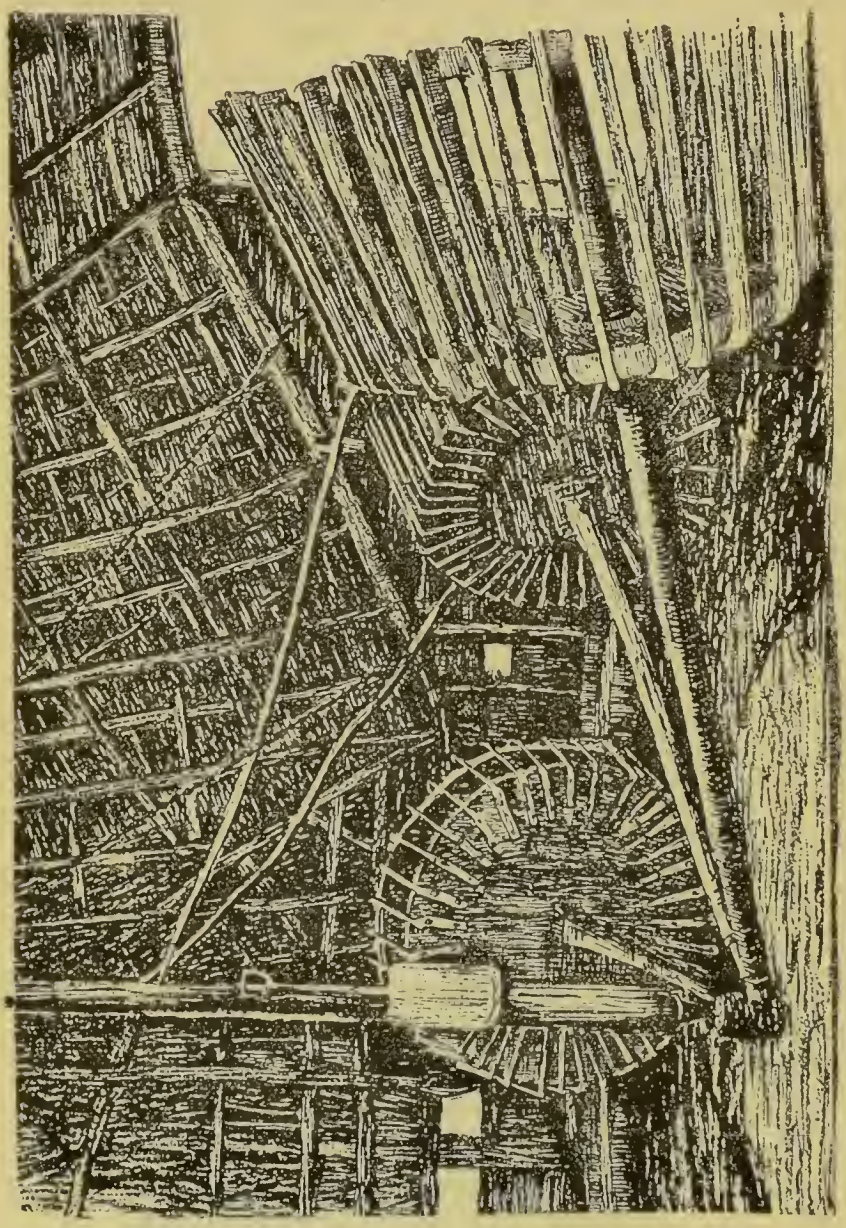
A.—The barn in which the Woad is couched; during which process the entrances are closed.
B.—The mill for crushing.
C.—The ranges on which the Woad is dried.

old leases still contain a clause forbidding the cultivation of Woad amongst other exhaustive crops; in fact it was looked on with the same suspicion as flax.

In the early spring the land intended for Woad cultivation is ploughed once or twice and well broken up; the field is divided into stretches twelve feet wide, with a trench two feet wide between each stretch; these stretches are very carefully harrowed so as to keep the land quite light, and the field is left until April or May, when the seed is sown. It takes about three bushels of seed to an acre, artificial manure being drilled in at the same time; the greatest care is necessary throughout its earlier cultivation, as the young plants are very tender and easily bruise, but they quickly become quite hardy, and in a few weeks are ready to be pricked out into even rows, less than a foot between each plant. In a short time the crop is weeded. This is done entirely by hand; the men lie down in the trenches and spud up the weeds, drawing them into the trench as they go on; one man on each side can weed to the middle of the stretch without damaging the plants; the field is weeded two or three times at intervals and always with the same care, a field of Woad in July being an extremely clean-looking crop. About the first week in August the leaves are ready for picking. Each one is gathered separately, as free from dirt as possible, and placed in a willow skep; these when full are taken straight to the mill and the leaves crushed immediately, as if left uncrushed they rapidly heat and become useless. There are usually two or three pickings of the leaves, and the crop is well weeded after each picking. The lower leaves being the first to mature, are naturally the first to be picked. It is usual not to take the leaves from plants intended for seed, as they develop more fruit if left untouched. The first picking produces the best Woad.

The mill is a round structure, very roughly built of sods placed diagonally in a herring-bone fashion to a height of four feet: this is lined inside with wood and surmounted by a roof of hurdles thatched with straw. The walls of the mill and couching shed are much thicker at the bottom than at the top, and both these buildings at Parson Drove are practically identical with those used at a much earlier period. The floor of the mill is circular, about twenty-four feet in diameter, and paved with slabs of stone; it is surrounded by a platform, three feet high and four feet broad. Attached to a central pillar are three poles, each of which forms the shaft to one of the crushers; these crushers or rollers, which resemble paddle-boxes, and are made of wood heavily shod with

many iron spokes, are seven feet high on the outer side and six and a half feet on the inner. A horse, which walks round at about four miles an hour, is attached to each of the rollers, and



Interior of the Woad Mill.
The post in the centre is the pivot on which each crusher, drawn by a single horse, revolves.

the leaves being shot from the skeps on to the stone floor, the heavy crushers quickly reduce them to a pulp.

These mills, on the old system, were roughly constructed, for the reason that a Woad grower was never certain of staying long

in one district, and since it was indispensable to crush the leaves directly they were picked, it was necessary for the mill to be close at hand; having exhausted the finest land, or from some other cause, he would migrate, taking only the rollers and paving-stones, quickly building a fresh mill of sods, hurdles, and straw, wherever he might stop.

The crushed pulp is taken from the mill and thrown into heaps, where any superfluous juice drains away, and in a short time the mass is ready to be made into balls. The leaves are usually crushed in the morning and balled in the afternoon. These balls are about as large as a Dutch cheese, and are placed in sheds on shelves made of slips of wood, with a broad space between each slip; the trays or shelves are in ranges some distance apart, and the sheds are open on all sides to the weather, being only covered in at the top; thus exposed to the air the balls quickly dry and shrink to the size of a small orange. In about a month they are removed from the shelves and crushed to powder under the rollers, or broken to pieces by hand. Then follows the most difficult part of Woad manufacture, namely, the "couching." The couching-shed, which is paved with stone, is built of the same material as the mill, turf being preferable to brick or stone, as it preserves a more equal temperature; this shed or barn is about fifty feet by twenty feet and holds many tons of Woad.

The powder is spread out on the floor, about two feet deep, and constantly turned over, thereby rapidly developing a fermentation, which is regulated by sprinkling the mass with cold water. This process lasts about two months, and the Woad requires constant care and attention during the whole of that period, as over-heating spoils the quality of the Woad, and too low a temperature checks the ferment. A very strong ammoniacal vapour is given off at this stage. The shed is kept almost dark, only one very small entrance being used. In about eight weeks the fermentation has practically ceased, all the heat has disappeared, and the Woad is ready for the dyer; it is rammed tightly into sugar tubs, holding from twenty to thirty hundredweight each, which are carefully headed up and each cask marked with the quantity contained and the year it was produced. Woad improves very much by keeping, due to a slight ferment that goes on after it is casked, and its power is said to be quite doubled in four years.

An acre of Woad produces from a ton to a ton and a half of prepared material.

Woad had some slight reputation medicinally, since Salmon, in the 'English Physician' (1693) says:—"Isatis, Glastum, Goadum, or Woad, *the Herb*, with its stalks and flowers, are dried without sharpness. *The Decoction*, which drunk opens the obstructions of the spleen, and helps the hardness thereof, and cures wounds and ulcers in strong bodies; but is most used by dyers to dye their cloth withall. *The Saline Mixture*, which more powerfully opens obstructions of the liver and spleen. *The Seed*, which some say purges;" but as the old herbalist found some medicinal properties in most plants, his information does not go for much.

Before the introduction of indigo into the dyeing houses of the Continent, Woad was prepared somewhat differently in France and Italy. The ground pulp was taken from the mill and placed on sloping floors made of stone, fitted with gutters; as the mass fermented large cracks were formed and a black juice exuded, which ran away down the gutters; the cracks were filled up as fast as they appeared, and in about a month the mass was sufficiently dry to be made up into cakes, called coques or cocaignes, these were packed in tubs for the dyer, to whom the second ferment was left. Woad prepared in this way gave a working percentage of blue colour, though nine parts of the leaves yielded only one part of paste, and this gave but two per cent. of pigment. To dye with Woad alone was always a very delicate process, and is probably never employed at the present time. The Woad was placed in a vat and boiling water added, the vat being then left for some time; slaked lime in small proportions was then put in, the vat kept at a gentle heat and constantly stirred; after a time a blue scum appeared on the surface showing that the ferment was going on; this would dye cloth green, which on exposure to the air developed into the deepest blue, thus acting identically as indigo. It is rather doubtful if the Woad manufactured in Lincolnshire at the present day would yield much if any colouring matter. From a description given in an old glossary of the thirteenth century it is evident that the blue colour was obtained from Woad even at that time, and was called Indum.

In the eighteenth century, indigo being very dear and Woad

yielding such a small percentage of pigment, many attempts were made on the Continent to obtain the blue colour profitably from Woad, and the French offered a very large reward to anyone who should discover an economical process, but the quantity obtained never compensated for the cost of production in the face of the decline in the price of indigo.

In Germany the blue colour was obtained direct from the leaves by placing them in tubs nearly filled with water, keeping the leaves down with wooden blocks; this set up a fermentation, and after a time the liquid was drawn away from the bottom of the tubs, the leaves were well washed and the two liquids mixed, lime water was then added and the whole constantly shaken; the dye was deposited as an insoluble paste, which was thoroughly washed and cut into cakes. A Woad vat at the present day consists of Woad, bran, slaked lime, madder, and indigo. The Woad is put into the vat with water at a temperature of 150° Fahr; after some hours, when the Woad has become soft, the bran, madder, indigo, and half the lime are added; the fermentation soon commences, the liquid becomes green and a blue scum forms on the surface, fresh slaked lime being carefully added as the ferment goes on; in three days the vat is ready for dyeing. This is a very old process. The Woad acts as a fermenting agent and mordant, bran also aiding the ferment. The madder is probably useless, being a survival of early days, and the lime makes the indigo soluble by converting it into indigo white. A hoop apparatus in the vat prevents the cloth from coming into contact with the mass at the bottom. This vat is largely used for dyeing woaded blacks, and was also used for dyeing mourning blacks, hence the term "widows' weeds" or woads, the plural being used in much the same way as the plural "blacks" used to be.

The artificial production of indigo in the chemical laboratory by Bayer is one of the latest triumphs in organic chemistry, and, as is the case with alizarine and madder, may ultimately drive the natural product out of the market. The discovery of the passage to India by the Cape was really the death blow of Woad cultivation in Europe, although previous to that discovery indigo was largely introduced into Europe by way of Alexandria. In spite of the most stringent prohibitions in Germany, France, and England in the sixteenth century to prevent the introduction of

indigo into the continental dye houses, it gradually pushed Woad out of the market. When first used it was customary to mix a little indigo with the Woad, to heighten and improve the colour of the latter, but by degrees the quantity of indigo was increased, until Woad was displaced entirely.

A law was passed in the reign of Elizabeth to prevent the use of indigo in England; this law was in full force in the time of Charles II. Henry of Navarre went so far as to make it a capital offence for anyone to sell that pernicious drug called "inde." In Germany it was known as "devil's dye," and was prohibited by an imperial edict in 1654, and great precautions were taken against its clandestine introduction. It was not until 1737 that the French dyers were left at liberty to employ those dyes they pleased; as late as 1598 the Woad growers of Languedoc solicited the prohibition of indigo in that province as it was ruining their trade in Woad. It was at that time cultivated at tremendous profit in many districts in Europe, principally Picardy, Normandy, and Languedoc in France, Thuringia in Germany, and Piedmont in Italy, these provinces owing the greater part of their enormous wealth to this industry. When Francis I. was defeated at the battle of Pavia, where he was taken prisoner, he owed the principal part of his ransom to Beruni, a Woad merchant of Toulouse, and it is even said that the expression "pays de cocaigne," figuratively meaning a land of milk and honey, takes its origin from the proverbial richness of those provinces where the coques or cocaignes were made.

Woad was known to the Romans as Glastum, Keltic for blue, and the use of Woad dating anterior to the Roman conquest, the Briton may have obtained his information from Gaul, and the Gaul from Italy. As the colour could at no time have existed naturally in the plant, it would be interesting to know by what means the pigment was obtained at this early period; the Britons probably used it more as a tattoo than a paint. The word comes from the Anglo-Saxon "geod," a herb or weed, and it was called by them waide, waisda, and wad, which last name still survives in the Fens; Goadum, an ancient town in Italy, where the plant was cultivated at an early period, is said to take its name from the same source. In England those employed in its sale or use were known as weyders, and are so described in the records of Norwich.

The earliest record of its importation into England is in the thirteenth century; at that time it came from Normandy and Picardy in frailles or baskets made of wicker, and was retailed by the merchants by the fraille or in smaller quantities. In succeeding years its sale rapidly increased in importance, the merchants of Amiens, Corby, and other French towns making London their principal port; they made an agreement with the civic authorities there in the year 1237. Some difference arising, partly from increased taxation and other impositions, on the merchants concerned in this trade, caused them to leave London and make Norwich the centre for this industry; after many years, however, Norwich being found inconvenient, or from some other cause, London was again made the principal port for Woad. There are two agreements extant, referring to this trade with the merchants of Amiens and Corby, one with Norwich in 1286, the other with London in 1334 (Liber Albus, Rolls Series, III., 164): in each case the same surnames occur, showing that this trade, like most others at that period, descended regularly in the same family. The Rev. W. Hudson has very kindly translated the agreement with the Norwich authorities from its original Latin (in the first Court Roll in the Guildhall).

"Agreement between the Citizens of Norwich and the Woad Merchants of Amiens and Corby.

"Ratified before the King's Itinerant Justices at Norwich, 29th June, 1286.

"Whereas of late a dispute has arisen between Nicholas le Monner, Peter Cokerel, John Fruyter, Firman Cokerel, Peter le Monner, and Ralph le Monner, merchants of Amiens and Corby, complainants on the one part, and Adam de Toftes, Roger de Morleye, William But, and Geoffrey de Bungaye, bailiffs of Norwich, and other citizens of the same city, defendants on the other part; because the said bailiffs and other citizens demanded from the said merchants of Amiens and Corby, for every granary [granario] of theirs of Woad fourpence, for every cask [doleo] of Woad fourpence, for every basket [fraillo] of Woad fourpence, for every barrel [barillo] of ashes twopence, and for every measure [mensura] of theirs four shillings; and because they sold their Woad [weydam]

by the comb and the bushel, and their ashes by barrels, and their wold [woldam]* by pecks;

"the said dispute was settled on Saturday, the Feast of the Apostles Peter and Paul, in the year of the Lord MCCLXXXVI, and in the fourteenth year of the reign of King Edward, by the grace of God king of England, son of King Henry, on this wise, namely, that the before-mentioned bailiffs of Norwich and the other citizens of the same city, for them and their heirs, have granted to the aforesaid merchants of Amiens and Corby and to all other merchants coming from the said towns to the city of Norwich, with their before-mentioned merchandise, that it shall be freely lawful for them to make their granaries of Woad there, rendering for every granary of Woad to the bailiffs of the aforesaid city fourpence only, for every barrel of ashes twopence only, and if they shall have brought their Woad in baskets [fraellis] they shall render to the bailiffs of Norwich for every basket fourpence only. They have granted also to the said merchants, that it shall be lawful for them to sell their Woad [weydam] by the comb and by the bushel, and their ashes† by one entire barrel, and their wold [woldam] by pecks to whomsoever they will, whether foreigners or natives, if they have brought those goods into the city; so that the aforesaid bailiffs shall not be able to exact anything from the aforesaid merchants for their measures of Woad or for the aforesaid sale. And they have also granted to the aforesaid merchants that they may at their will remove their aforesaid goods so introduced and sell them to whatever other persons they wish, provided that no one of them buys from another the same goods so introduced, unless they wish to remove them by an entire granary [per granarium integrum] outside the city and in

* Wold or weld, *Resida luteola*, also known as yellow weed and dyer's weed, belongs to the natural order Residaceæ. It is quite common in this country, and was formerly largely cultivated on the Continent and in Britain for its brilliant yellow dye; this has been almost entirely superseded by other pigments.

† The ashes were most probably similar to the barilla of the present day, an impure carbonate of soda, obtained principally from *Salsola soda*, a marine plant. The Saracens introduced barilla into Spain, and thence it was sent to France and England. In the Middle Ages ashes were used most probably as the alkali in dyeing, the term ashes being applied to kelp and pearlashes as well as barilla.

parts lying at a distance of ten leagues from the city of Norwich, performing for the bailiffs of the aforesaid city the right and due customs thereon. And that they may stay within the said city as long as they please.

"And the aforesaid merchants oblige themselves and all other merchants of Amiens and Corby bringing the aforesaid goods into the city of Norwich, to give to the bailiffs of the same city who for the time shall be, forty shillings per annum at the Nativity of the Lord, and to the commonalty of Norwich, or to their appointed attorney, forty shillings per annum at the Nativity of St. John Baptist, submitting to the distraints of the aforesaid bailiffs if it should chance that they fail in the said payment.

"They have granted also that if the aforesaid merchants all or several [omnes seu plures] do not come to the aforesaid city with the above-mentioned merchandise, and one comes from the aforesaid towns, that he be compelled by the aforesaid bailiffs to making the payment of the aforesaid four pounds in the above-mentioned form, or to performing fully the customs for which the dispute aforetime arose, which they confess that they themselves rightly perform, in such way as the bailiffs and citizens of Norwich think to be most expedient for themselves.

"In witness of which thing the seals of the aforesaid merchants of Amiens and Corby, and the seal of the commonalty of Norwich are alternately appended to this writing, made after the manner of a cirograph. Made [actum] on the aforesaid day, in the time of the Lord Salomann and his companions, itinerant justices of the Lord the King, at that time at Norwich."

Previous to the thirteenth century there was probably a large trade in Norwich with madder for dyeing, and though there is no mention of a madder market in the city in any extant record, the locality is perpetuated by the church of St. John being called, at least as early as 1250, St. John de Madermarket. There seems little doubt that the trade in madder declined during the thirteenth century, and the French merchants introduced Woad to take its place. At the close of that century there is frequent mention of men who are described as *le weyder*, for example: — "Peter Pyremond, 1287, le weyder. Thorald de Causton, 1289, le weyder. John de Chersi, 1292, le weyder. John Havekyn, 1294, weyder.

Nicholas de Donston, 1295, le weyder." None are at that time called by any name connected with madder.

With many another native industry already lost, that of the "Weyder" is on the verge of extinction; and unlike the primeval simplicity so graphically portrayed by Garth as existing

> "In times of old, when British nymphs were known
> To love no foreign fashions like their own;
> When dress was monstrous, and fig leaves the mode,
> And quality put on no paint but Woad,"

the mode is becoming daily more exacting, and should the fashion of Woad repeat itself, it seems probable that it will be rather in the laboratory of the chemist, than in that of nature, that the pigment will be produced.

III.

MEMOIR OF THE LATE JOHN HENRY GURNEY.

By Thomas Southwell, F.Z.S.

Read 31st March, 1891.

Hardly had our Society entered upon the twenty-second year of its existence when death deprived us of one of its most distinguished members, and one to whose name and influence is largely due the position which the Norfolk and Norwich Naturalists' Society has been enabled to attain amongst kindred associations. On the 24th April, 1890, some of us paid a last tribute of sincere respect at the grave of him whom just twenty-one years before we had elected our first Honorary Member, an act which, whilst intended to honour the recipient, reflected the greater honour and advantage upon ourselves.

Yours faithfully
J. D. Guernsey

Mr. John Henry Gurney, the only son of Joseph John Gurney, the distinguished philanthropist, was born at Earlham Hall on the 4th July, 1819, and from his earliest days evinced a love of natural history, which, though to some extent inherited,* was doubtless inherent in him, and strengthened by circumstances favourable to its development. At ten years of age he was sent to a private tutor at Leytonstone, on the borders of Epping Forest, where he made the acquaintance of Henry Doubleday.† To Doubleday, I believe, he subsequently owed an introduction to T. C. Heysham, who was afterwards indebted to him for many Norfolk rarities, and with whom he was for many years a constant correspondent; Heysham presented him with a copy of 'Montagu's British Birds,' which is now at Northrepps. No wonder that, in such a spot, and with such companions, his tastes became confirmed, and were so directed as to result in those habits of exact observation and cautious deduction for which in after life he was pre-eminently noted. From Leytonstone he went to the Friends' School at Tottenham,‡ where probably his opportunities for the study of natural history were not so great as they had been in the Forest; but that he did not abandon his favourite pursuits there is evidence, as he told of having got into trouble for converting his school-desk into a dissecting-table, on which to study the anatomy of a bird he had obtained, much to the detriment of the desk and to the disgust of his master.

When a boy he was taken by his father to pay a visit to Temminck, but he was never much on the Continent, though in after years he carried on a very extensive correspondence with naturalists in all parts of the world. He was also introduced to Yarrell about this time, and his interleaved copy of Temminck's 'Manuel d'Ornithologie,' a work which he highly prized, contains the following inscription:—"*Bought by the advice of William Yarrell, which he gave me when I was at Tottenham School.*" It bears date in Friends' style, "5th month, 1834," which probably

* Hunt mentions Joseph John Gurney as the owner of "a fine collection of Mexican birds;" he also possessed a Norfolk-killed Bee-eater, and a pair of Glossy Ibises, shot on Breydon.

† During his stay at Leytonstone he visited a well-known Raven's nest in Wanstead Heronry, a remembrance he was very fond of recalling.

‡ One of his friends here was the late William Edward Forster.

shews the date of his first visit to Ryder-street, St. James', where Yarrell lived. He afterwards sent Yarrell the Red-winged Starling, shot at Barton, from which the illustration in the 'British Birds' was taken; and notes of many other Norfolk rarities. At the age of seventeen he returned to Norwich, to commence business life in the bank in which his father was a partner.

In 1838 Mr. Gurney began to keep a Natural History Journal, in conjunction with J. G. Barclay, T. F. Buxton, and the late Charles Buxton: this volume is full of interesting notes, and none more so than his own, which are chiefly about birds. Perhaps the most important is one on the last Norfolk Bustard (killed near Swaffham in 1838) which he saw in the flesh when it was sent up to Norwich. Although his father was too strict a Quaker to allow him to handle a gun, he used to get Bright, the Earlham gardener, to shoot for him, and formed a collection of flat bird-skins, which were sewn into a large book with canvas leaves. His son, Mr. J. H. Gurney, tells me he has never seen this ornithological relic, but believes that not many years ago it was in existence. He also commenced a natural history collection when he was about ten years of age; and a list drawn up by himself, soon afterwards, enumerates sixty-one specimens at Earlham. This boy's collection was stuffed for him by Butcher, Hall, and Hunt, professionals, all of whom, except the last, have now sunk into oblivion. It consisted of Stoats, Owls, Thrushes, &c., but there were some rare birds, as three Smews, a Fulmar Petrel, and a Red-necked Phalarope, the latter shot at Weybourne by his uncle Sir Fowell Buxton. In 1838 he notes that he had already examined about twenty Norfolk-killed Sea Eagles, and I have reason to believe that he was the friend alluded to by Lubbock ('Fauna,' 2nd edit., p. 19), whose observations on the migration of this species he quotes, and from whom he says he has often derived information. On one of his rambles he suddenly found himself in the presence of a herd of wild Swans, which was a very unexpected apparition in the Earlham meadows. This was probably in 1838, in February of which year he notes in his journal that between forty and fifty of these birds were brought into Norwich. Colonel Hawker records their abundance in the same year. On another occasion he met with a flock of Cormorants by the Earlham bridge, one of which Bright shot, and Hunt stuffed for him.

When little more than nine years of age "Master J. H. Gurney" gave his first contribution to the Norwich Museum, which in after years he so greatly enriched; and only ten years later we find the true spirit of the naturalist again evincing itself in that love of original research, which, however the school-desks might suffer, has rightly been said to be the surest mode of acquiring knowledge.

The writer of the obituary notice in 'The Ibis' (July, 1890, p. 393) very truly remarks, that "there have been possibly few men who could, at the age of nineteen, write as Gurney did to Heysham on the 8th February, 1838:—'Though I can seldom or never resist the temptation of procuring a tolerable bird in the flesh, when opportunity occurs, I care little for them after I have once *learnt them by heart*, as I contrive to preserve them almost as well in my memory as I could hope to do in my cabinet. I therefore generally palm their remains off on some of my friends; because, though I know that in themselves they often are worthless, yet I always fancy that there is some interest in comparing specimens of the same bird from different localities.' This last must have been an original observation, as it was made before the question of the local variation of species had been publicly mooted!" But it foreshadowed that accurate and extensive knowledge which he acquired in after years of the racial variations of birds, by the careful examination of large series of specimens, from the most distant localities, a remarkable example of which is exhibited in the grand series of *Falco peregrinus* with which he enriched our Museum.

Mr. Gurney's connection with the Norfolk and Norwich Museum commenced, as I have before mentioned, in the year 1828; and from that time to the close of his life he continued to be a constant contributor to its collections in all departments.

In 1843, at Mr. John Scales's sale, he bought a magnificent pair of Bustards for £22, but although he had by that time begun to collect Norfolk Birds, he generously gave them to the Museum.* The male bird of this pair is probably one of the finest British specimens known. But it was to the birds of prey that Mr Gurney's attention soon became more especially directed, and it is probable that nineteen-twentieths of the Raptores bear his name as their donor, or were obtained through his intervention.

In these early years he was associated in the management of the

* *Cf.* Trans. Norfolk and Norwich Nat. Soc. vol. iv. pp. 93 (note)—113.

Museum with William Kirby, Bishop Stanley, Professor Sedgwick, Richard Lubbock, Dawson Turner, and others, and in 1849 was first elected President in succession to Dean Pellew; in 1869, however, he was elected permanent President, an office which he held till his death. In November, 1861, Mr. Gurney's portrait, by Sir Francis Grant, P.R.A., obtained by subscription among his friends, was placed in the British Bird Room of the Museum in recognition of his great services to that Institution. This interest in the Norwich Museum continued unabated to the last, and much of his leisure time was spent there in the study of the extensive collections with which he had enriched it, by means of collectors abroad and his personal influence with other ornithologists, both in Europe and America; and the Annual Reports of the Museum show that, although of late years such additions, owing to the completeness of the collections, were more and more difficult to obtain, scarce a year passed without his energy being rewarded by the acquisition of some new species. I think it may be said, owing to Mr. Gurney's efforts, that at a time not long since the collection of Raptorial Birds in the Norwich Museum was unequalled, not even excepting that of the British Museum; and that even now there are many type specimens, and some rarities, which are not to be found in the national collection, as well as finer series of some individual species from various localities.* The collection of Diurnal Birds of Prey contains 395 species or sub-species, represented by 3474 specimens; and the collection of Owls consists of 184 species or sub-species, out of about 210 known to science, represented by 1203 specimens; and of the series of single species may be mentioned 75 specimens, and two skeletons of *Falco peregrinus* and its southern form of *F. melanogenys*, and 49 specimens of *Strix flammea* and *poensis;* these almost cosmopolitan species being represented by individuals from the most varied localities; the former from Port Kennedy in 72° north

*Mr. J. H. Gurney tells me that his father's taste for the Raptores received a great impetus by the acquisition in 1865 of the new and very singular Hawk, which he named after its discoverer, *Machæramphus anderssoni*, and he well remembers the extreme pleasure with which he placed this unique specimen in the Norwich Museum, and had it drawn by Mr. Wolf. It was an entire novelty in 1865 and is still of the utmost rarity. He subsequently obtained its rare ally, *M. alcinus*, and the two may be seen in separate cases in the Museum.

latitude, to Cape Colony in the south, and the latter from Funen to a like southern latitude.

As might be expected, Mr. Gurney took great interest in the scheme for converting Norwich Castle into a Museum, and entered thoroughly into the arrangements necessary for the eventual transfer of the collections, although declining, from failing health, to take any part in the building operations; and there can be no doubt that his judgment and experience will be greatly missed by those whose duty it will be to carry into effect the final arrangements for the reception of the various collections.

Mr. Gurney was also a liberal donor to the Lynn Museum, to which he presented a large portion, which he had purchased, of the ornithological collection formed by Mr. Alfred Wallace in the Malay Archipelago, providing wall cases for their display. It is matter for regret that so interesting a collection should suffer from want of sufficient funds for its due preservation.

Mr. J. H. Gurney tells me that at various periods of his life his father indulged his taste for keeping beasts and birds alive, and he remembers besides Otters, Jackals, Foxes, and several Eagles, a Porcupine, a Coati-mundi, and a Badger caught at Intwood, to say nothing of Storks, white and black, which cut their legs on cucumber frames and impaled themselves on railings. A large yard at Catton was dedicated to the cause of zoology, and a row of cages put up, which were kept for birds of prey, of which he had much the best private collection then in existence, though since surpassed by Lord Lilford's. Although the birds never bred, he obtained many eggs of the Goshawk, Kite, African Kite, Jackal Buzzard, Rough-legged Buzzard, Wedge-tailed Eagle, Sociable Vulture, and others. The last-named laid about a dozen very fine eggs, though one or two of them were soft; she began to lay in 1859, and always laid in February, until 1868, when she changed her time to March. This Vulture,* familiarly known as "Mrs. Stockings," was the terror of children, as she was allowed to roam over the whole yard. Her death, in March, 1887, is duly recorded in 'The Ibis' for that year; and as she was an old bird in 1855 she could not have lived less than a quarter of a century.

Mr. Gurney was the introducer of the Japanese Pheasant into Norfolk, though he never obtained a pure-bred one; but the first

* Now in the Museum.

Japanese hybrids sprang, I believe, from the old cock bought by him at Lord Derby's sale in 1851, whose mixed offspring first peopled the woods of Easton and Northrepps, and then spread elsewhere. For many years a breeder of Mute Swans, which he fatted according to the plan in use at St. Helen's pit, he was naturally glad of an opportunity to visit the celebrated Swannery at Abbotsbury in Dorsetshire, of which visit he contributed an interesting account to the 'Zoologist' (1878, p. 208). His subsequent success with the Polish Swan at Northrepps, originally obtained from the Zoological Gardens, has formed the subject of a paper in our 'Transactions' (vol. ii. p. 258), and a nestling bred by him is in the Museum.

Mr. Wolf painted some exquisite sketches of birds on his visits to Easton and Catton, and I believe it was at Mr. Gurney's house that he designed his picture of a Merlin attacking a flock of Starlings in the snow, which he has of recent years elaborated into one of his finest pictorial works. He also made for Mr. Gurney a series of twenty-four paintings of birds of prey, which were possibly intended for publication in a large form; but if this were so the intention was never carried out, and the paintings still remain as they were left by the master-hand which did them. His beautiful painting of Pels' Owl, one of the most successful that has ever appeared in 'The Ibis,' was a portrait from life made at Catton ('Ibis,' 1859, p. 445).

Mr. Gurney's contributions to ornithological literature were very numerous, and some of them, particularly those relating to the orders *Accipitres* and *Striges* (in the knowledge of which he is rightly said to have "stood alone"), of great value. His first communication was printed in the 'Annals and Magazine of Natural History,' for March, 1842; but on the appearance of the 'Zoologist' in the year 1843, in the success of which periodical he took great interest, he became a constant contributor to its pages, and in 1846, in conjunction with Mr. W. R. Fisher (who died in 1889), he published in that journal "An account of the Birds found in Norfolk," a production remarkable not only for the care bestowed in its compilation, but also for the extensive acquaintance with the birds of the county displayed by its authors.

In 1858 Mr. Gurney took an active part in the formation of the British Ornithologists' Union, and in its journal, 'The Ibis,' some

of his most valuable work appeared. It is estimated that in this publication alone one hundred and forty communications from his pen appeared, the most important of which were the "Notes on a 'Catalogue of the *Accipitres* in the British Museum,' by R. Bowdler Sharpe," also his Notes on the Birds collected in Natal and the Transvaal Republic by Mr. Thomas Ayres. He was elected an Honorary Foreign Member of the American Ornithologists' Union at its formation in 1883, and a Member of the Natural History Society of Moscow, in recognition of his services to ornithology, in 1888. To the 'Proceedings' and 'Transactions' of the Zoological Society of London, of which he was elected a Fellow in 1852, Mr. Gurney was also an occasional contributor. Mention may be made of his papers on *Circus wolfi*, Proc. Zool. Soc., 1865, p. 823; *Polyborus tharus*, 1878, p. 230; "On the Immature Plumage of *Dryotriorchis spectabilis* (Schleg)," 1880, p. 621; and "On the Geographical Distribution of *Huhua nipalensis*," 1884, p. 558.

In the year 1869 the Norfolk and Norwich Naturalists' Society was established, and at its first monthly-meeting, on the 27th April, Mr. Gurney was elected an Honorary Member, and contributed to its 'Transactions' the following papers, besides many briefer communications, all however of some special interest: —

1869. May 25th. Stray Notes on Norfolk and Suffolk Mammalia.

1874. August 25th. Extracts from the Note-book of the late Miss Anna Gurney, of Northrepps.

1886. March 30th. Notes on a Female Specimen of *Pernis apivorus*.

1889. January 29th. Notes on the Food of some North American Birds of Prey.

Of separate works, Mr. Gurney produced in 1864 Part I. of "A Descriptive Catalogue of the Raptorial Birds in the Norfolk and Norwich Museum," this, however, was never continued in the form originally intended; but in 1884, on the completion of his notes on Mr. R. B. Sharpe's Catalogue of the *Accipitres* in the British Museum, he published 'A List of the Diurnal Birds of Prey, with references and annotations,' which contained a complete "Record of Specimens Preserved in the Norfolk and Norwich Museum." The list of the Nocturnal Birds of Prey, although

intended to follow, owing to his failing health was never seriously taken in hand, although I believe all the materials were available. Mr. Gurney was also author of a very useful, though popular, 'Sketch of the Collection of the Raptorial Birds in the Norwich Museum,' intended as a guide to the collection. In addition to these he edited a volume of 'Notes on the Birds of Damara Land,' by the late Charles John Andersson.

In 1852 Mr. Gurney delivered a course of Lectures on "Ornithology" in St. Andrew's Hall, Norwich, which was largely attended, and greatly stimulated the study of his favourite science in the county. Other lectures were given on the "Zoology of Ancient Egypt," at Lynn; "A stroll through the Zoological Gardens," at Lowestoft; "On the Birds of Prey," and "On the races of animals allied to the Ox," the last two at Norwich. The writer well remembers the lectures of 1852, and Mr. Gurney's very lucid and pleasing style, and evident extensive acquaintance with his subject, which was profusely illustrated by specimens from the Museum and elsewhere, made a great impression on him at the time.

Such is a brief but very incomplete account of Mr. Gurney's literary work, of which it has been truly said by the author of the obituary notice in 'The Ibis' that, "as he never wrote for writing's sake, and related what he had to state in the simple and precise terms which prove the true man of science, his contributions may have sometimes seemed dull compared with the brilliant essays and daring speculations that this Journal occasionally contains from other pens; but no attentive reader can fail to discern the solid foundation on which Gurney's work rests, and the probability, if not the certainty, of its being consulted and found useful, when theoretical treatises have passed out of mind" ('The Ibis,' July, 1890, p. 395).

Of Mr. Gurney's extensive acquaintance with almost every branch of zoological science the present writer can speak from personal knowledge; and of the generosity with which he placed his vast fund of information at the service of those who sought his help he has had abundant experience. Whether on birds, beasts, or fishes, Mr. Gurney was a safe authority, and it is with the deepest sense of gratitude for past help and friendly criticism, on many occasions, that these lines are penned.

It may perhaps be taken as a mark of the regard in which

Mr. Gurney's name was held by other naturalists, that seven new species were called after him, of which the finest was an Eagle, so named by his friend and correspondent, G. R. Gray; and the most beautiful an Asiatic Pitta, by Mr. Allan Hume, for whom he collected many birds, which are now deposited with the rest of the Hume collection in the British Museum; the others belonging to the genera Baza, Turdus, Promerops, Ploceus, and Pseudoptynx.

I have hitherto confined myself strictly to a retrospect of Mr. Gurney's career as an ornithologist, but I may be allowed to add that he married Mary Jary, daughter of Richard Hanbury Gurney, of Thickthorn, by whom he leaves two sons, Mr. John Henry Gurney of Keswick, and Mr. Richard H. J. Gurney, now of Northrepps Hall. In 1854 he entered Parliament as member for King's Lynn, and sat till 1865, when he resigned his seat. He was a Justice of the Peace for the County of Norfolk, senior member of the Norwich Bench, and also a magistrate for King's Lynn. In 1866 Mr. Gurney retired from active life, and resided first at Torquay; but in 1873 he removed to the quaint old family mansion, Northrepps Hall, the natural beauty of the wooded slopes and valleys in which it is situated bearing evidence of the care and excellent taste in ornamental planting displayed both by himself and the late Miss Anna Gurney, who preceded him at Northrepps, and was as keen a naturalist as himself. Here, although suffering for the last twenty years from an incurable disease, by constant attention to diet and strict adherence to rule, although his strength gradually declined, he spent his days in peace and tranquility, and after a very brief final illness passed away on the 20th April, 1890, in his 71st year.

Those who remember Mr. Gurney in his prime will recognise his somewhat portly figure and prepossessing features, lit up with a kindly smile, so well transferred to canvas in the Museum portrait; but the personal charm of manner, the cultivated yet natural tone of voice, and cheerful greeting, can never be reproduced. Those who knew him intimately will recall with pleasure the infinite fund of quiet humour and flow of anecdote, the result of keen powers of observation of men and manners extending over many years—which made his companionship so delightful, even when his bodily powers were failing—and feel that his loss has created a void never to be filled.

IV.

NOTES FROM THE NETHERLANDS.

By Charles and Henry Candler.

Read 25th November, 1890.

There are moments in the life of every man who delights in watching the habits and the movements of our wild birds which are not readily forgotten. He has seen, it may be, for the first time in its summer haunts some bird which in winter dress has been familiar to him from childhood, or which perhaps (and in this case the impression is the stronger) has become so closely associated in his mind with a vanished order of things, that the sight of it enables him to restore in imagination the moors and marshes of his own land to their old wildness, and to people them again with forms which unhappily have passed away for ever. At such times there is a strong impulse to share with kindred spirits a new experience, and to fix pleasant memories before the lapse of time has done anything to rob them of their freshness. It is rather in response to such an impulse, than with any hope of adding to the sum of ornithological knowledge, that the following notes have been written.

I. The Shores of Texel.

Texel is the southernmost of a series of islands, which, known by different names in different portions of the chain, fringes the coast of Europe from the Helder to the Horn of Jutland, a distance of nearly three hundred miles. Texel is separated from the mainland of Holland by the Marsdiep, a strait a mile and a half in width, which, kept open by the scour of a strong tide,


MAP
illustrating the past and present distribution of the
SPOONBILL
in Holland.
Deserted breeding haunts
Present breeding station
Scale — English Miles
0
10
20
30
4°
5°
6°
53°
53°
Ameland
Terschelling
Vlie
Vlieland
Waard Gronden
Harlingen
FRIESLAND
Cocksdorp
TEXEL
Sand Hills
Eyerland
Koog
Den Burg
Oude Schild
Hoorn ?
Noorder Haaks
Marsdiep
Nieuwe Diep
De Helder
Bald Zand
Wieringen
North Holland Ship Canal Completed 1825
Medemblik
Enkhuizen
Urk
Schokland
Hoorn
Alkmaar
Sand Hills
Beemster
R. Ijssel
ZUIDER
NORTH


S E A
North Sea Ship Canal Completed 1870
Marken
ZEE
Haarlem
AMSTERDAM
Muiden
The Weesp
Naarden
Haarlem Meer Polder drained 1840 53
Naarder Meer
Horsten Meer
Gooi
R. Eem
Leyden
Sand Hills
Old channel of the Rhine
Utrecht
The Hague
Zevenhuizen
Gouda
R. Ijssel
Delft
Wolfeschoren
Nieuwerkerk
R. Lek
Mouth of the Maas
Rotterdam
Rozenburg Island
R. Waal
Dordrecht
Meerwede
R. Maas
Biesbosch Submerged Nov. 1421
East Schelde
52°
4°
5°
6°

forms the main waterway into the Zuyder Zee. The size of Texel is considerable; the island is but slightly indented, and has a length from north to south of fifteen miles and a breadth from east to west of five miles. In comparison with the dead level of the North Holland polders, Texel is by no means flat; the base of the island is formed of glacial drift, and its surface is relieved by swelling mounds of sand and gravel, one of which, called "the Hoogte," is crowned by a fine grove of trees and has a height of sixty-five feet. Along the whole length of the North Sea coast extends an unbroken range of sandhills, running generally in a double line, with a deep intervening valley, but expanding in the north and in the south into tracts of undulating dunes two miles in breadth, formed by four or five parallel ridges. Near the little hamlet of Hoorn is the highest point in the island, Loodsmansduin (the pilot's dune), ninety-two feet above sea level. The south-eastern and north-eastern shores of the island are low, and are protected by massive dykes from the waves of the Zuyder Zee. Between the central hills of gravel and the sand dunes of the coast stretches a broad alluvial tract of pasture ground, in part wet and marshy, in other part a dry heath with a varying subsoil of sand or peat. Except the wood already mentioned, and the plantations around the decoys, there are very few trees of good growth upon the island, which has generally a bare, wind-swept, and unsheltered aspect. Texel possesses a fleet of fishing-boats, and many of the islanders are seafaring men; but their chief source of wealth is a fine breed of sheep, yielding a heavy fleece and much milk, from which a strong and pungent green cheese is made. The sheep-breeders are friendly and hospitable, and many of them are well-read and cultured men.

A steamer plies three times a day between Nieuwe Diep, on the mainland, and Oude Schild, the port and fishing haven of Texel; and in this little vessel we* crossed the Marsdiep in the afternoon of the 16th June. From Oude Schild we drove three miles to Den Burg, the chief town of the island, where we found comfortable and homely quarters at the Hotel Lindeboom, kept by Captain Slijboom, a retired skipper in the Dutch merchant service.

The conditions of our walk that evening were not favourable for

* The Rev. H. C. Fitch, Mr. George Candler, and the writers, who are spokesmen for the party.

making observations on bird life, for no sooner did we show ourselves in the street than we were surrounded by a crowd of children, who accompanied us till nightfall, showing a keen and somewhat embarrassing interest in our doings. To rid ourselves of them was impossible, for they were too active to be outrun, and too familiar with the country to be out-manœuvred; however they proved, on acquaintance, to be lively and interesting companions, and we learned much from them before we parted. The people of Texel differ slightly in race and speech from those of North Holland; they are of a Frisian stock, and their dialect is closely akin to that of Friesland.* Indeed the physiognomy and temperament of the islanders would lead one to suspect a greater divergence of race than any that can really exist; in the children particularly we noted a ruddy freshness of skin and a vigour and elasticity of mind and body which we rarely met with upon the mainland, where sallow complexions and phlegmatic tempers are largely prevalent.

If it had not been for the kindness of some residents, who took us under their care, our first day in Texel would have been dull and unprofitable, for rain fell in a deluge from morning till night, and a strong north-west wind drove it through all wrappings. Our hospitable friends drove us from Den Burg to Cocksdorp, a village at the north end of the island, pointing out to us everything of interest along the route. The outlook on all sides was as dreary as can be imagined; the level and treeless polders were wrapped in mist, and the horizon obscured by driving rain; from out of the surrounding dimness came the cries of birds we could not see; only now and then the mist lifted and gave us glimpses of pools, haunted by wild-fowl.

It was here that we first met with the Black Tern; the birds were following the course of the marsh drains, flying low, and now and then poising in the air or turning about with a quick fluttering motion, in chase apparently of insects hovering over the water. Wherever the meadows were rough and wet Redshanks were plentiful, and we were seldom out of hearing of their wild cries;

*The Frisian dialect, which comes so very close to our English tongue, was formerly spoken not only in Friesland, where it still holds its ground, but also in the provinces of Groningen to the east, and North Holland to the west of the Zuyder Zee.

they settled constantly on gates and rails, and once or twice we saw a bird perch on the telegraph wires alongside the road. At Cocksdorp we left the carriages and walked along the shore, and over a waste of sandhills, to the fine lighthouse, which marks the channel between Texel and Vlieland (or the Vlie), the next island to the north. Almost the only living object among the sandhills was the pretty orange-striped Natterjack Toad, which we saw in numbers. Once we passed near what, from the clamour that they made, we took to be a large assembly of birds, but they were separated from us by an impassable breadth of mud and water, and in the mist and rain we could not use our glasses to distinguish their forms.

Northern Texel has for long been known as "Eyerland," from the quantity of birds breeding upon its marshes and sandhills; but owing to causes operating in all thickly-peopled and progressive countries, the number has much decreased in recent years, and the district now scarcely deserves the name it still bears. Texel, however, still furnishes a considerable supply of "plovers' eggs" to the Amsterdam fishmarket; and no doubt the phrase is construed as liberally by the collectors of the island as it was by those of Norfolk in the old days.*

Our second day in Texel was in all respects a contrast to the first. The sun shone brilliantly, and starting early we struck westward across the island, towards the sandhills of the North Sea coast, which were clearly outlined against the blue sky, like a mountain range in miniature. We passed over a level tract of firm pasture land, in places light and sandy, with the flora of a Suffolk heath. The fields were divided by turf walls, about which the Wheatear was breeding. We had once a good view of a Black-tailed Godwit, flying uneasily in circles over a wet meadow, and uttering its loud cry, from which the Dutch have given it the name of "*Grüt-tò*."

Under the shelter of the sandhills, on the landward side, is a small village called the Koog, and on the dunes above (seventy-nine feet above the sea) a beacon has been erected, which is known as "the Scherm of Koog." It is a solid framework of timber, the top of which commands a wide prospect over land and sea, and it

*See Lubbock's 'Fauna of Norfolk' (Mr. Southwell's edition), pp. 81 and 96.

is a good starting-point for an exploration of the coast region. For some distance to the north of the *scherm* the trough between the inner and outer line of hills is dry and devoid of bird life, producing few plants but the Marrum (the *helmplanting* to which the Dutch owe so much), the Sea Buckthorn,* and one or two Hieracia. Half an hour's walking, however, brought us to the first of a series of pools and marshy hollows, some of large extent, some mere puddles, formed by the breaking through of the sea in high tides and winter storms. In the swampy depressions and upon the margins and islets of the little lakes a great number of birds were breeding. The Redshanks were most numerous, and made a great clamour as we invaded their haunts; but mingled with their cries we heard the unfamiliar notes of many other species, which, having no field ornithologist in our party, we could not safely identify. The most noticeable bird among these sandhills was the Sheldrake—the *Bergeend* of the Dutch—which was breeding here in considerable numbers. The birds were tame, and would allow a near approach; passing constantly in small parties from the dunes to the pools, and alighting on the water with a splash and a loud *kraak, kraak*, they added much to the animation of a scene full of life and colour. Upon the open marsh we picked up a couple of Shellduck's eggs; the common Wild Duck was breeding here, and the Oyster-catcher was very conspicuous; but of the Avocet, the chief object of our search, we saw nothing.

On the seaward side of the Texel sandhills there is generally, at least in summer, a great breadth of level shell-strewn sand, shelving very gradually into the sea. About midway between the Koog and Cocksdorp there is now lying, just below high-water mark, the wreck of a stranded English steamer the "Benbrach." We paid a visit to the vessel and found a party of English workmen on board dismantling her, and among them a young Dutchman, who professed a knowledge of the birds of the district; accordingly we took him with us as a guide, but he proved a disappointment, though he

* In September the berries of the Sea Buckthorn (*Hippophae rhamnoides*) are greedily devoured by the small song birds and by Thrushes, thousands of which, we were told, were caught here in snares. At this season *Lijsterbessen* (thrush berries), the fruit of the Mountain Ash, are a readily saleable article of trade.

himself set an extravagant value upon his services. Among the miscellaneous collection of objects in the cabin of the "Benbrach" we noticed a Lesser Tern's egg, and on the shore we found six nestlings of this bird, five of which were dead, killed by the chilling rain of the previous day. Inside the sandhills, opposite the wreck, a large tract of land had been recently overflowed by the sea, and was now a waste of sand and shingle, bare or thinly covered with coarse vegetation. Here both the Lesser and Common Terns were breeding, and we found a nest of the latter containing three eggs. On our homeward walk the near view of a Godwit, standing on a turf wall, in full breeding plumage, the sun shining upon his red breast, was a sufficient reward for the efforts of a long day.

In the evening we were fortunate enough to make the acquaintance of Mr. J. P. Thijsse, the Master of the Higher Grade State School of the island, and a keen naturalist, who hearing of our fruitless quest of the Avocet, promised to show us the bird in its feeding grounds, close to the town, the next day. At half-past five on a rough, stormy morning, Mr. Thijsse called for us, and took us to a marshy piece of land, between the wooded height called "The Hoogte" and the village of Onde Schild. Here, about a small and shallow pool, an extraordinary number of birds were assembled; Oyster-catchers were running to and fro, Godwits circling overhead, Redshanks dashing about us, and among them, to our great delight, from a dozen to a score of Avocets. We stood quite still, and in a short time the birds ceased to be disturbed by our presence, and with glasses we could enjoy the sight of their varied movements. Three or four Avocets were feeding in the shallow water, wading slowly and sweeping for food in their peculiar manner with lateral strokes of their long upturned bills; others were resting motionless; and others again were in the air, flying round with the striking cry which the Dutch have rendered *kluit*. On taking flight the birds rose vertically, with a slow and slightly laboured motion, though this perhaps was due to the strong wind then blowing. We left the place reluctantly, for there was a strong fascination about it: the gentle lift of the land behind us, the wide-stretching polder in front, the white-washed church of Scandinavian type beyond, the keen wind and the grey sky, the sight of the birds and the music of their cries, all suggested some

haunt of wild-fowl in the far north, and made it difficult to realise that we were in the latitude of Cromer and within eighteen hours of Charing Cross. The Avocets, we were told, bred regularly, if not upon the spot where we saw them feeding, yet at no great distance away upon the same marsh. This marsh is of inconsiderable extent, it is close to the village of Oude Schild and to the high road to Den Burg. Though shooting in the breeding season is prohibited, the birds are frequently robbed of their eggs and otherwise disturbed; but, following probably an instinct transmitted through countless generations, they cling to this spot, and will doubtless nest there year after year until the marsh is drained or the local race exterminated.

Fortunately we are able to supplement these very meagre notes on Texel by the following list of birds, which our correspondent, Mr. Thijsse, has found breeding upon the island in the single season he has spent there. Mr. Thijsse says that, except in the case of the Cormorant and the Wigeon, he has himself seen either the eggs or the young of all the birds included in his list. We have retained the popular Dutch names of the species, as these are very suggestive and interesting; and in most cases we have added in brackets the English equivalent, with an occasional note as to meaning or derivation.

Kestrel. Torenvalk (Tower Falcon); Slechtvalk.

Goshawk. Havik. The eggs were laid in an old Rook's nest, in a Birch tree of no great height.

Barn Owl. Kerkuil (Church Owl).

Great Grey Shrike. Klapekster; Negendooder (Ninekiller, an English provincial name).

Red-backed Shrike. Grauwe Klauwier (Grey Clutcher).

Spotted Fly-catcher. Vliegenvanger (Fly-catcher).

Golden Oriole. Wielewaal (also Wiedewaal; Eng. Wit-wall).

Song Thrush. Lijster.

Blackbird. Merel (Merle).

Hedge Sparrow. Basterd Nachtegaal (Bastard Nightingale).

Robin. Roodborstje (Little Redbreast).

Wheatear. Tapust; Stag.

Icterine Warbler. Spotvogel (Mocking Bird).

Great Reed Warbler. Karekiet (from its note).

Reed Warbler. Kleine Karekiet (Little Karekiet).

Whitethroat. Grasmusch (Grass Sparrow).

Garden Warbler. Tuinfluiter (Garden Flitter).

Blackcap. Zwartkop (Blackcap).
Willow Wren. Fitis.
Chiffchaff. Tjiftjaf.
Wren. Winterkoninkje* (Winter Kinglet).
Great Titmouse. Koolmees (Coal Tit).
Blue Titmouse. Pimpel (Tippler, *i.e.*, Bluenose).
Marsh Titmouse. Zwartkopmees (Blackcap Tit).
White Wagtail. Witte Kwikstaart (White Flirt-tail).
Yellow Wagtail. Gele Kwikstaart (Yellow Flirt-tail).
Tree Pipit. Boompieper (Tree Pipit).
Meadow Pipit. Graspieper (Grass Pipit).
Tawny Pipit. Duinpieper (Dune Pipit).
Skylark. Leeuwerik (*cf.* Scotch *Laverock*).
Crested Lark. Kuif-leeuwerik (Crest Lark). Nest built on the roof of a barn.
Yellow-hammer. Geelgors (Geel-yellow).
House Sparrow. Huismusch (House Sparrow).
Greenfinch. Groenling (Greenling); Vlasvink (Flaxfinch).
Goldfinch. Putter; Distelvink (Thistlefinch).
Linnet. Kuentje (Little Chirper); Hennepvink (Hempfinch).
Starling. Spreeuw. (From the same root probably as the Eng. *sparrow*; Sax. *speara*; Goth. *sparwa*).
Carrion Crow. Kraai (Crow). Nest placed in a Whitethorn bush on the dunes, so low that a boy standing on the ground was able to take out the eggs.
Rook. Roek.
Magpie. Ekster. (Some old Dutch forms are *aexter, egelster, hiestre*, &c.†)
Swallow. Boerenzwaluw (Farmer's Swallow).
House Martin. Huiszwaluw (House Swallow).
Sand Martin. Oeverzwaluw (Bank Swallow).
Swift. Gierzwaluw (Screaming Swallow, from *gieren* to scream).
Cuckoo. Koekoek.
Ring Dove. Houtduif (Wood Dove).
Turtle Dove. Torteldnif.
Quail. Kwartel.
Land Rail. Kwartelkoning (King Quail); Spriet.
Coot. Koet.
Stone Curlew. Griel.

* This name is suggestive rather of the Golderest, which however is known as the *Goudhaantje*.

† Ger. *elster*, O.H.G. ag-el-ster; Fr. ag-ace, from O.H.G. ag-azza; A.-Sax. ag-u, a magpie. All from an old root *ag* of unknown meaning (Professor Skeat).

Lapwing. Kieviet (from its note).

Oyster-catcher. Scholekster (query—School-pie; from *schoolen*, to flock together; used of birds).

Avocet. Kluit (from its note).

Ruff. Kemphaan (Soldier Cock); Kragenmaker (Battle Wager).

Redshank. Turelùur (from its note).

Black-tailed Godwit. Grutto (from its note); Marel.

Curlew. Wulp (*cf.* English provincial Whaup).

Black Tern. Zwarte Stern (Black Tern); Startje?

Sandwich Tern. Groote Stern (Great Tern).

Common Tern. Vischdiefje (Little Fish-thief).

Lesser Tern. Dwerg Stern (Dwarf Tern).

Black-headed Gull. Kapmeeuw (Cap Mew).

Common Gull. Kleine Zeemeeuw (Little Sea-mew).

Herring Gull. Zilvermeeuw (Silver Mew).

Great Black-backed Gull. Mantelmeeuw (Mantle Mew).

Cormorant. Aalscholver; Schollevaar. Nests in trees round the decoys.

Heron. Blauwe Reiger (Blue Heron).

White Stork. Ooievaar (Treasure or luck-bringer).*

Sheldrake. Bergeend (Barrow Duck; *cf.* Eng. provincial Bargander).

Wild Duck. Wilde End (Wild Duck).

Shoveler. Slobeend or Slobbereend.

Pintail. Pylstaart (Arrow-tail).

Teal. Taling; Krik (crecca).

Wigeon. Smient.

Pochard. Tafeleend (Table Duck);† Roodkop (Redcap, *cf.* English provincial, Red-head).

We have already referred incidentally, more than once, to the decoys of Texel, four of which are now worked upon the island. Mr. Thijsse has sent us a short account of one of these decoys, and we have added to our paper a translation of his letter, believing that no scrap of information (however humble) upon a subject so interesting, and until recently so much neglected, is without its value.

Texel,

21*st October*, 1890.

"Last week I had, at last, an opportunity of visiting one of our duck-decoys (*eendenkooien*), and of witnessing the capture of some Ducks and

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*Formerly *odevare*, treasure-bringer; old Sax. *od*, treasure, and *baar* bearer, from Teutonic *beran* to bear (Professor Skeat).

†"This is the best wild-fowl for the table of all the Anatidæ" (Lubbock).

Teal. The decoy lies half an hour to the north-east of Koog, in a level between low dunes, and consists of a small wood of alder and poplar trees and bushes from three to six metres high, in the middle of which is a pool, fringed with reeds, and twenty to thirty metres broad. From out of the pool run, in the directions of the most prevalent winds, four channels (*kanalen*), which at first are five metres broad, but become gradually smaller, and end in a small, enclosed cage, of wooden lattice-work. These channels do not run in straight lines, but are somewhat curved; on each side they are bordered by reed-screens two metres high, in which are openings at intervals of four metres. Between the reed-screens a net is stretched over the channel. The capture of the ducks is effected in the following manner:—The decoy-man (*kooiker*) and his dog betake themselves to the entrance of one of the channels, and the dog then runs up between the reed-screens and the water. The man remains concealed. The ducks, which are swimming round in the pool (some fifty tame ones and many wild), become curious at the sight of the dog, and swim into the channel; the man (still out of sight) now [?] throws oats and barley over the reed-screens into the water. In the meantime the little dog continues running about along the water's edge. Attracted by curiosity and by appetite, more and more ducks gather together. As soon as the man perceives that there are enough inside, he shows himself at the entrance; the tame ducks remain quietly feeding, while the wild ones, terrified, fly to the end of the channel, and are there taken in the cage. With a favourable wind (east to north-east) thirty to fifty are readily taken daily; at my visit the take was poor, as the wind was south-west. Ducks on passage (*trekvenden*) are chiefly captured.* Besides Ducks many Thrushes are also caught in the wood; sometimes a hundred in a day. It is now a true time of slaughter, everywhere the chase is going on."

II. The Spoonbill in Holland.

The Spoonbill has a special claim to the attention of Norfolk naturalists, for we have the testimony of Sir Thomas Browne that, in days now long past, the bird bred regularly in this county.† In Holland, within a few hours of our own shores, it still survives,

* Sir Ralph Payne-Gallwey, in the last chapter of his work on decoys, gives some interesting notes on those of Holland. He describes and figures the wooden box-trap, which in a Dutch decoy replaces the tunnel net, and alludes to the practice of the decoy-man of waiting concealed at the pipe's mouth, while he sends the dog alone along the screens. Both these points of difference appear in the above-quoted letter. Sir R. Payne-Gallwey estimates the number of decoys in active use in Holland and its islands at seventy to eighty; some, as this Texel decoy, being on the sea-coast and some inland. He mentions the South Frisian islands of Schiermonnikoog and Terschelling as possessing decoys, but does not refer to Texel.

† See 'Stevenson's Birds of Norfolk,' vol. ii. p. 184.

though to-day it breeds only in a single locality; and we propose in the following pages, first, to trace very roughly the gradual retreat of the species before the advance of drainage and cultivation, and then to add a few words descriptive of our own visit to its last stronghold in the North of Europe.

In the year 1673 John Ray published an account of a journey through the Low Countries, which he made in the company of his friends Francis Willughby, the ornithologist, Philip Skipton, and Nathanael Bacon;* chiefly, he tells us, with the view of studying the flora of the region visited. In this work occurs a quaint and interesting reference to the breeding of the Spoonbill :—

"Before we left Leyden we made a by-journey to Sevenhuys, a village about four leagues distant, to see a remarkable grove, where in time of year several sorts of wild-fowl build and breed. We observed there in great numbers (1) *Scholfers, i.e., Graeculi palmipedes,* in England we call them *Shags,* they are very like to Cormorants, only less. We were much surprised to see them, being a whole-footed bird, alight and build upon trees. (2) *Lepelaers,* called by Gesner *Plateæ sive Pelicani,* we may call them in English *Spoonbills.* (3) *Quacks* or *Ardeæ cinereæ minores,* the Germans call this bird the Night-Raven, because it makes a noise in the night, *Nocte clamat voce absona tanquam vomituriensis* (Gesner). (4) *Reyers* or Herons. Each sort of fowl hath its several quarter. When the young are ripe, they who farm the grove, with an iron hook fastened to the end of a long pole lay hold on the bough on which the nest is built, and shake the young ones out, and sometimes nest and all down to the ground. Besides the forementioned birds there build also in this wood Ravens, Wood-Pigeons, and Turtle-Doves. This place is rented for 3000 gilders per annum, of the Baron of Pelemberg, who lives at Lovain, only for the birds and grass." †

* We were in some doubt as to which of the many notable Nathanael Bacons of this period the companion of Ray and Willughby might be. The Rev. C. R. Manning, to whom we submitted the case, thinks he was Sir Nathanael Bacon, of Culford, second son of Sir Nicholas, the first baronet. He was an eminent painter, and his monument at Culford describes him as "well skilled in the history of plants, and delineating them with his pencil." He has been confused by several writers with his uncle, Sir Nathanael Bacon of Stiffkey, son of the Lord Keeper.

† 'Observations made in a Journey through part of the Low Countries, &c., with a Catalogue of Plants not native to England, found spontaneously growing in those parts, and their virtues.' By John Ray. London, 1673. Willughby himself alludes to this colony in his ornithological notes, completed and edited after his death by Ray. 'The Ornithology of Francis Willughby.' By John Ray, p. 289. London, 1678.

In 1789 the Dutch naturalist, Cornelius Nozeman, published the second volume of his work on the birds of the Netherlands. In the chapter on the Cormorant he gives an account of the breeding of this bird, together with Herons and Spoonbills, upon a marsh near Nieuwerkerk, a few miles from Rotterdam. This breeding-place he describes as given over to desolation; it lay, he says, in the rarely visited and little known Wolle voppen-polder enclosed within its own bound, over which no one might pass without leave of the tenant. The name of the spot was *Isselmeyr*, the designation apparently of a small lake, which before its embankment communicated with the Ijssel. The old naturalist warms into enthusiasm, when he recalls the sight of the birds in their lonely haunt. "In the Natural History of our Land," he says, "this is on the whole a spectacle as great and as worthy of attention as anything I have ever seen in our Provinces; and to see it the lover of this study should have no trouble to complain of, at the most he needs only to make a journey of a few miles."

Referring again to this colony in his long and interesting article on the Spoonbill, he describes a visit he himself made to the place as follows:—

"About an hour from the spot where, in lofty trees, the renowned Willughby, more than a hundred years ago, met with these beautiful birds nesting in great numbers, I, some few years since found the Spoonbills breeding on the lowest branches of pollarded, wide-topped, and so not very high alder trees; and also a few pairs upon the flat ground, in nests placed upon the accumulations of old nest heaps. They came there every year, so the tenant of the land informed me; that is to say, to an almost inaccessible spot in a morass in the neighbourhood of the so called Ijsselmeyr behind Nieuwerkerk, where quiet seclusion from men and from sounds, with water at hand abounding in fish, afforded to these birds a very favourable opportunity to dwell undisturbed, and day by day to find sustenance for themselves and food for their young in plenty. So, when attended closely by my guide, I ventured myself on the insecure crust of mud, I saw about ten pairs of them breeding close by one another; those further from me were not to be approached. The uneasy flight to and fro, however, of these last, from among some trees standing a short way off, and back again, revealed to us plainly that they were in the midst of breeding. Without great trouble, or marvellous exertions, I was thus able to possess myself of one of the nests (containing three eggs) which were built on the ground of the treacherous marsh, upon the heaped-up remains of some old nest, be it a Spoonbill's, a Cormorant's, or a Heron's. The white Spoonbill belongs therefore, beyond all contradiction, to the number of the birds of our

Fatherland, breeding every year, not only in the places referred to (in the polder of Wolle Foppen) but also, as I have been informed on good authority, here and there along the Haarlem Meer, as well as on the Bergsche Veld, and in one and another of the channels of the river Merwede, in the most solitary spots among the willow plantations there abounding."*

From the time of Nozeman to the date of Professor Schlegel's book on the 'Fauna of the Netherlands,' we have no information as to the status of the Spoonbill in Holland; but as the work of reclamation progressed slowly until well into the present century, we may infer that the decrease in the number of the birds breeding in the country was very gradual. Speaking of the distribution of the Spoonbill in his time, Schlegel says:—

"In our land it is met with breeding generally at or near the mouths of great rivers; as in the Biesbosch, at Nieuwerkerk, on the Ijssel, and in the marsh-pools about the island of Rozenburg, at the mouth of the Maas. Thence they wander, generally in late summer, united in small parties or sometimes in large flocks, to other marshy tracts, or pools where drainage work is in progress, and the bird is then very often seen on the ooze of the Zealand streams, and at the Helder, sometimes also here and there further inland.†

Of the three breeding-places known to Schlegel, two are identical with stations mentioned by Nozeman; for the Merwede, as the broad reach of the Maas above Dordrecht is locally called, is the northern boundary of that maze of channels which, with the numberless involved islands, is known by the general name of the Biesbosch.‡ From the other two localities given by Nozeman, the birds appear to have disappeared. Besides the breeding-places already mentioned, there is little doubt that there were many others of which no record now remains. We are informed, for

* 'Nederlandsche Vogelen.' By Cornelius Nozeman. Vol. ii. p. 171. Amsterdam, 1789. A splendid work, in three folio volumes, illustrated with coloured plates, many of which are excellent (*e.g.* that of the Black-tailed Godwit, of which the specific name *belgica* is based upon Nozeman's plate and description).

† 'Fauna van Nederland, Vogels.' By H. Schlegel. Leiden, 1854—8, p. 391.

‡ Literally "Reed-Forest," a large tract of land submerged by the famous inundation of 1421. Drainage has, in recent years, quite altered the character of this once lonely and desolate region.

example, that twenty-five years ago Spoonbills bred in great numbers in the marshes near Den Hoorn, in the south of Texel. The cutting of a drain has since laid dry this area; but it is interesting to hear that a well-known Texel sportsman has recently seen a pair of Spoonbills frequenting the spot regularly throughout the summer. Judging from the nature of the ground, however, it is very improbable that these birds bred in the locality.

At Nieuwerkerk they bred for several years longer, and in 1867 Mr. P. L. Sclater visited the locality and saw perhaps the descendants of the very birds which, a few miles distant, had delighted the eyes of Willughby two centuries before. Soon afterwards the Spoonbills were driven from this old stronghold, and they are next met with upon Horster Meer, a locality mentioned by neither Nozeman or Schlegel, about fifteen miles south-east of Amsterdam, on the southern verge of the low-lying district bordering the Zuyder Zee, and known as "the Gooi." In July, 1877, Messrs. P. L. Sclater and W. A. Forbes visited Horster Meer: they were informed that *several thousand pairs* were then nesting there; a great number of Cormorants were breeding in the same locality.*

In May, 1880, Mr. Henry Seebohm and Captain Elwes were at Horster Meer, and estimated the number of nests at fifty; they saw, however, a flock of two or three hundred birds.† Soon afterwards the Meer was drained, and the Spoonbills betook themselves to Naarder (or Naarden) Meer, three or four miles to the north-east, a tract of swamp and reed-beds well calculated to secure them food and shelter. This new breeding-place was visited by Mr. Philip Crowley in May, 1884, when he noted about two hundred Spoonbills, and also some fifty or sixty Purple Herons.‡ From that date until the present year we have no data as to the colony.

We had, previously to our own visit, some doubt as to how and where we should find the Spoonbills, and we are indebted, in the first place, to Mr. W. M. Crowfoot for putting us upon the

* 'On the Nesting of the Spoonbill in Holland.' By P. L. Sclater and W. A. Forbes. 'Ibis,' vol. i. 1877 (4th series) p. 412.

† 'History of British Birds.' By Henry Seebohm. Vol. ii. p. 516.

‡ 'Yarrell's History of British Birds.' 4th ed., vol. iv. pp. 237—243.

right track, and in the next to Dr. C. Kerbert, the Director of the Zoological Gardens at Amsterdam, who very kindly gave us full directions as to the exact whereabouts of the birds. Provided with his letter we called, on the morning of June 20th, at the house of Mr. Hoetmer, the caretaker of the Meer, which fortunately is strictly preserved by its owner. Hoetmer himself, his house, his boats, and eel-boxes, his garden, and his stacks of reeds and coarse marsh hay, strongly recalled to us our own Broad district; and as we rowed down the cut leading to the Meer, the resemblance between the two districts seemed complete. Hoetmer, indeed, is a thorough marshman of the old type, full of *broadcraft* and alive to the significance of every sight and sound of his watery domain. Naarder Meer was probably at one time a large sheet of water, but it is now almost filled by a dense growth of reeds and rank marsh vegetation, and there is little open water left. On all sides we heard the powerful ringing notes of the Great Reed Warbler—the *Karekiet*—and the marshman had no difficulty in showing us a nest. Both this and the Common Reed Warbler were abundant here; but Hoetmer said that in many districts one species only would be present, and would quite displace the other. Otters abounded in the thick reed-beds, and among many common water birds he mentioned the Bearded Tit as breeding about the Meer.

After pulling a considerable distance, and passing under the railway, which traverses the swamp on an embankment, we reached a distant part of the Meer, and punting the boat along narrow channels, we made our way into the heart of a great reed-bed. Presently we had a distant glimpse of two or three Spoonbills, and a few minutes later we came suddenly upon their quarters. The birds all took flight one after another, and so long as we remained upon the spot they flew slowly round overhead, giving no cry, and yet none the less betraying, by this strange silence, their uneasiness and solicitude. The sun was shining brightly, and we could watch to great advantage their manner of flight, and admire their snowy plumage and strangely-formed bills.

The nests were large, made of broken reeds loosely interwoven and secured to growing stems; they did not rest upon the mud, but floated on the water, which was here a foot or a foot and a half deep, so that by putting an oar underneath the whole mass

could be raised or depressed.* We understood from Hoetmer that there were this year thirty nests; they were placed near together, and all comprised in a small area. Some of the nests contained eggs, generally three in number and always hard sat; but in most cases the young were hatched. The birds in the same nest were of very unequal growth, proving that the eggs had been laid at intervals, the warmth of the nestling first hatched assisting in the incubation of the eggs subsequently laid. Parting the reeds with his oar the old marshman opened a view for us into a narrow lane of dark water, blocked by a large nest, the accumulation probably of some years; upon the heap stood, erect, a bird at least three weeks old, beneath him squatted a downy nestling, and he in turn was covering an egg or newly hatched bird. In this case an interval of eighteen or twenty days must have elapsed between the laying of the first and last egg.

Besides the Spoonbill, another interesting bird, the Purple Heron, still breeds upon Naarder Meer. The Dutch call this bird, which is fast becoming very rare in Holland, *Roode Reiger*, the *Red* Heron. During the day we saw four or five of these fine birds upon the wing, and as it is sluggish and retiring in habit, at least in the daytime, there were perhaps many more in the neighbourhood. We searched long for a nest, but without success, though all the time a bird was flying round in evident anxiety, and near enough for us to make out, with glasses, every detail of its plumage; the reed-bed, however, was so dense that we could

* It is probably the same instinct of self-protection which prompts the Spoonbill to place its nest sometimes in a lofty tree, sometimes in a dense reed-bed; sites of a very different character, but perhaps equally secure and difficult of access. The same remark applies to the Common Heron and other allied species. At Erzeroum Messrs. Dickson and Ross found the Spoonbill nesting in the river, the nests made of reeds piled a few inches above the water. In India Mr. Hume describes the bird as nesting on Tamarind and Peepul trees. In Ceylon Colonel Legge found it breeding in trees (Yarrell's Hist. of Brit. Birds, 4th ed., vol. iv. pp. 237—243). Naumann says it rarely nests on the ground; he refers to the old colony in the trees of Sevenhuys, and he remarks that the Cormorant and Spoonbill are often neighbours ('Naturgeschichte der Vögel Deutschlands.' Leipzig, 1838. Vol. ix. p. 331). Gruessner says, "the nest is generally found on trees, and only in quite treeless districts in the reeds of the swamp" ('Die Vögel von Mittel—Europa und ihre eier,' p. 146. Dresden, 1880—1).

see only a few feet into it, while to force the boat into its recesses would have been almost impossible.*

In another part of the Meer we saw a number of Black-headed Gulls, which presumably were breeding; and upon a soft and quaking island of mud, where vegetation was sparse, a colony of Common Terns was established, and we found several nests with eggs.† The Marsh Ragwort (*Senecio palustris*), now so rare in the Broad district, was growing plentifully here (and elsewhere on the Meer), imparting quite a glow of colour to the spot.

What may be the fortunes of the Spoonbills of Naarder Meer in the next few years it would be unsafe to predict; but the steady decrease in their numbers in the past, in spite of careful protection, does not promise well for the long continuance of the colony. Moreover a project was formed some years ago for the drainage of the lake and a pumping-station was actually erected. At present the work is at a standstill; but if at any time the engineering or financial difficulties, which stand in the way of its completion, should be surmounted, the Meer will become firm pasture ground, and the Spoonbills will be banished from their last breeding-place in the north of Europe.

* Mr. Seebohm does not appear to have found the Purple Heron breeding at Horster Meer in 1880, as he says in his 'History of British Birds:' "The valley of the Danube is the most northern locality where the Purple Heron breeds regularly" (vol. ii. p. 517).

† Lubbock mentions having found the nests of the Lesser and Common Terns in a similar locality, viz., "upon an island in Hickling Broad" ('Fauna of Norfolk' [Mr. Southwell's Ed.] p. 169).

V.

FALCONRY IN NORFOLK (JOHN DAWSON DOWNES).

By Thomas Southwell, F.Z.S., *Vice-President*.

Read 27th January, 1891.

Doubtless we all remember to have seen the very suggestive picture —by whom, or where, I cannot call to mind—of the angler who, incapacitated by age and infirmities from pursuing his favourite pastime, was comfortably seated by the fireside angling, not in the purling brook, but in a tub of water. This "ruling passion" seems by no means confined to anglers, for, says Mr. Lubbock ('Fauna of Norfolk,' 2nd edition, p. 48), "I find amongst my friend Girdlestone's notes the following:—'Visited Mr. Downes, who tells me that, having given up falconry, he amuses himself by seeing his tame Shrike catch flies in the room in which he sits.'" Little is known about this veteran falconer, and I am sorry that I have nothing original to add; but it seems desirable to collect all the scattered notices of 'Hawking in Norfolk' in our 'Transactions,' and I shall be glad to supplement what has already appeared by the following additional particulars.

The late C. J. Palmer, in his 'Perlustration of Great Yarmouth,' was at some trouble to gather what information he could with regard to Downes, and as this book is not very accessible it may be well here to reproduce the few facts recorded of this most enthusiastic old falconer by the Yarmouth historian.

The house at the south-west corner of Row No. 55, called Gurney's Bank Row, says Palmer (vol i. p. 309), "was occupied for many generations as a bookseller's shop. In the early part of the last century it was in the possession of William Eaton . . . after his death [it] passed into the possession of Messrs. Downes and

March . . . March . . . went to seek his fortune in the United States [p. 310]. John Dawson Downes, the senior partner, a man of great intelligence, was the second son of the Rev. James Downes, rector of Stratton Strawless, by Mary his wife, sister of Gibson Lucas, Esq., of Filby." He was therefore well descended on both sides, and doubtless spent his early days in the parish, rendered famous as the home of Robert Marsham (the friend and correspondent of Gilbert White), whose contemporary he was,* and from whom it may be that he originally imbibed the tastes which in after life became a passion. In a foot-note to the same page Palmer gives the following additional particulars:—"Downes was a man of singular skill in breeding of domestic animals, the cultivation of fruit trees, and the training of birds. On retiring from business he took up his residence at Gunton Old Hall, near Lowestoft, where he was most earnest in his endeavour to revive the once famous pastime of hawking. Here he was visited by Lord Rivers, Colonel Wilson, Sir John Sebright, Mr. Brigg Fountaine of Narford, and other gentlemen who took an interest in the same pursuit. In his walks he was usually attended by a tame Heron. He proved satisfactorily that the same Swallows revisited the same places annually, and usually on or about the same days. Downes was an open, plain-speaking, matter-of-fact man, firmly attached to the Protestant faith, and a fine specimen of what was then called a 'Church and King' man. He possessed a good library, containing, among other rare books, some curious old Treatises on Hawking. He had also a few good paintings, one being by Sir Joshua Reynolds. The whole were sold by auction after his death, which occurred at Lowestoft in 1829, at the age of seventy-one."

In the 'Addenda,' at p. 387, vol. iii., Palmer, referring to the above, adds the following note:—"Hawking—Dibdin in his 'Tour' (p. 388), says, 'At Yarmouth, for the first time in my life, I saw the diversion of hawking,' which he describes at considerable length and in a most graphic manner. Lord Orford's falconer, he says, attended with a cast and a half." This will be found in Vol. I. of Charles Dibdin's 'Observations on a Tour through almost the whole of England and a considerable part of Scotland'

* Downes was born in 1758, and Marsham died in 1791.

(two volumes, quarto). Dibdin's reference to Norfolk bears the date of 1801; but great was my surprise to find that the account referred to by Palmer was the same as that quoted by Professor Newton in an article on "Hawking near Yarmouth," in a former number of our 'Transactions,' as from 'The Hive, or Weekly Entertaining Register,' a magazine bearing the date of December, 1822, and forming part of an article on "Hawking," the authorship of which is not stated, but as Professor Newton rightly suggested, the falconer to whom the visit was paid was undoubtedly Downes. This extract, which I have compared with Dibdin's book, will be found in vol. iii. p. 34 of our 'Transactions.' The true authorship and date of the original of this article are however of interest, as they conclusively prove the professional falconer, then said to be in the employ of Lord Orford, to have been Jan Daams, as originally suggested by Professor Newton (*l.c.* p. 36), and not Jan Peels, who it is not certain was ever in Lord Orford's service, although he is known to have been in that of Mr. Downes. Professor Newton's difficulty was that Daams was not in England after 1808, whereas the article in question appeared in 1822; but the true date of the event proves to have been 1801, and therefore previous to the capture of Daams at Cuxhaven by Louis Bonaparte. The editor of the 'Hive' appears to have been guilty of a "crib," which, as the original authority was twenty-one years old, he seems to have considered of no consequence, but which in reality led to considerable confusion.

Mr. Harting has recently contributed to the 'Zoologist' (1890, p. 417) some remarks on the original MS. of Sir John Sebright's Observations upon Hawking, which, according to a pencil note on the last page in Downes' writing, was given to him by his friend Sebright on the 25th September, 1828. There are a number of critical notes by Downes, evidently made before the book was printed, and most of which Sebright had adopted. One of these notes states that "The late Nicholas Styleman, Esq., of Snettisham, in Norfolk, in reply to my enquiry of how long had the Hawks been known to breed in the cliffs of Hunstanton, in Norfolk, informed me for more than a century.... The last eyrie there was about eight years since." This MS. was purchased by Messrs. Jarrold and Son, from a descendant of Downes, and kindly lent to me to read. Wishing to fix the date of the last Peregrine Falcon's

nest at Hunstanton, I deducted eight years from the date of Mr. Downes' pencil note, thus arriving at the year 1820 as the date of the last eyrie; but I see Mr. Harting has taken the date of the publication of Sebright's book, two years before the MS. was given to Downes, and arrives at the year 1818 as the date of this interesting event. Of course Mr. Harting's mode of reckoning is the correct one, and I gladly adopt his conclusion. Mundford, in his 'Guide to Hunstanton,' says, that year after year the young Peregrines "were taken and trained to falconry, by Mr. Downes of Gunton, in Suffolk; till at length worn out by their constant persecution, they forsook the place in 1821." I do not know what was Mr. Mundford's authority for this date.

John Pells, the last of the Dutch race of falconers, but who was born in Norfolk ('Fauna of Norfolk,' 2nd edition, p. 229) died at Lakenheath, on the 24th March, 1883, aged sixty-eight years; a biographical notice of him will be found in the 'Field' for the 31st of March in that year (p. 431).

VI.

A REVISION OF THE RECORDED OCCURRENCES OF THE GREAT WHITE HERON, *ARDEA ALBA* (LINN.), IN GREAT BRITAIN.

By J. H. Gurney, F.L.S., F.Z.S., *Vice-President.*

Read 24th February, 1891.

There are certain birds which have every right, as occasional visitants, to claim enrolment in the British List; but as to whether they have been taken three, five, or ten times, nobody is certain, because so many spurious records spring up,—cases of wrong locality, cases of mistaken identity, cases even of fraud; against all of which we have to be on our guard. No gentleman would say a bird was killed in England if it was not; but the temptation to a

poor bird-stuffer, just able to earn a livelihood, is great to palm off a foreign skin on some unwary dupe. Perhaps our Society will be of opinion that these remarks do not apply so much to the Great White Heron as to some birds, for the position of the Great White Heron is *now* established on a certain footing; but for long it was not, although as a matter of fact there was an authentic occurrence as far back as 1826, and since that time more or less misapprehension has clustered round this fine bird. Mr. Seebohm, writing of this species in 1884, stated that there did not appear to him to be any reliable instance on record "during the last thirty or forty years" ('British Birds,' vol. ii. p. 477); though this was not the opinion of Mr. Howard Saunders, to be quoted later on; but I refer to it as showing the judgment of an authority on birds. Messrs. Harting ('Handbook of British Birds') and Saunders ('Yarrell,' 4th ed., and 'Manual') have each striven, and in a measure very successfully, to clear away the mist up to the date of their respective publications; but another revision of the thirty-two so-called "occurrences" will not be deemed out of place. Mr. Harting's 'Handbook' was printed in 1872, and he enumerated eighteen Great White Herons, to which list fifteen more can be added. We will now proceed to recapitulate these fifteen, several of which are mentioned by Mr. Saunders.

One. Obtained at Strathbeg in Aberdeenshire, in 1854, *fide* W. Horn, 'Natural History Society,' Glasgow, vol. iv. p. 246. This is an unsatisfactory record to begin with, inasmuch as the bird cannot be traced, and Mr. Horn does not remember his authority for it, so I think we may relegate it to oblivion.

One. Obtained at Branechoil, Loch Katrine, Perthshire; May 1881. Mr. William Evans of Edinburgh writes that there is not the least doubt about its having been really got at Loch Katrine; and that it was exhibited to the Royal Physical Society of Edinburgh, April 20th, 1887 (Journal IX. p. 568). It is now in the Edinburgh Museum, where I have lately had the pleasure of seeing it.

One. Obtained in Perthshire, in 1887, "somewhere in the same vicinity" as the last ('Scottish Naturalist,' 1888, p. 348). It frequently happens when a rare bird is obtained that a legend springs up sometime afterwards about another: this is a phenomenon familiar to investigators of rare birds.

One. Seen at Port Carlisle, on the Solway, in 1840 ('Naturalist's Library, Birds,' vol. iii. p. 135), but since thought to have been a Spoonbill ('Zoologist,' 1888, p. 330). The genuine occurrence, which took place the summer before in the Firth of Forth, to be afterwards mentioned, may have given rise to this later report.

Two. Seen in Orkney, 'Birds of West Scotland,' p. 277.

One. Seen at Penzance, Feb. 4th, 1866, 'Cornish Fauna,' p. 27.

One. Seen at Scilly: Gould, 'Birds of Great Britain.'

One. Obtained in Norfolk, 'Birds of Norfolk,' vol. ii. p. 149. This specimen has the appearance of having been stuffed very many years, and its antecedents are very doubtful.

Two. Obtained at Yarmouth, *fide* Miller, 'Birds of Norfolk,' vol. ii. p. 149. Very doubtful.

One. Obtained at New Hall, Yorkshire, in 1821, by John S. Townend; communicated by Dr. Farrow to Mr. T. Allis: (Morris, 'British Birds,' vol. iv. p. 115; 'Yorkshire Vertebratæ,' p. 50). Stated to have been formerly in Sir Joseph Radcliffe's collection, but I am informed it is not there now.

One. Seen at Romney in Kent, February 1849, 'Zoologist,' p. 2419.

One. Obtained in Cambridgeshire, June 1849, *fide* F. W. Foster ('Zoologist,' 1849, p. 2568); and J. R. Little (Morris, 'British Birds,' vol. iv. p. 115); and C. J. Strong (Gould, 'Birds of Great Britain'). This bird is preserved at Thorpe Hall, Peterborough, where I have had an opportunity of seeing it, and the farmer who shot it is still alive. It is an adult, having fine dorsal plumes.

At page 123 of 'The Vertebrates of Leicestershire and Rutland' mention is made of a "*White* Heron," shot at Groby many years ago, which had black legs and a yellow bill, and elongated crest. *Ardea cinerea* never has black legs, which *A. alba* has, and on the other hand *A. alba* has no elongated crest. Mr. Harting's way out of the difficulty is that it was a Spoonbill ('Zoologist,' 1886, p. 197), which has a pale beak when not adult. Whatever the bird was it was shot by a keeper named Chaplin, who is also credited with two Harlequin Ducks (!!) at the same pool (*l.c.* p. 134). Verily a fortunate sportsman.

Thus we have, including what are given in Harting's Handbook, thirty-three so-called occurrences, from which we may

eliminate nineteen which were only seen, and which may have been Spoonbills. This leaves the following fourteen to be dealt with.

1.—One. Cumberland, *fide* Dr. Heysham (Latham, 'History of Birds,' vol. ix. p. 84. Synopsis 1785, vol. iii. p. 91). Not included in Dr. Heysham's important list of birds in Hutchinson's 'History of Cumberland,' published in 1794. The Rev. H. A. Macpherson considers this shows that Dr. Heysham did not believe in it, inasmuch as his list was printed several years after Latham's works appeared, in which it was included on his authority.

2.—One. Cumberland. 'Zoologist,' 1854, p. 4169. This "occurrence" is quite unworthy of credit, no date is given, and it is not said if the bird was obtained or merely seen.

3.—One. Oxfordshire, September 1833, *fide* the late Mr. Frederick Holme and the late Rev. Henry Roundell (Yarrell, 'British Birds,' 1st edition, vol. ii. p. 456; 'Zoologist,' vol. vii. p. 2600). I learn that Mr. Holme died "some years ago," and Mr. Roundell "many years ago." Mr. Roundell's collection still exists, but the bird is not in it.

4.—One. Hornsea, East Riding of Yorkshire; about 1826. Stuffed by Dunn the bird-stuffer, at Hull, and now in the York Museum with the rest of the Strickland collection. Mr. Strickland does not seem to have seen it in the flesh ('Magazine of Natural History,' 1839, p. 31), but there is no doubt about it.

5.—One. New Hall, Yorkshire, 1821. Doubtful.

6.—One. Beverley, Yorkshire, summer of 1835. 'Magazine of Natural History,' *l.c.* p. 31. Well authenticated. It has been stated that this bird is in the York Museum, but this seems to be a mistake.

7.—One. Osberton, Nottinghamshire, prior to 1838. 'Magazine of Natural History,' *l.c.* p. 31. This had no other authority than a label on the back of the case, and must I fear be reckoned among the doubtful ones.

8.—One. Lincolnshire, prior to 1838. 'Magazine of Natural History,' *l.c.* Yarrell, 'British Birds.' Doubted by Mr. Strickland: probably wrongly identified.

9.—One. Firth of Forth, June 1840. Examined in the flesh by Macgillivray, and therefore unquestionable. 'British Birds,' vol. iv. p. 463. 'Globe' newspaper, Sept. 7th, 1840.

10.—One. Strathbeg, Aberdeenshire, 1854. Most likely an erroneous record.

11.—One. Perthshire, 1881. Well authenticated.

12.—One. Perthshire, 1887. Most likely an erroneous record.

13.—Three. Norfolk. No dates, and all very doubtful.

14.—One. Cambridgeshire, June 1849. Well authenticated.

Having now gone through the list we will see what there is to eliminate. We may at once accept Nos. 4, 6, 9, 11, 14, but we shall not go far wrong in rejecting Nos. 1, 2, 8, 10, 12, 13, and this leaves 3, 5, 7 doubtful.

No. 4. Hornsea, 1826 ,, 6. Beverley, 1835 ,, 9. Firth of Forth, 1840 ,, 11. Perthshire, 1881 ,, 14. Cambridgeshire, 1849	}	Sufficiently established as authentic.

I am forced to the conclusion that the above are the only undoubted Great White Herons—five examples out of fourteen—killed in Great Britain. In Saunders' 'Yarrell,' 4th ed., the number is put at six, and in the 'Manual' the same author thought it might be extended to eight; but this was taking too lenient a view I must think, if the evidence which is now brought forward be fairly weighed, all of which it should be added was not available when his work on British ornithology was published. It only shows what a number of erroneous records there are of very rare British-killed birds, and the need for all who write in the Ornithological Magazines to exercise caution in verifying statements made to them, especially by any person whose interest it is in any way to mislead.

VII.

NOTES ON THE GREAT FROST OF 1890—91.

By Arthur W. Preston, F. R. Met. Soc.

Read 24th February, 1891.

The severe frost which set in on the 25th November, 1890, continued until the 22nd January, 1891, a period of fifty-nine days; and, as this occurrence is such a remarkable one, it is proposed here to mention a few of the details of this exceptional winter. The mean temperature of the whole period, from observations taken by me at Blofield, was 29.8 degrees, or more than 2 degrees below the freezing point, and about 9 degrees below the average. At Hillington, Norfolk (which is a more exposed, bleak situation), the mean was 28.6 degrees, and at Somerleyton 29.9 degrees. The lowest mean registered in England for the period was 28.5 degrees at Bennington, Herts (in London it was 29.3 degrees, and at one or two other stations about the same), so that it will be seen that in Norfolk we were situated in the region of the greatest cold, although not quite in the centre of it. In the south-east of England, generally, the mean temperature for the fifty-nine days was more than 10 degrees below the average; in the north of England the deficiency was about 5 degrees, but in the extreme north of Scotland it was less than 1 degree.

Dealing with the frost as experienced in Norfolk, it may be said that it set in very suddenly. On Sunday, November 23rd, the

thermometer was standing at 57 degrees, and although heavy rain fell, the air was extremely soft and mild; a considerable depression in the barometer followed, and whilst it continued to fall mild south-westerly winds prevailed. On the morning of the 24th the barometer was standing at 29.15 in., but in the afternoon of that day the centre of the cyclonic disturbance had passed over us, the barometer rose four-tenths of an inch in twelve hours; the wind veered and blew strongly from the north-west, and heavy storms of hail were experienced. The next day we were plunged into mid-winter, with three inches of snow on the ground, after a further rise of the barometer of half an inch in twelve hours; and by the 28th the snow was lying on the ground, over the whole county, to the depth of from a foot to eighteen inches on the level. On the morning of the 30th a most exceptional frost was recorded, the thermometer falling to 14 degrees in the screen and 7 degrees on the grass, a degree of cold not before recorded in the month of November during the present century. A change occurred on December 4th, and a drizzling rain cleared away most of the snow, leaving only a few drifts under sheltered hedgerows. The thermometer, however, did not rise above 43.8 degrees, and there were only two nights on which ground frosts did not occur. After this there was a period of cold dry weather till the 15th, when another fall of snow occurred, which remained on the ground, with frequent additions, till January 23rd, the earth being thus covered with a white mantle for forty successive days. The most severe frosts which occurred in the month of December were experienced between the 15th and 26th, when the thermometer fell below 20 degrees on eight out of twelve nights, on four of which it fell to below 10 degrees on the grass. A slight thaw occurred on New Year's Day, but the thermometer only rose to 38 degrees, and by evening it was again freezing hard. Some intensely severe frosts again occurred in the second week in January: on the night of the 18th it fell to 18.6 degrees in the screen, on the 9th to 15.8 degrees, on the 10th to 9 degrees, and on the 11th to 7.2 degrees (the lowest of the winter); while on the grass the temperatures recorded on these four nights were respectively 11.5 degrees, 5 degrees, 2 degrees, and 0.5 degrees. On the 13th another slight thaw occurred, but snow fell again on the following day, and the frost returned. The following week

the frost began to show signs of breaking up, but before it left us it gave us one more very sharp "nip," under rather unusual circumstances. On the 19th, which was a brilliantly clear day, the thermometer at nine a.m. stood at 26 degrees, it subsequently rose to 32 degrees, but in the afternoon the temperature fell with extraordinary rapidity, and at four p.m. stood at 15.6 degrees in the screen and 6 degrees on the grass; an hour later some cirro-cumulus clouds worked up from the west, and the temperature rose 5 degrees. There was hardly any frost during the succeeding night, and on the following day there was a gale from the south-west with rain, and it was thought that the frost had left us; but the next morning the roads, which had been running streams the previous night, were covered with a sheet of ice! On the 23rd there was a complete break-up of the frost, and during the remainder of the month, and the first fortnight of February, there was hardly a frosty night, and the mean temperature was some-what above the average.

The mean maximum temperature of the entire period was 35 degrees, which was 1.5 degrees higher than in London. This is accounted for by reason of the dense fogs which prevailed in the metropolis in December on many days when we were enjoying bright sunshine. As an example, on December 19th the thermometer in London did not exceed 19 degrees, and a very dense fog prevailed all day, whereas in Norfolk there was no fog, and the temperature rose to 30 degrees, or 11 degrees higher than in London. During the frost the maximum temperature only rose above 40 degrees on seven days; and from December 9th to January 20th (a period of forty-two days) it did not once touch 40 degrees, an almost unprecedented occurrence. The mean minimum temperature of the period was 24.5 degrees as against 25 degrees in London, and the exposed radiation thermometer on the grass gave an average of 4.4 degrees lower.

At the end of this paper will be found a comparative table showing the principal features of the late frost, and that of the most remarkable ones of the present century, which was compiled by Mr. Charles Harding, F. R. Met. Soc.; and I have added to it my own figures from Blofield, which it will be seen agree very nearly with the London values, except as to the maximum readings, which differed from the causes I have already pointed out. One

striking feature of this table is that the late frost outstrips all the previous ones (even that of 1814) in the number of days' duration. It may be mentioned, however, that the frost of 1814, although it only lasted forty-two days, was succeeded by a second severe frost (ten days after the break-up of the first), which lasted thirty-three days, whereas the late frost has been succeeded by comparatively mild weather. Therefore in 1814 the frost may be said to have lasted from December 26th to March 20th, with the exception of ten mild days in the early part of February.

With regard to the effect of the recent frost upon vegetation it is as yet too early in the season to express any opinion. It is stated that in many parts of the county evergreens have been destroyed and rose trees seriously damaged; but with the return of spring it may be found, it is to be hoped, that the injury has not been so great as supposed. Within a week of the break-up of the frost Winter Aconites and Snowdrops were showing their blooms but little later than their usual time, and by the middle of February there were more flowers in blossom than at the same date in 1887 and 1888.

The season was a very trying one for the birds, many dying from sheer starvation. Some were so tame that they could almost be caught by hand, and a handful of crumbs thrown on the hard garden paths would be immediately devoured by quite an army of poor starved outcasts. I am indebted to Mr. T. Southwell, F.Z.S., for the following notes on the effect of the winter on our feathered songsters. He says:—"The resident birds suffered much and perished in great numbers; Kingfishers, Herons, and Bitterns, from all the inland waters being frozen, fell victims to starvation and the gun; but, strange to say, Otters seemed to take good care of themselves and very few were killed. The Coots probably went down to the open water in the estuaries of the great rivers or to the sea beach. Amongst the Thrushes the mortality was very great; but there was almost a total absence here of Redwings and Fieldfares, probably they had all gone south. Swans and Bean-geese, as also Brent-geese, on the marshes were numerous; but the cold weather produced singularly few rarities, with the exception of a most unusual number of Smews, some of them in very fine adult plumage. So severely did the Gulls suffer that many Common and Black-headed Gulls were taken in clap-nets on the

North Denes, at Yarmouth, at a spot where some refuse had been shot."

As to the effect of the severe cold upon the public health, one of the most remarkable facts was that in London the death-rate of children under one year of age decreased in an extraordinary manner. The cause of this is assigned to the fact that in ordinary winters young children are taken out and catch cold, whereas during the recent frost they were kept indoors and protected from the cold. This, however, does not appear to have been the case in Norwich, Mr. Charles Williams having informed me that the number of deaths of infants under one year during the ten weeks ending 24th January, 1891, was 96, as against 86 during the ten weeks ending 25th January, 1890, during an exceptionally mild winter. Mr. Williams has also been good enough to give me the following further details as to the death-rate, &c., in Norwich during the period of the recent frost. The death-rate during the ten weeks was 21, 17, 23, 23, 26, 27, 27, 28, 28, and 21 (or an average of 24.1 per thousand per week), as against 17, 11, 23, 27, 24, 11, 19, 19, 20, and 15 (or an average of 17.6 per week) during the corresponding period of the previous winter. The deaths of persons sixty years of age and upwards was 167, as against 116 in the previous winter. Deaths from the following diseases also occurred during the period of the frost—Diphtheria 11, Measles 9, Whooping-cough 19, Fever 4, Diarrhœa 3, Scarlet Fever 1.

The skaters had an unusually long period of enjoyment. In Regent's Park skating continued uninterruptedly for forty-three days, where the ice attained a thickness of over nine inches. Many large rivers were frozen over in all parts of England, and in Norfolk the broads were covered with a thickness of ice not ever before remembered. Towards the close of the frost some measurements were taken at Wroxham Broad, with a result which proved that the thickness of the ice was from twenty-one to twenty-two inches.

PROLONGED FROSTS OF THE LAST 100 YEARS.

DATE.	Days' duration.	Mean maximum.	Mean minimum.	Mean of max. and min.	Absolute minimum.	DAYS					Absolute maximum.
						with min. temp. below 20°.	of continuous frost.	with daily mean 32° or below.	with max. temp. 32° or below.	with max. temp. 40° or above.	
		°	°	°	°						°
*1788—89, Nov. 26 to Jan. 13	49	31.3	27.5	29.4	17.5	4	12	33	30	3	46.0
1794—95, Dec. 18 to Feb. 7	52	31.9	25.3	28.0	7.0	11	12	35	23	3	46.0
1813—14, Dec. 26 to Feb. 5	42	33.0	21.5	27.3	8.0	16	11	32	20	5	41.0
1838, Jan. 5 to Feb. 23	50	32.9	24.9	28.9	4.0	9	13	31	19	5	50.0
1855, Jan. 10 to Feb. 25	47	34.8	24.5	29.7	11.1	12	4	31	15	7	48.0
1860—61, Dec. 15 to Jan. 19	36	34.9	24.8	29.9	8.0	8	3	26	9	4	47.0
1879, Nov. 14 to Dec. 27	44	37.2	24.7	31.0	13.7	4	2	22	6	12	55.0
1881, Jan. 7 to 26.....	20	31.8	22.1	27.0	12.7	10	9	14	12	1	41.0
1890—91, Nov. 25 to Jan. 22 { London) Blofield)	59	33.5	25.0	29.3	12.0	10	10	41	27	9	44.0
	59	35.0	24.5	29.8	7.2	14	4	41	16	7	43.8

*The frost of 1788—89 has been included, as it occurred but little more than 100 years ago. The temperatures, however, are not from self-registering thermometers, but the observations used as the maximum were made at two p.m., and those for the minimum at eight a.m. each day. The observations for all other periods are from self-registering thermometers. The above table is compiled from observations made in London and its vicinity, with the addition for 1890—91 of the Blofield temperatures for comparison.

VIII.

NOTES ON A NORFOLK SPECIMEN OF THE RED-BREASTED FLY-CATCHER (*MUSICAPA PARVA*).

By F. Menteith Ogilvie, F.Z.S.

(Communicated by J. H. Gurney, F.L.S.)

Read 24th February, 1891.

The fact that this bird is new to the Norfolk list is perhaps sufficient apology for the following short paper. It has seemed best to commence with a description of the specimen and then add such notes as might be of interest to the Norfolk and Norwich Naturalists' Society.

Red-breasted Fly-catcher, ♀ adult. September 13th, 1890.

Weight, 4.3 drs. *Length*, $5\frac{1}{8}$ in. *Wing*, $2\frac{11}{16}$ in. *Tail*, $1\frac{7}{8}$ in. Beak, $\frac{3}{8}$ in.; tibia, $\frac{13}{16}$ in.; tarsus, $\frac{11}{16}$ in.

Mandibles: upper, dark brown colour; lower, ditto, lighter towards the base. *Irides*, blackish-brown. *Legs* and *Toes*, black. *Cheeks*, ashy-brown. *Crown*, *nape*, *back*, and *wing-coverts*, mouse-colour. *Primaries* and *secondaries*, shade darker, with paler margins. *Chin*, *throat*, and *flanks*, warm buff; a faint transverse line between throat and upper breast. *Belly* and *under tail-coverts* white, the latter faintly tinged with buff. *Upper tail-coverts*, mouse-colour above, lower feathers black tipped with wood-brown.

Tail, twelve feathers. Basal portion of four outer feathers on either side white (except part of outer web of outer feathers and

inner web of fourth feather, which are nearly black); four central feathers (and apical portion of other feathers) dark brown or black.

By dissection— ♀ ; *ovary* large and well defined (no ova visible on examination with a lens).

Crop, empty. *Stomach*, containing large quantity of insect remains. These were very kindly examined for me by Mr. James Edwards, F.E.S., of Norwich, and proved to consist mainly of Earwigs; there were also fragments of two species of ground Beetles (*Dyschirius globosus*, *Dichirotrichus obsoletus*) and of an homopterous insect, *Acocephalus nerosus*.

These notes were taken a few hours after death. Mr. T. E. Gunn, F.L.S., dissected the bird before me, and I am also indebted to him for verifying my description and measurements and for other assistance.

This Fly-catcher I shot on the beach at Cley-next-the-Sea, September 13th, 1890. I flushed it two or three times from "the Scrub" (as the Sea-blite which covers the beach there is called) before I was able to secure it, following it for about five minutes. It uttered no note during this time. Its flight was graceful and buoyant, and always at some height from the ground, differing in this from the other birds I saw in the scrub, chiefly warblers (Willow Wrens, Chiffchaffs, &c.), which flew very low, and were flushed with some difficulty from their hiding-places.

During the week ending September 13th the weather was very fine, with hot sun and light wind, mostly from the west and north-west; on the 13th wind was east at daylight, then north-east, going round to south in the afternoon.

The descriptions of this Fly-catcher in our latest ornithological text-books are not remarkable for their accuracy. In the fourth edition of Yarrell (Professor Newton), p. 228, the tail is said to consist of ten feathers in place of twelve; and Mr. Saunders, in his lately published Manual, p. 154, while he describes the tail as of twelve feathers, states that they all have conspicuous white bases, except the central *pair* which are black. In this specimen the four outer feathers on either side have more or less white on their basal halves, but the *four* central feathers are black. Mr. Sharpe [British Museum Catalogue, vol. iv. p. 161] perpetuates the same error, "two centre tail-feathers dark brown, the remainder

for the greater part white." Mr. Saunders gives the length of this species as 4½ in., in this specimen it reached fully 5 in. (5⅛ in.).

Unfortunately this bird was obtained too late to be included in the body, or rather the appendix, of the lately published third volume of the 'Birds of Norfolk;' but Mr. Southwell has inserted a short note on p. xiii of that work recording the capture of this bird, and I should like to break a lance with him concerning the statement he makes therein. Mr. Southwell says: "An example of this pretty little Fly-catcher, which proved to be an immature female, was shot," &c. By "immature" female I presume Mr. Southwell means a bird of the year, and I am entirely at a loss to know on what grounds the "proof" of its immaturity rests.* Neither its feathers, toes, or claws, the usual outward signs of immaturity, nor the appearance of the ovary, support his view. The feathers are those of a newly moulted adult, as a comparison with the large series of skins in the British Museum will show, and the well-formed toes and long sharp curved claws are altogether opposed to the supposition that it is a bird of the year. It may be said that the paler edgings to the wing-coverts and secondaries are a sign of immaturity; but these paler margins to the feathers are found in the adult ♀, as has been shewn by Gould in his figure of this Fly-catcher ('British Birds,' vol. ii.), and as described by Sharpe (British Museum Catalogue, vol. iv. p. 162), "*adult female* . . . wings brown; greater coverts and quills with edgings of lighter brown."

It is, of course, possible that the specimen may be a bird of the second year, as the difference between a second year's bird and one of greater age seems hardly perceptible, but I cannot believe it is a bird of the year. Both at the British Museum and Zoological Society, where I exhibited this specimen, it was held to be undoubtedly adult; and, backed by such strong authority as this, I have less hesitation in putting forward my own view so confidently.

* See page 202.

IX.

NOTES ON SOME RARE BIRDS OBTAINED IN NORFOLK IN THE YEAR 1890—91.

By Thomas Southwell, F.Z.S., *Vice-President.*

Read 24th February, 1891.

My purpose in what follows is not so much to dwell on the remarkable spell of severe weather, which, commencing with a heavy snowstorm from the north-east on the 25th November, 1890, continued, with one very brief intermission, till the 22nd January, 1891, and of which Mr. Preston has given us so complete a history; or, of the effects produced by such a long continuance of extreme cold upon the birds of this district, although they were sufficiently remarkable to be worthy of being recorded in our 'Transactions,' but rather to put on record some of the rare species, of which quite an exceptional number have come under my notice since the close of the Society's last year, in March, 1890. I may, however, say in passing, that the long continued cold had a most disastrous effect upon such species of land birds as were overtaken by it. Just previous to the 25th November, very extensive movements of small birds were observed, which soon, however, passed on; large flocks of Snow Buntings and Shore Larks passed along the coast; the Fieldfares very quickly left us, followed by the Redwings, which rapidly exhausted the hedge-row berries; and soon the Thrushes followed, leaving piles of broken snail-shells at their feeding-stones, and few have hitherto returned; the Mistletoe Thrushes suffered very severely, and many of them perished; and the same may be said of those useful birds the Barn Owl. The Rooks were very hard pressed,

and even Gulls along the shore, in many instances, fell victims to starvation; so hard were they pressed for food that many Black-headed Gulls, and a few *Larus canus* were taken in clap-nets on the North Denes at Yarmouth, near a spot where refuse had been deposited. Mr. George Smith, of Yarmouth, informed Mr. Gurney that he alone had about a hundred and fifty of these birds brought to him that were thus obtained, and that in one instance so many were enclosed in the net that, on rising, their united power threw back the flap of the net, and they escaped. The Starlings seem to have braved the cold and scarcity of food as successfully as any species; and in my small garden at Chapel Field, where there is always abundance of food of various kinds placed for the extraordinary variety of birds which visit us with more or less regularity, on one particular occasion thirty-six Starlings were counted, partaking of the food placed for them. The pleasure of watching the ceaseless activity of the mountebank Tits, the demure little Hedge Sparrows, the tamest of all our visitors, the pert, enquiring Robins, and above all the awkward, uncouth, greedy, but beautiful-plumaged Starlings, afforded us an infinite fund of amusement, and amply repaid the trifling cost and trouble of administering in some degree to their wants.

Of water-birds, the most conspicuous were the Swans, of which a considerable number of both the Whooper and Bewick's occurred, also numbers of Brent and Bean Geese, and many beautiful examples of the Shield Duck, whilst Smews were more numerous than probably in any year since the spring of 1861. Certainly over thirty of these birds must have been procured in this county, a large proportion of which were fully adult males and females; and towards the end of December very many Dunlins and Sea Ducks were procured at Yarmouth. Bitterns and Kingfishers had a hard time of it, several of the former having been killed, and a large number of the latter, whilst many Herons, most of them in very poor condition, were received by our local bird-stuffers. On the 17th December, in the midst of the severe weather, Mr. Edward Birkbeck heard a Snipe drumming most vigorously on the sewage farm at Bixley, the temperature then being exceedingly low; and on January 8th, Mr. Gurney tells me an Oyster-catcher, still in summer plumage, with a good black-throat, was shot at Palling.

Red-breasted Fly-catcher (*Muscicapa parva*). On the 13th September, 1890, Mr. F. M. Ogilvie was shooting in the "Scrub" on the beach at Cley-next-the-Sea, a locality which has produced so many rare autumn migrants, when he was so fortunate as to procure a female of this pretty little Fly-catcher, a species new to the Norfolk fauna (P.Z.S., 1890, p. 616). I regret that in the 'Birds of Norfolk' I referred to this bird as an immature female, it was so reported to me, and on the only brief opportunity I had of seeing the bird I did not examine it with a view to determining its age. Mr. Ogilvie (see page 199) tells me it is certainly in mature plumage; and I take this opportunity of correcting my former statement, the only excuse for which is, that I had to stop the press to enable me to include it at the very last moment; but I ought not to have committed myself to the statement without verification.

Lapland Bunting (*Calcarius lapponicus*). On January 12th the 'Eastern Daily Press' announced the capture of a Lapland Bunting at Lowestoft, and on the 19th another was taken at Yarmouth, which Mr. Gurney saw at Mr. Lowne's shop. Both of them were caught by birdcatchers.

Bustard (*Otis tarda*). A small migratory flock of these birds appear to have visited England this winter, of which one was killed in Wales, one in Essex, one in Hampshire, one in Wiltshire, one in Sussex, one in Norfolk, and another in Suffolk. Of the latter, which was procured in Mildenhall Fen, some four miles from the Norfolk boundary, the Rev. Julian Tuck has given us full particulars which will be found at p. 209. The Norfolk bird was found on the 19th of January, 1891, dead, in a road leading from Stiffkey Windmill to the salt marshes, and about a mile and a half from the sea. It had been previously shot at, and evidently died of its wounds. It was taken to Mr. Bell, and by him forwarded to Mr. T. J. Mann, of Hyde Hall, Sawbridgeworth, who unfortunately found it in too advanced a state for preservation, and only the wings and sternum were saved. It proved to be a female, weighing eight and a half pounds, in very fair plumage, and measured fifty-nine inches from the carpal point to the end of the longest quill-feather. It is worthy of note, that so far as I have been able to learn, all the examples met with in the past winter—seven in number—have been females.

Caspian Plover (*Ægialitis asiatica*). On the 23rd May, 1890, I received from Mr. Lowne, of Yarmouth, the fresh skin of a full-plumaged male of this species, which had been killed on the previous day on the North Denes at that place, and which he sent to me for determination. When killed it was accompanied by a companion of its own species, presumably a female, which escaped, and was no more seen. Full particulars with regard to this interesting occurrence will be found in the 'Birds of Norfolk,' vol. iii. p. 382.

Pectoral Sandpiper (*Tringa maculata*). This New World Sandpiper was first made known as an accidental straggler to our shores by the occurrence of a female specimen on or near Breydon on the 17th October, 1830. This remained for some years in the collection of the celebrated J. Harvey, of Yarmouth, where it was discovered by Mr. J. D. Hoy, and sent by him to Audubon, who was staying in London, and who pronounced it to be an example of *Tringa pectoralis*. Mr. Hoy recorded it in the 'Magazine of Natural History' for 1837 (new series, vol. i.), p. 116. A second specimen was obtained in the same neighbourhood on 30th September, 1853 ('Zoologist,' p. 4124); a third, which passed from Mr. Stevenson's collection into the Norwich Museum, at Caister, on the 16th September, 1865; and a fourth, now in the Lynn Museum, was netted in Terrington Marsh, near that town on 9th January, 1868. The next Norfolk specimen was shot on the banks of the Bure, close to Yarmouth, on 8th September, 1887, and is now in the collection of Mr. R. W. Chase, of Edgbaston ('Zoologist,' vol. 1887, p. 433); and finally, in September of the past year, three others (making eight in all) were killed near the same spot. The first was shot on the 9th September, 1889, and the other two on the 12th and 13th of the same month. Through the kindness of Mr. B. Dye and Mr. Lowne, I had the opportunity of examining these three birds, the first in the flesh and the other two shortly after they were set up. On comparing these with each other, and with two specimens in the Norwich Museum, I was much struck with the great disparity in size, and this was not characteristic of age or sex. Mr. Stevenson's bird, which showed greater signs of maturity than either of the other Norfolk specimens, measured in the flesh 200 mm. in total length, whilst two immature examples, the

first a male, and the second a female, measured 227 and 221 mm., respectively. In a series of measurements of twelve individuals, collected from various sources, the wing from the flexure to the end of the longest quill-feather, varied from 127 mm. to 146 mm., the bill from 25 to 32 mm., and the tarsus from 24 to 32 mm. A young male, which I measured in the flesh, agreed precisely with the measurements given of a bird of the same sex by Macgillivray in his 'Manual.' A very remarkable feature in this bird during the breeding season, which, owing to the few opportunities naturalists have enjoyed of observing it at that time, appears to have been till recently imperfectly known, was, I believe, first observed by the late Surgeon Adams, a native of the adjoining county of Suffolk, who served as surgeon and naturalist on board the "Investigator" in the Arctic Seas in 1848—49, and again in the same capacity in 1849—55 on board the "Enterprise," and had exceptional opportunities of observing the birds of Berings Straits. Many of his drawings, made during the latter voyage, came into the possession of the British Museum, others were presented to Mr. G. R. Gray and Mr. Gould. On the 29th May, 1859 (P.Z.S. for that year, p. 130), Mr. Gray laid before a meeting of the Zoological Society a drawing of *Tringa pectoralis* by Mr. Adams, which "exhibited the bird in the act of having inflated its throat and breast in the manner of a pouter pigeon." Mr. Gray had little doubt, from the correctness of his other drawings, "that Mr. Adams observed this singular phenomenon in the specimen from which the drawing was made."

Mr. E. W. Nelson, who visited Alaska and the islands in Berings Straits, in the "Report upon the Natural History Collections" made by him between the years 1877 and 1881, published by the Washington Government, gives a coloured illustration of this bird, showing this remarkable inflation of the throat, and thus remarks upon its singular habits: "The night of May 24th I lay wrapped in my blanket, and from the raised flap of the tent looked out over as dreary a cloud-covered landscape as can be imagined. The silence was unbroken, save by the tinkle and clinking of the disintegrating ice in the river, and at intervals by the wild notes of some restless loon, which arose in a hoarse reverberating cry, and died away in a strange

gurgling sound. As my eyelids began to droop, and the sense to become indistinct, suddenly a low, hollow, booming note struck my ear, and sent my thoughts back to a spring morning in Northern Illinois, and to the loud vibrating tones of the prairie chickens. Again the sound arose nearer and more distinct, and with an effort I brought myself back to the reality of my position, and, resting upon one elbow, listened. . . . Once again the note was repeated close by, and a glance revealed its author. Standing in the thin grasses, ten or fifteen yards from me, with its throat inflated until it was as large as the rest of the bird, was a male *A. maculata*. . . . The note is deep, hollow, and resonant, but at the same time liquid and musical, and may be represented by a repetition of the syllables tōō û, repeated eight times. Before the bird utters this note, it fills its œsophagus with air to such an extent that the breast and throat is inflated to twice or more its natural size, and the great air sack thus formed gives the peculiar resonant note" (p. 108). In fact the amatory performances of this bird seem to rival those of the Ruff, for Mr. Nelson says "he crosses back and forth in front of the female, puffing his breast out and bowing from side to side, running here and there, as if intoxicated with passion." I trust I may be excused this quotation as I am not aware that this singular, perhaps unique, inflation, and the remarkable breeding habits of the Pectoral Sandpiper had previously been put on record, or even, except in the case of Mr. Adams, observed.

King Duck (*Somateria spectabilis*). In our last year's 'Transactions' (p. 58) I was able to record the undoubted occurrence in this county of a young male King Duck, which was killed at Hunstanton in January, 1888. Through the kindness of Dr. Whitty I have since had the opportunity of examining in the flesh two other specimens of this bird, both killed in the same locality as that first mentioned. On the 3rd November, 1890, a young female, and on the 15th of the same month an adult female were sent me by Dr. Whitty, to be preserved for him. When shot both were in company with Scoters.

Whiskered Tern (*Sterna hybrida*). We are indebted to the Rev. Julian G. Tuck for the discovery of a second Norfolk specimen of this rare accidental visitor. On a visit to Newmarket in February last, he observed it in the shop of Mr. Howlett of

that town, who stated that he had received it with other Terns, early in October, 1890, from the neighbourhood of Dersingham, between Lynn and Hunstanton, but was not aware until informed by Mr. Tuck that he possessed such a rarity. The latter gentleman's determination of the species was confirmed by Mr. Harting. Mr. Howlett tells me that this bird has passed into the possession of the Honorable Walter Rothschild, of Tring Park.

Fork-Tailed Petrel (*Procellaria leucorrhoa*). Although not an excessively rare bird with us, the Fork-tailed Petrel is quite sufficiently so to render its occurrence worthy of record, and I was very pleased to receive a specimen in the flesh from Mr. B. Dye, of Great Yarmouth, who was kind enough to send it for my inspection. It was killed near the North Battery, on the 6th January, 1891. A list of all the Norfolk examples of this bird with which I am acquainted will be found in the 'Birds of Norfolk,' vol. iii. p. 370.

X.

SOME ADDITIONS TO THE NORFOLK AND NORWICH MUSEUM IN THE YEAR 1890.

By Thomas Southwell, F.Z.S., *Vice-President.*

Read 24th February, 1891.

It is impossible to record the progress of an Institution in which he was so deeply interested, and to which for so many years he has proved such a liberal benefactor, without one word of regret for the irreparable loss which has fallen upon it, during the past year, in the death of its respected President, Mr. J. H. Gurney. For how long a time the Museum has been indebted to Mr. Gurney, and to what extent, I cannot do better than quote the following

passage from the Annual Report; and how great the loss sustained by ornithologists at home and abroad by his death, our President has endeavoured to express in his address; but to the loss sustained by those who were associated with him, and enjoyed the privilege of his friendship, it would be vain to attempt to give expression.

"In the year 1853," says the report, Mr. Gurney, "in a letter dated December 1st, and addressed to the then Secretary, Mr. Harper, his object is thus stated :—

"'With regard to the Ornithological department, I am endeavouring to make a complete collection of all the Raptorial birds, and I trust the Members will agree with me that if this can be effected, a complete series of even a single order of birds will be a feature in the collection of considerable interest and value. I am happy to say that we have already made some good progress in this enterprise, and to add that I expect to receive specimens of about thirty additional Raptorial species between this time and the end of the month.'

"Since this letter was written how immensely the collection has been increased is well known to all lovers of the Museum, and it is equally well known that it is to Mr. Gurney it is indebted for the chief part of this increase. It is not too much to say that Mr. Gurney's contributions amount altogether to the large number of nearly four thousand specimens of birds of prey alone."

Two Owls, new to the collection, have been received during the past year, namely, *Bubo pacificus* and *Scops kennicotti* from British Columbia, both obtained by exchange, through the late President; and a second specimen of the latter, also from British Columbia, was subsequently obtained and presented by him.

No new species of Diurnal Raptor has been added to the collection, but a second specimen of *Æsalon suckleyi* has been obtained through Mr. A. C. Brooks, from Chilliwack, British Columbia; this species was first represented in the Museum collection last year, and its acquisition was a matter of considerable satisfaction to Mr. Gurney. Colonel Feilden has presented a specimen of *Tinnunculus caribbæarum*, and its eggs, from the island of St. Lucia, and *Hierofalco candicans* from Hudson's Bay; two skins of *Bulaca leptogrammica* from Baram, Sarâwak, collected and presented by Mr. Charles Hose; and three specimens of

Accipiter francesi from Madagascar; *Baza verreauxi*, and a large number of other Raptores from Mr. J. H. Gurney and others, including nestlings of *Athene noctua* and *Bubo maximus*, the latter bred at Northrepps.

Of British Birds the most noteworthy are a beautiful male specimen of the Caspian Plover (*Ægialitis asiatica*), killed at Yarmouth on 22nd of May, 1890, and presented by subscription; two fine specimens of *Cygnus immutabilis*, handsomely cased, which were killed at Wroxham in 1878, presented by Mr. J. J. Colman, M.P., and a nestling of the same bred at Northrepps, from Mr. Gurney. Mr. Colman has also presented a large case, containing a very fine male *Cygnus olor*, which is known to have lived at Trowse for about sixty years, and which of late became so pugnacious that it was found necessary to kill it.

Of Fishes Mr. Patterson has contributed specimens of the Ocean Pipe-fish (*Syngnathus æquoreus*), Power Cod (*Gadus minutus*), and Müller's Topknot (*Rhombus hirtus*), all new to the county, besides several others of considerable interest.

Among the additions to the Conchological collection should be mentioned a series of specimens of *Hydrobia*, including a new species *H. Jenkinsi* from Essex, presented by Mr. A. J. Jenkins; also the reversed form of *Helix nemoralis* var. *hortensis*, found by the donor, Mr. J. Chittock, at Lakenham, near Norwich. Some interesting specimens to the other departments have likewise been received.

Books do not quite come within our province, although considerable additions have been made in this department; but a valuable and interesting donation made by the family of the late Mr. Stevenson, who was for so many years Honorary Secretary to the Museum, cannot be passed over without mention. It consists of fifteen diaries and nine quarto volumes of MS., containing his Ornithological Notes between the years 1850 and 1888, the last entry being dated only a few days before his death. It is impossible to estimate too highly the value of this long-continued record of the ornithological events of the county, which contains not merely brief notes, but often observations of great interest and critical remarks on species, variations of plumage, and other subjects, as well as records of many a field-day which contributed to the intimate knowledge of birds in their haunts for which

Mr. Stevenson was so remarkable. In placing this memento of their late father in the Norfolk and Norwich Museum, which had for so many years been the object of his constant and unremitted care, his family may feel assured that they have made the disposal of his journals which would above all others have been most in accordance with his wishes.

XI.

NOTE ON THE GREAT BUSTARD IN SUFFOLK.

By Rev. Julian G. Tuck.

Read 24th February, 1891.

On Saturday, the 7th of February, my attention was called to a letter in 'The Standard' of the day, from Mr. Howlett, the well-known Newmarket fisherman and bird preserver, to the effect that a female Great Bustard (*Otis tarda*) had been shot in Mildenhall Fen on the 5th of February.

"The fenman that shot it," says Mr. Howlett, "had not the slightest idea what it was, and had I not happened to have seen him as he was carelessly carrying the bird along, and at once secured it, no doubt it would soon have been skinned or plucked and eaten, and thus lost sight of. The bird is now in my possession."

Unfortunately I saw the paper too late to be able to get over to Newmarket the same day, and on Sunday of course it was impracticable, but Monday morning saw me *en route* for Newmarket. I just missed seeing and handling the bird in the flesh; for when bought by Mr. Howlett it was in such a condition from

fen-mud and blood, that it was thought unadvisable to keep it for more than two nights without skinning and cleaning it. From the shot marks visible in the skin it was easy to imagine that considerable cleaning had been required, as the bird had been first winged, then chased, and finally shot in the neck at a short distance. One or two fenmen saw it in Mr. Howlett's possession, and were greatly perplexed as to what it might be; one suggested a Stork, another a Bittern.

The body had been cooked, and Mr. Howlett very kindly invited me to taste it, adding that probably I should never taste another Bustard shot in the county. In colour and taste the flesh reminded me of Welsh mutton. On the day the letter appeared in 'The Standard' over-one hundred callers came to see the bird, and the number of letters received has been very large; offers to purchase it have been numerous; and at least one would-be possessor has offered a sum which would purchase a good carriage-horse, but the owner has not yet decided to part with his prize. Like the other four Great Bustards recorded in 'The Field' as obtained during this winter in Essex, Hampshire, Sussex, and Norfolk, this example was a hen bird; but the weight recorded in 'The Standard' (18 lbs.) was a mistake in the printing, it should be 13 lbs. It is many years since a Great Bustard was obtained in the county, possibly not since the indigenous race disappeared.

Dr. Babington in his 'Birds of Suffolk' (pp. 112, 113) mentions a Bustard said to have been shot at Norton about 1850, and presented to the Queen. With regard to this bird, Mr. Southwell writes me that Mr. Bilson, of Bury, remembers seeing it at Clarke's, the Bury fishmonger, in Abbeygate street, to whom the landlord of the Norton "Dog" had sent it to be packed and forwarded as a present to the Queen; and that it certainly was not a Bustard, but "a Turkey gone wild," and he was amused at the idea of sending such a present to Her Majesty. I have not the least doubt that Mr. Bilson, who was well acquainted with Bustards, was perfectly correct in what he says. Norton joins our parish, and my father, then in the prime of life and a keen sportsman, shot up to the Norton boundary; I never heard him mention the circumstance, nor is there any note in his 'Yarrell.' Moreover the gentleman on whose authority the occurrence is mentioned did not come to reside in the neighbourhood till 1855. In conclusion, I may add that

Mildenhall Fen, where the Bustard was shot, is in the north-west corner of Suffolk, within an hour's walk of the Norfolk boundary; so it is quite probable that this unfortunate bird passed some of its last days or hours in the county of Norfolk, hence this note to the Norfolk and Norwich Naturalists' Society. Mr. Howlett has since informed me that this bird was purchased of him by the Honorable Walter Rothschild, of Tring Park.

XII.

NOTES ON THE HERRING FISHERY OF 1890.

By Thomas Southwell, F.Z.S., *Vice-President.*

Read 31st March, 1891.

The past season has illustrated another phase of the ever-varying nature of the Herring Fishery of the east coast, and goes to prove that the paying character of the voyage is almost in inverse ratio to the number of fish taken, for, with a return of eight or nine thousand lasts less, the season of 1890 has been a fairly paying one as compared with those of the two previous years with their much larger catches. And this applies to all concerned, with the exception of the labourers who handle the fish on shore, under which heading (counting, carting, "riving," packing, &c., amounting in all to about thirty shillings per last) some £13,000 less has been expended at Yarmouth alone; but this sum has undoubtedly been saved to the catchers and curers, who have not been called upon to pay for handling unprofitable produce.

At Lowestoft a few fish were landed in February, but the

spring voyage, which was very active in March and April, closed in May with a total of 694 lasts, compared with 1864 lasts in the corresponding season last year. The spring voyage from this port is spoken of as dull in the extreme and the prices ruinous: the highest boat is said to have made only £100, and the lowest not half that amount for eight weeks' hard work. It is an open question whether it would not be better to discontinue this spring fishing; the quality of the fish, which are immature, being simply wretched and valueless, except for bait. By many it is thought that these spring Herring, if left till June and July, would largely augment the midsummer catch, when they would have arrived at maturity, and be of the same excellent quality which characterises the fish taken at that season. This is denied by others; but it is useless to hope for impartial evidence until some properly constituted authority has thoroughly investigated the matter. This will never be done by the "practical men," whose whole time is occupied in earning an often scanty livelihood, and is one of the many problems which can only be solved by scientific experts, such as do so much excellent work in connection with the Scottish Fishery Board.

June and July produced 379 lasts, and prices were very good, so that this portion of the voyage appears to have been exceptionally satisfactory. In August and September very few Herrings are landed at Lowestoft, and the autumn voyage, which may be said to commence in October, went on fairly all through that month; but early in November came, first light winds, which kept the boats at sea, followed towards the end of the month by north-east gales, which prevented many of the boats from leaving the dock, and deprived them to a great extent of the advantage of the November moon. The total result of the autumn voyage was 6381 lasts, against 10,050 last year, and there were, as usual, great fluctuations in value; but on the whole prices averaged fairly well, and the nett results of the voyage appear to have been satisfactory. The total catch of the year at Lowestoft was 7583 lasts, as compared with 13,098 lasts in 1889. The number of boats employed in the autumn voyage was 173 Home and 87 Scotch, manned by 1730 and 670 men and boys respectively.

At Yarmouth the spring Herring fishery produced only about 104 lasts, a much smaller number than in the two preceding years,

and probably for that reason those who were successful in falling in with the fish obtained a ready sale at remunerative prices. June and July also produced a few fish; these were of the usual good quality of the midsummer Herrings, and sold well. But most of the fleet are busy at this time fitting out for the North Sea voyage, and little is done by the Yarmouth boats. August and September produced 2654 lasts, and then commenced the all important autumn voyage.

Large numbers of Scotch boats, hailing from Montrose, Banff, Leith, Peterhead, Aberdeen, Wick, and Berwick, with others from Hartlepool, Shields, Ferryden, &c., make use both of the ports of Yarmouth and Lowestoft; but they are, as a rule, smaller boats, carrying fewer hands and not so expensively equipped as the home boats. The result is that they take fewer fish. But, as their expenses are considerably less than those of the home boats, they will make a fair profit on their catches, when our men are actually losing money. They also watch the weather, and as they do not go so far afield, but land all their fish fresh, they always have the pick of the market. From the first, fish came in slowly, and, in consequence, sold well, the quality, too, being all that could be desired. On the 20th of October a few Herrings, brought in by a mackerel boat, are said to have realised at the rate of fifty guineas a last, while the next day small "bloater stuff" produced £13 15s., and larger £28 10s. per last; but these were, of course, exceptional prices. Then came bad weather which interrupted the fishing and confined the Scotch boats to port; but this was only temporary, and the week ending November 5th saw 2243 lasts landed, one day only (31st October) producing 836 lasts, the largest quantity on any one day of the season. All these fish, more than eleven millions, were counted, in handfuls of four, in one day! This was a red-letter day for the labourers, who had hitherto fared but badly. Prices varied considerably, but were fairly remunerative.

With the November moon should come the finest catches of Herring during the whole season. This event came in on the 12th, the moon being at the full on the 26th, but unfortunately it was attended on and after the 17th by dull, foggy weather, to which, on the 25th, gales of wind with rain and snow had to be added, commencing the memorable spell of severe weather which lasted

till the 22nd of the following January, and either keeping the boats at home, or protracting their voyages so as greatly to detract from the value of the fish when landed. Fresh fish thus brought very high prices; but, unhappily, only a few of the larger vessels could face the weather. After 23rd November the Scotch boats, with two or three exceptions, remained in port, waiting a lull in the weather to take their way homeward. Two Leith steamboats brought in ten lasts between them on 1st December, and on the 4th three of these boats made a final trip for a total of only two lasts. Till the end the catches were fair, some of the boats coming in heavily laden, and the prices ruled high for fish of good quality, £10 to £16 often being paid for salt fish, and from 2/- to 4/2 per 100 for fresh. The total of the autumn voyage amounted to 11,701 as against 19,631 lasts in 1889. Of these 3509 were taken by the Scotch boats.

The total produce of the year's Herring Fishery at Yarmouth was 14,554 lasts, compared with 23,905 lasts; and at Lowestoft 7583 lasts, compared with 13,098 lasts in 1889, a falling off between the two years of 14,867 lasts, or more than the produce of the whole of the past year's fishery from the port of Yarmouth.

In the past season at Yarmouth for the first time the returns of the Scotch have been kept distinct from those of the home boats; it will thus be seen that the 150 Yarmouth boats landed 11,000 lasts, or an average of 73 lasts each, and as the average price may be taken at £10 per last, the gross return would be £730 per boat; deducting from this the outgoings for wages, provisions, harbour and wharf dues, salesmen's commission, sail-maker, &c., insurance, and wear and tear of nets (the last a very considerable item, say thirty-three per cent. on a fleet of nets which costs £400, and is only calculated to last three years), the expenses will amount to at least £420, or say £6 per last, leaving a profit of say £300 per boat; by no means an excessive return, taking into consideration the risky nature of the business, and the capital employed, which at £900 for boat, and £400 for nets, would be about £1300. Of course it is needless to say that many of the boats secured far larger returns than others, but I believe there were much fewer actual losers than in the previous two years.

The quality of the fish during the past season may be considered to have been good; and, as there were none of those tremendous catches of previous years the Herrings were better handled and landed in good condition, which ensured a better price. The absence of the disturbing "gluts" of former years also tended to equalise prices, which were not subject to the violent extremes so often witnessed of late. The result is that both catchers, curers, and salesmen have had a moderately fair season; but, as I said before, the labourers have suffered severely from the greatly decreased numbers of fish which they have had to handle. This falling off in the amount of wages paid, as compared with the season of 1889, represents, in Yarmouth alone, a sum of about £13,000. The only other sufferers were the carriers. The chairman of the Great Eastern Railway, at the half-yearly meeting of the Company, stated that the falling off in the receipts for carriage of Herrings was ten or twelve thousand pounds.

From the point of view of the merchant, a friend, who has had considerable experience in this branch of the trade, writes: "The demand has been fairly good, but I must confess not so good as I had anticipated, considering the scarcity; this was doubtless caused by the higher prices required. The business with the German markets this year has been of a very limited character. There might, I think, have been more had the Herrings been cheaper, but the returns, what few there were, did not pay; those from the Italian markets, I think, should yield a profit, but not what I expected. The demand has been fair, at moderate prices, but if I again use the term 'moderately fair,' I do not think I can better express the result of the Yarmouth fishing for 1890, and I am of opinion that two or three years with a similar result, would put the fishing industry in its proper condition, that is to say, there would not be sufficient inducement for capitalists to embark in the venture; on the other hand there would be sufficient for those who can manage to work their own capital economically."

In conclusion, as this completes the tenth year of these imperfect notes, and will probably be the last, I should like to append a few general observations. I fear that my notes have been, on the whole, of a very commercial character, but after

twenty years watching the reports of the Herring voyages, I have learned singularly little else, and I believe my statistics, such as they are, are the only ones published. From time to time I have called attention to the lamentable ignorance which exists with regard to all that it seems so desirable we should know as to the habits, food, distribution, and reproduction of these valuable fish; the causes which govern their movements, the influence of temperature in expediting or retarding their approach to the coast; the much vexed question of the spring fishery; whether it is desirable to commence the autumn fishery always on the same date; or if it would be to our advantage, occasionally, to defer the voyage till the fish were in finer condition, or the weather more suitable for handling them; the all important question of the size of the mesh in the nets used; and the not less serious questions of over-production, and the utilisation of unsaleable fish, with a view to prevent the waste which follows, in some seasons, the too frequent gluts, when many tons of valuable food fish have been cast back into the sea, or spread in a crude state on the land for manure, as well as the utter absence of any competent authority to collect information on these and many other important points connected with this great industry. With such admirable examples before us as the Scotch Fishery Board and the United States Fishery Commission, this is really lamentable, and it behoves the Fishery Department of the Board of Trade to justify its existence by at once taking steps to remove such a reproach.

The figures previous to the opening of the Yarmouth and Lowestoft Fish Wharfs, the former in 1867, are, I believe, not much to be relied on, but looking back over the past twenty years, 1871, 1873, 1883, 1884, 1886, and 1889, have been the most productive. Taking successive periods of five years, they have averaged as follows: for the period ending 1875, 27,154 lasts per annum; 1880, 21,240 lasts; 1885, 28,537 lasts; and 1890, 30,184 lasts. The average annual return for the first decade has been 24,199 lasts, and for the second 29,360 lasts; while the annual average over the whole period, from such figures as I have been able to obtain, has been 26,780 lasts per annum. Estimating the weight of each last of Herring to be one and three-quarter tons, and the value at only £6 per last, the total annual contribution to the food supply of the nation by this branch of the great harvest of the

sea, on the coasts of Norfolk and Suffolk alone, amounts to the enormous weight of 46,865 tons, of the value of £160,680 each year. During the past ten years, only three, 1881, 1883, and 1887, can be said to have been really good years; 1885 and 1890 were fairly paying years; and 1882, 1884, 1886, 1888, and 1889, although all productive above the average (with the exception of 1882, which was very disastrous to life and property), have been black-letter years to masters and men alike.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1890.

		Yarmouth.			Lowestoft.		
		Lasts (13,200).	Thousands (1320).	Hundreds (132).	Lasts (13,200).	Thousands (1320).	Hundreds (132).
Spring	January	—	—	—	—	—	—
	February	—	—	—	4	1	—
	March	50	1	3	266	2	2
	April	51	7	4	329	—	3
	May	2	3	8	94	8	7
Mid-Summer	June	64	5	7	129	9	5
	July	29	7	6	249	4	5
North Sea	August	556	5	9	52	9	3
	September	2098	1	—	75	4	2
Autumn Home Voyage	October	5164	1	2	3018	7	1
	November	5124	9	6	2418	7	8
	December	1412	—	9	943	9	3
		14,554	4	4	7,583	4	2
		7,583	4	2			
		22,137	8	6			

Since the above was written, at a meeting of the Yarmouth Town Council, held on the 14th April, 1891, a Committee was appointed to "consider and report upon the present state of the fishing industry, as carried on at that port." In the course of the discussion Mr. Norford Suffling, one of the principal fish salesmen of Yarmouth, is reported in the 'Yarmouth Mercury' to have spoken as follows with regard to the Herring Fishery: "The cause of the failure of the Herring fishery was, to a great extent, the over abundant supply of fish. It might seem paradoxical, but it was nevertheless true, that the bigger the harvest of the sea was, as regards Herring, the bigger was the failure as regarded the catchers and others. There was a certain demand for salted Herrings, and

when the supply was in excess of that, prices fell to a ruinous figure. The Herring Fishing last year [1890] was short but profitable, and if the supply in the year before had not been so big, that also would have been successful. In addition to the large catch, the trade was subject to a very serious foreign competition, which generally lasted from November until April or May, and drove the good red Yarmouth Herring from the market. . . . The Yarmouth fishermen were, as a rule, extremely conservative as to the way in which they conducted their business, and were not easily moved out of their old groove. The Lowestoft men were beyond them in that respect, and were to a certain extent more enterprising. . . . His experience of the fishing people of Yarmouth was that though desirable changes might be pointed out to them, they, though admitting such might be advantageous, would not take any action to move out of the old ways. If that was a fault, it was a difficult one to remedy. He believed, however, that to a certain extent the disease would remedy itself in time. He was pleased to be able to say that not only was the last Herring voyage more successful than any which had preceded it for several years; but the trawl fishing for the past nine months had been exceptionally good, compared with what it had been for years previous."

XIII.

METEOROLOGICAL NOTES, 1890.

(From observations taken at Blofield, Norfolk.)

By Arthur W. Preston, F. R. Met. Soc.

Read 24th February, 1891.

January.

The month entered with a continuance of the seasonable winter weather with which December closed; but on the 5th a very decided change set in, and the weather was abnormally mild, stormy, and unsettled to the month's end. The mean temperature of the month was 4 degrees above the average, and with the exception of 1884, which gave a slightly higher mean, there had been no such mild January since 1877. The most notable feature of the month was the almost constant prevalence of high winds and disastrous gales, caused by frequent deep depressions skirting our north-western coasts, travelling rapidly in a north-easterly direction. The barometer, in consequence, was most unsteady throughout the month, but, with the exception of the 22nd and 23rd, no very low readings were obtained, owing to the great distance of the storm centres from these parts. The depression of the 22nd and 23rd, however, passed straight across England, and the barometer at 9 a.m. on the 23rd stood at 28.72 in.; at 2 p.m. it had fallen to 28.62 in., after which it rose with a rapidity almost unprecedented, rising 0.70 in. in seven hours, and an inch in twenty-four hours. This rapid rise was accompanied by a furious gale from the north-west, doing much damage by sea and land. The above reading of the barometer was the lowest noticed since the 8th December, 1887. The thermometer reached 50 degrees and upwards on nine days, and 45 degrees and upwards on twenty

days, a very unusual occurrence in January, and which did not occur even in the very mild January of 1884. The result of such high temperature upon vegetation was very apparent, and the earlier spring flowers made their appearance some weeks earlier than usual.

February.

This was an unusually dry month, slightly colder than the average, and with very little range of temperature, but 3 degrees colder than January. There were no very sharp frosts and no warm days, the thermometer not once touching 50 degrees. There was an unusual preponderance of easterly wind for so early in the season, and the month concluded with some very rough winterly weather. The barometer kept very high, being above 30 in. on every day but four throughout the month.

March.

The month entered with a spell of cold of abnormal severity, with driving snow-storms. On the 2nd the highest reading of the thermometer during the day did not exceed 28.4 degrees, an occurrence which had not happened for over seven years; and on the mornings of the 3rd and 4th the temperature in the screen fell to 18 degrees and 12 degrees respectively. On the latter date the exposed thermometer on the surface of the snow fell to 3.8 degrees. On the 5th the weather suddenly changed to mild again, which mildness was maintained to the close of the month. The respective mean temperatures of the first four weeks were 32.3 degrees, 45.4 degrees, 43.9 degrees, and 49.4 degrees, and the mean of the whole month was about 1 degree above the average; constituting the warmest March since 1884. The rainfall was excessive, chiefly owing to heavy rains on the 18th and 19th, and low-lying districts were flooded in many parts of the country.

April.

The first six days of April were cold and clear, with penetrating east winds. The second week was cloudy and ungenial, accompanied by hail, cold rain, and slight snow. An extraordinary hailstorm occurred at Norwich on the afternoon of the 12th; the hailstones were of great size, and lay on the ground nearly three

inches deep, giving the landscape the appearance of mid-winter. This storm was purely local. The latter part of the month was somewhat warmer, but throughout the month there was a remarkable absence of any really warm spring days, and the mean temperature was about 3 degrees below the average, thereby constituting the fifth cold April in succession. The month was very dry, the total rainfall being under an inch, a circumstance which has not occurred in April for many years past.

May.

This was a very fine month, with a large amount of bright sunshine, and warm, pleasant days, on many of which there was no cloud whatever. The mean temperature was in fair agreement with the average, but 2 degrees lower than May, 1889. The rainfall was also about the average, although the only heavy falls occurred on the 9th and 10th; the latter part of the month being very dry and parching. Thunder occurred in the second and third weeks.

June.

June was a showery and rather unsettled month, with some fine days intervening; but there were but few really warm days. The thermometer only exceeded 70 degrees on four occasions, and did not once touch 80 degrees. The mean temperature was 1 degree below the average. A great deal of cloud prevailed at times, and the humidity was eight per cent. greater than in May. Altogether the month was a great contrast to the fine and brilliant June of 1889.

July.

This was the third July in succession with a deficient temperature and excessive rainfall. The former was about 4 degrees below the average, and at no time did the thermometer approach 80 degrees, whereas in 1887 it exceeded 80 degrees on six days in July, and in 1884 on eight days. Three consecutive years with no reading of 80 degrees and upwards in July is almost unprecedented, although not quite so, as it appears that a similar coincidence happened in 1821, 1822, and 1823. The rainfall has now exceeded 4 in. in July three years in succession, viz., 4.88 in. in 1888, 4.11 in. in 1889, and 4.12 in. in 1890; whereas the

average for July is about $2\frac{3}{4}$ in. The mean temperature of the first fortnight was about 7 degrees deficient, and the rain of that period, although not very excessive as to quantity, was very persistent, falling on thirteen days out of the fourteen. The greatest fall of the month was on the 17th and 18th, when 1.97 in. fell in two days. The latter part of the month was finer, with a temperate heat; but harvest prospects at the month's close were certainly far from being what could be desired.

August.

The first week was exceedingly fine and warm, the 5th being the hottest day of the summer, and the only one on which the thermometer reached 80 degrees. On the 8th colder weather set in, and continued with frequent showers to the end of the month, the thermometer touching 70 degrees on only three days, and the last eight nights being unusually cold for the season. Although some parts of England were visited with great rains, the amount measured at Blofield was only 2.68 in., or very slightly over the average. The frequency of light falls of rain, and the low temperature, made the weather of the latter part of the month excessively ungenial, there being only three days between the 10th and 31st on which rain did not fall. Harvest began generally about the second week of the month, but was much interrupted by rain.

September.

This was an exceedingly fine month, with a mean temperature of 2 degrees above the average, and with but a trifling rainfall. Although the Septembers of 1868 and 1875 gave a slightly higher mean temperature, they were not so continuously fine, and we have to go back to 1865 for a finer September. In that year the mean temperature of September was 64 degrees, and the rainfall in the east of England *nil*, the latter being an occurrence which has not since happened in any month. In September 1890 the thermometer exceeded 70 degrees on eleven days, and in no case was there a day temperature under 64 degrees. On the 27th the thermometer reached 75.4 degrees, a height rarely attained so late in the season. The weather was exceedingly favourable to the harvest, which was concluded by the middle of the month.

October.

The fine weather which prevailed throughout September continued up to the 15th of October. Such a fortnight has not been known in October for many years past, the bright warm days being more in character with July than October. The thermometer reached 60 degrees and upwards on twelve days (in 1889 it did not reach 60 degrees all the month), and it was 67 degrees and upwards on eight days. The mean temperature of the first week was 57.2 degrees, or about 7 degrees above the average; that of the last week was 6 degrees below, the fine weather having completely broken up on the 15th, giving place to winterly storms and heavy rains. On the afternoon of the 26th snow fell, intermingled with rain; and on the morning of the following day, which was a most winterly one, there were frequent blinding storms of snow and sleet. On the 28th snow was lying an inch deep upon the ground, unmelted. Similar instances of heavy snowstorms in the last week of October occurred in 1819, 1836, and 1869, and in each case were followed by a severe winter.

November.

The first three weeks were mild with rain, mist, and fog at times, and on the 23rd the thermometer stood as high as 57.6 degrees. The last week was extremely winterly, and of a severity almost unparalleled in November. The mean temperature of the last seven days was 31.6, or about 10 degrees under the average. The falls of snow were extraordinary for so early in the season, reaching an average depth over the county from a foot to eighteen inches. On the night of the 29th—30th the thermometer fell to a lower degree than, so far as can be ascertained, has been registered in November during the present century, a minimum of 14 degrees in the screen and 7 degrees on the grass being recorded. It appears, however, that minima of 17 and 18 degrees were noted respectively on the 23rd and 24th November, 1816, near London; and in 1851 snowstorms quite as severe as those above-mentioned took place between the 16th and 21st November. The suddenness with which the cold succeeded the mildness of the 23rd and previous days was very remarkable, and made it the more keenly felt, the range of temperature in one week amounting to upwards of 43 degrees.

December.

This month will long be remembered on account of its extraordinary severity. The mean temperature was 30.2 degrees, or about 9 degrees below the average; there were only two nights throughout the month on which it did not freeze, and there were only five days on which the temperature exceeded 40 degrees. At Greenwich the mean temperature was lower than in any December since 1788. Further details as to the exceptional character of the frost will be found in a supplementary paper. The falls of snow were at no time so heavy as in November, but the ground was covered in a white mantle from the 15th to the end of the month without a day's intermission. Christmas Day was one of those known as the "old-fashioned" sort, and it is many years since such an one had been experienced.

The Seasons.

The following tables show the mean temperature and rainfall for the four seasons, together with those of the four previous years, and of a twenty-year approximate average :—

TEMPERATURE.

Seasons.	1886.	1887.	1888.	1889.	1890.	20-year average.	Departure of 1890 from average.
	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.
Winter (Dec. to Feb.)...	35.5	35.8	35.5	37.4	38.9	38.7	+ 0.2
Spring (Mar. to May) ...	46.5	43.3	43.5	46.5	46.8	47.5	— 0.7
Summer (June to Aug.)	59.5	61.4	57.7	59.9	58.6	61.3	— 2.7
Autumn (Sept. to Nov.)	52.0	46.9	49.3	49.2	50.2	50.0	+ 0.2
Year	48.2	47.0	46.9	48.0	48.0	49.4	— 1.4

RAINFALL.

Seasons.	1886.	1887.	1888.	1889.	1890.	20-year average.	Departure of 1890 from average.
	in.	in.	in.	in.	in.	in.	in.
Winter	4.18	5.83	4.42	4.14	4.80	6.45	— 1.65
Spring	5.35	5.14	5.83	7.09	5.14	5.15	— 0.01
Summer	6.70	4.04	8.52	9.57	9.61	7.10	+ 2.51
Autumn	6.23	7.68	7.00	8.94	6.87	8.50	— 1.63
Year	25.23	20.52	25.65	29.82	25.96	27.20	— 1.24

It will be seen from the above that the winter was milder than the preceding four, but like 1888 and 1889 was drier than the average. The spring was of about the same mean temperature as in the preceding year and in 1886, but considerably milder than in 1887 and 1888. It was nevertheless, like all four of the preceding springs, under the average temperature. The rainfall of the spring quarter was in almost exact agreement with the average, and considerably less than in 1889. The summer, like the preceding two, gave a deficiency in temperature and an excess of rainfall (the excess in the latter being 2¼ in., which is almost identical with that of 1889), and the autumn was milder and drier than the preceding three.

Year.

The mean temperature of the year was 48 degrees, which is identical with that of the previous year, and although this value is not much more than a degree below the average, it still shows the same tendency to cold rather than to heat, which has been remarked in each year since 1884. The only exceptionally mild months were January and September, and although March gave rather a high mean temperature, owing to the warmth of the three latter weeks, the first week of the month was the most severe of the whole winter. The month of greatest defect in temperature was December, which gave a mean of nearly 9 degrees below the average. Next to this come July and August, with deficiencies of 4 degrees and 3 degrees respectively. The wettest months were July and November, each of which gave over an inch of rain more than usual. The driest months were February, April, September, and December, in each of which the rainfall was under an inch. The total rainfall for the year was about an inch under the average.

N.B.—The instruments from which the foregoing observations are taken consist of a Kew-pattern standard barometer, corrected for temperature and reduced to sea level, standard maximum and minimum thermometers and dry and wet bulb thermometers, mounted in a Royal Meteorological Society's screen, in a freely exposed situation. All the above instruments are by Negretti and Zambra, and have been verified at Kew Observatory. The rainfall is measured by a Symons' Snowdon rain-gauge, and the observations of the direction of the wind are, for the most part, taken from the vane on the spire of Norwich Cathedral.

1890.

Month.	BAROMETER.					THERMOMETER.					HYGRO-METER.	CLOUD.	RAINFALL.		WIND.								
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Relative Humidity, 9 a.m.	Estimated proportion 9 a.m.	Inches.	No. of days.	Direction.								Mean estimated force
															N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	
Jan. .	30.41	1	28.72	23	29.904	54.8°	25	19.4°	2	41.2°	93	6.6	2.77	24	1	0	1	2	7	11	7	2	3.5
Feb. .	30.74	23	29.40	15	30.240	48.6	16	28.2	4	38.2	89	6.4	0.81	12	5	4	9	4	1	1	3	1	3.2
March	30.51	3	29.20	24	29.808	64.0	28	12.0	4	43.0	86	6.0	2.69	20	2	3	1	0	2	11	10	2	3.1
April	30.38	1	29.31	25	29.851	62.8	22	29.8	2	44.5	81	7.1	0.95	15	2	6	7	2	2	3	3	5	3.6
May .	30.34	22	29.37	11	29.866	71.6	19	32.6	3	53.0	75	5.2	1.50	10	3	4	7	6	3	4	2	2	2.9
June .	30.39	15	29.15	30	29.983	77.0	25	37.8	8	58.1	83	6.4	2.81	20	5	1	1	3	1	10	6	3	2.4
July .	30.22	20	29.27	1	29.890	74.4	14	40.0	12	58.7	85	6.7	4.12	23	5	0	2	1	1	6	9	7	3.1
Aug. .	30.26	31	29.37	26	29.935	80.2	5	41.0	25 & 29	58.9	80	6.2	2.68	21	0	4	2	2	1	10	3	9	2.8
Sept..	30.49	7	29.69	21	30.162	76.7	9	37.6	1	59.5	83	4.5	0.92	7	1	2	3	3	5	5	7	4	2.4
Oct. .	30.52	22	29.35	26	30.052	69.2	4 & 6	28.2	29	49.7	89	4.8	2.05	16	3	1	0	2	1	7	10	7	2.9
Nov. .	30.44	19	28.95	7	29.850	57.6	23	14.0	30	41.4	96	7.6	3.90	25	0	4	1	2	3	7	5	8	2.8
Dec.	30.41	21	29.35	19	30.087	43.8	3	13.0	22 & 23	30.2	95	7.6	0.76	11	0	6	12	7	5	0	1	0	2.1
Means					29.969					48.0	86	6.2											2.9
Extremes & Totals	30.74	Feb. 23rd	28.72	Jan. 23rd		80.2	Aug. 5th	12.0	Mar. 4th				25.96	204	27	35	46	34	32	75	66	50	

XIV.

NOTES ON SOME RARE SEA-FISHES FOUND IN THE NEIGHBOURHOOD OF GREAT YARMOUTH.

By Arthur Patterson.

Read 31st March, 1891.

The following list of Fishes observed in the neighbourhood of Yarmouth, which are either new to that locality or of very rare occurrence there, is the result of observations chiefly made since the year 1887, when I determined to verify the only list existing at that time, namely, that contained in the Messrs. Paget's 'Sketch of the Natural History of Yarmouth and its neighbourhood,' published in 1834. In addition to the eighty-one species there enumerated, the majority of which I have been able to confirm, I have a considerable number of new ones, bringing the total number up to one hundred and thirty species. Several of these I have had the pleasure of detecting for the first time in Norfolk: these I have marked with an asterisk.*

The neighbourhood of Yarmouth is, in my opinion, not a good working-ground, the flat, sandy, shifting nature of the coast being very unfavourable to many species which might be looked for at a place like Cromer, where suitable hiding and feeding grounds afford the necessary attractions and protection. But, nevertheless, during the summer months when Shrimps abound, the so-called "Red Shrimps" or Æsop's Prawn (*Pandalus annulicornis*) in particular, a good number of species certainly are attracted thither by them, and any one who could in those months take frequent trips—as I hope in the coming season to be able to

do—into the shrimping-grounds with the men, and help them to sort the Shrimps as they are caught, would undoubtedly find the process profitable. I think in 1834 Paget wrote something to the same effect, but hitherto nobody seems to have tried the experiment. Most of the species here recorded have been picked up with my own fingers, either out of the draw-net refuse, or at the high-water mark.

* Boar-fish (*Capros aper*). On the morning of July 9th, 1881, it was my good fortune to espy, quite by accident, lying on a shrimper's board, a little red fish, which I purchased and found to be a Boar-fish, at that time new to the Norfolk list. A second specimen was found dead on Yarmouth beach on May 1st, 1882.

Sword-fish (*Xiphias gladius*). I recorded in the 'Daily Press' for November 2nd, 1881, a specimen of this fish, measuring a little over seven feet in length, which came ashore at Palling on the 31st of October of that year.

Rock Goby (*Gobius niger*). On the authority of the late Mr. F. J. Cresswell, Dr. Lowe records the first Norfolk specimen of this fish, taken at Hunstanton, June 13th, 1876. One was brought me by a shrimper, August 13th, 1889. Two others, locally taken, have been brought me since.

Speckled Goby (*Gobius parnelli*). I met with this fish about the 7th of May, 1890, when overhauling the "take" of a small Breydon trawler. I have since seen several specimens.

* White Goby (*Aphia pellucida*). A shrimp-lad brought me on June 9th, 1890, a small semi-transparent, smelt-like fish measuring one and three-quarter inches in length. He also brought me two or three others on the 21st of the same month, which I sent to Dr. Günther, who very kindly informed me that they belonged to this species.

Lesser Grey Mullet (*Mugil chelo* var. *septentrionalis*). A small Mullet, measuring seven and a half inches in length, was taken on Breydon on November 10th, 1890, which Mr. Southwell referred to this variety. Dr. Lowe gives the late Mr. F. J. Cresswell as his authority for the occurrence of *M. cheio* in the Norfolk estuary.

* Power Cod (*Gadus minutus*). On the 6th April, 1890, I found a specimen of this fish on the Yarmouth beach. It

measured three and three-quarter inches in length. Although attracted by its rather yellow-banded appearance, had I not been on the look-out for this species, which has not before been recorded for Norfolk, I might probably have passed it over for a juvenile Codling, which it greatly resembles.

* Pollack (*Gadus pollachius*). Every spring in greater or smaller numbers young fish of this species, running to about ten inches in length, put in an appearance in local waters. They take a bait freely, and are known here as "pinnikin coles." During a "rush" I hooked seventeen before breakfast on the 8th May, 1888, and identified them as belonging to this species. It is strange that previous to this date the Pollack was unrecorded as a Norfolk fish. Large ones are rarely taken by the cod-liners.

Three-bearded Rockling (*Motella tricirrata*). A fine specimen was taken near Yarmouth in the spring of 1882. Dr. Lowe gives two previously for this county. A second for this locality was taken off the Britannia Pier on a line, September 25th, 1890.

* Four-bearded Rockling (*Motella cimbria*). Found amongst the refuse left by the draw-netters on Yarmouth beach, 23rd May, 1889 (*ante* p. 110). Not previously recorded for Norfolk.

* Long Rough Dab (*Hippoglossoides limandoides*). I procured a fine specimen of this fish, sixteen inches long, from a Yarmouth fishmonger. It was taken off the Norfolk coast on the 18th or 19th of January, 1891.

* Muller's Topknot (*Zeugopterus punctatus*). On the 11th June, 1890, by the merest accident, I fell in with a shrimper who had taken in the Roads on the same day a—to him – strange fish; it had, fortunately, not been thrown overboard again as unsaleable fish usually are, and I at once secured it. Upon examination it proved to be a very nice example of this species, measuring seven and a half inches in length and four and a half inches in width. It was preserved for the Norwich Museum, where it now is.

* Pearl-sides (*Maurolicus pennantii*). Of the many names by which this little fish is known, I prefer to follow Mr. Day in the scientific, and Mr. Yarrell in the trivial name, which is not only very descriptive, but is not likely to lead to confusion, either with the Argentine or with the conflicting claims of Humboldt, Pennant, or Müller, after each of whom it has been called. I found this beautiful little fish in some draw-netters' refuse

on the Yarmouth beach on April 1st, 1889. Two others were found by Mr. J. B. Beckett, washed up on the beach after heavy winds, on February 23rd, 1890 (see *ante* p. 109).

Ocean Pipe-fish (*Nerophis æquoreus*). When taking an early walk along the shore on the morning of April 13th, 1890, I found a specimen of this curious fish washed up opposite the North Battery at Yarmouth. A second example was brought me on the 22nd of May following. Although Dr. Lowe mentions this species as having been taken in the Norfolk estuary, I am not aware of any previous record for the Yarmouth district.

In addition to the above I may mention that I have received three very lovely specimens of the *Greenland Bullhead*, to which Mr. Day does not accord specific value; also of the so-called *Little Gurnard*, the individuality of which, I believe, is also denied. A very good example of the *Double Turbot*, which I purchased at a fish shop on August 12th, 1890, is now in the Norwich Museum. A very fine *Sting Ray*, weighing nearly half a hundredweight, was taken on a line in the Yarmouth Roads, in October, 1890. I may also mention a *Monk-fish*, forty-nine inches long, which was brought in by the smack "Pet," on the 2nd June, 1890: almost immediately after being taken it gave birth to twenty-two young ones, each about ten inches in length; two of these which came into my possession have found a final resting-place in the Norwich Museum. From a small Herring, six and three-quarter inches in length, I picked up on the beach on April 13th, 1890, I took no less than one hundred and forty-three Opossum Shrimps (*Mysis chameleon*), most of them perfect.

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3. Oxford Court
Norwich. 7 July 1876

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I enclose receipt for your Works, for which our Society is much indebted.

Yours faithfully
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To Balance from last year	6	19	2	By Fletcher and Son, for Printing *Transactions*, 1891—92	39	7	0
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1 for 1887—88	0	5	0	,, A. H. Goose for Printing	1	1	6
2 ,, 1888—89	0	10	0	,, Advertisements	0	6	0
3 ,, 1889—90	0	15	0	,, Insurance	0	3	0
7 ,, 1890—91	1	15	0	,, Postage and Carriage	5	10	8
182 ,, 1891—92	45	10	0	,, Year Book of Scientific Societies	0	7	6
1 ,, 1891—92	0	10	0	,, Gratuity to Doorkeeper	0	10	0
1 ,, 1892—93	0	5	0	,, Rent of Room	1	1	0
	49	10	0	,, Museum Subscription	2	2	0
,, Additional payments for monthly notices	0	14	0	,, Assistant Secretary's Salary	5	0	0
,, Sale of *Transactions*	7	14	6	,, Balance at Messrs. Gurney's	8	12	10
,, Donation	0	10	0				
,, Interest	0	13	10				
	£66	1	6		£66	1	6

LIBRARY ACCOUNT.

	£	s.	d.		£	s.	d.
To Grant from Life Membership Fund	£22	0	0	By Youngs and Son for Shelves	4	5	0
				,, Bookbinding	8	9	9
				,, Balance at Messrs. Gurney's	9	5	3
					£22	0	0

LIFE MEMBERSHIP FUND.

	£	s.	d.		£	s.	d.
To Balance from last year	98	11	6	Transferred to Library Account	22	0	0
,, Interest	2	8	5	By Balance in Post Office Savings Bank	78	19	11
	£100	19	11		£100	19	11

Norwich, 29th March, 1892.

Examined and found correct,
STEPHEN WM. UTTING, *Auditor.*

ADDRESS.

Read by the President, F. D. Wheeler, M.A., LL.D., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Twenty-third Annual Meeting, held at the Norfolk and Norwich Museum, March 29th, 1892.*

Ladies and Gentlemen—On the conclusion of my year of office I have to congratulate the Society on its continued prosperity as shown by the Treasurer's report. The numbers of the Society have also been fairly maintained.

During the past year we have lost by death six members: Sir R. N. Fowler, Bart., the Rev. J. R. Feilden, Mr. Francis J. Gurney, Mr. J. A. Miles, Mr. F. B. Middleton, and the Rev. H. P. Marsham. Only the last-named gentleman took an active part in the affairs of the Society.

Mr. Marsham was born at Stratton Strawless in 1817, and graduated at Cambridge, where he was a scholar of Trinity Hall, as S.C.L. in 1842, and LL.B. in 1846. In 1842 he took orders, and succeeded in 1859 to the living of Stratton Strawless, which he held till 1872. In 1874 Mr. Marsham entrusted to Mr. Southwell, then Hon. Sec. of this Society, the diary of his great-grandfather, Robert Marsham, F.R.S., of Stratton Strawless, who originated the unique series of observations from which his 'Indications of Spring' were compiled. These observations, commenced at Stratton Strawless in 1736, were communicated to the Royal Society by Mr. R. Marsham in 1789, and continued (with one interval of twenty-six years, which occurred between 1810 and 1836) by his successors to the spring of 1891. A paper

was contributed to this Society in 1875 by Mr. Southwell, giving some account of Mr. Marsham's journal and of his remarkable register of Natural History phenomena, and bringing the summary down to the year 1874. Since that time Mr. H. P. Marsham has kindly supplied him with his annual observations. I do not know whether these will now be discontinued, but in that event it would be interesting to have a summary of the whole.

We are also indebted to the late Mr. Marsham for the interesting series of letters written by Gilbert White to his great-grandfather, together with which we have been able to print the corresponding letters from Marsham to White, through the kindness of the late Professor Bell, in whose possession they were. The whole form a series of twenty letters, unpublished up to that time, and possess great interest. They will be found printed in our 'Transactions' for the year 1874—5.

The late Mr. Marsham inherited to the full that love for all that is beautiful in nature which so distinguished his ancestor; and, in spite of failing health and impaired eyesight, he continued his annual observations to the last. Mr. Marsham's kindly nature and great amiability endeared him to many beyond his immediate circle of friends, and with him has passed away another of the courteous country gentlemen of the old school, a type fast becoming so rare. His expressed desire that no flowers might be sent to his funeral was highly characteristic of his love for these exquisite productions of nature; for the thought that his committal to earth might be the occasion of the lavish destruction of many of these beautiful objects, which had afforded him such intense pleasure during life, could not fail to be distressing to one who loved so well "all things both great and small."

We have lost also by removal or other causes ten names, but twelve new members have been added, bringing the roll of membership to a total of two hundred and fifty as against two hundred and fifty-four.

At the first ordinary meeting of the Society Dr. Plowright gave a most interesting paper on some Remains of Neolithic Man, which will appear in the 'Transactions,' exhibiting a number of flint

implements from Massingham, West Norfolk. The evening of the 26th of May was most pleasantly filled up by the examination of some living Hydroids under the microscope, especially *Cordylophora lacustris*, which Mr. E. Corder exhibited on behalf of Mr. Bidgood, who had found it in some plenty at Hickling Broad, growing in colonies on the under side of dead wood or attached to water plants. Mr. Geldart gave a graphic account of its life history, commencing with the planula, which travels freely by means of cilia, until after a longer or shorter time it loses these and becomes fixed to its future home. Tentacles are developed, and by various stages the creature becomes a perfect *Cordylophora*. The colony is continually increased by buds formed on the mature Hydroids.

In accordance with our usual custom no meetings took place during the summer months; but an excursion was made to Wells on June 19th, by invitation of Colonel Feilden, for the purpose of visiting the nesting-place of the Common and Lesser Terns near that spot, and the trip was a most enjoyable one. It is a privation which I keenly feel that I can never take part in any of these excursions; but I received an enthusiastic account of the day from Mr. E. Corder, and can well imagine the pleasure it must have given to all who were present to see these charming birds tenanting in considerable numbers the stations which, a few years ago, seemed in imminent danger of being deserted. Colonel Feilden, with the support of Lord Leicester and a few friends interested in the preservation of these beautiful birds, and assisted by the tenants of the warren, engaged a watcher to protect the birds from molestation during the breeding season, and with the happiest results. Besides the Terns other species were seen; nests of the Ringed Plover were in some places so thick as to require care in walking, and the Redshank was also found breeding. By kind permission of Lord Leicester the party visited the hall, and inspected the collection of local birds, the library, &c. The hearty thanks of the Society are due both to His Lordship and to Colonel Feilden for a most successful excursion.

At the next ordinary meeting, held in September, Mr. Southwell

read us a paper on the Swan-pit at St. Helen's, which will appear in the 'Transactions.' Mr. Corder exhibited two British Crocuses, *C. nudiflora* and *speciosa*, from Shrewsbury and Warwick respectively. Mr. Edwards also exhibited a specimen of the rare Longicorn *Astinomus aedilis*, found in Norwich, and communicated a short note on the species.

At the October meeting Mr. Bidwell exhibited a slab of Itacolumite or Flexible Sandstone, a variety which, as he informed us, is met with in Brazil (from a mountain in which country, Itacolumi, it takes its name), in Georgia, in North Carolina, and in India, and is flexible only in those parts which have been affected by the atmosphere. The mobility is due to the arrangement of its particles, which are hinged together, the projections of one fitting into hollows of another, while clear spaces between allow of a certain amount of play. A paper was also read on the Diamond-back Moth, *Plutella cruciferarum*, pointing out that in the destructive abundance of this species we had a case, not of a foreign invasion, but merely of the unusual plenty of a resident always abundant, but harmless except when in overwhelming numbers.

At the November meeting no special paper was read beyond the "Notes for the Month" contributed by Mr. Patterson of Yarmouth; and I may be allowed to take this opportunity of expressing the gratitude which we owe to Mr. Patterson for his most interesting and often valuable notes. Extracts from them will appear in the 'Transactions;' but I feel that the details of matters of interest connected with birds, animals, and fish thus regularly supplied, and freely illustrated by characteristic sketches, have added greatly to the pleasure of our meetings during the year.

At the January meeting a paper was read from Mr. Clement Reid, F.L.S., of the Geological Survey, on the Natural History of Isolated Ponds; giving details of the plants and animals inhabiting them, which were doubtless conveyed thither mainly by the agency of birds.

The last meeting was held on February 23rd, when a valuable paper on the distribution of the Red-backed Shrike in Great Britain

and Ireland was communicated by Mr. O. V. Aplin. Mr. Preston also contributed his Meteorological Notes for 1891.

Several contributions to the Library were made during the year, among which we may mention two volumes of Emelin's 'Travels in Russia in 1798,' and Hermandez' 'Rerum Mexicanorum,' thus adding to the many valuable works for which the Society is indebted to the kindness and liberality of Professor Newton. We have also received from Herr Gätke, of Heligoland, the valuable work embodying his observations for a lifetime—'Die Vögelwarte Helgoland.'

A Catalogue of the Library has been compiled, and will be printed and issued with the forthcoming number of the 'Transactions.'

The subject to which I wish for a few minutes to request your attention to-night, is the change which has taken place in recent times in the distribution of some species of insects. When at the close of his year of presidency in 1880 Mr. Southwell read us a paper giving details of the extinction of native races of men, animals, and birds, I was not only much interested in the paper itself, but impressed with the idea that one of the most permanently useful employments of such a society as this is to collect and place on record details of species rapidly becoming scarce, or even verging on extinction.

When you did me the honour of electing me as your President this idea recurred to me, and I at once determined to attempt something of the kind with reference to those species of fen insects which are now almost or entirely things of the past. I have been unable to classify these species according to the cause of their disappearance; most of them, no doubt, in some way owe their destruction to the action of man, but, as I think, indirectly. Indeed, I believe that few insects are ever directly exterminated by collectors. Where the imago only is captured, it is well-nigh impossible that such should be the case, since almost all the female specimens caught have deposited at least a portion of their ova before capture; and in a locality offering so much shelter as a fen, the idea of every specimen being hunted down or searched

out is too absurd for consideration. If any one thinks otherwise, let him try to find, in a piece of average fen, a living moth which he has accidentally dropped, and which he knows to be sitting quietly within a few inches. Where, however, the larva is collected, an element of danger comes in; and if it feeds on a plant which, from its scarcity or its conspicuous nature and accessible position, offers facility for a thorough search, it is quite possible that extinction may result. Indeed, I believe that this has been the case in some instances, though I am by no means sure. A supposed case in point is the disappearance of the Black-veined White Butterfly (*Aporia crataegi*) from localities in Kent where it was formerly abundant. At least I have seen more than one rather warm letter on this subject; and it must be owned that many things seemed to indicate such a cause for its disappearance. The Butterfly was always curiously local; and the larvæ, though feeding on such abundant food plants as Whitethorn and Apple, yet were easily detected from their habit of feeding gregariously during their early life. But the insect occurred in a large number of localities scattered over a considerable area, though still with the same local habit, and it has disappeared from nearly, if not quite all of them, lingering longest near Dover and Ramsgate, where one specimen was taken last year. In 1871 I received a good series of the insect from Newport, Monmouthshire, with the assurance that I might at any time have as many as I liked, since it was in profusion there. I believe it was not more than three or four years later that my correspondent informed me that it had entirely disappeared from the locality, and that without any persecution by collectors whatever. Thus we must, I think, put aside almost entirely the idea of direct human agency in the extinction of insects. Indirectly, through the drainage of the Fens, man has no doubt done much to bring it about, but even this by no means accounts for the whole. I believe that where an insect is extremely local, if the same species is generally distributed in other parts of the world, we may conclude that it is a straggler beyond its proper geographical area (in which case the climatic conditions of its place of sojourn are probably unsuited to it). If, on the

other hand, it is nowhere otherwise than local and scarce, it is probably the remnant of an old fauna gradually giving way before other forms of life better fitted for the struggle for existence. When the area becomes very limited, and the stock small, inter-breeding may help to bring on the end, and various other causes no doubt contribute, at one of which I shall hazard a guess later on; but in the present state of our knowledge, or rather ignorance, on the subject, all I can do is to place on record some scraps of information as to various species either extinct or threatening to become so. The typical insect fauna of our Fens may be divided into three classes :—

1. Those species which are confined to the old fen-lands of Huntingdonshire and Cambridgeshire.
2. Those common to this district and to the Norfolk Broads.
3. Those confined to the latter locality.

The second and third of these groups are both important and interesting, and it is eminently desirable that their life history and habits should be thoroughly worked out and recorded; as, however, the risk of extermination is in their case not immediate, they do not come within the scope of my subject to-night.

Nor can I deal with more than a very few of the first class within the limits of such a paper. I propose merely to bring forward a few notes relative to those species which have already become extinct, and, perhaps, one or two others more directly threatened, bearing in mind that the whole of this first group, being now almost entirely confined to the small area of Wicken Fen (about a square mile in extent), are in danger of extermination at no very distant time. I hardly realised, however, till I tried to put them together, how extremely meagre and unsatisfactory my notes were; and I now venture to introduce them, not so much for any value of their own, as in the hope of inciting some member, with more time at his disposal, to devote himself to the task before the opportunities are for ever lost. Already they are vanishing fast. Of the sources of information on this subject available to me in my younger days, incomparably the most valuable was that of intercourse and correspondence with the late Mr. F. Bond and

Mr. T. Brown of Cambridge. The former gentleman, whose practical acquaintance with more branches than one of Natural History is well known, was a perfect mine of information on the old fen-lands, and was most ready to impart it when questioned on any special point, but unfortunately never published any details. Mr. Brown's acquaintance with the Huntingdonshire Fens appears to have commenced not many years before their drainage; but I have heard him tell many a curious story of his experiences there, and of the resident fen-men, who there, as at Wicken in later days, formed collections of the local insects to sell to entomologists visiting the district.

The species already extinct are probably four in number; but it is necessary to use great caution in making this statement; for owing to the inconspicuous appearance of a large proportion of moths, their retiring nature, and the irregularity of their appearance, it is very difficult to ascertain with certainty when they are extinct, and we have but recently had proof of this.

The first of the above four species is the Great Copper Butterfly (*Polyommatus dispar*). This is generally regarded as a permanent local variety or sub-species of *P. hippothoë*, a Butterfly widely distributed over the Continent, and of which I exhibit specimens from Siberia and from North Germany. Dr. Staudinger, however, breaks it up into two species, taking our *P. dispar* as the type of one, to which he refers the *hippothoë* of Hübner, while regarding the *hippothoë* of Linnæus as distinct. As to its occurrence in this country, Harding, writing in the 'Entomologist' of 1883 says: "It had been known and figured in 1792, and about forty* years ago, Mr. B. Standish took a coloured figure of the Butterfly down to Yaxley, and showing it to a man who worked in the Fen, heard

* This would make the date about 1843, but, as mentioned below, the Rev. E. C. Jenkins took the insect in 1829, so that if Harding's account refers to the first discovery at Whittlesea Mere, as he clearly imagines it to do, his memory is at fault as to the date, and sixty years would be nearer the mark. Possibly Jenkins' capture may have been the earlier of the two, and remained unknown to London entomologists at the time of Standish's excursion. But the larva was evidently well-known in 1836 (*vide* Salmon), so that Harding's date must in any case be ten years too late.

that he had seen some that day. Mr. Standish ascertained the locality (with some difficulty, as the man wanted to keep it secret), and took a number of the butterflies. Two men from Cambridge came later and took a large number to London, where they were sold at sixpence each. Three years later, I [Harding] went down myself and took the larvæ. They were very local, and were collected by all persons, young and old. I bought two dozen of an old woman for ninepence, from which I bred some fine specimens, and sold them for a shilling each. Mr. Cole, at Holme Fen, had a large quantity, but the last time I went he said he had not seen one for some years."

In the article on the subject written by Mr. Balding of Wisbech, and published in Miller and Skertchley's 'Fenland,' is a record from the Rev. E. C. Jenkins, stating that about 1829 he found it in abundance, and once captured sixteen in half an hour; but adding that, except in bright sunshine, it was hard to find. The larva was then unknown.

Salmon in his diary under the head "Yaxley, 13th May, 1836," has the following: "Phillips says that he obtained threepence per dozen for the caterpillars of the Copper Butterfly (*Lycæna dispar*); a few seasons ago he collected thirty dozen for one person."

I have no means of fixing accurately the date of Mr. Brown's first acquaintance with Yaxley, but from various incidents of his conversation I imagine that it was at least prior to 1844. He told me that in his time the fen-men always asked a shilling each for pupæ or good specimens of the butterfly. Bearing in mind that the Norfolk reed-cutters usually offer Swallowtail pupæ at one penny each, and the Wicken men ask only twopence each for them, we may infer that at that time the supply was decidedly limited. A similar instance of sudden diminution, in the case of *Liparis salicis*, occurring in the Norfolk Fens within my own experience is recorded below.

It seems at first sight probable that the rapid decrease and final extinction of this Butterfly, which, according to Mr. Balding, took place not later than 1848, and before the draining of the Fen (this is also borne out by the last clause of Harding's account).

was due chiefly to the systematic search for its larva; but it must be remembered that this view was not generally received at the time, and the opposite causes of floods and the burning off the surface growth of parts of the Fen were given in explanation. I might add to this sketch a note of Mr. Bond's (communicated by Professor Newton), that in his experience the larvæ were to be found only on those plants of the *Rumex hydrolapathum* which grew in water. The Butterfly was probably at one time distributed more widely over the area of fens draining into the Wash, since Mr. Dale records that in 1827 Haworth found it abundant at Bardolph Fen in Norfolk

The next vanished species is *Liparis dispar*, the Gipsy Moth. This insect has been frequently a source of wonder to entomologists. Not only was it abundant at Whittlesea Mere, but also in our own fens, and its history in the county is summarised by Mr. C. G. Barrett in the "List of Norfolk Lepidoptera" published by this Society.

How are we to account for the disappearance of an insect once occurring in the utmost profusion in more localities than one, and which has certainly not suffered at the hands of collectors? No species is more easily reared, and thousands have been turned out, but, unless protection was given, they were speedily destroyed by birds. It is possible that this may have been the cause of its disappearance in a wild state, but it by no means follows, since a conspicuous larva freshly introduced to a district is very apt thus to attract the attention of birds. It must, however, be remembered that birds sometimes become educated to such habits, as seems to be the case with the nest-hunting proclivities of the Rook in the north of England, so much complained of in the 'Zoologist' of late years. I remember, too, to have heard that Mr. Doubleday, after keeping up a colony of *Callimorpha dominula* in his garden for several years, lost them all through the attentions of a pair of Great Tits. Still I am rather inclined to attribute the loss of our British colonies of *L. dispar* to climatic causes. The Moth is even hurtfully abundant in many parts of the Continent, and is bred in this country like the Silk-worm Moth as a domestic race. I found

two larvæ on Whitethorn, near Monkswood in Hunts in 1872, but it has so often been turned out, that there is no great reason to suppose them relics of the wild race, which seems to have vanished from Huntingdonshire twenty years, and from Norfolk ten years, before that date.

In connection with this species I may draw attention to one very closely allied to it, the Satin Moth (*L. salicis*). In 1869 I found this insect in the utmost profusion around the small house on Whitesley, then occupied by Harmer, a keeper and fen-man in the employ of the late Colonel Duff, and well known in the fens. The graphic description of *L. dispar*, as given by Curtis, and quoted in Mr. Barrett's list, would have applied word for word, save as to the food-plant, which in this case was Willow. This species kept up its numbers at Whitesley for some years, and is still distributed over our fens, but only in small numbers, and I strongly suspect it to be dying out in the locality.

The third species, *Phibalapteryx polygrammata*, occurs in Austria, Switzerland, France, and in fact over a great part of central Europe, though it should be mentioned that Mr. Doubleday considered our insect as distinct from the continental form. In our own country it was not among the species taken at Whittlesea Mere, but was confined to the districts of Burwell and Wicken. Mr. Brown informed me that he used to take it abundantly, flying in the afternoon, both at the former locality, now long since drained, and also between that spot and Wicken, but never in Wicken itself. I am assured, however, that Mr. Bond records it from the latter locality; but it certainly never turned up there during my acquaintance with the Fen, and must, I fear, be looked upon as wholly a thing of the past. It should be mentioned that this insect has several times been recorded in error, owing to the mistake in the first edition of Newman's 'British Moths,' where the names of this species and the next are transposed.

The fourth species is *Noctua subrosea*. This appears to be a northern form, probably belonging to an early race, as it seems confined to one or two distant localities, and to be far from plentiful there. Staudinger records it from Finland and Livonia,

and I have seen specimens of this, or a very closely allied species, from North-east Russia; but all the continental specimens that I have examined differ to some extent from ours, being decidedly brighter and more variegated in colour. This in itself would not amount to much, for many continental insects occurring also with us show a tendency to melanism in the insular form. But Mr. Doubleday, on seeing the Finland insect, and reading a description of its larva, was decidedly of opinion that it was distinct from though closely allied to our own, of which he had bred hundreds in former years. *Subrosea* was first discovered at Yaxley, on the borders of Whittlesea Mere, by Weaver, who took it in plenty about 1827. It was then lost sight of, being apparently very local, until in 1846 a collector named English, sent for that express purpose by Messrs. Bond and Doubleday, turned it up. Next year (1847) they went down themselves, and took it in profusion at sugar and at flowers, and in the following years they obtained abundance of larvæ. Mr. Bond informed me that these were feeding not only on *Myrica gale*, as described by Guenée and others, but also on dwarf Sallow and Willows, and mentioned particularly that he took many on the Pollard Willow-trees bordering roads through the Fen. Absolutely no details of the extinction of this species seem to have been preserved, and Mr. Bond distinctly assured me in 1872 that he believed it to be still in existence at Yaxley, but as it was then many years since he had been to look for it, this must be taken as merely an opinion. However, until the district of Whittlesea, Yaxley, and Holme has been thoroughly explored, it would be rash to be too positive of its extinction, especially as it showed so much power of adaptation to circumstances as to take to the Pollard Willows for food. Very little entomological work has been tried in the district of late, but that little has not been very encouraging in its results.

Following on these species, we may consider another which a few years ago was looked upon as certainly extinct. *Tapinostola extrema* or *concolor* is a small and little known *Noctua*, belonging to the group called Wainscots, which seems confined to a few

localities among Fens and to be passing away in some of these. Though best known from English specimens, it was recorded as occurring long after the draining of Whittlesea Mere, in Silesia and near Berlin, as well as from Hungary and near Vienna; but Standinger in 1871 already affixes "olim" to his German localities, and I imagine it to be generally scarce. I have not seen a continental specimen. In England it was first discovered at Yaxley in 1844, but in 1848 and 1849 it was taken in some numbers, its habits being better understood. Mr. Brown informed me that the local collectors took it at the end of June, flying in the early daylight about 3 or 4 A.M. over ground from which the reeds had been cut. Mr. Bond also took a few specimens at sugar about the same date. It continued to be taken until the draining of the Mere in 1851. This, as recorded by Skertchley, was speedily accomplished, and before the end of 1852 much of the land was brought under cultivation in some way. During the short interval, the draining off the water gave access to parts of the Fen which had previously been unapproachable, and many of the insects were taken in greater numbers than before. The burning of the surface plants, however, and the ploughing up of the soil doubtless destroyed nearly all the insects inhabiting the Fen itself, and it is doubtful whether any lingering remnant still inhabit nooks and corners of the old locality.

Within the last three or four years, however, *extrema* has been rediscovered. No record seems to have been made of the event, which, in fact, appears to have been kept as private as possible; but I am informed that two or three specimens were taken at Wicken by the Rev. G. H. Raynor, and that it has also been taken by Captain Vipon on his own estate on the borders of Cambridgeshire and Northamptonshire. The latter capture admits of no doubt, as Mr. Barrett tells me that he has seen some of the moths. With regard to the former, in the absence of any record of the capture by Mr. Raynor himself I venture to think that there is some mistake in the locality, as the Wicken fen-men are quite unaware of any such capture, or of any recent visit of Mr. Raynor's to the Fen.

Few spots in the country, I should imagine, have been more worked than Wicken Fen. It is only about a mile square, and for several years entomologists have visited it frequently, besides two or three local collectors, one at least of whom (a resident shoemaker named Houghton) has done excellent work. I have myself seen five large attracting lamps all in operation at the same time in the Fen, forming a regular lighted street, which we called "Rotten Row." That an insect so much sought after as *extrema* should have been there undiscovered till now would be indeed extraordinary, yet I should not venture to call it impossible. Some Moths seem to linger on in extremely small numbers in a spot, not actually dying out, but only detected at long intervals. Thus *Hydrilla palustris* has never been known in this country save as an extreme rarity. Single specimens were taken; the first by Mr. Allis, in Yorkshire, about 1858, then at Quy Fen (Cambs) in 1862; and at a gas lamp on the Newmarket Road, in this city, by Mr. Barrett, in 1869. While collecting with light at Wicken Fen in June, 1877, I secured one specimen of this rarity, and lost another owing to the sudden extinction of my light (a magnesium lamp). Two others were taken in the Fen that year. Next season several collectors worked hard for this insect, and I think that fifteen in all were secured, of which two fell to my lot. In the following season three more were taken; but from that time to this I have heard of only two captures, the last more than ten years ago.

Of the species that survived the drainage of the old fen-land, but are now on the verge of extinction, I would place first *Orgyia cænosa*, the Whittlesea Ermine. This insect was so abundant at Whittlesea Mere as to be thought unworthy of record; hence I can find no details as to its earlier captures. In Wicken Fen it was also abundant; the sedge-cutters regularly supplying the larvæ and pupæ in any number, as Mr. Brown informed me, at a shilling a dozen. This price was ultimately raised to three shillings a dozen; and about 1865 the supply altogether fell off. My first visit to Wicken was in 1872, when I learned that in the previous season two larvæ had been found. In 1873 I devoted some time

to working this locality, and introduced the large attracting lamps which have revolutionised fen collecting. I was fortunate enough to take over forty *cænosa*, all males, so that the presence of at least that number of females may be inferred, and a fair stock of eggs must have been laid. In 1874, however, though the season was the best for collecting that I ever remember, and I worked the Fen regularly on alternate nights throughout July and August, I took only four specimens. Eight specimens in all were captured in 1875, four in 1876, and five in 1878, since which time I have not received complete records of the captures at Wicken. It certainly lingered a few seasons after that date. I fear, however, that for some years past it has not been taken at all.

The insect is clearly dying out, if not dead. Possibly the confinement of the colony to so small a space and consequent close inter-breeding was fatal; but this does not seem to have affected others of the local species that inhabit this last remnant of the old Fens. I have heard it suggested by several entomologists that the hibernating larvæ were drowned off in floods. My own idea is just the converse of this, viz., that the increasing dryness of the Fen is affecting the food-plant of *cænosa* (the Sedge, *Cladium mariscus*, which forms the crop of Wicken) so as to render it unsuitable as a pabulum. I am told that the crop now requires four years to come to maturity, whereas three years used to be the outside allowance. The following facts first suggested to me this notion. The winter 1873–74, which appeared disastrous to *cænosa*, also seriously diminished the numbers of two other species. *Callimorpha dominula* (the Scarlet Tiger) used to swarm at Wicken. On May 7th, 1873, Mr. Fletcher and myself took in a few hours a large number of larvæ from one patch of Dwarf Sallow, and could have secured hundreds more without moving many yards—there must have been tens of thousands in the Fen (I may state, by parenthesis, that a good supply from our captures were turned down at Ranworth, but did not thrive). The next year it took me the best part of a day to collect three dozen, and it has been scarce ever since.

Again, *Leucania phragmitidis*, a common species in our own fens, was in profusion at Wicken in 1873. Mr. Fletcher and myself used to examine them feeding on the flowers of the grasses in hundreds, selecting a few fine specimens, but as a rule passing them by. Next season this, too, was comparatively scarce, and remained so to the end of my personal acquaintance with Wicken. Now in the winter 1872–73, there were heavy floods, and on one occasion when I walked down to look at the Fen I found it under water, with only the Sallow bushes standing out. But in the following winter no floods of any account took place, and the spring of 1874 was forward and dry. The summer was very dry. A long succession of rainless days and dewless nights occurred, and the bottom of even the larger fen-drains became quite dry and hard. Of course, this may have been only a coincidence, but the facts appear to me curious and worth preserving.

Another name, I fear, must be added to the list of the fen insects whose days are numbered. Perhaps the most singular and "fenny" in appearance of all this interesting group is *Macrogaster arundinis* (the Fen Leopard). It occurs in most of the fen-lands of Central Europe, and was discovered in this country by Mr. Doubleday, who found a male floating in a drain at Holme in 1841, but did not again meet with it till 1848, when he took two females in the same locality. In 1850, the larva having been discovered, it was found to be common all round Whittlesea Mere. This larva feeds inside the reed-stems, living for the most part in the lower joints underground, and seems able to bear some amount of hardship. It still holds out at Wicken under very unfavourable circumstances. For the reeds in this fen are not large enough for a full-sized *arundinis*. Save in the ditches, you can hardly find even a moderately large reed, and the moth has, as you may see from the specimens shown, accommodated itself to its surroundings, and dwarfed considerably. My acquaintance with it began in 1873, when I captured two females and five males. From that date to 1878 I found it in fairly uniform numbers, never securing more than a dozen or so in any one season, but never wholly missing it. It is still taken annually in the Fen

in small numbers, but is becoming decidedly scarcer.* From one of the females taken in 1873 I obtained a few eggs, which Mr. Barrett turned out at Ranworth; the curious result is chronicled in our 'Transactions,' vol. iii., page 30, showing that as late as 1878 it still survived. Unfortunately, I never again succeeded in getting eggs, my captures being nearly all males. I fear I shall never again see the insect alive, as it is now impossible for me to get away during June and July; but I should esteem it a very great favour if any one could procure ova for the purpose of again attempting to plant a colony in Norfolk. The number of eggs available at first was scarcely more than a dozen, and it is a most remarkable thing that out of so small a number any descendants should have survived.†

Nascia cilialis may be taken as another and somewhat different type of this group, being not so much a remnant of a once abundant insect, but a species always more or less rare. It was discovered at Yaxley a few years only before the draining of the mere, but was esteemed such a prize, that Mr. Brown told me the fen-men asked as much as ten shillings for it at first, though this high price was somewhat lowered during the last year or two. At Wicken

* Within the last few years, however, it has been found in some numbers in a small tract of fen-land at Chippenham. This fen, though as yet very little worked, owing to the objections of the owner, has produced a marvellous number of rarities, and its discovery by Messrs. Raynor and Warren forms an era in entomology.

† I find in my Journal the following note on this insect:—"Wicken Fen, July 15th, 1874—Caught a ♂ *arundinis* on the wing away from the attracting lamp. I was dimly conscious of something dashing across my path, and struck at it. On examining my capture I was surprised to find so large an insect as a ♂ *arundinis*—the only one I have thus caught. Generally you are made aware of the presence of *arundinis* by a violent bang on the lamp, followed by a rustling in the herbage below, and on looking down, see the moth boring in the grass, &c., as I have seen a Lackey Moth do under similar circumstances. The ♀ is not so swift, and on the very few occasions when I have taken it, it was clearly visible on the wing."

N.B.—The only time I have thus taken the ♂. I once found a ♀ at rest. All my other captures by means of lamp. But for this means, or by searching for the larva, it would escape notice. In twenty years I do not believe that twelve specimens have been taken in any other way.

it had been captured as a rarity on several occasions prior to 1874, when I had the good fortune to take twenty-one, all males with one exception, by means of the attracting lamp. Since that time it has been captured in greater or less numbers by the same means every year, but is evidently far from common. During the past season, however (1891), it turned up at light in unusual numbers. The larva feeds on Sedge (*Cladium mariscus*), and is very beautiful, but little known and hard to rear. Lord Walsingham and Mr. Fletcher discovered it about twelve years ago but failed to prove its identity, though they had no doubt as to the species. This surmise has since been found to be correct, and the perfect insect has been bred more than once. But for its partiality to light the moth would very rarely be taken.

There are many other insects belonging to the "old fen" group which it would be interesting to treat individually, but I only propose to mention one more, whose claim to notice rests not so much upon any imminent risk of extinction, as upon the singularly meagre nature of the published accounts of what is to the fen collectors a very well-known insect. *Tapinostola helmanni*, a species nearly allied to *concolor*, was taken at Yaxley by Mr. Bond in 1847, and afterwards in some numbers by other collectors.

When I first met Mr. Brown at Cambridge he informed me that the insect was then only to be met with at Monkswood, if indeed it still lingered there; and, in fact, no captures appear to have been made for several years before that time (1872). When therefore, in the same year, I found some species of *Tapinostola*—which was new to me—fairly common at Wicken, I concluded that my captures were *T. concolor*, of which species I had then no details, while the published descriptions were to my inexperience utterly insufficient to distinguish them. On comparing them, however, with the types in the collection of the Anatomical Museum, I soon discovered the mistake; and, in my subsequent experience of Wicken, found it to occur regularly, and in considerable plenty. I mentioned the matter to Mr. Bond, and heard, in reply, that he had himself discovered it at Wicken, and had bred it from a larva feeding internally in the upper part of the reed,

like that of *Leucania phragmitidis*, and at the same time as that species.* It was characteristic of Mr. Bond's reticence that he should not only have failed to record his capture, or to describe a larva then, and still (I believe) unknown, but should have kept it so quiet that the occurrence of the insect at Wicken was unsuspected. What was far more remarkable was that so able a collector as Mr. Brown should have failed to discover it at Wicken, where he constantly worked; passing it over, I suppose, as *T. fulva*, which it resembles in size and colour, but from which it is abundantly distinct, and even differs to some extent in habit. It was a long time, however, before he could be convinced that my insect was *helmanni* at all. Curiously enough, in the 'Entomologist' for 1878, a record was made of its capture at Monkswood as an altogether new locality; so completely has the new habitat obliterated all recollection of the old. In fact, the history of this insect affords an excellent illustration of the loss to science caused by failure to record captures and observations on the part of those fully competent to do so. *T. helmanni* has been found to occur at Whittlesford, as well as at Monkswood and Wicken; and is, perhaps, the most widely distributed (over the district) of the "old fen" insects, though always strictly local. The specific points of difference from its common relative *T. fulva* are recorded elsewhere; but it may be mentioned, that the broader wings, and somewhat different build of *helmanni*, give it a softer and less dashing style of flight, so that it may be readily distinguished on the wing, and seems to me, when alive, intermediate in appearance between *T. fulva* and *Miana arcuosa*. It is readily attracted both by sugar and light, coming to the latter attraction in fairly regular numbers throughout the night; whereas *fulva* puts in only a very straggling appearance until the small hours of the morning.

I must now bring these rambling notes to a conclusion, and apologise for asking your attention so long to a subject which can, I fear, interest but a small section of the Society.

* Possibly Bond made some mistake, as the moth occurs in at least one locality at a distance from any reed.

I.

NEOLITHIC MAN IN WEST NORFOLK.

By Charles B. Plowright, M.D., F.L.S.

Read 28th April, 1891.

When one picks up an artificial flint-flake it is sure to arouse feelings of interest—Who made it? How it came there? What object was in the mind of its maker when it was struck off? —and the like questions arise in one's mind. Such an object carries us back to remote antiquity. When we contemplate the centuries which have elapsed since our ancestors, living in a state of barbarism, had to utilise the crude products of nature for their daily wants, we are very apt to fall into a reverie. Although neolithic man, as compared with his palæolithic progenitors, is but a "thing of yesterday," yet, when we reflect upon our mode of living, as contrasted with his, we can but marvel at the changes which have taken place. Even if neolithic man was for a considerable period contemporaneous with the more fortunate possessors of bronze weapons, yet even then the gulf between him and ourselves is stupendous. In the absence of written record we can at best but surmise how he existed: how his daily wants were supplied; and how he contrived to hold his own in the struggle for existence, not only with the larger animals, but also with the vicissitudes of climate.

To many persons the term "flint implement" recalls a mahogany cabinet, filled with choice specimens of highly finished celts, arrow-heads, knives, and scrapers, such as collectors are only too proud to exhibit. It falls to the lot of but few to be able to amass such collections as these; there is, however, much good

work yet to be done, if we want to come at the daily life of our progenitors, in the study of much ruder specimens than those generally considered worthy of a place in our specimen cabinets.

Between two and three years ago my attention was drawn to the fact that the road-metal employed in several villages in this district contained a large number of flakes, evidently of artificial origin. On tracing this road-metal to its source it became clear that these were neolithic flakes, and that they were derived from a so-called gravel pit situated upon Massingham Heath. On visiting this pit it was found located on the slope of hill not far from the main road; an examination showed that a layer of flakes, about a foot in thickness, existed immediately beneath the turf; the pit itself consisted of masses of flint of various sizes, mixed with chalk rubble. At one place this bed of flakes was seen to extend to a depth of between three and four feet, where it was clear they had been used for filling up a hole. At the bottom of the pit, which was not more than five or six feet deep, a number of large blocks of flint, a foot or two in diameter, were found; it was obvious that the chalk in which these flints were imbedded had been disturbed, and amongst these larger blocks of flints were found portions of several stags' horns. Frequent visits have been made to this pit while it was being worked, the outcome of which constitutes the basis of the present communication.

With regard to the flakes, it may be observed that they are of all sizes, some mere chips as thin as cardboard, while others are six or eight inches long, sometimes considerably more, and proportionately thick. Many possess a peculiarity which is worthy of note, namely, that instead of being smooth and covered with that high degree of surface-polish which is usually regarded as indicative of antiquity, they are almost all porous, resembling unglazed porcelain; their edges are quite sharp and uneroded. In colour they vary from creamy white to pale blue, often mottled with yellowish or brownish patches, frequently they are covered by minute black or dark brown specks. These changes have taken place in the flakes since they were buried, and are probably due to some alteration in the molecular structure of the flint, the result of some chemical action induced by vegetation, since those flakes which are found upon the surface of the ground are as highly polished externally as neolithic flakes usually are.

Further search in and around the pit has revealed the type of implement which the former workers here manufactured, namely, roughly-trimmed celts of various types. In addition to these finished implements, however, what are of almost equal interest, specimens were found in various stages of manufacture. Like the Cissbury celts the last-named differ in type: some are of equal width at both ends, others have one end broader and more finished than the other, as in a specimen found by Mr. W. Whittaker some years ago on the surface of a field at Massingham, and deposited by him in the Museum. This was doubtless fashioned by the same race of men who worked on Massingham Common, and who have left so many flakes and spalls as mementos of their industry. Whether the most highly finished implement, the polished celt, was ever fabricated here is at least doubtful. Polished celts are not very common in West Norfolk, although they have been met with in many places; two have been found at Pentney, one of which is in the Museum, the other in the collection of Mr. R. Fitch. A less finished specimen was found some years ago on

Fig. 1.

Fig. 2.

Figs. 1 and 2. Two rough-hewn celts from Massingham.

Roydon Fen, and I have a specimen from East Walton; specimens have also been found at Barton Bendish, Beachamwell, Narborough, Oxborough, and Westacre. Doubtless other examples exist in private collections in this part of the county.

From the general type of the Massingham celts it is evident that the majority, at any rate, were never intended to receive the ultimate rubbing or grinding which completed the process of manufacture in the most highly finished class of these implements. One of the forms of these Massingham celts is elongated oval in outline, about 5½ or 6 inches long by 2 to 2½ inches wide (fig. 1); another is about the same length but narrower and thicker, being from 1½ to 1¾ inches wide and from 1½ to 2 inches in thickness (fig. 2). Others are worked to a cutting-edge at one end only; sometimes this latter is oblique and considerably longer than the opposite extremity (fig. 3). Another specimen has the cutting-edge

Fig. 3. Rough-hewn celt with cutting-edge at one end only.

Fig. 4. Rough-hewn celt with circular cutting-edge at one end: towards the other end it has received lateral trimming, so that it could be hafted with a hazel or willow twig, after the manner of an adze.

The figures 1, 2, 3 and 4 are of what are generally known as rough-hewn celts; it is, however, very probable that these Massingham specimens were really intended for use as mining tools.

in the segment of a circle, while the opposite end has received distinct lateral trimming, so that it was evidently fashioned with the view of being shafted after the manner of an adze (fig. 4).

The fields in the vicinity of this pit present upon their surface great quantities of flakes; and although both myself and my friend Dr. H. C. Brown have searched on several occasions, we have failed to come across more than two or three scrapers: this is the more remarkable, when one considers how abundant these so-called scrapers usually are in neolithic localities. Dr. Brown found one upon Massingham Heath, circular in form, made from an outside flake; and another, made from an inside flake, was found by myself in a field some little distance away. We may therefore conclude that the implement principally made at Massingham was the rough-hewn celt, similar in type to those from Cissbury.

Besides the cart-loads of flakes which have been removed from the pit since it was first opened, and which have been used for mending the roads, numbers of these celts in a rudimentary condition occurred. I am able to place before you specimens illustrating the manufacture of these implements from the rough mass of flint, of considerably greater magnitude than the finished celt, which by a few blows has been roughed out into the initial form. Other specimens show the process carried further, the larger angles being rounded off, and the mass has assumed the contour of a celt. We observe that the celt, in its primary condition, demanded a comparatively large mass of flint to begin with; these masses were derived from the large blocks of flint which occur at the bottom of the pit, that is to say, about five feet below the surface.

As the flint-knappers at Brandon, for the manufacture of such comparatively simple objects as gun-flints, find it worth while to mine for flint from a particular bed in the chalk, so their predecessors, both at Brandon and at Cissbury, also found it necessary to mine for their material, even under such adverse circumstances as the absence of spades and pickaxes made of metal entailed. The Brandon knappers are very particular, not only as to what kind of flint they employ, but also as to the time which it has been taken from the chalk, and the manner in which it is stored, before they use it. Now if the fashioning of a gun-flint demands such care in the preparation of the material from which it is made, how much

more important must it have been to our ancestors to provide themselves with such material as could be worked into implements of far more complicated structure, and this, too, with such simple tools as they possessed for the purpose.

From the explorations of Canon Greenwell at Grimes's Graves, we now know that they did mine for their material—and mine too in a very systematic manner, by sinking perpendicular shafts some forty feet deep, through sand and chalk; even passing through a bed of inferior flints, which were neglected as not being good enough for their purpose, until they came to a bed of suitable flints—the "floor-stone," as it is called—and for obtaining this they further worked galleries into the chalk at right angles to the shaft. The tools with which these excavations were accomplished were mainly antlers of the red deer, both used as spades and also trimmed into picks; they probably also employed some of the more rudely chipped flints, either held in the hand or hafted. The disused shafts and galleries at Grimes's Graves were filled up, when they were no longer worked, with rubble chalk from the more recent excavations. The flints obtained were worked on the spot, so that the whole surface of the land is now covered with flakes, cores, hammer-stones, and wasters.

To a less extent the same holds good at Massingham. We have on the surface of the surrounding land flakes in abundance; we have in the pit evidence that the chalk has been disturbed, and that the holes made in the ground were filled up with rubble and flakes; we have the deer antlers deeply buried in this rubble, as deep as large blocks of flint. More than this, however, we find numerous exceedingly rough and rude flints, that have evidently, by a few blows, been artificially trimmed into a definite shape, and which would constitute suitable implements for working the chalk. Not only their extreme roughness, but also their shape, preclude the idea that they were ever destined to receive further working on the lines of celt formation.

Mining Tools.—When our ancestors came to recognise the fact that the most suitable flint for them to work was not that on the surface of the ground, but the larger blocks buried in the chalk, at a depth of from three to six feet at Massingham, they had by no means an easy problem to solve. Although they were much more advantageously circumstanced than were their Brandon neighbours,

where the suitable stone was thirty or forty feet below the surface of the ground, yet the four or five feet of excavation required at Massingham to reach the stone would afford a considerable obstacle to most men in the absence of picks and spades. True, they might and did use the antlers of deer, but even these, which could be used for both picking and digging, would afford but awkward and inconvenient excavation tools—especially for the purpose of picking up the chalk, intermixed as it is here with flint stones. It would not take them long to grasp the fact that the very stones which were so great an impediment to their excavations, could be utilised with but little labour for this very purpose. A considerable number of stones have been found in the pit itself, and in its vicinity, which have been constructed in the simplest manner, and yet which are evidently suited for the above-named purposes. They may be grouped under the following classes—

1. Picks.
2. Hammer-picks.
3. Borers.
4. Diggers.
5. Hand-choppers.

Picks.—Any elongated piece of flint is capable of being used for picking into the ground. The stones may have either been held in the hand, or hafted by some such simple means as a willow or hazel twig twisted around their middle; in the same way as one sees blacksmiths in the present day hold their punches and chisels. One of the simplest of these stones is shown at fig. 5. It consists of an elongated piece of flint, six or seven inches long by from two to three inches wide, which by some half-dozen blows has had its angles removed, and its end brought to more or less

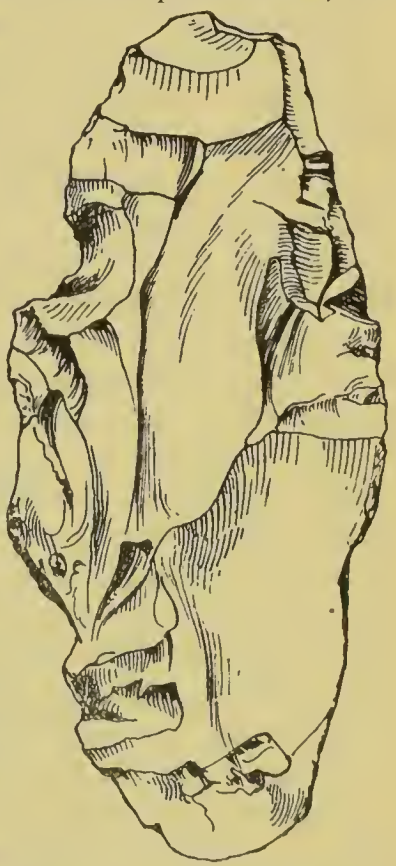


Fig. 5. A very rudely trimmed flint for use as a pick; it is notched on each side towards the upper end so as to be hafted with a hazel twig.

of a point. In this instance the blows have been given from one side only; the opposite surface having no marks of artificial touching whatever, being formed by the natural fracture of the stone. It is noteworthy that two of the side blows have been given, one on each side, nearly opposite each other, so as to give an outline to the stone, very suggestive of its having been intended for a ligature, or for hafting in some manner. This stone is so slightly worked that it might easily be passed over as a "waster" or a failure in the fabrication of some more highly finished celt; but on looking at the specimen its nature becomes evident, and also the fact that it could never have been intended for a celt, on account of its thinness and the way in which it was naturally fractured before the artificial blows were given to it.

Many other specimens of stones, capable of being used as picks, have been found; they are very various in size, one which is in the possession of Mr. W. G. Smith being some eight or ten inches long, worked at both ends, but more pointed at one than at the other, having a slight curvature lengthwise, and weighing three or four pounds.

Other specimens, much smaller, and either sharpened or pointed at one or both ends, have been found, specimens of which are upon the table.

Hammer-picks.—Several specimens of this class have been found. They are all rough in workmanship, elongated in form, thick at one end and thinned at the other. One specimen (fig. 6)

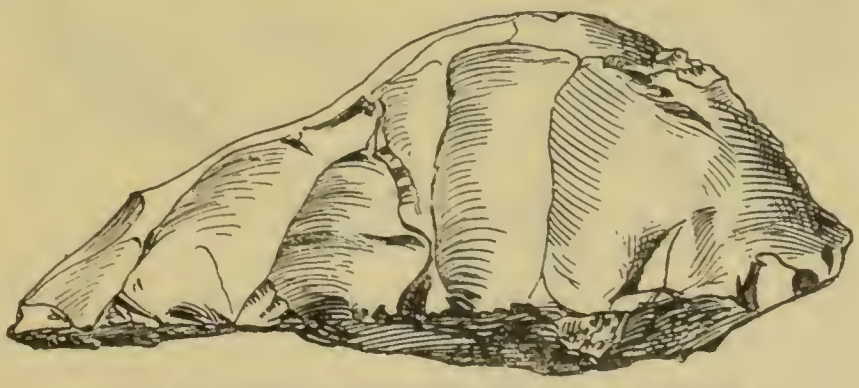


Fig. 6. Hammer-pick probably intended for hafting.

consists of a piece of flint seven inches in length by about two inches in width, nearly flat upon one side, where the surface is

a natural fracture; the opposite convex side has received a considerable number of blows to trim it into shape. Its greatest thickness, three inches, is about one-third its length from the butt end, from which part it slopes away to a sharp edge at the opposite extremity. A number of blows along the sides have brought this stone into a very hammer-like form; clearly no known celt form was in the mind of the person who fashioned this stone. Another form is shown at fig. 7. These kind of stones are

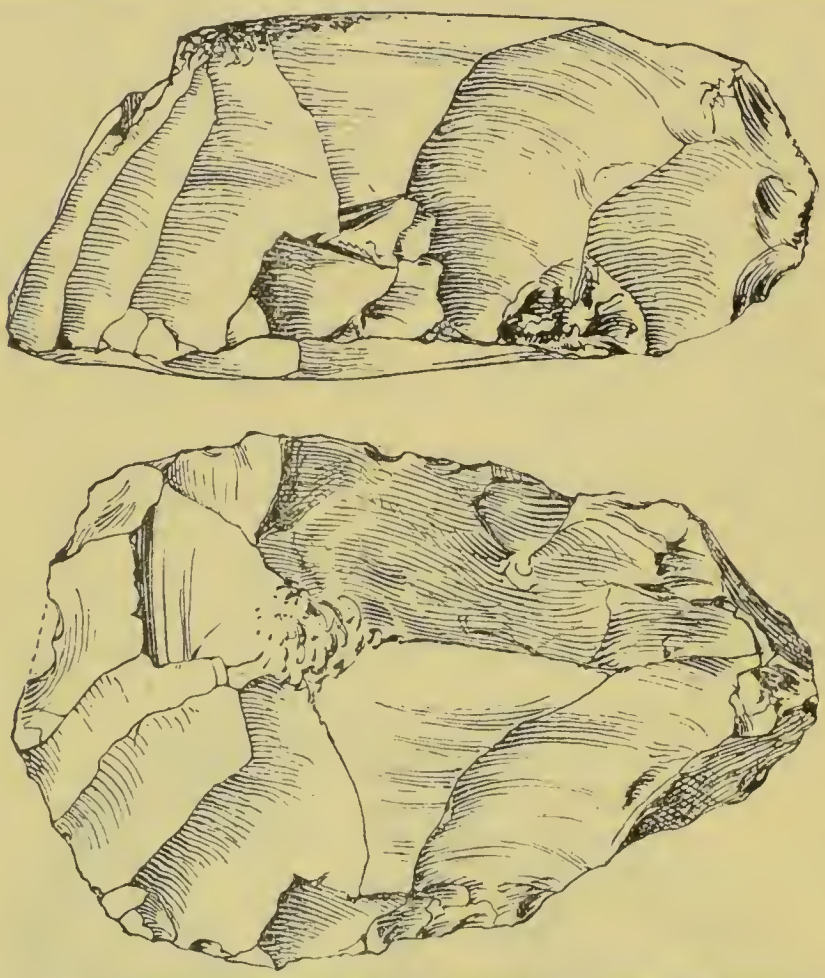


Fig. 7. Hammer-pick, a large heavy implement, probably intended to be held in the hand.

admirably adapted for picking into the chalk, either by being held in the hand, or more probably hafted in the manner of a hammer. Some specimens are much more carefully worked than others, but the general type is that above described.

Borers.—These are much larger and coarser than the implement to which the term is usually applied, their probable use being to bore into the chalk or earth to loosen other stones. One specimen is a large, coarse, and clumsy but effective borer (fig. 8); it is

Fig. 8. Hand-borer, made from an external flake; the bulb of percussion is observable on the right-hand upper angle.

Fig. 9. Hand-borer, resembling a rough-hewn celt, but bent at an angle in the middle. The upper half above the bend is cylindrical, the lower, thinner with sharp edges. These points do not come out well in the figure.

formed from an outside flake, the original bulb of percussion being distinctly visible. At the expanded end it is four inches wide, it tapers to a sharp point, and is five and a half inches long; the outer rounded surface fits the palm of the right hand, a natural depression receiving the thumb. The boring end has been trimmed, both lengthwise and transversely by about a dozen blows; the point is sharp and chisel-shaped, one side being flat, the other roughly semi-circular but angular. Another implement (fig. 9), probably of the same nature, looks at first sight like an ordinary

rough celt, bent at an angle; it is about an inch wide and five inches long, worked on both sides rather carefully. One half is thick and sub-cylindrical; but the other half, below the bend, is much thinner, with sharp edges and point; the cylindrical portion fits the hand, and it was apparently intended for use in the hand as a borer.

Diggers.—These are mostly flakes which have received a certain amount of trimming, especially around the edges and at the point. Several of these are of large size, seven or eight inches long, five

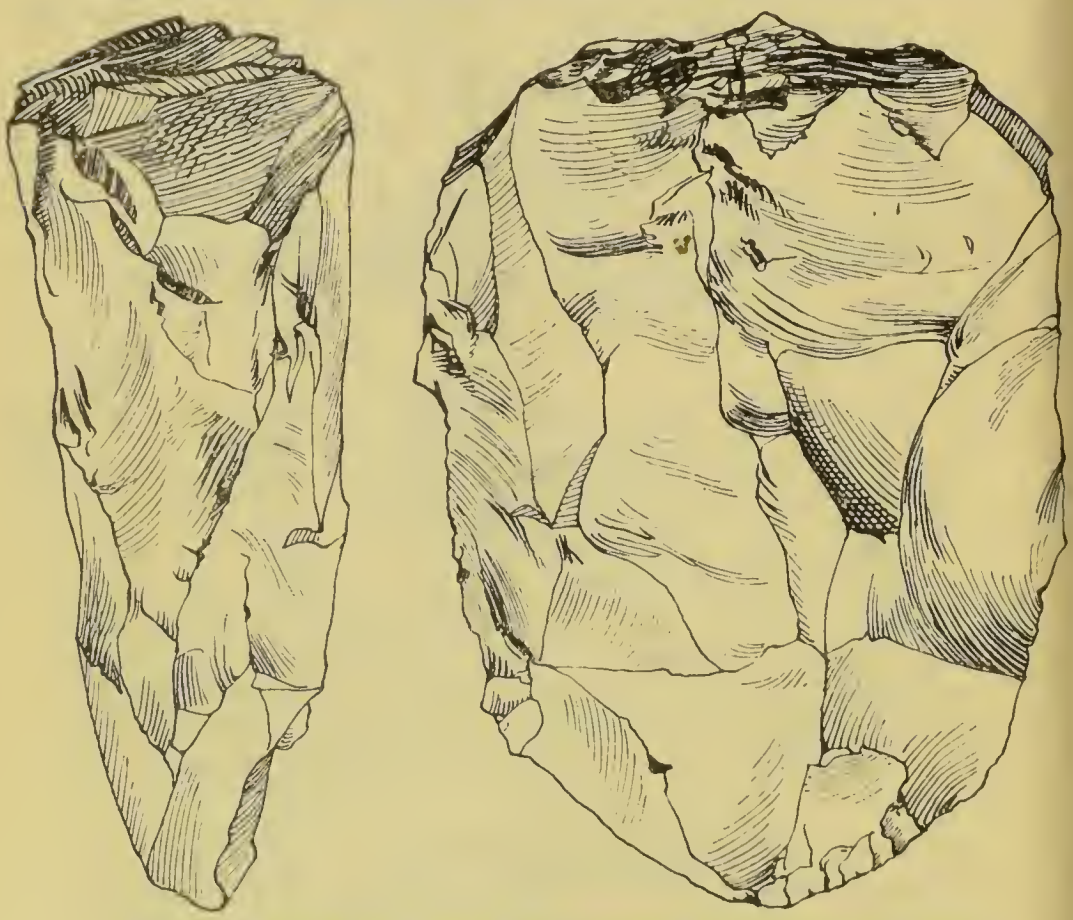


Fig. 10. A large heavy stone, thick and square above, trimmed thinner below into a sharp semi-circular edge.

or six inches wide, and two to three inches thick at the butt end (fig. 10). Where these are square the opposite end is trimmed on one or both sides into a sharp edge, with a semi-circular outline. They weigh four or five pounds, and could be used partly as diggers

and partly as picks, when held in the hand. Another implement of the same type (fig. 11), viz., flat, with a sharp semi-circular edge, exhibits evidence of much more careful workmanship; it is 7 inches long, by 3½ inches wide, and 1½ inches thick at the butt end. It is gradually thinned away towards the lower end, where it terminates in a carefully worked semi-circular edge. This specimen belongs to Dr. H. C. Brown.

Large flakes, eight or ten inches long, rounded and thick at one end, thinned away towards the point, having a little lateral trimming, were frequently found. These, too, when held in the hand, would form very effective tools for working into the chalk. Smaller thin flakes, of which several specimens are upon the table. They are four or five inches long, of various shapes, but all thin and sharp at the edges; they have all received trimming round the edges, some have only had the angles taken off, others have been trimmed all round. They are adapted for scooping or scraping into the ground, and from the numbers found appear to have been a form of tool much employed. When we remember that this particular pit was on the side of a hill, it is easy to see how useful they would be in working the upright face of the chalk in which the flints are imbedded, we can thus understand their abundance.

Fig. 11. A wedge-shaped carefully worked implement, showing the bulb of percussion at its upper end. The lower end is trimmed on both sides to a semi-circular edge. Figs. 10 and 11 may be termed either diggers or hand-choppers, and were probably not intended for hafting.

Hand-choppers.—For want of a better name a number of worked

stones may be called "hand-choppers." Without examination by a trained eye they would readily enough be passed over as accidentally fractured stones. They consist of masses of flint of various sizes and irregular forms, which have received a certain number of blows, by which one side has been worked into a cutting-edge—a number of these are on the table. They have evidently been fashioned for some definite purpose, and as they occur with the other forms described above, it is most probable that they, also, were used for working the chalk. Such stones could, by a skilled hand, be fashioned in a few minutes, from any lump of flint that was valueless for other uses, and they would serve the purpose of the chalk worker as well as a more finished article, hence their frequent occurrence.

Fabricating Tools or Hammer-Stones.—The stones used for working the flint after it had been mined, are technically called hammer-stones. It is generally thought that quartzite pebbles constituted the most frequently employed hammer-stone of the early flint workers. Numerous quartzite pebbles were found in and near the pit; they are of various sizes, many of them about the size of a hen's egg. But much larger stones of great hardness, formed of some igneous rock, were also found; they were probably employed for breaking up the large blocks of flint into convenient masses. So hard are these stones that the workmen are unable to break them with their hammers, so that they were thrown on one side and not converted into road-metal, as the rest of the stones from the pit are. The specimen on the table shows not only the blows given by the early users, but also the recent attempts to convert the stone into road-metal.

For some processes in the fabrication of flint implements, nodules of flint were believed by many persons to have been employed. These nodules show evidence of battering upon them; a specimen from the pit is on the table.

From what has been stated above, it is highly improbable that this particular spot is the only one in Massingham where flint had been mined. Upon inquiry, moreover, amongst my friends, it came to my knowledge that a former clergyman of antiquarian proclivities, the Rev. C. Grenside, many years ago held the opinion that upon Massingham Heath there were traces of an ancient British village. Now it will be remembered that formerly the

same view was held as to the nature of Grimes's Graves, near Brandon, and this view was the accepted one until the excavations made in 1870, by the Rev. Canon Greenwell, revealed their true nature. Careful inquiries were therefore made as to the existence of any number of hollows upon the common, but, strange to say, without success; several visits were made to the locality before much light was thrown upon the subject. A short distance to the north of the before-mentioned pit there is a circular depression in the ground, forty feet across in its widest part and about thirty in its narrowest, and some eight feet deep; at the bottom of this hollow a number of flakes were found. That this is not an excavation made in recent times for stone is pretty evident, because had it been so some trace of a cart-way out of it would have been visible. Still further to the north, near the Grimston road, are other similar bowl-shaped depressions, one eighty by sixty feet across and fifteen deep. Another, as nearly as possible circular at the top, ninety feet across. The bottom of the last-named is divided by a ridge into two nearly equal cup-like hollows, one eight the other ten feet deep, exactly as we see many of the hollows at Weeting. A fourth depression exists in a ploughed field, a very short distance to the north-east. In all the above flakes were found by Dr. Brown and myself. Two other similar hollows, one forty and the other nearly fifty feet across, exist on the higher ground, a little to the south of the Grimston road. All the above have the same general appearance: circular depressions, about eight or ten feet deep, from forty to ninety feet in diameter, without any trace of a cart-way out of them, in which flakes are found. Looking at them one cannot but be struck by their resemblance to the hollows at Grimes's Graves—from the abundance of flakes on the surface of the land around them, and from the fact that large blocks of flints suitable for the manufacture of flint implements are imbedded in the chalk at a short distance from the surface. There is strong reason to believe that these hollows owe their origin to the same cause as Grimes's Graves do, namely, that they were shafts sunk by neolithic man for the purpose of procuring suitable flint for the fabrication of the various articles manufactured from it by him.

Their large size precludes the notion that they were ever "Ancient British Huts;" and their depth, which must have been

considerably greater in their recent state than it now is, affords convincing evidence to the contrary. These hollows are so large and so scattered that they could hardly have suggested the idea of a village to any one's mind; neither are they sufficiently numerous to have attracted attention had it not been for the flakes and worked stones brought to light by the working of the pit first mentioned. Dr. Brown and myself tramped about the common, which is an extensive one, on several occasions, in search of traces of the so-called village without success. One afternoon, however, we were led by a happy accident to the object of our search. It was during the winter, after we had measured the above-described depressions, standing on the higher ground, on the north side of the Grimston road, that we saw by the slanting rays of the setting sun a number of hollows on the south side of the road. The sun had sunk just low enough to cause the edge of each hollow to cast a shadow into its interior. Plainly displayed before us, on the opposite hill, were a number of round shadows, which marked the objects of our search. These consisted of a cluster of about a dozen small round depressions, from fifteen to twenty feet across, not more than a foot or two deep, occupying the summit of a small eminence, within a hundred yards of the main road from Grimston to Great Massingham: this eminence is on the south side of the road, and is the first high ground approaching the road beyond Little Massingham Belt, on the road from Lynn to Great Massingham. I have taken the opportunity of visiting other sites of acknowledged ancient British villages for the purpose of comparison—notably those on the Dunstable Downs, where my friend Mr. Worthington G. Smith, who kindly piloted me, has opened several of these hut-dwellings. As far as one can judge from external appearance the hollows are identical. It is quite possible that the inhabitants of this village were the same men who chipped the flints they had previously mined from the before-mentioned shafts. At present the traces of the village are plain enough; but there may come a time when the plough of the agriculturist, in one short day, will obliterate this interesting relic of the past. May this day be long distant!

P.S.—The figures are to scale one-half the natural size, from figures by my friend Mr. Worthington G. Smith.

II.

ST. HELEN'S SWAN-PIT.

By Thomas Southwell, F.Z.S., *Vice-President.*

Read 29th September, 1891.

There exists in our midst, quite unsuspected by the majority of the citizens, and but little known to the rest, an institution of great interest to the naturalist and hardly less worthy the attention of the antiquary; I allude to the St. Helen's Swan-pit, where year after year in the second week of August are gathered together from seventy to a hundred dusky cygnets, which may be seen, in happy unconsciousness of their fate, busily preparing themselves to fill the important and honourable place they are destined to occupy at the tables of the great and rich in the feasts of good things for which the closing months of the year are celebrated.

At Abbotsbury, on the Thames, and in a few other localities in England, there are large numbers of Swans bred upon the waters; but I doubt if in any of these of like extent, with the exception of the first-named, so many cygnets are reared as on the rivers and broads of North-east Norfolk, and I am not aware of any other establishment for the systematic fatting of these fine birds, save that at St. Helen's Hospital and one or two other private Swan-pits also in the neighbourhood of Norwich.

I regret my inability to enter upon the interesting subject of "Swan rights," or of the "Cygninota" or Swan marks attached to such rights; a branch of the subject which would amply repay

the researches of any of our archæological friends, and which has been only superficially treated by Mr. Stevenson in the third volume of his 'Birds of Norfolk'; nor can I pretend to say much with regard to the history of the ancient Swan-pit at St. Helen's, about which, indeed, very little is known, but that it is of considerable antiquity there can be no doubt. Blomfield in his 'History of Norwich' (8vo. vol. ii. pp. 376–391), as quoted by Mr. Stevenson, states that "St. Helen's Hospital, or Almshouse, for aged men and women, in Bishopsgate street, known also as the Great, St. Giles', and the Old Men's Hospital, occupies the site of the dissolved hospital of St. Giles', founded by Walter Suffield, *alias* Calthrop, Bishop of Norwich, in 1249, but which, in 1547, was granted by Edward VI., in accordance with the will of his late father, to 'the mayor, sheriffs, citizens, and commonalty,' with all the revenues belonging thereto, 'to be henceforward a place and house for the relief of poor people, and to be called GOD'S HOUSE, or the house of the poor in Holm street,'" and to this pious purpose it has continued to the present time to be devoted, soothing the latter days of many generations of the deserving poor of both sexes, and altogether one of the most excellent and carefully managed charities of our city. In the meadow attached to this institution is situated the Swan-pit. Mr. Stevenson was of opinion that a swannery, in some form or other, existed in the Hospital meadows prior to the grant already mentioned, by Edward VI. to the Mayor, &c., of "all the site, circuit, compas, and precinct of the late Hospital of St. Gyles', withyn the Cytie of Norwych, in the Paryshe of St. Elyn, next Bushope Gate, &c." —since indirectly, the antiquity of this swannery may be inferred from the allusions of the same author, to local swan-rights and marks ('Birds of Norfolk,' vol. iii. p. 102); but the only direct evidence obtainable is an entry discovered by Mr. Simpson, the late governor, in the books of the Hospital, of a minute to the effect that "about May, 1793, the late Mr. Thomas Ivory constructed *a new Swan-yard*, and made other improvements on the premises . . . . this entry, therefore, not only marks the date of the present Swan-pit, but establishes the existence of a previous one, near the same spot," probably it was of monastic origin. By the Municipal Reform Act of 1835 the management of the Hospital was vested in the Corporation.

The pit is situated in the meadow at the back of the Hospital, and is solidly constructed of brick-work; it is seventy-four feet in length, thirty-two feet in width, and six feet deep, the water rising to a depth of about two feet; along the sides are floating troughs, which rise and fall with the altering level of the water, they are kept in place by posts placed for that purpose, and in them the food for the cygnets is deposited; at one end of the pit is a sloping stage, which enables the cygnets to leave the water when so disposed, and to obtain access to a railed-in enclosure, in which they can rest and prune themselves. The tank has connection with the river, near which it is situated, and the water rises and falls with the tide, being regulated by a sluice and valve.

Having now described the receptacle which is to be the home of the young birds for the final stage of their brief existence, we will visit their birth-place, and trace their progress from the egg until they are ready to return with us to St. Helen's.

And here I must beg to be allowed to quote from another source in which I have described the life-history of a cygnet, and to which I do not think I could add materially.*

"We will suppose the month of March to have arrived, and the young birds, it may be only in their second year (if so, their brood will be a small one), to have paired (probably for life), settled all preliminaries, and chosen a site for their nest: then begins the important work of building a receptacle for their eggs; and this is no mean labour, for the swan's nest is of ample dimensions, and requires a very considerable quantity of material for its construction; and even when sitting, the old birds appear to be constantly adding to and rearranging their already, to all appearance, ample structure. The spot chosen for the nest is always near the water, either on an island in the river or broad, on the marshy 'rond,' or at the entrance to some marsh drain, and is composed of the coarse herbage which is sure to be found in abundance in such a locality, often supplemented by a load of marsh-grass and sedges, deposited in a convenient position by the broad-keeper. The male bird takes his fair share of the work, and when the nest is in all other respects ready for the eggs, he stations himself upon it, shaping out, with the weight and motion of his body, a hollow

* 'Blackwood's Magazine,' Dec. 1888, p. 859.

centre in which they are deposited, nor does his assiduity then cease, for in addition to guarding his mate when upon her nest, he is always ready to take her place should she desire to leave it for a time. An old male Swan never shows to greater advantage than when proudly sailing up and down keeping guard over his nest, with neck thrown back and wings arched, every feather on his body seeming to stand apart from its fellow and to bristle with excitement as he surges through the water to drive away the intruder. And this is not mere display; there is plenty of evidence of the old male's ferocity, even to his boldly boarding a boat and attacking its occupants. The onslaught of an old male Swan, although not so dreadful as it has often been depicted, is by no means devoid of danger, and some of the broadmen tell of serious inconvenience arising from the blows administered by the stump of the pinioned wing of an infuriated bird. The number of eggs laid by the Mute Swan varies considerably. It often happens that an adult bird is paired with a young mate, say of the second year: in this case the produce would be greater than that resulting from two young birds; for should both birds be only two years of age, they will probably not produce more than three or four eggs the first year. They will, however, in each successive year become more and more productive, till the full complement of nine to twelve eggs are produced. Mr. Stevenson, the author of the 'Birds of Norfolk,' in a paper on the Mute Swan as observed in that county, printed for private circulation, gives a table of the produce of a pair of Swans which bred on Surlingham Broad. In eight years they produced eighty-five eggs and reared eighty-two cygnets. The writer has known several instances in which the same bird has laid twelve eggs, and more than one in which she has hatched that number of cygnets.

"In due time—that is, in about five weeks—the eggs hatch into little balls of dusky down, which are conveyed to the water, and assiduously tended by their proud parents; and what a beautiful sight is the snow-white mother, surrounded by or attending her dusky little ones, or perhaps, with arched wings, bearing them upon her back, their queer little heads peeping from beneath her sheltering plumage—fit emblem of peace. Then is heard the gentle crooning note of the female before referred to, whilst the proud father is sailing protectingly round in all his warlike pomp,

ready to give battle in their defence to all the forces of the universe! The life of the little cygnets must be a happy one, as, tended by their constant parents, they are taught all that it is becoming for baby swans to know, gradually progressing from the down of their infancy to the rather inelegant figure and plumage of their hobedyhoyhood; but there is a sad future before them, happily hidden from their knowledge.

"The second Monday in August is an eventful day in the history of the existence of the dusky cygnets, for on that day their fate is decided; either they are destined to live a life of freedom like their parents, or they are hurried off to the swan-pit, there to undergo a course of gradual preparation, which ends in the spit.

"The Swan Upping or 'Hopping' on the Norwich rivers, although formerly attended with some little pomp, is nowadays a prosaic affair enough. On the river and its broads below Norwich, it takes place on the second Monday in August, but on the streams above the city it is deferred till the last Monday in the same month. The morning having arrived, the keeper of the St. Helen's Swan-pit, who represents the Swan right of the city corporation, meets the representatives of the various other Swan rights, at Buckenham Ferry, ten miles below Norwich, on the river Yare; and the preliminary of breakfast having been got through, the procession of boats starts to take up the young Swans. This is not always a very easy matter, as the old birds, probably with a glimmering recollection of former raids upon their broods, make every effort to lead their young ones into a place of safety. Before long, however, they are either surrounded by boats, and the young ones captured by means of a sort of shepherd's crook, or both old and young are driven out of the water and secured. Sometimes, however, a pair of cunning old birds will manage to get into the open water, or dodge between reed-beds, and give a great deal of trouble before they are captured; but as a rule, they do not show so much fight as might be expected, seeming, between their anxiety for the safety of their young ones, and fear for themselves, to be quite bewildered; and although the piping of the captured young ones will induce them to follow the boat at first, they soon give up the chase, and seem to forget the loss of their families. When the parent birds are taken from the water, their 'marks' are examined, in order to

ascertain to whom they belong; and if, as is generally the case, the male and female birds are owned by different proprietors, the brood is equally divided; if there is an odd young one, the representatives of the two owners 'toss up' for it, and by this means make an amicable distribution. Should the marks in the bill of the old birds be defective from any cause, the opportunity is taken to renew them by fresh cutting.

"The young birds have their feet turned on their backs, where they are tied by a piece of soft list, and are then placed on a bed of rushes at the bottom of the boat if they are to be taken away for fatting; but if they are destined to replenish the breeding stock, they are pinioned by removing a portion of the wing at the carpal joint—a rough but effectual piece of surgery—and are then returned to the custody of their parents. All are 'marked' by having certain cabalistic signs, the ancient 'Swan mark' pertaining to the 'right of Swans,' cut upon their bills. This is either done by incising the skin or notching the side of the bill; the latter is the more permanent, but both are probably equally painful to the bird; and ancient as is the practice, it seems a pity that one less cruel cannot be substituted for it, such, for instance, as punching small holes in the web of the foot, which would admit of an infinity of combinations, and would be much less painful for the bird. The young Swans intended for the Swan-pit are not pinioned, as it would tend to prevent their fattening so readily."

We will now return with the cygnets to the St. Helen's Swan-pit, where they are received by Mr. Cox, the governor. When all are assembled the number will amount to from seventy in a bad season to about a hundred in a good one. The birds soon settle down and the mortality is very slight; it sometimes happens, however, that a few weakly individuals, or those removed too early from their parents, pine and die, but on the whole they seem to lead a very happy life. At first they are fed principally on cut grass; but they soon take very kindly to barley, of which each bird in the process of fatting is estimated to consume about three or four bushels.

It is, as may be imagined, a very pretty sight to see such a large number of these fine birds feeding. After their appetites are somewhat satisfied, they, duck-like, elevate their pointed ex-

tremities in the air, searching for the grains which may have gone to the bottom, rise in the water flapping their extended wings; or, with one foot turned over the back, leisurely prune and dress their plumage; or, with head buried under the scapular feathers seek sweet and refreshing repose. Later in the season, when the cygnets have grown still larger and are assuming the white plumage, the Swan-pit presents an even more attractive appearance than in their earlier stage, and it is sad to think that by Christmas all will have fallen victims to the spit, and the Swan-pit, late the scene of so much life and activity, will be dreary and deserted. When the cygnets arrive at the Swan-pit they are worth about ten shillings each, but when fatted the value is two guineas. Mr. Cox, the master of the Hospital, however, receives cygnets for fatting at a charge of one guinea each,—not too large a sum, considering the quantity of food they consume and the care required to bring them to maturity; if purchased at the Swan-pit the price is two guineas. At their prime they weigh sometimes as much as 28 lbs., but usually, when dressed for the table about 15 lbs.; after Christmas they lose flesh, and are by no means so good for the table.

In a recently published book, purporting to portray the manners and customs prevailing in the East Country in the latter part of the seventeenth century, Mrs. Dorothy Browne, the wife of the celebrated Norwich physician, afterwards Sir Thomas Browne, is represented as lamenting that the cygnets on the spit (note the plural, and this at an *impromptu* supper!) testified "by an odour too strong to be agreeable," to their having been kept a trifle too long, a circumstance rendered not at all improbable from the fact of Mistress Browne's supper taking place in the month of March, whereas cygnets are only in season from October to the end of December!

Cygnets from the St. Helen's Swan-pit have been sent to the tables of various crowned heads, and I believe to the Pope; Her Most Gracious Majesty and the Prince of Wales having been frequent recipients. The following humourous receipt, "done into verse," by the late Rev. J. C. Matchett, is sent with each Swan. I need not add that so noble a bird constitutes a dish literally fit to set before a king, tender and succulent, and Swan giblet soup is a pottage once tasted not soon to be forgotten.

To Roast a Swan.

"Take three pounds of beef, beat fine in a mortar,
Put it into the Swan—that is, when you've caught her!
Some pepper, salt, mace, some nutmeg, an onion,
Will heighten the flavour in gourmand's opinion.
Then tie it up tight with a small piece of tape,
That the gravy and other things may not escape.
A meal paste (rather stiff) should be laid on the breast,
And some 'whitey-brown' paper should cover the rest.
Fifteen minutes at least ere the swan you take down,
Pull the paste off the bird that the breast may get brown."

The Gravy.

"To a gravy of beef (good and strong), I opine,
You'll be right if you add half a pint of good wine;
Pour this through the Swan—yes, quite through the belly—
Then serve the whole up with some hot currant jelly."

N.B.—The Swan must *not* be skinned.

III.

ON THE NATURAL HISTORY OF ISOLATED PONDS.

By Clement Reid, F.L.S., F.G.S.

Read 26th January, 1892.

The successive faunas and floras that have inhabited this country during times which, geologically speaking, are quite modern, convince one that no truly aboriginal animals and plants are now to be found in Britain. Even during the life-time of existing species there has been a ceaseless ebb and flow across our islands. We find, for instance, that during the deposition of the Cromer Forest-bed the climate was temperate, the plants were like those

still living in Britain, but a large proportion of the mammals are now extinct. Next came a cold period, when the inhabitants of the Arctic regions moved southward, and took possession of a country no longer fit for forest-trees or southern animals. Finally, the cold became less, the Arctic species retreated northward, and were replaced by an assemblage similar in many respects to that which inhabited the country previous to the Glacial epoch. Continual change is traceable in the organic world throughout all geological periods, and the present forms no exception to the rule.

When we realise the ceaseless migration which is always going on in the organic world, the enquiry is forced upon us, How did the existing fauna and flora enter this country, and what facilities has each of the species for dispersal into new regions? It is no longer sufficient to answer, as in the old days, that this species is "native," and that other is "introduced," for we soon learn that in those regions which were affected by the great waves of cold and heat there is no such thing as an aboriginal species. All our animals and plants are here, not by reason of this country being their original home, but because they are species that were able to seek new homes when the climate changed, or are species that could spread rapidly into new districts.

The British fauna and flora is not insular. It is made up of winners in the race, and survivors in the struggle, for an unoccupied country; since its introduction too short a time has elapsed for many insular modifications to appear. Our flora, being made up of recently successful competitors in such a race, tends to spread far and wide. The plants of true oceanic islands seldom establish themselves in new regions, for a truly insular assemblage consists largely of locally-modified forms which are now little adapted for dispersal, for dispersal with them meant only waste and destruction.

So often have the fauna and flora of this country changed, that we are led to wonder whether geological time can be sufficiently long for the process; or, on the other hand, whether most species may not possess greater facilities for dispersal than is usually imagined. The constant recurrence of such questions, and the conviction, after close study of Pliocene and Pleistocene natural history, that changes in the organic world are often, in all probability,

both more sweeping and more rapid than is thought, have led me into various by-paths. Especially have I been led to study the "outliers," which are completely separated from other favourable stations by tracts of desert or unsuitable country, and yet contain the same species. Various classes of these "oases" are to be found. We have the fertile oasis in the desert of Sahara; the isolated mountain, bearing an arctic flora in a temperate region; the outlier of limestone, with its peculiar fauna and flora; the isolated pond; and other varieties of oasis too numerous to mention.

One of my enquiries has been, How do the animals and plants of isolated ponds get there, and how long do aquatic species take to spread across barriers of dry land to a newly formed basin? The bearing of the enquiry is this: If in completely isolated artificial ponds we constantly find aquatic plants and animals, not brought by man, and if we can prove that these ponds had no existence till recent times, then it follows that such species have great facilities for dispersal, and can be transported across a belt of uncongenial country. This will be true, even though up to the present time we have not traced the actual transfer of the species, and do not yet know by what means they are carried. The more common the occurrence of any species in isolated ponds, the greater, as a general rule, must be its facilities for dispersal; and also, the less will it prove any former water-connection with other districts, or show the long continuance of suitable conditions.

The ponds to which the following notes are confined form a somewhat peculiar class. I do not propose to refer to any of the lakes, broads, or meres, for all of these have some outlet up which aquatic species might have spread from other districts. The mountain tarns also will not be dealt with, for though in many of them the only outlet is over a waterfall, and they are truly isolated, I have not yet had sufficient opportunities for studying their natural history.

Two classes of ponds remain—the isolated pool of water that collects in an old brick-yard, quarry, or marl or gravel-pit, and the "dew-pond," which is dug on the dry Chalk Down to provide water for the cattle and sheep. The only supply in both these cases is received from the rain or dew which falls in the immediate neighbourhood, or percolates through the soil; there is either no

outlet and the water evaporates, or the only outlet is by percolation. Such ponds are perfectly isolated, and though some of them may disappear during exceptionally dry summers, the majority are perennial, and always contain sufficient water to keep alive the animals and plants which inhabit them.

It might be thought that an isolated pond on an open Down, a mile or more from the nearest stream, and perhaps 400 feet above its level, would contain no life except the aquatic larvæ of flying insects, a few creatures such as entomostraca, of which the eggs are small, can bear dessication, and might be transported by the wind, and certain plants with small spores or winged seeds. This, however, is not the case. Aquatic plants and animals are common under such conditions; but among the more highly organised species the most common are not those which could be brought by the wind, they are species which are heavy, and which have seeds or eggs of considerable size and weight.

Some fourteen years ago I commenced occasional observation of the higher animals and plants which were found in isolated ponds, but, unfortunately, have lost my Norfolk notes. In the present paper only the general results of the earlier work can therefore be given. For two reasons the observations have been confined to the amphibia, fish, mollusca, and flowering plants. In the first place, I have not much time at my disposal; and secondly, the other invertebrata, and the cryptogams, are more easily transported, and their occurrence would, therefore, be of less importance for the present enquiry.

Though it will be needless to trouble the Society with a mass of details, it may be advisable before giving general results to quote a few examples, to show the method employed, and the character of the evidence. I will take for this purpose the district most recently examined; a district which happens also to be the one where the ponds are most completely isolated.

The South Downs form a range of undulating chalk hills, extending through Sussex from Beachy Head to the Hampshire boundary. They constitute a district pre-eminently dry; no streams occupy the coombes, and the only water visible is in the few rivers which, rising in the Weald, must cut through the Downs to reach the coast. All the rainfall of this district either evaporates or sinks into the ground without forming streams,

except in two or three of the deepest valleys, and these only contain water in part of their course, and at certain seasons.

The dryness of this region has made it absolutely necessary to provide water for the cattle by digging ponds at frequent intervals. The bottom of these ponds is made impervious by puddling with clay or chalk-mud, or sometimes by a lining of concrete. When once formed the rain, dew, and condensation of the mists, which often hang on the tops of these hills, suffice to provide a constant supply of water, except, perhaps, during droughts like that of the summer of 1887. We may thus find ponds which are distant two or three miles from the nearest stream or marsh; and as the Downs rise to 800 feet, and the average height is fully 200 feet above the highest streams, it follows that any aquatic animals or plants found in the ponds must have been transported up hill, as well as across uncongenial tracts of dry grass.

Human agency is not likely to play much part in the transport of seeds or eggs to these ponds, for most of the Downs are seldom visited by strangers, and the majority of the ponds are not near any road. Open natural pasture, with an occasional pond, occupies much of the higher land, and on this, day after day, one meets only the shepherd tending the sheep, or the farmer making a short cut across the open country. There are no vehicles which might transport seeds in the mud adhering to their wheels, as may often have been the case with the plants found in horse-ponds. Even the spades which were used when the dew-pond was dug came from an upland farm which drew its supply of water either from a deep well or from an isolated pond; so any earth sticking to the tools would only contain ordinary weeds of cultivation, not seeds of aquatic plants. The sheep remain on the Downs, and when taken to the lower lands to fatten they do not come back again; when transferred to lower ground during severe weather they are kept as far as possible on dry spots. The shepherd lives not far off, and the mud on his boots is usually upland chalk-mud. Thus everything seems to show that human agency is not likely to transport any aquatic plants or animals to these dew-ponds.

I will now give a few examples of the dew-pond and its natural history, premising that the distances and heights are taken from the six-inch Ordnance Survey, and that usually I could only stay to note the common and conspicuous plants and animals. It may

also be observed that the drought of 1887 probably killed a good many of the plants, for not only did many of the pools completely dry up, but the farmers took the opportunity, in many instances, to clean out the mud and deepen the ponds.

Large dew-pond on the open Down nearly a mile east-south-east of Amberley Station; height 310 feet above the sea, and 300 feet above the marshes of the Arun; nearest water, the marshes of the Arun, distant half a mile. Noted 15th November, 1884. This pond has evidently been made several years, and is now full of water-plants. The species observed were *Juncus* (not in flower or fruit, though very abundant), *Potamogeton densus* (very common), *Ranunculus aquatilis*, *Chara*, and a single small, but vigorous tuft of *Elodea canadensis*. This was the first time that *Elodea* was observed in an isolated pond, though I have since come across three other cases of its occurrence. As the plant never fruits in this country, it probably has been transported twisted round the leg of a bird. (I have apparently omitted to note the mollusca from this pond, if there were any).

Redlion Pond, on the open Down, three miles south-east of Lewes; height 540 feet above the sea, and 530 feet above the marshes of the Ouse; nearest water, the marshes of the Ouse, distant seven furlongs. Noted June, 1890. The species observed were *Limnæa peregra*, *Ranunculus aquatilis*, and *Elodea*.

Small pond by the side of the high road half a mile west of Christ Church, Stansted (near the Hampshire border); height, 312 feet above the sea, and 220 feet above the nearest stream; nearest water, a small stream, distant about two miles to the south-south-west, but apparently containing neither of the plants found in the pond. Noted September 25th, 1891. The species found were *Limnæa peregra*, *Planorbis spirorbis*, *Potamogeton natans*, *Zannichellia palustris*, all abundant; the two plants in fruit, and carrying many eggs of *Limnæa*. *Zannichellia* occurs again in a pond in a brick-field two miles to the south-west, but does not fruit there; the nearest natural station for it seems to be in the slightly brackish marshes near Emsworth, four miles to the south. *Potamogeton natans* can probably be found within three miles. This pond is overshadowed by a large oak, and supplied by dew and rain off the road; neither of the plants, however, is

a species likely to be brought to the locality by carts or on the hoofs of horses. I took home a small quantity of the *Zannichellia*, after shaking it well to get rid of the snails, but found afterwards that I had brought away, adhering to it, fully 150 specimens of *Planorbis* and *Limnæa*, mostly very minute, and several clusters of eggs.

These few detailed notes will give some idea as to the general character of the observations; it now remains to deal with the question of the relative abundance of the different species noticed in isolated ponds, and with the probable method by which they are transported. For a study of such questions it will be most convenient to take the species in order, beginning with the highest; but it may be observed that forms of constant recurrence have seldom been noted, except when associated with rarer forms, and exact statistics cannot be given of the more abundant species.

Amphibia are not nearly so common as one would expect, being mainly confined to the low-lying ponds which are within an easy night march from the next water across the dewy grass. Under such circumstances plenty of frogs and newts are to be found in isolated ponds, but I have only one record of newts observed in a dew-pond on the Downs. In this case they were seen in a pond near the Lewes Race Course, about 400 feet above the sea, but I could not obtain specimens to observe the species. The rarity of Amphibia in dew-ponds may, however, be mainly due to the circumstances that there is seldom any shade over these ponds, and that there is very little mud at the bottom in which the animals could bury themselves. Uncongenial conditions have probably as much to do with the poverty of the fauna and flora in dew-ponds as want of transport.

Of Fish the only species yet observed has been the Stickleback, which occurs not uncommonly in ponds in old brickyards and gravel-pits, but has only once been seen in a dew-pond on the Downs. The nest of he Stickleback is attached to water plants, and would be liable to transport with the plants. The Eel I have not come across, but may easily have overlooked, though, like the Amphibia, it is probably confined to low-lying ponds not far from other water. I found Eels in a pond in the large ballast-pit near Chichester Station, but the navvies tell me that some years

since they placed a number of young ones in this pond to fatten. They fattened, but became very unwholesome, and the men had reason to remember the hunt they made when the Eels were full grown. If this account is true, I do not know of any instance of Eels having travelled a long distance.

Passing next to the Mollusca, we obtain some curious results; for while among the gasteropods, Limnæids of various species are abundant in isolated ponds, there is an almost entire absence of the operculated pond-snails, generally so common in stagnant water. I have never seen either of our species of *Paludina*, and our two species of *Bythinia*, and two of *Valvata* have only been observed in ponds closely adjoining rivers or extensive marshes. *Neritina* we can scarcely expect to find in a small pond. *Sucrinea putris* and *S. elegans* both occur occasionally; when found at all they are abundant, so have evidently no difficulty in living in these ponds when once introduced.

Limnæa peregra is the mollusc most commonly found in isolated ponds; indeed, its occurrence is so habitual that where found without other species I have long ceased to note it—the number of occurrences observed must now be at least one hundred. *Limnæa truncatula* is fairly common, and has a curious tendency to turn up in horse-troughs and stone basins. In one instance a number of specimens were found in a raised stone cattle-trough on the marshes of the Humber. The dykes in this marsh contain water much too salt for cattle to drink, and it is necessary to provide a supply of water by deep borings, one of which overflowed from the tube into this cattle-trough. Thus a small colony of *L. truncatula* was found living in a cattle-trough in the middle of a salt-marsh, where the surrounding dykes were too salt for this snail to live in. *Limnæa auricularia* is seldom found in isolated ponds, but possibly the species has sometimes been overlooked among *L. peregra*. Stunted varieties might easily escape observation, and the unfavourable conditions make dwarf forms of common occurrence among the mollusca in small ponds. *Limnæa palustris*, though so abundant in our marshes, is a rare species in isolated ponds; I have only noticed it two or three times. *Limnæa stagnalis* has been found twice; in one case in a dew-pond on the dry South Downs.

Limnæa glabra, our last species of the genus, is a rare form which we could scarcely expect to find in artificial ponds; but

though not belonging strictly to the subject of this paper, one occurrence of this species is so suggestive of recent transport that it may be placed on record. Hornsea Mere, in Holderness, is a natural lake or broad of considerable size, with an outlet to the sea, but with no connection with other basins. In this Mere live numerous fresh-water mollusca, but though the species have been recorded more than once, *Limnæa glabra* does not appear in the list. On one occasion I found, however, a single full-grown dead specimen on the shore of the lake, but repeated search did not produce a second. This occurrence of a single specimen of a gregarious genus like *Limnæa* suggests that here was a case in which only one young individual was transported to the lake, and that the mollusc, therefore, grew up and died without leaving descendants.

The genus *Planorbis* is next in abundance in isolated ponds; in fact, the species *spirorbis* and *vortex* rank next to *Limnæa peregra* in number of occurrences. *Planorbis albus*, *P. nautileus*, *P. complanatus*, *P. carinatus*, and *P. contortus* have each been seen once or twice, *P. corneus* only once. The only species of the genus noticed in dew-ponds on the Downs are *P. spirorbis* and *P. vortex;* these flat shells tend to cling to a stick or piece of weed taken out of the water, the other species generally drop off.

In the genus *Physa*, one record of *P. fontinalis*, and one of *P. hypnorum* is all that have been made. A vigorous colony of the last-named species was observed in Holderness in a small pool in a ditch, with no outlet except through a pipe, which formed a raised spout discharging into another ditch. The lower ditch did not contain the species, and I did not observe it anywhere in the neighbourhood. *Ancylus lacustris* has only been noticed once in an isolated pond. *A. fluviatilis* is still unrecorded.

Turning next to the Bivalves, one is surprised to find that no species is at all common in isolated ponds, though they are said often to be transported attached by the closing of their valves to the toes of birds. *Anodon* and *Unio* have not been observed, *Sphærium corneum* has occurred once, *Pisidium amnicum* once, *P. pusillum* and *P. henslowianum* several times; but it is possible that the small *Pisidia* may often be overlooked.

The list of plants found associated with the above-mentioned mollusca contains a few only of our aquatic species; but nearly all

those yet met with are plants that are not uncommon under such circumstances, or at any rate have been noticed in more than one pond. Taking the species in botanical order, the first in the list, *Ranunculus aquatilis*, happens to be by far the most abundant plant in isolated ponds, and is usually associated with *Limnæa peregra*. Though exact statistics have not been collected, I think that it may be said to occur in about one out of four of the isolated ponds which have neither completely dried up, nor been purposely cleared out, during the three or four seasons preceding the observation. *Ranunculus flammula* is common in pools or swampy places in old gravel-pits, but seldom occurs in dew-ponds on the Downs, probably because around these ponds there is no swampy margin such as this plant loves. The same remark applies to *Ranunculus sceleratus*, which, however, is somewhat more rare. *Caltha* has not yet been noticed in ponds entirely surrounded by dry ground, and both *Nuphar* and *Nymphæa* are also absent, except where purposely introduced.

Nasturtium officinale occurs occasionally, but, as far as observed, only in the few isolated ponds which happen to be fed by springs. It is a plant we could not expect to find in stagnant water. *Myriophyllum spicatum* has been met with once, and so also, I believe, has *Hippuris vulgaris*, though no note was taken of the locality. *Callitriche* is one of the most abundant genera, being second to *Ranunculus aquatilis* in its number of occurrences. *Peplis portula*, though not a truly aquatic plant, is found under somewhat similar conditions; it occurs on the wet floors of sand-pits which, though surrounded by perfectly dry heaths, have been deepened till the water-level has been reached, and consequently have their floors always moist. Various marsh plants occur under such circumstances, including *Hydrocotyle*, *Anagallis tenella*, *Pedicularis palustris*, and several sedges and rushes.

Conditions are seldom favourable around dew-ponds for the growth of our aquatic Umbellifers, for most of them would easily be broken down by the cattle, and their fruit cannot ripen in the water. In ponds in old sand-pits a few are occasionally seen, but the species have not been noted.

Both our species of *Bidens* have been seen on the margin of ponds, but neither is common. *Hottonia*, *Samolus*, *Menyanthes*, and *Limnanthemum* are all absent as far as observation has yet

gone. *Myosotis* is not uncommon, but I have omitted to note whether the species was *palustris* or *cæspitosa*, or whether both occur. *Scrophularia* is rare, and has not been observed in ponds far from other water. *Utricularia* may have been overlooked owing to want of time, and the inconspicuous character of the plant when out of flower; it has not been carefully searched for. *Mentha*, *Lycopus*, and *Stachys palustris* are often seen in ponds railed in so that cattle cannot get at them. The aquatic species of *Polygonum* occur frequently in horse-ponds by the road-side, but are uncommon in dew-ponds on the open Downs.

Rumex maritimus was once found in an old moat (probably fifteenth century); it, however, is a species which from its burr-like fruit would be very liable to be carried by human agency. Of the other aquatic docks, I believe that *Rumex hydrolapathum* has been seen in some of the larger ponds in old ballast-pits, but no note has been preserved of the localities. *Ceratophyllum* is rare in isolated ponds, only having been observed once. *Elodea* has been found on three occasions in dew-ponds on the open Downs. *Hydrocharis*, though a common plant in the marshes of the Arun and other Sussex rivers, does not find its way to the dew-ponds; it occurs in a pool in an abandoned brick-yard, where, however, it is associated with other handsome water plants, probably purposely introduced to make the brick-yard somewhat less unsightly.

Both our species of Bulrush, and also *Sparganium ramosum*, and more rarely *S. simplex*, are found in ponds inaccessible to cattle, but none of these plants have been seen in the dew-ponds on the Downs. *Lemna* is common, though many of the more distant ponds are without it. The chalky bottom of a dew-pond, perhaps, does not suit *Alisma plantago*, for it is seldom found there, though sufficiently common in old sand-pits. *Sagittaria* and *Butomus* have only yet been noticed along continuous water-ways.

Of the pond-weeds *Potamogeton natans* occurs rarely, the commonest species being *P. densus*, and some narrow-leaved forms which, not finding in fruit, I have not attempted to determine. *Zannichellia* has only been noted in the two instances mentioned in the early part of this paper, but when not in fruit it may have been overlooked among the other linear-leaved plants.

No attempt has yet been made properly to determine the various Rushes, Sedges, and aquatic Grasses which soon make their

appearance around new ponds. I believe that *Carex pulicaris*, *C. paniculata*, *C. vulpina*, *C. glauca*, *Juncus communis*, and *J. bufonius* are all common; and *Phragmites* is certainly abundant where safe from treading down, and where there is a sufficient depth of soft soil at the bottom of the pond.

A few of the clear-water ponds in old quarries and gravel-pits are full of *Chara fragilis*; I have not noticed any other species of the genus under such circumstances, and even *Chara fragilis* is rare.

Those plants which are of most common occurrence in dew-ponds are the floating species, with finely divided leaves, and with fruit ripening in or on the water. The comparative rarity of erect aquatic forms may be principally due, however, to the prevention of fruiting, through the treading down of the plants by animals that come to drink at the pond. That this is the cause, to a large extent, of the poverty and peculiarity of the flora of the dew-ponds, is shown by the fact that upright plants, such as Bulrushes and Burr-reeds, occur abundantly in pools inaccessible to large mammals. Thus it seems probable that many more species are brought to each dew-pond than can establish themselves under such unfavourable conditions. But even under circumstances not favourable for the introduction of new forms—except that for the first comers there is no competition with other plants—we learn that a considerable proportion of our aquatic flora can find its way into recently-formed isolated ponds, and must, therefore, have greater facilities for transport than is often imagined.

The question next arises, how do the plants and animals, found thus isolated, succeed in crossing the intervening deserts and reaching the small oases formed by distant ponds in the middle of a dry country? We have singularly little direct evidence as to the mode of dispersal in the groups with which we are now dealing. The plants are not species with succulent fruit, such as we know are habitually eaten by birds; and species with burrs or hooked fruit are by no means abundant among them. The list is essentially a list of plants with fruit dry-seeded and thin-shelled, which, if eaten at all, would probably be digested and would have their vitality destroyed. *Sparganium* and *Potamogeton* alone have a somewhat succulent outer coat, surrounding a hard woody seed, which might pass through the digestive canal of a bird uninjured.

But the Water-lilies, the fruit of which we know are eaten by Coots, do not appear in isolated ponds.

Perhaps the occurrence of the fruitless *Elodea*, and the fact that most of the plants found in distant ponds have, like *Elodea*, extremely brittle stems, detached fragments of which will grow, may give the clue to the ordinary mode of dispersal. All these plants, besides brittle stems, have finely divided or thin leaves, which, on removal from the water, collapse and cling closely to any object which they may touch. It is therefore not improbable that most of them are transported in fragments, which breaking, cling to the feet of waders, to be washed off when the bird flies to the next pond. If fragments of stems are carried by birds, this will also account for the constant occurrence of the Limnæids, which both adhere to the stems and attach their eggs to them. The other freshwater mollusca, except the small *Pisidia*, mostly live in the mud, are viviparous, or do not attach their eggs to plants; for these reasons the operculated mollusca, and the larger bivalves, are less likely to find their way to isolated ponds.

Although so many aquatic animals and plants have now been added to the list of species which can cross barriers of dry land, we are still in great danger of under-estimating the rapidity with which the dispersal takes place. As yet only a limited number of observations on isolated ponds have been made; and these ponds are small, liable to shrink greatly in dry weather, and are usually exposed to the trampling of large animals which come to drink. Thus the species found, as already remarked, may represent most imperfectly the number that have been carried to each pond since its formation. In most cases only one or two individuals would be transported, and the species for the first year or two would be particularly liable to extermination, on account of the small number. In a small pool of water competition also must be very active, and must tend to keep down the number of species living together, especially when many of the forms have similar habits, as is the case with the Limnæids. We might, therefore, expect to find in the mud of the pond the remains of various species which had been introduced at different times, had lived and multiplied, and had then been crowded out by stronger competitors. The species found in any one small pond may be merely the victors in the struggle; the remains of the conquered races will be found in

the mud below. Observations on the species which inhabit a pond in successive years have still to be made. It is only in a large railed-in pond with shelving margins and tolerably deep water in the centre, that we may expect to obtain clear evidence of the rapidity with which the introduction of species takes place, and it is certainly in such ponds that the variety is greatest.

Although my notes have been mainly confined to ponds which are certainly no older than the present century, yet so considerable a proportion of our aquatic flora, and of our freshwater mollusca, has been observed in these ponds, that one is inclined to say that with longer time for the accumulation of the results of rare accidents, most of the other species would appear also. We know, for instance, that some of our bivalves are transported attached to the toes of birds, and we know that these species are found in various natural lakes, though so rare in modern ponds. Is not the common occurrence of these species in natural lakes merely the result of time? In the one case we are dealing with a pool of water, the whole history of which is included in the present century; in the other we see a larger lake whose origin dates back probably ten thousand years.

No doubt it will be said that the eggs of many aquatic animals, and the seeds of many water-plants are not fitted for transport by birds. But even with these, the eggs or seeds of most must be occasionally included in the mud which adheres to the feet of birds, or they must sometimes be entangled in the floating plants which so readily are transported. Add to this, that when raptorial birds were more abundant, the violent death of so many of the smaller species must often have led to the scattering of the undigested contents of their stomachs, and thus to the occasional introduction into river-basins of animals and plants previously unknown there.

The natural history of isolated ponds shows that when results are accumulated during long periods, accidents apparently rare may have more to do with the distribution of animals and plants than is imagined. Among naturalists there is a tendency to account for isolated colonies by former continuity in nearly every case. We are told that the botanical and zoological similarity of our different river-basins is due to the former connection of the rivers. In the case of the British rivers, however, we must guard against any such conclusion. Each year's work at the subject

makes it more clear, that ever since our climate became sufficiently mild to allow of the existence of our present fauna and flora, many of the river-basins of Britain have formed isolated areas. Each of the mountain tarns has probably obtained its inhabitants gradually through the accumulation of accidents, and not by wholesale migration along a continuous water-way. In the Eastern Counties, however, there is evidence of a former continuity of water-ways greater even than that now existing. That continuity is probably the reason of the more prolific aquatic fauna and flora of Norfolk when compared with other districts, like the Severn valley, which have always been more completely isolated.

To guard against misapprehension, it may be observed that this paper deals only with a single group of animals and plants—that found in isolated ponds. These species are apparently most often transported on the feet of birds. There are other equally large groups which are dispersed in quite different ways, and it must not be thought that any attempt is here being made to account in the same way for the whole of our fauna and flora. One branch only of a wide subject is here dealt with.

IV.

ON THE DISTRIBUTION IN GREAT BRITAIN AND IRELAND OF THE RED-BACKED SHRIKE.

(*LANIUS COLLURIO*, LINN.).

By O. V. Aplin.

Read 23rd February, 1892.

Introductory Remarks.

The Red-backed Shrike (*Lanius collurio*) is a bird in which I have always taken a peculiar interest, and its curious and remarkably local distribution in Great Britain has suggested to me that it would be worth while to trace carefully its range throughout the kingdom.

The present paper is the result of my researches and enquiries.

Having put together under the heads of the counties of England and Wales, and of Scotland and Ireland, all the matter bearing upon the subject which I could find in the works upon British Birds (especially the local avi-faunal books), and in some periodicals, &c., &c., I endeavoured to supplement the information so obtained with the unpublished evidence of naturalists residing in different parts of the country. With this end in view I asked, through the medium of the 'Field' and the 'Zoologist,' for information upon the subject; and I gladly take this opportunity of thanking those observers who kindly responded to my request, as well as my numerous ornithological acquaintances and correspondents to whom I was able to make individual applications, and who have furnished me with a large amount of data.

It is almost impossible to give, *shortly*, an accurate account of the British distribution of this bird; but roughly speaking, it may be said that the Red-backed Shrike is little more than a casual visitor to Northumberland and Durham; and although it breeds occasionally (possibly annually) in parts of Cumberland, Westmorland, Yorkshire, and Lancashire, it cannot be considered as other than a rare bird in those counties. From Anglesea, the northern parts of Carnarvon and Denbigh, and from Flintshire, I have no records of its occurrence; and the evidence from Cheshire militates against its visiting that county; while in the northern portions of the counties of Derby, Nottingham, and Lincoln it is a decidedly rare bird, and in some parts seems unknown, except, perhaps, as a passing autumnal migrant. Indeed, one may almost say that latitude 53° marks off the country south of which the Red-backed Shrike is a common summer migrant; but a boundary line drawn here would, of course, have to be deflected in places. Turning to the south-west we find it rare in Pembrokeshire, Cornwall, and South-west Devon. Possibly longitude 4° 5′ W. might be laid down as a western boundary, beyond which it ceases to be a regular and common visitor, but as in the case of its northern confines no very strictly defined marches can be prescribed. Over the rest of England and Wales we find the Butcher-bird occurring as a regular summer visitor, breeding annually in larger or smaller numbers, but over the whole of its range preserving its character of an extremely, almost capriciously,

local bird. It is commonest in parts of Southern, South-eastern, and Eastern England, of the home counties, and of North Wales. To Scotland this Shrike is merely an occasional visitor. The evidence of its breeding in that country is, I believe, hardly satisfactory, resting, according to the data at my disposal, upon the observation of adult birds in the early, and of young birds in the latter part of summer. As the Red-backed Shrike is a late spring migrant, and changes its quarters almost immediately after its young become strong on the wing,* this evidence is not conclusive. In Ireland it has only occurred on one occasion, so far as I have been able to ascertain.

So locally, however, is this bird distributed in the breeding season, that it is impossible to get a right notion of its British range without reading the evidence which has been adduced, *in extenso;* I have accordingly laid the whole of it before the members of this Society.

The distribution of the Red-backed Shrike seems, within certain limits of latitude and longitude, to be determined mainly by the nature of the soil and climate, and the bearing of these upon the insect life of a particular district. The favourite food of this Shrike during its residence with us consists of large-bodied insects especially beetles and bees; and I believe that the comparative abundance or scarcity of that food in any given district largely determines the numerical strength or weakness of this species therein. So far as I can learn, Mudie is the only author who has hitherto paid much attention to this point. He writes ('Feathered Tribes of the British Islands,' 2nd ed., vol. i. p. 236), ... "it leaves the gravelly and clayey districts, and takes up its abode in a central zone, beginning at the channel, and terminating at the light soils in the valley of the Dee. The climate of that zone is warm, and the soil peculiarly adapted to the habits of the larger beetles, which seem the natural and peculiar food of these birds;" and it must be confessed that there is a good deal in what he says, although I cannot entirely agree with his definition of the exact range of the bird, and the kinds of soil it affects or avoids.

* Mr. J. Lucas writes: "These birds commence their autumnal migration in July, when they are to be seen along the coast of Sussex. On July 30th and 31st, 1867, I saw two at Heene; and on August 7th and 8th, S. F. Lucas shot two migrating" ('Zoologist,' 1879, p. 404).

Eyton also, writing of it in Merionethshire, speaks of the abundance of this species, and the corresponding plenitude of its favourite food (*vide* p. 307). Other recent observers have also described this Shrike as common in that locality (*vide* p. 307), and in my notes on it in North Oxon (*vide* p. 300) I have shown that its scarcity in that district is concomitant with something like a dearth of certain forms of insect life. A warm soil (*e.g.*, sand, gravel, limestone, or chalk) is, then, attractive, though not absolutely necessary, to this Shrike, which is also affected indirectly by climate. The "tall tangled hedgerow," or "bullfinch," so often insisted upon as attractive to the bird, is certainly not essential to its welfare, although the Butcher-bird is undoubtedly fond of these big hedges with their long thorns for impaling prey, and the convenient nesting sites they afford; nor will they of themselves induce the Shrike to adopt a particular district. In North Oxfordshire and in Northamptonshire tall hedges are common, but the Shrike is not; and I gather from a recent work that even in "High Leicestershire" the Butcher-bird is decidedly scarce. On the other hand open commons, and half-wild sides of sheltered valleys, if they are furnished with scattered bushes and over-grown clumps of the same, are often favourite localities. It is certain that the "Flusher" likes to haunt the neighbourhood of gardens, and in late July and in August often brings its young brood into both pleasure and kitchen gardens.

In conclusion, I may call attention to two facts, evidence in support of which is brought forward in the following pages. One is the Red-backed Shrike's habit of coming year after year to breed in a particular spot; in one instance in North Oxon even after both birds of a pair were destroyed one year before they had reared their young. The other is the reported decrease of this species in some parts of the country.

ENGLAND.

Northumberland and Durham. "A rare casual visitant. Two specimens were killed near Kenton, on the Newcastle Town Moor, in the summer of 1829. These are mentioned in Mr. Selby's Catalogue, and are now in my collection. Another example, also in my collection, was shot at Horsley, Northumberland, May, 1834.

Bewick's figure of the female represents the young in first plumage" (Hancock's 'Catalogue of Birds of Northumberland and Durham,' p. 42).

Durham. Mr. James Sutton, of Durham, writes to me as follows: "A few years ago I had the nest sent me, recently taken by the late Mr. Wearmouth, Taxidermist, &c., in the neighbourhood of High Force, Teesdale, Durham; it contained four fine eggs, which, owing to a mishap, were broken; the nest is in my collection" (*in lit.*).

Cumberland and Westmoreland. "A scarce summer visitant, a few pairs breeding annually in the lake district. In the north of the county it only occurs irregularly. Mr. Tom Duckworth found a nest some years ago near Newby Cross, and we have seen the thorns festooned with insects in other seasons. A pair nested near Carlisle in 1883, and another pair was observed near Gilsland. In August, 1885, we observed an immature specimen being vigorously mobbed by some small birds" (Macpherson and Duckworth's 'Birds of Cumberland,' page 27).

The Rev. H. A. Macpherson writes: "I have seen both eggs and birds obtained in the English lake district, and I think I could show you a pair any summer, but it is very local . . . . If anything, it is losing ground in the north-west of England, certainly not gaining it; and it does not generally occur as far north as Carlisle" (*in lit.*).

Dr. C. A. Parker wrote of West Cumberland: "The R.-b. Shrike is common" ('Zoologist,' 1879, p. 117).

In a note in the 'Zoologist' (1884, p. 128) the Rev. H. A. Macpherson speaks of this Shrike as rare; and after mentioning one seen near Carlisle on the 2nd July, 1883, adds: "Though established in the Lake district, *L. collurio* has only once before bred near Carlisle in the memory of Messrs. Duckworth and other observers."

Yorkshire. Mr. W. Eagle Clarke gives me the following information: "Possibly breeds annually in the county; but is extremely erratic in its visits as a nesting species to any particular district; and does not seem to have a great desire to return even to those particular localities where it has reared its young successfully. Thus I can only regard it as a rare casual nesting species in any portion of the county, though a pair or so *may* breed

annually in some portion of its broad acres, but nowhere regularly. I have seen specimens at Spurn Head, both on the spring and autumn migration. I well remember a beautiful pair, male and female, at the extreme end of the headland on the 28th of May, 1882. They were off the next day. I have also seen on several occasions birds of the year in the same locality late in August. These may have been bred in the county" (*in lit.*).

One in Upper Teesdale in 1887 (Mr. J. Backhouse, 'Naturalist,' 1888, p. 80). One, perhaps a little doubtful, in Central Ryedale in 1882 (Mr. C. W. Smith, 'Naturalist,' 1889, p. 327). One, "presumably of this species," at Easington in the second week in May (Mr. Cordeaux in the 'Naturalist,' 1890, p. 201). For these records I am indebted to Mr. T. H. Nelson.

Mr. J. Cordeaux informs me that this Shrike has been recorded as nesting near Beverley in 1877 (*in lit.*).

Mr. George C. Swailes, of Beverley, sends me word of the occurrence of a nest with one egg; also a male and two females (one of latter apparently breeding) at Beverley in May, 1876 (*in lit.*).

"Has been recorded as nesting near Richmond" (Mr. J. E. Tinkler, 'Zoologist,' 1884, p. 133).

Mr. H. D. Astley saw a pair at Bolton in June, 1885 (Zool., 1886, p. 76).

Mr. Joseph Lucas, F.G.S., in an article, entitled, "The Naturalist in Nidderdale," mentions that he saw one at Hole Bottom (950 ft.), a dell full of trees and bushes, slightly exposed to south-east, on 1st July, 1869. He remarks that it was rare, as he had no other record of its occurrence (Zool., 1879, p. 404).

One (Juv.) obtained near Hackness about beginning of October, 1888 (Mr. R. P. Harper, 'Zoologist,' 1889, p. 150).

A clutch of eggs, taken near Middleton, was in the collection of the late Mr. Nicholas Wearmouth (Mr. J. Backhouse, 'Naturalist,' 1891, p. 148).

Selby says that it was occasionally met with in the western parts of Yorkshire, where it had received the name of "Flusher" (Ill. of B. Orn., vol. i. p. 151, 1833).

One, obtained at Melbourne, near York, is in the collection of the York Blue Coat Boys' School (Mr. J. Backhouse, 'Naturalist,' 1886).

Mr. T. H. Nelson writes me word from Redcar, that a taxidermist and bird-catcher there told him he caught two near Redcar twenty years ago in early August. They were young birds, and might have been bred there (*in lit.*).

Lancashire. "A summer visitor; still breeding regularly, though in decreasing numbers." Mentioned as having bred at Bootle and Brockholes, and Rainhill (1860), and occurring at Warrington (1873). Still found in some numbers at Farington and Penwortham, and not at all scarce in the year 1882, in which year both young and old were seen at Midge Hall. Nests taken in May, 1872, at Haighton; in June, 1875, at Broughton; and May, 1878, at Goosnough. Seen in May, 1882, at Knott End; and birds and eggs several times taken between Preston and Southport. In the Clitheroe district, Mr. F. S. Mitchell only knew of one nest, viz., on June 3rd, 1860, near Rimington; but on the other side of Pendle Hill, at Colne, Mr. T. Altham said that up to a few years ago eggs were taken year after year. Dr. Skaife in 1838 wrote of it as by no means a rare bird in the neighbourhood of Blackburn. In Furness, Mr. Durnford reported it as once common, and that it was still found in the Lake district (*vide* Mr. F. S. Michell's 'Birds of Lancashire,' p. 49, 1885).

Cheshire. Mr. T. A. Coward of Bowdon, near Manchester, writes: "I have no note of the occurrence of . . . . the Shrike . . . . in Cheshire, though . . . . reported, but on rather slender evidence" (*in lit.*).

Lincolnshire. Mr. G. H. Caton Haigh, of Grainsby Hall, has never met with it in North Lincolnshire (*in lit*).

"The Red-backed Shrike is of rare occurrence in North Lincolnshire. It *occasionally* occurs in *May* on migration in the vicinity of the coast on both sides of the Humber, and again in August (immature birds). In 1878 a pair nested in Raventhorpe parish, near Brigg. Also the nest has been taken in Hibaldstowe parish, in the same neighbourhood" (Mr. J. Cordeaux, *in lit.*). When Mr. Cordeaux brought out the 'Birds of the Humber District' he spoke of it as rare, and had never seen it himself in North Lincolnshire. Mr. J. Cullingford wrote of the south of the county: "I have known it to be a regular summer visitor . . . . for a good many years, breeding in the tall hedgerows . . . . A male bird is now in my possession which was obtained there in

1873; and it was known as a summer visitor before that" (Zool., 1883, p. 339).

Mr. R. W. Chase has also met with this Shrike in Lincolnshire (*in lit.*).

Norfolk. "A constant summer visitant, though not in large numbers, and breeds regularly in the county; but is, at the same time local in its distribution" (H. Stevenson, 'Birds of Norfolk,' vol. i. p. 62).

. . . "Not common. A pair or two generally nest near Cromer" (Mr. J. H. Gurney's Catalogue of the Birds of Norfolk in Mason's 'History of Norfolk,' 1884, p. 12).

Three were seen at Eaton, 21st April, 1884, by the late Mr. H. Stevenson (Zool. 1884, p. 371).

Two pairs nested at Northrepps in 1881, as recorded by Mr. J. H. Gurney, who gave a good note on the larder (Zool., 1881, p. 484).

In the Norfolk and Norwich Museum are two examples of an isabelline variety procured at Thorpe in 1869.

In the latest list of Norfolk Birds, by Messrs. Gurney and Southwell, this Shrike is entered as "A summer migrant, not so numerous as in the days of the good old 'bullfinch' hedgerows" (Trans. N. and N. Nat. Soc., vol. iv. p. 268).

Mr. T. Southwell, of Norwich, has kindly given me some further particulars relating to the Shrike in this county. He writes: "I remember, as a youth, this Shrike quite a common bird in the neighbourhood of Lynn and Fakenham. I used to find numbers of nests in the old 'bullfinch' hedges of that day, as also its 'larders.' About Norwich, and I think all through Norfolk, it has been, according to my experience, becoming gradually scarcer for many years, and rapidly so for the past few. Recently (since I received your MS.) I have asked many of my friends, and they all agree with me, that it is much less frequent than formerly; and many of them attribute this to the absence of the big fences and thorn cover which it loves to frequent" (*in lit.*, 2nd Feb., 1892).

Suffolk. The Rev. Julian G. Tuck, Tostock Rectory, writes: "The Red-backed Shrike is common all over this county." He mentions six nests in 1891, three of which he found himself (*in lit.*).

A creamy-white variety was shot at Belstead, Ipswich, in the summer of 1882 (Zool., 1883, p. 186).

Essex. Mr. Miller Christy writes: "A common summer visitor . . . . It varies considerably in number in different years, and appears to be decreasing with us." And he quotes the following evidence:—Mr. Joseph Clarke said in 1845 that it was formerly not common round Saffron Walden, but latterly more so; Henry Doubleday, in 1831, said it was then very common in Epping Forest; Mr. Buxton said they bred in that district frequently, if not every year; Mr. King said it was common round Sudbury; in the Birdbrook district it was common, but at Maldon somewhat rarer. Mr. Hope wrote: "It is very common in Essex" ('Birds of Essex,' 1890, p. 105).

The Rev. H. A. Macpherson saw it in Epping Forest in 1876 (*in lit.*).

Derbyshire. Mr. A. S. Hutchinson, of Derby, considers it rather rare in that district, but reports that it used to breed regularly at Littleover (in one particular spot) when he resided there a few years ago (*in lit.*). Mr. F. B. Whitlock writes: "Scarce. I have only once met with it in the south of the county. In the Peak district I have never seen it" (*in lit.*).

"This bird is not unfrequent in the neighbourhood of Duffield. It arrives towards the latter end of May, and visits the same spot for a number of years" (Glover's 'History of the County of Derby,' vol. i. p. 146).

Nottinghamshire. Regular summer visitor. Known to breed in a garden at Lenton, close to Nottingham, and at Colwick every year (Messrs. Sterland and Whitaker's 'List of Birds of Nottinghamshire,' 1879, p. 12).

Mr. J. Whitaker shot a female at Rainworth in 1882, the first he had seen in North Nottinghamshire (Zool., 1883, p. 31).

Mr. F. B. Whitlock, of Beeston, writes of South Notts: "Occurs here every year, and breeds very sparingly. I have seen it in Clifton Grove, at Attenborough, and other parts. A specimen was shot at Mapperley in the spring of 1890, and another at Attenborough in the spring of the present year (1891). I have seen young birds obtained in the neighbourhood of Gedling and Basford" (*in lit.*).

Staffordshire. Mr. J. S. Elliott, of Sutton Coldfield, writes:

"Fairly distributed wherever suitable nesting sites occur" (*in lit.*).

Mr. F. Colam, of Birmingham, reports that he has received very few specimens from this county, excepting the north-west corner, which abuts on to Worcestershire (*in lit.*).

Mr. R. W. Chase has met with it in this county (*in lit.*).

Leicestershire. The following particulars are extracted from Mr. M. Browne's 'Vertebrate Animals of Leicester and Rutland': "A summer migrant, sparingly distributed, and remaining to breed." Young ones were brought to the late Mr. Widdowson from the neighbourhood of Melton. Mr. Macaulay considered it "not very common." Mr. Davenport has never taken its nest in the county, and is confident it is a rare bird there. Mr. Browne saw a male in Narborough "bogs" on 20th June, 1885, and another at Barrow-on-Soar on 15th July, 1886. He mentions a male, female, nest, and one egg procured at Belgrave on 27th May, 1885, and other specimens procured many years ago. In Harley's day it seems to have nested annually (p. 72).

Mr. F. B. Whitlock, of Beeston, Notts, writes: "A scarce bird, seldom met with at any time of the year. I have a clutch of eggs taken near Loughborough" (*in lit.*). This relates to the north of the county.

Rutland. From Mr. Browne's work I take these notes. "A summer migrant, sparingly distributed, and remaining to breed." Seen at Exton. Several nests reported to have been taken in the neighbourhood of Uppingham in 1886. One seen at North Luffenham. A few pairs reported by Mr. N. L. Calcraft to arrive to breed in Rutland every spring (pp. 72, 73).

Northamptonshire. "Twenty years ago I should have been justified in describing this bird . . . . as exceedingly rare in our neighbourhood; indeed, till 1860 I never even heard of its occurrence near Lilford. Since that time I have been constantly told of a pair or two having been met with in the early summer, at which time I am unfortunately almost always away from home; and now the Butcher-bird is, though not very abundant, a regular summer visitor, and breeds annually in our district . . . . I have many notices of the occurrence of this bird in various parts of the county, but no records, except from our own district, as to whether it has become more abundant of late years. It is, I think,

more common on light soils than our stiff clays, and therefore probably better known in the southern than the northern division of Northamptonshire" (Lord Lilford, 'Notes on the Birds of Northamptonshire,' vol. i., 1880—83, p. 43).

In recording a nest of these eggs at Wadenhoe on the 15th June, 1884, Lord Lilford writes that it was only the second instance of the finding of its nest in that neighbourhood which had come to his knowledge (Zool., 1884, p. 454). A male was caught at Thorpe on the 27th June, 1888 (Zool., 1888, p. 460); and the species arrived at Lilford in 1889, on the 8th May (Zool., 1889, p. 430).

The Rev. G. C. Green sends me the following notes: "I used to find the bird of frequent occurrence in Northamptonshire when I lived there. My father's living was Everdon, near Daventry, and I was there for twenty-five years, though I have left that part of the country now for more than thirty years. I fancy the bird built regularly in a large double hedge on my father's glebe. I know I shot one or two specimens of young birds of the year there one September, when out Partridge shooting, shortly before I left; and I used to continually come across specimens all about that neighbourhood" (*in lit.*). In South Northamptonshire, on the Oxon boundaries, the Shrike is now decidedly uncommon. I saw three local specimens at a village birdstuffer's, in Middleton Cheney, a few years ago. He considered them rare, and knew them as "Horse-matches."

Cambridgeshire. Mr. George Potts, Regent's Park, N.W., who has had considerable experience of this Shrike in other parts of the country, writes that he "never saw it near Cambridge, although I had abundant opportunities" (*in lit.*).

The Rev. H. A. Macpherson writes that he "had young from Cambs," and Mr. R. W. Chase has also met with it in this county (*in lit.*). Professor Newton writes: "I take the Red-backed Shrike to be pretty generally distributed throughout this county—the fen district excepted,—though it is nowhere numerous" (*in lit.*).

Bedfordshire. Mr. J. S. Elliott, of Sutton Coldfield, writes: "Fairly distributed over the whole county" (*in lit.*).

Shropshire. Mr. W. E. Beckwith, of Radbrook House, Shrewsbury, in some detailed and valuable 'Notes on Shropshire

Birds,' traces the distribution in this county very carefully. I extract the following particulars: " . . . . still visits the county every summer," but in consequence of it, or its nest, being frequently destroyed, and of changes in the country, has of late years become rather rare. It prefers the south and west of the county, where it is more generally distributed; but it breeds every year about Newport and Edgmond. Occurrences at Shifnal, the Wrekin, Leighton, and near Wroxeter are mentioned; and the fact that a pair frequently breed on Haughmond Hill. In 1881 three pairs were found breeding near Broseley. It has been observed about Ironbridge, Church Stoke, and Chirbury; and Mr. G. J. Dumville Lees sent Mr. Beckwith word that it bred at Nant Marw, near Llanyblodwell in 1885, remarking that it was not uncommon along the borders of Montgomeryshire. A nest was seen near Llansilin in the summer of 1887. "Indeed, it is extremely likely to be found all along the Welsh borders, as the tracts of partly cultivated, partly wild country, so common in Wales, are eminently suited to it" (pp. 28 and 29).

Mr. W. E. Beckwith writes me word that in July, 1889, he several times saw a pair near Church Stretton, which were catching moths by the railway (*in lit.*).

Mr. George Potts, Regent's Park, London, N.W., sends me the following notes: "The Red-backed Shrike is a fairly common visitor to many places in Shropshire, especially round the small towns there. Around the small town of Broseley I have seen as many as six broods of young birds (out of the nest) in one morning, being attracted to them by their conspicuous squealing and other cries. I rarely see them outside a radius of a mile from the town. I fancy they are on the increase; but I fear that their partiality to feeding their family on hive bees tends rather the other way on occasions" (*in lit.*).

Herefordshire. "Not uncommon in particular localities throughout the county, and its beautiful eggs are to be seen in every schoolboy's collection. It usually visits the same locality year after year. The Rev. Clement Ley observed it in the same place, near Ross, for twenty-three years" . . . . (Dr. Bull's 'Notes on the Birds of Herefordshire,' 1888, p. 39).

Mr. J. B. Pilly, of Hereford, writes that he is of opinion that the Shrike is "but sparingly distributed." Among the eggs

brought to him to name he seldom sees those of this species (*in lit.*).

Monmouthshire. Mr. C. Parkinson, of Worcester, found a nest in May, 1890, in this county (*in lit.*).

Worcestershire. Mr. C. Parkinson, of Worcester, writes: "Appears to be increasing in our orchard country . . . . I have watched the same pair return three years in succession to breed at Powick, near Worcester" (*in lit.*).

Mr. Lionel Talbot, of Worcester, writes: "Some twenty years ago Shrikes were quite common here. The eggs were about as common as a Pied Wagtail's, and rather more common than a Long-tailed Tit's or a Jay's. The bird seems to have got steadily rarer, until the last year or so. Eggs were sometimes brought to me to name; and boys regarded them as something very rare . . . . In the last two years I am certain many more have nested in this neighbourhood. I saw a good many in 1889, but from various causes did not look after their nests. Last spring (1890) I had two nests in a quarter of a mile from my house, and I knew of four or five more in a circle of perhaps two or three miles" (*in lit.*).

Miss Ruth Prescott Decie writes from Brockleton Court, Tenbury: "Though always scarce, used to be seen occasionally by some of us in this corner of Worcestershire till within the last few years, when they seem to have disappeared. One pair used to build year after year about three miles from here, in Herefordshire that was (for we are just on the borders of the two counties), till they were too much disturbed by" boys (*in lit.*).

Mr. J. S. Elliott, of Sutton Coldfield, reports it as "common. Earliest arrival, May 1st, 1890, Wyre Forest. Out of several nests taken at Shipston-on-Stour one contained seven eggs" (*in lit.*).

Mr. F. Coburn, of Birmingham, writes of Worcestershire. "Throughout the whole district bordering upon the north-west of Birmingham *Lanius collurio* breeds in moderate numbers, in some parts more plentifully than others, noticeably so from Northfield to Hopwood. Here they have appeared every summer in abundance for many years past, but, it is said, in slowly decreasing numbers." They were plentiful in the summer of 1891 (*in lit.*).

Warwickshire. Mr. G. E. H. Barrett-Hamilton informs me,

on the authority of the Rev. H. J. Torre, of Norton Curlieu, that at Leamington there were a few places where the bird might be found (*in lit.*).

Mr. J. S. Elliott, of Sutton Coldfield, writes: "Fairly distributed wherever suitable nesting sites occur" (*in lit.*).

Mr. F. Coburn reports that almost every season he receives specimens from some part of the county. And that about twenty-five years ago some nestlings, taken from a hedge in a garden at Chad Valley, Edgbaston, about two miles from the centre of Birmingham, were brought to him (*in lit.*).

Mr. C. G. Beale, of Edgbaston, Birmingham, tells me that he does not see it in the neighbourhood of Birmingham; but adds, that it is common in South Warwickshire, where it is called "Horse-match" (*in lit.*). I have previously recorded this as a local name for the bird on the Northamptonshire borders of Oxon.

Mr. R. W. Chase writes: "Common during the summer months throughout the county, breeding regularly at Sutton Coldfield, Alcester, Knowle, and doubtless other localities; but is especially numerous on the borders of Worcestershire" (*in lit.*).

At Rugby (about 1871–4) I believe it was not very uncommon, as the eggs were occasionally brought by boys for sale; but I do not remember having seen the bird myself. On the Oxfordshire borders it has occasionally been observed and reported to me. Mr. J. Gardner, of Warwick, told me it was fairly common there; and I have known the eggs taken at Leamington.

Gloucestershire. Mr. W. K. Mann, of Clifton, writes of the borders of this county and Somerset, "A few years since was a common species here, but of late years it has become somewhat rare" (*in lit.*).

Oxfordshire. In North Oxon this Shrike cannot be considered as other than a rather rare bird. Since I have been collecting notes upon the birds of the county, I have only become aware of the following instances of its occurrence in this (the northern) division.

1879. A pair with nest and young were taken near the brickyard on the road between Broughton and Banbury.

And I saw at a birdstuffer's in Banbury, in September, a male which had been obtained near there a short time previously.

1883. I observed a pair (July and August) which bred in the Cherwell Valley, at the foot of the hill, below Great Bourton.

I also observed a male on the 17th July in a garden by the canal at Cropredy.

1884. Mr. F. C. Aplin saw a pair near the before mentioned brickyard in June.

1887. A male (one of a pair) was shot by the canal at Little Bourton on the 23rd June.

1890. A pair were shot by the canal opposite Bodicote in the second week in July.

1891. I observed a pair, with their young brood on the wing, near the before mentioned brickyard on the 31st July.

The country *seems* suitable for them, as we have plenty of big hedgerows. I am inclined to attribute their scarcity to the nature of the soil and its effect on the Shrike's favourite food—large insects. Our sub-soil is a ferruginous marlstone (rather rich in iron in places), holding a great deal of water, as much as twenty per cent. sometimes: rheumatism is prevalent. I am no entomologist, and cannot say whether the district yields fewer large beetles and bees than some others which have warmer soils, but I am inclined to think that this is so. I can answer for it that it is a very poor locality for butterflies. The Stag Beetle I have never known to occur here as it does in South Oxon, and the Cockchafer never seems to be abundant, though the Maychafer often swarms. In the above list of occurrences two facts may be noticed. One is that they all happened in the main Cherwell Valley, either on its lower slopes, or at the bottom, where the marlstone does not appear, or is a long way from the surface. The other is the extremely local habit of the bird as shown by the fact that three out of the six pairs noticed breeding were at one spot, a clay-pit. The rest of Oxfordshire (except the lower parts of the larger valleys, and the low, flat "Otmoor") is either limestone or chalk, with some sand and gravel about Oxford.

In the north-west, Mr. Fowler tells me there are always two pairs about Kingham village, and others in the district. Further south-west, near the Thames valley, it does not seem to be common. A single bird brought to Mr. Warner in May, 1885, was the only instance in which he had ever met with it about Standlake; and Mr. Wells, of Burford, seems to consider it

uncommon there, although he had one from Bradwell Grove in 1890, and saw another the following year near Filkins on the 22nd May. About Oxford it becomes much more numerous, but retains its character of preferring particular localities. At what point as we pass from this district southward to Oxford the Red-backed Shrike begins to increase I cannot say, but Mr. F. C. Aplin saw one between Woodstock and Oxford on the 22nd May, 1889. Arrived there, the Rev. H. A. Macpherson tells me one or two pairs used, in his time, to nest about Binsey and Horsepath, and these are still favourite localities. Mr. F. W. Lambert observed a male at the last-mentioned place on the 1st May, 1890, and two males and a female about Godstow and Binsey on the 12th May, 1891. At Cuddleston several pairs are observed every summer. From the south of the county—the chalk hill district—I have little information. Some years ago it was fairly common about Reading, just over the river boundary; but from the little data I possess I imagine it is not abundant in the northern part of the western side of the Chiltern range.

Wiltshire. "Not a very abundant species with us, though several pairs may be seen annually. They seem to have a particular affection for the same spot; one pair at least, and often more, may be seen every year in a small clump of fir trees to the left of the Swindon road, just before it passes through Ogbourne St. Andrew. Their nests have also been found in the forest" (Mr. E. F. in Thurn's 'Birds of Marlborough,' 1870, p. 53).

The Rev. A. C. Smith writes in 1887: "Frequents our woods every summer . . . . this is one of its most choice localities . . . . I have often noticed it at Yatesbury, as well as in many other parts of the county." Mr. Smith feared it had become more scarce than it was, as he had not seen it for several years. It is mentioned as seen in 1886 at Devizes; and in summer between Clyffe and Hilmarton, and at Bayntun ('Birds of Wiltshire,' 1887, p. 122).

Mr. Arthur H. Macpherson writes: "Out of the last twenty-six summers there are records for twenty-five; in nineteen of which the nest was found by a member of Marlborough School . . . . My personal experience of it near Marlborough was that it was a regular summer visitor in rather small numbers" (*in lit.*).

Berkshire and Buckinghamshire. "Regular summer visitant

. . . . It is numerous over every part of Berkshire and Buckinghamshire, and breeds abundantly." An old woman, who for years sold eggs taken in the neighbourhood of Eton and Windsor, received (about 1868) about ten eggs, on an average, per diem (*vide* Mr. A. W. M. Clark Kennedy's 'Birds of Berks and Bucks,' 1868, p. 72).

Dr. Lamb (about 1814) wrote: "Rare about Newbury; very common about Reading. Are partial to former breeding places" (*Ornithologia Bercheria*, 'Zoologist,' 1880, p. 313). At Newbury, at the present day, the late Mr. Montagu H. C. Palmer wrote (in a recent edition of Hawkins' 'Guide to Newbury'): "By no means rare in our neighbourhood; never a year goes by but I see its eggs and the bird itself." I was informed that a pair were killed near Newbury in the summer of 1891, and in the same year I saw a pair on some French bean sticks in a garden on the outskirts of the town on the 30th August. At Reading, some fifteen years ago, I have seen it, and the nest was uncommonly found at that date. The Rev. B. D'Oyly Aplin saw several in his garden at Coleshill, near Amersham, on the top of the Chiltern Hills, in Buckinghamshire, in August, 1891, and thinks a brood was hatched not far off (*in lit.*). He used to observe the birds every year in the neighbourhood of Great Horwood, near Winslow.

"The place that of all others," writes the Rev. G. C. Green, "I have found to abound most in Red-backed Shrikes was the neighbourhood of Eton and Windsor—at least it did so when I was an Eton boy" (*in lit.*).

Mr. Arthur H. Macpherson writes: "I have seen it near Radley, ... and once or twice near Abingdon early in the summer term of 1888" (*in lit.*).

Mr. W. W. Fowler also informs me that there are generally some about Radley.

Hertfordshire. From the entries relating to this species in the valuable and interesting series of Notes on Birds observed in Hertfordshire (1880–1887), communicated by my late acquaintance and correspondent, Mr. J. E. Littleboy, to the 'Transactions of the Hertfordshire Natural History Society,' I gather that the Red-backed Shrike is a tolerably abundant visitor to this county; especially to the neighbourhood of Port Vale (where as many as four nests have been discovered in a season). Royston; Nortonbury;

and Barnard's Heath, St. Albans, are other localities in which its occurrence is recorded in the Notes.

Mr. Percy E. Coombe, of The Cedars, Rickmansworth, reports that the Red-backed Shrike was "fairly abundant in the neighbourhood of Kings Langley in 1879. In May of that year a fine male was seen near Elstree, and on the same day another was noticed near Odsey Grange. Seen also near St. Albans" (*in lit.*).

"It used to be fairly common round Haileybury (on the Hoddesdon side) in the years 1872–6" (Rev. H. A. Macpherson, *in lit.*).

Mr. Arthur H. Macpherson writes of more recent years concerning the same locality: "It seems to be quite common; and my brothers, who have been at school there, always talked of its eggs as being most easily procured" (*in lit.*).

Middlesex. "A common summer visitant . . . . This bird has not been numerous of late years. Perhaps this is owing to the prevailing habit of 'plashing' or 'laying' the hedges, for the Butcher-bird delights in a tall tangled hedge" (Mr. J. E. Harting's 'Birds of Middlesex,' 1866, p. 24).

Lord Lilford mentions that in his school-days it was especially abundant in the neighbourhood of Harrow-on-the-Hill, "where we often used to find two or three nests on a summer afternoon in the thick and ragged fences which divided the great grass fields of that district." He adds: "I understand that the bird is now uncommon thereabouts" ('Notes on Birds of Northamptonshire').

Mr. J. Young writes: "It is very common between London and Harrow (or was). I have seen young birds being fed by the parent birds just the other side of Stonebridge Park," a mile beyond Willesden, on the Harrow road. He has also known the nest close to Stanmore (*in lit.*).

Several naturalists attest the abundance of this bird in the neighbourhood of Harrow-on-the-Hill. Mr. G. E. H. Barrett-Hamilton writes, from observations in the years 1885–90, that it was a common bird in some places about there, and he had known of its nest being built right on the hill, in the garden of the Knoll. He remarks that it would no doubt be more abundant were it not for the number of its nests taken by birds'-nesters (*in lit.*).

Mr. Joseph Vine, of South Highgate, writes: "Although not so frequently seen at Highgate now as in former years, there are

one or two places where the R.-b. Shrikes still breed." He mentions three pairs breeding regularly in certain localities; and that to the north of Hampstead and Highgate he had often seen one of these Shrikes (*in lit.*).

Surrey. H. L. Mëyer wrote ('Coloured Illustrations of British Birds and their Eggs,' 8vo. 1842, vol. i. p. 220): "In some parts of Surrey the eggs are so common as to be found strung among other ordinary eggs, in the possession of every little village urchin."

Mr. J. Young writes: "Met with close to London on the south. I have seen it sitting on the telegraph wires just the other side of Clapham Junction (five or six years ago)" (*in lit.*).

Mr. Joseph Vine, of Highgate, tells me that a pair is generally to be seen on the hedge surrounding a chalk-pit at Guildford (*in lit.*).

Mr. Arthur H. Macpherson informs me that in August, 1890, at Leatherhead, a pair used to come into a garden of the house in which he was living and wash in a fish-pond on the lawn. He adds, that they evidently had a nest in the garden, as the young were constantly seen; and that the nest is reported as taken, or found, near Epsom in 1890, in the Epsom College Natural History Report.

Dr. E. Hamilton (Avi-fauna of Wimbledon Common) states that a pair frequented a garden at Putney Hill, and had a nest in the hedge of an adjoining meadow. A pair or two were always to be seen on the lower part of the common. The observations were made during the ten previous years (Zool., 1881, p. 237).

Kent. "An annual visitor in this district [East Kent], but I think rather less abundant than formerly. It may, however, be called fairly common, breeding in thick hedges where such exist" (Mr. W. Oxenden Hammond, St. Alban's Court, Wingham, *in lit.*).

"Fairly common in the neighbourhood of Bexley Heath . . . I have often seen the bird myself; and last year heard of three or four nests being found" (Mr. P. T. Lothy, Bexley Heath, *in lit.*).

Mr. Joseph Vine writes me word of two pairs which he had several times seen near Hythe (*in lit.*).

Mr. G. Bradshaw found a nest with four eggs at Hawkhurst in the last days of May, 1891 (*in lit.*).

Sussex. "Although decidedly local, it cannot be called *uncommon*. It may be seen occasionally between the South Downs

and the sea; but the north side of that range, throughout its whole length, may, I think, be considered its favourite haunt. Nevertheless, it is fairly distributed throughout the inland parts of the county, especially in the more open districts of the Weald" (Mr. W. Borrer's 'Birds of Sussex,' 1891, p. 38).

"On Chailey Common I saw a pair of Red-backed Shrikes two years ago (*i.e.*, 1889), and another pair near Cook's Bridge . . . but I think the Woodchat prefers lanes and more enclosed country than" this species (Captain F. Henniker, Car-Colston Hall, Bingham, Notts, *in lit.*).

Mr. Percy E. Coombe, of Rickmansworth, reports that he has rather frequently, of recent years, seen this bird near Goodwood (*in lit.*).

Mr. G. Bradshaw, of Hastings, writes: "I think they must be fairly common in this part, as during only twelve months' nest hunting this is the second I have procured" (*in lit.*). The nest referred to was taken at Burwash on the 18th May, 1891, and contained three eggs of the Shrike, and one which proved to be that of a Cuckoo.

Hampshire. "Summer visitor to all parts, but not common everywhere" (Rev. J. E. Kelsall's 'List of the Birds of Hampshire and the Isle of Wight,' 1890). In July, 1887, I saw a male near Ryde, and a pair at Brading, in the island.

Dorsetshire. "It breeds here regularly, and may often be seen in our orchards and hedgerows; very seldom in woods, preferring the open country" (Mr. Mansel-Pleydell's 'Birds of Dorset,' 1888, p. 16).

Somerset. The Rev. Murray A. Mathew considers that this Shrike is commonly distributed in Somersetshire, and writes: "When I resided at Bishop's Lydeard, near Taunton, there was a nest most years upon our lawn" (*in lit.*).

"Common in this neighbourhood [Bridgewater]; pairs return to the same spots year after year, and at certain points they may be nearly always seen" (Mr. H. St. B. Goldsmith, *in lit.*). Mr. Goldsmith adds, that there he usually finds eggs of the green type; indeed, until 1891, when he found one nest with red eggs, another with yellowish red, and a third with yellow eggs, he had found no other. In Dorsetshire (Sherborne) he recollects finding the red type.

Mr. Arthur H. Macpherson has seen it near St. Andrew's in August or September, 1886 (*in lit.*). It is incidentally mentioned as breeding near Taunton, in July, 1884, by Mr. F. Stansell, and appeared to be not uncommon there (Zool., 1884, p. 341). Three or four clutches of eggs were taken near Taunton and Bishop's Lydeard; and two pairs of birds were seen by the late Mr. C. Smith in the latter parish in the summer of 1884 (Zool., 1885, p. 66).

Devonshire. Montagu wrote in 1813 that it had been noticed throughout the whole longitudinal extent of Devonshire, but he had never seen it in the southern promontory; though he had heard of one being killed in that part (Orn. Dict. Supplement).

Mr. W. E. H. Pidsley notes that it is a summer visitant, local in its choice of breeding haunts, and varying in numbers in different seasons. That Mr. Rawson considered it comparatively common, and that Mr. Mitchell's experience was similar, but that elsewhere it was a scarce bird. That about Exeter it was comparatively rare, and that, though Mr. Gabcombe met with many in the neighbourhood of Plymouth, these were chiefly young birds, preparing to leave the country in August and September ('Birds of Devonshire,' 1891, p. 35).

The Rev. Murray A. Mathew writes: "Is commonly distributed during the summer in Devonshire" (*in lit.*).

Mr. W. E. H. Pidsley, of Broadclyst, regards it as "not at all a common bird" there. In 1890 he procured a male, the only one he had ever seen in that locality (*in lit.*).

The Rev. G. C. Green writes from Modbury Vicarage, near Ivybridge, South Devon: "The bird is very rare indeed in this district, although we are so far south. I have never seen one myself during the thirty-one years that I have been here" (*in lit.*). It is apparently more common in the northern part of the county, and, as we might expect, on parts of the Somerset border. Mr. W. W. Fowler has seen a pair at Ilfracombe; a pair were seen by the late Mr. Cecil Smith in the Valley of Rocks, Lynton, on the 17th May, 1884 (Zool., 1885, p. 4); and the Rev. H. A. Macpherson saw young birds near Brixham in July, 1879.

Cornwall. "Although an annual summer visitant, this bird is by no means numerous, nor is it very regular in the date of its appearance. I have noted its occurrence at Trembath, Madron; and the Minney, Penzance" (Rodd's 'Birds of Cornwall,' p. 24).

In the same work it is included in a list of birds observed on the Scilly Islands, but not as breeding there. An immature specimen is mentioned as occurring in the Abbey Gardens on the 22nd September, 1870. The local name is given as Flusher. Mr. H. St. B. Goldsmith ascertained, from a friend, that in the Liskeard district this Shrike is rare (*in lit.*).

WALES.

Carnarvonshire. Mr. T. A. Coward, of Bowdon, near Manchester, informs me that he found a nest with four eggs between Pwllheli and Abersoch on the 6th June, 1887, and watched both birds (*in lit.*).

Denbighshire. Mr. C. G. Beale informs me that it is an occasional visitor to that part of the valley of the Ceiriog known as the Glyn valley, which extends westward from Chirk to Llansaintffraid-Glyn-Ceiriog; and he expects that it frequents all the warmer Welsh valleys more or less. Like many other observers he has often seen it in the Dolgelly and Barmouth district (*in lit.*).

Merionethshire. Captain E. A. Swainson has found it rather common at Dolgelly and Barmouth, and remarks on its abundance in the districts adjoining the sea in this county and Cardigan (*in lit.*, April, 1891).

Mr. G. H. Caton Haigh writes from Aber-iâ, Penrhyndeudraeth, that in that immediate neighbourhood the Red-backed Shrike is a scarce though regular summer visitor. Further south, "in the neighbourhood of Llanbedr and Barmouth, and along the valleys of the Mawddach and Dwfi," he adds, "it appears to be much more common, and may often be seen perched on the telegraph wires" (*in lit.*).

Mr. F. Coburn, of Birmingham, reports that on several occasions he has found it numerous around Barmouth, and on one occasion observed four "branchers" perched close together on a hedge between Mochras Island and Pensarn (*in lit.*).

Eyton in 1838 wrote of it: "Very common in Wales, particularly near Capel Curig and Barmouth; at the latter place they feed chiefly on insects belonging to the genus *Geotrupes* (Dorr beetles), which particularly abound. At Capel Curig, grasshoppers appear to constitute their chief food; some dozens of them may

be seen on the hill above the lakes, which is thinly covered with scattered Hawthorn bushes, and abounds with their prey" (Mr. W. E. Beckwith's 'Notes on Shropshire Birds').

"Very common" (Mr. F. C. Rawlings' 'List of Birds of Barmouth District,' p. 3). Mr. F. H. Birley found two pairs breeding south of Cader Idris, on the Montgomery borders, in the summer of 1885 (Zool., 1886, p. 76).

Cardiganshire. Captain E. A. Swainson has found it rather common near Aberystwith (*in lit.*).

Radnorshire. "Thinly distributed over this locality (north-west Radnorshire)" (Mr. E. H. Jones, Cwmithig, Rhayader, who published a list of local birds, *in lit.*).

Breconshire. Captain E. A. Swainson, of The Woodlands, Brecon, writes that this bird is now rare, and he has not observed it for two years. Previous to this he had known its nest found on three occasions. He adds, "Judging from what some ornithological friends have told me, it must have been once rather common here" (*in lit.*, April, 1891).

Mr. E. Cambridge Phillips writes from Brecon: "Common; four nests have been taken in one hedgerow near Brecon" (*in lit.*, 1891). In 1881 Mr. Phillips wrote of it as "common," and that he often observed it in the hay-fields adjoining Brecon (Zool., 1881, p. 402).

Glamorgan. Mr. W. Warde Fowler writes that there is always one pair near a house at Swansea.

Pembrokeshire. The Rev. Murray A. Mathew tells me that "it is a scarce bird; a few occurring in the south of the county, while in the north it is extremely rare, not one being seen by me in the eight years I was at Stone Hall" (*in lit.*).

SCOTLAND.

To Scotland the Red-backed Shrike can only be considered as a very occasional, if more than a chance and casual, visitor, although it is recorded to have bred in some instances. In the last edition of Yarrell's 'British Birds' the following particulars are given. It "has only of late years been recorded from Scotland, though noticed there, according to Mr. Robert Gray, so long ago as 1817, when a pair were shot near Hawick. Mr. Arbuthnot, in

1833, seems, however, to have been the first to publish the fact of the occurrence of this species in the northern kingdom; since which time Mr. Sinclair, Professor Duns, Dr. Gordon, Lord Haddington, and Mr. Harvie Brown have recorded similar observations, shewing that, during the season of its migration, it is an occasional visitor to the eastern parts of Scotland, while in a few instances it has been seen in pairs, and may possibly have bred there" (vol. i. p. 211).

In the 'Report on the Ornithology of the East of Scotland,' by Colonel H. M. Drummond Hay, C.M.Z.S. (for a copy of which I am indebted to the kindness of the author), the following occurrences are noted: "A specimen was shot at Charlton, near Montrose, about 1864 or 1865 (*fide* J. A. H. B.). Mr. Gray ('Birds of Scotland,' p. 67) alludes to one having been got near Peterhead about the year 1883; and states that he has one in his own collection which was killed near Cupar-Fife in the autumn of 1861 (p. 6). In the 'Migration Report' for 1885, the occurrence of one on the Isle of May, on the 5th May, is recorded. Mr. A. Nicol Simpson, of Arbroath, writes me word of one, a female of the second year probably, which was shot on the 19th August, 1890, at Ethie, about five miles east of Arbroath, Forfarshire, and a mile or two inland from the headland known as Redhead. Others were said to be about Ethie at the time" (*in lit.*).

Messrs. Harvie Brown and Buckley mention that there is a young bird in the collection of the Duke of Portland at Welbeck Abbey. No particulars are known about it beyond the statement that "all the birds in the collection were shot on the Duke's property in Caithness" ('Vert. Fauna of Caithness and Sunderland,' p. 120).

In the Shetlands, Saxby says he shot a young male on the 5th October, 1866, and that on the 9th June, 1870, he saw a female followed by three young birds, one of which remained about a garden for two or three weeks. There is no occasion to doubt this latter observation on account of the extraordinarily early date. Saxby was far too keen and careful an observer to give us an utterly false statement, and the explanation probably is that June was a misprint for July; his book was published after his death.

Mr. R. Service kindly informs me that this bird is mentioned in

the New Statistical Account (1844)—parishes of Lochinaber and Langholm, both in Dumfriesshire. Also that old Hastings, the birdstuffer at Maxwelltown, assured him he saw one in the year 1868 at Broomlands, in Kirkcudbrightshire (*in lit.*). But it is apparently very rare in the West of Scotland. Mr. Howard Saunders says: "In the south-east of Scotland it has occasionally been known to breed, but it is very rare in the south-west, and an exceptional visitor to the north ('Manual of British Birds,' p. 143).

Mr. W. Evans, of Edinburgh, does not believe in the statement to the effect that this Shrike has bred in Berwickshire, which seems to have been founded only on somebody's impression that a pair had bred, he thinks, because they had been seen in the county in May or June. He looks upon the species as probably a regular bird of passage in very limited numbers (*in lit.*).

IRELAND.

There is, as far I have been able to discover, only one record of this Shrike occurring in Ireland. On the 10th August, 1878, a male was shot near Castlereagh, about three miles from Belfast, County Down. Five or six others were said to have been in its company at the time ('Zoologist,' 1878, p. 437).

V.

NOTES ON THE HERRING FISHERY OF 1891.

By Thomas Southwell, F.Z.S., *Vice-President*.

Read 29th March, 1892.

As stated in my last report it was my intention to have discontinued these notes, not being quite convinced either of their usefulness or of their suitability for publication in our 'Transactions;' but from the number of requests which I have received to proceed with them, I presume there are more who take an interest in the local

Herring Fishery than I supposed. I will therefore give briefly the results of the past year's operations, but do not purpose entering so fully into the subject as on previous occasions.

The spring fishery at Yarmouth produced only 119 lasts; at Lowestoft 1042 lasts were landed. As a rule good prices were produced, as much as £25 per last having been realised on one occasion; and the total result was very satisfactory to all.

The midsummer fishery resulted in 810 lasts at Yarmouth, and 1576 lasts at Lowestoft; and was also very satisfactory. From the North Sea voyage 2413 lasts were landed at Yarmouth, and 108 lasts at Lowestoft.

In October the home voyage commenced, and the opening was marked by unprecedentedly rough weather, which continued with intervals of fine until its close. Under these circumstances short supplies caused prices to run high, and consequently in favour of the owners, who when not subjected to loss from destruction of gear owing to bad weather, must have done exceedingly well. The Scotch boats made up early, as it was impossible for them to face the weather; and for the home boats the voyage virtually came to an end in the middle of December; the full moon, which occurred on the 15th of that month, being lost to the fishermen in consequence of the unfavourable weather. The total quantity of fish landed at Yarmouth in the last three months of the year was 10,522 lasts; and at Lowestoft, 5,426 lasts, the bulk in both cases being taken in November. At Yarmouth the returns for the home and Scotch boats are kept separately; of the latter there were 170 at that port, and the result of their season's fishing was only 1,870 lasts (as compared with 5,221 in 1889 and 3,509 in 1890): this poor result was entirely due to the prevalence of weather which these boats were quite unsuited to contend against.

The total result of the year's fishing at Yarmouth, in which 150 home and 170 Scotch boats, manned by some 2,690 men and boys, took part, was 13,866 lasts (against 14,554 lasts in the previous season); and at Lowestoft, 8,153 lasts (against 7,583 lasts in 1890), employing 185 home and 92 Scotch boats, and about 2,494 hands; a grand total of 22,019 lasts, which at an estimate of £12 per last, represent the sum of £264,228.

As to the commercial result of the past season, I am informed that it has been entirely a "catchers' year." The small supply of

fish, and the large number of buyers, ran the prices up to such a pitch that the curers could not buy to any advantage; added to which, the state of the foreign markets is such that it is next to impossible any profit should be left to the exporters. Hitherto our exporters have relied chiefly on the German and Italian markets for the disposal of their produce; but I notice that at the recent Sea Fisheries Conference, a resolution was passed calling upon Her Majesty's Government to instruct their consuls and representatives in North and South America, Africa, Australia, New Zealand, Spain, and Portugal, to specially report whether there was any demand for salted and smoked Herrings in or near their respective districts, and to give all information they could respecting the same. This is, doubtless, a very wise resolution; and I trust such an inquiry may be instrumental in opening up fresh outlets for the produce of an industry of such vast importance to this district.

I am, as on previous occasions, greatly indebted to Mr. W. J. Nutman, the Borough Accountant of Great Yarmouth, and to the Harbour Master of Lowestoft, for their kindness in furnishing me with authentic returns of the quantities of Herrings landed at their respective ports.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1891.

		Yarmouth.			Lowestoft.		
		Lasts (13,200)	Thousands (1320)	Hundreds (132)	Lasts (13,200)	Thousands (1320)	Hundreds (132)
Spring	January	—	—	—	—	—	—
	February	—	—	—	12	3	—
	March	—	—	—	123	6	1
	April	81	—	5	673	3	9
	May	38	8	2	232	9	7
Mid-Summer North Sea	June	472	7	9	880	9	—
	July	337	6	4	695	7	2
	August	785	2	6	33	8	8
	September	1627	9	4	74	4	6
Autumn Home Voyage	October	2843	—	2	957	3	7
	November	6282	3	3	3740	7	5
	December	1397	6	2	728	1	5
		13,866	4	7	8,153	5	—
		8,153	5	—			
		22,019	9	7			

VI.

METEOROLOGICAL NOTES, 1891.

(From observations taken at Blofield, Norfolk.)

By Arthur W. Preston, F. R. Met. Soc.

Read 23rd February, 1892.

January.

The severe frost which set in on the 25th November, 1890, and continued until the 22nd January, 1891 (a period of fifty-nine days), has been commented upon in detail in a former paper (see *ante*, vol. v. p. 191). After the break up of the frost, the weather was comparatively mild until the end of the month. The mean temperature was, however, as much as 5 degrees under the average, owing to the great cold of the first three weeks, during which time the daily deficiency averaged 10 degrees.

February.

This month presented many unusual meteorological features; one of the most notable of which was the smallness of the rainfall, the total amount measured being only .07 inch, of which nearly one half was made up of moisture deposited by wet fogs. There does not appear to have been such a dry month in East Anglia since September, 1865, nor so dry a February since 1857. The temperature (the mean of which was but little under the average) was extremely variable during the last six days of the month, the daily range on many days exceeding 30 degrees, and on the 28th exceeded 37 degrees. On the latter date, the thermometer rose to 64 degrees, which appears to be a higher temperature than any registered in February since the year 1846. Another notable

feature of the month was the abnormal height of the barometer. The mercury did not once fall below 30 inches, and more than twenty-five years have elapsed since such an occurrence was, in this neighbourhood, recorded in any one month. On many days during the third week there was a great prevalence of fog, rendering the atmosphere exceedingly uncomfortable.

March.

The mild weather with which February closed continued until the 7th March, when winter returned, and the remainder of the month was cold and cheerless, with rough winds from the north-west, accompanied by frequent snow and sleet. Although a cold month, the mean temperature was somewhat higher than in 1887 and 1888.

April.

This was another cold, ungenial month, with a great prevalence of north-easterly winds, and cloudy, dry weather. The mean temperature was over 3 degrees deficient, and this is the more remarkable when it is remembered that the four previous Aprils had been so exceptionally cold; in fact, we have not had a really warm April since 1885. Vegetation, at the close of the month, was extremely backward, and about the same as in 1887, but a few days earlier than in 1888.

May.

The first week of this month was dry and of a medium temperature. From the 11th to the 14th it was exceedingly fine and warm, with a cool breeze from the north-north-east, which somewhat subdued the temperature. More inland some very high maxima were recorded, and in London 80 degrees was touched. A sudden and most extraordinary return to winter occurred on the 16th, and the Whitsuntide holiday of 1891 will long be remembered by the remarkable snowstorms which took place on the mornings of both Sunday and Monday. On the latter day the snow lay from 4 to 6 inches deep on the level in some parts of the county; and a good deal remained on the roadsides and hedge banks, unmelted, until late in the afternoon. In the early morning the fields were as white as on any day during the previous severe winter; and some of the boughs of those trees which were in their

full spring foliage, such as Beeches, Horse-chestnuts, &c., were quite bowed down, and nearly broken, by the weight of the snow. The thermometer failed to touch 50 degrees on the 16th, 17th, and 18th; and the mean temperature of the week, ending the 23rd, was only 44.8 degrees, or about the normal temperature at the close of March. The 9 a.m. readings of the thermometer on the 16th and 18th were slightly lower than is usual in January; in fact, there were twenty-two days in January, 1890, when the 9 a.m. readings were higher than on the two days in question. The weather remained cold and wet till the 28th; over 3 inches of rain falling in the fortnight ending the 29th. The mean temperature of the month was about 3 degrees below the average; about 4 degrees colder than May, 1890; about 6 degrees colder than May, 1889; but a little in excess of May, 1887.

June.

The first twelve days of the month were exceedingly cold for the season, with a great prevalence of northerly winds. The thermometer did not touch 60 degrees for eight consecutive days (4th to 11th), an unusual occurrence in June. From the 13th to the end of the month, the weather was fine, bright, and warm, the temperature rising above 70 degrees on eleven days. The rainfall of the month was about an inch and a quarter deficient.

July.

July, for the fourth year in succession, gave us over 4 inches of rain, and a deficient mean temperature, making it appear almost as if the hot days, and brilliant sunshine with which the month was associated, had become a thing of the past. This month is, however, very frequently the wettest of the year; its average rainfall is almost as great as November; and it sometimes happens that a succession of cold summers occur without a break. This was particularly remarked towards the close of the last century; and again, in each of the years 1809 to 1817 inclusive, there was a deficient temperature both in July and August. On the other hand, in more recent times, 1868 to 1876 inclusive (with the exception of one year), gave summers of great heat and dryness. The rainfall of the month, as above stated, exceeded 4 inches, and in some parts of the county over 6 inches were gauged; the

heaviest falls being on the 1st, 19th, 21st, and 29th, when .81, .52, .55, and .67 inches were respectively recorded.

August.

The cool, rainy weather, which prevailed in July, continued throughout August; and there were scarcely two fine days together. There was a great absence of sunshine throughout the month, and the percentage of humidity was unusually high. Although in Norfolk the total rainfall was slightly less than that of July, in some parts of the country it was largely in excess.

September.

This month was somewhat remarkable by reason of the unusual outburst of excessive heat in the second week, which coming suddenly, after a most prolonged period of cold, was the more notable. On each day from the 8th to the 13th inclusive, the thermometer exceeded 75 degrees, whereas that value had only been three times previously touched throughout the entire summer. On the 10th the maximum reading was 82 degrees, which was the highest since August, 1888. The third week was warm, but less settled; but the last week was again very fine. The prevalence of much fine weather during this month was of the highest importance to farmers, whose prospects at the close of August, after a long period of cold and wet, were most depressing, but little corn having been cut. As it was, reaping went on with very little check; and the ingathering was completed within a few days of the average time.

October.

After a fine and warm week at the beginning of this month a period of very stormy weather set in, and continued with greater or less intensity for upwards of nine weeks. Some of the gales were of unusual fierceness; and the fluctuations of the barometer were remarkable. Deep depressions, travelling from the south-west of our islands in a north-easterly direction, produced, in this neighbourhood, an almost constant succession of south-westerly winds and gales, accompanied by rain and a mild humid atmosphere. The rainfall of the month, although in excess of the average, did

not equal in amount that of some previous Octobers, particularly in 1885, when nearly double the amount of rain fell. In the South of England, however, the rainfall was considerably in excess of that measured in the Eastern Counties.

November.

This was another stormy month, with great fluctuations of the barometer. The depression of the 11th was one of the most remarkable on record. After a period of high pressure, extending from the 27th October to the 8th November, during the greater part of which time the barometer stood from 30.50 inches to 30.69, it fell with great rapidity from 30.17 inches at 9 a.m. on the 8th, to 28.69 inches at 9 a.m. on the 11th, and by noon on the same day to about 28.50 inches. A very severe and most destructive gale accompanied the depression, causing many disastrous shipwrecks along the south coast. The recovery of pressure following was very rapid, the barometer rising .60 inch in nine hours. The weather of the latter part of the month was of the usual November character, with much fog and mist. The mean temperature of the month was about 1 degree below the average; and the rainfall slightly deficient, although the number of humid days made it appear as if more rain fell than was actually gauged.

December.

The weather of December was very varied in character. During the first fortnight frequent cyclonic disturbances passed over the country, accompanied by violent south-westerly gales, heavy rains, and an unusually high temperature for the time of year. On the 3rd, 4th, and 5th, the thermometer exceeded 55 degrees; and on the 9th and 10th nearly approached that value, which is 13 degrees higher than the average day temperature for December. The mean temperature of the week ending December 10th was 46.2 degrees, or 2.2 degrees higher than that of the week ending 21st May 1891; and at 9 a.m. on the 10th December the thermometer stood 18 degrees higher than at the same hour on last Whit Monday. From the 17th to the 25th, the weather underwent a complete change, with severe frost, and an almost cloudless sky. The lowest temperature observed was 18 degrees (11 degrees on grass)

on the morning of the 22nd. Fog prevailed at times, particularly on the 21st and 24th. On the evening of Christmas Day a thaw set in, and the remainder of the year was mild.

The Seasons.

The following tables show the mean temperature and rainfall for the four seasons, together with those of the five previous years, and of a twenty-year approximate average :—

TEMPERATURE.

Seasons.	1886.	1887.	1888.	1889.	1890.	1891.	20-year average.	Departure of 1891 from average.
	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.
Winter (Dec. to Feb.)...	35.5	35.8	35.5	37.4	38.9	33.9	38.0	— 4.1
Spring (Mar. to May) ...	46.5	43.3	43.5	46.5	46.8	44.0	46.4	— 2.4
Summer (June to Aug.)	59.5	61.4	57.7	59.9	58.6	58.9	60.6	— 1.7
Autumn (Sept. to Nov.)	52.0	46.9	49.3	49.2	50.2	50.9	49.6	+ 1.3
Year	48.2	47.0	46.9	48.0	48.0	47.7	48.6	— 0.9

RAINFALL.

Seasons.	1886.	1887.	1888.	1889.	1890.	1891.	20-year average.	Departure of 1891 from average.
	in.	in.	in.	in.	in.	in.	in.	in.
Winter	4.18	5.83	4.42	4.14	4.80	3.10	6.45	— 3.35
Spring	5.35	5.14	5.83	7.09	5.14	6.64	5.15	+ 1.49
Summer	6.70	4.04	8.52	9.57	9.61	9.39	7.10	+ 2.29
Autumn	6.23	7.68	7.00	8.94	6.87	7.00	8.50	— 1.50
Year	25.23	20.52	25.65	29.82	25.96	28.35	27.20	+ 1.15

The most striking features in the above table are the great deficieney of temperature during the winter, spring, and summer of 1891—the dryness of the winter, and the wetness of the summer. It will also be remarked that all the winters but one (1890) in the series have been below the average temperature, and all unusually dry ; the springs have in most instances been colder than the average (those of 1887, 1888, and 1891 being most exceptionally cold) ; every summer since 1887 has exhibited a considerable defieiency in temperature and excess in rainfall (the excess of rain in the last three summers being over 2 inches in each case) ; and the autumns, in both temperature and rainfall, have been much nearer the average than any of the other seasons.

Year.

But little can be added in the way of general summary. The many exceptional features of the weather during the past year have been alluded to under the various months and seasons. The mean temperature of the year was again deficient, which, as recorded in our last year's notes, has been the tendency in every year since 1884. Each month was below its average temperature until September, which, with October and December, were the only months of the year in which the temperature was equal to, or above its usual standard. Rain was very excessive in May, July, August, and October; considerably deficient in June and December; and most remarkably deficient in February. The number of days on which rain fell during the year was exceptionally large.

1891.

Month.	Barometer.					Thermometer.					Hygrometer.	Cloud.	Rainfall.		Wind.								
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Relative Humidity, 9 a.m.	Estimated proportion 9 a.m.	Inches.	No. of days.	Direction.								Mean estimatd force
															N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	
Jan. .	30.69	11	29.40	22	30.135	50.5°	31	7.2°	11	32.5°	95	6.2	2.27	22	4	3	3	0	2	10	3	6	2.6
Feb. .	30.71	18	30.04	26	30.465	64.0	28	24.2	24	38.9	96	5.7	0.07	6	1	3	6	3	1	4	6	4	1.4
March	30.27	3	29.29	11	29.787	60.7	1	26.5	22	40.1	88	7.1	1.79	23	4	4	2	1	2	2	7	9	4.6
April	30.32	20	29.54	28	29.983	64.0	30	25.0	1	42.9	89	7.0	1.25	15	4	11	2	3	2	3	1	4	3.7
May .	30.24	12	29.36	18	29.787	72.7	13	29.8	17	49.1	86	6.3	3.60	18	5	6	2	2	2	7	2	5	3.1
June .	30.43	12	29.77	29	30.032	79.0	26	38.0	13	58.1	85	5.9	0.78	10	7	5	7	1	0	4	4	2	3.2
July .	30.30	13	29.54	30	29.914	79.0	17	45.0	28	59.6	87	7.4	4.71	20	3	1	1	1	2	10	3	10	2.4
Aug. .	30.07	6	29.15	21	29.773	77.0	14	40.4	30	59.2	90	7.1	3.90	22	1	0	0	1	2	7	12	8	2.8
Sept. .	30.28	16	29.42	1	29.985	82.0	10	44.0	15	59.3	86	4.8	1.25	8	0	1	1	3	3	14	8	0	2.7
Oct. .	30.69	30	29.11	13	29.796	69.0	3	31.2	31	51.6	89	6.2	3.60	21	1	3	3	1	7	15	1	0	3.6
Nov. .	30.65	5	28.69	11	29.854	54.8	1	26.2	28	41.9	94	7.8	2.15	24	0	9	2	0	11	2	5	1	2.1
Dec.	30.72	19	28.89	13	29.943	55.4	3	18.0	22	39.1	94	5.2	2.98	21	1	1	1	2	5	10	10	1	3.0
Means					29.954					47.7	90	6.4											2.9
Extremes & Totals	30.72	Dec. 19th	28.69	Nov. 11th		82.0	Sept. 10th	7.2	Jan. 11th				28.35	210	31	47	30	18	39	88	62	50	

VII.

SOME ADDITIONS TO THE NORFOLK AND NORWICH MUSEUM IN THE YEAR 1891.

By Thomas Southwell, F.Z.S., *Vice-President.*

Read 29th March, 1892.

The past year has not been a very eventful one in the history of the Museum so far as the acquisition of new species is concerned; but there are two gifts which, although not strictly within the province of these notes, it is desirable to record. The first is a legacy of £1000 left by the late Rev. Charles Turner, which will be found exceedingly useful in helping forward the finances of the Institution, which, owing to its anticipated removal to the Castle, are in rather a languishing condition; the second is the splendid gift by Mr. Robert Fitch, F.S.A., of his fine collections of Archæological and Geological Specimens, Flint Implements, Articles of Vertu, Drawings, and Books—the whole forming a very fine series of illustrations of local history and geology, collected with great judgment during a long life spent in this city. We are probably indebted for both these gifts to the increased usefulness which it is anticipated will be imparted to the Norfolk and Norwich Museum when transferred to the new home now being prepared for it in the fine old Castle, the keep of which is in itself of great historic and archæological interest.

The collection of Diurnal Birds of Prey has received from Professor Menzbier a pair of *Scelospizias cenchroides*, a species of

which he is the describer. They are from Turkestan, and were collected by the deceased naturalist Severtzoff. Menzbier figures this bird in his 'Ornithology of Turkestan,' plate 3; but it is very doubtful whether it is worthy of specific distinction. To the liberality of Mr. Seebohm we are indebted for an addition to the collection of Owls in the form of a specimen of *Scops elegans* (Cassin) (*S. semitorques* of Mr. Seebohm), from Loo-Choo Islands, lying to the south of Japan, which is a very important and welcome gift. Mr. Gurney has also presented a second specimen of *Ninox dimorpha* from New Guinea; and Mr. R. H. J. Gurney a specimen of *Pholeoptynx hypogæa*, also from Florida. Amongst the additions to the general collection may be mentioned a Wood Lark, given by Sir Edward Newton, which was killed at Lowestoft on December 20th, 1890; and six nestlings of Reeve's Pheasant hatched in confinement at Herringfleet in June and July, 1891, and presented by Colonel Butler.

We are indebted to Mr. A. Patterson for a Long Rough Dab (*Hippoglossoides limandoides*), taken at Yarmouth in April, 1891; and to Mr. E. Corder for a Father-lasher (*Cottus bubalis*); and specimens of *Cottus scorpius*, and variety *grœnlandicus*, all collected at Yarmouth by Mr. Patterson.

Mr. Albert J. Fison has contributed to the Entomological collection 277 specimens, including 120 species of European Lepidoptera, collected by him in the Rhone Valley, Switzerland. Several other valuable contributions have been made both of Lepidoptera and Coleoptera from various parts of the world.

Of Shells new to the Museum we have received six specimens of *Pisidium roseum*, taken at Cossey by Mr. A. Mayfield; and six of *Vertigo pusilla* from Telegraph Lane, Norwich, by Mr. A. A. Moore; we are also indebted to Mr. Clement Reid for two examples of *Helix obvoluta*, found by him in Winden Wood, Sussex, a new locality for this species.

Mr. James Reeve has contributed to the Geological collection a tooth of a new species of Otter (*Lutra Reevei*), a small cheek tooth of a Rodent (genus at present undetermined), and otoliths of *Gadus morrhua* and *G. pollachius*, figured in 'Memoirs of the Geological Survey,' Newton, 1891, plates i., v., and x. Drs. Plowright and H. C. Brown have presented to the Museum

the series of Neolithic Flint Implements from Massingham, used by the former gentleman to illustrate the lecture which he delivered to this Society in April, 1891, and which will be found printed in the present part of the Society's 'Transactions,' p. 250 *et seq.*

VIII.

SOME MARINE NOTES FROM YARMOUTH.

By Arthur Patterson.

Read 29th March, 1892.

I regret I am unable to record the occurrence of more than two species of Fish new to the County fauna since the publication of my "Fish Notes" in last year's 'Transactions,' viz., the Two-spotted Goby (*Gobius ruthensparri*) and the Pole or Craig-fluke (*Pleuronectes cynoglossus*). I have exercised equally as much vigilance as in other years, but, from a variety of causes, not the least of which was the extreme and unusual "sheerness," or transparency, of the water during the summer months when the shrimpers were most busy, producing less satisfactory results. These men take less "muck" (small fishes, crustaceans, starfishes, &c.), as well as fewer shrimps when the water is very clear. I have, however, met with some others both rare and interesting, which may be thought worthy of special mention in the records of the Society. An * signifies new to the county list.

* Two-spotted Goby (*Gobius ruthensparri*). This handsome little fellow, the "gayest" of the Gobies, was taken in a shrimp-net on April 13th, 1891. It measured $2\frac{1}{4}$ inches in length. Its brightly-marked dorsal fins gave it a striking appearance. A second was brought me alive on the 15th, and a third on the 18th of the same month: three specimens of a fish, hitherto unrecorded for Norfolk, thus turning up in one week.

* Pole (*Pleuronectes cynoglossus*), or Craig-fluke. On Feb. 11th, 1892, I met with a sole-like fish which I at once suspected to belong to this species, and forwarded it to Dr. Günther, who was kind enough to confirm my finding. It measured 18 inches in length. Another, taken in Yarmouth Roads, which measured 19 inches, was sold on the Fish Wharf on March 21st, 1892. Although hitherto unrecorded for Norfolk, I strongly suspect this fish and the Long Rough Dab (*Hippoglossoides limandoides*) are frequently captured on the eastern coasts, especially those of Yorkshire and Lincolnshire; where they are sold under the name of "witches," and afterwards disposed of as soles. Careful investigation would, I believe, bring to light the Carter, the Sail-fluke, and other seldom recognised members of the *flat-fish* family.

Lesser Forkbeard (*Raniceps trifurcatus*). Couch gives a vague reference to one being taken at Yarmouth. A second, and the first to my knowledge, of what Yarrell terms "one of the rarest British species" ('Fishes,' vol. ii. p. 293), was brought to me alive, having been taken in a shrimp-net on April 11th, 1891. Length, $2\frac{5}{8}$ inches. Another, about the same size, was taken on May 6th in the same year.

Bubalis, or Father-lasher (*Cottus bubalis*). After a three years' hunt for this brilliantly marked fish, the first locally-taken specimen I have met with, was brought me alive by a shrimp lad on April 7th, 1891. Paget mentions it not. I had *heard* of a previous capture. Dr. Lowe writes: "Cromer, one specimen (J. H. G.), Norfolk estuary. It is also mentioned in Sir Thomas Browne's list."

Twait Shad (*Clupea finta*). Dr. Lowe, under a misapprehension, quotes the Messrs. Paget as his authority for this species being "not uncommon" at Yarmouth, whereas only the Allis Shad

(*C. alosa*) is mentioned in their list. This species is very rarely taken here. One, 9¾ inches in length, taken in a net on Breydon, April 13th, 1891. I have seen but one or two taken in draw-nets on the beach.

Allis Shad (*Clupea alosa*). A number of young Shads, running from 7½ to 9 inches in length were being washed ashore alive on May 4th, 1891. It was a fine day, with the wind *off* the land.

Atherine (*Atherina presbyter*). A glut of these fish occurred in September, 1891. Hundreds were taken on the 25th of that month near the Harbour mouth. Local, "Smolt." Fishermen say when Smolts are plenty Smelts are scarce. Only occasionally in ordinary seasons are one or two of these taken in the smelt-nets on Breydon.

Smelt (*Osmerus eperlanus*). One taken on Breydon April 20th, 1891, measuring 12 inches in length, and weighing 6 ounces.

Sting Ray (*Raia pastinaca*). Small one brought ashore July 17th, 1891.

Surmullet (*Mullus surmuletus*). In Paget's time this fish appears to have been numerous. Very rare now. Saw a freshly-taken one on July 23rd, 1891. Length, 15 inches; weight, 20 ounces.

Pilchard (*Clupea pilchardus*). Several taken close in-shore in "driving-nets" August 12th, 1891.

Scad (*Caranx trachurus*). Numbers taken in "driving-nets" with long-shore Herrings, August 30th, 1891: some 15 inches in length. Crowds of young ones 3 to 4 inches in length pass along the shore in October.

Opah (*Lampris luna*). A beautiful specimen of this fish was tumbled ashore at Caister on October 17th, 1891, during heavy weather. It was put up at auction on the Fish Wharf, and realised £2. This rare fish had a narrow escape from being thrown on the refuse heap in the garden of the coastguardsman who found it,—and it was only through extreme pressure that he was persuaded by a carrier to let it try its fortunes under the hammer,—was afterwards preserved by Mr. Lowne, the taxidermist. Length, 38 inches; girth, 41 inches; width at "shoulders," 5½ inches; weight, 51 lbs.

Toper (*Squalus galeus*). Locally rare. A 14-inch specimen taken in a shrimp-net August 20th, 1891.

Porbeagle (*Lamna cornubica*). A seven-foot specimen brought to Yarmouth Fish Wharf, October 17th, 1891.

Long Rough Dab (*Pleuronectes cynoglossus*). A couple of these fish were displayed for sale here on March 14th, 1892. They were respectively 9 and 10 inches in length. Both were heavy with roe.

The departures from the normal forms, or *deformities*, worthy of mention are as follow :—

Double Turbot. One on August 29th, 1891. Length, 17 inches; weight, 3½ lbs. And another on February 12th, 1892, which, differing from the usual duplex article, which generally has both sides dark-coloured and spinous, this one had the reverse side perfectly white; and, stranger still, the "other" eye was fixed quite in apposition with the one on the dark and upper side. The "notch" differed from any I have before seen in forming quite a circle through which one could push the end of the finger. It measured 20 inches in length.

Albino Brill. On February 13th, 1892, a perfectly Albino specimen of the Brill was brought into this port. The upper surface was entirely white like the under side, with the exception of the extreme edges of the fins, which merged into yellowish-grey. When fresh, the fish had a strikingly pretty appearance; the thin, polished upper surface exhibiting near the base of the "side fins" reflections of a metallic-like pink. Round the eyes were irregular rings of an orange colour, which gave the fish the red-eyed appearance we generally deem the finishing touch to an Albino. Length, 15 inches.

A Brill, with fins rounding off under the tail after the fashion of a Topknot, brought in on October 19th, 1891; and a Sole, exhibiting a similar malformation, on October 29th of the same year.

Amongst the marine *mammalia* worthy of note may be mentioned :—

A White-beaked Dolphin (*Delphinus albirostris*) washed up on the South beach, April 19th, 1891. Length, 4 ft. 8 in.

Found the skull and fragments of another on North beach, June 14th, 1891. Length of skull, 10 inches.

Another seen floating up the Yare towards Breydon, August 27th, 1891. Length, 7 ft. 4 in. It was recovered and exhibited on the beach. Teeth, $\frac{48}{44}$.

A number, I believe, of these animals, late in September, bound southward, got into shoal-water near Caister, between a sandbank and the shore, the former at low water, running in a semi-circle to the beach. They found themselves in an awkward fix, and floundered about in an excited manner. Trying to "retrace their steps," and failing, after considerable effort, over-topped the barrier. Once again in deeper water, they splashed and thrashed about as they hastened onward, apparently delighted with their escape.

On June 8th, 1891, a fine female of the Lesser Rorqual Whale (*Balænoptera rostrata*), "losing its bearings" among the numerous sandbanks of the neighbourhood, eventually found its way into the harbour at Gorleston, where it was speedily attacked by the hardy natives, whom it would have undoubtedly eluded but for an accident which occurred to it when making again for the Roadstead. Coming into contact with the piles it so badly fractured its snout, that it was for a time rendered insensible. From loss of blood, and repeated ill-usage at the hands of its unmerciful assailants, it speedily succumbed, and was towed, tail foremost, up the river into the lifeboat house, the boat having been previously launched to make room for it. By means of a winch it was hauled into the building, where for some days it proved a great source of attraction to visitors, and of gain to its possessors. It was afterwards given a public *post-mortem*, and the skin removed to Yarmouth, and admirably mounted by Mr. Lowne. It has since been exhibited in London and elsewhere. Length, 30 feet; girth, 18 feet; span of tail, 8 feet 2 inches; length of pectoral fins, 4 feet 6 inches; length of jaws, 6 feet 6 inches; baleen running up to 15 inches in length.

Dead Porpoises washed up (1) July 18th, 1891, 4 feet long; (2) November 1st, 1891, 5 feet long; (3) November 4th, 1891, 4 feet long.

Nine Seals in all, brought from the vicinity of Lynn, were

exhibited in tanks on barrows on the Marine Parade during autumn of 1891: they were all examples of *Phoca vitulina*; mostly young ones.

A Seal took a hook, when striking at a Codling impaled thereon, from the Jetty, November 3rd, 1891. It eventually broke away, carrying the hook with it.

IX.

BOTANICAL NOTES.

1890.

Saponaria Vaccaria was found by Mrs. Gurney Hoare at Aylsham in 1890. I saw it also in seed at Mr. C. Bussey's, Stoke Holy Cross, last autumn; in both cases a casual, probably introduced with foreign "seeds."

Galium erectum, Huds. In July, 1890, Mr. Long sent a very puzzling *Galium* from Wells, which Mr. Arthur Bennett very kindly named: "at first sight he thought it something new."

Asperula cynanchica, Linn. Sent by Mr. Long from the Danish Camp at Wighton.

Crepis setosa, Hall. fil. Appeared in great quantity at Rockland in 1890, in the "e." division, an additional record for this alien to that of Godwick in "ne.," where it was found by Mr. Glasspoole.

Orobanche minor, b. flavescens, Reuter, was found by Mr. Bidwell at Moulton, near Aele, in a Clover field, in 1890. I searched for it in 1891, but could not find it. This curious variety, of which the name was confirmed by Mr. Arthur Bennett, and which is "yellow all over," is much more common in Belgium than it is here. I have seen something very like it near Cromer. In both cases it is a casual, probably due to foreign seed. It is an addition to the county list for the "e." division.

Scutellaria minor, Linn. I found this in considerable quantity at Hempstead, near Holt, thus confirming the old entry in the 'Botanists' Guide' of "Holt Heath." It has not, so far as I know, been recorded in that part of the county during the interval.

Sparganium neglectum, Beeby. I found this form of *Sparganium* at Hempstead, near Holt, in 1890, and at Northrepps in 1891. The former is an addition to the "nc." division.

Goodyera repens, Br. Miss A. M. Barnard reports this Orchid from the neighbourhood of Holt, where she found it in abundance. This new locality is about twelve miles, as the crow flies, from Westwick, where the plant was first found in 1885 (where it has been since exterminated). It can hardly be regarded as truly wild in either locality. The Scotch Firs, amongst which it grows, were probably brought from Scotland and the plant with them.

Juncus compressus, Jacq. Mr. Long has sent fine characteristic specimens of this Rush from Burnham Sutton, the first time that I have seen such from the county.

Juncus acutus, Linn. The Rev. E. K. Kerslake sent good specimens of this from Burnham Deepdale. So far as recorded it seems in Norfolk to be confined to the north coast from Cley to Titchwell.

Juncus supinus, Moench. The two varieties of this *uliginosus* and *subverticillatus* grow in great quantities at Westwick and Hempstead. They seem to run one into the other by almost insensible degrees; their extreme forms are very unlike, but any amount of intermediates may be found.

Carex stricta, Good. I received from Dr. C. B. Plowright from Wroxham.

1891.

Viola Reichenbachiana, Bor. Found at Felbrigg; is an addition to the "nc." division.

Silene inflata and S. maritima. On the day of the Society's excursion to Wells I found, near the Harbour's mouth, a large patch of *Silene*, in which these two species seemed to be growing intermixed. Some of the plants, if found by themselves, would

certainly have passed for "*inflata*," and others for "*maritima*." Bentham, in his 'Handbook,' vol. i. p. 108, 1865, unites the two species. Is not he right?

Trifolium agrarium × procumbens. At Halvergate, in August, I found a Trefoil, which seemed exactly intermediate between the two forms known as *T. agrarium* and *T. procumbens* both in habit and the colour of the flowers. *T. agrarium* is upright, the stems almost unbranched, the heads of flowers oblong but almost globular, and the flowers themselves bright orange. *T. procumbens* is prostrate, the stems much branched, the heads of flowers oblong and smaller than in *agrarium*, and the flowers themselves pale-lemon colour. My specimens have a branched but not at all straggling upright stem; the heads of flowers are rounder than in *procumbens*, but not so large as in *agrarium;* and the colour of the flowers is a bright yellow. Has not the form known as *T. agrarium*, and which is doubtfully native, been introduced with foreign seeds, and then hybridised with the native *procumbens?*

Vicia angustifolia b. Bobartii, Forster, was found at Sheringham in June, and is an addition for the "ne." division.

Centaurea nigra, b. decipiens, Thuill. One patch was found in Holkham Park by Mr. Long, and the name comfirmed by Mr. Arthur Bennett. It is an addition to the county list, "nc." division.

Ajuga reptans, Linn. Metton, near Cromer; is an addition to the "nc." division.

Scilla nutans fl. albo. White Hyacinths were common near Cromer in June, 1891. There were a good many on the Lighthouse Hills, and also near the "Encampment" at Beeston.

Bromus erectus, Huds. Sidestrand, in the new churchyard. This is an addition for the "e." division."

1892.

Hydrocharis morsus-ranæ. Early in this year Mr. J. H. Gurney sent me to name some small oblong tubers which he had taken out of the crop of a Golden-eye Duck: they were from a third to half an inch long, with a small mucro at one end; dark green, but bleached for about a third of their length from the blunt

end. A short time afterwards I recognised the same thing in Mr. E. Corder's aquarium, and found from him that they are the winter bulbs of the Frog-bit, which fall off the roots in the autumn, and sit immersed about a third of their height in the mud (which accounts for the bleaching), and grow again in the spring.

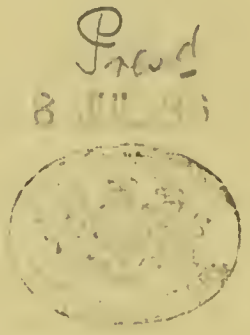
HERBERT D. GELDART.

X.

MISCELLANEOUS NOTES AND OBSERVATIONS.

FOOD OF THE GOLDEN-EYE DUCK, EIDER, AND PINTAIL. As not much has been written on the food of Ducks it will do no harm to place on record that a Golden-eye sent to Mr. Roberts from Woodbastwick, which I examined with him on January 23rd, had in its mouth and throat some green tubers; and that these have been identified by Mr. Geldart as the winter bulb of the Frog-bit (*Hydrocharis morsus-rana*). Two Eider Ducks were shot off Cley on January 25th, probably when engaged in diving for Cockles, as one of them had four in its gullet, all entire, and the largest one three inches in circumference. Some more could be felt lower down, but in the gizzard there were only broken fragments, a Periwinkle, and a seed of some kind. The last day before the close-time a beautiful pair of Pintails, paired it is to be feared for the honeymoon, were shot at Cley. They had been feeding on small shells, seemingly from the Museum collection of the genus *Rissoa*, which they may have got in the harbour. The female weighed only 1 lb. 5 oz., which is less that half what some of the males go up to according to "Yarrell."—J. H. GURNEY.

Early reference to Pheasants in Suffolk. In 'The expenses of Sir John Howard, Knight, afterwards Duke of Norfolk,' edited in 1841 by Beriah Botfield for the Roxburghe Club, we find (p. 399) the following early reference to Pheasants at Ipswich, under date of April, 1467 :—"Item, xii fesawntes, pryse xii. s." There appears to be no earlier mention of the Pheasant in Norfolk than some references in the L'Estrange "accounts," 1519 : and the passage now quoted, contained in a volume entitled 'Manners and Household Expenses of England,' is the earliest for Suffolk. But in Essex the Pheasant is mentioned in a bill of fare A.D. 1059; and this very early allusion is the first in any part of England (*cf.* Newton, 'Encyclopædia Britannica,' p. 732).—J. H. Gurney.



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Ordinary Members proposed and seconded at any meeting of the Society, are balloted for at the next meeting. The Annual Subscription is 5s., payable in advance on election, subsequent subscriptions becoming due on the last Tuesday in March annually. This subscription may be compounded for by a single payment of £3.

Ladies or Gentlemen distinguished for their attainments in Natural Science, or who have rendered valuable services to the Society, may be nominated by the General Committee as Honorary Members, and elected by a show of hands at the next meeting of the Society. Such Honorary Members have all the privileges of Ordinary Members.

CONTENTS.

TRANSACTIONS

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PRESENTED TO THE MEMBERS FOR

1892—93.

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1893.

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1. The Practical Study of Natural Science.

2. The protection, by its influence with landowners and others, of indigenous species requiring protection, and the circulation of information which may dispel prejudices leading to their destruction.

3. The discouragement of the practice of destroying the rarer species of birds that occasionally visit the County, and of exterminating rare plants in their native localities.

4. The record of facts and traditions connected with the habits, distribution, and former abundance or otherwise of animals and plants which have become extinct in the County; and the use of all legitimate means to prevent the extermination of existing species, more especially those known to be diminishing in numbers.

5. The publication of Papers on Natural History, contributed to the Society, especially such as relate to the County of Norfolk.

6. The facilitating a friendly intercourse between local Naturalists, by means of Meetings for the reading and discussion of papers and for the exhibition of specimens, supplemented by Field-meetings and Excursions, with a view to extend the study of Natural Science on a sound and systematic basis.

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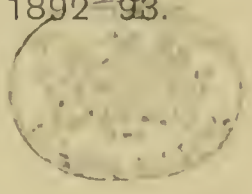

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* Members who have compounded for their subscriptions are marked with an asterisk.

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To Balance from last year	8	12	10	By Fletcher and Son, for Printing *Transactions*, 1891—92	30	0	0
,, Subscriptions:—				,, ,, ,,	3	11	0
1 for 1890—91	0	5	0	,, A. H. Goose for Printing	0	14	6
11 ,, 1891—92	2	15	0	,, Advertisements	0	6	0
162 ,, 1892—93	40	10	0	,, Insurance	0	3	0
1 ,, 1892—93	0	10	0	,, Postage and Carriage	3	18	11
10 ,, 1893—94	2	10	0	,, Cheque Book	0	1	0
2 ,, 1894—95	0	10	0	,, Year Book of Scientific Societies	0	7	6
	47	0	0	,, Gratuity to Doorkeeper	0	10	0
,, Additional payments for monthly notices	0	13	0	,, Rent of Room	1	1	0
,, Sale of *Transactions*	4	9	0	,, Museum Subscription	2	2	0
,, Interest	0	7	2	,, Assistant Secretary's Salary	5	0	0
				,, Balance at Messrs. Gurney's	13	7	1
	£61	2	0		£61	2	0

LIBRARY ACCOUNT.

	£	s.	d.		£	s.	d.
To Balance from last year	9	5	3	By Fletcher & Son—Printing Catalogue	6	14	0
,, Donation (Mr. J. H. Gurney)	3	0	0	,, Bookbinding	0	7	6
				,, Balance at Messrs. Gurney's	5	3	9
	£12	5	3		£12	5	3

LIFE MEMBERSHIP FUND.

	£	s.	d.		£	s.	d.
To Balance from last year	78	19	11				
,, Two Compositions for Life Membership	6	0	0	By Balance in Post Office Savings Bank	£87	9	11
,, Interest	2	10	0				
	£87	9	11				

Norwich, 28th March, 1893.

Examined and found correct,
STEPHEN WM. UTTING, *Auditor.*

List of the Publications received by the Society as Donations or Exchanges from March, 1892 to March, 1893.

Barrett (C. G., F.E.S.). The Lepidoptera of the British Islands. Vol. i. Rhopalocera. 8vo. Lond. 1893. *From the Author.*

Bath Natural History and Antiquarian Field Club. Proceedings. Vol. i.; vol. ii. nos. 2, 3; and vol. vii. nos. 3 and 4. 8vo. Bath, 1867—93. *From the Club.*

Bennett (Arthur, F.L.S.). Records of Scottish Plants for 1891 and 1892. Additional to 'Topographical Botany,' Ed. 2. [Reprinted from 'The Annals of Scottish Natural History,' April, 1892 and April, 1893.] 8vo. *From the Author.*

——— Notes on the Records of Scottish Plants for 1891. [Reprinted from 'The Transactions and Proceedings of the Botanical Society,' Feb., 1892, pp. 253—255.] 8vo. *From the Author.*

——— The Nomenclature of Potamogetons. [Reprinted from the 'Journal of Botany.'] pp. 10. 8vo. *From the Author.*

Bennett (F. J., F.G.S.). The Geology of the Country around Attleborough, Watton, and Wymondham. [Memoir of the Geological Survey.] roy. 8vo. Lond. 1884. *From Mr. H. B. Woodward, F.G.S.*

——— The Geology of the Country around Diss, Eye, Botesdale, and Ixworth. [Memoir of the Geological Survey.] roy. 8vo. Lond. 1884. *From Mr. H. B. Woodward, F.G.S.*

Belfast Naturalists' Field Club. Annual Report and Proceedings for the year ending March, 1892. Series ii. vol. iii. parts 4 and 5. 8vo. Belfast, 1891—2. *From the Club.*

Belgium. Annales de la Société Belge de Microscopie. Tomes, 16 et 17 fasc. i. 8vo. Bruxelles, 1892—93. *From the Society.*

Blake (J. H., F.G.S.). Geological Survey:—Explanation of the Sections of the Suffolk Cliffs at Kessingland, and Pakefield, and at Corton. pp. 8. roy. 8vo. 1884. *From Mr. H. B. Woodward, F.G.S.*

——— The Geology of the Country near Yarmouth and Lowestoft. [Memoir of the Geological Survey.] roy. 8vo. Lond. 1890. *From Mr. H. B. Woodward, F.G.S.*

——— The Geology of the Country around East Dereham. [Memoir of the Geological Survey.] roy. 8vo. Lond. 1888. *From Mr. H. B. Woodward, F.G.S.*

Bristol Naturalists' Society. Proceedings. New Series, vol. vii. part 1. 8vo. Bristol, 1892. *From the Society.*

——— Flora of the Bristol Coal-Field. Edited by James Walter White. 8vo. Bristol, 1881—86.
From the Bristol Naturalists' Society.

——— Engineering Section. 8vo. Bristol, 1887.
From the Bristol Naturalists' Society.

Brodie (Rev. P. B., F.G.S.). President's Address to the Warwickshire Naturalists' and Archæologists' Field Club, March 26, 1891. pp. 8. 8vo. *From Mr. H. B. Woodward, F.G.S.*

Brown (Horace T., F.G.S.). A Grain of Barley. [Reprinted from the 'Transactions of the Burton-on-Trent Natural History Society,' vol. i. pp. 86—113. 1888.] 8vo.
From Mr. H. B. Woodward, F.G.S.

Buckman (Professor James). Weeds. [Reprinted from Morton's 'Cyclopedia of Agriculture.'] pp. 12. roy. 8vo.
From Mr. H. B. Woodward, F.G.S.

Cambridge Museum of General and Local Archæology. Third to Eighth Annual Reports of the Antiquarian Committee to the Senate. 5 nos. 4to. [From the 'Cambridge University Reporter,' 1887—93]. *From Col. Feilden, F.G.S.*

Cardiff Naturalists' Society. Report and Transactions. Vols. xxiii., xxiv. 8vo. Cardiff, 1892—93. *From the Society.*

Costa Rica. Lista de las plantas encontradas hasta ahora en Costa Rica y en los territorios limitrofes, extractada de la 'Biologia Centrali-Americana.' Catálogo de las aves de Costa Rica, por José C. Zeledón. imp. 8vo. 1817. *From Col. Feilden, F.G.S.*

Croydon Microscopical and Natural History Club. Proceedings and Transactions, 1891—92. 8vo. Croydon, 1892. *From the Club.*

——— Pictorial Selection in Photography. By W. G. D. pp. 19. 8vo. *From the Club.*

Cumberland and Westmorland Association for the Advancement of Literature and Science. Transactions, no. 13. 1887—88. 8vo. Carlisle, 1888. *From Mr. H. B. Woodward, F.G.S.*

Edinburgh. Royal Society of Edinburgh. Proceedings. Vol. xviii. 8vo. Edinb. 1891. *From the Society.*

Edinburgh. Royal Physical Society of Edinburgh. Proceedings. Vol. xi. 8vo. Edinb. 1892—93. *From the Society.*

Essex Field Club. Journal of Proceedings, February, 1884, to January, 1887. Vol iv. part 2. 8vo. Buckhurst Hill, 1892.
From the Club.

——— The Essex Naturalist: being the Journal of the Essex Field Club. Vol. v. no. 2; vol. vi.; and vol. vii. nos. 1—3. 8vo. Buckhurst Hill, 1892—93. *From the Club.*

Falconer (Hugh, M.D., F.R.S.). On the Species of Mastodon and Elephant occurring in the Fossil state in Great Britain. Part 2, Elephant. [Reprinted from the 'Proceedings of the Geological Society,' vol. xxi. pp. 253—332]. 8vo.
From Mr. H. B. Woodward, F.G.S.

Fitch (Frederick, F.R.M.S.). The Fly. [Reprinted from the 'Journal of the Postal Microscopical Society.'] pp. 14. 8vo. 1883. *From Mr. H. B. Woodward, F.G.S.*

Forster (Thomas, F.L S.). A Synoptical Catalogue of British Birds. 8vo. Lond. 1817. *From Professor Newton, F.R.S.*

Glasgow. Natural History Society of Glasgow. Proceedings and Transactions. New Series, vol. iii. parts 2 and 3. 8vo. Glasgow, 1892. *From the Society.*

Godwin-Austen (R. A. C.). Memoir of Robert Alfred Cloyne Godwin-Austen, F.R.S. [Reprinted from the 'Geological Magazine,' January, 1885.] 8vo.
From Mr. H. B. Woodward, F.G.S.

Goodchild (J. G., F.G.S.). Observations on the Disposition of the Cubital Coverts in Birds. [Reprinted from the 'Proceedings of the Zoological Society,' April, 1886.] pp. 21. 8vo.
From Mr. H. B. Woodward, F.G.S.

——— Some observations upon the Natural History of Gypsum. Reprinted from the 'Proceedings of the Geologists' Association,' vol. x.] pp. 21. 8vo. *From Mr. H. B. Woodward, F.G.S.*

Gunn (John). Memorials of John Gunn, M.A., F.G.S.; being some Account of the Cromer Forest Bed and its Fossil Mammalia, and of the associated strata in the cliffs of Norfolk and Suffolk: from the MS. notes of the late John Gunn. With a Memoir of the Author. Edited by Horace B. Woodward, F.G.S., with the assistance of E. T. Newton, F.G.S. roy. 8vo. Norwich, 1891.
From Mr. H. B. Woodward, F.G.S.

——— Conversazioné at the Museum. Presentation of the Rev. J. Gunn's Portrait. [Reprinted from the 'Norfolk Chronicle,' April 30th, 1870.] pp. 8. sm. 8vo.
From Mr. H. B. Woodward, F.G.S.

Gurney (John Henry). Catalogue of a Collection of British Birds formed by the late Mr. Henry John Gurney and his son; with the localities, sex, and state of plumage. pp. 33. 8vo. Lond. 1892. *From Mr. J. H. Gurney, F.Z.S.*

Hart (Henry Chichester, B.A.). A list of Plants found in the Islands of Aran, Galway Bay. pp. 32. 8vo. Dublin, 1875.
From Col. Feilden, F.G.S.

Henslow (Rev. J. S.) and Skepper (Edmund). Flora of Suffolk: a Catalogue of the Plants found in a wild state in the County of Suffolk. 12mo. Lond. (1860).
From Mr. H. B. Woodward, F.G.S.

Hinde (George Jennings, F.G.S.). Fossil Sponge Spicules from the Upper Chalk. Found in the interior of a single flint-stone from Horstead in Norfolk. 8vo. Munich, 1880. *From the Author.*

Ibis (The), a Quarterly Journal of Ornithology. Edited by Philip Lutley Sclater, M.A., Ph.D., F.R.S. Sixth Series, vol. iv. nos. 3 and 4; vol. v. no. 1. 8vo. Lond. 1892—93.
From Mr. G. F. Buxton, F.Z.S

Jameson (H. Lyster). The Yellow-billed Sheathbill (*Chionis alba*, Latham) on the Irish Coast. [Reprinted from the 'Irish Naturalist,' June, 1893.] pp. 7. 8vo.
From Mr. J. H. Gurney, F.Z.S.

Jeffreys (J. Gwyn, F.R.S.). The Mollusca of Europe compared with those of Eastern North America. [From the 'Annals and Magazine of Natural History' for October, 1872. pp. 237—247.] 8vo. *From Col. Feilden, F.G.S.*

——— On some new and peculiar Mollusca procured in the "Valorous" Expedition. [From the 'Annals and Magazine of Natural History' for 1876 and 1877.] 8vo. 3 nos.
From Col. Feilden, F.G.S.

Jenyns (Rev. Leonard). A Manual of British Vertebrate Animals. 8vo. Cambridge, 1835. *From Mr. H. B. Woodward, F.G.S.*

Joske (Adolph B.). The Nanga of Viti-Levu. With note by Baron Anatole von Hügel. [From 'Internationales Archiv für Ethnographie, Bd. ii. pp. 254—271.] 4to. 1889.
From Col. Feilden, F.G.S.

Kendall (Percy F., F.G.S.). Glacial Geology, Old and New. [Reprinted from the 'Geological Magazine,' November, 1892. pp. 491—500.] 8vo. *From Mr. H. B. Woodward, F.G.S.*

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Pres.

ADDRESS.

Read by the President, H. B. Woodward, F.G.S., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Twenty-fourth Annual Meeting, held at the Norfolk and Norwich Museum, March 28th, 1893.*

Ladies and Gentlemen—It is written in the Laws of this Society, that "the President shall be invited to deliver an Address containing a review of the proceedings of the Society during the past year, with such other observations from himself as he may deem conducive to the welfare of the Society, and the promotion of its objects." I interpret this law in a manner not unfavourable to myself; and, following the example of some former Presidents, depend mainly on our Secretary for an account of the proceedings during the past session. If I do not apologise for my poor attendance at the meetings, it is because you took me, for better or worse, on the understanding that I should be an absentee President; but none the less do I regret my inability to be present on more than two occasions. I may say I have appreciated the honour you have conferred upon me, and more especially as I take it as a compliment to the memory of my grandfather and father, both of whom were Norwich men, and Norfolk naturalists.

During the past session the subjects brought before us have not been wanting in variety, nor in interest and importance. Our record fitly commences with the Mammals, for Mr. H. R. Everitt read a paper on April 26th on the Scandinavian Lemming (*Myodes lemmus*), directing attention to its peculiar migratory journeys. The species is not unknown to us in this country, for it occurs in the Pleistocene brickearth of the Thames Valley; and has also

been recorded from a cave in Somerset.* On October 25th Colonel Feilden sent a note on a Grey Seal, which was killed at Wells during the preceding February; while on January 31st Mr. Southwell recorded the occurrence of Sowerby's Whale at Overstrand, and Mr. W. D. E. Bulwer sent some notes on the winter-breeding of the Otter at Barton Broad.

The subject of Birds is one that is sure of attention and regard in this Society. A good work, undertaken by a sub-committee, was a circular letter on behalf of the Owls and the Hawks, and with them were appropriately included the Weasels. Our charity towards these birds and beasts may be considered as, to a certain extent, interested, for they are the "police of nature," who arrest large numbers of mice and rats, and prevent their undue multiplication. Our work, however, would not command the sympathy of our fellow-creatures, if we did not take every opportunity of making practical use of scientific knowledge; and in the letter sent forth, the claims of the Barn Owl to the friendship of the farmer were particularly mentioned.

On September 27th Mr. Southwell exhibited and described a small Sandpiper which had been shot on Breydon. It proved to be the *Tringa acuminata*, a species not previously recognised in Europe. Attention was called to other birds by Mr. Southwell, Mr. J. H. Gurney, Dr. Wheeler, Colonel Feilden, and Mr. Patterson; and Mr. Gurney noticed (November 29th) a remarkable visitation of Lapland Buntings to one or two points on the Norfolk coast.

The subject of Reptiles was not neglected. Sir Peter Eade communicated (November 29th) "A Further Note upon Tortoises." This was a continuation of a paper read before the Society in 1886,† and it dealt more especially with the rate of increase in weight and size of the common European Land-tortoise, *Testudo graeca;* examples of which have, for some years, found a happy home in Norwich. On the same evening the Rev. W. F. Creeny introduced to the meeting a live Alligator from Florida: a young and sportive visitor, fortunately no more than a foot in length.

* E. T. Newton, Geol. Mag. 1890, p. 455.

† 'Transactions,' vol. iv. p. 316.

Various memoranda relating to Fishes have been brought before us by Mr. A. Patterson, whose Yarmouth Notes form a prominent feature at our meetings. He mentioned (September 27th) that a Sturgeon, weighing about 140 lbs., was stranded last June on the mud-flats of Breydon.

Mr. Hamon le Strange sent a note (November 29th) on the occurrence of Ray's Bream, *Brama rayi*, in Norfolk; it was washed ashore last October on Hunstanton beach after a heavy gale, and was picked up alive. At our last meeting Mr. Southwell continued his valuable "Notes on the Herring Fishery," giving us the particulars for 1892.

Turning to the humbler orders of animals, I should mention that Mr. Patterson exhibited (September 27th) a small Crustacean, *Eurydice pulchra*, from Breydon.

On the subject of Insects, Dr. Wheeler recorded (September 27th) the finding last summer, and in some abundance, of the Moth, *Meliana flammea*, at Ranworth and elsewhere; while Mr. J. Edwards (February 28th) sent a list of Norfolk Coleoptera, that will form a valuable feature in our 'Transactions.' "Notes on Norfolk Slugs" were contributed by Mr. A. Mayfield (January 31st); and he pointed out that the Broad district offered a good field for further observations on this neglected section of the Mollusca.

Botany has received every attention in its recent aspect from Mr. Geldart; while Mr. Clement Reid (September 27th and January 31st) has sent Notes on New Fossil Seeds from the Cromer Forest Bed. This subject naturally leads into the domain of Geology, and to the mention of a memoir of Caleb B. Rose, communicated (February 28th) by myself. On the same evening Mr. A. W. Preston sent his Meteorological Notes for 1892, thus completing in an appropriate manner our yearly record of facts and phenomena.

I should not omit, however, to express our obligations to Mr. Geldart, Mr. E. Corder, Mr. Mottram, Mr. Waddington (of the Quekett Microscopical Club), and to our Secretary, for the exhibition of microscopic and other objects.

The Society has to lament the loss, during the past session, of

four of its members by death: Mr. T. W. Crosse, surgeon, of Norwich; Mr. R. Z. Pitts, surgeon, of Chelmsford, a relative of R. C. Pitts, chemist, of Norwich, who in his time paid a good deal of attention to our Crag deposits and their organic remains;* Mr. William Castell Southwell, of Swaffham; and lastly, this morning we have received tidings of the death of our former president, Mr. T. G. Bayfield.

Thomas Gabriel Bayfield was born in the parish of St. Saviour's, Norwich, on January 7th, 1817. At an early age he was sent to a dame's school (Mrs. Chesteney's) in St. Clement's Alley, and afterwards to Mr. Brooke's school at Greyfriars' Priory, where B. B. Woodward, the eldest son of Samuel Woodward, was one of his schoolmates. As a lad, Bayfield was somewhat delicate, and he suffered a good deal from the free fights that not uncommonly took place between the boys of Brooke's school and others in the city. Consequently his father, after six months, removed him to Mr. Norman's school in Golden Dog Lane, as this establishment was close to his home at Stump Cross, in Magdalen Street. In due course Bayfield gained a sound knowledge of Latin and Greek, arithmetic, and the ordinary English subjects. It was the intention of his father to educate his son for the medical profession; but circumstances unfortunately prevented this plan from being carried out. At the age of fifteen Bayfield left school to temporarily assist his father in his business as an ironmonger. Two years later (1834) the father died, and in consequence, his son remained in the business, which for many years was carried on in the name of Ann Bayfield and Son. It was a good old-fashioned business, with extensive storehouses and workshops; and at the rear, a large garden with greenhouses. Here it was that Bayfield lived and laboured for nearly forty-five years, though it must be said that he was known to his many friends more as a man of science than as a man of business. His interest was certainly centered in his large collections of fossils and antiquities, in his garden, and in the choice succulent plants which he tended in his greenhouse. For many years he was churchwarden of St. Saviour's.

* See Paper in Proc. Scientific Society, London, vol. ii. p. 3, 1840.

Associated as he was in his school-boy days with B. B. Woodward (afterwards librarian to the Queen at Windsor Castle) and with S. P. Woodward (subsequently author of a Manual of the Mollusca), he imbibed a love for archæology and natural history which influenced his subsequent career. Together the lads made many excursions in pursuit of insects, fossils, &c. With respect to one topic, that of poetry, Bayfield never manifested any feeling but that of abhorrence. My father, writing to a friend in 1841, remarked: "For the last hour or two Bayfield had emitted no sound save a short little growl when I began to poetise on the dim high clouds that flitted over the glorious sky." The only "poetry" he would countenance was that beginning: "Thirty days hath September!" Eventually Bayfield married the eldest daughter of Samuel Woodward.

The subject of Coins was one in which Bayfield took great interest, and he has told how this interest was aroused, for when a boy some one presented him with a bag of two hundred specimens. He devoted much attention to Electrotypes, of which he made many examples; and also helped others to follow this, at one time, popular hobby. On the subject of Ancient Seals he was an authority, and he rendered valuable assistance to the work on Norwich Cathedral by Dean Goulburn. In Geology he laboured more especially at the fossils of the Chalk and Norwich Crag; and his collection from the former formation has been acquired by the British Museum. He published, however, but little on this or any other subject, being content, and ever ready to communicate his stores of information to others. While engaged on the geological survey of the country around Norwich, I gathered many facts from my uncle (Bayfield), as noted in the official memoir. Two short communications of his were published: one, in 1851, "On the Occurrence of Trigonellites in the Upper Chalk at Norwich" (Ann. and Mag. Nat. Hist., ser. 2, vol. viii. p. 236); and another, in 1864, on the "Discovery of the Skeleton of *Leiodon anceps* in the Chalk at Norwich" (Geol. Mag. vol. i. p. 296).

Bayfield was an active member of the Norwich Geological Society during its term of existence, and first drew attention to the

disturbed chalk at Trowse. He was one of the leading spirits of the Norwich Science Gossip Club, of which he was chosen president in succession to the founder, Dr. J. E. Taylor. In that club his genial nature and extensive knowledge were much appreciated. He was also an original member of this Society, and filled the office of president for the session of 1876—77.

Perhaps the most remarkable feature about him was his wonderful memory; whatever he learnt, and it was largely from conversation with others and personal observation, he never forgot. His was ever a most inquiring mind, eager to seize hold of any new scientific truth, and to impart it to others. In the course of years he acquired such a knowledge of various subjects that to many of us he was looked upon as a sort of encyclopædia, which was always accessible, and which rarely failed to yield the information that was sought. On matters of local Archæology especially, he had few, if any, equals. His scientific pursuits, and his readiness ever to give up his time to others, were by no means advantageous to business; and it is not surprising that some fifteen years ago, he was glad to relinquish the anxieties of commerce, and to undertake the duties of master of the Blind School. This post he filled for about seven years, when his health broke down, and he retired to Bracondale. For the past eight years he never left his home, but he retained all his interest in matters scientific, and his memory seemed in no wise impaired. During the last three months, however, he gradually lost strength, and he passed quietly away on Monday evening, March 27th, in the seventy-seventh year of his age.

Seven members have retired from our ranks; and although happily ten new members have been elected, our numbers show a decrease of one, being 249 as against 250 last year. Honorary membership has been conferred on Sir James Paget, Bart., F.R.S., the surviving author of the 'Natural History of Yarmouth and its Neighbourhood;' also on Mr. James Edwards, who has left Norwich, and to whom we are indebted for the admirable list of Norfolk Coleoptera before mentioned; and on Dr. G. J. Hinde, F.G.S. Our financial position is satisfactory.

With regard to excursions, our record has been a poor one, as

the only field-outing was that made on June 27th by rail to Holt, and thence by road to Weybourn and Sherringham. This was attended by nine members and friends, and was chiefly of a Botanical nature. For this shortcoming in the way of excursions you must, I fear, hold your President responsible; but I hope that this important function of our Society will not be neglected, and that directors each year will be found to undertake Botanical, Zoological, and Geological expeditions.

Our first object is "the practical study of Natural Science;" and this means the advancement of all knowledge relating to the Geology and Geography, the Botany and Zoology of Norfolk. How well this object has been carried out our 'Transactions' sufficiently show. It is true that in the earlier days of the Society, Geology was left mainly in the hands of the older Norwich Geological Society; but the subject was by no means ignored by us. The first President, the Rev. Joseph Crompton, who "rocked the cradle" of this Society, was himself a student of Geology. The science has been well represented in the presidential chair by Mr. Harmer and Colonel Feilden; and sundry communications on the subject have been made from time to time by various members. Since, however, we incorporated the Norwich Geological Society, in 1889, we have taken upon ourselves the chief responsibility of looking after the interests of local Geology.

In this, as in all societies, the work depends on a comparatively small number of members; and in provincial societies and field-clubs it is unlikely that every branch of natural science will be continuously and adequately represented. Hence the subjects that occupy a foremost place in the field or in the meeting-room vary in different societies and at different times.

With us both Botany and Zoology have received full attention, the chief shortcoming being in the matter of the Recent Marine Invertebrata—a large subject that has at present occupied but little space in our 'Transactions.'

The bibliography of Natural History has assumed proportions so gigantic, that I think we and other local societies should do our best to aid the investigator by publishing only those papers that

deal with local subjects, or that have some local bearing. In adopting such a course we may at times refuse papers of great originality and value; but such papers, though the Society be honoured by their reception, are out of place in our records if they have no reference or application to the county of Norfolk. It may be of great service to read them at our meetings; but if printed in our 'Transactions,' they are likely either to be overlooked by students at work on the particular subjects, or to be absent from any library to which they have access. The vitality of all societies must vary from time to time, and it is not to be expected that a publication of uniform size can be maintained.

An individual, presumably a naturalist, who writes under the pseudonym of "Free Lance," has lately published some lamentations 'On the Organisation of Science.' * He would abolish all provincial scientific societies, and have in their place local sections of the principal learned societies of London—such local sections of the Linnean, Geological, Zoological, and other societies to be formed "whenever in any one town or district there is a sufficiency of members." Then might there be but one publishing society for each branch of science! It is certainly a serious disadvantage that original papers of wide importance should be scattered among so many publications; and it seems to me that in some of the larger towns and cities the plan suggested by "Free Lance" might be carried out. At the same time I feel assured that there will always be room and need for local Natural History Societies or Field-clubs, and for their publications. If their work is essentially of a local character it is not unimportant on that account; but when new species are discovered, the descriptions of them, which have a world-wide interest, should in all cases be sent to one of the London publications. It would be well, indeed, if a local society were established in every county; and a useful feature in their proceedings would be an annual list and brief account of books and memoirs published elsewhere, on subjects that illustrate or describe facts relating to the local natural history. Perhaps we may set an example in this matter ourselves.

* 8vo. London (Williams and Norgate), 1892, pp. 32.

Strong remarks are made by the same "Free Lance" about the futility of local or county lists of plants and animals. These strictures, as you will admit, are unjust and uncalled for. Local lists furnish the materials from which the general works on British Natural History can be constructed. Theoretically it may be absurd to limit one's special studies to an area bounded (in part) by the middle of a stream or high-road; but practically one must draw the line somewhere, and the careful study of the natural history of a county, or even of a parish, may serve its useful purpose, so long as attention is given to facts. The resident can do far more in the gathering of facts, whether on Geology, Zoology, or Botany, than the most distinguished man of science, who can spend but a few weeks here and there. In Geology it may be of great importance to have a list of fossils from a particular chalk-pit.

The Geology of Norfolk has attracted the attention of many a zealous worker during the past seventy-five years; but, sad to say, the gaps left by the death of the older geologists, do not appear to be filled by new comers. It is no easy task to stir up others to follow in their footsteps. It is not enough to awaken interest in matters geological—every one of us may take a general interest in the progress of science. To further knowledge, needs much study, and much incentive to study.

Enthusiasm is apt to be damped at the outset by a contemplation of all that has been done—by the mere list of papers that have been published on Norfolk Geology. One cannot but think that the harvest has been gathered and that only stray stalks remain to be collected. Where then is the incentive to work?

There are many, it is true, who take up science as a pastime or recreation; who are content with collecting the fossils that have been collected before, and in studying the strata that have been described over and over again. In their rambles they find true enjoyment and profit, for in the contemplation of the great changes which the earth has undergone, the philosophy of each individual must attain a higher standard. Those are they who pursue knowledge for its own sake. They are the patrons of science, and they serve to stimulate and encourage others to work.

Those who seek to advance knowledge pursue it with varied motives. It may be as a means of livelihood, or with motives of personal ambition, or with the desire to do some useful work. The several motives may co-exist: but the greatest spur in any work must be that of its utility, using the word in its highest sense—that it should be of some service, intellectual or practical, to our fellow-creatures.

Now the methods of science differ in the course of time according to increased knowledge and better apparatus. This very fact indicates that much may be done in going over old ground and reinvestigating known phenomena. At the same time the progress of science shows the greater need with those who seek to be workers, of preliminary training in the fundamental sciences of Chemistry, Physics, and Biology. Such training is indeed necessary for those who would become experts in Mineralogy, Petrology, or Palæontology; but the fact that it cannot be obtained by many who would like to devote their attention to Geology, need not deter them from taking some part in the work that has to be done. Science owes a very great deal to those who never had any scientific or academic training.

In a maritime county like Norfolk the student has a natural text-book of Geology all along the sea-coast, and the subject is further illustrated by the rivers and broads. There is, indeed, much in the physical geography and natural history of Norfolk that will throw light on the origin of the later Tertiary strata that are developed in the eastern part of the county. Let the beginner, then, give an attentive study to all that is going on at the present day in his own county. The waste of the cliffs, and the character of the beach-deposits furnish lessons; for in the accumulations of rough flints on the fore-shore near Sheringham, may be discerned the formation of a layer like the "stone-bed" or basement portion of the Norwich Crag; while in the sands and shingles that fringe the shore, and appear in shoals further out at sea, that sometimes yield many marine shells, and sometimes are barren, may be seen resemblances to the Crag strata. Along the borders of the Glaven, by Blakeney Harbour, there will be found estuarine muds, and

plant-growths, and blown sand and shingle, side by side; and likewise in the Broads, with their silty and peaty accumulations, there are features that resemble the Forest Bed Series, with its laminated clays and gravels, its peaty deposits and rootlet-bed.

Going further into the subject it will be needful to interpret the phenomena by observations made elsewhere by others; but once the principles of geology are grasped, and the student realises that he can explore the beds of ancient seas and estuaries, the moraines of old ice-fields; that he can hunt for the Hippopotamus, the Elephant or Mastodon, and other animal remains in parts of Norfolk, his interest may be aroused.

As a preliminary study no better task can be undertaken by the geological inquirer than the mapping of the strata that lie around his home. On the six-inch Ordnance maps such a work can be undertaken without serious difficulty; and no more instructive and interesting task could be found. The experience gained would enable the worker to interpret the Geology of tracts elsewhere, in a shorter time and with greater accuracy, than would be possible with one unacquainted with the art and science of mapping. The process, to a certain extent, is an art, for it consists in depicting not only that which is seen, but that also which is not seen.

Not many counties can boast of having had an original geological survey, undertaken and accomplished as it was over East Norfolk on the one-inch scale, by private and disinterested enterprise. Such a map was produced by our former President, Mr. Harmer, who was inspired by the great master of Drift geology, the late Searles V. Wood, jun.

The production of that map, and of the subsequent maps of the Government Geological Survey, has by no means exhausted the subject; indeed, for many scientific and for most practical purposes, maps on the six-inch scale are requisite.

I have alluded to the bewildering aspect of geological literature, but that is not so serious a matter to the student when he becomes interested in his work. When familiar with certain tracts of country, with certain formations, or groups of fossils, he will be curious to know how far his observations accord with those of other

workers, and he will readily select from the published lists of papers those that deal with his own particular subject. He will soon learn what has been done, and in what ways he may aid in furthering knowledge.

Among the many labourers in the science of Geology, perhaps, none is more important than the collector; and yet, notwithstanding the wider diffusion of knowledge, the number of large private collections appears to be less than it was twenty or thirty years ago.

Of the older workers of the present century we have left to us but one, Robert Fitch, whose recreative labours have been devoted mainly to the acquisition of our Norfolk fossils. To him, as well as to those who have pursued a similar course, we owe a large debt of gratitude, for have not others made use of their stores of fossils, and made known to the world the information thus derived? Mr. Fitch's work is accomplished; but his treasures will remain as a memorial of his labours, in the Norwich Museum.

The greatest drawback felt by the local student is, no doubt, the difficulty of naming his specimens, or in getting others to do it for him. This appears to be an ever-increasing trouble, whether we have regard to fossils or to existing species: it is verily the "pursuit of knowledge under difficulties." The multiplication of names is certainly a vexation, to say nothing of the constant replacement of familiar names according to the law of priority: whereby species have as many aliases as a rogue.

In some respects the multiplication of names seems a necessary process to the specialist who is anxiously studying the evolution of species. Modern research shows that there are two forms of divergence from what may, for convenience sake, be termed the type. There is the divergence among species due to varied conditions of habitat: these are the *varieties* which co-exist with the type, and they, of course, occur fossil as well as living. Then there are the divergences which follow the type in sequence: they are chronological variations which appear to mark the passage of one species into another, and they have been termed "*mutations*" or "*exallagous forms*."* It is the giving of distinct names, equivalent

* See J. E. Marr, 'Natural Science,' 1892, pp. 124, 240.

to our old specific names, to these mutations, that tends to introduce into natural science almost endless appellations, most of them unintelligible except to the specialist.

Every one will readily admit that no hard and fast lines can be drawn between certain species that follow one another in chronological order. There is, however, a limit to our capacities for utilising material, and I look upon the present fashion of naming these endless "mutations" as the most serious obstacle that has ever been placed in the pathway of the student of nature.

The specialist naturally wishes to record the facts that come before him; but he might devise other means of indexing his knowledge that would not interfere with the intelligible nomenclature of species.

Not the least unfortunate result of this publication of working material, is that the common and characteristic medals of creation, once familiar to geologists, are apt to become lost sight of and undistinguishable in the chaos of words. For the present we must be content to leave these names to the specialists who invent them, hoping that in time they will be lumped together as "time-varieties," and that broad general specific names may be reinstated.

The collector who may feel that "love's labour is lost," should, however, still keep up his occupation, for by gathering many specimens of the same species from each locality and bed of rock, and by studying the variations that may accrue from duration in time as well as change of sedimentary condition, he may help in many ways towards the progress of knowledge.

While on this subject I may mention that some palæontologists are disposed to abandon the doctrine of special centres of creation, and to believe that as species result from adaptation to environment, similar conditions may lead to the independent evolution of species that are practically identical.* If true, this means that the same species may be developed at different epochs; but the view is one that must at present be regarded as very speculative.

A good deal of attention is paid to the subject of geological

* See J. W. Gregory, in 'Bonney's Year Book of Science' for 1892, 1893, p. 295.

"zones"; these are stages in the history of life on the earth that are characterised by one or more species whose geographical distribution was wide, but whose duration in time was comparatively restricted. Thus among the older rocks we find certain strata characterised by particular forms of Graptolites, and similar species or genera succeed one another in the same order over areas now widely separated. In the Lias again we find a sequence in the species of Ammonites that corresponds over large tracts. It is concluded that the strata yielding these successively similar forms of life are practically contemporaneous; but from what has been said of the possible evolution of identical species in different areas, it is necessary to consider the general characters of the fauna that constitutes these zones.

In the Chalk different assemblages of fossils characterise successive portions of the formation. Some species, indeed, may range through the entire formation, but the particular assemblages, named for convenience after some prominent species, are found generally to correspond over large areas.*

It must not be supposed that these zones are anything more than pages in the history of the earth; but they afford the only means we have of comparing in age, formations that are remote one from another. They are not in themselves to be separated by definite planes of division, any more than English history is interrupted by a change of sovereign or by a change of government. New forms of life come to the front and oust others; and such changes, as in human history, while more marked over limited areas, yet blend in the general sequence of events. Ordinary events go on much the same.

Each country must have its separate grouping of strata, and although we employ all the world over such general terms as Silurian, Jurassic, and Cretaceous, yet so far as the strata are concerned we can only look upon the correlation as broad and general—probably exact within certain limits; but we cannot define those limits as they shade away irregularly, and must vary in different areas. We see this in our own country, for at

* See Proc. Geol. Assoc. vol. xii. p. 295.

Hunstanton the Chalk formation begins with the Red Chalk. Elsewhere that basement Chalk is represented in point of time by the clays of the Gault. We know this from the fossil evidence, that the occurrence in both of such zonal forms as *Ammonites interruptus*, *A. lautus*, and *A. rostratus*, marks an approximate period of time, and that the Red Chalk as suggested by Rose, and confirmed by Messrs. Jukes-Browne and Hill,* was "formed outside the limits of the area reached by mud-bearing currents." Hence it is that some forms, allied more closely to chalk fossils, appeared earlier on the scenes in the Hunstanton area than elsewhere, as the chalky conditions were suitable to their welfare.

A fact of great interest in connection with the Chalk in this country was made known in 1891 by Mr. A. Strahan.† He then ascertained the existence of two phosphatic bands (four and eleven feet thick) in the Upper Chalk at Taplow, in Buckinghamshire. These bands consist of pale brown sandy-looking chalk; and they are composed almost wholly of phosphatised Foraminifera, together with fish-remains, in a chalky matrix. The lower band contains about 18 per cent., and the higher band 35 per cent., of phosphate of lime: and they bear a close resemblance in aspect and composition to a phosphatic chalk which is worked for economic purposes in the north of France.

The fact of most interest to us, is that phosphatic beds occur both in France and at Taplow in England, in the zone of *Marsupites*: a zone developed at Wells and Fakenham, in Norfolk. Still higher beds of Chalk, higher than any known in England, have yielded at Ciply, in Belgium, phosphatic deposits of commercial value. The eyes of local geologists may well be directed to this feature in the Chalk, for it is by no means improbable that similar beds may be detected in Norfolk. What John Linnell remarked in reference to Art, is equally true of Science: "What you see depends upon what you take with you." The old chalk-pit at Taplow has been open for many a year, and as Mr. Strahan remarks, it is hardly

* Quart. Journ. Geol. Soc. vol. xliii. p. 593.

† Quart. Journ. Geol. Soc. vol. xlvii. p. 356; and 'Natural Science,' June, 1892, p. 284.

more than twenty miles from London. Nevertheless until two years ago the phosphatic bands were not recognised.

In our shallow-water formations we can rarely indicate zones, because most of the forms of life are restricted within comparatively limited areas. Such horizons as have been determined are local; and so we find, when we study our later Tertiary and Quaternary strata, that the difficulties in correlating them with beds at a distance are great. The zones in older formations are taken from deeper water deposits, where often a few feet of strata represent long intervals of time.

We are unable to study the deep-water deposits of later geological times; and in our correlations of those Pliocene and Quaternary strata, that are exposed to view, we have to be guided by general considerations of the fauna and flora, and of their relations to the forms of life now existing. In such studies Norfolk offers advantages that may be excelled in no other part of the world. It is not everywhere that the field-naturalist can readily compare the past with the present. In a district where the surface strata are as old as, and older than the Eocene, the studies of the zoologist and botanist must be restricted to the living or recently extinct forms of life: for no comparisons with the fossil forms would aid their researches. In Norfolk, the modern fauna and flora can be compared stage by stage with the forms of life that existed since Pliocene times. Numerous important additions to the fauna, both of the Norwich Crag and Forest Bed have been made known during the past twenty years, especially by Mr. E. T. Newton; but we must not forget that to Mr. A. C. Savin and other fossil-hunters we owe many of these accessions to our knowledge.

The Cromer Forest Bed, now sometimes termed the 'Cromerian' deposit, attracts considerable interest on the Continent, not only on account of its fauna, but also of its flora; to our knowledge of which we are particularly indebted to Mr. Clement Reid.* He indeed has opened up a new field of investigation, for prior to his work scarce any attention had been paid to the subject of fossil

* See Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 189; and 'The Pliocene Deposits of Britain,' 1890.

seeds. Now he has shown, in reference to various deposits of Pliocene and Post-Pliocene times, how much light may be thrown by their study on the former geographical distribution of species and on past climatic conditions. Referring to these discoveries, Mr. Carruthers has remarked that he was unable to carry the history of any existing species of plant beyond the period of the Cromer deposits.*

The hypothetical pathways of geology afford much temptation to geologists—but without these diversions little progress could be made. Those who are content to be spectators may be amused at the halts, and stumbles, and occasional retreats of those who pursue these thorny ways. It is remarkable how different are the opinions that in turn prevail on such subjects as Metamorphism and the permanence of Ocean Basins. They need not much disturb the mind of the inquirer in Norfolk; but he cannot fail to be interested in the views enunciated by Professor Suess (of Vienna), on the fluctuations of sea-level; and also in certain speculations on the Mammoth and the Flood, which have culminated in the 'Glacial Nightmare' of Sir Henry Howorth. The ideas put forth by Suess have attracted a large amount of attention, and they formed the theme of Professor James Geikie's address, last year, to the Geographical Section of the British Association at Edinburgh. †

It has been generally held that the sea has been fairly stationary, while the land has been subjected to repeated upheaval and depression. It has been admitted that contraction of the mass of the earth might give to the sea a relatively larger bulk; that great terrestrial movements must locally modify the water-level; and that the freezing and melting of large masses of ice in the polar regions, during and after glacial episodes, must have had some effect on the ocean.

The views now brought forward, to a certain extent, recall old notions of the raising of the sea-level, but they are based on a wider general knowledge of facts. There are still many things to

* Address to Biological Section, Brit. Assoc. 1886.

† Published (with map) in the Scottish Geographical Magazine for Sept. 1892.

be learnt and explained. The contraction of the earth, and its efforts to accommodate itself to smaller limits, have resulted in great crust-movements, and reversed or overthrust faults; but it is by no means clear that any very great diminution in the relative bulk of land and water has taken place since the earlier epochs of which we have life-records.

The distribution of marine life over the surface of the globe in the older geological periods tells of widespread oceans: and Suess points out that some of these must have been very deep. Reviewing this part of the subject, Professor Geikie remarks that "relatively small areas of the continental plateau appeared above the level of the sea"; but when larger tracts of land did appear they may have risen because the floor of the oceanic basin became depressed. Suess considers there is no evidence of vertical elevation affecting wide regions, but that the broad invasions of continental areas by the sea are due to secular movements of the water.* How these movements are brought about is a problem; but the deposition of sediment must in the course of ages influence the sea-level. I cannot attempt to enter further into this subject, nor is it necessary with Professor Geikie's address before us; but I wished to call attention to these views, because they may help us in such matters as Raised Beaches and Submerged Forests, where there is often evidence of changes in the relative levels of land and water without any marked change in the inclination of the strata. Thus in the case of our Cromer Forest Bed there is very little change in its level from Sherringham to Kessingland; and if it had been repeatedly depressed and upheaved during the Glacial period it is remarkable, at any rate, that it shows so little evidence of any movement. If we admit that the level of the sea may have fluctuated, the difficulties are not so great.

Professor James Geikie, in another recently published paper, advances the view that the Cromer Forest Bed represents an interglacial period.† This to us is a startling notion. The Forest Bed, as we know, yields *Elephas meridionalis*, it is based on the

* E. Suess, Das Antlitz der Erde; see also his paper in 'Natural Science,' March, 1893, p. 180.

† Trans. Roy. Soc. Edin. vol. xxxvii. 1892, p. 145.

Weybourn Crag, which contains some Mollusca of an Arctic type, and it is overlaid by the Glacial Drift. Professor Geikie points out that in Auvergne there are interglacial beds that yield *E. meridionalis*, and are covered by and rest upon moraines. Again, in Northern Italy, beds which have likewise yielded *E. meridionalis* occupy an interglacial position. He remarks that "It matters little whether we relegate to the top of the Pliocene or to the base of the Pleistocene the beds in which this species occurs. That it is met with upon an interglacial horizon is certain; and if we are to make the Pleistocene co-extensive with the glacial and interglacial series, we shall be compelled to include in that system some portion of the Newer Pliocene."

In this country the Forest Bed Series is so intimately connected with the Crag Series that we cannot part them into separate systems: nor is there need to class strata in this country as Glacial, because they are coeval with Glacial strata elsewhere. We might as well class our recent formations as Glacial because the polar regions are now under icy conditions.

The age of the Mammoth and associated fauna has during the past few years attracted considerable attention, and attempts have been made by Sir Henry Howorth to show "that wherever we can find the remains of the Mammoth and its contemporaries undisturbed and *in situ*, these remains are found under and not over or in the drift." This is a very important point, and Sir Henry does good service in directing particular attention to the evidence. He does not mean (as he tells us) that the Mammoth preceded "the so-called Glacial age"; but "that it lived before the diluvial movement which distributed the Drift," or, in other words, before that "great catastrophe, caused in all probability by the upheaval of some of the greatest mountain-chains of the world," a catastrophe that, in his opinion, led to the distribution, mainly by water, of great sheets of gravel, clay, and sand, and the erratics connected with them; and which caused the extermination of the Mammoth and some of its contemporaries.* Sir Henry thus pictures a

* Geol. Mag. 1892, pp. 251, 405; and 1893, p. 26. See also 'The Mammoth and the Flood,' 1887.

Great Post-Glacial Flood, akin to that which for something like a century hindered the progress of geology. He believes (so he says) in the early Fathers and Grandfathers of Geology, and quotes many honoured names in support of his views "that the Drift, as we find it, was very largely distributed by water and not by ice."

It has been said that "by a judicious selection of facts you can prove anything:" but I would not venture to find fault with Sir Henry Howorth if he quoted facts only in support of his views. Surely his conclusions can gain but little strength from the *opinions* of the geologists of old, for it may fairly be questioned if any one of them would have been of the same opinion still had he lived to the present day.

Sir Henry treats the glacial deposits in far too comprehensive a way—as if there were one great torrential deposit of Boulder Clay, gravel, &c. The evidence that has been gathered in the east of England points to two, if not three, stages of glaciation, which directly affected larger and smaller areas. We recognise in Norfolk a general distinction in age between the Cromer Till and Contorted Drift (taken together), and the great sheet of Chalky Boulder Clay that spreads over the eastern and midland counties. The beds below the Chalky Boulder Clay are in many places markedly disturbed—conspicuously so in the case of the Contorted Drift; but any beds, be they Lias Clays (as in Northamptonshire), Chalk, Norwich Crag, or older glacial accumulations, locally tell of the action of ice by their frequently disturbed condition, where under this Chalky Boulder Clay.

Into this subject of the action of ice I do not intend further to enter, as I wish to refer more particularly to the age of the Mammoth.

It is hardly necessary in Norfolk to insist on the fact that everything beneath Boulder Clay is not pre-glacial in the strict sense of the term: yet many misconceptions have arisen on this matter.

Dr. Hicks has obtained remains of Mammoth and other Pleistocene Mammalia from beds older than Boulder Clay in the Vale of Clwyd; but the assemblage is not that of our Cromer Forest Bed, and the remains cannot be considered as pre-glacial.

The same may be said, and has been said, of the Pleistocene Mammalia of Holderness: they occur beneath Boulder Clay, but that Boulder Clay may be newer than our Chalky Boulder Clay; and, in any case, the fossil remains indicate an horizon newer than that of the Cromer Forest Bed.

In Norfolk we are in a position to test the question of the pre-glacial age of the Mammoth. I quote Mr. E. T. Newton. He says: "The only Pliocene horizon which has yielded specimens which could possibly be referred to *E. primigenius* is the Forest-bed, and the teeth which have been found do not supply such undoubted proof of the occurrence of this species as could be desired. Although some of them approach the *E. primigenius* type of tooth, none are precisely like any undoubted example of the species, and the utmost that can be said is that some of the Forest-bed specimens may be extreme forms of *E. primigenius*." *

All, therefore, that we are justified in saying is that forms approaching the Mammoth in character were developed in pre-glacial times; while we may safely conclude that the period indicated by the presence of abundant specimens of Mammoth of the ordinary or characteristic type, such as occur in the brickearths of the Thames Valley, is of later date than the Forest Bed of Cromer. We have no evidence of Mammoth even in that earliest Pleistocene Bed, the Arctic Freshwater Bed, that underlies the lowest drift on the Norfolk coast.

Mr. Gunn obtained a tooth of *Elephas primigenius* "from Drift marl at Witton, near Bacton," a deposit referred by Mr. Reid to the Contorted Drift, and by Mr. Gunn to the Upper or Chalky Boulder Clay. Mr. Gunn says the tooth "was found in a pocket or cavity of the bouldered chalk." † This is the specimen which, as Professor Boyd Dawkins states, is "striated and rubbed as if by glacial action." ‡

* 'The Vertebrata of the Pliocene Deposits of Britain,' 1891, p. 47.

† Gunn, 'Sketch of the Geology of Norfolk,' reprinted from the fourth edition of 'White's History, &c., of the County,' p. 19, 1883; Reid, 'Geology of Cromer,' p. 104; and 'Memorials of John Gunn,' p. 96, plate II. fig. K.

‡ Howorth, Geol. Mag. 1892, p. 397.

In the same neighbourhood beds of Valley Gravel rest irregularly on the Contorted Drift and older strata, and Mr. Reid notes that a jaw of *E. primigenius* was found at one point near the base of the gravel.* The only positive evidence of the occurrence of ordinary specimens of Mammoth along the Cromer coast is in beds newer than the Contorted Drift. Here at any rate we have evidence of remains of that animal (*in situ*) above portions of the Glacial Drift.

Near Norwich remains of Mammoth and Deer have been found in disturbed Chalk, where the surface-layers of that formation have been broken up, contorted, and intermingled with sand and gravel, to a depth, sometimes, of eight feet. This disturbed Chalk, in some localities, may be attributed to glacial action that took place during the accumulation of the Chalky Boulder Clay.†

It is possible that the Witton fossil may belong to the same stage. The account of its mode of occurrence is not quite clear. It may have been found in a "pipe" in the Contorted Drift; or it may have been introduced into that drift at a time when the large chalk-boulders were forced into it, and the violent contortions were produced—phenomena everywhere closely connected with the agent that produced the Chalky Boulder Clay. This view of the age of the contortions, enunciated by Mr. Reid, is supported by facts obtained in various parts of Norfolk. The evidence seems to favour the view that the Mammoth was in existence prior to the accumulation of the Chalky Boulder Clay. Definite confirmation of this is however desirable.

Professor Prestwich, in 1858, recorded the finding of portions of the tusk and tooth of an Elephant in gravel beneath the Chalky Boulder Clay at Bricket Wood, between Watford and St. Albans. Unfortunately the remains were not sufficient to determine the species;‡ and the same may be said of the Elephant-remains lately found by Dr. Hicks at Finchley. ||

* Horizontal Section (Geol. Survey, sheet 127); and Geol. Cromer, p. 118.

† H. B. W., 'Geology of Norwich' (Geol. Survey), p. 138.

‡ 'Geologist,' vol. i. p. 241.

|| Geol. Mag. 1893, pp. 90, 139.

The evidence obtained in the Thames Valley tends to show that the fossiliferous valley-deposits with remains of Mammoth and Rhinoceros, *Corbicula fluminalis*, &c., are somewhat older than the main mass of rough flint-gravels and associated stony brickearths. Dr. Hicks has obtained fine examples of Mammoth just above the London Clay, near Euston Square, in London: he believes that they belong to a period prior to the Chalky Boulder Clay of Finchley.* At present, however, there is no proof that this is the case.

Mr. Reid speaks of these fossiliferous beds as relics of lacustrine strata that may be compared with similar beds at Selsey, in Sussex. There freshwater beds, with Mammoth, Rhinoceros, &c., overlie a glacial deposit that he correlates with the Chalky Boulder Clay in time, though not in method, of formation.

These fossiliferous freshwater beds are covered in both Sussex and the Thames Valley by what he terms "frozen-soil gravels." They indicate a mild interglacial period, while "Afterwards an increase of cold caused a second glaciation of the area north of the Wash, whilst in non-glaciated areas rain falling on frozen soil led to the formation of extensive sheets of gravel."† These would include the beds of rough flint-gravel, &c., that overlie the Mammoth-bearing deposits in the Thames Valley.

We have evidence that the Chalky Boulder Clay preceded these "frozen-soil gravels" of the Thames Valley, for it has been exposed beneath them in a section at Hornchurch, in Essex, lately described by Mr. T. V. Holmes.‡ When this discovery was announced it seemed as if at last the positive evidence of the relations between the Thames Valley deposits and the Boulder Clay, that has been looked for in vain for the last forty years, had been found. If, however, the beds yielding Mammoth belong to a period antecedent to the main mass of valley gravel, then the above evidence is inconclusive as to the relative age of the Boulder Clay and the Mammoth-bearing deposits in the Thames Valley.

* Quart. Journ. Geol. Soc. vol. xlviii. p. 453.

† Quart. Journ. Geol. Soc. vol. xlviii. pp. 359–361.

‡ Quart. Journ. Geol. Soc. vol. xlviii. p. 365.

These discussions ought to interest Norfolk geologists for they can survey a considerable tract of Chalky Boulder Clay, and they should lose no opportunity of recording any facts that may bear on the question of the relation of the Mammoth to this great glacial accumulation. At present it may be said that none of the more striking discoveries of Mammoth have been made in deposits clearly beneath or clearly above any distinct mass of the Chalky Boulder Clay.

Observations may profitably be made from time to time in the brickyards at Rockland, to which I have elsewhere drawn attention. The brickearth is older than the Chalky Boulder Clay, and according to Dr. J. E. Taylor a humerus of Elephant (species not named) was found in it.*

The famous Lacustrine deposit, opened up in the brickfield at Hoxne, has yielded a number of Arctic plants, and these have been worked out by Messrs. C. Reid and H. N. Ridley. In the course of their observations they noted that the small traces of Chalky Boulder Clay that had been seen to overlie the Hoxne deposits, "proved to be merely the remains of some clay which had been brought to the pit at an early date—perhaps more than one hundred years ago—when the clay [brickearth] was first dug." They add that "Thus far what the writers have seen is strongly in favour of Professor Prestwich's contention, that the lacustrine deposits rest in a hollow in the Boulder Clay."† Remains of Elephant have been found in the Hoxne lacustrine deposit, but the species has not been determined. Further observations are wanted on this locality, for, as Mr. Reid informs me, the relative ages of the layers yielding the Plants, the Palæolithic Implements, and the Bones, are not clearly established.

A somewhat similar plant-bearing deposit, which likewise occupied a hollow in the Boulder Clay, was afterwards found at Saint Cross, near South Elmham, and this was described by Mr. Charles Candler.‡ While the assemblage of plants did not

* 'Geology of Norwich,' pp. 110—112.

† Geol. Mag. 1888, p. 442.

‡ Quart. Journ. Geol. Soc. vol. xlv. p. 504.

yield the Arctic forms found at Hoxne, yet, as Mr. Reid has remarked, there was no reason to conclude that the freshwater beds at the two localities were distinct in age.

My colleague, Mr. F. J. Bennett, has described a section at the brickyard west of the church at Rickinghall Superior, south-west of Botesdale; and there beneath Boulder Clay, and sand with layers of grey clay, he found dark blue laminated sandy clay, with freshwater shells and plant-remains.* This locality might repay investigation; but sufficient has been said to show that much interest attaches to the fossiliferous beds that overlie and underlie our main mass of Boulder Clay.

A good deal of attention has been given during the past fifteen years to the source of the various crystalline rocks that occur in our Drift deposits. Quite recently Herr Victor Madsen, of the Danish Geological Survey, has recognised boulders in the Cromer Till that he regards as certainly of Scandinavian origin.† This view is in accordance with that of previous observers. It is to be hoped that some space may be given in the new Museum to the exhibition of our Norfolk erratic rocks.

In a large county like Norfolk there must every year be many fresh sections to record. The student need not hesitate to note new facts, even if they present no new features. Had it not been for the observations of Caleb Rose on the brickearth of the Nar Valley, we should now know very little of that deposit. I say this on the authority of my colleague, Mr. Whitaker, who was engaged on the Geological Survey of that region. In preparing the geological map he had only a few ditch-sections to rely upon in his examination of the Nar Valley brickearth; but fortunately he had the careful records of sections in brickyards now closed, that were made nearly sixty years ago by Rose. In the Survey Memoir (now in the press) he acknowledges the great help thus afforded by that excellent observer.

So in other parts of the county, deep foundations, new pits and quarries, well-sinkings and borings, may afford a large amount of

* Geology of Diss, Eye, &c. (Geol. Survey), p. 12.

† Quart. Journ. Geol. Soc. vol. xlix. p. 114.

information, that may not always at the moment seem important, but the record of which, sooner or later, may become of great service.

During a brief visit to Norfolk last autumn I was grieved to find that the famous pit at Coltishall was closed and obscured; but the Chalk and Crag are being energetically worked near by in the parish of Great Hautbois, and the pit is one that should be visited from time to time. No portion of the Crag appeared to be shelly, but any day a seam of fossils may be encountered. This is one of the tracts where remains of Mastodon were entombed—Horstead is not so far away,—and other remains of this animal may be expected. Of especial interest is it to note the state of preservation of any bones and teeth, for it has been doubted whether the Mastodon lived during the period of the Norwich Crag. It is also of importance to determine whether, if it lived, as I believe, during this period, it was the companion, friendly or otherwise, of the *Elephas meridionalis*. Although it has been found in the Red Crag, there is no certain record of the occurrence of this species of Elephant in the Norwich Crag, but *Elephas antiquus* has been found in it.* On a casual visit to the Thorpe pit I obtained remains of an Antelope not previously recorded, and Dr. Herbert King has likewise found examples of the same animal. Such discoveries are generally accidental; but the knowledge that they may be made serves to stimulate enthusiasm in any expedition that may be made to our Norfolk Crag-pits.

Here I may mention that only last week Mr. R. J. W. Purdy, of Aylsham, communicated to me his discovery of *Tellina balthica* and other fossils in the Crag at Aylsham. Hitherto this newest stage of the Norwich Crag Series has not been recognised in its fossiliferous form at that locality. During the coming session I trust that Mr. Purdy will give us full particulars of his discovery.

The literature of the Norfolk Broads has been somewhat voluminous during the past fifteen years. Two aspects of the subject have lately come before us—the one political, the other purely scientific. In an article printed in 'Natural Science'†

* Newton, 'Vertebrata of the Pliocene Deposits of Britain,' pp. 46, 47.

† July, 1892, p. 347.

Mr. J. W. Gregory has discussed the origin of the Broads. While agreeing with certain general explanations of the physical changes, that had previously been given,* he points out that the Broads of Wroxham, Hoveton, Salhouse, and Woodbastwick are most likely but remnants of one very large broad; and he proceeds to show how this big broad might be cut up by the river. At first the river would drop its sediment on its entrance into the expanse of water, on account of the diminution of its velocity and carrying power. In process of time this sediment would be extended further and further across the broad, and when the water was low the river would cut its own channel through the accumulations it brought. Vegetation would grow upon the banks of the river and aid in the ultimate isolation of different portions of the great broad. This idea is, I believe, a new one. At the same time it is quite possible that those broads which lie away from the direct course of the river may be simply the deeper hollows that were excavated by estuarine action before the mouths of the rivers were barred.

The other point of interest, in reference to the broads, is the decision made public on July 7th, by Mr. Justice Romer in the case of Micklethwaite *v.* Vincent—a decision which embodies much valuable and interesting information, and one which, I trust, will be regarded with satisfaction by naturalists.†

The plaintiffs' claim was for an injunction to restrain the defendant from shooting or fishing on that part of the broad which is in the parish of Hickling, and from boating over it except in a certain channel. It was decided that the plaintiffs had established their claim to that part of the broad in question, and that the defendant, as one of the public, had no right to shoot and fish in it. It was, however, admitted that there is a public right of way over the broad, and that that right of way could not be restricted to any particular channel.

There is no doubt that the broads furnish one of the pleasantest areas for recreation in this country, and it would be a national

* Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 439.

† 'Eastern Daily Press,' July 8th.

calamity if the public were to be denied the right of cruising uninterruptedly over all the natural waterways in East Norfolk. From a purely scientific point of view it does seem sad that the serenity of the scenes should be broken by steam-launches, and by vessels laden with boisterous, and too often, destructive and untidy holiday-makers; but the benefit to the many, who are well-conducted, must surely be allowed to outweigh the evil that arises in all communities from that "remnant of savagery" which still exists. Hence I think the very laudable desires of the naturalist cannot be justly urged against the claims for rest and recreation that are needed by the majority.

It was urged that the waters of Hickling Broad were influenced by the tides; but the evidence showed that the rise and fall were limited to about three inches at Potter Heigham Bridge, and that the tide practically ceased to be felt at, or about, Kendal Dyke. It was pointed out that certain fluctuations in the water-levels in this area were due to the wind, the rainfall, and to the numerous pumping-mills; moreover, in Meadow Dyke and Horsey Mere, as stated by Mr. F. Sutton, numerous salt-springs exert some influence on the water-level, and give a brackish character to Hickling Broad. These springs may, it was thought, have an underground connection with the sea.

In Norfolk, no doubt, the most important topic is that of Agriculture. Geology, as I have already noted, might render some service to the industry if it indicated the presence of important phosphatic deposits; but farmers themselves might aid the discovery, if those who cultivate areas of bare Chalk drew attention to any tracts of exceptional fertility. Geology and geological maps otherwise can have but a general bearing on Agriculture. The information they give may be valuable so far as the subsoil and means of drainage are concerned, but no maps yet constructed for public use have been on a scale large enough to show the nature and extent of the soils. Soils are liable to vary in each field, and on the same geological formation. This variability shows that no general statements regarding soils are of much importance, while chemical analyses can have but a local value.

More attention might be given to the minute petrology of soils, such as the microscopic study of their constituents. It would be interesting to ascertain how far they are due, in particular cases, to the immediate weathering of the sub-strata, and to adventitious matter brought by the wind, as suggested by Mr. C. Reid.*

Attention has lately been directed to the micro-organisms or bacteria of the soil. Some of these oxidise constituents of the soil; others reduce or destroy the same; while a third group of organisms enrich the soil in nitrogen.†

Subjects of this kind are deserving of special investigation; but in Norfolk, at present, we have no institution that would adequately aid those desirous of furthering knowledge.

This leads me on to some final remarks on a topic that has, I believe, already commended itself to the hearts, if not to the pockets, of all Norfolk naturalists—I should hope to all residents in East Anglia—the possibility of establishing a University College in Norwich.

There are in the British Isles about twenty-one provincial colleges of science and art or technical colleges; but, without overlooking the classes for technical instruction that have been established both in this city and at Ipswich, it may be said that at present there is no properly equipped university or technical college in the whole of East Anglia. It is not only in the larger manufacturing centres that such colleges have been established, but a town like Huddersfield, with a population less than that of Norwich, has its technical college; while university colleges have been established at Aberystwith and Bangor, and there is the Hartley Institution at Southampton.

In these days no question can arise as to the desirability of having in Norwich an educational institution where science, art, and literature could be taught; and especially if prominence were given to the teaching of subjects of special practical importance in

* Geol. Mag. 1884, p. 165.

† Address by Professor Alfred Springer (American Association), 'Nature,' Oct. 13th, 1892, p. 576.

the district. Medical schools also are attached to many of the colleges. Thus the Medical School of Queen's College, Birmingham, was last year amalgamated with the Mason College.

The lesson is more and more forcibly taught every year, that progress can only be made, that present positions can only be maintained, by keeping ourselves instructed; and I would add that, not only is the highest standard of knowledge required, but an equally high standard of duty.

Nottingham has large technical schools in connection with its University College. The whole, including museum and library, cost about £83,000; and of this amount "no less than £65,000 has been provided out of the municipal funds, the rest being given by private donors." The cost of maintenance, apart from fees, amounts to about £6000 a year, and towards this the Government contributes £1400 a year from the Consolidated Fund, and the town contributes its share of the beer and spirit dues, and the profits arising from the sale of gas and water.* The Hartley Institution, which has 500 or 600 students, derives about £800 a year from the beer and spirit dues; but this is a source of income that may be liable to great fluctuation. No government aid is granted, as the institution has not attained the dignity of a university college.

In founding the University College at Bristol it was estimated that a capital sum of £25,000, and an annual subscription of £3000 (secured for the first five years) would be requisite. A public meeting was held in 1874, and the college was established two years later.

A college such as might be worthy of Norfolk would (I am told) cost not less than £4000 a year for maintenance; and nothing ought to be attempted until an endowment of at least £2000 a year is ensured, irrespective of government aid. Students' fees might amount to £1000 or £2000 a year.†

* Article in 'Star' newspaper, 13th January, 1893.

† I am indebted to Professor Lloyd Morgan, Principal of the Bristol University College, for some of the above particulars and suggestions.

With regard to a building-fund, that is, perhaps, the main difficulty; but universities and colleges, like other establishments, have grown and developed from comparatively small beginnings.

Norwich has its library, and as soon as its rich collections are arranged in the Castle Buildings, it will possess one of the finest of provincial museums. It has also all the materials for a medical school, and its hospital education is accepted; while, if we may judge by the biographical records of the county, there must be plenty of young men and maidens ready to do honour to any teaching establishment.

Have not Norfolk and Suffolk produced some of the most eminent of British naturalists? to say nothing of other celebrities. Indeed, we learn from an article "On the Geographical Distribution of British Intellect," published by Dr. Conan Doyle,* that in proportion to their population the agricultural districts have proved to be richer in distinguished individuals than the mining and manufacturing districts. Dr. Doyle found that Hampshire could boast a larger number of celebrities than any other county, Suffolk came next, and then followed in equal position Norfolk, Gloucestershire, and Devonshire.

There is no doubt, as he remarks, that towns have a higher intellectual activity than rural places, for the wise men seem to leave their native homes and develop elsewhere in places where higher education can be gained. I must not venture to say more on this subject, for I have already occupied too much of your time.

In conclusion I may remind you, and at the same time congratulate you, that we have now completed our twenty-fourth year, and that for the ensuing session, which will mark a quarter of a century of our existence, we have in our new President the great advantage not only of one who resides in this city, of an original member of this Society, and of one who has served as Secretary; but we have also an old President in the new President, and one of the most distinguished of Norfolk naturalists.

* 'Nineteenth Century,' August, 1888, p. 184.

I.

ON THE OCCURRENCE IN NORFOLK OF THE SIBERIAN PECTORAL SANDPIPER

(*TRINGA ACUMINATA*, HORSFIELD).

By Thomas Southwell, F.Z.S., *Vice-President.*

Read 27th September, 1892.

It is little more than two years since I had the pleasure of exhibiting in this room a beautiful specimen of the Caspian Plover, and now, through the vigilance of Mr. Lowne of Yarmouth, I am enabled to record the addition of yet another rare Asiatic straggler to the already long list of Breydon rarities. On the morning of the 30th of August Mr. Lowne called upon me with a small, freshly killed wader, which he said puzzled him, asking me if I could name it for him. Not having any special general work on this class of birds at hand I sent it on to Mr. Gurney, who in returning it stated his belief that it was an example of Horsfield's *Tringa acuminata* (*S. australis* of Gould), with which opinion, aided by the description in Mr. Seebohm's 'Geographical Distribution of the Charadriidæ,' the figures in Gould's 'Birds of Australia' (vol. vi. plate 30), and after the examination of two specimens, marked Australia and N. S. Wales respectively, in the Norwich Museum, I fully concurred, and this determination of the species was subsequently confirmed by Professor Newton. The bird was exhibited at a meeting of the Zoological Society on the 15th November, 1892.* This species, which closely resembles *T. maculata*, from which it chiefly differs in having all the under parts spotted, and which was originally described by Horsfield from

* P.Z.S. 1892, p. 581.

a specimen procured in Java, is known to be a regular winter bird in Australia, breeding in Eastern Siberia, where it occurs plentifully; in Alaska it is met with in autumn. Mr. Seebohm gives its distribution as follows: he says examples have been obtained "in the middle of June in the valley of the Argun River, it has been observed on Bering's Island during the autumn migration. It passes along the coasts of Japan and China, and has been frequently obtained on many of the islands of the Malay Archipelago from Java to New Guinea. It winters in Australia and New Zealand." I cannot find that it has previously been recognised in Europe. The occurrence of this species in England is certainly of considerable interest; and Mr. Thomas Ground, of Moseley, near Birmingham, who was fortunate enough to shoot it, has favoured me with the following particulars of his meeting with it: "I only saw the bird just as it alighted, and it did so in perfect silence; it then remained quite still as if examining the ground, the other birds all took a short run. I fired on the instant, and it fell dead. The Ring-plover also fell to my friend's shot at the same moment. The precise locality was on the Breydon mud-flats on the end nearest Yarmouth, on one of the flats which are left dry, or nearly so, at high tide. The date was the 29th August. The tide had been running out about an hour. Had I recognised the bird as a stranger I should have taken care to have given it an opportunity of displaying itself." Mr. Ground's bird proved to be a female by dissection, probably fully adult; the legs, when fresh, were olive-green; the inside of the mouth flesh-coloured. The following comparative measurements of three of these birds—No. 1 from "Australia," No. 2 from New South Wales, and No. 3 the recently killed Breydon specimen—will show that individuals of this species, like the Pectoral Sandpiper, differ considerably in size.

	No. 1.	No. 2.	No. 3.
Bill along the culmen ...	25 m.m.	22 m.m.	24 m.m.
Wing—from flexure to end of first quill (the longest)	135 m.m.	137 m.m.	129 m.m.
Tarsus	32 m.m.	30 m.m.	28 m.m.
Middle toe and claw ...	30 m.m.	28 m.m.	28 m.m.

On comparing the principal measurements of the above three specimens of this bird with the average of twelve examples of

T. maculata (see *ante* p. 203) I find the wing from the flexure to the end of the first quill feather is much shorter (133·6 m.m. against 138·58 m.m.); the bill also is much shorter (23·6 against 27·83 m.m.); on the other hand the tarsus is longer (30 against 28·6 m.m. in *T. maculata*), as is the middle toe and claw (28·6 against 27 m.m.).

It is a remarkable circumstance that this bird should have been killed in the same locality as the first British example of its New World ally, the Pectoral Sandpiper, which was met with on the 17th October, 1830; and it is equally curious that whereas many rare Continental wanderers have been procured at Blakeney and other parts of the Norfolk coast, the rare waders from the Trans-Caspian and Northern America have in almost every case been first obtained at or near Yarmouth.

The close similarity between these two species (or races) of *Tringa* led me to re-examine all the Norfolk-killed specimens of *T. maculata*, in order to ascertain whether they were correctly named. This I found to be the case with six of the eight examples; the two remaining are one in the possession of Mr. Chase, of Birmingham, which he informs Mr. Gurney is certainly *T. maculata;* and of Hoy's bird already mentioned as killed in 1830, of which there is a photograph in Babington's 'Birds of Suffolk.' This also appears to be correctly named; but on referring to the specimen mentioned by Mr. Stevenson ('Birds of Norfolk,' vol. ii. p. 367) now in the Norwich Museum, it proves to be an undoubted example of the Siberian form. The history of this bird is as follows: In the winter of 1848—9, the late Mr. Gurney purchased of a man named Wilmot, for the sum of £5, a Sandpiper which he stated he had killed at Yarmouth in the last week of September, 1848; this transaction Mr. Reeve, the curator of the Norwich Museum, perfectly recollects, and he informs me that the bird was set up by Mr. Gurney's birdstuffer, Knights. The occurrence is recorded under the heading of "Pectoral Sandpiper (*Tringa pectoralis*)" in 'The Zoologist,' 1849, p. 2392, the communication being dated "Feb. 2, 1849." Subsequently the same man brought to Mr. Gurney two freshly killed specimens of the Red-winged Starling, which, upon inquiry, proved to be of very doubtful origin; and Mr. Gurney was fully convinced that an attempt was being made to deceive him. He therefore, finding the man to be

unworthy of trust, sent a second note to 'The Zoologist,' dated August 14th of the same year, and which will be found at page 2568 of that magazine, referring to his previous communication, and concluding with the following remark: "I fear that I was imposed upon with respect to this specimen, and that it is in reality a foreign one." On the 30th March, 1850, Mr. Gurney gave this bird (with others) to the Norwich Museum, instructing Mr. Reeve to place it in the British collection, but without any locality. Everybody who knew Mr. Gurney will be perfectly aware of the extreme caution he exercised in matters of this kind, and will not be surprised at his at once rejecting the bird in question; but I should like to be allowed to state some reasons which have led me to think that in this instance he acted precipitately. (1) *Tringa acuminata*, although described and named by Horsfield in 1820, could not have been a very well-known species to British ornithologists in 1848, and even the Pectoral Sandpiper would have been a most unlikely species for this man to have obtained otherwise than by its accidentally falling to his gun; how much more unlikely, therefore, would it be for him to obtain in any other way an example of the Siberian form. The Red-winged Starling (*Agelæus phœniceus*), on the contrary, a species frequently imported alive into this country, is by no means an unlikely bird to have been selected for a dishonest purpose, and the circumstance of an example of this bird having actually been obtained in Norfolk in June, 1843, may have suggested the deception. (2) The time of year, also, is in favour of the bird being genuine, for all the Norfolk-killed Pectoral Sandpipers which have since been obtained have occurred (with a single exception) in September or October; the bird in question, an adult in autumn plumage, is therefore appropriate to the season. (3) It seems not improbable that the large sum obtained, honestly it may be, by this man for the Sandpiper, may have tempted him to fraud on a subsequent occasion. (4) Mr. Roberts, who has had great experience in mounting birds from skins, and who recently restuffed this bird, tells me that he has no hesitation in saying that it was originally set up from the flesh, and that it was badly shot in the neck and leg. After carefully weighing the evidence *pro* and *con*, I am of opinion that Mr. Gurney, annoyed at the attempted imposition with regard to the Red-winged Starling, too hastily

rejected a genuine Norfolk-killed specimen of what proved to be the Siberian form of the Pectoral Sandpiper. With this opinion Mr. Reeve, who is in a better position to appreciate the circumstances of the case than any other person now living, entirely concurs. It seems highly probable therefore, if not an absolute certainty, that *Tringa acuminata* has been obtained twice in the county of Norfolk, and that the Norwich Museum possesses the earliest example. This bird was exhibited with the recently killed specimen at the meeting of the Zoological Society of London, on the 15th November, 1892.

II.

A FURTHER NOTE UPON TORTOISES.

By Sir Peter Eade, M.D.

Read 29th November, 1892.

In the year 1886 I read before this Society a paper in which I recorded some of the observed habits and peculiarities of a pair of Tortoises which I had then kept in my garden for three and four years respectively. This paper was afterwards published in our Society's 'Transactions' (vol. iv. p. 316), and will probably be remembered by some of our members.

I would like this evening to say a few further words upon these creatures, which are still living, and in my possession,—more particularly with reference to their *rate of growth and increase.*

The two Tortoises have now been in my possession ten and nine years respectively. Six years ago I reported to this Society that *they measured*, the one 7½ and the other 7 inches *in length*. Now at the end of six further years their antero-posterior measurements are 9½ and 9 inches respectively—the measurements being made from before backwards over the convex surface of the carapace. They have therefore, each of them, thus measured, increased exactly 2 inches in length in the last six years, or at the rate of exactly one-third of an inch per year.

(The under flat surface of the shell now measures $6\frac{1}{2}$ and $6\frac{1}{4}$ inches from before backwards. These Tortoises are said not usually to exceed 10 inches in entire length).

Then as to their *weight*. I have now kept an exact record of their respective weights in the spring and autumn of each of the past seven years, *i.e.*, their weight on commencing to hybernate in October or November, and again their weight on returning afresh to light and more active existence in April or May of the following spring. And it is interesting to notice how almost continuously they have increased both in size and weight; and also how corresponding are the alterations, or otherwise, in the consecutive years, both of spring and autumn, of the two animals.

In my former paper, I mentioned that during the summer months of 1886, when I first weighed them, *i.e.*, from May to September, my Tortoises had gained in weight, the one $2\frac{1}{2}$ ounces, and the other $1\frac{1}{2}$ ounces; whilst each of them became lighter in the following winter by $2\frac{1}{2}$ ounces. Since that time the spring and autumn weighings have been regularly continued, and the result is shown in the following table.

WEIGHT

	Of Larger Tortoise.				Of Smaller Tortoise.			
	April.		October.		April.		October.	
Year	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
1886	2	$7\frac{1}{2}$	2	10	2	$3\frac{1}{2}$	2	5
1887	2	$7\frac{1}{2}$	2	10	2	$2\frac{1}{2}$	2	5
1888	2	10	2	$13\frac{1}{2}$	2	5	2	$8\frac{1}{4}$
1889	2	13	2	14	2	8	2	$8\frac{1}{2}$
1890	2	$12\frac{1}{2}$	3	$0\frac{1}{2}$	2	$7\frac{1}{2}$	2	12
1891	2	$15\frac{1}{2}$	3	2	2	10	2	$12\frac{1}{2}$
1892	3	1	3	$3\frac{1}{2}$	2	12	2	$14\frac{1}{2}$

In the seven years, therefore, 1886 to 1892, the larger Tortoise has increased in weight from 2 lb. 10 oz. to 3 lb. $3\frac{1}{2}$ oz.; and the smaller Tortoise from 2 lb. 5 oz. to 2 lb. $14\frac{1}{2}$ oz., giving a total increase of weight in this period of exactly $9\frac{1}{2}$ ounces for each animal, or an average annual increase of about 1 ounce and $5\frac{1}{2}$ drachms (avoirdupois).

The general result also of the above weighings is to show, that in average seasons in England, these creatures gain from 2 to $2\frac{1}{2}$

ounces in each summer, and lose again a varying, but considerable portion of this increase during the ensuing six or seven months of hybernation; but, on the whole, showing an average gain of a little more than one ounce in the year,—the average gain of weight per month in summer working out at about 6 or 7 drachms, with an average loss in the winter months of about 4 or 5 drachms per month. This last fact scarcely agrees with Cuvier's statement that "during winter . . . their loss of substance amounts almost to nothing."

It will be noted that the foregoing table shows certain variations in the increases and decreases of weight in the several years; also that in two of the years there was but little change between the autumn and spring weights,—this period of stagnation occurring in both of the animals simultaneously. Probably several causes for this were at work, but I have little doubt that the variability of our English seasons is by far the largest factor in the case; and that the variations in the gainings and losings of the different summers and winters depend very largely upon the special character of these seasons. Thus, when the summer months are hot the Tortoises eat much more abundantly and constantly, and consequently put on (or rather put inside their skeletons) much more flesh than in colder seasons. On the contrary, a warm autumn, with a temperature not sufficiently cold to make them go early and thoroughly to sleep, must conduce to greater loss, or rather waste, of their flesh, for it is well known that these animals cease to eat many weeks before they finally retire to rest for the winter; and necessarily during this period, especially on sunny days in which (even at this season) they are often moderately lively and active, they are doubtless breathing and consuming some of the material which has been stored up for winter consumption. Whilst again, in a very mild winter or spring they will, as is well known, frequently wake up from their dormancy, and of course, on each such occasion will make further inroads upon their reservoir of nutrient material.

It is therefore pretty certain that hot summers and cold winters are most conducive to their rapid increase in size and weight; whilst of course the contrary conditions would have an exactly opposite result.

Cetti says that the common Greek Tortoise seldom weighs

above 3 lb. My larger one now weighs 3 lb. 3½ oz., and is still growing. But there is a Tortoise now in this city which weighs as much as 6 lb. 5 oz. I judge, however, from its size and form, that it may be a variety of the common Tortoise. This creature must be not only an "old inhabitant of this city," but thoroughly naturalised into a British subject, as it is known to have lived in Norwich for at least thirty years.

I have little to add to what I previously said (and to what *White* has said) as to Tortoise habits and manners. These appear to be very uniform, and to be guided by a most definite instinct; and it is very noticeable and very remarkable how the two Tortoises will constantly both do the very same thing at the very same time, often almost at the same moment of time. For example, when feeding, even when apart from each other, they will constantly suddenly leave off eating almost at the same instant; or they will in like manner when basking in the sun, both at once get up and walk off to some other place; or they will both all at once suddenly get up and march off to their evening place of shelter and rest,—and this without any definite atmospheric or other cause that is appreciable.

Cuvier has well called the Tortoise "*un animal retourné*," an animal inverted, or "turned inside out, or rather outside in." And it is said that the large Land Tortoise, when withdrawn into its shell, "can defy the whole animal world except man, from whom nothing is safe." And with reference to this point I have observed that our Tortoises when retiring to rest always take the greatest care to protect their noses and the anterior opening of their shells. When they burrow their head is of course covered up by the earth. But when, as is often the case in the warmer weather, they simply go to sleep in some sheltered place, they habitually place their heads close against the wall, or under the projecting roots of a tree or shrub, so as not to leave this part exposed. I presume, therefore, that they are conscious of some insecurity, and it would certainly appear that their heads would otherwise be open to the attack of rats or other predaceous animals.

Professor Forbes describes the peculiar way in which he has in Greece observed the Tortoises to do their courting, *i.e.*, the method by which the male Tortoise seeks to attract the attention of his lady-love, namely, by repeatedly knocking his shell violently

against hers. I have noticed the same process in my own garden. Both my animals are, I believe, males. But I have observed one of them, when in an amorous humour, to strike the other several times in succession a sounding blow on its shell; and this he does by suddenly withdrawing his head into his shell, so as to be out of harm's way, and then as suddenly throwing his body forward by a sort of butting process against the shell of his fellow. This proceeding causes a very considerable, and indeed, comparatively speaking, quite a loud and resounding noise; and at first sight these sudden and severe blows would appear to be more calculated to cause corporeal discomfort or injury than to excite affection. These very marked attentions are usually followed by the utterance of a quick and soft, or almost whining cry.

I will only add that my Tortoises show an increasing familiarity and sense of being at home as years roll on.

III.

AN IMMIGRATION OF THE LAPLAND BUNTING

(*CALCARIUS LAPPONICUS*, LINN.)

By J. H. Gurney, F.L.S., F.Z.S., V.-P.

Read 29th November, 1892.

(*With subsequent additions.*)

Norfolk is remarkable among the counties of England, not only for the rarity of its feathered visitants, but for the numbers of them which occasionally come to us. One year it is a plethora of Red-necked Grebes, another year it is Waxwings, and another Glaucous Gulls; in 1884 we had eighty Bluethroats; in 1879 a hundred and fifty Pomatorhine Skuas; in 1870 sixty Little Gulls visited our shores never to return again. In 1863 the number of Sand Grouse in Norfolk exceeded any other district of like size in Europe ('Ibis,' 1864, p. 201). It is now the Lapland Buntings

whose visitation I have to bring under the Society's notice. They came from the same quarter as the Bluethroats and Shorelarks, which, like many other insessorial species, seem to be extending their range westwards; yet it is a fact that there are ten observers now where there was but one a quarter of a century ago, and we must not forget what this means. In France, comparatively speaking, no rare birds are seen, because there are no ornithological observers: the country is as well suited for rare birds as England is, and the common idea that they are all eaten is quite an insufficient explanation of the absence of common ones. But to return to the Lapland Buntings.

An examination of the comparative list given in our 'Transactions' (vol. iv. p. 55), will show all the great avian migrations to Norfolk between 1867 and 1883, and also that in most instances, as in the case of the Lapland Buntings in 1892, the wanderers have not stopped at Heligoland on their way to Norfolk. The Lapland Bunting is at no time very common there (*cf.* 'Ibis' 1892, p. 16), and it will be seen that it is only mentioned in my list once, viz., in 1873 (*l.c.* p. 56). In Norfolk, prior to 1892, the Lapland Bunting had not occurred more than about eight times, the last one being duly noted in our 'Transactions' by Mr. Southwell (vol. v. p. 202).

The first intimation of their presence in the year 1892 was in September. On the 22nd of that month a Lapland Bunting was taken at Saxmundham, in Suffolk, and on the 23rd one was shot at Yarmouth. These were the forerunners of the flocks which settled at Cley and Yarmouth in the following month. It cannot be said that these wind-driven migrants came to Norfolk with the intention of wintering here, but being here I think they would have stayed if unmolested, as Shorelarks sometimes do. Any such good intentions on their part were speedily frustrated, for no sooner did their presence become known than bird-catchers and bird-shooters were on the alert; fifty-six, if not more, were taken at Yarmouth, I am sorry to say, all of them on the strip of sand denes between that place and Caister. Some were shot, but more were caught in clap-nets. I saw fifteen on sale in one cage. In common with other ornithologists I regret so many Lapland Buntings have been netted and shot; but when there are rare birds people will go after them, and as the species is

common in Lapland and "extremely abundant" in Siberia, we may expect that their invasion will be repeated: in that case let us hope they will not be so persecuted.

The sexes appeared to be evenly distributed, males preponderating a little. The female is decidedly a smaller bird than the male, as is the case with the Snow Bunting. With regard to the plumage, Dr. Power says that only one of the Cley birds had any attempt at dark cheeks and breast; but in this respect five or six Yarmouth males were nicely marked, particularly one of Mr. Connop's obtained on November the 11th and one got on October the 30th. But a good many were like Dresser's second plate, 'Birds of Europe' (vol. iv. pl. 225), or the plate in the 'Linnæan Society's Transactions' (vol. xv. p. 156), which represents winter plumage. Mr. Otty's four now exhibited are in this dress.

In Saunders' 'Manual of British Birds' forty Lapland Buntings are set down for the whole of England. Six or seven of them, he says, were obtained near London, which one would not have expected. But forty is a number now trebled; we will see what there is to account for this vastly increased migration, not spread over several years, but condensed into three months.

The visitors were first noticed in Norfolk by that acute observer, Dr. G. E. Power, at Cley. On October 13th he saw a Snow Bunting and shot a Lapland Bunting, a single bird flying with Linnets by the watch-house. It rose from a little bush at the commencement of the "marrams"; but afterwards, when the Lapland Buntings became commoner, they also became shyer, and took to the stubble-fields. The largest number seen by Dr. Power in one flock was eighteen, and probably they all came together, as they could not have been long over. The wind was north-east on October the 12th, with half a gale, and Dr. Power saw flocks of Skylarks coming over the sea. On the 13th it was north-east, and on the 14th he notes a gale from the south-east with rain, "Gold-crests along the sea-wall." On the 15th (I quote from his journal) "wind light, N.W., but hard from the N.E. at night." "Starlings in thousands," "Robins in hundreds," and one very immature Bluethroat. From the 12th to the 29th Dr. Power's memoranda record a succession of high winds from north-west, south-west, and north-east, with much rain.

To the north-east winds we probably owe the Lapland Buntings,

and especially to the easterly gale on the 14th of October. What effect that had in Yorkshire in bringing quantities of Goldcrests, Robins, and other birds, will be seen by reading Mr. Cordeaux's article in the 'Zoologist' (1892, p. 417). It was the most remarkable rush of migratory birds "ever witnessed" by him in his long experience. On that day the wind at Cley veered round to south-east, and probably this stemmed the migratory movement, and is the reason why the Lapland Buntings did not go on to Thorpe Mere and other places in Suffolk and Essex.

Our honorary member, the veteran Herr Gätke, observed the passage in Heligoland. "Early in the morning of the 13th and 14th of October," he writes, "great numbers of birds were passing from east to west, but did not stay here." No Lapland Buntings were obtained on the island of Heligoland, but some Cole Tits turned up almost daily, from which he "judged that an unusual move from the east was going on," but the weather being unfavourable all passed on high overhead, and England reaped the harvest (Gätke *in lit.*). Gätke does not give the direction of the wind, but from the Meteorological Office I learn that it was east at the mouth of the Elbe on the 14th. On that day it was north at the Naze and Bergen, and north-north-east on the 13th. How long the Lapland Buntings would have stayed in Norfolk if they had been allowed to stay no one can say now; though not much molested at Cley, after October Mr. Pashley tells me they were still about, but happily there were no bird-catchers to meddle with them as at Yarmouth. Mr. Smith reports one taken at Yarmouth as late as January 2nd, and some were shot at Cley on the 5th and 6th of that month, though I did not see them, but heard of them from a reliable source.

They were first noticed in Northumberland by Mr. George Bolam on January 2nd, 1893, on a low-lying stubble-field near the sea, on the mainland opposite Holy Island, twelve miles south of Berwick. I am far from thinking that they had only then arrived, more probably they came in October and November, and remained there unnoticed, until Mr. Bolam chanced to come across them. "The ground," writes Mr. Bolam, "was there partially covered with about an inch of snow, and the frost was very severe, but a very rough stubble enabled the birds to reach the ground, where lay much damaged grain, and they were feeding in scattered

companies over the entire field of fifty acres. The Buntings were then so mixed up with the hundreds of Larks feeding upon the field, as well as a few Snow Buntings, and a few Linnets, &c., that it was most difficult to come on terms with them, and it was not until I had been in the field for four hours that I was able to obtain a single specimen. There were at that time certainly not less than fifty Lapland Buntings in the field, and possibly may have been twice as many. On the 5th of January, when I returned to the same place, there had been an additional fall of some two inches more snow, and there being then only one or two bare patches, where Rooks and other large birds had reached the heaps of 'rakings,' &c., the small birds in the field were all congregated to these spots. There was also upon this occasion not a hundredth part of the number of Larks which were present on the 2nd, and it was therefore with ease that specimens of the Laplanders were obtained, and their habits and movements watched." Examples procured by Mr. Bolam "had been eating the barley from the stubble," they "also appeared to be pecking for seeds at bunches of knot grass."

I am much indebted to Mr. Bolam for the narrative from which he has permitted me to quote, and further for the information that a single Lapland Bunting was netted in South Northumberland; another was "telegraphed" on Holy Island (T. Thompson, 'Field,' March 11, 1893).

One might have expected the Lapland Buntings to have touched at many other places on the east coast, but none were seen at Spurn Point, nor any at Orfordness in Suffolk, or Thorpe Mere, where Mr. M. Ogilvie was looking out for them. Two were got at Flamborough ('Naturalist,' 1893, p. 57); and I heard from Mr. Harvie-Brown of one in Shetland. Mr. Macpherson reported two at Dover, and Mr. Pratt says a good many passed Brighton ('Zoologist,' 1893, p. 108), where they have been known to the bird-catchers for many years. I have to thank Mr. Pratt and Mr. Swaysland (who had twenty) for answering my queries, and also Mr. Cordeaux for informing me (just as this is going to the press) that on May 11th he saw an adult male at Bempton Cliffs, in Yorkshire.

With the Laplanders there came to Norfolk a larger number of Snow Buntings than usual. Mr. Patterson called them "wonder-

fully numerous" at Yarmouth; one bird-catcher informed him that he took 13½ dozen in the week ending November 5th, but this may have included a few Laplanders. He considers that Lapland Buntings get tame sooner than Snow Buntings, and that their notes are rather more silvery. In captivity their habits seem no more terrestrial than Snow Buntings, both appearing to perch with freedom and by preference, and at night they roost on the perches in their cage. As spring drew on the tints of the males in my aviary were observed to deepen, and they even showed a disposition to nest, by carrying about bents of hay, and on the removal of a canary from the cage one of them generally favoured us with a soft, musical, well sustained song at breakfast-time. I placed one pair in a breeding-cage, and hung them near a canary which was sitting, but the good example was lost on them.

IV.

OCCURRENCE OF SOWERBY'S WHALE (*MESOPLODON BIDENS*) ON THE NORFOLK COAST.

By Thomas Southwell, F.Z.S., *Vice-President*.

Read 31st January, 1893.

On the 19th December, 1892, I received a telegram stating that a strange fish was on shore at Overstrand, near Cromer, and subsequently that it was some species of Whale. On the 20th, in the company of Mr. S. F. Harmer of the University Museum of Zoology at Cambridge, who happened to be staying in this neighbourhood, I went to Overstrand; and we found it to be an adult female of the above rare species. Its history we learned was as follows: At about 8 a.m. on Sunday, the 18th December, one of the Overstrand fishermen saw from the cliff an object which he at first took to be a log of wood, but soon perceived to be a "large fish," lying in the water near the beach. After obtaining

assistance he fastened a noose over its tail and secured it by an anchor; it was then placed on a trolley and drawn up the gangway to a shed on the cliff, where we saw it. The animal was alive when first observed, but died before it was taken from the water. As placed, it was unfortunately in such a position that it was impossible to photograph it, and our attempts proved unsuccessful. I believe no photograph was taken after it had been removed from the shed. Before our arrival it had been evicerated, and a very advanced fœtus was taken from it. We made a very careful examination of the exterior, and hope to publish a full description both of the old female and the young one in due course.* In the mean time I may say that the female was of a uniform glossy black colour, with the exception of the anterior edges of the flukes of the tail and the jaws, which were grey of various shades, in places almost white; and the body was spotted and blotched with white or pale grey in a very curious manner. The fishermen told us that when fresh out of the water there was a bluish shade pervading the whole. The young animal was black above, and reddish on the sides and lower parts, probably owing to the effusion of blood into the skin, which would doubtless otherwise have been white. The principal measurements were:

	Female.	Fœtus.
Total length in straight line ...	16 ft. 2 in. .	5 ft. 2 in.
Across the flukes of the tail ...	3 ft. 8 in. .	—

The present is the nineteenth known example of this remarkable animal, all of which have been met with in the North Atlantic in the present century, but with the exception of one taken in 1889 at Atlantic City, which came into the possession of the United States National Museum at Washington—and of which no account has at present been published—in no other instance has an example in a perfect state come under the notice of a cetologist. Individuals or their remains have been found in Scotland and Ireland, but the only previous English example was met with at the mouth of the Humber in September, 1885.†

Both mother and little one were purchased for the Hon. Walter Rothschild, and are being preserved for his museum at Tring.

* See Ann. and Mag. Nat. Hist., April, 1893, p. 275, plate xv.

† Southwell and Eagle-Clarke, Ann. and Mag. Nat. Hist., Jan. 1886, p. 53.

V.

SHOOTING AT HOLKHAM.

By Thomas Southwell, F.Z.S., *Vice-President.*

Read 31st January, 1893.

I am indebted to the Earl of Leicester for permission to lay before the Society the following extracts from a number of papers in the Holkham library, the bulk of which appear to be records of shooting on the Holkham and outlying estates in which a Mr. R. Wilbraham (possibly Randle Wilbraham of Rode Hall, born 1773, died 1861) took part, and are apparently in that gentleman's writing. These are chiefly interesting as records of the distinguished guests who formed the Holkham shooting parties at the end of the past century and the commencement of the present. One of the papers is a summary of the game killed at Holkham between the years 1793 and 1807, both inclusive, by which it appears that 38,419 Partridges, 14,727 Hares, 32,909 Rabbits, 2054 Woodcocks, 6360 Pheasants, 1598 Snipe, 160 various (these latter for only four years), making a total for the fifteen years of 96,257 head. The large number of Woodcocks killed is interesting; the greatest number, 565, were killed in 1804, 519 in 1798, and 480 in 1801—these were the best years. In comparing the total number with the large bags made in the present day it must be remembered that they were killed over dogs, with muzzle-loading, slow-shooting, flint-lock guns, probably single-barrelled,* and the Pheasants would doubtless be wild birds.

* The following letter from Charles James Fox illustrates the disfavour with which double-barrelled fowling-pieces were regarded on their first introduction:—"Dear Coke—Lord Robert and I think of being at Holkham on the 2nd of Nov. & to stay with you until the 9th. If any other time is more convenient to you in any respect, pray let me know. A gentleman—a neighbour of mine who was shooting with me last Wednesday had a double barrelled gun burst in his hand, so that double barrels are more decried here than ever. We have heard of no Woodcocks yet, but I am told you have. Yours affty. C. J. Fox. St. Ann's Hill, 17 Octr. [1802?]."

Four days' Partridge shooting at Castleacre show that in 1801 these birds were abundant there. September 21st, 23rd, 24th, and 25th produced 733 Partridges, 12 Hares, 2 Rabbits, 2 Quails, and 3 Snipe; there being sometimes six and sometimes seven guns.

A note addressed to "R. Wilbraham Esq." endorsed "Ld. Rendlesham, Ld. Rous" apparently in Lord Rous's writing, and further marked: "This paper was given me by Ld. Rons, March 13th, 1807," in the writing of Mr. Wilbraham, is as follows: "Game killed at Rendlesham between the 1st of Septr., 1806 and the 1st of Febry., 1807. Partridges 1815, Redlegs 112 = 1927; Pheasants 1314, Hares 698, Woodcocks 44; total 3983 . . . Ld. Rendlesham thought that on the 2nd Feby. he had more Pheasants left than he ever before had on the 1st of October."

This record is interesting from its early mention of the Red-legged Partridge, which is believed by some to have been introduced by the Marquis of Hertford, at Sudbourne, and Lord Rendlesham, at Rendlesham, in Suffolk, about the year 1770,* and therefore seems to have thriven well to have allowed of 112 being killed in 1807. It is said to have spread rapidly both in Norfolk and Suffolk.

The following notes on the "Weight of Game" are in the writing of Mr. Wilbraham:

"Weight of different sorts of game. I have known a hare weigh $9\frac{3}{4}$ pounds, and have heard of one passing 11 pounds—but it is a very large Hare which weighs 8 lbs.

"I have seen at Holkham Woodcocks from $15\frac{1}{2}$ to 16 ounces, and pheasants from 3 lbs. & $\frac{3}{4}$ up to 4 lbs.

"On Saturday, Oct. 6, 1804, Mr. Wm. Churchill, Jr., killed at Mr. Motteux's on Hingham [?] a partridge which weighed more than $16\frac{1}{4}$ ounces and not quite $16\frac{1}{2}$.

* See 'Birds of Norfolk,' vol. i. p. 405. There is considerable confusion as to the date of the introduction of this bird; Lord Rendlesham (born in 1761) was in 1770 only about nine years old; it is therefore hardly probable that, if introduced by him, the above date is correct. It was Dr. Clarke, in an article in Charlesworth's 'Magazine of Natural History' for 1839, p. 142, who stated that it was introduced by the Marquis of Hertford and Lord Rendlesham about the year 1790. Daniel ('Rural Sports,' vol. iii. p. 95) ascribes the introduction to Lords Hertford and Rochford, and speaks of shooting one of these birds in 1777, which may possibly be a misprint for 1797. There is thus equal confusion both as to the date of introduction and the name of the introducer jointly with the Marquis of Hertford.

"At Holkham Dec. 6, 1805 Mr. Coke in one of the Chumps South East of the Barn plantation killed a cock partridge, which I weighed very exactly, changing the scales—its weight passed 17¼ ounces & was not quite 17½ ounces—this was the largest common partridge I ever saw, the same day a remarkably fat hen pheasant was killed by the Dogs, it weighed 2 lbs. 13 ounces.

"Mr. Rolfe of Heacham told me that he once picked up before his Dog, for it could not fly, being lamed, a partridge which weighed 19 ounces all but a half penny—it was covered with lumps of fat.

"Jany. 24th 1806 I killed at Mr. Motteux's a hare which I weighed 2 days after and which was full 8 pounds 10 ounces.

"Dec. 12. There was killed at Mr. Mouby's a hare weighing 9 pounds—and a Cock pheasant which I weighed myself, changing the scales, 4 pounds one ounce & three quarters.

"Mr. M. Smith at Houghton in 1807 killed a pheasant weighing 4 lb. 2¼ oz.

"Monday Jany. 9th I killed a Hare at Castle Acre weighing 8¾ lbs.

"Monday Jany. 16th [1809 by the game book] a pheasant was killed at Holkham which weighed 4 pounds 2 oz."

The following statement in the writing of the Lord Albemarle of that day, and which throws some additional light on the feats performed by George Turner, of Bustard shooting notoriety, is well worthy of preservation:

"George Turner having for several days observed flocks of wild fowl at Wretham which frequented the lake, placed three guns level with the surface of the water—they were fired from one cock, with a communication by a train of powder, the trigger pulled by a string. The 1st gun carried 9 pipes of powder and 10 of shot.

"The 2nd 4 pipes of powder & 5 of shot.

"The 3rd 3 pipes of powder & 3 of shot.

"The 1st shot killed 48 Ducks 3 Vewers.

"The 2nd ,, 93 Ducks 3 Vewers.

"With the same contrivance he has frequently killed several Bustards at one discharge, and once he killed 4 Bustards at one volley of his 3 guns. In October 1808 By the same means he killed 111 Wild Ducks at one volley."

The Lord Albemarle to whom this is ascribed, was William

Charles, fourth Earl (born 1772, died 1849), the owner of Elveden, from whom it was purchased by the late Mr. Newton. The Duck shooting feat is referred to at p. 176, vol. 3 of the 'Birds of Norfolk,' on the authority of the late Mr. Birch, as communicated to Sir Edward Newton; Lord Albemarle's account being that of a contemporary may doubtless be taken as the more correct where the two differ. The use of the word "Vewer" for Wigeon is interesting. The Lord Rous of the Rendlesham memorandum was subsequently the second Earl of Stradbroke, who was born in 1794, and died in 1886.

VI.

ON *PARADOXOCARPUS CARINATUS*, NEHRING, AN EXTINCT FOSSIL PLANT FROM THE CROMER FOREST-BED.

By Clement Reid, F.L.S., F.G.S.

Read 31st January, 1893.

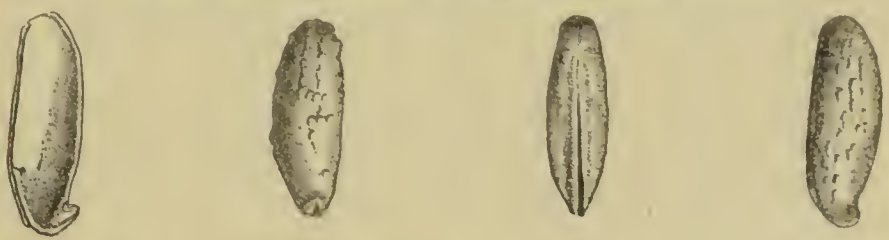
About sixteen years ago, while engaged on the examination of the Geology of the Norfolk Coast for the Geological Survey, I came across a number of specimens of a peculiar bolster-shaped fruit. The first examples of these fruit were discovered at Beeston, near Cromer; subsequently a few more were found at Sidestrand; and later on Mr. J. H. Blake collected abundance of the same species at Corton and Pakefield, near Lowestoft. All these specimens were found in peaty lacustrine deposits belonging to the Cromer Forest-bed. It seemed at first as if this singular fruit were characteristic of, and entirely confined to our newer Pliocene strata; but in 1889 I discovered a single specimen in the Pleistocene lacustrine deposit of Saint Cross, South Elmham, in Suffolk, so well described by Mr. Charles Candler.* As this deposit lies in a hollow in the Chalky Boulder Clay, and is apparently of the same age as the similar mass at Hoxne, it seems probable that the plant survived in Britain down to the Palæolithic period.

* Quart. Journ. Geol. Soc. vol. xlv. p. 504 (1889).

Towards the end of October last I received from Professor Alfred Nehring, of Berlin, some undetermined fruits and seeds obtained from a deposit, apparently interglacial, at Klinge, near Cottbus, not far from Berlin; and amongst them were specimens of the bolster-shaped fruit of the Cromer Forest-bed. I immediately informed Professor Nehring that this plant was known to us as a fossil, but that none of the botanists to whom I had shown the specimens during the last fifteen years had been able to recognise it as a living species. Professor Nehring afterwards described and figured it under the name *Paradoxocarpus carinatus*.*

With regard to the systematic position of this peculiar fruit there is still the greatest uncertainty; and it is on account of this uncertainty that neither Mr. Carruthers nor I had ventured to describe the plant as a new species. Now, however, that the German specimens have been named and figured, it may be advisable to describe and figure our English ones, for neither of the published illustrations † is altogether satisfactory; and the bad illustrations will lead botanists to imagine that the Forest-bed fruit belongs to a different species from that found in Germany. Comparison of the actual specimens side by side shows only the most unimportant varietal differences.

PARADOXOCARPUS CARINATUS, Nehring (= *Follieulites carinatus*, Potonié) from the Cromer Forest-bed at Beeston (enlarged 2½ times).



Endocarp, 11 mm. in length, thick woody cylindrical, slightly curved or straight, except the proximal end which curves sharply towards the axis so that the scar of attachment appears to be

* 'Naturwissenschaftliche Wochenschrift,' vol. vii. p. 454, No. 45, 6 Nov., 1892. A much better figure of the fruit from Klinge has since appeared ('Gesellschaft naturforschender Freunde,' 1893, p. 57).

† *Op. cit.*; see also Dr. H. Potonié, "Über die Räthselfrucht (*Paradoxocarpus carinatus*, A. Nehring) aus dem diluvialen Torflager von Klinge bei Kottbus" ('Gesellschaft naturforschender Freunde,' 1892, No. 10, p. 205).

lateral; keeled dorsally and more or less covered externally with elongated tubercles or irregular ridges. Exocarp not preserved in the English specimens, and extremely rare in those from Germany, apparently coriaceous and similar to that of *Naias* (which also is only occasionally preserved in fossil specimens). Endocarp indehiscent, but on decay splitting first dorsally then ventrally (as in *Naias*). Connecting groove running obliquely through endocarp nearly to the apex. Seed pendulous, testa membranous with an excrescence or aril (the "caruncula" of Potonié) near or on the funicle. The British specimens of *Paradoxocarpus carinatus* vary considerably among themselves in size, rugosity, and thickness of the endocarp; the German specimens appear to be more uniform, but scarcely distinguishable from the average fruit found in Norfolk.

After Mr. Carruthers and I had, without satisfactory result, compared this fruit with a variety of recent plants, I sent some specimens to Sir Joseph Hooker, who under date May 24th, 1887, writes (*in lit.*): "Prof. Oliver & I have given our best attention to your curious seeds & fruits from the Cromer beds, but we are, I am sorry to say, quite unable to hazard a guess as to their true position . . . . . Possibly they may have been gigantic Naiadeæ to which such fruit might belong, *e.g.*, *Zannichellia*."

Later on I found that there was a striking resemblance between the bolster-shaped fruit and another smaller undetermined endocarp from the Cromer Forest-bed, and that there was also a more distant resemblance with the so-called *Folliculites* of the Oligocene strata of the Isle of Wight. It was not, however, till last year that I learnt from Professor Nathorst that the smaller endocarps from the Cromer Forest-bed had been determined by Dr. Gunnar Andersen to belong to *Naias marina*.

Professor Nehring (*op. cit.*) mentions that many botanists, to whom he sent specimens of the fruit from Klinge, placed them in the genus *Zannichellia*, whilst others thought that they were allied to *Naias*; Professor Nathorst suggested a relationship with

The same fruit has also been discovered by Dr. C. Weber in lacustrine deposits filling hollows in the Boulder Clay in Holstein ("Vorläufige Mittheilung über neue Beobachtungen an den interglacialen Torflagern des westlichen Holsteins," 'Neues Jahrb. für Mineralogie,' etc., 1893, bd. 1, pp. 94—96).

Calla (Aroideæ); Professor Nobbe thought that they belonged to Nymphæaceæ.

Dr. Potonié, in a special paper on these fruit (*op. cit.*), figured and described them under the name *Folliculites carinatus* (Nehring), on account of their close resemblance to the *Folliculites kaltennordheimiensis*, Zenker, which he also figures. There can be no doubt as to the striking resemblance between the two figures given by Dr. Potonié; but his figure of *Folliculites* is quite unlike the fruits supposed to belong to the same species (=*F. thalictroides*), which occur so abundantly at Bovey Tracey and in the Isle of Wight. Zenker's original figure of *Folliculites* is too bad to allow one to ascertain the generic characters; but if his fruits were anything like the figure given by Dr. Potonié, it is difficult to understand how it has happened that the extremely different fruits from Bovey Tracey and the Isle of Wight have been referred to the same genus and species. In the British specimens of "*Folliculites*" the seed is erect, not pendulous as in *Paradoxocarpus;* but an additional complication comes in, for the internal structure of my examples of the so-called *Folliculites* from the Isle of Wight, though corresponding with certain specimens from Bovey in the Museum of Practical Geology, is different from that of the specimens from Bovey figured by Sir Joseph Hooker.* The two British Oligocene fruits evidently belong to different species, if not to different genera. If the plant figured by Dr. Potonié is the true *Folliculites* of Zenker, the species found at Klinge and in Norfolk will probably belong to the same genus; but I can trace no generic relationship between the well-known *Folliculites* of Bovey and of the Isle of Wight and the plant from the Cromer Forest-bed, though the various forms under discussion may all belong to the same order.

Since the last-mentioned paper appeared Dr. Potonié has referred *Folliculites* (including *Paradoxocarpus*) to the Anacardiaceæ.† It is not easy to see on what grounds this reference is made, and I still think that the most probable position is with the Naidaceæ, close to *Naias*. If the relationship were with Anacardiaceæ, or

* "On some small Seed-vessels (*Folliculites minutulus*, Bronn) from the Bovey Tracey Coal," by J. D. Hooker, Quart. Journ. Geol. Soc. vol. xi. p. 566, pl. xvii. 1855.

† Naturw. Wochenschrift, 1893, pp. 58, 59.

with *Zannichellia*, I feel sure that the interior of the endocarp would preserve an impression, in some specimens at least, of the folded embryo. Of this I can find no trace in *Paradoxocarpus*, and the smooth inner surface seems to point to an anatropous seed and straight embryo, such as is found in *Naias*. One character in which *Folliculites* and *Paradoxocarpus* differ from the Naidaceæ, and seem to approach the Anacardiaceæ, is the presence of the caruncula, on which Dr. Potonié lays so much stress. This excrescence, unfortunately, is badly preserved in most of the Norfolk specimens, though present in many of them. But if Sir Joseph Hooker's figure of the Bovey Tracey *Folliculites* is accurate the excrescence in that genus is an outgrowth of the funicle, and not of the seed, and cannot therefore agree with the caruncula of Anacardiaceæ. A long discussion by Professor Nehring and Dr. Potonié on the systematic position of *Paradoxocarpus* and its relation with *Folliculites* has appeared since this paper was read ('Sitzungs-Bericht d. Gesellschaft naturforschender Freunde zu Berlin,' 1893, No. 2). The question is by no means settled, and it is singular that so little is known about these extremely abundant Tertiary plants. They seem all to have been aquatic or marsh forms. *Paradoxocarpus carinatus* appears to have flourished in peaty swamps, for its fruit have only been found in peaty deposits, and all the localities yield also recent marsh plants. In the lacustrine parts of the Cromer Forest-bed it is extremely rare; and it is absent from the drifted material brought down by the great Newer Pliocene river. The fruit, therefore, can scarcely belong either to a truly aquatic species, or to a dry-soil tree overhanging a river; the plant probably lived in the marshy swamps where its remains are now found.

Yours
Very Truly
E. B. Rose

VII.

A MEMOIR OF CALEB B. ROSE, F.R.C.S., F.G.S.

By Horace B. Woodward, F.G.S., *President.*

Read 28th February, 1893.

Among the early workers on Norfolk Geology there were Richard Cowling Taylor,* sometime resident in Norwich as a land surveyor; Samuel Woodward,† clerk in Gurney's Bank; John Gunn,‡ rector of Irstead; and the subject of the present memoir, Caleb Burrell Rose, surgeon, of Swaffham. Rose was born at Eye, in Suffolk, on February 10th, 1790. As a youth he was apprenticed to his uncle, a surgeon in that town, and later on pursued his studies in London, at Guy's and St. Thomas' Hospitals. Afterwards he became assistant to a surgeon in Derbyshire, and then, for a short time, took up a practice at Botesdale, in Suffolk. There is no record of his passing any examinations: indeed, in those early days of the century, such qualification was not necessary. Rose went to Swaffham, in Norfolk, in 1816, and there settled down, and practised as a surgeon for forty-three years. In 1836 he became a Member of the Medical and Chirurgical Society of London, and in the same year was admitted a Member of the Royal College of Surgeons. Ten years later he attained the distinction (by examination) of becoming a Fellow of the Royal College of Surgeons.

* R. C. Taylor (1789-1851) was born at Banham in Norfolk; he was third son of Samuel Taylor of New Buckenham. He was engaged for a time on the Ordnance Survey; and settled in the United States about the year 1830.

† S. Woodward (1790-1838); see Memoir in Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 563; and Geol. Mag. 1891, p. 1.

‡ J. Gunn (1801-1890); see 'Memorials of John Gunn,' 8vo. Norwich, 1891.

Swaffham, in the early part of the century, was a comparatively busy little market-town of about 3000 inhabitants, while the Union comprised no less than thirty-three parishes in an area of about twenty-six square miles. Pleasantly situated on rising ground, with a good market-place, wide streets, a fine church, a brewery, two banks, and an assembly room, the town was by no means devoid of attractions; indeed it has been spoken of as "one of the handsomest in the county." It possessed also a "divisional county jail," and it was said that "the prison invariably fills as soon as the harvest is got in and work ceases." To the south and west of the town, in those days, the country was wild and open, with large tracts of heath, and the Bustard, as Rose himself observed, was to be found on Marham Smeeth and Beachamwell Warren. There were then no regular roads to some of the villages in that direction, only tracks across the heath; and most people rode on horseback.

In early life Rose manifested great love for natural science, and he was especially attracted to the study of geology, which continued always to be his favourite pursuit. Shortly after he settled at Swaffham he began to form a collection, and the men who worked in the chalk-pits and brick-yards soon became acquainted with the fact, and with the value of specimens; and they laid aside fossils and anything unusual which they might find for the doctor's inspection.

Goddard Johnson, of Little Dunham, well-known in those days as a sagacious man, and a keen archæologist, was a frequent visitor at Mr. Rose's house. Generally on market-day he came to tea, and there were great talks on archæology and geology. Nevertheless, sympathy was not always forthcoming, and it may be worth noticing, as a not unfamiliar sign of those times, that certain clergymen and others looked askance at the doctor because he was a geologist, for they thought him likely to have dangerous and unsound notions; that in fact he might not believe all that, in their opinion, he ought to believe.*

It was in 1826 that Rose first came in contact with Samuel

* For most of the foregoing particulars, and for some that follow, I am indebted to Mr. Rose's son, Dr. Caleb Rose, of Ipswich. I have also had the advantage of reading many letters from Rose to S. Woodward (1826-1837); these letters are now in the possession of Dr. Henry Woodward.

Woodward, of Norwich, who was but a few months his junior in age. The latter hearing from the Rev. James Layton, of Catfield, that Rose contemplated bringing out a work on Norfolk Fossils, wrote (May 24) to offer any assistance he could give to this project.* Shortly afterwards Rose came to Norwich, and henceforth the two geologists became good friends, helping one another by the loan of books and the exchange of specimens, and communicating news of the observations and discoveries they made in their respective neighbourhoods. S. Woodward visited Rose at Swaffham in the same year, and they thus made acquaintance with the fossil treasures that each had gathered together—the one mainly from the strata of Upper Chalk and Crag in East Norfolk, the other from the Middle and Lower Chalk and the brickearth of West Norfolk.

Rose had commenced his labours when but little was known about the geology of West Norfolk, excepting from the descriptions of agricultural writers, and the early map of William Smith, published in 1819. Later on, in 1823, R. C. Taylor† gave some account of the Alluvial Strata and the Chalk of Norfolk and Suffolk; and also published a brief though detailed description of the strata in Hunstanton Cliff—the only important natural section in West Norfolk.

These were the few special works relating to the district; but in the 'Outlines of the Geology of England and Wales,' by Conybeare and Phillips (1822), although there were but brief references to West Norfolk, there were general accounts of the Chalk and other strata, most valuable for reference and comparison. Stimulated in his studies by this work, and still more perhaps by the great work of the two Sowerbys, on 'Mineral Conchology,' then in course of publication, Rose pursued his work with ardour, carefully noting all sections of the strata, and gathering together all the fossils which he could obtain. Writing of William Smith (in 1834) Rose says: "the more I examine West Norfolk, the more I can confirm his early observations."

* S. Woodward had in 1825 nearly completed two MS. works, illustrated with about 300 coloured drawings of the fossils of the Norwich Crag and Chalk. See Memoir in Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 570.

† Trans. Geol. Soc. ser. 2, vol. i. p. 374; and Phil. Mag. vol. lxi. p. 81.

Rose's contemplated work on the Norfolk fossils did not make great progress, indeed he ultimately abandoned his idea of publishing a book on so comprehensive a subject, and it was left to his friend, S. Woodward, to bring out the first 'Outline of the Geology of Norfolk,' which was issued in 1833.

In the meanwhile Rose forwarded specimens from time to time to James de Carle Sowerby, who since 1822 carried on the great work commenced by his father, James Sowerby. Writing to S. Woodward (Aug. 23, 1827) Rose says: "I sent this summer twenty specimens of Ammonites to Sowerby to name, and he found among them seven new species, or [species] not figured in his 'Mineral Conchology'; he took sketches of them. I also sent him two new Serpulæ, which he intends publishing." On referring to Sowerby's work (vol. vi. 1829), it will be seen that the following species from Rose's collection are figured:—

Baculites Faujasii, Sow.	...	...	Fig. 592
Inoceramus involutus, Sow.	...	...	„ 583
„ latus, Mant.	...	...	„ 582
Serpula obtusa, Sow.	...	...	„ 608

As Miss Etheldred Benett and Dr. Mantell were at the time sending to Sowerby many chalk fossils from Wiltshire and Sussex, it is probable that they obtained better specimens than some of those sent by Rose; an explanation sufficient to account for the fact that all Rose's "new species" were not figured.

Early in 1828 a sad trial came to him in the death of his wife, and for a time he contemplated leaving Swaffham. Writing to S. Woodward (Jan. 31) he says: "My heavy domestic calamity, that has taken from me an inestimable companion, has sadly broken in upon my pursuits, and it is very probable I shall leave my present house. I am at this time inclined to part with my collection of fossils, and think of offering it to the Norwich Museum. Do you think they have spirit or means to purchase it, for I cannot afford to give it?"

Later on, in the same year, his interest happily revived. He finds a new *Inoceramus*, which was sent to Sowerby, but is somewhat surprised to learn that his shells from the brickearth of East Winch, in the Nar Valley, were not considered by that authority to be fossils. Sowerby did, however, figure the *Aporrhais* (*Rostellaria*)

pes-pelicani and *Turritella terebra* from Rose's specimens, for these species occur also in the Crag.*

Rose also forwarded a paper to the 'Philosophical Magazine.' This, however, was not accepted, and he feels that he has not had "fair play" from the editor, Richard Taylor (a cousin of R. C. Taylor). Later on he sent a paper to the 'Quarterly Journal of Science, Literature, and Art' (the Journal of the Royal Institution), and received a complimentary letter from Professor W. T. Brande. His paper, "On the Organic Remains of the Diluvium in Norfolk," was printed, but curiously enough, as Rose remarks, a reference in it is by mistake made to a former part of the paper that was not published (letter to S. Woodward, February 5th, 1829). This former paper dealt with the character of the so-called diluvial formations.

During the years 1830 to 1833 the first edition of Lyell's 'Principles of Geology' was published in three volumes; and his son remarks: "I well remember, many years ago as it is, the exceeding great pleasure which this book gave him."

Rose mentions (in a letter to S. Woodward) that driving through Sandringham in August, 1834, he was tempted to enter the hall, where a sale of the property of H. H. Henley † was then going on. Although Henley had resided at Sandringham Hall, he was Lord of the Manor of Lyme Regis, in Dorset; and a number of Lias fossils, as well as other specimens, were being sold at the auction. Rose purchased a few fossils, and mentioned that a very fine example of the Liassic fish *Dapedium politum* was sold for eight shillings. While in the yard at Sandringham looking at a cast-away skin, his son Caleb, who was with him, inquired what it was. "The skin of a Boa, my lad," said Rose. "A Boar, sir!" quoth a countryman, "I believe it is something of a Sarpent."

Rose had in 1830 sent a list of the localities of his West Norfolk fossils to S. Woodward, and later on helped him with his Geological Map of Norfolk, by drawing the divisions of the Chalk in the western portion of the county. ‡

* 'Mineral Conchology,' vol. vi. figs. 558 and 565.

† The well-known *Ammonites Henleyi* of the Lias was named after H. H. Henley by Sowerby.

‡ See 'Geology of Norfolk,' pp. 3, 32.

It was not until 1835—36 that Rose published his most important paper, 'A Sketch of the Geology of West Norfolk,' which contained the results of his observations made during the previous seventeen years. Geologists at the present day are hardly content to wait so long a time before recording their facts and conclusions; the consequence is that, while more prolific in producing papers, the results appear often in an attenuated form, and lack the sterling value of some of the earlier and more matured pieces of work.

Rose tells us that in arranging and publishing his geological notes, he but responded to an appeal made by Dr. Fitton, from the chair of the Geological Society at the Annual General Meeting of the Fellows in 1828, in the following words:

"But those who are deprived of the privilege of travelling even in England, must not suppose that they can be of no service as geologists: or if they belong to our body, that they are thus released from their obligation to be active in our cause: and there are two descriptions of persons,—the resident clergy, and members of the medical profession in the country,—to whom what I am about to say may be more particularly deserving of attention. Such persons, if they have not yet acquired a taste for natural science, can hardly conceive the interest which the face of the country in their vicinity would gain, however unpromising it may appear, by their having such inquiries before them; how much the monotony of life in a remote or thinly inhabited district would thus be relieved; nor how much benefit they might confer on the natural history of their country."

It is interesting to note that Fitton appeals to the clergy, for, as previously remarked, their attitude was often opposed to scientific inquiry. He, however, had admirable examples in Buckland, Conybeare, and Sedgwick; while in Norfolk, John Gunn, James Layton, and others devoted themselves in a humbler way to the search after truth.

In his paper on West Norfolk, Rose took as the eastern limit of his observations a line drawn from Wells to Thetford. Commencing with an account of the oldest strata, he shows how difficult it is to fix a plane of division between the Oxford and Kimmeridge Clays, on account of the local absence of the "Coral rag beds." His careful record of facts, and the fossils which he determined, enable us, however, to identify the horizon of the Corallian beds at Denver Sluice, and in a deep well-sinking at Lynn; for the recent observations of Thomas Roberts in Cambridgeshire and Lincolnshire, show that the "Coral rag," or Corallian beds, as they are now called, are

represented by their fossils in the great clay-foundation of the Fenland. In the Kimmeridge Clay Rose obtained a specimen of shale that "burns readily, crepitating like cannel coal," a fact of interest, as similar bituminous shale is well known to occur in Dorsetshire and also in Lincolnshire in the same formation; and in the former county the "Kimmeridge Coal" has proved of some economic value.

Rose gives a good stratigraphical account of the "Inferior Greensand," provincially called Carstone, but he had at that time obtained no fossils from it. In lithological characters he identified it with the Lower Greensand of Sussex.

In S. Woodward's Geological Map of Norfolk the Gault was omitted, as Rose then entertained great doubt of its presence in the county: but when he met William Smith at the Cambridge meeting of the British Association in 1833, that geologist so positively assured him of its existence in Norfolk, that on his return home he "redoubled his inquiries." Sedgwick, moreover, had stated in 1826 that the Red Chalk of Hunstanton was exactly in the place of the Gault of Cambridge; and eventually Rose was able to "fully concur with the distinguished Professor in considering the red beds the equivalent of the gault."

His observations are full of interest when we bear in mind the subsequent debates that have taken place on the age of the Hunstanton Red-rock;* for Rose clearly recognises the true state of the case when he remarks: "The gault of Norfolk affords a remarkable example of dissimilarity in the mineralogical character of adjoining portions of a contemporaneous deposit, and is an additional illustration of the necessity for employing the zoological character to determine their identity."

Again, in reference to the White Chalk of Hunstanton, Rose found it difficult to determine the equivalents of Upper Greensand and Chalk Marl, for the fossils were so intermingled. He remarks: "And from this circumstance we are led to infer that at the epoch when the *upper green-sand and chalk-marl* of Wiltshire and Devonshire were depositing, and the then existing marine Testaceæ were entombed, similar phænomena were in progress in this portion of the great chalk basin: but the material supplied being more

* See Whitaker, Proc. Norwich Geol. Soc. vol. i. p. 212.

cretaceous, the strata consequently exhibited a dissimilar *mineralogical* character." Subsequent researches fully bear out this view of the case.* With regard to the "ramose Zoophyte" of the so-called Sponge Bed, he cautiously remarks that the nature of the organism is "not satisfactorily determined." It is now regarded as an inorganic structure by Professor Hughes.†

Rose also mentions that "The singular striæ observed by Mr. Mantell to occur at the natural separations of the chalk in Sussex, are also seen here, particularly in the pits at Marham and Westacre. Mr. Mantell thinks these striæ were 'produced by a subsidence of the strata which caused them to slip over each other before they were entirely consolidated.' May they not also be the result of concussion from remote volcanic action?" Like appearances have since been noticed in Yorkshire and elsewhere; and it is thought that in some cases they are due rather to "incipient crystallisation" than to agents producing slickensides. ‡

Rose mentions the various kinds of flints, including thin tabular flint: and he asks, "Does it not favour the opinion, that the siliceous molecules, by elective attraction, separate themselves from the calcareous matter, above and below certain parallels determined by the proportion of silex contained in the chalk, and approach each other until they arrange themselves in the tabular form?" This explanation would apply rather to the nodules that occur in layers than to the tabular flint that occurs in veins that cross the beds obliquely; but, in illustration, Rose quotes from the 'Penny Magazine' of October 4th, 1834, the statement that when the masses of clay mixed with ground flints, prepared for making fine pottery and china, "are allowed to stand unused for some time, it often happens that the particles of the powdered flint separate from the clay into detached hard stony nodules. The observation of this fact has thrown considerable light on the probable origin of the nodules of flint in chalk, a subject which was very obscure, and of which no satisfactory theory had previously been proposed." This suggestive statement was based on

* A. J. Jukes-Browne and W. Hill, Quart. Journ. Geol. Soc. vol. xliii. p. 544. See also C. Reid and G. Sharman, Geol. Mag. 1886, p. 55.

† Quart. Journ. Geol. Soc. vol. xl. p. 273.

‡ Quart. Journ. Geol. Soc. vol. xxix. pp. 417—419.

observations recorded by Charles Babbage;* but the matter during the past sixty years has not attracted the attention it would seem to deserve.

Rose's careful lists of fossils, and his remarks on their geological and geographical distribution are most valuable, for he clearly recognised that succession of forms belonging to different stages in the Chalk, that are now ranged into "zones."

Coming to the "Diluvium," he remarked that "the *boulders*, so abundantly found in the clay, inclose organic remains which enable us to determine that their parent rocks are situated fifty, nay hundreds of miles apart from *them*. Without noticing the fragments of primitive rocks (which are more difficult to identify, in consequence of their not containing *organic remains*), I may particularise boulders from the *old red sandstone*, *mountain limestone*, *alum-shale* of Whitby, *blue lias*, *cornbrash limestone*, *Sepiaria of the Oxford and Kimmeridge clays*, &c., all inclosing exuviæ that indubitably determine from what strata they were disrupted." His descriptions of this mixed accumulation, which we now know to be Glacial Drift, is exceedingly accurate; but we cannot wonder that he remarks (cautiously enough) that the facts "all combine to render it highly probable that the transport of these materials could not have been effected by any other agent than the Noachian Deluge." An account of the organic remains of this Drift formed the subject of his earliest geological paper (1828); and he then maintained, from the absence of contemporaneous "marine testacea," that the deluge must have been produced by freshwater. As he remarks in a letter to S. Woodward (1834): "I cannot yet desert the Scriptural account of the Deluge."

Rose's name will always be connected with the "Brickearth of the Nar," which he introduced to the attention of geologists. Arthur Young, in his 'Agricultural Survey of Norfolk,' had indeed described the shelly mud with oysters, as being used by farmers in the proportion of ten loads to an acre, as a good dressing for land. Rose collected and determined the fossils, and traced out the extent of the strata. His earliest account appeared in 1836, and he then recorded many of the species, including not only Mollusca,

* 'Economy of Manufactures,' ed. 2, p. 50. Babbage's statements are quoted and enlarged upon by De la Beche, 'Researches in Theoretical Geology,' 1834, p. 98.

but also fragments of a tooth and bones of an Elephant (*Elephas primigenius*) and a broken tooth of Rhinoceros (*R. tichorhinus*). My father, Dr. S. P. Woodward, examined Rose's collection in 1863, and named the species of Mollusca. A revised list of the organic remains was afterwards published by Rose, and he then recorded all his further observations on the deposits.* He mentions that Lyell, in 1839, visited the East Winch brickyard, under his guidance; and in 1864 Professor Otto Torell went with him to see the famous Nar Valley deposit.

In his early paper Rose rightly regarded the deposit as an estuarine mud or alluvium of "post-diluvian" age. Comparing this with other beds that had been described, he then suggested that, "in imitation of the technical language of Mr. Lyell, the period of these deposits may be termed the *pascene*," from the Greek words signifying *all*, and *recent;* all the shells being of recent species. The term Pleistocene is now employed for the deposits yielding remains of the Mammoth, &c. Rose describes the Submarine Forests off Brancaster and other parts of West Norfolk, and recognises that they must be newer than the Forest Bed of Cromer. He also gives an account of an "Ancient Beach" at Hunstanton, to which much attention has since been given by others.†

Some years later Rose obtained remains of the Reindeer (*Cervus tarandus*) from "beneath a peat-moss in a small moor at East Bilney, near East Dereham." The remains, which consisted of a fragment of the skull with the antlers attached, were sent to Owen, who figured them.‡ In his paper of 1843, Rose gives a very full account of the strata that form the Bedford Level, and he describes the changes effected by man, as well as those due to natural causes. Of other geological papers a brief mention only need be made.

In 1836 Rose went to London, met Owen and Sowerby, and paid a visit to the Museum of the Geological Society. In 1837 he spent some time at Cromer, whither he went in search of rest.

Rose was elected a Fellow of the Geological Society of

* Geol. Mag. 1865, p. 8.

† See B. B. Woodward, Proc. Geol. Assoc. vol. viii. p. 97.

‡ 'British Fossil Mammals and Birds,' 1846, pp. 479, 481.

London on April 24th, 1839; and it is interesting to note that Robert Fitch, of Norwich, was elected a Fellow during the following month.

Concerning the researches connected with his profession, it may be mentioned that as early as 1815 Rose communicated to the 'Annals of Philosophy' (vol. v. pp. 424—428) the results of some experiments relating to Hepatitis.

In 1826 he described a case of transposition of the viscera (Lond. Med. and Phys. Journ. vol. lvi. pp. 345, 346); and in 1831 related "Instances of Monstrous Productions" (Mag. Nat. Hist. vol. iv. pp. 103—110). His son informs me that "he took great interest in the study of Entozoa, particularly those hydatids so frequently found in rabbits and sheep; and devoted much time and attention to the subject, making many dissections and microscopical examinations. In 1833 he published in the 'London Medical Gazette' a paper on the "Vesicular Entozoa," in which he, first I believe in this country, correctly described and named a hydatid which infests the rabbit. This was the *Cysticercus tenuicollis*, a fuller account of the anatomy and physiology of which organism he communicated in 1848 to the 'Transactions of the Medical and Chirurgical Society' (vol. xxxi. pp. 215—238). In 1832 he notes that the Asiatic cholera had affected some individuals within his district; and he mentions in particular a case at Downham in which he was greatly interested.

In later years Rose was much occupied in the study of certain parasitic borings in scales of fossil fishes. In 1852 he brought before the Belfast meeting of the British Association his discovery of borings in Chalk fish-scales; and he suggested the name of *Talpina squamæ* for the new organism. In 1855 he communicated his fuller observations on the subject, together with illustrations, to the Microscopical Society.

There can be no doubt that the cultivation of any branch of natural history is valuable to the surgeon and physician, not only from a recreative point of view, but also on scientific grounds—for the study of nature tends to infuse a more scientific spirit into the ordinary work of the surgeon. As his son informs me, "he had always the habit of careful and accurate observation, which made him a good practitioner;" and "in several respects he was quite in advance of his time." Thus Rose gained an extensive

sphere of professional labour, while the work of his leisure hours brought him into correspondence with many of the leading geologists and microscopists of his day.

In 1859 Rose retired from practice and went to reside at 25 King Street, Great Yarmouth, where he passed the remainder of his days. Here he continued his geological observations, and they afforded him ample scope and solace after his busy professional career. In October, of the same year, he accompanied John Gunn, Prof. Prestwich, and Sir John Evans on a visit to Hoxne; and he again visited the locality in the following autumn. He records the finding, by the Rev. S. W. King, of two Celts or flint-implements: one in brickearth four feet from the surface, the other from gravelly shingle between the brickearth and the fluviatile bed that underlies it.*

Rose paid some attention to the Glacial Drifts near Yarmouth, and ventured to doubt the occurrence of a lower Boulder Clay, speaking of the "Lower Drift" that occurs beneath the [Chalky] Boulder Clay, as a ferruginous loam with sands and gravels, while he employed the term Upper Drift for the gravels, &c. that overlie the Boulder Clay.† He refers also in one of his papers (1859) to a "drifted mass of chalk lying upon the Kimmeridge Clay in a pit at Ely." ‡ This statement is interesting, as some controversy subsequently arose on the mode of occurrence of the Chalk at this locality: and the rock was eventually proved to be a Boulder.

In 1860 he drew the attention of John Gunn and Professor Prestwich to the deep boring at Lacon's Brewery at Yarmouth, whereby the presence of the London Clay and Woolwich and Reading series was for the first time notified in Norfolk. ‖ Rose himself has given some account of the boring, § and notes the presence of ten feet of Crag above the London Clay. The occurrence of Crag has always been a doubtful matter. Rose recorded the occurrence of *Balanus*, *Mytilus edulis*, and *Tellina balthica*. §

* 'Geologist,' vol. iii. p. 347.

† *Ibid*, p. 137.

‡ *Ibid*, vol. ii. p. 295; and O. Fisher, Geol. Mag. 1868, p. 407.

‖ Prestwich, Quart. Journ. Geol. Soc. vol. xvi. p. 449; and vol. xxviii. p. xliv.

§ 'Geologist,' vol. iii. p. 141.

The last-named species would relegate the deposit to the highest stage of the Norwich Crag Series (if it be Crag at all), or in other words, to the Weybourn Crag or Bure Valley Beds of some authorities. Rose also refers to the Mammalian remains obtained from an Oyster-bank about 11 fathoms deep, and from 1½ to 2 miles from Yarmouth beach. These remains include Hippopotamus, Mammoth, Irish Elk, &c. Similar remains have been obtained from the Dogger Bank.

On November 5th, 1860, Rose became a member of the Geologists' Association, and to the Proceedings of this Society he contributed several papers. In 1861 he described the "beds of redeposited Crag shells" in the Drift Sand near Yarmouth; and in 1862 gave a general account of the Cretaceous group in Norfolk, together with notes on the deep boring made by Messrs. Colman at Norwich. Therein Rose records the presence of Upper Greensand, as well as Gault, beneath the great thickness of Chalk. In this paper he supplements his early work on Western Norfolk with additional notes on the fossils; and records his discovery of some species in the Lower Greensand.* Further observations on the Cretaceous Beds of Norfolk and Kent were also communicated in 1866 to the Norwich Geological Society: Rose having in the meanwhile paid a visit to Folkestone.† In 1864 he journeyed to Boulogne in company with his friend the Rev. Thomas Wiltshire, and published a short account of their observations.

In the same year Rose drew attention (by letter) to the occurrence of fossiliferous Crag at Yarn Hill, near Easton Bavent; and the section was afterwards independently noticed and described by the Rev. O. Fisher.‡ Four years later Rose first brought into notice the rich bed of Crag that occurs at Aldeby; but he had already discovered it in 1865, at that time regarding the section as in Toft Monks an adjoining parish. He rightly grouped this Aldeby Crag with the upper bed of Norwich Crag at Bramerton.

Rose was for many years a regular attendant at the meetings of

* Proc. Geol. Assoc. vol. i. p. 226.

† Geol. Mag. 1867, p. 29. In this paper he records several fossils from the Lower Greensand of West Norfolk.

‡ Whitaker, 'Geology of Southwold,' p. 15; and Fisher, Quart. Journ. Geol. Soc. vol. xxii. p. 26.

the British Association. He was at the first Cambridge meeting in 1833, where he met William Smith; but it was not until the Manchester meeting of 1861 that he became a member of the Association. He was away at the Birmingham meeting when in the autumn of 1865 I went in company with Mr. T. G. Bayfield to call upon him; but next year I had the privilege of seeing him and of glancing over many of his treasures from the Chalk and the Crag. One of the large Ammonites from the Lower Chalk (*A. peramplus*, two feet in diameter) and a double Paramoudra attracted my attention.

Rose was active in promoting the successful reception of the British Association at Norwich in 1868, and (as afterwards remarked) "it is to be feared he never recovered the exertions he made at that time."* He died at Yarmouth on January 29th, 1872, in the eighty-second year of his age.

The large and valuable collection of fossils which he had gathered together and arranged was given, according to his wishes, to the Norwich Museum.† Although not confined to specimens from West Norfolk, the collection consisted chiefly of fossils from that district, and especially from the Chalk. Unfortunately, as I am informed by Mr. J. Reeve, the type specimens figured by Sowerby were not presented to the Museum.

In one of his early letters to S. Woodward, Rose remarked on the importance of collecting facts and avoiding theories. His published papers prove how clearly he kept this idea in mind, and they remain of the highest value for reference on the districts he described. There is, I believe, in all geological literature no more valuable paper of its kind than Rose's "Sketch of the Geology of West Norfolk;" and Professor Prestwich has spoken of it as one of the best accounts of any county geology we possessed. ‡

It is pleasant to look back at the time, some seventy-five years ago, when the four geologists mentioned at the beginning of this memoir commenced their labours; to consider the state of science

* Geol. Mag. 1872, p. 191.

† Some account of this Collection was read before the Norwich Geological Society, in 1872, by John Gunn, see 'Norfolk News,' No. 1424, April 6th, 1872.

‡ Obituary Notice of C. B. Rose, Address to Geol. Soc. 1872.

at that period, the difficulties of travel and of communication, the few workers, the trouble in getting books or in visiting museums; and then to realise how much they did. The field, it is true, was comparatively clear, and there was no vast amount of literature to be studied; but while it is one thing to go into the field now with the benefit of the training and experience of others, it was quite another thing to start in a country about which little was known, and at a time when geology was quite in its infancy.

The annals of Norfolk naturalists have indeed been enriched by the labours of Caleb B. Rose.

The accompanying portrait is from a negative taken by the late Mr. Hugh Rump, of Wells, during a visit which Mr Rose paid him about the year 1868, and which was kindly lent by Lady Eade, of Norwich.

List of Geological Papers by C. B. Rose.

1828.

1. On the Organic Remains of the Diluvium in Norfolk (Quart. Journ. Sci. Lit. and Art, part 2, July to Dec. pp. 308–314).

1829.

2. On the Anatomy of the Ventriculites of Mantell (Mag. Nat. Hist. vol. ii. pp. 332—341).

1835—36.

3. A Sketch of the Geology of West Norfolk (Phil. Mag. ser. 3. vol. vii. pp. 171—182, 274—279, 370—376; and vol. viii. pp. 28—42).

1840.

4. On the Brickearth Deposit of the Valley of the Nar (Proc. Sci. Soc. Lond. vol. ii. pp. 61—63).

1842.

5. Notice of Bones of the Ox, found in Clay at Gayton Thorpe, Norfolk ('Moxon's Geologist,' vol. i. pp. 36, 37).

1843.

6. On the Alluvium of the Bedford Level ('Moxon's Geologist,' vol. ii. pp. 73—103).

1846.

7. On the Occurrence of a Fossil Petro-tympanic Bone of a Whale from the Crag near Ipswich (Quart. Journ. Geol. Soc. vol. ii. pp. 32, 33).

1853.

8. Notice of the Discovery of a new *Talpina*? (Rep. Brit. Assoc. for 1852, Trans. of Sect. pp. 55, 56).

1855.

9. On the Discovery of Parasitic Borings in Fossil Fish-scales (Trans. Micros. Soc. ser. 2. vol. iii. pp. 7—9).

1859.

10. Geological Pearls ('Geologist,' vol. ii. p. 295).

1860.

11. On the Divisions of the Drift in Norfolk and Suffolk ('Geologist,' vol. iii. pp. 137—141, 317).

12. Flint Implements at Hoxne (*Ibid*, pp. 347, 348).

13. On the Mastoid Appearances exhibited on the Faced Flints employed for the Outer Walls of Buildings (Proc. Geol. Assoc. vol. i. pp. 192—194).

1862.

14. On two beds of Re-deposited Crag Shells in the Vicinity of Yarmouth, Norfolk (Proc. Geol. Assoc. vol. i. pp. 192—194).

15. On the Cretaceous Group in Norfolk (Proc. Geol. Assoc. vol. i. pp. 226—237).

16. Notice of some Fossilised Mammalian Remains from the Bed of the German Ocean (Rep. Brit. Assoc. for 1862, pp. 91, 92; 'Geologist,' vol. v. p. 459).

1864.

17. On the Occurrence of Cycloid Fish-scales, &c. in the Oolitic Formation (Geol. Mag. vol. i. pp. 92—94).

18. On a Recent Marine Deposit at Boulogne (Proc. Geol. Assoc. vol. i. pp. 402—404).

1865.

19. On the Brickearth of the Nar (Geol. Mag. vol. ii. pp. 8—12).

1867.

20. On the Cretaceous Groups of Norfolk and Kent (Norwich Geol. Soc. Oct. 2, 1866; Geol. Mag. vol. iv. pp. 29—31).

1868.

21. On the Crag at Aldeby (Rep. Brit. Assoc. for 1868, Trans. of Sect. p. 77; Geol. and Nat. Hist. Repertory, vol. ii. p. 244).

22. The Conchoidal Fracture of Flint, as seen in Norwich Buildings (Rep. Brit. Assoc. for 1868 [title only]; 'Norfolk News,' Aug. 22 [see No. 13]).

23. On the Thickness of the Chalk in Norfolk (Rep. Brit. Assoc. for 1868 [title only]; Geol. and Nat. Hist. Repertory, vol. ii. pp. 257, 258).

VIII.

NOTES ON THE HERRING FISHERY OF 1892.

By Thomas Southwell, F.Z.S., *Vice-President*.

Read 28th February, 1893.

The spring Herring Fishery at Yarmouth was in 1892 as usual very unimportant, only about 37 lasts were landed up to the end of May; and probably in consequence of the small number it was fairly remunerative, as there were about sufficient obtained to meet the demand for bait; but it seems to be a growing opinion in Yarmouth that it is unwise to continue this branch of the fishery. Some attempts were made at "kippering," but the quality was found to be quite unsuitable. At Lowestoft, as is usually the case, the spring fishery formed a much more important feature—1024 lasts being landed.

The summer voyage proved a very good one. Fish were of fine quality, and many were sold as high as six shillings per 132; but prices as usual rose or fell rapidly in accordance with quality or abundance. The Scotch boats fishing from Yarmouth did very well; but the quantity of fish landed at Yarmouth was only 459 lasts, whereas the Lowestoft return shows 1059 lasts.

By the beginning of August the boats were away for the North Sea fishery, and the bulk of the fish taken were as usual landed in the northern ports. During the months of August and September 3071 lasts were brought into Yarmouth, the great bulk (2135 lasts) in the latter month. Some of the reports speak of a growing tendency on the part of the local boat owners to commence the home fishery too early in the season. This doubtlessly deserves condemnation; but previous returns do not show that the quantity of Herrings landed in these months has increased of late. At Lowestoft the home fishing commences later, and only 149 lasts were landed in August and September.

With October the home voyage commences in earnest, and the fish-wharves assume a lively aspect at both ports. The month of October shows a very fair return, and the fishing went on steadily with some slight interruption arising from bad weather about the middle of the month. Prices varying, according to quality and supply, from 1s. 6d. to 4s. 6d. per hundred for fresh Herring, and £4 to £12 per last for salted. In November also the fishing went steadily on both at Yarmouth and Lowestoft, both quantity and quality being good; but great complaints were prevalent as to the prejudicial effects on the market of the large imports of Norwegian Herrings. Towards the end of the month, too, the weather became unsettled, and the Scotch boats finding the fishing unremunerative, the bulk of them had departed earlier than usual. In December the fishing fell off rapidly, and soon came to an end. The total number of Herrings landed at Yarmouth in the last three months of the year being 13,668 lasts, and at Lowestoft 6876 lasts.

From Yarmouth there were 143 home and 123 Scotch boats engaged in the Herring fishery, manned by 2434 men and boys. The total catch for the year being 17,237 lasts (as compared with 13,866 lasts in 1891), of which 2809 lasts were landed by the Scotch boats; and at Lowestoft the number of boats were 180 home

and 59 Scotch, employing some 2033 hands, with a return of 9110 lasts (as compared with 8153 lasts in the previous season), or a total of 26,348 lasts, which at an average of £7 per last represent a sum of £184,436, or a deficit of £79,792 as compared with 1891, notwithstanding an increase of 4329 lasts in the returns, owing to the prices realised being lower.

As to the general results of the year's fishing, with a few exceptions, it is considered to be a very poor one for the catchers, the prices ruling so low; and, notwithstanding their exemption from the losses which so frequently occur from destruction of nets and gear owing to bad weather, there cannot be much margin for profits. On the other hand, the curers who suffered last year will probably reap the advantage of the lower prices which will enable them to compete more successfully in the foreign markets. From the labourers' point of view, their earnings being in proportion to the numbers of fish landed, the season must have been an improvement on the preceding one.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1892.

		Yarmouth. Lasts (13,200)	Thousands (1320)	Hundreds (132)		Lowestoft Lasts (13,200)	Thousands (1320)	Hundreds (132)
	January	—	—	—		—	—	—
	February	—	—	—		—	—	—
Spring	March	8	—	8		114	6	5
	April	18	8	3		621	5	3
	May	11	—	—		288	7	5
Mid-	June	168	6	7		427	5	5
Summer	July	290	9	8		631	6	8
North	August	936	4	2		47	2	3
Sea	September	2135	5	2		102	4	3
Autumn	October	4755	4	7		1517	5	8
Home	November	7682	9	—		4586	6	6
Voyage	December	1229	9	1		772	4	3
	Yarmouth	17,237	7	8		9110	4	9
	Lowestoft	9110	4	9				
	Total	26,348	2	7				

IX.

NOTES ON NORFOLK SLUGS.

By Arthur Mayfield, M.C.S.

Read 31st January, 1893.

The great amount of attention that has lately been given by naturalists to the British Slug-fauna induced me to write an article on 'Norfolk Slugs,' which appeared in the 'Eastern Daily Press.' These further notes are written by the request of Mr. W. A. Nicholson, Honorary Secretary of the Norfolk and Norwich Naturalists' Society. The records are, except when otherwise specified, the result of my own observation.

Arion ater (L.). Abundant in damp places. Meadows near the Asylum at Thorpe. Meadow at Colney. Very plentiful upon a damp hedgebank at Horsham St. Faith's, where many of the specimens approach *var. brunnea* Rbk.

—— var. succinea. Four specimens under moss on a tree-stump at Costessey.

Arion minimus, Simroth. This new slug is recorded for East Norfolk by Mr. W. Denison Roebuck, F.L.S. ('Journal of Conchology,' vol. vi. p. 269).

Arion hortensis, Fér. Common, but requires careful searching on account of its habits. Earlham, Heigham, under moss on tree-stumps at Rackheath.

—— var. grisea. A single specimen with the type at Heigham.

Amalia sowerbyi (Fér.) = (A. marginatus Jeffr.) I believe that this species has not been recorded for Norfolk by any one but myself. It may have been mistaken for *L. marginatus* (Müll.), but it is easily distinguished from that species by the shape of the mantle, as well as by the thicker shell. I have found it upon flint walls at Kirby Bedon and Catton.

Limax maximus, L. Fairly common. Upon a flint wall at Kirby Bedon. In outhouses, Heigham. I have taken several specimens at different times from the brickwork at the north gate of Norwich Cemetery.

Limax flavus, L. In cellars, beneath rain-water tubs, and among rubbish in gardens, Norwich.

Limax marginatus (Müll.)=(L. arborum, B-Ch.). Several small specimens under moss on willows at Eaton and Lakenham. A single one upon the railway bridge near Dunstan. Two light coloured specimens at the base of a beech-tree at Rackheath.

Agriolimax agrestis, L. Very common everywhere, varying in colour from pure white to brown and dark grey.

Agriolimax levis, Müll. Upon sedges and flags by river side at Bramerton Common, Costessey, Ringland, Colney, and Cringleford.

Testacella haliotidea, Drap. Some specimens of Testacella, collected at Aylsham by Rev. S. Spencer Pearce, were forwarded to Dr. Heinrich Simroth, of Leipzig, for identification; he said in reply: "The dissections showed undoubtedly that all were *Testacella haliotidea*" ('Journal of Conchology,' vol. vi. p. 423). I have never met with any Testacella near Norwich, and I should like to know if any one has found specimens lately upon the Ipswich road.

Testacella scutulum, Sby., which is now considered specifically distinct from the preceding species, has been recorded for East and West Norfolk in the Conchological Society's "Census of the Distribution of British Land and Fresh-water Mollusca."

It will be seen from the above list that my records are confined to the Norwich district. For any one with time and inclination to attempt to enlarge the Norfolk list the Broad district ought to prove a happy hunting-ground. Not only might other species be found, but a great deal of information might be gained as regards the colour-variation of those species already recorded.

X.

SOME ADDITIONS TO THE NORFOLK AND NORWICH MUSEUM IN THE YEAR 1892.

By Thomas Southwell, F.Z.S., *Vice-President.*

(Hon. Curator—Vertebrata.)

Read 28th February, 1893.

It is not often that we have to record any addition to the small collection of local Mammalia which our Museum contains, but during the past year we have acquired, by purchase, a specimen of considerable interest, which has been exhibited for some years only as a loan. It was not till December, 1881, that I was enabled to speak positively of the Grey Seal (*Halichœrus gryphus*) as a Norfolk animal, although it was strongly suspected to occur occasionally in the Wash; the question was at that time finally set at rest by the occurrence of an old female and its young one in the locality just mentioned. In November, 1882, a young female was killed on Breydon, and passed into the possession of Mr. W. W. Spelman, and it is this specimen which we have recently purchased, its skull being already in our collection. The Osteological collection has also received the cranium of an adult Grey Seal, killed at Wells in February, 1892, and presented by Colonel Feilden.

As usual, the Museum is greatly indebted to Mr. J. H. Gurney for additions to the collection of Birds of prey. Through his influence the Zoological Society of London sent the Museum an adult female of the Pagoda Owl, *Myrtha seloputo* (*Syrnium sinense* (Lath.),) received by them from Penang, Malay Peninsula, and which died in the Gardens. This being a fresh specimen has mounted well. It is the only Owl which has been added to the collection of *Striges*.

From a box of *Accipitres*, sent him by Mr. H. Whitely, the well-known dealer, a skin of *Urubitinga zonura* (Shaw), differing in its plumage from any in the Museum, was selected by

Mr. Gurney. It is labelled as obtained in Guiana, South America, February 4th, 1890, and may possibly belong to the more northern race, *U. ridgwayi*, Gurney, of which we already possessed one specimen. It was doubtless obtained in America by Mr. Whitely's son, an excellent collector, the last years of whose life were devoted to the exploration of the wilds of British Guiana.

By a good exchange the Museum has received from Dr. Meyer a specimen of *Baza bismarki*, Sharpe, a new species, figured in Gould's 'Birds of New Guinea.' It was shot in the island of New Britain, and some account of it will appear in 'The Ibis' for July.

A still better acquisition is *Leucopternis semiplumbea*, Lawrence, from Costa Rica, Central America, a species never obtained by the late Mr. Gurney, and quite as fine a specimen as that figured in the Exotic Ornithology.

These three Hawks belong to genera which are not represented in England.

To Mr. T. Digby Pigott, C.B., the thanks of the members are due for having obtained for the Museum from the Lords of Her Majesty's Treasury eighty-six birds' skins, collected during the exploring expedition of H.M.S. Challenger (1873 to 1876) principally from Kerguelen Island, Australia, and the Southern Ocean.

Some rare birds from Sarâwak have also been contributed by Mr. Charles Hose.

It is always gratifying to be able to announce the rescue of historic specimens from the dangers and vicissitudes to which they are liable in private collections, and to record their arrival in the county museum, where they will be accessible to all, and find a lasting home. How much more is this the case when the specimen chances to be one of a species once the glory of the district which it inhabited, but from which the native race has long been exterminated, never to return. One such treasure has recently come into the possession of the Museum. I allude to a fine male example of the Bustard, which the kindness of Mrs. J. H. Lee, of Nottingham, has enabled us to acquire. The existence of this grand bird had long been known to Mr. Stevenson and myself, and we had in vain sought to secure it for the Norwich Museum, but without success. In the summer of 1891 I paid a visit to Nottingham chiefly for the purpose of seeking an interview with

Mrs. Lee and obtaining a sight of the bird; and I think, perhaps, as a result of that interview Mrs. Lee most kindly consented, notwithstanding her wish to retain it, to allow us to acquire this fine bird on terms which the liberality of some supporters of the Museum enabled me to offer. The history of this Bustard is set forth at length at p. 401 of the third volume of the 'Birds of Norfolk,' and I hope that its wanderings are now at an end. The female bird, which the late Rev. Robert Hamond sent to Sir Robert Clifton at the same time, is still in the possession of a lady in London, who was kind enough to allow me to see it, and the only impediment to its rejoining its mate is the rather large, but not excessive sum, required for its ransom. We have now in the Museum two fine males and four females of the indigenous flock which frequented the borders of the counties of Norfolk and Suffolk, and it is the ambition of Mr. Reeve to have this beautiful group displayed in the new Museum in such a way as to be worthy of the birds themselves, and of the counties of whose avifauna this magnificent species formed the chief glory.

We have also been able to obtain, by purchase, a very good Snowy Owl, killed in February, 1847, at St. Andrew's, near Bungay (Suffolk), which possesses the additional interest of having formed part of the collection of the late Mr. J. Spalding, of Westleton.

A specimen of *Tringa acuminata* which has long been in the Museum has been brought into prominence by the occurrence of an individual of that species on the Breydon mud-flats in August last, and should the claim which I have endeavoured to set up for it as a Norfolk killed bird (p. 366) be accepted, our collection contains the first British killed specimen of this species, which is also the first recognised example which has been met with in the Western Palæarctic region.

Several additions have been made to the collection of birds' eggs, also in the departments of Ichthyology and Conchology; and to Miss Barnard, the honorary botanical curator, the Museum is indebted for a collection of Marine Algæ from Victoria, Australia, and 119 species of dried Ferns and their allies from New Zealand and North America.

The books, portraits, and antiquities, which it does not come under our province to speak of in detail, have all received interesting and important additions.

XI.

METEOROLOGICAL NOTES, 1892.

(From observations taken at Blofield, Norfolk.)

By Arthur W. Preston, F. R. Met. Soc.

Read 28th February, 1893.

January.

This was, on the whole, a cold and winterly month. The first snow of the season fell on the 5th (or seventy-one days later than in the previous winter) and remained on the ground till the 22nd, during which period sharp frost prevailed, accompanied by occasional falls of snow. The frosts were at times of considerable severity, and on the night of the 9th—10th the thermometer fell to 8 degrees, which was nearly as low as in January, 1891, when on the night of the 10th—11th it fell to 7.2 degrees. The last week of the month was exceedingly mild and pleasant, the thermometer reaching 53 degrees on the 29th. Although rather a dry month, there was a great prevalence of cloud and general gloominess and rawness of the atmosphere. This, combined with an unusual amount of sickness, and a great outbreak of the influenza epidemic, had a generally depressing effect.

February.

The first fortnight was fine and mild, with slight rain at times, and much cloud, except on the 5th, 11th, and 12th, which were the brightest days of the month. On the 15th a week's very cold weather set in, with snow and some very sharp nights; the frost on the night of the 18th—19th (9.5 degrees in the screen and 3.2 degrees on the grass) being of a severity only recorded in exceptional winters. The last week, although milder, was the most unpleasant of the month, the sky being almost continuously overcast, with much fog and drizzling rain, and a cold, raw atmosphere.

March.

The weather of this month was extremely winterly nearly throughout. The first fortnight was most exceptionally cold for the season, the thermometer only rising to 40 degrees on two days, and the mean temperature for that period was 31.9 degrees, or nearly 10 degrees below the average. There were only three warm days during the month (the 17th, 18th, and 31st), and the preponderance of cloud was unusually large. There were frequent falls of snow, and on the night of the 9th—10th the screened thermometer fell to 14.5 degrees, and on the grass 27 degrees of frost were recorded. The mean temperature of the month was 36.6 degrees, or about 4 degrees below the average, and it was the lowest recorded for March since 1883, although in 1887 and 1888 it was nearly as low. During the last fifty years March has only been colder three times, viz., in 1845, 1865, and 1883.

April.

The month opened with eleven days of unclouded sunshine accompanied, on some occasions, with unusually high day temperatures for April. On the 4th the temperature rose to the height of 75 degrees in the shade, and on the following day to 72 degrees. A great change took place in the middle of the month. On the night of Good Friday (15th) a great fall of snow and rain took place, the total yield in forty-eight hours being 1.28 inches. The whole of the Easter holidays were most ungenial and winterly, snow and hail falling at frequent intervals for several days. On the 16th the day temperature did not exceed 36.8 degrees, which is 38.2 degrees lower than eleven days previous. The remainder of the month was variable, some fine spring days being interspersed with cold, harsh weather. The mean temperature of the month was below the average, as has been the case in each April since 1886.

May.

The month opened with cold, changeable weather, north-easterly winds and cloudy skies. From the 2nd to 6th inclusive, the thermometer did not once touch 50 degrees, a most unusual occurrence so late in the season. The mean temperature for the

week ending the 7th was 43.9 degrees, or about 7 degrees below the average for the time of year. On the 7th a decided change set in, and the temperature of the two succeeding weeks was normal, the rainfall moderate, and the weather genial and forcing. The last week was unusually warm for May; the mean temperature of the last seven days being 64.2 degrees, or about 11 degrees above the average, and over 20 degrees higher than that of the first week of the month. Some of the daily maxima were remarkably high, the thermometer rising to 82.2 degrees on the 28th, and 81.3 degrees on the 31st; whereas in each of the summers of 1889, 1890, and 1891 the temperature only touched 80 degrees once during the entire season. The 28th was the warmest day in May for twelve years past. Severe thunderstorms occurred on the 26th and 31st, but the total rainfall for the month was not excessive.

June.

The first eight days were of moderate heat with occasional showers. The 9th and 10th were very warm, 80.8 degrees being recorded on the last-named day. From the 12th to the 19th the thermometer did not once touch 60 degrees by day, and on the night of the 14th—15th the exposed thermometer on the grass fell to 30.8 degrees. The mean temperature of the week ending the 18th was 49.4 degrees, or about 10 degrees below the average. Heat again set in on the 24th and continued till the 27th, when 80 degrees was again reached, and was followed by one of the most severe thunderstorms that have been experienced for many years, during which 1.42 inches of rain was gauged. Thunder and lightning occurred on several other days during the month, and the rain accompanying the storms brought up the total rainfall of the month to nearly double the average.

July.

Although not so wet as in the four previous years, this month was, for the fifth year in succession, abnormally cold, the mean temperature being nearly 4 degrees below the average. Opening fine, a wet period set in on the 4th, and continued until the 20th. Some of the falls of rain were heavy, 0.81 inch being gauged on the 16th, and 0.77 inch on the 19th. The barometer was unsteady during the earlier part of the month, but after a sudden rise from

29.54 inches on the evening of the 19th to 30.20 inches on the evening of the 20th, it remained nearly stationary at from 30.20 to 30.30 inches until the close of the month. In the ordinary course this should have been attended by fine, warm weather; and in fact, there was magnificent weather throughout the period in the south-west of England, but in Norfolk, although no rain fell, an almost unbroken canopy of cloud obscured the sun, a chilling north-east wind prevailed, and on some evenings sea-mists made it feel more like November than July. The thermometer did not once touch 80 degrees throughout the month, making the fifth July in succession in which this value has not been attained. Such a circumstance does not appear to have been previously on record during the present century.

August.

The earlier part of this month was dry, and chiefly very fine, with many warm days. Up to the 18th the rainfall was only 0.18 inch, but the remainder of the month was exceedingly wet, no less that 3.16 inches falling in a fortnight. The highest temperature recorded was 80.8 degrees on the 17th, which was the fifth time the thermometer exceeded 80 degrees during the summer, whereas in the three preceding years 80 degrees was only once attained. The mean temperature of the month was 60.3 degrees, or about 1 degree deficient. It was, however, higher than for any month since August, 1887, and the first time since the last-named month that a mean of 60 degrees has been recorded.

September.

This month was not so fine and warm as in the two previous years, the rainfall being 0.87 inch in excess of 1891, and 1.20 inches of 1890; and the mean temperature nearly 4 degrees colder than in either of those years. There were, however, many fine days, particularly after the first week. Very heavy rain fell on the 29th, and the month closed with cold, unsettled weather.

October.

This was the wettest October for many years past; in fact, it was probably one of the wettest months in East Anglia during the present century. The total amount of rain which fell (7.62 inches) appears to have been only once exceeded in Norwich (at least since

1865) in any one month, viz., in November, 1878, when 7.92 inches was gauged. In the Norwich complete record from 1865—1884 the only months in which 6½ inches and upwards was recorded are November, 1875, 6.55 inches; November, 1878, 7.92 inches; October, 1882, 6.50 inches; and October, 1885, 6.77 inches. The number of days on which rain fell was unprecedentedly large, being twenty-seven against twenty-one in November, 1875; twenty-two in November, 1878; seventeen in October, 1882; and twenty-five in October, 1885. The temperature of the air was abnormally low, being nearly 4 degrees below the average. The day readings were exceptionally deficient, 60 degrees not being once touched throughout the month; whereas in 1891, 60 degrees was exceeded on fifteen days in October, and in 1890 on twelve days, on many of which it was nearer 70 degrees than 60 degrees. Snow fell in considerable quantities on the early morning of the 23rd, but soon melted, and did not lie on the ground all day as on the 28th October, 1890.

November.

The mean temperature of the air (44.9 degrees) was about 2 degrees above the average, and only about 1 degree lower than October. The rainfall was only half the average, and was less than one-fifth of the amount which fell during October. An unusually large amount of cloud prevailed, and the air was very damp throughout the month. There was hardly any frost, and some of the days, especially about the middle of the month, were remarkably mild. The wind was chiefly southerly, and there was a complete absence of gales.

December.

The month opened with frosty weather, which continued until the 12th, with slight snow at times. The coldest night during this period was the 6th, when the thermometer fell to 22.6 degrees in the screen, and 16 degrees on the grass. From the 12th to the 23rd the weather was mild for the season, with hardly any frost; the thermometer rising to 51.2 degrees on the 15th, and 50.2 degrees on the 18th. On the 24th the frost returned with increased severity, the screened thermometer falling below 20 degrees on the 26th and 29th, and on the grass to between 12 and 16 degrees on several nights. The year closed with sharp

frost and a slight fall of snow. On the whole, the month was about 2 degrees under the average temperature, and about 4 degrees colder than the previous December, though 5 degrees warmer than the same month in 1890. The rainfall was deficient, only about half the usual quantity falling, and no moisture whatever was deposited in the gauge between the 16th and 30th, constituting the longest interval without rain since the early part of April. Owing to the severity of the frost, and the absence of snow, the broads and flooded marshes became frozen over with unusually good ice, and during the last week better skating was obtained than for some time past.

The Seasons.

The following tables show the mean temperature and rainfall for the four seasons, together with those of the five previous years, and of a twenty-year approximate average :—

TEMPERATURE.

Seasons.	1887.	1888.	1889.	1890.	1891.	1892.	20-year average.	Departure of 1892 from average.
	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.
Winter (Dec. to Feb.)...	35.8	35.5	37.4	38.9	33.9	37.0	37.7	— 0.7
Spring (Mar. to May) ...	43.3	43.5	46.5	46.8	44.0	44.9	46.1	— 1.2
Summer (June to Aug.)	61.4	57.7	59.9	58.6	58.9	58.3	60.3	— 2.0
Autumn (Sept. to Nov.)	46.9	49.3	49.2	50.2	50.9	48.8	49.5	— 0.7
Year	47.0	46.9	48.0	48.0	47.7	46.9	48.4	— 1.5

RAINFALL.

Seasons.	1887.	1888.	1889.	1890.	1891.	1892.	20-year average.	Departure of 1892 from average.
	in.	in.	in.	in.	in.	in.	in.	in.
Winter	5.83	4.42	4.14	4.80	3.10	6.36	6.45	— 0.09
Spring	5.14	5.83	7.09	5.14	6.64	5.10	5.15	— 0.05
Summer	4.04	8.52	9.57	9.61	9.39	10.20	7.10	+ 3.10
Autumn	7.68	7.00	8.94	6.87	7.00	11.15	8.50	+ 2.65
Year	20.52	25.65	29.82	25.96	28.35	31.05	27.20	+ 3.85

It will be seen from the above that the winter was below the average in temperature, though more than 3 degrees warmer than the previous winter. The spring was nearly as cold as the ungenial one of 1891. The summer was the coldest but one, of the series

(only 1888 being colder), and the autumn was the coldest since 1887. The rainfall of the winter and spring quarters was about the average; that of the summer was even greater than in any one of the previous four summers, which were all wet; and the autumn was excessively rainy, owing to the great downpour during the month of October.

YEAR.

The mean temperature of the year was about 1.5 degrees below the average, and 0.8 degree lower than the previous year. All the months were below the average temperature except May and November, which were slightly above. The rainfall of the year was 3.85 inches above the average, and it was the wettest year since 1882. The wettest month was October, which was as much as 4.82 inches above its average; June was 1.92 inches above its average, August about an inch, and January and April each about half an inch above the mean. On the other hand November and December were about 1½ inches, and September three-quarters of an inch below the average. The rainfall of the remaining four months was not abnormal. The mean estimated force of the wind during the year was somewhat less than in the previous year, and the number of gales recorded were only ten, against twenty-one in 1891.

N B.—The instruments from which the foregoing observations are taken consist of a Kew-pattern standard barometer, corrected for temperature and reduced to sea level, standard maximum and minimum thermometers and dry and wet bulb thermometers, mounted in a Royal Meteorological Society's screen, in a freely exposed situation. All the above instruments are by Negretti and Zambra, and have been verified at Kew Observatory. The rainfall is measured by a Symons' Snowdon rain-gauge, and the observations of the direction of the wind are, for the most part, taken from the vane on the spire of Norwich Cathedral.

[In consequence of the illness of Mr. Preston he has not been able to read the above as it passed through the press.—ED.]

1892.

Month.	Barometer.					Thermometer.					Hygrometer.	Cloud.	Rainfall.		Wind.								
															Direction.								Mean estimated force
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Relative Humidity, 9 a.m.	Estimated proportion 9 a.m.	Inches.	No. of days.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	
						°		°		°													
Jan. .	30.46	25	29.27	6	29.831	53.0	29	8.0	10	34.6	93	7.3	1.37	16	0	4	0	7	0	4	9	7	2.6
Feb. .	30.45	11, 13	29.03	18	29.780	52.2	11	9.5	19	37.2	94	7.6	2.01	21	2	4	3	4	1	4	5	6	3.0
March	30.61	30	29.33	12, 13	30.036	58.7	18	14.5	10	36.6	87	7.0	1.34	17	1	12	6	2	2	3	2	3	2.9
April	30.46	1	29.45	16	30.004	75.0	4	24.0	15	44.9	78	4.8	2.24	13	3	7	5	1	1	3	3	7	2.6
May .	30.42	12	29.57	16	29.987	82.2	28	29.6	7	53.3	80	5.8	1.52	13	3	6	1	2	2	5	10	2	3.4
June .	30.44	8	29.53	23	29.991	80.8	10	36.2	15	56.5	83	6.0	3.92	17	4	0	3	1	2	4	8	8	2.4
July .	30.32	24	29.54	19	30.008	77.2	3	41.5	22	58.3	87	7.4	2.94	15	3	10	2	1	2	5	5	3	3.5
Aug. .	30.26	10	29.54	27	29.909	80.8	17	40.0	5, 11	60.3	84	6.2	3.34	16	3	0	1	3	2	10	5	7	2.7
Sept. .	30.35	4	29.48	30	29.973	71.0	16	35.0	18	35.7	87	6.3	2.12	14	3	2	1	1	3	10	7	3	3.2
Oct. .	30.26	18	29.27	6	29.690	59.2	29	28.4	26	45.9	94	7.7	7.62	27	1	8	2	2	4	6	5	3	3.1
Nov. .	30.44	21, 22	29.64	3	30.055	59.0	14	30.8	19	44.9	95	8.2	1.41	14	1	2	2	5	11	2	3	4	1.8
Dec.	30.34	16	29.36	11	29.970	51.2	15	19.2	26	35.2	91	6.2	1.22	15	4	1	4	3	2	2	13	2	2.2
Means					29.936					46.9	88	6.7											2.8
Extremes & Totals	30.61	March 30th	29.03	Feb. 18th		82.2	May 28th	8.0	Jan. 10th				31.05	198	28	56	30	32	32	58	75	55	

XII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Hollow Ways. While engaged on the Geological Survey near Aylsham in 1879, I noticed, south of Calthorpe church, a short, but deep and picturesque lane-cutting, which had been excavated through the glacial sand into the underlying brickearth. At the time the feature appeared to me a striking one, and recalled some of the deep and narrow lanes of Devonshire and West Somerset, which are often cut deeply into the red marls and sandstones, and where the foliage of the thick hedgerows and trees that border the way meet overhead, and form in places a leafy tunnel. Since then I have seen other even more striking "hollow ways," as they are sometimes called, near Yeovil and Bridport, on the borders of Somerset and Devon, where the lanes run deeply through the sands that underlie the Inferior Oolite. They occur also in the Wealden area of Kent, Surrey, and Hants, to the occurrence of which attention was drawn by Gilbert White in the fifth letter addressed by him to Thomas Pennant. He gives the explanation that may reasonably be accepted for the majority of these deep lanes, namely, that they have been worn down "by the traffic of ages, and the fretting of water." Thus the original track-ways, mere foot-paths and bridle-ways, became deepened on the slopes because the rains would fill them, and they would be temporary water-courses. In the course of centuries there would be formed, partly by the traffic, and more largely by the streams during heavy rainfall, these Hollow Ways. They differ from roads that have been excavated by artificial means to ease the gradient, because in the Hollow Ways the crests of the hills are not deepened.—H. B. Woodward.

Grey Seal (*Halichœrus gryphus*) at Wells. On the 28th of February, 1892, two of our fishermen leaving the harbour on the ebb tide, to look at their Welk traps, saw an object on the bar, which they at first thought to be the stranded carcase of a horse or some animal; but on their return in the afternoon with the first of the flood, still seeing it there, they landed on the sandbank, and

discovered it to be a large Seal fast asleep. Procuring a rope from their boat, they passed a running-noose over the Seal's head, dragged it to the boat, and towed it to the wharf. I saw it shortly after its capture. It measured over six feet in length, and was of a silvery-grey colour when dry, but when soused over with buckets of water the blotches of colour in the pelt came out distinctly. This Seal, a female, lived in captivity for several days, and was exhibited in the neighbouring villages. After its demise the head was brought to me. It proved to be that of a very old individual; the teeth are much worn down, and decayed teeth have produced caries of the maxilla, which discharged purulent abscesses into the nasal cavities. In spite of this the animal was fat and in excellent condition when fresh captured. In addition, I found flattened against the skull and embedded in cysts, eight or nine pieces of lead about the weight of buckshot. Mr. Southwell has recorded in our 'Transactions' two prior occurrences of this species on the Norfolk Coast; namely, from the Wash in 1881, and then from Breydon in 1882. I have prepared the cranium for the Norwich Museum.—H. W. Feilden.

Breeding of the Otter in November. When shooting Snipe on Barton Broad on the 26th November, 1892, I came across a female Otter and her young family under the following circumstances: We were punting alongside a "hover," outside of the Carr, some Snipe rose, I dropped one into tall reeds, and the keeper with a large retriever landed to look for it. Presently the dog began to give tongue, and when I joined the keeper I found that an old bitch Otter had driven the retriever to heel, the Otter having taken up her abode with her cubs in the very same patch of reeds into which the Snipe had fallen. The dog in the first instance had managed to kill one of the cubs, but the old Otter soon drove him back; the keeper had seen her dodging about in the reeds and hissing loudly. With some difficulty we pushed the punt through the knotted lumps of rush, and found the recent lair of the Otter and her family. One young one was left on the nest or platform, and we took it with us. This young Otter was fed by hand for about ten days, when, unfortunately, it was killed by one of our house dogs. When I found it, the young Otter had its eyelids closed, so that it must have been newly littered; by the tenth day after capture one eye had opened. As this occurrence fixes with precision a date for the

breeding of the Otter in Norfolk, it may be considered worthy of record.—W. D. Bulwer.

Additions to the Norfolk Avifauna. An example of the Russian Bullfinch, a large and brilliant race which Brehm named *Pyrrhula major*, was shot on Yarmouth Denes by Arthur Smith, January 22nd, 1893. I happened to be at his father's house the next day and saw it, being instantly struck by its great size, and the greyness of its back; it measured in the flesh, length 5.7 inches, expanse 9.7 inches, wing 4 inches. The wing of *P. europæa* is 3.2 inches. It is as much deserving of specific distinction as some of the foreign Hawks and Owls which have received names. The last few months have produced some other additions to the list of Norfolk birds; in September a Ruddy Sheldrake was washed up at Snettisham, being the sixteenth and last recorded in three consecutive months by Mr. Ogilvie, who adds that none were known to have escaped ('Zoologist,' 1892, p. 398). This was on September 13th, and on the 3rd a female Scarlet Grosbeak was caught on Yarmouth Denes by a birdcatcher named Jessup. On December 6th the right of the Iceland Gull to be a Norfolk bird was placed beyond doubt by Mr. Smith; and on the 22nd he had a Greater Shearwater from Caister, bringing up the avifauna of Norfolk to three hundred.—J. H. Gurney.

Sabine's Gull in Norfolk. An immature female, I think a bird of the year, was caught in the shore-nets at Wells along with several Black-headed Gulls (*L. ridibundus*) on the 16th October, and brought to me on the following day. A reference to Stevenson's 'Birds of Norfolk' shows that this is the fourth recorded example for the county. All have occurred in the month of October, and after exceptionally bad weather for the time of the year. The gizzard contained the broken otoliths of a small fish and a few minute fragments of coal, probably taken with its last meal of small fish picked up on the shore, no doubt lying amongst coal grit.—H. W. Feilden.

Occurrence of Ray's Bream (*Brama Raii*) in Norfolk. A recently killed specimen of the above rare fish was brought to me on the 12th October, 1892. It had been picked up alive that morning on Hunstanton beach, having been stranded after a heavy gale which had recently been blowing. C. Sexton, who found the fish, stated that it went for him like a dog when he tried to handle

it. It measured 23.5 inches in length, and weighed 5 lbs. 14 ozs. The coppery colour, especially on the fins, was very brilliant. It was a female fish, and contained a small quantity of hard roe. It has been preserved for me by Mr. T. Roberts, of Norwich.

HAMON LE STRANGE.

MELIANA FLAMMEA. The past season having proved unusually prolific in this species, it seems a good opportunity to place on record a few notes as to its distribution and habits. In our entomological books *Meliana flammea* is always spoken of as one of the greatest rarities (recorded from Whittlesea Mere and Wicken Fen), and I well remember the delight with which in 1873, when collecting on Barton Broad with Mr. C. G. Barrett, I took my first specimen. I am inclined to believe, however, that long before that time it had been taken in some numbers in Wicken Fen (Cambs), though the captors sedulously concealed the fact that they had met with it otherwise than as a great rarity, and for several years no one appeared to have taken it. At all events, in 1876, my friend Mr. N. M. Richardson, working Wicken Fen in June with an attracting lamp, secured a nice series, and in the two following seasons I took it there myself in some numbers, as did other entomologists working there at the time. Since that date it has been taken there regularly, and was doubtless to be had all along if any one had worked for it at the right time. Being exclusively a fen insect, it is of course extremely local, though the wider extent of undrained fens in our own county gives it a more extensive range here than elsewhere, and I doubt not it is to be met with on suitable ground throughout the Broad district. I have in previous seasons taken it at Ranworth, Horning, Barton, and Sutton. In the present year my first excursion was to Ranworth on May 24th, in very favourable weather. In the evening nothing was on the wing but *Panagra petraria*, though one *M. flammea* occurred just before dark. Lighting the attracting lamp, I worked till midnight, when I was obliged to desist, having regard to the next day's school work and the journey home. In the interval twenty-four specimens of *Flammea* occurred, the most singular feature being that, with the exception of one *Simyra venosa*, it was absolutely the only noctua on the wing. On Whit Monday I was on the Broads in the Hickling district, and spent the night near Horsey Mere Having a boatload of boys on board there was

no room for the attracting lamp, &c., but we selected for our camp a spot where the fen appeared unusually promising. Here for the first time in my life I saw *Flammea* really common, flying naturally at dusk. The small boat-lamp was not powerful enough to attract them, though I hoisted it in the fen on a boat-hook, and I only took about a score, but we must have seen two or three times that number. Nothing else worth notice occurred; but I never remember to have seen larvæ of *Odonestris potatoria* so abundant. On June 21st I visited Ranworth again, but the weather proved bad and nothing was taken. A third visit on July 1st was more fortunate, the weather being fairly good, though again the necessity of leaving early diminished the number of my captures. Amongst other interesting species two *M. flammea* astonished me by putting in an appearance so late in the season, and one of them, by its condition, would probably have been on the wing for at least another week. The regular season for this species appears to be from the middle of May to the middle of June. As regards its habitat, *M. flammea* affects not so much the dense reed beds growing in the water, which are the haunt of its nearest congener (*Senta nivea*), but rather those parts of the fen where the reed grows in dwarfed and straggling fashion over the land. Here it flies with a fairly rapid flight, though softer than that of most noctuæ, and generally keeps below the level of the tops of the reeds, dropping on the first alarm to the ground, where it finds a secure retreat among the dense herbage. Thus, when flying naturally, it is not so easily netted as many swifter species, though if it leaves its shelter to fly to a hoisted lamp, nothing could be more readily taken. My first experience of the larva was in 1878, when I took a number of caterpillars feeding externally on reed at night, and noticed three or four rather prettily marked, which I attributed to some species of *Leucania*. Expecting them to hibernate, I was surprised to find them pupate the same autumn, spinning a cocoon in the leaves of the reed. In 1879, from May 20th to 31st, I reared from them what I believe to have been the first specimens of *Flammea* bred in this country. Three years later, Mr. W. H. B. Fletcher found the larva fairly common at Wicken, and it has been obtained there regularly since that time by sweeping the reeds at night in August and September. I procured two or three in this way at Ranworth last August, but they were surprisingly scarce, and very small.—F. D. Wheeler, LL.D.

Chara polyacantha. Two years ago I removed from Royden Fen, in Norfolk, specimens of *Chara polyacantha*, A. Br., which I have since cultivated in an aquarium. When collected the plants showed, in a very exaggerated form, the long basal cell (*stielzelle*) of the antheridium noted by A. Braun in that variety which Kutzing named *C. spondylophylla*. A similar lengthening of the basal cell of the antheridium is stated by W. Migula (Rabernhorst's 'Kryptogamen-flora: Die Characeen,' p. 36) to have been observed by him on one occasion in a specimen of *C. ceratophylla*. The plants have fruited freely both last year and this, but on neither occasion have I been able to see on them what Braun called "lang gestielte Antheridien." Instead of this the archegonia have developed very long stalks. This does not take place until late in the life of the archegonium, and consequently is not observed in the upper whorls of leaves at first. Long after fertilization, and when the archegonium has attained a black colour, the basal cell (which is an equivalent internodal cell) lengthens suddenly, in some cases reaching a length of half a centimetre, and pushes the ripe archegonium quite out of the whorl of leaves. The elongated basal cell remains quite colourless, and is at first sight indistinguishable. The slightly elongated stalk cells of the archegonia of species of *Tolypella* are well known, but I can find no record whatever of such a thing in any other species of the *Characeæ*.—John Bidgood.

Note on Silene inflata and Trifolium agrarium. In the last 'Transactions' (vol. v. part 3, pp. 329, 330) Mr. H. D. Geldart reports finding a patch of *Silene inflata* and *S. maritima* growing together at Wells, and asks the question whether Bentham was not right in uniting the two species. Mr. Geldart does not say whether any of the plants seemed intermediate in character; but he cannot mean that the fact of two species casually growing intermixed is an argument for regarding them as one species rather than two, even in a case in which the two species happen to be closely allied. I have on one occasion found a quantity of *S. inflata* and *S. maritima* scattered over about an acre of ground in the Mendips, a few miles from Cheddar, and most of the plants were easily placed to one or the other, the characters being distinctly maintained; but there were some two or three roots, where the species grew thickest, which were fairly puzzling,

till it dawned upon my companion, the Rev. R. P. Murray, and myself, that we had come across a natural hybrid. I did not take a root to grow; and as it was early in the season, I am unable to say whether these intermediate plants were sterile or not; but judging from the specimens I have preserved, I still have no doubt the plants were of hybrid origin. It is most unlikely Bentham's view will be adopted, that *S. inflata* and *S. maritima* are one species. In the note that follows the one on which I have been commenting, Mr. Geldart suggests hybridity as a means of accounting for a plant which appeared to him intermediate between *Trifolium agrarium* and *T. procumbens*. I have seen a plant in both Hants and Dorset which may very likely be just the form Mr. Geldart means. It is a form of *T. procumbens*, as is proved by leaf and stipule characters, but it has very much the facies and habits of *T. agrarium*, and is sometimes taken for *T. agrarium*. If the terminal leaflet of Mr. Geldart's plant is distinctly stalked, and the stipule ovate or ovate-acuminate, I should have little doubt of its being the same as my plant, which I believe to be *T. procumbens*, var. *majus*, Koch. If, however, the terminal leaflet is *sessile*, and the stipule oblong-lanceolate, it would no doubt be *T. agrarium*. These characters will be found the easiest and safest for separating the two species. The shape of the heads elongates in both during flowering, and the colour of the flowers alters as they go over; and consequently these two latter characters form rather slippery ground for purposes of identification.

E. F. Linton.

Whales in the Cromer "Forest-bed." The occurrence of cetacean remains in the Cromer "Forest-bed" has long been known to all interested in Norfolk Geology, and some fine examples of large vertebræ are to be seen at the Norwich Museum in the Gunn collection, that much respected veteran geologist having been one of the first to note the presence of these huge mammals in this deposit.* In one of the Geological Survey Memoirs attention was called to a very large vertebra, which at that time was in the possession of the late Mr. William Barker, of Birmingham, but was not accessible.† This specimen has now come into the

* See 'Memorials of John Gunn,' 1891, p. 47.

† 'Vertebrata of the Forest-bed Series of Norfolk and Suffolk,' 1882, p. 108; and Quart. Journ. Geol. Soc. vol. xlii. p. 321, 1886.

possession of the Museum of Practical Geology in London, and appears to be the largest fossil cetacean vertebra known. Fortunately there is no doubt as to its origin, for it was found by Mr. Barker in the "Forest-bed" on the foreshore near Cromer, and was dug out under his own supervision. The processes of this vertebra are wanting, but the centrum is in an unusually good state of preservation; and the distinct articulations for chevron bones show unmistakably that it is from the anterior caudal region. The width of the centrum across the front face is nearly 16 inches, its length about 10½ inches, and its height nearly 14 inches. The proportion of length to breadth corresponds most nearly with a front caudal vertebra of the Right Whale, *Balæna*, and the specimen is therefore referred to that genus. I have not seen a recent skeleton of *Balæna* with vertebræ as large as this fossil; but, by the courtesy of Sir William Flower, I have been able to examine an unmounted skeleton of a *Balænoptera sibbaldi* in the British Museum, which is said to have been 80 feet long when alive; and what seems to be a corresponding vertebra of this colossal creature measures as much as 16½ inches across the face of the centrum. This, however, gives no clue to the size of the "Forest-bed" *Balæna*, as the proportions of the two genera are very different. At the present time the following cetacea are known to occur in the "Forest-bed"—*Balæna biscayensis*, Gray; *Balænoptera*, sp.; *Physeter macrocephalus*, Linn.; *Orca gladiator*, Gray; *Pseudorca crassidens*? Owen; *Monodon monoceros*, Linn.; *Delphinopterus leucas*, Pallas; *Delphinus delphis*, Linn.; *Tursiops tursio*? Bonnaterre; *Phocæna communis*, Lesson; Ziphoids?

E. T. Newton.

Naias marina. Some unknown Fossil Seeds from the Cromer Forest-bed, received from Mr. Clement Reid, have just been identified by Professor A. G. Nathorst, as belonging to *Naias marina*, a plant now only living at one locality in Britain—in Hickling Broad, Norfolk. Dr. Gunnar Andersson, who first recognised the species in a fossil state, points out that, like *Trapa natans*, it was formerly more plentiful, for he has found the sub-fossil seeds in peat-mosses in various parts of Southern Sweden; and has also identified specimens in collections from Schleswig-Holstein, Germany, and Switzerland.—'Natural Science,' June, 1892, p. 254.

XIII.

FAUNA AND FLORA OF NORFOLK.

Part XII. Coleoptera.

By James Edwards, F.E.S.

Read 28th February, 1893.

In the group of insects which forms the subject of this list the species are so numerous and varied in their habits, that the production of a fairly complete list of the Beetles of a county like ours can only be expected when the collection of material to that end, and its subsequent determination, shall have been undertaken by a properly organised body of workers; but in the meantime it is hoped that the following essay, which, owing to the nature of the subject, can hardly be regarded as more than preliminary, may prove useful, in the first place as a convenient starting-point for a future undertaking, and next as affording some encouragement to others to take up and continue the work.

It long since occurred to me that a notice of some of the older Norfolk entomologists would form a fitting introduction to this list, but unfortunately my endeavours to collect material for that purpose have met with such scant success that I am compelled to abandon the idea. Curtis, writing more than fifty years ago, says that a translation of Latreilles' 'Genera Crustaceorum et Insectorum,' was suggested by several talented scientific men connected with the 'Entomological Society of Norwich.' Very little information as to this body is now obtainable; but we get a glimpse of what manner of men they were from the Scales correspondence printed at pages 97—109 of volume iv. of our 'Transactions.' There we

find Robert Scales sending to William Spence from Halvergate *Carabus clathratus*, an insect only found nowadays in Scotland and Ireland; Simon Wilkin opening a parcel of *Apions*, sent by Scales to Kirby for determination, naming them himself, and helping himself to certain of his desiderata; and we learn that the society regularly "journalized" all Norfolk insects, whatever that may have been.

It is a matter of great regret that, of all the long list of Norfolk names that one meets with in the older entomological works, there are scarcely any of whom we can obtain any particulars at the present day. It is true that they were mere collectors, and that in all probability a record of their doings would not be of much account from a scientific point of view; but still it is natural that we, as Norfolk men, should feel an interest in the state of the insect fauna of our own county under conditions differing widely from the present. For my own part I have always felt a keen interest in the personality of the Rev. John Burrell, A.M., F.L.S., and F.E.S., sometime rector of Letheringsett, and the author of a list of Norfolk insects, of which the first portion dealing with the Coleoptera appeared in the 'Transactions' of the Entomological Society of London during the first decade of the present century. All that I can learn about him is almost exclusively contained in a letter from a gentleman to whom he was personally known, from which I gather that although he was a good entomologist (and of this his list gives ample evidence) he was but an indifferent parson.

Simon Wilkin, too, merits something more than a mere passing notice. It is, perhaps, impossible now to form an accurate estimate of the influence which, directly and indirectly, he exercised on the study of Entomology in this country. He contemplated the production of a Catalogue of Insects, actually printing a portion of it at his own expense; and he bore the cost of the plates to Kirby and Spence's 'Introduction to Entomology;' but probably the greatest benefit which he conferred on science was his early patronage of John Curtis. The talented author of 'British Entomology' was originally a clerk in Norwich, and in the year 1811 was engaged by Wilkin as a draughtsman, remaining in his service until about 1817; and being in the meantime placed with an engraver at Bungay, by whom he was taught the art in which he afterwards gained such distinction.

Although there can be but little doubt that the real worker in Entomology is born and not made, a consideration of the rich and varied field for research which our county presents induces me to make some observations introductory to the study of the Coleoptera. To take, then, the case of a resident naturalist proposing to himself a serious study of the Beetles of his particular district,—he will, in the first place, possess himself of a copy of the late E. C. Rye's 'British Beetles,'* an illustrated work from which he may gather much general information on the subject, and a knowledge of the distinctive appearance of the members of the different main groups into which the Coleoptera are divided. Having made himself acquainted with the contents of this book he will be in a position to undertake the collection and preservation of material; and the next step will be to find out the names by which his captures are known to entomologists. The latter may be effected in different ways, but we will assume that he intends to adopt the more profitable course and determine his insects for himself. In order to do this he must have some book or books containing descriptions of all the species of Beetles usually regarded as British; and the student of to-day is fortunate in the existence of at least two such works; namely 'A Handbook of the Coleoptera of Great Britain and Ireland,' by H. E. Cox, in two volumes (London: Janson, 1874); and 'The Coleoptera of the British Islands,' by the Rev. Canon Fowler, in five volumes (London: Lovell, Reeve, and Co., 1887—91). The former work is a careful compilation of short descriptions of all the British species known at the date of its publication, conveniently arranged according to the analytical method, but all references to habitat and locality are omitted. In the latter work the defect last mentioned is amply remedied, the descriptions are original and preceded by analytical tables, classification is discussed at some length, and much information is given as to the geographical distribution of the various genera. The determination of species from written descriptions is, to the mind of the writer, the most enjoyable part of an enjoyable study; but it is essential that the student should first acquire a knowledge of the general forms of

* 'British Beetles: an introduction to the Study of our Indigenous Coleoptera' (London: Lovell, Reeve, and Co.). A second edition by the Rev. Canon Fowler has recently been published.

the particular families and groups by reference, if possible, to a properly named collection or good figures. It is nearly impossible to obtain this knowledge from mere descriptions, which are only of real practical use after this superficial knowledge has been gained. The writer, as an isolated student, found the excellent outline figures in Spry and Shuckard's 'British Coleoptera Delineated' very helpful; but the use of the old nomenclature for the genera illustrated is a serious disadvantage to the average student who, unless he has some previous knowledge of zoological classification, will hardly be prepared to work out the modern equivalents for the generic names employed. The exchange of specimens with students more advanced is of course very helpful to the beginner; and there is in the Norfolk and Norwich Museum a fair general collection of British Coleoptera which is always available for study on application to the proper quarter. The student, whose course I have attempted to sketch, will soon find out that the aptness of entomological descriptions is by no means uniform; and if, as is certain to be the case sooner or later, he finds that his progress in determining the species of certain groups is not altogether satisfactory, he will find it advantageous to consult the writings of continental entomologists on the groups in question where such exist. Works dealing with the coleopterous fauna of particular regions, and revisional works on special groups, are of comparatively frequent occurrence now-a-days, and it is generally not difficult to obtain them from the libraries of one or other of the learned societies or otherwise.

In preparing this list I have availed myself of the general works of Stephens and Curtis, as well as C. and J. Paget's 'Sketch of the Natural History of Great Yarmouth and its Neighbourhood' (1834), and Burrell's list mentioned above. The nomenclature and arrangement adopted is, with a few trifling exceptions, that of the second edition of Sharp's Catalogue (1883). I have not thought it necessary to give separate localities except in cases where a species has occurred to me but rarely; and in all cases where a species has not occurred to me personally I have appended the name of the person on whose authority it is recorded, with the view of assisting individual judgment in deciding whether any given species really occurred in the county. I am indebted to Fowler's book for many records; the Norfolk references in that work being rather

numerous, as the author had access to the notes of that indefatigable and most successful collector, the late Dr. Power, who is believed to have occasionally stayed at Woodbastwick. Canon Fowler's own captures were for the most part made at Hunstanton and Bircham Newton.

It will be seen that the records for many species are taken from the older authors, and that therefore confirmation of their occurrence is desirable; but these records are not to be approached with initial distrust on that account. It is true that very few Beetles are actually rare, but it should be borne in mind that the circumstances which must be coincident in order to favour the capture of a given species by a given collector are both numerous and complex, and that the chances of its capture in a given area are in direct proportion to the number of collectors engaged in its pursuit. Moreover, the records given on the authority of the old writers are for the most part those of large and easily recognised species, so that the probability of errors in determination is comparatively small.

I am indebted to the Rev. C. T. Cruttwell, sometime Rector of Denton, for the opportunity of examining his extensive collection, from which I took notes of his Norfolk captures, exclusive of the Brachelytra, for which, unfortunately, time did not serve. Mr. Frank Norgate, whilst living at Sparham, gave me from time to time many interesting species taken by himself in Foxley Wood and his immediate neighbourhood. My friend Mr. G. C. Champion spent a few weeks in 1890 at Waxham, and he has furnished me with a list of his captures in that district, and also in short excursions to Ranworth and Honing; species from all or any of these places are included in the phrase "Waxham (Champion)." The Rev. Theodore Wood kindly sent me, in response to a printed appeal for information to non-resident collectors, an extensive list of his captures in this county; and Mr. J. B. Bridgman allowed me to inspect and take notes of a collection of Beetles formed by his late father, and also furnished information as to the Stylopidæ.

Although the records standing under his name are not numerous, I must nevertheless express my obligations to the late Mr. T. P. Dossetor, with whom I became acquainted about the time of his settlement in Norwich in 1876. A coleopterist of the old school, and a contemporary of the late E. W. Janson and Dr. Power.

I found his knowledge and experience, of which he was ever ready to give me the full advantage, of the greatest possible use to me. His collection came into my hands shortly after his death in 1887.

To my friend and colleague, Mr. H. J. Thouless, my thanks are due for much general assistance in the preparation of this list, and the records of several species which had not occurred to me, although our hunting grounds have for many years been in the main the same.

A few records are taken from an interleaved copy of Stephens' 'Systematic Catalogue,' which formerly belonged to the Rev. J. Landy Brown; a few from a list by Robert Wigham in Chambers' 'History of Norfolk' (Norwich, 1829); and others from Henry Denny's 'Monographia Pselaphidarum et Scydmænidarum Britanniæ' (Norwich, 1825).

Cicindelidæ.

Cicindela campestris, L. Common in sandy places in spring and early summer.

„ maritima, Dej. On coast sands; Caister next Yarmouth; Burnham Market (Fowler).

Carabidæ.

Notiophilus aquaticus, L. The insects of this genus are found running on the ground in the bright sunshine. This species and the two following are common.

„ palustris, Duft.

„ biguttatus, L.

„ quadripunctatus, Dej. Cromer; Yarmouth (Thouless).

„ substriatus, Wat. Fairly common.

„ rufipes, Curt. Sparham (Norgate); Hunstanton (Fowler).

Elaphrus riparius, L. } Common on the edges of ponds
„ cupreus, Duft. } and streams.

Bledius multipunctata, L. "In Paludibus, Bardolph Fen" (Burrell); Horning; Hethersett (Curtis); Lower Close (Wigham); North Denes, Yarmouth (Paget).

Cychrus rostratus, L. Not common; occurs by single specimens, sometimes in houses.

CARABUS CLATHRATUS, L. "The first indigenous specimen was taken by Mr. Haworth at Halvergate, in Norfolk, in the year 1809; subsequently to that period others were taken there" (Stephens). "April, in drills, Halvergate marshes" (Curtis). "Burgh marshes, very rare" (Paget). This well-known Scotch species was evidently distributed by Robert Scales to the collectors of his day from Halvergate, where he resided for a few years prior to 1812; but beyond the foregoing notices there is no other record of its ever having occurred in England.

,, GRANULATUS, L. Common under rotten bark, &c., in marshy places.

,, MONILIS, F. Common.

,, ARVENSIS, Hbst. A few specimens were given to me several years ago by Mr. J. B. Bridgman, which I understood were taken by himself in this county.

,, CATENULATUS, Scop.
,, NEMORALIS, Mull.
,, VIOLACEUS, L.
} Common.

CALOSOMA SYCOPHANTA, L. A rare occasional visitant. "The one found at Norwich in June was the furthest from the sea of any that I have heard of. I saw this specimen soon after it was taken; it was then quite dead, but not stiff. Last year (1829) a considerable number were found along the coast of Norfolk, Suffolk, and Essex. One was brought to Yarmouth found thirty miles from the shore; and Mr. Sparshall writes me word that some were found in the wash of the sea near that town, and several were taken on the shore feeding on putrid fish" (Curtis). "One was taken by a boy crawling in the cloisters of Norwich Cathedral" (Stephens). "Lower Close and on the coast" (Wigham). There are two specimens in the collection of the late W. K. Bridgman, and two in the Sparshall collection in the Norwich Museum, but without any note of time of capture in either case.

Calosoma inquisitor, L. "The late Mr. J. Hooker took one in St. Faith's Wood" (Curtis). The species should be sought for on Oaks in woods.

Nebria livida, F. In crevices of clay cliffs. Cromer, September, 1827 (Giles *fide* Stephens), 1890 (Thouless); also taken at Cromer by the Rev. Theodore Wood. Mr. Thouless' specimen has one of its forelegs duplicated from the base of the femur, the duplicate parts being somewhat shortened and twisted, but otherwise normal.

„ brevicollis, F. Abundant.

Leistus spinibarbis, F.
„ fulvibarbis, Dej.
„ ferrugineus, L.
„ rufescens, Fab.
Clivina fossor, L.
„ collaris, Hbst.
} Common.

Dyschirius thoracicus, Ross. Sandy places. "Coast of Norfolk" (Stephens); Ringmere, Wretham Heath, June, 1890 (Thouless).

„ nitidus, Dej. "Norfolk coast" (Fowler).

„ politus, Dej. "Norfolk coast" (Dawson).

„ globosus, Hbst. Common at roots of Grass in marshy places.

Polystichus vittatus, Brullé. "Two specimens procured from Cley beneath marine rejectamenta by Dr. Leach" (Stephens).

Odacantha melanura, Payk. Marshy places on the ground amongst Reeds. Common in the Broad district and by the river at Brundall.

Ætophorus imperialis, Germ. Rare; habitat of the last. Horning, &c. (Fowler); Palling, April, 1889 (Cruttwell).

Demetrias monostigma, Leach. "Hedges in sandy maritime situations. Repeatedly captured near South Creake by the Rev. T. Skrimshire. Occurs in plenty on the Norfolk coast" (Stephens).

„ atricapillus, L. Very common.

Dromius longiceps, Dej. Rare; a fen species. Horning, May, 1889 (Thouless).

Dromius linearis, Ol.
,, meridionalis, Dej. } Abundant.
,, agilis, F. Somewhat uncommon.
,, quadrimaculatus, L.
,, quadrinotatus, Panz. } Common.
,, quadrisignatus, Dej. Rare; a few examples under bark of Ash, December, 1875.
,, nigriventris, Thoms. Rare; one specimen ex. coll. Dossetor.
,, melanocephalus, Dej. Common.

Blechrus maurus, Sturm. Denton (Cruttwell).

Metabletus obscuro-guttatus, Dnfts. Norfolk (Fowler).
,, truncatellus, L.
,, foveola, Gyll. } Common.

Lebia chlorocephala, F. H. Not common.

Cymindis axillaris, F. "I took a single specimen under a stone in a gravel pit on Witchingham Heath, Norfolk, in 1810" (Curtis).

Masoreus wetterhali, Gyll. Sand hills, Hunstanton; very rare (Fowler).

Loricera pilicornis, F. Very common.

Panagæus crux-major, L. Horning Fen (Wigham); "once found at Caistor Marrams" (Paget).

Chlænius vestitus, Payk. Under stones and refuse in marshy places; not common.

,, holosericeus, Fab. "Very rare; taken by the Rev. T. Skrimshire in Norfolk in the spring" (Curtis).

Oodes helopioides, Fab. Not common. Colney; it also used to occur in the Heigham "Canser," which occupied the site of the Eastern and Midlands Railway Station; Horning; Brundall (Thouless).

Licinus depressus, Payk. "Taken by my brother 5th November, 1810, upon Mousehold Heath, near Norwich, under a stone. Mr. Sparshall found another specimen on the 15th May the following year upon a bank in the same neighbourhood; and several were found afterwards by the late Mr. Griffin in a gravel pit not far from the same city" (Curtis). It is remarkable that there is no

evidence of this species having survived in its old locality to the present day, since so many of the Mousehold Heath rarities mentioned by the older authors have fallen to my lot. The species is local, but not uncommon on the Chalk in the southern and south-eastern counties.

Badister bipustulatus, Fab. This species cannot be called common with us.

„ sodalis, Duft. Rare; one specimen in flood refuse at Harford Bridges, February, 1891 (Beaumont).

Broscus cephalotes, Linn. Common on coast sands and on Mouschold Heath; specimens from the latter locality are unusually large.

Sphodrus leucophthalmus, Linn. In cellars, &c.; not common. My specimens came from a house in the Lower Close.

Pristonychus terricola, Hbst. Common.

Calathus cisteloides, Panz. Very abundant.

„ flavipes, Fourc. } Sandy places; local.
„ fuscus, Fab. }

„ mollis, Marsh. Common on coast sands.

„ melanocephalus, L. Very common.

„ piceus, Marsh. Not uncommon.

Taphria nivalis, Panz. Rare; one example running on the road at Lakenham, July, 1890.

Anchomenus livens, Gyll. "Taken in Norfolk" (Stephens).

„ prasinus, Thunb. Very common.

„ albipes, Fab. Abundant.

„ oblongus, Fab. "In the marshes near Norwich by the late Mr. Griffin" (Stephens).

„ marginatus, L. One example at roots of grass by the roadside on Bracondale in 1880; Denes, Yarmouth, common (Paget); Salthouse, August, 1888 (Thouless).

„ sexpunctatus, L. "In the same season (July, 1812) it was taken, I believe plentifully, in Norfolk" (Stephens); "St. Faith's from 6th to 21st May" (J. Brown).

„ parumpunctatus, Fab. Common.

ANCHOMENUS VIDUUS, Panz. } Not uncommon.
,, ,, var. MÆSTUS, Duft. }
,, GRACILIS, Gyll. Rather local.
,, FULIGINOSUS, Panz. Common.
,, THOREYI, Dej. Several specimens in a marsh at Weybourne, September, 1888.
,, PUELLUS, Dej. Very common near the Broads.

OLISTHOPUS ROTUNDATUS, Payk. } Common.
STOMIS PUMICATUS, Panz. }

PLATYDERUS RUFICOLLIS, Marsh. Scarce; my specimens were taken in a cellar with Pristonychus, &c.

PTEROSTICHUS CUPREUS, Linn. Common.
,, DIMIDIATUS, Ol. Rare; several specimens from Mousehold Heath in 1883.
,, LEPIDUS, Fab. Norfolk (Dawson).
,, PICIMANUS, Duft. Hunstanton (Fowler); Denton (Cruttwell); Sparham (Norgate).
,, VERNALIS, Panz. Marshy places; common.
,, ATERRIMUS, Payk. There has been no record of the capture of this species for many years. "It was discovered in Norfolk by my lamented friend, the late Joseph Hooker, Esq., of Norwich. Mr. Sparshall afterwards found a specimen at Horning in the same county, which had just settled upon a plant in the marshes, the wings being at the time unfolded; and in January, 1822, he was so obliging as to take me to the same neighbourhood, where I had the pleasure of finding two specimens secreted in crevices of the bark of Pollard Willows by the side of the river. They did not appear to be much affected by the cold at the time, although the tranquil waters which covered the surrounding country were frozen over, for one of them made its escape, and falling into the river which had overflowed its banks, it sank and must have attached itself to the grass at the bottom, for after the most diligent search we could not find it. At the end of November in the same year we went again, when we found

a considerable number apparently in their natural habitation, the decayed stumps of trees that had been cut down by the side of ditches which frequently overflowed them. We dug many out of the trees, so completely enveloped that it was difficult to imagine how they could have got there, unless they had resided in the wood in their larvæ state. It is evidently a very local species attached to damp situations, and able in warm weather to fly with celerity" (Curtis).

PTEROSTICHUS NIGER, Schal. } Common.
,, MELANARIUS, Ill. }
,, ANTHRACINUS, Ill. Norfolk (Stephens).
,, NIGRITA, Fab. }
,, MINOR, Gyll. } Common at roots of grass, &c.
,, STRENUUS, Panz. } in damp places.
,, DILIGENS, Sturm. }
,, MADIDUS, Fab. Very abundant.
,, STRIOLA, Fab. Rather local.

AMARA FULVA, De G. Household Heath; not common.
,, APRICARIA, Payk. Common, especially in sandy places.
,, CONSULARIS, Duft. Scarce; Brandon, Hunstanton (Fowler); Household Heath.
,, SPINIPES, Linn. Common; generally taken by sweeping.
,, CONVEXIUSCULA, Marsh. Hunstanton (Fowler); Cley, August, 1889.
,, INFIMA, Duft. Norfolk (Stephens).
,, BIFRONS, Gyll. Postwick Grove, July, 1875; Cromer, August, 1890 (Thouless).
,, LUCIDA, Duft. }
,, TIBIALIS, Payk. } Common.
,, FAMILIARIS, Duft. }
,, ACUMINATA, Payk. Household Heath, July, 1885 (Thouless).
,, TRIVIALIS, Gyll. Common.
,, LUNICOLLIS, Schiod. Household Heath, June, 1883; Horning, May, 1889 (Thouless).
,, COMMUNIS, Panz. }
,, OVATA, Fab. } Not common.
,, SIMILATA, Gyll. }

ZABRUS GIBBUS, Fab. "Captus in viis, Jul." (Burrell). Near Norwich (Wigham). This species is said to occur in cornfields on stems of plants at dusk.

DICHIROTRICHUS PUBESCENS, Payk. Common on coast sands.

ANISODACTYLUS BINOTATUS, Fab. Very local; banks of the Yare at Postwick.

HARPALUS ROTUNDICOLLIS, Fairm. Yarmouth, August, 1883; previously recorded from thence by Paget as *H. obscurus*.

,, PUNCTATULUS, Duft. Common in the Norwich District, Hunstanton (Fowler).

,, AZUREUS, Fab. Norfolk (Stephens).

,, RUPICOLA, Sturm. Hunstanton (Fowler).

,, PUNCTICOLLIS, Payk.
,, RUFIBARBIS, Fab.
,, RUFICORNIS, Fab. } Common.

,, HONESTUS, Duft. Mousehold Heath; common.

,, ATTENUATUS, Steph. Coast sands, Yarmouth. Hunstanton (Fowler).

,, ÆNEUS, Fab. Very common.

,, DISCOIDEUS, Fab. Brandon (J. J. Walker).

,, RUBRIPES, Duft. Mousehold Heath; not uncommon.

,, LATUS, Linn. Not generally common.

,, MELANCHOLICUS, Dej. Yarmouth, August, 1883.

,, TARDUS, Panz. Common.

,, SERVUS, Duft. Yarmouth, Hunstanton (Fowler).

,, ANXIUS, Duft. Coast sands; Yarmouth; common.

,, PICIPENNIS, Duft. Thetford, August, 1888, one female; Norfolk coast (Dawson).

STENOLOPHUS SKRIMSHIRANUS, Steph. "Fakenham, Rev. T. Skrimshire" (Stephens).

,, VESPERTINUS, Panz. Marshes near Norwich, late Mr. Griffin (Stephens).

ACUPALPUS MERIDIANUS, Linn. Common.

BRADYCELLUS PLACIDUS, Gyll. Horning, April, 1889 (Thouless).

,, COGNATUS, Gyll. Norwich, August, 1875.

,, VERBASCI, Duft.
,, HARPALINUS, Dej. } Common.

Bradycellus collaris, Payk. The occurrence of this mountain species in this county is remarkable; but specimens from Mousehold Heath, where it occurred rarely in 1883, are identical with northern examples.

„ similis, Dej. Very common at the roots of Heath, &c.

Patrobus excavatus, Payk. Not very common.

Pogonus luridipennis, Germ. First discovered in Britain by the Rev. J. Burrell at Salthouse in 1806, and the following paragraph from his pen which accompanies Curtis' plate 47 (*Pogonus burrelli*, as it was then called) seems worthy of reproduction here: "The genus *Raptor*, confined as it is to three British species (*burrelli*, Haw; *chalceus*, Marsh.; and *æruginosus*, Steph., MSS.) is perfectly maritime; the species being all found in the same situation, and may be deemed subaquatic; for in winter and a considerable part of the summer the habitat of these pretty animals is entirely covered with water, which stagnates many inches deep in the low places of the marshes after the tide has flowed and ebbed. When these spots, which are first formed by a casual removal of the oozy soil for agricultural purposes, are dried, through evaporation caused by the summer sun, the soil cracks in various directions; and out of these cracks when any one walks across the place the Raptores dart up with swiftness and in great numbers. They are principally found in the months June, July, August, and September; and if the weather be warm and dry, they may be captured, though in less quantity, in May and October. They associate with many species of *Bembidium*, and not unfrequently the *Cillenum laterale* is seen in their company. The most manifest habitat of our species is at Salthouse in Norfolk, upon the salt marshes separated from the German Ocean by a high mound of pebbles and other small stones rounded by attrition, and through which mound the tide penetrates at its highest flow." Salthouse,

July, 1840 (Brown). I have repeatedly searched for this insect without success, possibly because I was not on the ground sufficiently early in the day; it has, however, of late years become very rare in the Island of Sheppey, where it used to be very common.

POGONUS CHALCEUS, Marsh. Wells; Cley; Salthouse.

TRECHUS DISCUS, Fab. Norfolk (Stephens).

,, MICROS, Hbst. Denton (Cruttwell).

,, MINUTUS, Fab. Common.

,, SECALIS, Payk. Norfolk coast (Stephens).

CILLENUS LATERALIS, Sam. "Taken in abundance at Cley by Mr. Brightwell" (Curtis); Heacham (Fowler); Cromer (Thouless).

BEMBIDIUM RUFESCENS, Guer. } Not uncommon.

,, QUINQUESTRIATUM, Gyll. }

,, OBTUSUM, Sturm. Common.

,, BIGUTTATUM, Fab. Not common.

,, VAR. RIPARIUM, Ol. Stoke Holy Cross; Bixley.

,, ÆNEUM, Germ. Trowse, in flood refuse, February, 1877.

,, GUTTULA, Fab. Common.

,, MANNERHEIMI, Sahl. Brundall.

,, ASSIMILE, Gyll. Brundall, April, 1886.

,, CLARKI, Daws. St. Faith's Common, August, 1886.

,, FUMIGATUM, Duft. Ranworth, May, 1886.

,, QUADRIMACULATUM, Linn. } Common.

,, QUADRIGUTTATUM, Fab. }

,, ARTICULATUM, Panz. Not very common.

,, NORMANNUM, Dej. Hunstanston; Morston.

,, MINIMUM, Fab. Coast marshes; Cley, &c.; common.

,, LAMPROS, Herbst. Very common.

,, TESTACEUM, Duft. Mousehold Heath, July, 1883.

,, SAXATILE, Gyll. Not common.

,, FEMORATUM, Sturm. Aylsham (Wood).

,, BRUXELLENSE, Wesm. Brumstead Common.

,, LITTORALE, Ol. Very common.

,, LUNATUM, Duft. Norfolk (Fowler).

,, STOMOIDES, Dej. Rare; Mousehold Heath, October 1884, June 1889.

Bembidium pallidipenne, Ill. Norfolk (Fowler).
,, flammulatum, Clair. Coast marshes; common.
,, varium, Ol. "Breydon Bank; common" (Paget).
,, ephippium, Marsh. Cley, August, 1888.
Tachypus pallipes, Duft. Cromer (Thouless; Wood).
,, flavipes, Linn. Not very common.

Pelobiidæ.

Pelobius tardus, Herbst. Local; Swardeston Common; Ringmere, Wretham Heath, abundant, May, 1890; Mousehold Heath, pit on the Rifle Range (Thouless).

Haliplidæ.

Cnemidotus impressus, Fab. Not uncommon.
Haliplus obliquus, Fab. Ranworth, with the next; Colney; Waxham (Champion).
,, confinis, Steph. Ranworth, August, 1874 (2); Horning (Fowler).
,, variegatus, Sturm. Ranworth, August, 1874 (1); Norfolk Fens (Fowler).
,, fulvus, Fab. Horning, May, 1889; Waxham (Champion).
,, flavicollis, Sturm. Colney; Heigham.
,, fluviatilis, Aubé. } Abundant.
,, ruficollis, De G. }
,, striatus, Sharp. I have a few specimens which agree with the description of this species; but I am inclined to think that they are, nevertheless, only extreme varieties of one or other of the two preceding species.
,, lineatocollis, Marsh. Very common.
Brychius elevatus, Panz. Running water; Whitwell Common; Flordon Common; Cossey (Thouless).

Dytiscidæ.

Noterus clavicornis, De G. } Common.
,, capricornis, Herbst. }
Laccophilus interruptus, Panz. }
,, obscurus, Panz. }

Bidessus unistriatus, Schr. Hickling Broad. I took my first two examples in shallow water at the edge of the Broad in May, 1890; but Mr. Champion subsequently found it commonly in ditches in the vicinity.

„ geminus, Fab. Brandon, May, 1889.

Hyphydrus ovatus, Linn.
Cælambus inequalis, Fab.
„ versicolor, Schall. } Common.

„ impressopunctatus, Schall. Brandon, May, 1889; Waxham (Champion).

„ parallelogrammus, Ahr. Cley, August, 1889, common; Mousehold Heath, May, 1890, one dull female; Waxham (Champion).

„ confluens, Fab. Locally common; Mousehold Heath; Weybourne.

„ decoratus, Gyll. Horning; Brandon; Waxham (Champion).

Deronectes 12-pustulatus, Ol. Colney, May, 1883; Stalham (Wood); Waxham (Champion).

„ depressus, Fab. Common in running water.

„ assimilis, Payk. Colney, May, 1883; Aylsham (Wood); Waxham (Champion).

Hydroporus halensis, Fab. Horning (Rev. Hamlet Clark). I learn from Dr. Sharp that this species was taken in quantity by Mr. Crotch and himself many years ago in the small pit which formerly existed just outside the Brundall Railway Station. Stalham (Wood).

„ lepidus, Ol. Widely distributed, but local.

„ lineatus, Fab. Very common.

„ granularis, Linn. Horning, May, 1889; Waxham (Champion).

„ pictus, Fab. Very common.

„ memnonius, Nic. Local, but widely distributed.

„ nigrita, Fab. Brooke, April, 1890; Waxham (Champion).

„ obscurus, Sturm. St. Faith's, April, 1887, May, 1888; Waxham (Champion).

HYDROPORUS PUBESCENS, Gyll. Very common.

,, LITURATUS, Fab. Not uncommon in stagnant waters.

,, PLANUS, Fab. Very common.

,, GYLLENHALI, Schiod. Common.

,, NEGLECTUS, Schaum. Stratton Strawless, September, 1875.

,, SCALESIANUS, Steph. Stephens writing in 1828 says : "Captured by the late R Scales, Esq. in Norfolk." At the present day this species is only found at Askham Bog, near York.

,, ANGUSTATUS, Sturm. Not uncommon.

,, UMBROSUS, Gyll. Horning; Woodbastwick; not uncommon; Waxham (Champion).

,, VITTULA, Er. Thorpe, April, 1876 ; Felthorpe, April, 1882 ; Horning (Fowler).

,, INCOGNITUS, Sharp. Ditch by Arminghall Wood, April, 1889.

,, PALUSTRIS, Linn. Very common.

,, ERYTHROCEPHALUS, Linn. Common.

,, RUFIFRONS, Duft. Brandon, May, 1889; Norfolk Fens (Fowler).

,, DORSALIS, Fab. Widely distributed, but not common.

,, FERRUGINEUS, Steph. Horning, June, 1888, one example.

,, OBLONGUS, Steph. Brandon, May, 1889, one example; Horning (Fowler).

AGABUS PALUDOSUS, Fab. Eaton Common, February, 1891, one example; Aylsham (Wood).

,, ULIGINOSUS, Linn. Horning, March 5th, 1840 (Brown); "Stagnant water in marshes between Yarmouth and Caister, common" (Paget). This insect is the *Dytiscus hybneri* of Burrell's list.

,, AFFINIS, Payk. Brandon, May, 1889. The only other British locality for this species is near Dumfries.

,, UNGUICULARIS, Thoms. Horning, March 3rd, 1838, March 10th, 1840 (Brown); Waxham (Champion).

,, DIDYMUS, Ol., Burrell's list. Mousehold Heath, May, 1890 (Thouless); Aylsham (Wood).

AGABUS CONGENER, Thumb. Norfolk (Stephens). Some recent confirmation of this record is desirable, as this is essentially a northern species.

,, NEBULOSUS, Forst. Common.

,, CONSPERSUS, Marsh. Cley (Thouless); Waxham (Champion).

,, STRIOLATUS, Gyll. Taken by the Rev. J. Landy Brown at Horning in March, 1839 and 1840, and not otherwise known as British.

,, FEMORALIS, Payk. Common in ponds in the West Norfolk Heath District; St. Faith's (Fowler).

,, ABBREVIATUS, Fab. Norfolk (Stephens); also in Burrell's list as in W. J. Hooker's collection.

,, STURMI, Schon.
,, CHALCONOTUS, Panz.
,, BIPUSTULATUS, Linn. } Abundant.

PLATAMBUS MACULATUS, Linn. Local; a small, almost spotless variety at Aylsham (Wood).

ILYBIUS ATER, De G.
,, OBSCURUS, Marsh. } Common.

,, SUBÆNEUS, Er. Previous to my capture of a single female specimen at Brandon in May, 1889, this species was considered very doubtful as British, its claim to be admitted into our lists resting on a single specimen taken in the London district some twenty years before. I recognised it again amongst some Water Beetles taken during an excursion to Wretham Heath with Mr. Thouless in May, 1890, and we subsequently obtained from thence as many specimens as we desired. Mr. Thouless subsequently obtained a single example at St. Faith's.

,, GUTTIGER, Gyll. Ranworth and Horning, July, 1890; St. Faith's (Thouless).

,, ÆNESCENS, Thoms. St. Faith's.

,, FULIGINOSUS, Fab. Very common.

,, FENESTRATUS, Fab. Locally abundant.

COPELATUS AGILIS, Fab. Widely distributed, but not common. Mousehold Heath; Wretham Heath; St. Faith's; Stalham; Aylsham (Wood); Waxham (Champion).

Rhantus pulverosus, Steph. Mousehold Heath; St. Faith's; Wretham Heath; Stalham (Wood); Waxham (Champion).

,, grapii, Gyll. Stratton Strawless; Wretham Heath; Horning (Fowler); Waxham (Champion).

,, notatus, Berg. Wretham Heath; Yarmouth (Thouless); Norfolk Fens (Fowler).

,, bistriatus, Berg. St. Faith's, May 1889; Waxham (Champion); Norfolk Fens (Fowler).

,, exoletus, Forst. Widely distributed, and not uncommon.

,, adspersus, Fab. Norfolk (Stephens).

Colymbete fuscus, Linn. Locally common.

Dytiscus punctulatus, Fab. The commonest species of the genus with us. Drayton; Eaton; Arminghall; St. Faith's; Ranworth; Horning.

,, dimidiatus, Berg. "Once found on the beach" (Paget).

,, marginalis, Linn. By no means common.

,, circumflexus, Fab. Burgh Castle, one example, 1887 (Thouless); "Not uncommon in ditches" (Paget).

Hydaticus transversalis, Berg. Norfolk (Fowler).

Acilius sulcatus, Linn. Common.

Gyrinidæ.

Gyrinus minutus, Fab. Hickling Broad; Horning. Recorded by Burrell under the name of *kirbii* (Marsh).

,, natator, Scop. Common.

,, suffriani, Scrib. Horning; Ranworth; Hickling Broad; Roydon Fen.

,, bicolor, Payk. Hickling Broad; Horning (Fowler).

,, elongatus, Aub. Common near the coast; at Hickling Broad, &c.

,, colymbus, Er. Ranworth, one male, July, 1890; Hickling Broad, common.

,, marinus, Gyll. Abundant everywhere; probably the commonest species with us.

,, opacus, Sahl. Common and widely distributed; excessively abundant on the Back River near Norwich. This insect is sometimes regarded as a variety of the preceding, from which it is, however,

abundantly distinct, as well in facies and elytral sculpture as in the form of the *ædeagus*. The distinctive characters of the British species of *Gyrinus* are laid down by the writer in a paper in the 'Entomologist,' vol. xxiii. No. 323, p. 105 (April, 1890).

Orectochilus villosus, Mull. Not uncommon; Back River, &c.; usually nocturnal and found lurking by day in cracks of river banks, &c., but I once found it very lively in the day-time in a small stream on Swardeston Common.

Hydrophilidæ.

Hydrophilus piceus, Linn. Horning (Wigham); I have heard of its occurrence at Brundall; Waxham (Champion); "North Denes in ditches, rare" (Paget).

Hydrous caraboides, Linn. Burrell's list; "Rare" (Paget).

Hydrobius fuscipes, Linn. Very common.

,, piceus, Thoms. Not quite so widely distributed as the last. When I collected in the marsh ditches at Thorpe, Whitlingham, and Postwick, some fifteen years back, this species was the only one met with.

Helochares lividus, Forst.
,, punctatus, Sharp. } Both species are equally common and widely distributed with us.

Cymbiodyta marginellus, Fab. Horning; common.

Philhydrus testaceus, Fab. Norwich; Horning; not uncommon.

,, maritimus, Th. Cley; Hunstanton (Fowler).

,, nigricans, Zett. Common and widely distributed.

,, melanocephalus, Ol. Brandon, May, 1889, one example.

,, minutus, Fab. Brandon, May, 1888; St. Faith's, May, 1890; scarce.

,, coarctatus, Gred. Common.

Enochrus bicolor, Payk. Very local. I took my first specimen at Thorpe in May, 1876, and did not see the species again alive until May, 1890, when I took several specimens from a pond on Wretham Heath. Waxham (Champion).

ANACÆNA GLOBULUS, Payk. } Very abundant.
„ LIMBATA, Fab. }

„ BIPUSTULATA, Steph. Very local; it has only occurred to me in wet Moss at Arminghall.

LACCOBIUS ALUTACEUS, Th. Widely distributed but much less common than the following species.

„ NIGRICEPS, Th. Common and widely distributed.

„ MINUTUS, Linn. Scarce.

„ BIPUNCTATUS, Fab. Common.

BEROSUS SPINOSUS, Stev. Hunstanton (Fowler).

„ SIGNATICOLLIS, Charp. St. Faith's, May, 1890; "Marshes between Yarmouth and Caister, very common" (Paget).

„ LURIDUS, Linn. Widely distributed and common.

LIMNEBIUS TRUNCATELLUS, Thumb. } Common and widely distributed. I have taken all three out of wet Moss in some clay pits at Arminghall.
„ PAPPOSUS, Muls. }
„ NITIDUS, Marsh. }

„ PICINUS, Marsh. Hunstanton (Fowler); Waxham (Champion).

CRÆTARTHRIA SEMINULUM, Payk. Arminghall; common in wet Moss; Waxham (Champion).

HELOPHORUS RUGOSUS, Ol. Not common.

„ NUBILUS, Fab. Very common; often found far from water.

„ INTERMEDIUS, Muls. Not uncommon in coast marshes at Cley, &c., in the spring.

„ AQUATICUS, Linn. Very common.

„ MULSANTI, Rye. Rare; one specimen in a pond on Wretham Heath, 26th May, 1890.

„ GRISEUS, Herbst. Common.

„ AFFINIS, Marsh. Mousehold Heath; not uncommon.

„ BREVICOLLIS, Thoms. I have a single specimen taken at Felthorpe in April, 1882, which possesses the characters given by Fowler for this insect; but it is, as he says, a somewhat doubtful species.

„ ÆNEIPENNIS, Thoms. Common.

„ DORSALIS, Marsh. I took two specimens of this species in a small duck pit, supplied only by

surface water from the road, in a garden on the Earlham Road. It had previously been recorded for this county by Stephens, but it is certainly a rare insect in Britain at the present day.

Helophorus nanus, Sturm. Horning; very local (Fowler).

Hydrochus brevis, Hbst. Horning; not uncommon. Woodbastwick, Hoveton (Power); Stalham (Wood).

,, carinatus, Germ. Brandon, May, 1888. Discovered by the late Mr. Dossetor in 1859 in Holme Fen, Huntingdonshire; but since found in the Cambridgeshire Fens.

,, elongatus, Schall. With the last at Brandon; more commonly at Horning; Stalham (Wood).

,, angustatus, Germ. Common and widely distributed.

Octhebius marinus, Payk. Not uncommon at Cley, &c.

,, pygmæus, Fab. With the last, very common.

,, bicolor, Germ. Cley, not uncommon. Waxham (Champion).

,, rufimarginatus, Steph. Rare; Morston, two examples, 1887.

,, æratus, Steph. Local; Thorpe, May, 1876; Waxham (Champion); Hunstanton (Fowler).

Hydræna riparia, Kug. Very local; Arminghall. Aylsham (Wood); Waxham (Champion).

Cyclonotum orbiculare, Fab. Locally abundant.

Sphæridium scarabæoides, Linn.
,, bipustulatum, Fab.
,, marginatum, Fab. } Common.
Cercyon hæmorrhoidalis, Fab.
,, hæmorrhous, Gyll.

,, aquaticus, Muls. Waxham (Champion).

,, flavipes, Fab.
,, lateralis, Marsh. } Common.

,, littoralis, Gyll. Common near the coast.

,, unipunctatus, Linn.
,, quisquilius, Linn.
,, melanocephalus, Linn. } Common.

,, terminatus, Marsh. Rare; one specimen taken in the Norwich district.

CERCYON PYGMÆUS, Ill.
,, NIGRICEPS, Marsh. } Common.
,, MINUTUS, Fab. Not common.
,, LUGUBRIS, Payk. Rare; one example taken by myself in the Norwich district.
,, GRANARIUS, Er.
,, ANALIS, Payk. } Not uncommon.
MEGASTERNUM BOLETOPHAGUM, Marsh.
CRYPTOPLEURUM ATOMARIUM, Fab. } Common.

STAPHYLINIDÆ.

ALEOCHARA RUFICORNIS, Grav. "Captured in Norfolk by Professor Lindley" (Stephens). Occurs rarely near Ants' nests.
,, FUSCIPES, Fab. Common.
,, BREVIPENNIS, Gr. Rare.
,, LANUGINOSA, Gr. Common.
,, VILLOSA, Mann. Arminghall, one example in Moss, May, 1889.
,, MÆSTA, Gr. Common.
,, GRISEA, Kr. Not uncommon.
,, NITIDA, Gr. Common.
,, ,, var. BILINEATA, Gyll. Much less common than the type.
,, MORION, Gr. Not uncommon.
MICROGLOSSA SUTURALIS, Sahl. Common.
,, NIDICOLA, Fairm. By sweeping near the haunts of Sand Martins; not uncommon.
OXYPODA LIVIDIPENNIS, Mann.
,, OPACA, Gr.
,, LONGIUSCULA, Gr.
,, ALTERNANS, Gr. } Common.
,, FORMICETICOLA, Märk. Local.
,, HÆMORRHOA, Sahl. Not uncommon.
THIASOPHILA ANGULATA, Er. In Ants' nests; scarce.
ISCHNOGLOSSA RUFOPICEA, Kr. Under bark; not common.
OCYUSA MAURA, Er. Not uncommon in marshy places.
,, PICINA, Aubc. Local; Horning.
OCALEA CASTANEA, Er. Not uncommon in Moss.

Ilyobates nigricollis, Payk. Rare; Brundall, July, 1883; Horning (Fowler).

Calodera nigrita, Mann. Rather common in marshes, Horning, Brundall, &c.

,, æthiops, Gr. Not uncommon.

Chilopora longitarsis, Steph. Common.

Atemeles emarginatus, Payk. "Near Norwich" (Wigham).

Myrmedonia haworthii, Steph. "Taken only in Norfolk (in boleti)" (Stephens). Occurs very rarely in the vicinity of the nests of *Formica fuliginosa*.

,, collaris, Payk. Rare; Horning; Postwick, one example (Dossetor); Ranworth (Fowler).

,, humeralis, Gr. Rare; one specimen ex. coll. Dossetor.

,, limbata, Payk. Not common; one specimen taken in the Workhouse Lane, and two ex. coll. Dossetor.

,, laticollis, Mark. Rare; one specimen ex. coll. Dossetor.

Drusilla canaliculata, Fab. Very common.

Callicerus obscurus, Gr. Local.

Homalota insecta, Th. River banks; not common.

,, gregaria, Er. Common.

,, luteipes, Er. Rare; Horning (Sharp).

,, plumbea, Wat. Not uncommon near the coast.

,, fallax, Kr. Under vegetable refuse in marshes in the spring.

,, lividipennis, Mann. Not uncommon.

,, londinensis, Sharp. Marshy places not uncommon.

,, hygrotopora, Kr. Not common.

,, elongatula, Gr. Very common.

,, vestita, Gr. Common under seaweed, &c., on the coast.

,, vicina, Steph. Common.

,, pagana, Er. Local.

,, graminicola, Gr. Damp places; very common.

,, halobrectha, Sharp. Common under seaweed.

,, incana, Er. In the axils of leaves of water-plants, also amongst Moss and rubbish at the edges of pools; Horning, &c.; not common.

Homalota nigella, Er. Marshy places in company with the preceding, but much more frequent.

,, æquata, Er. Under bark of Oak stumps; not common.

,, angustula, Gyll. Not common.

,, linearis, Gr. Common.

,, debilis, Er. Marshy places; local.

,, cæsula, Er. At roots of Grass in sandy places; Thetford; rare.

,, circellaris, Gr. Very common.

,, immersa, Heer. Under Fir bark; not common.

,, cuspidata, Er. Under bark; not uncommon.

,, aubei, Bris. Very rare; Horning (Sharp).

,, analis, Gr. Very common.

,, exilis, Er. In Moss and under leaves in early spring; local.

,, depressa, Gyll. In similar places to the last; rather common.

,, aquatica, Th. In wet Moss; local.

,, æneicollis, Sharp. Common in decaying vegetable matter.

,, xanthoptera, Steph. Common in Fungi in the autumn.

,, succicola, Th. Not uncommon.

,, trinotata, Kr. In vegetable refuse, dung heaps, &c., very common.

,, fungicola, Th. Very abundant in Fungi.

,, ignobilis, Sharp. In Fungi; not common.

,, coriaria, Kr. Scarce.

,, gagatina, Baud. Rather common.

,, palustris, Kies. Not uncommon.

,, atomaria, Kr. } Both rare; taken by the late

,, perexigua, Sharp. } Mr. Dossetor in vegetable refuse.

,, sericea, Muls. Common.

,, inquinula, Gr. In dung; local.

,, nigra, Kr. Very common.

,, hodierna, Sharp. Horning, very rare (Sharp).

,, intermedia, Th. Rare.

,, longicornis, Gr. Very common.

,, fimorum, Bris. Very rare; probably taken in this county by Crotch (Fowler).

Homalota villosula, Kr. Not uncommon.
,, atramentaria, Gyll. Very common.
,, parva, Sahl. Common.
,, melanaria, Sahl. Very common.
,, aterrima, Gr. Common.
,, pygmæa, Gr. Not uncommon in wet Moss.
,, muscorum, Bris. } Common.
,, fusca, Sahl. }
,, montivagans, Woll. Horning (Fowler).
,, fungi, Gr. }
,, ,, var. dubia, Sharp. } Very common.
Schistoglossa viduata, Er. Very rare; taken at Merton by Crotch.
Gnypeta labilis, Er. Common in spring on muddy banks of ditches.
Tachyusa flavitarsis, Sahl. Not uncommon on muddy banks of streams.
,, umbratica, Er. Waxham (Champion).
,, atra, Gr. Marshes; not common.
Myrmecopora sulcata, Kies. Hunstanton, Heacham (Fowler).
Falagria thoracica, Curt. "On the sea shore near Hunstanton in August, 1807; Kirby" (Stephens). Hunstanton (Fowler).
,, sulcata, Payk. Very common.
,, sulcatula, Gr. Rather less common than the preceding.
,, obscura, Gr. Common.
Encephalus complicans, Steph. Hunstanton (Fowler).
Gyrophæna gentilis, Er. Common.
,, affinis, Mann. Rather common.
,, nana, Payk. } Hunstanton (Fowler).
,, congrua, Er. }
,, lævipennis, Kr. Local and not common.
,, manca, Er. }
Agaricochara lævicollis, Kr. } Rare; ex. coll. Dossetor.
Epipeda plana, Gyll. Under bark; not common.
Silusa rubiginosa, Er. Wroxham (Fowler); Norwich, 1889, in a *Cossus*-infected Elm (J. J. Walker).
Leptusa fumida, Er. Common under bark.
Bolitochara obliqua, Er. In Fungi; not common.
Phytosus balticus, Kr. } Waxham (Champion).
,, spinifer, Curt. }

AUTALIA IMPRESSA, Ol. Common.
,, RIVULARIS, Gr. Less common than the preceding.
DIGLOSSA MERSA, Hal. Hunstanton (Fowler).
HYGRONOMA DIMIDIATA, Gr. Not uncommon in marshy places, Brundall, Horning, &c.
OLIGOTA INFLATA, Mann. Not uncommon.
,, ATOMARIA, Er. Horning; not common.
,, PUNCTULATA, Heer. Common.
MYLLÆNA DUBIA, Gr.
,, INTERMEDIUS, Er.
,, GRACILIS, Mat.
} Not uncommon in wet Moss.
,, BREVICORNIS, Mat. Scarce.
GYMNUSA BREVICOLLIS, Payk. Rare; Horning.
DEINOPSIS EROSA, Steph. In flood refuse; scarce.
HYPOCYPTUS LONGICORNIS, Payk. Common.
,, SEMINULUM, Er. Scarce.
,, DISCOIDEUS, Er. Horning (Fowler).
CONURUS LITTOREUS, Linn.
,, PUBESCENS, Gr.
} Common.
,, IMMACULATUS, Steph. Not common.
,, LIVIDUS, Er.
TACHYPORUS OBTUSUS, Linn.
} Very common.
,, FORMOSUS, Mat. Aylsham (Wood).
,, SOLUTUS, Er. Not common.
,, CHRYSOMELINUS, Linn. Very common.
,, PALLIDUS, Sharp. Horning (Fowler).
,, HUMEROSUS, Er.
,, HYPNORUM, Fab.
,, PUSILLUS, Gr.
} Common.
,, TERSUS, Er. Not uncommon.
,, TRANSVERSALIS, Gr. Scarce.
,, BRUNNEUS, Linn. Common.
HABROCERUS CAPILLARICORNIS, Gr. Not common.
CILEA SILPHOIDES, Linn. Widely distributed, but not common.
TACHINUS HUMERALIS, Gr.
,, RUFIPES, De Geer.
,, SUBTERRANEUS, Linn.
,, LATICOLLIS, Gr.
} Common.
,, MARGINELLUS, Fab. Local.

Tachinus collaris, Gr. Not uncommon.
Megacronus analis, Payk.
Bolitobius atricapillus, Fab.
,, trinotatus, Er.
} Common.
,, exoletus, Er. Said to be less generally common than the other species, but certainly more numerous with us.
,, pygmæus, Fab.
Mycetoporus splendens, Marsh.
} Common.
,, longulus, Mann.
,, lepidus, Gr.
} Not very common.
,, reyi, Pand.
,, clavicornis, Steph.
} Waxham (Champion).
,, splendidus, Gr. Common.
,, longicornis, Kr. Horning; rare.
Heterothops dissimilis, Gr. Horning; not common.
,, binotata, Steph. Hunstanton (Fowler).
,, prævia, Er. Rare.
Quedius cruentus, Ol. Not common.
,, impressus, Panz.
,, molochinus, Gr.
,, tristis, Gr.
,, fuliginosus, Gr.
} Common.
,, picipes, Mann.
,, nigriceps, Kr.
,, peltatus, Er.
,, maurorufus, Gr.
} Rather common.
,, rufipes, Gr. Common.
,, semiæneus, Steph. Hunstanton (Fowler).
,, attenuatus, Gyll. Rather local.
,, boops, Gr. Common.
,, chrysurus, Kies. Hunstanton (Fowler).
Creophilus maxillosus, Linn. Very common.
Emus hirtus, Linn. Beechamwell; recorded by Curtis.
Leistotrophus nebulosus, Fab. Not uncommon.
Staphylinus pubescens, De Geer.
,, stercorarius, Ol.
} Scarce.
,, erythropterus, Linn. Rare; Horning, June, 1888.
,, cæsarius, Ceder. Not common.

Ocypus olens, Muller. Abundant.
,, cyaneus, Payk. Rare; several specimens from gravel pits on Mousehold Heath, and one from Lakenham in 1883. Drayton, one example (Thouless).
,, brunnipes, Fab. Not common.
,, cupreus, Rossi. Very common.
,, pedator, Gr. "Caister Marrams, September, very rare" (Paget).
,, ater, Gr. Not common.
,, morio, Gr. Common.
,, compressus, Marsh. Not common; Norwich; Hunstanton (Fowler).

Philonthus intermedius, Boisd. } Not very common.
,, laminatus, Crentz. }
,, æneus, Rossi. Abundant.
,, decorus, Gr. Somewhat scarce.
,, politus, Fab. Common.
,, lucens, Mann. Very rare; a specimen found running on the road at Kirby Bedon in April, 1876.
,, umbratilis, Gr. East Rudham (Wood).
,, marginatus, Fab. Rare; Mousehold Heath.
,, varius, Gyll. Common.
,, sordidus, Gr. } Very common.
,, fimetarius, Gr. }
,, cephalotes, Gr. Scarce.
,, ebeninus, Er. Rather common.
,, sanguinolentus, Gr. Local.
,, bipustulatus, Panz. } Rather common.
,, scybalarius, Nord. }
,, varians, Payk. Common.
,, agilis, Gr. In Moss, Ringland, September, 1876.
,, debilis, Gr. Not uncommon.
,, discoideus, Gr. Norwich; Cromer; Aylsham (Wood).
,, vernalis, Gr. Hunstanton (Blatch).
,, quisquiliarius, Gyll., var. dimidiatus, Er. Meadows near Thorpe Station, May, 1876.
,, fumarius, Gr. Arminghall, October, 1876; East Rudham (Wood).
,, nigrita, Nord. Ringland, September, 1876.

PHILONTHUS MICANS, Gr. Common in marshy places.

,, FULVIPES, Fab., var. RUBRIPENNIS, Steph. Found near Norwich, and on the coast of Norfolk by the Rev. T. Skrimshire, in company with *Bledidius tricornis* (Stephens).

,, TROSSULUS, Nord. Very common.

CAFIUS XANTHOLOMA, Gr. Common under sea-weed on the coast.

ACTOBIUS CINERASCENS, Gr. Arminghall, October, 1876.

XANTHOLINUS GLABRATUS, Gr.
,, PUNCTULATUS, Payk.
,, OCHRACEUS, Gyll. } Common.

,, TRICOLOR, Fab. Hunstanton (Fowler); Cromer (Wood).

,, LONGIVENTRIS, Heer.
,, LINEARIS, Ol. } Very common.

,, FULGIDUS, Fab. Occurs sparingly.

LEPTACINUS BATYCHRUS, Gyll. Cromer (Wood).

,, LINEARIS, Gr. Common.

OTHIUS FULVIPENNIS, Fab. Scarce.

,, LÆVIUSCULUS, Steph.
,, MELANOCEPHALUS. } Common.

,, MYRMECOPHILUS, Kies. Dunston Common, September, 1874.

LATHROBIUM BRUNNIPES, Fab. Common.

,, ELONGATUM, Linn. Ranworth, October, 1888.

,, FULVIPENNE, Gyll. Common.

,, RUFIPENNE, Gyll. Very rare; Horning (Fowler).

,, MULTIPUNCTUM, Gr. Postwick Grove, September, 1874.

,, QUADRATUM, Payk. Waxham (Champion).

,, TERMINATUM, Gr. Common.

ACHENIUM HUMILE, Nic. One specimen in flood refuse at Salthouse, October, 1890.

STILICUS RUFIPES, Germ. Common.

,, AFFINIS, Er. Common.

,, ORBICULATUS, Payk. Hellesdon, April, 1879.

LITHOCHARIS OCHRACEA, Gr. Common.

,, MELANOCEPHALA, Fab. Very common.

,, PROPINQUA, Bris. Common.

SUNIUS DIVERSUS, Aub. Ranworth, October, 1888.

,, ANGUSTATUS, Payk. Common in haystack refuse, &c.

PÆDERUS LITTORALIS, Gr. Common.

,, RIPARIUS, Linn. Waxham (Champion).

EVÆSTETHUS SCABER, Grav. "Found in Norfolk by Mr. Denny" (Stephens).

STENUS BIMACULATUS, Gyll. } Common.
,, JUNO, Fab. }

,, LONGITARSIS, Thoms. Trowse, in flood refuse, February, 1877.

,, INCRASSATUS, Er. Waxham (Champion); Aylsham, East Rudham (Wood).

,, BUPHTHALMUS, Gr. Common.

,, MELANARIUS, Steph. Rare; Horning (Fowler).

,, MELANOPUS, Marsh. Norfolk Fens (Rye).

,, CANALICULATUS, Gyll. Aylsham, East Rudham (Wood).

,, NITENS, Steph. Horning (Crotch); Waxham (Champion).

,, PUSILLUS, Steph. } Common.
,, SPECULATOR, Lac. }

,, PROVIDUS, Er., var. ROGERI, Kr. Much less common than the preceding.

,, LUSTRATOR, Er. Waxham (Champion).

,, PRODITOR, Er. Horning, rare (Crotch).

,, CARBONARIUS, Gyll. Horning, Ranworth (Crotch); East Rudham (Wood).

,, ARGUS, Gr. Horning (Crotch).

,, VAFELLUS, Er. Horning (Crotch); Waxham (Champion).

,, FUSCIPES, Gr. Horning (Crotch).

,, OPTICUS, Gr. Horning and Ranworth, by sweeping in the dark late at night (Crotch); Potter Heigham, one example (Wood).

,, NIGRITULUS, Gyll. Horning (Crotch).

,, BRUNNIPES, Steph. Very common.

,, BINOTATUS, Ljung. Stratton Strawless; Trowse, in flood refuse, February, 1877; Horning (Crotch); Aylsham (Wood).

,, PUBESCENS, Steph. Common.

,, PALLITARSIS, Steph. Common.

,, BIFOVEOLATUS, Gyll. Stratton Strawless; Thorpe Hamlet; Waxham (Champion); Aylsham (Wood).

,, PICIPES, Steph. Common.

Stenus nitidiusculus, Steph. Somewhat common.
,, ossium, Steph. Common.
,, palustris, Er. Horning (Fowler).
,, impressus, Germ. Common.
,, erosus, Er. (annulatus, Crotch). Hunstanton (Fowler).
,, erichsoni, Rye. Aylsham (Wood).
,, flavipes, Steph. Very common.
,, cicindeloides, Gr. Common.
,, solutus, Er. Horning (Fowler).
,, similis, Herbst.
,, tarsalis, Ljung. } Common.
,, paganus, Er. Ringland; Waxham (Champion); East Rudham (Wood).
,, latifrons, Er. Common.
,, fornicatus, Steph. Stratton Strawless; Horning (Fowler); Waxham (Champion).
Oxyporus rufus, Linn. In Agaries in summer; not uncommon.
Bledius taurus, Germ. Salthouse, October, 1890, two specimens in flood refuse; Wells, &c. (Fowler).
,, tricornis, Herbst. Salthouse, July, 1840 (Browne); Hunstanton (Fowler).
,, unicornis, Germ. Hunstanton (Fowler).
,, subterraneus, Er. Cromer (Fowler).
,, fracticornis, Payk. Norwich.
,, opacus, Block. Hunstanton (Fowler).
,, atricapillus, Germ. Wells (Fowler); Waxham (Champion).
Platystethus arenarius, Fourc. Common.
,, cornutus, Gr. One specimen ex. coll. Dossetor.
Oxytelus rugosus, Fab. Common.
,, laqueatus, Marsh. Common.
,, sculptus, Gr.
,, sculpturatus, Gr.
,, inustus, Gr.
,, nitidulus, Gr.
,, complanatus, Er. } Common.
,, tetracarinatus, Block.
Haploderus cælatus, Gr.
Trogophlœus bilineatus, Steph.
,, elongatulus, Er.

Trogophilæus fuliginosus, Gr. Norfolk (Fowler).
,, pusillus, Gr.
Coprophilus striatulus, Fab.
Lesteva longælytrata, Goez. } Common.
,, punctata, Er. Common; Trowse, in flood refuse; Waxham (Champion).
Acidota crenata, Fab. Norwich, rare; one specimen taken casually in 1889.
Olophrum piceum, Gyll. Common.
Lathrimæum atrocephalum, Gyll. Much less common than the next species.
,, unicolor, Steph. Common.
Philorinum sordidum. Steph. East Rudham (Wood).
Omalium rivulare, Payk. Common.
,, læviusculum, Gyll. Common under seaweed on the coast.
,, riparium, Thoms.
,, excavatum, Steph.
,, cæsum, Gr. } Common.
,, planum, Payk. Norfolk (Fowler).
,, pusillum, Gr. Common.
,, deplanatum, Gyll. Norfolk (Fowler).
,, concinnum, Marsh.
,, vile, Er. } Common.
,, rufipes, Foure.
,, striatum, Gr. } Norfolk (Fowler).
Anthobium minutum, Fab.
,, ophthalmicum, Payk.
,, torquatum, Marsh } Common.
Proteinus ovalis, Steph.
,, brachypterus, Fab. } Common.
,, atomarius, Er. Hunstanton (Fowler).
Megarthrus depressus, Payk
,, sinuatocollis, Lac. } Common.
,, denticollis, Beek. Thorpe, Sept., 1876.
,, hemipterus, Ill. Norfolk (Fowler).
Phlæobium clypeatum, Müll. Not uncommon in Fungi.
Prognatha quadricorne, Kirby. Stephen writing in 1834, says, "About ten years since a pair were taken by Mr. Denny in Norfolk."

Micropeplus porcatus, Payk. Local (Burrell).

,, staphylinoides, Marsh. (Burrell). As the differences between this species and the next were not well known in Britain previous to 1861, it is possible that Burrell's record may refer to the next species.

,, margaritæ, Duv. Ringland, one specimen in Moss, April, 1877.

Pselaphidæ

Bryaxis sanguinea, Fab. Occurs sparingly in marshy places. Waxham (Champion); Congham (Wood).

,, fossulata, Reich. Common. The rare var. *rufescens* is recorded by Denny, *l.c.* p. 38.

,, helferi, Schmdt. Weybourne; at roots of grass on the sea wall, August, 1888, and in profusion in tidal refuse, in October, 1890.

,, hæmatica, Reich. } Common.
,, juncorum, Leach. }

,, impressa, Panz. Horning, May, 1889. Congham (Wood).

Pselaphus heisei, Hbst. According to Denny, commoner in this County than the next species.

,, dresdensis, Hbst. Very rare. One specimen taken by sweeping water-plants in a pit by the roadside at Horsford Heath, 17th August, 1886. Loddon, Woodbastwick (Denny).

Tychus niger, Payk. Common.

Bythinus punctipollis, Den. Horning, 1822 (Denny).

,, validus, Aubé. This is the insect referred to by Denny as the female of the last species.

,, bulbifer, Reich. Locally abundant.

,, curtisi, Leach. Scarce.

,, burrelli, Den. Discovered by Burrell near Letheringsett, in April, 1824; the species is rare in Britain.

Euplectus nanus, Reich. South Creake (Skrimshire).

,, sanguineus, Den. Moderately common.

,, karsteni, Reich. South Creake (Skrimshire).

,, ambiguus, Reich. Horning, Woodbastwick (Denny).

Trimium brevicorne, Reich. Denny says that Burrell, Sparshall, and himself each had a specimen of this species, and it is probable that all were taken in the County. The insect is extremely local in Britain.

Scydmænidæ.

Eumicrus tarsatus, Müll. Moderately common.

Scydmænus scutellaris, Müll. } Common.
,, collaris, Müll. }

,, exilis, Er. (bicolor, Den). Norwich (Fowler).

,, angulatus, Müll. } Moderately common.
,, elongatulus, Müll. }

,, sparshalli, Den. Discovered by Sparshall in Arminghall Wood, in November, 1823.

,, denticornis, Müll. Under the name of *ruficornis*, which is the female of this species, Denny records the capture of a pair near Loddon, in April, 1824.

,, hirticollis, Ill. Horning (Fowler).

,, fimetarius, Th. Moderately common.

Cephennium thoracicum, Müll. Not common. First discovered in Britain by Simon Wilkin, in Cossey Park.

Scaphidiidæ.

Scaphidium 4-maculatum, Ol. "Sub. cortice. Captus a Dom. J. Hooker" (Burrell).

Scaphisoma agaricinum, Ol. Foxley Wood, August, 1888.

,, boleti, Panz. Hunstanton (Fowler).

Trichopterygidæ.

Nossidium pilosellum, Marsh. Hunstanton (Blatch).

Ptenidium kraatzi, Mat. Dunston Common, July, 1883.

,, evanescens, Marsh. Common.

,, atomaroides, Mots. Brandon (Fowler).

,, nitidum, Heer. Common.

Ptilium foveolatum, All. } Locally common.
,, exaratum, All. }

,, marginatum, Aub. Norfolk fens, 1868 (Matthews and Crotch).

NEPHANES TITAN, Neurn. Locally common.

SMICRUS FILICORNIS, Fair. Hunstanton, one specimen on a window, August, 1879 (Fowler). Denton, near Harleston, one specimen (Cruttwell).

TRICHOPTERYX GUERINI, All. Hunstanton, one specimen on a window, August, 1879 (Fowler).

,, MONTANDONI, All. Hunstanton (Fowler).

,, LONGULA, Mat. Not uncommon.

,, KIRBYI, Mat. Three examples taken under Sedge refuse at Ranworth, in April, 1863, by the Rev. A. Matthews, are the only specimens at present known.

,, BOVINA, Mots. } Moderately common.
,, SERICANS, Heer }
,, FASCICULARIS, Hbst. }

,, LATA, Mots. } Common.
,, GRANDICOLLIS, Man. }
,, ATOMARIA, De G. }

PTINELLA DENTICOLLIS, Fair Rather common.

CORYLOPHIDÆ.

ORTHOPERUS KLUKI, Somewhat uncommon.

,, ATOMUS, Gyll. Common.

SERICODERUS LATERALIS, Gyll. In vegetable refuse; local.

CLAMBIDÆ.

CLAMBUS MINUTUS, Sturm. Horning (Fowler).

,, ARMADILLO, De G. Common in vegetable refuse.

SILPHIDÆ.

AGATHIDIUM LEVIGATUM, Er. Dunston Common.

,, ATRUM, Payk. Captured in a Boletus, growing on a fir, in Thorpe Wood, near Norwich, in April, 1803, by the Rev. W. Kirby (Stephens).

,, SEMINULUM, L. Widely distributed; the only common species with us.

,, MARGINATUM, Sturm. Norfolk fens (Fowler).

LIODES HUMERALIS, Fab. Stratton Strawless.

,, ORBICULARIS, Hbst. Ringland, June, 1877.

Acaricophacus cephalotes, Schmdt. Ringland, September, 1876.

Cyrtusa minuta, Ahr. Postwick Grove, June, 1875.

Anisotoma rugosa, Steph. Writing of his *Liodes armata*, which is synonymous with this species, Stephen says, "Mousehold Heath, near Norwich, the late M. J. Griffin, Esq., from whose collection I obtained my specimen."

,, dubia, Kug. Stratton Strawless, September, 1877. Waxham (Champion).

,, scita, Er. One specimen taken near Hunstanton, by Canon Fowler, was somewhat doubtfully referred to this species by Mr. Rye.

,, curta, Fair. Very rare. One example taken near Norwich, by the Rev. J. Landy Brown.

,, calcarata, Er. Common.

,, badia, Sturm. Mousehold Heath, August, 1875.

Hydnobius punctatissimus, Steph. Weybourne, October, 1888, one example.

Colon brunneum, Lah. Stratton Strawless, September, 1875.

Choleva angustata, Fab. Not common.

,, cisteloides, Fröh. Rather common.

,, agilis, Ill. Mousehold Heath, October, 1884.

,, fusca, Panz. Moderately common.

,, nigricans, Spence. One specimen, ex. coll. Dossetor.

,, coracina, Kell. Brooke, October, 1888.

,, tristis, Panz. Common.

,, grandicollis, Er. Brandon, September, 1888.

,, kirbyi, Spence. Norwich, local.

,, chrysomeloides, Panz.
,, watsoni, Spence
,, fumata, Spence
,, velox, Spence
} Common.

,, wilkini, Spence. Thorpe, August, 1875.

,, anisotomoides, Spence. Widely distributed, but not common.

,, sericea, Panz. Very common.

Necrophorus germanicus, L. Mousehold heath (Stephens); "The fine male figured *** was taken many years back, in Norfolk, by the Rev. J. Burrell" (Curtis).

Necrophorus humator, Fab. Common.
,, vestigator, Hers. Common.
,, interruptus, Steph. Rare; Norwich. Hunstanton (Fowler).
,, ruspator, Er. } Common.
,, mortuorum, Fab. }
,, vespillo, Linn. }
Silpha littoralis, Linn. Local.
,, thoracica, Linn. Ringland, on one occasion only.
,, rugosa, Linn. Common.
,, dispar, Hbst. "Captured, I believe, in Norfolk" (Stephens).
,, sinuata, Fab. Very common.
,, opaca, Linn. "May under stones in sandy places, Norfolk, and in flowers of the mountain-ash, Rev. J. Burrell" (Curtis).
,, reticulata, Fab. Norfolk (Stephens). "Cum priore (*i.e.*, obscura). Frequens in cretaceis" (Burrell).
,, quadripunctata, Linn. "In quercûs foliis. In cadaveribus infrequentissime. Maio. Hyemat sub muscis" (Burrell).
,, tristis, Ill. "In cretaceis" (Burrell).
,, obscura, Linn. "In cadaveribus" (Burrell). "About Burgh Castle, uncommon" (Paget).
,, lævigata, Fab. "Frequens in viis" (Burrell).
,, atrata, Linn. Common.

Histeridæ.

Hister cadaverinus, E.H. } Common.
,, unicolor, Linn. }
,, merdarius, E.H. Norwich, one example; Aylsham (Fowler).
,, neglectus, Germ. Framingham Earl, May, 1882.
,, carbonarius, E.H. Common.
,, purpurascens, Hbst. Moderately common.
,, stercorarius, E.H. Norfolk (Stephens).
,, 12-striatus, Schr. Thorpe Hamlet, April, 1876.
,, bimaculatus, Linn. Moderately common.
Carcinops minima, Aub. Local, and not common.

Dendrophilus punctatus, Hbst. "Norwich, by the late J. Hooker, Esq." (Stephens).

,, pygmæus, Linn. Norfolk (Fowler).

Myrmetes piceus, Payk. Norwich (Fowler); "In Boleto, infrequentissime" (Burrell).

Gnathoncus rotundatus, Ill. One specimen given to me by Mr. Frank Norgate; Cromer, 1889, several under the remains of a dead fowl, and with them one specimen possibly referable to *G. punctulatus*, Th. (J. J. Walker).

,, punctulatus, Th. A single example ex. coll. Dossetor.

Saprinus nitidulus, Payk. Common.

,, æneus, Fab. Thorpe Hamlet, May, 1875; Waxham (Champion).

,, immundus, Gyll. Hunstanton (Fowler).

,, virescens, Payk. Norwich (Fowler); Fornectt (Brown).

,, rugifrons, Payk. Yarmouth, Hunstanton (Fowler); Waxham (Champion).

,, metallicus, Hbst. }
,, maritimus, Steph. } Not uncommon on the coast.

Teretrius picipes, Fab. "Near Norwich by Mr. Paul" (Stephens); Paul lived at Starston Hall.

Onthophilus sulcatus, Fab. Mousehold Heath, one in October, 1883, and one in October, 1884. "The first specimen, I believe, that was discovered in Britain of this rare insect was found by myself in a gravel pit on Great Witchingham Heath, Norfolk, the 24th August, 1810; from the number of specimens which Dr. Leach possessed, it must have subsequently been taken in plenty; it is stated to inhabit dung and putrid carcases in the spring" (Curtis). Burrell, however, says that he once took it in April under a piece of wood lying on the ground. Roudham Heath, May, 1893 (Thouless).

,, striatus, Fab. Norwich, one specimen from vegetable refuse. Not uncommon in June and July in the dung of horses on the marshes of Norfolk" (Curtis).

Abræus globosus, E.H. "Sub lapidibus infrequentissime" (Burrell).

Acritus minutus, Payk. Rather common.

Phalacridæ.

Phalacrus corruscus, Payk. Common.
,, substriatus, Gyll. Hunstanton (Fowler).
,, caricis, Sturm. Locally common.

Olibrus corticalis, Panz. Not uncommon under bark of Beech; also by sweeping.
,, æneus, Fab. Not common.
,, millefolii, Payk. Brandon, Horning (Fowler).
,, pygmæus, Sturm. Horning, Cromer (Fowler).

Stilbus consimilis, Marsh. Common.
,, oblongus, Er. Horning (Fowler).

Nitidulidæ.

Cercus pedicularius, Linn.
,, bipustulatus, Payk.
,, rufilabris, Latr.
} Locally common in marshy places.

Brachypterus gravidus, Ill.
,, pubescens, Er.
,, urticæ, Fab.
} Common.

Epuræa decemguttata, Fab. Rare; Eaton.
,, æstiva, Linn. Common.
,, deleta, Er.
,, pusilla, Hbst.
,, florea, Er.
} Common.
,, limbata, Fab. Ringland, September, 1875; Hunstanton (Fowler).

Nitidula bipustulata, Linn. Common.
,, rufipes, Linn. Norfolk (Stephens).
,, quadripustulata, Fab. Ringland, June, 1877; Hunstanton (Fowler).

Soronia grisea, Linn.
Omosita colon, Linn.
,, discoidea, Fab.
} Common.

Pria dulcamaræ, Ill. Very local.

MELIGETHES RUFIPES, Gyll.
,, LUMBARIS, Sturm.
,, ÆNEUS, Fab.
,, VIRIDESCENS, Fab.
} Common.

,, CORACINUS, Sturm. Ringland, September, 1876; Hunstanton (Blatch).
,, FULVIPES, Bris. Hunstanton, September, 1874.
,, DIFFICILIS, Heer. Locally common.
,, MEMNONIUS, Er.
,, BRUNNICORNIS, Sturm.
} Not uncommon.

,, BIDENS, Bris. Whitlingham, June, 1875.
,, SERRIPES, Gyll. Brandon, Cromer (Fowler).
,, MURINUS, Er. Locally common on Echium.
,, PICIPES, Sturm. Common.

POCADIUS FERRUGINEUS, Fab. June, Fungi, Cossey Park (Curtis).

CYCHRAMUS FUNGICOLA, Heer. Sometimes common in Fungi in Autumn.

BYTURUS SAMBUCI, Scop.
,, ROSÆ, Scop.
} Common.

CRYPTARCHA STRIGATA, Fab. Cossey, April, 1874.
,, IMPERIALIS, Fab. Forncett (Brown).

IPS QUADRIPUSTULATUS, Fab. "Captus a D. T. Skrimshire sub cortice Salicis" (Burrell).
,, FERRUGINEUS, Fab. "Near Norwich, and in other parts of Norfolk" (Stephens).

RHIZOPHAGUS DEPRESSUS, Fab. Rather common.
,, CRIBRATUS, Gyll. Earlham, once only.
,, PARALLELOCOLLIS, Gyll. Waxham (Champion).
,, DISPAR, Gyll. "Sub cortice fagi, Maio et seq" (Burrell).
,, BIPUSTULATUS, Fab. Common.

COLYDIIDÆ.

SARROTRIUM CLAVICORNE, Linn. Winterton Sandhills (Wood); "North Denes, rare" (Paget); "Captus a Dom J. Hooker ad radices Lichenis canini" (Burrell).

SYNCHITA JUGLANDIS, Fab. Thetford (Crotch).

CERYLON ANGUSTATUM, Er. Stratton Strawless, June, 1884.

Cucujidæ.

Lemophlæus ferrugineus, Steph. Norwich (Fowler).
,, ater, Ol. Norfolk (Stephens).
Psammæchius bipunctatus, Fab. Widely distributed, but not common.
Silvanus surinamensis, Linn. "In some bonding warehouses, abundant in Wheat" (Paget).
Nausibius dentatus, Marsh. Norwich.

Cryptophagidæ.

Telmatophilus sparganii, Heer. Horning (Sharp and Crotch).
,, typhæ, Fall. Cromer (Fowler); Waxham (Champion).
,, caricis, Ol. Common.
,, schonherri, Gyll. Arminghall pits; Horning (Fowler).
Antherophagus nigricornis, Fab. Brandon (Fowler).
,, silaceus, Hbst. Hunstanton (Fowler).
,, pallens, Ol. Rare. Dunston Common; Ketteringham Common.
Cryptophagus lycoperdi, Hbst. Very common.
,, pilosus, Gyll. Common.
,, affinis, Sturm. Cromer (J. J. Walker).
,, cellaris, Scop. Common.
,, acutangulus, Gyll. Rather common.
,, vini, Panz. Common.
,, populi, Payk. "Near Norwich" (Stephens).
Paramecosoma melanocephalum, Hbst. Cromer (Fowler).
Atomaria barani, Bris. Moderately common.
,, nigriventris, Steph. } Common.
,, linearis, Steph. }
,, elongatula, Er. Norwich, one example, July, 1875.
,, umbrina, Gyll. Rather common.
,, fuscipes, Gyll. Aylsham (Wood).
,, pusilla, Payk. }
,, atricapilla, Steph. } Common.
,, fuscata, Sch. }
,, rhenana, Kr. Very rare. Great Yarmouth (Rye).
,, mesomelas, Hbst. Ringland, May, 1876.

ATOMARIA BASALIS, Er. Woodbastwick (Fowler); Aylsham (Wood).
,, MUNDA, Er. Not uncommon.
,, APICALIS, Er.
,, ANALIS, Er.
,, RUFICORNIS, Marsh. } Common.
EPHISTEMUS GLOBOSUS, Waltl. A few specimens ex. coll. Dossetor.

LATHRIDIIDÆ.

HYPOCOPRUS LATHRIDIOIDES, Mots. Brandon (Crotch).
MONOTOMA PICIPES, Payk. Common.
,, BREVICOLLIS, Aub. Scarce.
,, QUADRICOLLIS, Aub. Common.
,, RUFA, Redt. Locally abundant.
HOLOPARAMECUS DEPRESSUS, Curt. Norfolk (Fowler).
LATHRIDIUS LARDARIUS, Deg. Not common.
,, ANGULATUS, Man. White Horse Lane, Trowse, by beating Elm in a fence.
,, NODIFER, Westw. Common on inside walls of outhouses, &c.
,, RUFICOLLIS, Marsh. } Common.
,, TRANSVERSUS, Ol. }
,, TESTACEUS, Steph. Local; common where it occurs.
,, MINUTUS, Linn. Common.
CORTICARIA PUNCTULATA, Marsh. Rather common.
,, CRENULATA, Gyll. Common.
, FULVA, Com. Widely distributed, but scarcely common.
,, DENTICULATA, Gyll.
,, ELONGATA, Gyll.
,, GIBBOSA, Hbst. } Common.
,, FUSCULA, Man.

EROTYLIDÆ.

DACNE BIPUSTULATA, Thunb. According to Fowler, who found both species at Hunstanton, this species is rare, whilst the next is locally common; judging from my own experience, however, they are both locally common with us, and I certainly took them in company out of Fungus on an Ash tree, at Earlham, in June, 1874.

Dacne rufifrons, Fab.

Triplax russica, Linn. In flood refuse at Harford Bridges, February, 1891 (Beaumont).

Endomychidæ.

Endomychus coccineus, Linn. Taken under Willow bark by Skrimshire, according to Burrell.

Lycoperdina bovistæ, Fab. In *Lycoperdon bovista* at the end of September, and also during the winter (Burrell).

Coccinellidæ.

Hippodamia variegata, Goez. Common.

Anisosticta 19-punctata, Linn. Common in a coast marsh at Weybourne; Yarmouth (Fowler).

Adalia obliterata, Linn. Common on Fir trees.

,, bipunctata, Linn. Common, but apparently less abundant than formerly.

Coccinella decempunctata, Linn. } Common.
,, undecimpunctata, Linn. }

,, quinquepunctata, Linn. "In queren, Jun." (Burrell). Possibly there may have been some mistake about the occurrence of this northern species in our county.

,, ,, septempunctata, Linn. Common.

,, hieroglyphica, Linn. By sweeping *Erica*; rather local: Drayton, Mousehold Heath, &c.

Mysia oblongoguttata, Linn. } Locally common on Fir trees.
Halyzia ocellata, Linn. }

,, octodecimguttata, Linn. } Common.
,, 14-guttata, Linn. }

,, sedecimguttata, Linn. Rather scarce.

,, 22-punctata, Linn. Very common on Nettles, &c.

,, 14-punctata, Linn. Moderately common.

Micraspis 12-punctata, Linn. Locally common.

Chilocorus bipustulatus, Linn. Rather common under stones on Mousehold Heath.

Exochromus quadripustulatus, Linn. On Spruce Fir, Ringland, April, 1877.

Subcoccinella 24-punctata, Linn. Very local; Whitwell and Booton Commons.

Scymnus frontalis, Fab. Common.

,, suturalis, Thunb. Very common on Scotch Fir.

,, limbatus, Steph. Waxham (Champion).

,, hæmorrhoidalis, Hbst. Scarce; Bixley Wood, May, 1885.

,, capitatus, Fab. Common.

Rhizobius litura, Fab.
Coccidula rufa, Hbst. } Very common.

,, scutellata, Hbst. Horning (Fowler). I only know it from Weybourne, where I took a few examples by sweeping in October, 1888.

Mycetophagidæ.

Mycetophagus quadripustulatus, Linn. Common.

,, piceus, Fab. Norfolk (Fowler).

,, multipunctatus, Hell. Forncett (Brown); Burrell's list.

,, populi, Fab. Found in profusion in the rotten black interior of an old Elm by the late Mr. William Leedes Fox, of Harleston.

Triphyllus punctatus, Fab. Scarce; Arminghall, October, 1889; Forncett (Brown).

Typhæa fumata, Linn. Common.

Mycetæa hirta, Marsh. Not common; Mousehold Heath, May, 1883.

Dermestidæ.

Dermestes murinus, Linn. Very common.

,, undulatus, Brahm. One example in a dead bird at Blakeney Point, August, 1889.

,, lardarius, Linn. Common.

Attagenus pellio, Linn. Very common in old houses.

Tiresius serra, Fab. Burrell seems to have been well acquainted with this species, for he says: "The larva of *Serra* is a curious ferrugineus one, living under the bark of Elms and Oaks, where it may be found almost all the year, particularly in the early spring months."

Anthrenus musæorum, Linn. Common.

,, claviger, Er. On flowers of *Umbelliferæ*; not common.

Byrrhidæ.

Syncalypta hirsuta, Sharp. } Norfolk (Fowler).
,, spinosa, Rossi. }

Byrrhius pilula, Linn. }
,, fasciatus, Fab. } These three species are nearly equally common on Mousehold Heath in the
,, dorsalis, Fab. } spring.

,, murinus, Ill. Abundant in gravel pits on Mousehold Heath in 1883; sparingly in the same locality before and since that time.

Cytilus varius, Fab. Mousehold Heath; scarce. Waxham (Champion); Aylsham (Wood).

Simplocaria semistriata, Ill. Common.

Georyssidæ.

Georyssus pygmæus, Fab. Arminghall, in wet Moss, October, 1876.

Parnidæ.

Elmis æneus, Müll. Common.

,, volkmari, Panz. Scarce; Ketteringham Common.

,, cupreus, Müll. Whitwell Common.

Limnius tuberculatus, Müll. Common.

,, troglodytes, Gyll. I have taken at Colney and also at Horning, at the latter place in company with the preceding species, a *Limnius*, distinguished from *L. tuberculatus* by the straighter raised lines on the thorax, and the evidently finer discal striæ on the elytra. According to descriptions this should be *L. troglodytes* previously recorded from Slapton Ley, Devon, only.

Parnus prolifericornis, Fab. Common.

,, striatellus, Fair. St. Faith's, May, 1887; Horning and St. Faith's (Power).

,, auriculatus, Ill. Rather common.

Heteroceridæ.

Heterocerus flexuosus, Steph. Hunstanton (Fowler).

,, marginatus, Fab. Burrell's list. "Breydon banks, rare" (Paget).

,, lævigatus, Panz. Burrell's list.

Lucanidæ.

Lucanus cervus, Linn. Kirby Bedon (Wigham). It is exceedingly doubtful whether this species has ever occurred in a state of nature in this county, the foregoing record notwithstanding. One hears every now and then of the capture of a "Stag Beetle," but in all cases where I have been able to examine the specimens they have proved to belong to the next species.

Dorcus parallelopipedus, Linn. Occasionally found abundantly in rotten wood of Ash.

Sinodendron cylindricum, Linn. Burrell simply says, "Hab. cum priore," *i.e.* Dorcus; Norfolk (Wigham).

Scarabæidæ.

Onthophagus vacca, Linn. "In Musæo D. Gul. Hooker" (Burrell).

,, cænobita, Hbst. East Carlton, July, 1874. "In stercore asino" (Burrell).

,, fracticornis, Prey. Common.

,, nuchicornis, Linn. Yarmouth; Hunstanton (Fowler).

,, ovatus, Linn. Scarce; Mousehold Heath, June, 1883; Roudham Heath, May, 1893 (Thouless); "In stercore vaccino infrequentissime" (Burrell).

Aphodius erraticus, Linn.
,, subterraneus, Linn.
,, fossor, Linn.
,, hæmorrhoidalis, Linn.
,, scybalarius, Fab.
,, fœtens, Fab.
} Common.

,, fimetarius, Linn. Much less common than the preceding.

APHODIUS ATER, De G. } Common.
,, GRANARIUS, Linn. }
,, SORDIDUS, Fab. Norwich; one specimen flying to light, 1889.
,, RUFESCENS, Fab. Local; Swanton Morley; Eaton Common; Hunstanton (Fowler).
,, NITIDULUS, Fab. Local; Hunstanton, September, 1874.
,, PLAGIATUS, Linn. Norwich (Fowler).
,, INQUINATUS, Fab. Locally abundant.
,, STICTICUS, Panz. Very local.
,, PORCUS, Fab. Not common.
,, TRISTIS, Panz. Scarce; Waterworks lane, Norwich, July, 1875.
,, PUSILLUS, Hbst. Not uncommon.
,, QUADRIMACULATUS, Linn. "In stercore ovino" (Burrell); Roudham Heath, May, 1893 (Thouless).
,, MERDARIUS, Fab. } Common.
,, PRODROMUS, Brehm. }
,, PUNCTATOSULCATUS, Linn. }
,, CONTAMINATUS, Hbst. }
,, OBLITERATUS, Panz. }
,, RUFIPES, Linn. }
,, LURIDUS, Fab. }
,, DEPRESSUS, Kug. Postwick Grove, May, 1875; Horning (Wigham); Horning ("J. B." Brown).

HEPTAULACUS SUS, Hbst. Norwich (Fowler).

OXYOMUS PORCATUS, Fab. In vegetable refuse, not common.

PSAMMODIUS SULCICOLLIS, Ill. Norfolk (Fowler).

ÆGIALIA ARENARIA, Fab. Common on coast sands.

ODONTÆUS MOBILICORNIS, Fab. "Tres vel quatuor cepi volantes" (Burrell); Mousehold Heath (Sparshall *fide* Curtis).

GEOTRUPES TYPHŒUS, Linn. Sandy places, not common; Mousehold and Wretham Heaths.

,, STERCORARIUS, Linn. } Very abundant.
,, SPINIGER, Marsh. }
,, MUTATOR, Marsh. Rather scarce.
,, SYLVATICUS, Panz. Common.

TROX SABULOSUS, Linn. "Bis cepi in septi postis fraxineos" (Burrell).

Trox scaber, Linn. Taken by Mr. Thouless, flying, in the evening, in St. Martin's Lane, Norwich; Brandon (Fowler); "Captus a D. Deere qui misit ad Gul. Hooker" (Burrell).

Hoplia philanthus, Sulz. Forncett (Brown); "In floribus" (Burrell, who treats the species under the names of *Scarabæus argenteus* and *pulverulentus*, and quotes the opinion of his friend, the Rev. T. Skrimshire, that the two latter were the sexes of the same species). "Very uncommon" (Paget).

Homaloplia ruricola, Fab. Norfolk (Stephens); Roudham Heath, May, 1893 (Thouless).

Serica brunnea, Linn. Not uncommon.

Melolontha vulgaris, Fab. Common.

Rhizotrogus solstitialis, Linn. Very abundant.

Phyllopertha horticola, Linn. Sometimes very abundant.

Anomala Frischii, Fab. Coast sands, common; also occurs at Brandon. I took a specimen of the rare unicolorous green variety at Yarmouth, in July, 1879.

Cetonia aurata, Linn. In my early collecting days I used to take this species, commonly, on the flowers of Mountain Ash, in the Norwich district, but it is now many years since I saw a living specimen.

Gnorimus nobilis, Linn. Mr. Thouless has a specimen taken in the Norwich market-place, whither it may have been conveyed from the country on flowers or other garden produce.

Buprestidæ.

Agrilus viridis, Linn. "In Betula alba" (Burrell).

„ angustulus, Ill. Scarce; Hethersett; Howe Grove; Horsford; Booton Common (Thouless). It is very probable that Burrell's *viridis* was really this species.

Trachys minuta, Linn. Poringland (Wigham).

„ troglodytes, Gyll. St. Faith's (Power). It is probable that the *Buprestis pygmæa* of Burrell's list, which William Hooker took on *Menyanthes*, was this species.

Eucnemidæ.

Throscus dermestoides, Linn. Occasionally found by sweeping.

Microrhagus pygmæus, Fab. "A single specimen is in the collection of N. A. Vigors, Esq., who obtained it from that of Mr. Wilkin; I believe it was found in Norfolk" (Stephens).

Elateridæ.

Lacon murinus, Linn. Not generally common.

Elater balteatus, Linn. On Oaks, in July, and under fragments of wood, in March (Burrell).

Megapenthes sanguinicollis, Panz. Norfolk (Stephens).

Cryptohypnus riparius, Fab. Common at roots of Grass, in marshy places, Brundall, &c.

,, quadripustulatus, Fab. "In Mus. Dom. J. Hooker" (Burrell).

Cardiophorus asellus, Er. Rare, one example ex. coll. Dossetor.

,, ruficollis, Linn. "Hab. in quercu. Captus a Dom. T. Skrimshire" (Burrell).

,, thoracicus, Er. "In Musæo Dom. Hooker" (Burrell).

Melanotus rufipes, Hbst. Not uncommon.

Limonius cylindricus, Payk. Rare; I have taken two specimens at Brandon, at different times.

,, minutus, Linn. Widely distributed, but not common.

Athous niger, Linn. Common.

,, hæmorrhoidalis, Fab. Very common.

,, vittatus, Fab. Taken by J. Hooker at Sprowston, according to Burrell.

,, longicollis, Fab. Norfolk (Stephens.)

Corymbites cupreus, Fab. "Mousehold Heath, Norwich, W. C. Hewitson" (Stephens).

,, castaneus, Linn. Writing in 1830, Stephens says: "I believe that hitherto a single elytron only, of this insect, has been found in Britain, and that was picked up by the late W. Hooker, Esq, on Mousehold Heath, near Norwich."

Corymbites tessellatus, Linn. Horning (Wigham, Fowler); Cringleford (Brown); Waxham (Champion).

,, quercus, Gyll. Drayton (Thouless).

,, holosericeus, Fab. Mousehold Heath; rare. Congham (Wood). Not uncommon at Yarmouth in spring (Thouless).

,, æneus, Linn. Mousehold Heath; very common under stones, in the spring and early summer of 1883, but scarcely seen since that time.

,, metallicus, Payk. Foxley Wood, one example (Thouless).

,, bipustulatus, Linn. One beaten from Nettle (Burrell).

Agriotes sputator, Linn. Very abundant.

,, lineatus, Linn. Not generally common.

,, obscurus, Linn. Very common.

,, sobrinus, Kies. } Common.
,, pallidulus, Ill. }

Dolopius marginatus, Linn. } Widely distributed, and rather
Adrastus limbatus, Fab. } common.

Campylus linearis, Linn. Not uncommon by sweeping.

Dascillidæ.

Dascillus cervinus, Linn. "In aquaticis. Jun." (Burrell).

Helodes minuta, Linn. } Common.
,, livida, Fab. }

Cyphon coarctatus, Payk. I have but one specimen, which I took at Wacton, in August, 1883.

,, nitidulus, Th. } Very abundant.
,, variabilis, Thunb. }

,, pallidulus, Boh. Framingham Pigot, May, 1876.

,, padi, Linn. Common by beating and sweeping in marshy places; Horning, &c.

Scirtes hemisphæricus, Linn. Locally common by sweeping in marshy places.

,, orbicularis, Panz. Usually rare, but occurred rather freely at Brundall, in July, 1885.

TELEPHORIDÆ.

EROS MINUTUS, Fab. Norfolk (Stephens).

LAMPYRIS NOCTILUCA, Linn. Locally abundant; the males sometimes swarm in the evening about the lamps at the Brundall railway station.

TELEPHORUS FUSCUS, Linn. Rather local.

,, RUSTICUS, Fab.
,, LIVIDUS, Linn. } Common.

,, LITURATUS, Fab. Scarce; Hellesdon, July, 1887; Marston, May, 1887; Waxham (Champion).

,, FIGURATUS, Mann. Horning; somewhat common.

,, PELLUCIDUS, Fab.
,, NIGRICANS, Müll. } Common.

,, ,, var. DISCOIDEUS, Steph. Rare; I have a specimen from the Sparham district given to me by Mr. F. Norgate; Eaton (Brown).

,, BICOLOR, Fab. Common.

,, HÆMORRHOIDALIS, Fab. Local; my specimens are from Ketteringham.

,, LATERALIS, Linn. Not common; Howe Grove; Cley East Bank; Waxham (Champion).

,, THORACICUS, Gyll. Local, and not common; Ranworth; Poringland, Eaton Common; Aylsham (Wood).

,, FLAVILABRIS, Fall. Rare; Cley, July, 1887; Horning (Brown); Waxham (Champion).

,, FUSCICORNIS, Ol. Horning, July 2nd, 1835 (Brown). I have seen no recent specimens.

,, FULVUS, Scop. Very common.

,, TESTACEUS, Linn.
,, LIMBATUS, Th.
,, PALLIDUS, Fab. } Common.

SILIS RUFICOLLIS, Fab. Marshes in the Broad district; not uncommon; Brandon (Fowler).

MALTHINUS FASCIATUS, Fall. Scarce; Dunston, Cossey; Hunstanton (Fowler).

,, BALTEATUS, Suff. Rare; Dunston; Hunstanton (Fowler).

,, FRONTALIS, Marsh. Rare; Hethersett, August, 1879; Hunstanton (Fowler).

Malthinus punctatus, Fourc. } Common.
Malthodes marginatus, Latr. }

„ dispar, Germ. Rather common.

„ flavoguttatus, Kies. Aylsham (Wood).

„ sanguinolentus, Fall. Common.

„ nigellus, Kies. Rare; one specimen ex. coll. Dossetor.

Malachius æneus, Linn. Burrell's list; Long Stratton (Brown).

„ bipustulatus, Linn. Common.

„ marginellus, Ol. Norfolk (Stephens).

„ ruficollis, Ol. Dunston Common (Thouless); Horning (Brown); Brandon (Fowler).

Anthocomus sanguinolentus, Fab. Occasionally not uncommon at Horning. "Oby turf meadow, July, scarce" (Paget).

„ fasciatus, Linn. Widely distributed, but not common.

„ terminatus, Men. Rare; Horning, June, 1889. Ranworth; Horning, May, 1893 (Thouless).

Dasytes plumbeus, Müll. } Common.
„ plumbeo-niger, Gocz. }

Dolichosoma nobile, Ill. One example ex. coll. Dossetor, and one from Harford Bridges (Thouless). This record extends the recorded range of the species northward in England.

Cleridæ.

Clerus formicarius, Linn. Twice taken in April (Burrell).

„ apiarius, Linn. Norfolk (Stephens).

Corynetes cæruleus, De G. Widely distributed, but not common.

„ ruficollis, Fab. Locally abundant.

„ violaceus, Linn. Somewhat common.

Anobiidæ.

Hedobia imperialis, Linn. Occurs sparingly in old hedges.

Ptinus germanus, Fab. Norfolk (Fowler).

„ lichenum, Marsh. Locally common.

„ fur, Linn. Very abundant.

Niptus hololeucus, Fald. Common in old houses.

Dryophilus pusillus, Gyll. Scarce; Earlham; Foxley Wood; Ringstead Downs; Brandon (Fowler).

Priobium castaneum, Fab. Rather common.

Anobium domesticum, Fourc. Very common.

„ paniceum, Linn. "Sometimes in abundance" (Paget).

Xestobium tessellatum, Fab. Not uncommon in old houses.

Ernobius mollis, Linn. One specimen under bark of a larch post at Thorpe, June, 1874.

Ptilinus pectinicornis, Linn. Locally abundant; Swardeston Common in an old post; Yarmouth, common in some houses (Paget).

Ochina hederæ, Müll. Not uncommon.

Dorcatoma chrysomelina, Sturm. Denton (Cruttwell).

Cænocara bovistæ, Hoff. Norwich; Horning; Ashwicken (Power).

Bostrychus capucinus, Linn. "One specimen on the coast of Norfolk, near Cromer" (Stephens).

Lyctus canaliculatus, Fab. Very local; Earlham, July, 1885; Wroxham (Fowler).

Cissidæ.

Cis boleti, Scop. Very abundant.

„ nitidus, Herbst. One example given to me by Mr. F. Norgate.

Octotemnus glabriculus, Gyll. Common.

Tenebrionidæ.

Blaps mucronata, Latr. Very common in old houses.

Crypticus quisquilius, Linn. Sandy places on the coast, common: also at Brandon.

Heliopathes gibbus, Fab. Sandy coasts; Yarmouth, &c.

Microzoum tibiale, Fab. Sandy places on the coast, common; also at Brandon.

Phaleria cadaverina. Locally common on coast sands; at roots of Grass, &c.; Yarmouth; Hunstanton (Fowler).

Heledona agricola, Hbst. In Boleti on Oaks, &c.; very local; Norfolk (Fowler).

Scaphidema æneum, Payk. Rare. Two specimens under stones at Arminghall.

Tribolium ferrugineum, Fab. Norfolk (Fowler). Occurs in flour, &c.

Gnathocerus cornutus, Fab. Norwich (Fowler). Also occurs in flour, &c. about bakers' shops and mills.

Hypophilæus bicolor, Ol. Very local; Norfolk (Fowler).

Tenebrio obscurus, Fab. I have seen no recent specimens of this species, although it doubtless still occurs.

,, molitor, Linn. Very common. The larvæ of this species and the preceding are the well-known "Meal-worms."

Helops cæruleus, Linn. Lower Close (Wigham). Has been occasionally found about the Lower Close from the days of Wigham to the present time. Its larva lives in rotten wood. Yarmouth, rare (Paget).

,, striatus, Fourc. One specimen from Mr. F. Norgate; Horsford, two specimens at the roots of a Fir stump (Thouless).

Cistela luperus, Hbst. By hedgerow sweeping; not uncommon.

,, murina, Linn. Very common.

,, atra, Fab. Rare; Norwich (Fowler). It is found on the trunks of Willows, &c. at night.

Cteniopus sulphureus, Linn. Common by hedgerow sweeping.

Pythidæ.

Salpingus æratus, Muls. One example taken by myself in the Norwich district.

,, castaneus, Panz. Stratton Strawless, &c.; not uncommon on dead Fir branches.

Rhinosimus ruficollis, Linn.
,, viridipennis, Steph.
,, planirostris, Fab.

Under bark, especially of Holly, and by sweeping. The three species are about equally common with us.

Melandryidæ.

Tetratoma fungorum, Fab. Whitlingham (Wigham); Forncett (Brown). Occurs under bark, in rotten wood, &c.

,, desmaresti, Latr. Taken by Mr. W. Leedes Fox, probably in the Harleston district.

Orchesia micans, Panz. Forncett; Broome (Brown).

Hallomenus humeralis, Panz. I once found this rare species in a railway sleeper fence at Lakenham.

Melandrya caraboides, Linn. "Sub cortice Fraxini" (Burrell); Yarmouth, rare (Paget).

Conopalpus testaceus, Ol. Rare; Dunston Common, July, 1883.

Lagriidæ.

Lagria hirta, Linn. Common by sweeping in hedgerows.

Pedilidæ.

Xylophilus boleti, Marsh. Rare; one specimen beaten from Sallow in a marsh by the Back River, August, 1885.

„ pygmæus, De G. Rare; Dunston Common, on Oak.

Anthicidæ.

Notoxus monoceros, Linn. Very abundant in dry places.

Anthicus floralis, Linn. Common in haystack refuse, &c.

„ antherinus, Linn. Yarmouth (Thouless).

Pyrochroidæ.

Pyrochroa serraticornis, Scop. Common about pathways, &c., especially in early summer.

Mordellidæ.

Mordellistena brunnea, Fab. Scarce; Hellesdon, July, 1877; Bircham Newton (Fowler).

„ pumila, Gyll. By sweeping flowers, Horning: Aylsham (Wood).

„ inæqualis, Muls. Rare; one specimen taken at Hellesdon in company with *M. brunnea*.

Anaspis frontalis, Linn. }
„ forcipata, Muls. } Common.

„ fasciata, Först. Rather common.

„ ruficollis, Fab. Common on flowers of Whitethorn.

„ subtestacea, Steph. Moderately common.

„ melanopa, Forst. Very common.

Rhipidophoridæ.

Metœcus paradoxus, Linn. Burrell's list; Cossey (Wigham).

Cantharidæ.

Meloe proscarabeus, Linn. Common in spring.

,, violaceus, Marsh. Reepham (Thouless).

Cantharis vesicatoria, Linn. In November, 1877, Mr. Laddiman showed me a specimen of this species which was taken in the summer of that year in a garden on the Dereham Road; this specimen he afterwards gave to Mr. Dossetor, but it was not in the latter's collection when it came into my possession shortly after his death. It was once taken by William Hooker, and once by Skrimshire, according to Burrell.

Œdemeridæ.

Œdemera nobilis, Scop. Rare; Postwick (Dossetor).

,, lurida, Marsh. Rather local.

Oncomera femorata, Fab. "Captus a Dom. Roberto Paul ad Starston" (Burrell).

Ischnomera cærulea, Linn. Eaton; Kirby (Brown); Yarmouth, very common (Paget).

Nacerdes melanura, Linn. Household Heath, not uncommon; its occurrence there is very curious, for its recorded habitat is old posts and timber on the seashore, and near the mouths of large rivers. "On the Quay, July, common (Paget).

Curculionidæ.

Otiorhynchus raucus, Fab. Cromer (Fowler).

,, scabrosus, Marsh. Not uncommon by sweeping.

,, picipes, Fab. Very common.

,, sulcatus, Fab. Common; sometimes quite a pest in greenhouses and vineries.

,, ligustici, Linn. "Semel cepi in viâ" (Burrell).

,, ovatus, Linn. Common.

Otiorhynchus muscorum, Bris. One example in Moss, at Hellesdon, April, 1879.

Cœnopsis fissirostris, Walt. This rare species occurred rather freely on Mousehold Heath, about the year 1883, and more sparingly before and since that time; it is found in the gravel pits, and under low plants.

,, waltoni, Boh. This species also occurs sparingly on Mousehold Heath, in company with *Trachyphlœus scabriculus*, for which it might easily be mistaken in the field.

Barypeithes sulcifrons, Boh. Taken in the Sparham district by Mr. F. Norgate.

Platytarsus echinatus, Bons. In Moss, and by sweeping; by no means generally common.

Trachyphlœus spinimanus, Germ. Recorded from Cromer, somewhat doubtfully, by Walton; the doubt in this case would seem to be reasonable since *Helianthemum vulgare*, at the roots of which the insect occurs, is a rare plant in the county.

,, scabriculus, Linn. } Common.
,, scaber, Linn. }

,, squamulatus, Ol. Ringland, one example, September, 1876.

Phyllobius alneti, Fab. }
,, pyri, Linn. }
,, argentatus, Linn. }
,, maculicornis, Germ. } Common.
,, oblongus, Linn. }
,, pomonæ, Ol. }
,, uniformis, Marsh. }

,, viridicollis, Fab. Brandon, May, 1888, one example; Yarmouth (Fowler).

Tropiphorus carinatus, Müll. Once taken by Burrell.

Cneorhinus geminatus, Fab. Yarmouth, common; Waxham (Champion).

,, exaratus, Marsh. Mousehold Heath, common.

Liophlœus nubilus, Fab. Occurs sparingly in the spring and early summer.

Barynotus obscurus, Fab. One example, in a chalk pit at Hellesdon, May, 1879; "Caister marrams, common" (Paget).

,, mærens, Fab. Aylsham (Fowler).

Strophosomus coryli, Fab.
,, obesus, Marsh. } Common on Hazel, &c.

,, retusus, Marsh.
,, faber, Hbst.
,, lateralis, Payk. } Common in gravel pits on Mousehold Heath, in early summer.

Sitones griseus, Fab. Coast sands; not very common.

,, sulcifrons, Thunb.
,, tibialis, Hbst.
,, crinitus, Ol. } Common.

,, regensteinensis, Hbst. Very abundant on Furze and Broom.

,, punctcollis, Steph. Widely distributed, but not common.

,, lineatus, Linn.
,, hispidulus, Fab.
,, humeralis, Steph. } Common.

Polydrusus undatus, Fab. Burrell's list.

,, flavipes. De G. Rare; Brooke Wood; Kettering-ham Common, on Oaks.

,, pterygomalis, Sch. Locally common on Oaks.

,, cervinus, Linn. Very common.

,, chrysomela, Ol. Rare; Wells, August, 1883; Brancaster, July, 1886; one specimen in each case; probably not uncommon on its food-plant, *Artemisia maritima*, in early summer.

,, confluens, Steph. Brandon (Fowler).

,, micans, Fab. Two examples given to me by Mr. F. Norgate, some years ago, probably came from Foxley Wood.

Sciaphilus muricatus, Fab. Locally common.

Tanymecus palliatus, Fab. Cromer (Fowler); Waxham (Champion).

Gronops lunatus, Fab. Under low plants on Mousehold Heath, whence I obtained it in quantity, in 1883.

Orthochletes setiger, Germ. Mousehold Heath, rare. Yelverton (Brown). Occurs at the roots of *Senecio jacobæa*.

Molytes coronatus, Lat. Taken once only (Burrell)

Liosomus ovatulus, Clairv. Common in Moss, and by sweeping.

Alophus triguttatus, Fab. "Sub lapidibus" (Burrell).

Hypera punctata, Fab. Common.

,, fasciculata, Hbst. Norfolk (Stephens).

,, arundinis, Fab. Stephens records this very rare species doubtfully, from this county; it occurs on *Suæda fatifolium*.

,, pollux, Fab. Not common; Heigham Osier Carr, May, 1875; Aylsham (Wood).

,, alternans, Steph. Rudham (Fowler); Waxham (Champion).

,, suspiciosa, Hbst. Hellesdon, July, 1874.

,, plantaginis, De G. Forncett, October, 1884.

,, variabilis, Hbst. Common.

,, polygoni, Linn. Felbrigg, August, 1883.

,, meles, Fab. A specimen taken at Yarmouth under *Ononis*, in August, 1877, and another from Foxley Wood, August, 1886, agree with the descriptions of this species.

,, nigrirostris, Fab. Very common.

Procas picipes, Marsh. Norfolk (Stephens).

Cleonus sulcirostris, Linn. Sometimes common on Thistles on Mousehold Heath; Yarmouth (Fowler).

,, albidus, Fab. Thetford (Salmon) in coll. S. Stevens. "Taken by Mr. Hooker, in a gravel pit at Hilsdon (Hellesdon) near Norwich" (Stephens).

,, nebulosus, Linn. Mousehold Heath, under Ling and Heather, rare. Burrell says, "Captus in Rosæ caninæ foliis"!

Lixus paraplecticus, Linn. Halvergate (Stephens); Horning, one example on *Angelica sylvestris* (Thouless).

Hylobius abietis, Linn. Not generally common, Stratton Strawless; Sparham district (Norfolk); Arminghall Wood (Wigham).

Grypidius equiseti, Fab. Cringleford (Brown); Aylsham (Wood).

Eribhinus bimaculatus, Fab. Norfolk (Fowler).

Erirhinus acridulus, Linn. Common.

" festucæ, Hbst. Marshy places; particularly common at Horning. In my long series, I have some specimens which agree with the description of *E. nereis*, but the two forms seem to me to run the one into the other.

" nereis, Payk. Horning (Fowler).

" vorax, Fab. On Poplars; very local, but abundant when found.

" costirostris, Gyll. Stoke Holy Cross, on a young Aspen, in spring and early summer, I see no reason to follow Fowler and regard this as a variety of *maculatus*, as, apart from the differences in the insects themselves, their food-plants and times of appearance are different.

" maculatus, Marsh. On Sallows and Willows, generally distributed and common.

" tæniatus, Fab. On *Salix alba*, at Thorpe, September, 1876.

" salicinus, Gyll. On Willows, rare; Horning, May, 1889; previously recorded from thence by Curtis; Hoveton (Power).

" pectoralis, Panz. On Sallows; widely distributed, but not common.

" tortrix, Linn. On Poplars, near Lakenham bridge; locally common.

Mecinus pyraster, Hbst. Common.

Hydronomus alismatis, Marsh. On water-plants; common.

Bagous binodulus, Hbst. "Marshes near Norwich" (Stephens).

" tempestivus, Hbst. Local, but rather common where it occurs.

" petro, Hbst. Brandon, one in May, 1888, one in May, 1889; St. Faith's Common, July, 1889.

" lutosus, Gyll. Very rare; Wretham Heath, one example, August, 1890. Previously recorded from Norfolk by Stephens.

Tanysphyrus lemnæ, Fab. Common amongst Duck-weed.

Smicronyx cicur, Reich. St. Faith's (Power).

Anoplus plantaris, Mez. Common on young Birches.

BALANINUS GLANDIUM, Marsh. Not common. Ringland; Beeston Park; Foxley Wood.

,, NUCUM, Linn. Scarce. Foxley Wood.

,, CERASORUM, Hbst. Rare; one example beaten from Elm at Eaton, May, 1888.

,, RUBIDUS, Gyll. One specimen swept up in a Clover field at Ringland, September, 1875; Ashwicken (Power). Its food-plant is Birch.

,, VILLOSUS, Hbst. Brundall, May, 1883.

,, BRASSICÆ, Fab. } Common.
,, PYRRHOCERAS, Marsh. }

ANTHONOMUS ULMI, De G. On Elms, not very common.

,, ROSINÆ, Des Goz. By hedgerow beating, not uncommon. Bixley; Lakenham; Eaton; Bircham Newton (Fowler).

,, PEDICULARIUS, Linn. Common.

,, POMORUM, Linn. Locally common on Apple trees.

,, RUBI, Hbst. Common.

ORCHESTES QUERCUS, Linn. Common.

,, TESTACEUS, Müll. On Alder, rare; Drayton Drewray, June, 1889. Norfolk (F. Smith).

,, ALNI, Linn. Very common on Elms.

,, ,, var. FERRUGINEUS, Marsh. Less common than the type.

,, ILICIS, Fab. Common on Oaks.

,, FAGI, Linn. Very abundant on Beech.

,, RUSCI, Hbst. Brandon, July, 1882.

,, AVELLANÆ, Don. On Hazel, widely distributed, but not common.

,, STIGMA, Germ. On Sallows, very local; Foxley Wood.

,, SALICIS, Linn. Occurs sparingly on Sallows, in early summer.

,, SALICETI, Payk. Norfolk (Stephens).

RHAMPHUS FLAVICORNIS, Clairv. Common.

ELLESCHUS BIPUNCTATUS, Linn. Not common. I took a few specimens at Stratton Strawless, in August, 1884, and at St. Faith's in August, 1887, off Broom, in each locality; the food-plants, given by Fowler, are Sallows and Poplars.

Tychius quinquepunctatus, Linn. South Creake (Stephens).
,, venustus, Fab. Norfolk (Stephens).
,, meliloti, Steph. Ditchingham (Fowler).
,, tibialis, Boh. Yarmouth, June, 1883.
,, picirostris, Fab. Common.

Cionus scrophulariæ, Linn. Generally common.
,, similis, Müll. Framingham Pigot, June, 1878; will probably be found not uncommon on *Verbascum* in early summer.
,, hortulanus, Marsh. Eaton; Earlham; Forncett (Brown). This species should be sought on *Scrophularia*, early in the season.
,, blattariæ, Fab.
,, pulchellus, Hbst. } Locally common on *Scrophularia*.

Nanophyes lythri, Fab. Common.

Gymnetron pascuorum, Gyll. Postwick Grove, June, 1875.
,, villosulus. Gyll. Not common. Harford bridges; Earlham; Postwick; Whitwell Common; East Raynham (Wood).
,, beccabungæ, Linn. Not uncommon on *Veronica beccabunga*.
,, labilis, Hbst. Norfolk (Fowler).
,, rostellum, Hbst. Rare. Harford Bridges, May, 1878.
,, melanarius, Germ. Ashwicken (Fowler).
,, noctis, Hbst. Formerly common in flowers of *Linaria vulgaris*.
,, linariæ, Panz. Norfolk (Stephens).
,, campanulæ, Linn. Barton Bendish, August, 1881, on *Campanula glomerata*.
,, plantarum, Dej. Bixley, September, 1878, one in a flower of *Campanula rotundifolia*.

Orobitis cyaneus, Linn. Foxley Wood; Waxham (Champion); Yarmouth, Yelverton (Brown). Widely distributed, but never common.

Acalles ptinoides, Marsh. Gravel pits; Mousehold Heath; common.
,, turbatus, Boh. Ringland, June, 1877; Bircham Newton, one example, August, 1877 (Fowler).

CRYPTORHYNCHUS LAPATHI, Linn. Heigham Osier Carr; Eaton Common; not rare on Willow and Osier stumps; East Raynham (Wood).

CELIODES QUERCUS, Fab. Widely distributed, but local.

,, RUBER, Marsh. Scarce; Dunston Common; Thetford; Ashwicken (Fowler).

,, QUADRIMACULATUS, Linn. Very abundant.

,, CARDUI, Hbst. Common.

,, GERANII, Payk. Norfolk (Stephens). It is possible that this record refers to *C. exiguus*, which also occurs on Geranium.

CENTHORHYNCHUS ASSIMILIS, Payk.
,, ERYSIMI, Fab.
,, CONTRACTUS, Marsh. } Common.

,, SETOSUS, Boh. Ringland, June, 1877; St. Faith's (Fowler).

,, COCHLEARIÆ, Gyll.
,, CONSTRICTUS, Marsh. } Locally common in marshy places.

,, ERICÆ, Gyll. On Ling and Heather; locally common.

,, GEOGRAPHICUS, Goez. On *Echium vulgare*; local, but common where it occurs.

,, TRIMACULATUS, Fab. On Thistles; widely distributed, but not common. *C. litura*, its generally common ally, has not occurred to me in this county.

,, ASPERIFOLIARUM, Gyll. Widely distributed, but not common.

,, CAMPESTRIS, Gyll. Near Norwich, J. Sparshall (Stephens).

,, MOLITOR, Gyll. Mousehold Heath, July, 1886, one pair at roots of *Achillæa millefolium*. Brandon (J. J. Walker).

,, RUGULOSUS, Hbst. Morston, May, 1888; Waxham (Champion).

,, MELANOSTICTUS, Marsh. In marshy places on *Mentha*; local and not common; Heigham Osier Carr, August, 1875; Harford Bridges, June, 1876; Dunston Common, August, 1877; Aylsham (Wood).

CENTHORHYNCHUS QUADRIDENS, Panz. On *Cruciferæ* in damp places; local.

„ RESEDÆ, Marsh. On *Reseda*; very local; Horning; Waxham (Champion); Cromer (J. J. Walker).

[*C. verrucatus*, Gyll., which is found at the roots of *Glaucium luteum*, doubtless occurs in the county, though I have not met with it.]

„ POLLINARIUS, Forst. Very common on Nettles.

„ SULCICOLLIS, Gyll. Common.

„ ALLIARIÆ, Bris. Scarce; East Carlton, June, 1879; Brandon, May, 1888.

„ CYANIPENNIS, Germ.
„ CHALYBÆUS, Germ. } Locally common.

CENTHORHYNCHIDIUS FLORALIS, Payk. Common.

„ HEPATICUS, Gyll. Ditchingham (Fowler).

„ PYRRHORHYNCHUS, Marsh. Common.

„ PULVINATUS, Gyll. Very rare; Hunstanton (Blatch).

„ MELANARIUS, Steph. Not uncommon on Watercress, &c.

„ TERMINATUS, Hbst. Horning, May, 1889. Brandon (Fowler). The species is said to occur on *Daucus maritimus*.

„ SPINOSUS, Goez. On Thistles, widely distributed, but not common.

„ TROGLODYTES, Fab. Very common.

AMALUS SCORTILLUM, Hbst. Local; Ringland, May, 1878; Bowthorpe, June, 1879; Ashwicken (Fowler).

POOPHAGUS SISYMBRII, Fab. Widely distributed, but not common.

„ NASTURTII, Germ. East Rudham, fairly common (Wood). Stream on the road to Heacham (Fowler). I have not been able to meet with this species, although I have repeatedly worked its food-plant (Watercress) for it.

TAPINOTUS SELLATUS, Fab. On *Lysimachia vulgaris*, extremely rare. One specimen in the late Dr. Power's collection, taken by the Rev. J. Landy Brown, at Horning, in 1838.

PHYTOBIUS VELATUS, Beck. Eaton Common, May, 1889; Aylsham (Wood); Waxham (Champion).

,, LEUCOGASTER, Marsh. Arminghall, October, 1876; Wretham Heath, August, 1890; Aylsham, Rudham (Wood); Waxham (Champion).

,, NOTULA, Germ. Not common; Poringland, July, 1888; Waxham (Champion).

,, WALTONI, Boh. Woodbastwick; Horning (Fowler).

,, QUADRITUBERCULATUS, Fab. Norfolk (Fowler).

,, COMARI, Hbst. Heigham, June, 1876; Brumstead Common, 1887.

RHINONCUS PERICARPIUS, Fab. Common.

,, PERPENDICULARIS, Reich. In marshy places; widely distributed, but not common.

,, CASTOR, Fab. Mousehold Heath, not uncommon; Waxham (Champion).

,, INCONSPECTUS, Hbst. Rare; Hickling, June, 1888; Brandon, May, 1889, on *Polygonum amphibium*.

,, BRUCHOIDES, Hbst. Mousehold Heath, one example, June, 1883; Ashwicken (Power).

BARIS T-ALBUM, Linn. Not uncommon by sweeping in marshy places. Horning; Ranworth; Booton Common.

,, GLABRA, Hbst. The *Laticollis* of Burrell's list.

,, PICICORNIS, Marsh. Cromer (Brown); Cromer (1889); Brandon (J. J. Walker); Sheringham, August, 1893.

,, LEPIDII, Germ. Swanton Morley, one example, August, 1888.

CALANDRA GRANARIA, Linn. The Corn Weevil; only too common.

,, ORYZÆ, Linn. Taken by J. Hooker according to Burrell; it is doubtless still to be found in places where Rice is stored.

MAGDALINUS ATERRIMA, Linn. Local, but widely distributed.

,, CERASI, Linn. Not very common.

,, PRUNI, Linn. Aylsham (Wood).

APION POMONÆ, Fab. Not uncommon.

,, CRACCÆ, Linn. Norfolk (Fowler).

,, SUBULATUM, Kby. Norfolk (Fowler).

,, CARDUORUM, Kby. } Common.
,, ONOPORDI, Kby. }

APION CONFLUENS, Kby. On *Chrysanthemum leucanthemum*; not uncommon.
,, FLAVIMANUM, Gyll. On *Teucrium scorodonia* and other Labiatæ; scarce.
,, HOOKERI, Kby. Waxham (Champion).
,, ULICIS, Forst. Very abundant.
,, PALLIPES, Kby. Ditchingham (Fowler).
,, VERNALE, Fab.
,, ÆNEUM, Fab.
,, RADIOLUS, Kby.
,, STRIATUM, Kby. } Common.
,, IMMUNE, Kby. Thorpe, October, 1875.
,, CURTISI, Curt. Norfolk (Fowler).
,, SIMILE, Kby. Hunstanton (Fowler).
,, SENICULUM, Kby.
,, RUFIROSTRE, Fab. } Common.
,, VICIÆ, Payk. Waxham (Champion).
,, DIFFORME, Ahr. Widely distributed, but not common.
,, ONONIDIS, Germ. Yarmouth.
,, VARIPES, Germ. Not common.
,, FAGI, Linn.
,, TRIFOLII, Linn.
,, FLAVIPES, Fab.
,, NIGRITARSE, Kby. } Common.
,, EBENINUM, Kby. Ashwicken (Fowler).
,, TENUE, Kby. Not common.
,, PUNCTIGERUM, Payk. Not uncommon on *Vicia cracca*.
,, VIRENS, Hbst.
,, ERVI, Kby. } Common.
,, ONONIS, Kby. Locally common on *Ononis*.
,, PISI, Fab. Very common.
,, ÆTHIOPS, Hbst.
,, SCUTELLARE, Kby. } Common.
,, MELILOTI, Kby. Ditchingham (Fowler).
,, LOTI, Kby.
,, SPENCEI, Kby. } Common.
,, VORAX, Hbst. Aylsham (Wood).
,, MINIATUM, Germ.
,, FRUMENTÆRIUM, Linn. } Common.

Apion rubens, Steph. Rather local.
,, malvæ, Fab. Common.
,, limonii, Kby. Occurs in salt marshes about the roots of *Statice*. Wells; Hunstanton; Burnham Market; Holme (Kirby).
,, violaceum, Kby. } Common.
,, hydrolapathi, Kby. }
,, marchicum, Hbst. Waxham (Champion).
,, humile, Germ. Common.

Rhynchites betuleti, Fab. } Both species occur sparingly in
,, populi, Linn. } Foxley Wood on their respective food plants, Hazel and Aspen.
,, cupreus, Linn. Burrell's list.
,, æquatus, Linn. On Whitethorn blossom; common.
,, æneovirens, Marsh. Burrell's list.
,, conicus, Ill. } Common.
,, germanicus, Hbst. }
,, nanus, Payk. Cawston Heath (Wood); Burrell's list.
,, pubescens, Hbst. Occurs sparingly in Foxley Wood.
,, betulæ, Linn. Not uncommon in woods. Foxley; Brooke, &c.

Attelabus curculionoides, Linn. On Oaks, &c.; Foxley Wood.
Apoderus coryli, Linn. On young Hazels; Foxley Wood.

Scolytidæ.

Hylastes ater, Payk. I have taken a few specimens on the wing in early summer.
,, opacus, Er. Ringland, June, 1877.
,, palliatus, Gyll. Not uncommon where Firs have been planted, as at Stratton Strawless, Swanington, &c.
Phlæophthorus rhododactylus, Marsh. Weeting, May, 1888.
Hylesinus crenatus, Fab. Cromer, &c. (Fowler); Aylsham (Wood).
,, oleiperda, Fab. Bowthorpe, June, 1879; Cromer (Fowler); Aylsham (Wood).
,, fraxini, Fab. Common.
Scolytus destructor, Ol. Common. Only this species of the genus has occurred to me.
Cryphalus abietis, Ratz. Rare; by beating Scotch Fir, East Carlton, May, 1877.

Anthribidæ.

Platyrhinus latirostris, Fab. In *Sphæria fraxinea*, Norfolk (Stephens).

Tropideres albirostris, Hbst. On palings near Norwich (Stephens). Extremely rare. There is no other record for the species as British. It occurs in dead wood of Beech, Oak, and Poplar.

„ niveirostris, Fab. Norfolk (Stephens).

Anthribus albinus, Linn. Norfolk (Stephens).

Brachytarsus fasciatus, Forst. "In Museis Dom Hooker" (Burrell).

Choragus sheppardi, Kby. "Four specimens from Fungus; locality unknown, but supposed to be Forncett" (Brown). The species is said to occur in dead twigs in hedges, and has been found sitting on the trunks of trees, near the ground, at Kingsgate near Margate.

Bruchidæ.

Bruchus cisti, Fab. Two specimens ex. coll. Dossetor.

„ pisi, Linn. } In Peas and Beans, sometimes
„ rufimanus, Boh. } common in granaries, &c.

„ seminarius, Linn. East Rudham (Wood).

„ loti, Payk. Swanton Morley, July, 1877; Rudham (Fowler).

„ ater, Marsh. On Broom at Eaton. St. Faith's, Rudham (Fowler); Aylsham; Potter Heigham (Wood).

Cerambycidæ.

Prionus coriarius, Linn. This fine species is widely distributed, but by no means common. Mr. F. Norgate used to take it rather freely in the Sparham district. I have taken it myself on several occasions at Swanton Morley, and Mr. Bridgman has taken it on Mousehold Heath and in the Workhouse Lane, Norwich.

Aromia moschata, Linn. Very local; Norwich (Thouless); Sparham district (Norgate); "Willows, Turf Meadow, Oby, rare" (Paget).

Callidium violaceum, Linn. Norfolk (Stephens); St. Stephen's Road, Norwich, June, 1892 (Thouless).

Clytus arcuatus, Linn. "Accepi a D. Francis" (Burrell); Yarmouth, rare (Paget).

„ arietis, Linn. Common.

Gracilia minuta, Fab. Norwich. From old timber in the roof of Sparham Church (Norgate); Yarmouth, rare (Paget).

Monohamnus sartor, Fab. Norfolk (Stephens).

„ sutor, Linn. Norwich (Stephens).

Astynomus ædilis, Linn. This species is an evident importation. I know of only two instances of its occurrence in the county: a specimen in the Bridgman collection, and one in my own, both taken whilst crawling in the streets of Norwich.

Liopus nebulosus, Linn. Foxley Wood; Howe Grove; Booton Common (Thouless); Aylsham (Wood).

Pogonocherus fasciculatus, De G. "On palings near Norwich" (Stephens).

„ dentatus, Fourc. Eaton Common; Swanton Morley; Stratton Strawless. Bircham Newton (Fowler).

Agapanthia lineatocollis, Don. "Found abundantly in some parts of Norfolk" (Stephens); "Turf Meadow, Oby, July, rare" (Paget).

Saperda carcharias, Linn. Not uncommon in the vicinity of Poplars.

„ populnea, Linn. Foxley Wood in Aspens.

Polyopsia præusta, Linn. Postwick Grove, May, 1874; Ringland, May, 1878. Norwich, in dead Apple sticks (Thouless).

Oberea oculata, Linn. Downham Market, 1888 (Norgate).

Phytœcia cylindrica, Linn. Ketteringham; Eaton, Gawdy Wood (Brown); near Norwich (Bridgman); Yarmouth, rare (Paget).

Rhagium inquisitor, Fab. "In Fraxini trunco, Maio" (Burrell); Horning (Wigham).

Rhagium indagator, Linn. Edgefield Wood (Wigham); probably an error.

,, bifasciatum, Fab. Brundall, April, 1886. Horsford; not uncommon in Fir stumps (Thouless).

Toxotus meridianus, Linn. Arminghall; Hellesdon (Thouless); Sparham district (Norgate). On flowers of *Umbelliferæ*, not common.

Strangalia quadrifasciata, Linn. Ranworth; several specimens in a rotten log (Thouless); Horning (Wigham); "Turf Meadow, Oby, July, rare" (Paget).

,, maculata, Poda. Common on Umbelliferous flowers.

,, nigra, Linn. Norfolk (Fowler).

,, melanura, Linn. Foxley Wood; common on flowers of *Heracleum*.

Leptura sanguinolenta, Linn. So far as the Norfolk record of this species is concerned the remarks given under *Gonioctena affinis* (*post*) apply here. It had, however, already been recorded by Stephens from this county.

,, livida, Fab. Not uncommon.

Grammoptera ruficornis, Fab. Common.

Chrysomelidæ.

Donacia crassipes, Fab. In flowers of *Nuphar*, Ranworth Dyke (Thouless).

,, versicolora, Brahm. Locally common on *Potamogeton natans*; Hickling Broad; Booton Common; Horning (Thouless); Aylsham (Fowler).

,, dentata, Hoppe. On *Saggitaria* at Lakenham, August, 1890.

,, sparganii, Ahr. Locally common in flowers of *Nuphar*.

,, dentipes, Fab. Locally common.

,, bicolora, Tsch. Not common. My specimens were taken at Harford Bridges in May, 1875, and I have not seen the insect alive since. Horning (Thouless).

,, limbata, Panz. Locally common.

,, thalassina, Germ. Scarce; Lakenham, August, 1890; Arminghall Pits; Brundall (Thouless).

Donacia impressa, Payk. Not common; Ranworth; Lakenham, August, 1890; Horning (Thouless).

,, simplex, Fab. Very common.

,, vulgaris, Tsch. Rare; a single specimen off Reed in a pit at Arminghall in April, 1890; Cringleford, Forncett (Brown); Harford Bridges, July, 1891 (Thouless).

,, semicuprea, Panz. } Common.
,, clavipes, Fab. }

,, cinerea, Hbst. Rare; Ranworth.

,, sericea, Linn. Common.

,, discolor, Panz. Whitwell Common, rare; very likely to be passed over as *D. sericea*, from which it may be known by its rather smaller size, stouter legs, and much more rugosely punctured thorax.

,, braccata, Scop. Locally common on Reeds; Horning; Ranworth; Surlingham (Thouless).

,, affinis, Kunze. Ranworth (Thouless).

Hæmonia curtisi, Lac. Taken rather plentifully near Lakenham on *Potamogeton pectinatus* by the Rev. T. Skrimshire (Stephens). "On the banks of the Yare between Thorpe and Norwich, the 14th June, 1811; the Rev. T. Skrimshire met with it near Burnham, and afterwards near Wells in Norfolk the 29th of May in salt-water ditches." Curtis' statement as to the locality of Skrimshire's captures is, I think, to be preferred, as the known habitat of the species is on water-plants in brackish ditches; and if an Hæmonia did occur on the banks of the Yare between Thorpe and Norwich the probability is that it was *H. appendiculata*, a larger insect than *H. curtisi*, with distinctly clavate femora, which occurs very rarely on plants growing in fresh water.

Zeugophora subspinosa, Fab. On Aspens in woods, common. "In Betula alba" according to Burrell.

Lema cyanella, Linn. }
,, lichenis, Voet. } Common.
,, melanopa, Linn. }

Criocerus asparagi, Linn. Locally abundant.

Lamprosoma concolor, Sturm. "Norfolk" (Stephens).

Cryptocephalus coryli, Linn. "In Corylo infrequentissime, in eadem sylva," *i.e.*, Edgefield (Burrell).

,, aureolus, Suff. "In floribus Hieracii" (Burrell).

,, moræi, Linn. "In pontis et in graminosis locis in sylvis" (Burrell). Its food plant is *Hypericum perforatum*.

,, lineola, Fab. Edgefield Wood on Birch, June (Burrell).

,, bilineatus, Linn. Norfolk (Fowler).

,, fulvus, Goez. Mousehold Heath; not uncommon on low plants in gravelly places.

,, pusillus, Fab. Not common; Sprowston; Foxley Wood.

,, labiatus, Linn. Common on Oaks.

,, exiguus, Schneid. Eaton Common, August, 1888; Horning (Thouless); Woodbastwick (Power).

,, frontalis, Marsh. Rare; Foxley Wood, July, 1885.

Timarcha lævigata, Linn. This usually common species has become much less abundant of late years.

,, violaceo-nigra, De G. Very common.

Chrysomela banksi, Fab. Rare; one example out of Moss at Kirby Bedon.

,, staphylæa, Linn. Common.

,, varians, Fab. Foxley Wood, 14th September, 1891.

,, gœttingensis, Linn. Rare; one specimen crawling on the pathway in the Workhouse Lane, Norwich, April, 1880. "In eratægi sepibus, Jun." (Burrell).

,, hæmoptera, Linn. In tidal refuse, Weybourne, October, 1890.

,, distinguenda, Steph. Locally common.

,, menthrastri, Suff. Norfolk (Stephens).

,, graminis, Linn. On Mint and other water-plants (Burrell).

,, fastuosa, Linn. On *Lamium album* and *Urtica*, June (Burrell).

Chrysomela polita, Linn. Very common.

,, orichalcia, Müll. Lakenham, June, 1883.

,, hyperici, Forst. Occurs sparingly on *Hypericum perforatum*.

,, didymata, Scrib. Widely distributed, but never common.

Lina populi, Linn. Ranworth, August, 1883; on Dwarf Sallow, Horning (Thouless); Oby, common (Paget).

,, longicollis, Suff. Burrell, whose *Tremulæ* was evidently this species, says: "In populo cum priore (*i.e.*, *Populi*) infrequentissime, Jul."

Gonioctena rufipes, Gyll. Brandon (Fowler).

,, viminalis, Linn. Brandon (Fowler).

,, affinis, Suff. This specimen was introduced to the British list by Mr. C. O. Waterhouse in 1865 on the strength of a specimen taken in the Norfolk Fens, and found amongst some insects sent to him by the collector Winter, who at that time chose to be known by the name of "Cocking." Winter's dealings with his entomological patrons were certainly not calculated to inspire them with unbounded confidence; but it is difficult to account for his possession of the specimen in question if he did not take it himself.

,, olivacea, Forst. Locally common on Broom.

Gastrophysa polygoni, Linn. Common.

,, viridula, De G. By sweeping in damp places; not generally common.

Phædon tumidulum, Kby. Not uncommon in early summer.

,, betulæ, Linn. Occurs very sparingly by sweeping in damp places.

,, cochleariæ, Fab. Very common.

Phratora vulgatissima, Linn. Locally abundant on Willows.

,, cavifrons, Th. Widely distributed, and not uncommon.

,, vitellinæ, Linn. Very common.

Prasocuris aucta, Fab. Burrell merely says, "non frequens," and if it were not evident that he was well acquainted with the next species I should suspect some mistake.

PRASOCURIS MARGINELLA, Linn. } Very common.
„ PHELLANDRII, Linn. }

„ JUNCI, Brahm. Occurs sparingly on *Veronica beccabunga.*

ADIMONIA TANACETI, Linn. Not common. I have taken it singly on several occasions, but never on *Tanacetum.*

„ CAPREÆ, Linn. Locally abundant on *Salix repens;* Stratton Strawless, &c.; Potter Heigham (Wood).

„ SUTURALIS, Th. Mousehold Heath; very common on Heather.

„ SANGUINEA, Fab. Not uncommon on Whitethorn blossom.

GALERUCA LINEOLA, Fab. Locally common on Osiers.

„ CALMARIENSIS, Linn. } Common by sweeping in
„ TENELLA, Linn. } marshy places.

„ SAGITTARIÆ, Gyll. Much less common than the two preceding.

„ NYMPHEÆ, Linn. Common on leaves of White Water-lilies at Horning, &c.

„ VIBURNUM, Payk. On *Viburnum opulus,* local; Foxley Wood; Howe Grove.

AGELASTICA HALENSIS, Linn. Locally abundant in grassy places.

PHYLLOBROTICA QUADRIMACULATA, Linn. Scarce; Horning; Brundall; Surlingham (Thouless); "Turf Meadow, Oby, July, rare" (Paget). Said to occur on *Scutellaria galericulata.*

LUPERUS NIGROFASCIATUS, Goez. Mousehold Heath. On Furze and Broom; not common.

„ NIGER, Goez. Stratton Strawless (Thouless).

„ FLAVIPES, Linn. On Birch, Willow, &c.; common.

HALTICA CORYLI, All. Occurs sparingly on Hazel in Foxley Wood.

„ LYTHRI, Aub. By sweeping in marshy places; not generally common, but occasionally found in numbers on *Epilobium hirsutum.*

„ ERICETI, All. On Heather and Ling. Very abundant on Roudham and Wretham Heaths in 1890, and I once found it on Mousehold Heath.

„ OLERACEA, Duft. Found on various plants, but not very common.

HALTICA PALUSTRIS, Weise. Scarce; by sweeping in marshy places (Whitwell Common, &c.), but nearly always occurs singly; the latter peculiarity of the species has been noticed by Dr. Sharp in other districts. I have taken it rather commonly in Gloucestershire on *Epilobium montanum*.

CREPIDODERA TRANSVERSA, Marsh. } Common.
,, FERRUGINEA, Scop. }

,, RUFIPES, Linn. By roadside sweeping in spring; not very common.

,, NITIDULA, Linn. "In salicibus, Jul." (Burrell).

,, AURATA, Marsh. Common on Sallows.

,, CHLORIS, Foud. Rare; one specimen on Black Poplar by the river at Thorpe, July, 1874.

,, MODEERI, Linn. }
,, SALICARIÆ, Payk. } Marshy places, not uncommon.

,, VENTRALIS, Ill. St. Faith's (Fowler).

MANTURA RUSTICA, Linn. Framingham Earl, June, 1878.

,, OBTUSATA, Gyll. By sweeping herbage; not common.

PODAGRICA FUSCICORNIS, Linn. Common on Mallows.

BATOPHILA RUBI, Payk. On *Rubus*, &c., in a hedgerow at Ketteringham.

,, ÆRATA, Marsh. Locally common by roadside sweeping.

APHTHONA LUTESCENS, Gyll. On *Lythrum salicaria*; common at Ranworth, Horning, &c.

,, NONSTRIATA, Goez. On *Iris pseudacoris*, sometimes in swarms.

,, VENUSTULA, Kuts. Ringland, September, 1875; doubtless common on *Euphorbia amygdaloides*.

,, ATROCÆRULEA, Steph. On *Solanum nigrum*, Bixley, June, 1875.

,, HILARIS, Steph. Ditchingham (Power); Hunstanton (Fowler).

PHYLLOTRETA NODICORNIS, Marsh. Locally common on *Reseda lutea* and *Senecio jacobæa*. I have found it very abundant on Mignonette in my garden; Aylsham (Wood).

,, MELÆNA, Ill. Norfolk (Fowler).

,, ATERRIMA, Schr. }
,, CRUCIFERÆ, Goez. } On various Cruciferæ; local.

PHYLLOTRETA PUNCTULATA, Marsh. Ditchingham (Power).
,, VITTULA, Redt. On Cruciferæ, and in winter in haystack refuse; common.
,, UNDULATA, Kuts. On Turnips and other Crucifers; common. This species and not *P. nemorum* is the "Turnip-flea" of this county.
,, NEMORUM, Linn. } On Cruciferæ; rare.
,, SINUATA, Steph. }
,, OCHRIPES, Curt. On *Erysimum alliaria*; common in spring.
,, TETRASTIGMA, Com. } Locally common in
,, EXCLAMATIONIS, Thunb. } marshy places.
PLECTROSCELIS CONCINNA, Marsh. Very common.
,, SAHLBERGI, Gyll. Rare; Horning Common, July, 1887.
,, HORTENSIS, Fourc. Common by sweeping.
THYAMIS ANCHUSÆ, Payk. East Rudham (Wood).
,, ATRA, Fab. Rare; Caister (on *Salix alba*); Waterworks Lane, Norwich; Ditchingham; Ashwicken (Power).
,, HOLSATICA, Linn. On *Pedicularis*, &c.; not uncommon at Horning.
,, QUADRIGUTTATUS, Pont. "In Cynoglosso officinali, August" (Burrell).
,, CASTANEA, Duft. By roadside sweeping; widely distributed, but rare.
,, BRUNNEA, Duft. } Not uncommon.
,, LURIDA, Scop. }
,, FUSCICOLLIS, Steph. Scarce.
,, ATRICILLA, Linn. Not very common.
,, MELANOCEPHALUS, De G. Common by sweeping.
,, NASTURTII, Fab. Not uncommon by sweeping; Ditchingham (Power).
,, FEMORALIS, Marsh. Ditchingham (Power).
,, BALLOTÆ, Marsh. On *Ballota nigra*; locally common.
,, PUSILLA, Gyll. Not common; occurs on *Thymus serpyllum*. Aylsham; Hunstanton (Fowler).
,, TABIDA, Fab. On *Verbascum thapsus*; locally common.
,, JACOBEÆ, Wat. Abundant on *Senecio jacobæa*.

THYAMIS RUTILA, Ill. One example in a chalk pit at Eaton, August, 1875.

„ OCHROLEUCA, Marsh. By roadside sweeping; not uncommon.

„ GRACILIS, Kuts. Not uncommon on *Senecio jacobæa*.

„ PELLUCIDA, Foud. Ditchingham (Power); Hunstanton (Fowler).

„ FLAVICORNIS, Steph. On *Eupatorium cannabinum*; scarce; Ditchingham (Power).

PSYLLIODES DULCAMARÆ, E.H. On *Solanum dulcamara*, Hickling, June, 1888; Horning (Fowler).

„ CHALCOMERA, Ill. Hunstanton (Fowler).

„ NAPI, E.H. Common by sweeping in damp places.

„ HYOSCYAMI, Linn. "In Hyoscyamo nigro, Jul." (Burrell).

„ CHRYSOCEPHALA, Linn. In the early spring of 1874 I had occasion to place some slices of Turnip on the ground in my garden to act as Slug-traps, and I found this species commonly under these. I have but rarely met with it by sweeping.

„ MARCIDA, Ill. Locally abundant on *Cakile maritima*.

„ CUPRO-NITENS, Forst. Arminghall, September, 1877, one example.

„ AFFINIS, Payk. On *Solanum dulcamara*; locally common.

„ PICINA, Marsh. On *Lythrum salicaria*, Brundall, April, 1886.

APTEROPEDA GRAMINIS, Panz. Common.

„ GLOBOSA, Panz. }
„ SPLENDIDA, All. } Hunstanton (Blatch).

SPILERODERMA TESTACEA, Fab. }
„ CARDUI, Gyll. } Common.

CASSIDA MURRÆA, Linn. St. Faith's Wood (Wigham).

„ VIRIDIS, Linn. Common on Thistles.

„ VIBEX, Linn. Stoke Holy Cross (Thouless); Ditchingham (Fowler).

„ SANGUINOLENTA, Fab. Heigham Osier Carr, June, 1877; Mousehold Heath (Thouless).

CASSIDA VITTATA, Vill. Sent by the Rev. T. Skrimshire to Curtis, who described it under the name of *Salicorniæ*, and figured it on his plate 127. It occurs in salt marshes under *Salicornia*, &c.

„ NOBILIS, Linn. Burrell says that he once took this species in August on *Typha minor*. Probably *T. angustifolia* was the plant intended.

„ NEBULOSA, Linn. Ludham; Woodbastwick (Thouless).

„ FLAVEOLA, Thunb. Not common; Dunston, April, 1874; Mousehold Heath, April, 1875; Aylsham (Wood).

„ EQUESTRIS, Fab. Common on *Mentha*.

The following table has been prepared with the view of furnishing a concise statement of the number of species in any family or higher group occurring in Britain and Norfolk respectively, and will render a detailed analysis unnecessary.

COLEOPTERA.

	Number of species occurring in BRITAIN	NORFOLK.
ADEPHAGA:		
Cicindelidæ	5	2
Carabidæ	303	183
Pelobiidæ	1	1
Haliplidæ	13	11
Dytiscidæ	105	76
Gyrinidæ	10	9
	437	282
PALPICORNIA:		
Hydrophilidæ	91	72
BRACHELYTRA:		
Staphylinidæ	771	358
CLAVICORNIA:		
Pselaphidæ	33	19
Scydmænidæ	22	11
Scaphidiidæ	4	3
Trichopterygidæ	77	21
Sphæriidæ	1	—
Corylophidæ	7	3
Clambidæ	4	2
Silphidæ	109	51
Histeridæ	43	27
	1299	712

	Number of species occurring in BRITAIN	NORFOLK.
CLAVICORNIA:	1299	712
Phalacridæ	15	9
Nitidulidæ	93	45
Trogositidæ	3	—
Colydiidæ	15	3
Cucujidæ	16	5
Cryptophagidæ	69	32
Lathridiidæ	42	20
Erotylidæ	6	3
Endomychidæ	2	2
Coccinellidæ	45	28
Mycetophagidæ	15	7
Dermestidæ	16	7
Byrrhidæ	12	8
Georyssidæ	1	1
Parnidæ	14	8
Heteroceridæ	8	3
	672	318
LAMELLICORNIA:		
Lucanidæ	3	3
Scarabæidæ	88	53
	91	56
STERNOXI:		
Buprestidæ	10	4
Eucnemidæ	6	2
Elateridæ	57	31
	73	37
MALACODERMA:		
Dascillidæ	15	10
Telephoridæ	65	39
Cleridæ	9	5
Lymexylonidæ	2	—
	91	54
TEREDILIA:		
Anobiidæ	37	17
Cissidæ	21	3
	58	20
HETEROMERA:		
Tenebrionidæ	34	18
Pythidæ	10	5
Melandryidæ	21	6
	2284	1197

	Number of species occurring in BRITAIN	NORFOLK.
HETEROMERA:	2284	1197
Lagriidæ ...	1	1
Pedilidæ ...	5	2
Anthicidæ	11	3
Pyrochroidæ	3	1
Mordellidæ	18	9
Rhipidophoridæ	1	1
Cantharidæ	9	3
Œdemeridæ	6	5
	119	54
RHYNCHOPHORA:		
Curculionidæ	467	263
Scolytidæ...	49	9
Anthribidæ	8	6
	524	278
LONGICORNIA:		
Cerambycidæ	57	28
PHYTOPHAGA:		
Bruchidæ	13	6
Chrysomelidæ	244	165
	257	171
	3241	1728

I have excluded the Stylopidæ from the above figures, inclining to the opinion of the late Professor Westwood that they should be regarded as forming a distinct order of insects; but Mr. Bridgman tells me that he has several times bred *Stylops* from Bees of the genus *Andrena*, although he has not met with *Halictophagus*. Mr. Edward Saunders recently captured a nymph of *Liburnia*, from which a male *Elenchus* was in process of emerging; and it is probable that this genus occurs in Norfolk, as I have a specimen of the nymph of *Liburnia fairmairei* taken at Framingham Pigot, which exhibits near the apex of the abdomen a large tubular projection exactly similar to that by which the *Elenchus* is represented as emerging in Mr. Saunders' figure ('Entomologists' Monthly Magazine,' new series, vol. iii. p. 297).

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Burgh House, Great Yarmouth

M

Macpherson A. H.
51 Gloucester Place, Hyde Park, W.
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Manning Rev. C. R., M.A., F.S.A.
Diss Rectory
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Middleton C. Holkham
Miller Henry, Jun. Bosmere House, Norwich Road, Ipswich
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Mottram James Bank House, Norwich

N

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Newton Professor, M.A., F.R.S., *Hon. Mem.* Magdalene College, Cambridge
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Newton E. T., F.R.S., *Hon. Mem.*
H.M. Geological Survey Office, 28 Jermyn Street, London
Nicholson F., F.Z.S.
111 Portland Street, Manchester
Nicholson W. A., *Honorary Secretary*
3 Oxford Street, Norwich
Nightingale Rev. R. C.
Beechamwell Rectory

O

*Ogilvie F. M. Sizewell House, Leiston

P

Page G. W. Fakenham
Paget Sir James, Bart., F.R.S., *Hon. Mem.*
5 Park Square West, Regent's Park, London, S.W.
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5 Ovington Gardens, S.W.
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H.M. Geological Survey Office, London
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Royal Microscopical Society, President of the, *Hon. Mem.* 20 Hanover Square, W.
Ruston A. Harold Chatteris

S

Saunders Howard, F.L.S., F.Z.S.
7 Radnor Place, London, W.
Savill-Onley C. A. O.
Boxfields, Galleywood, Chelmsford
Seebohm H., F.L.S., F.Z.S.
22 Courtfield Gardens, South Kensington, London, W.
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10 The Crescent, Norwich
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Tostock House, Bury St. Edmunds

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Woodward H. B., F.G.S., *Ex-President, Hon. Mem.* 60 Hamilton Road,
Highbury Park, London, N.
Wright C. A., Knight of the Crown of Italy, F.L.S., F.Z.S.
Kayhaugh House, Kew

Y

Young John, F.L.S., F.Z.S.
61 Hereford Road, London, W.

The Treasurer in Account with the Norfolk and Norwich Naturalists' Society, Year ending 27th March, 1894.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from last year	13	7	1	By Fletcher and Son, for Printing *Transactions*, 1892—93	54	12	6
,, Subscriptions:—				,, ,, ,, ,,	2	1	5
4 for 1891—92 ... ... £1 0 0				,, A. H. Goose for Printing	4	2	6
18 ,, 1892—93 ... ... 4 10 0				,, Advertisements	0	9	0
179 ,, 1893—94 ... ... 44 15 0				,, Insurance	0	3	0
1 ,, 1893—94 ... ... 0 10 0				,, Postage and Carriage	6	6	8
12 ,, 1894—95 ... ... 3 0 0				,, Year Books of Scientific Societies	0	13	6
	53	15	0	,, Gratuity to Doorkeeper	0	10	0
,, Additional payments for monthly notices	0	11	0	,, Rent of Room	1	1	0
,, Sale of *Transactions*	4	8	6	,, Museum Subscription	2	2	0
,, Donations	2	10	0	,, Assistant Secretary's Salary	5	0	0
,, Balance due to Treasurer	2	10	0				
	£77	1	7		£77	1	7

LIBRARY ACCOUNT.

	£	s.	d.		£	s.	d.
To Balance from last year	5	3	9	By Bookbinding	1	14	3
				,, Balance at Messrs. Gurney	3	9	6
	£5	3	9		£5	3	9

LIFE MEMBERSHIP FUND.

	£	s.	d.				
To Balance from last year	87	9	11				
,, Two Compositions for Life Membership	6	0	0	By Balance in Post Office Savings Bank	£95	12	7
,, Interest	2	2	8				
	£95	12	7				

Norwich, 3rd April, 1894.

Examined and found correct,
STEPHEN WM. UTTING, *Auditor.*

List of the Publications received by the Society as Donations or Exchanges from March, 1893 to March, 1894.

Barrow Naturalists' Field Club and Literary and Scientific Association. Annual Reports and Proceedings for the years ending March, 1891, and March, 1893. Vols. vi. and viii. 8vo. Barrow-in-Furness, 1891—93. *From the Club.*

Belgium. Annales de la Société Royale Malacologique de Belgique. Tome 26. roy. 8vo. Bruxelles, 1893. *From the Society.*

Belgium. Annales de la Société Belge de Microscopie. Tome 17 fasc. ii. et tome 18 fasc. i. 8vo. Bruxelles, 1893—94. *From the Society.*

Bennett (Arthur, F.L.S.). Notes on Potamogetons. [From the 'Journal of Botany' for October, 1893.] pp. 4. 8vo. *From the Author.*

Birds. Report [of the Committee appointed by the British Association] on the Migration of Birds in the Spring and Autumn of 1887. Ninth Report. 8vo. Edinb. 1889. *From Mr. T. Southwell, F.Z.S.*

Bourguin (M.). Les Rubiettes. [Extrait d'une étude inédite sur les Petits Oiseaux de notre pays.] pp. 11. 8vo. 1867. *From Professor Newton, F.R.S.*

Bristol Naturalists' Society. Proceedings. New Series. vol. vii. part 2. 8vo. Bristol, 1893. *From the Society.*

Brown (Horace T., F.R.S.) and Morris (G. Harris, Ph.D.). A Contribution to the Chemistry and Physiology of Foliage Leaves. [Reprinted from the 'Journal of the Chemical Society,' May, 1893, pp. 604—683.] 8vo. Lond. 1893.

Burmeister (H.). Anatomie der Coracina scutata. [Abh. der Nat. Ges. zu Halle. Band III, pp. 191—212.] 4to. *From Professor Newton, F.R.S.*

Cardiff Naturalists' Society. Reports and Transactions. Vol. xxv. parts 1 and 2. 8vo. Cardiff, 1893—94. *From the Society.*

Cazin (Maurice). Observations sur l'anatomie du Pétrel géant (Ossifraga gigantea, Linné). pp. 27. 8vo. Paris, 1886. *From Professor Newton, F.R.S.*

Coues (Dr. Elliott). Description of the Original Manuscript Journals and Field Note-Books of Lewis and Clark, on which was based Biddle's History of the Expedition of 1804—6. [Reprinted from the 'Proceedings of the American Philosophical Society,' vol. xxi. pp. 17—33.] 8vo. *From Professor Newton, F.R.S.*

Croydon Microscopical and Natural History Club. Proceedings and Transactions, 1892—93. 8vo. Croydon, 1893. *From the Club.*

Daubenton (M.). Observations sur la disposition de la trachée-artère de différentes espèces d'Oiseaux, et sur-tout de l'oiseau appelé Pierre. [Mémoires de l'Académie Royale des Sciences, 1781, pp. 369—376.] sm. 4to. *From Professor Newton, F.R.S.*

Dollo (L.). Note sur la présence chez les oiseaux du "troisième trochanter" des Dinosauriens et sur la fonction de celui-ci. [Bulletin du Musée Royal d'Histoire Naturelle de Belgique, 1883, pp. 13—18.] 8vo. *From Professor Newton, F.R.S.*

——— Note sur la présence du Gastornis Edwardsii, Lemoine, dans l'assise inférieure de l'étage landenien, à Mesvin, près Mons. [Bulletin du Musée Royal d'Histoire Naturelle de Belgique, 1883, pp. 297—308.] 8vo.
From Professor Newton, F.R.S.

Edinburgh Botanical Society. Transactions and Proceedings. Vol. xvii. parts II. and III, and vols. xviii. and xix. 8vo. Edinburgh, 1888—93. *From the Society.*

Edinburgh Geological Society. Transactions. Vol. vi. part 5. 8vo. Edinburgh, 1893. *From the Society.*

Edinburgh. Royal Society of Edinburgh. Proceedings. Vol. xix. 8vo. Edinburgh, 1893. *From the Society.*

Essex. The Essex Naturalist: being the Journal of the Essex Field Club. Vol. vii. nos. 4—12. 8vo. Chelmsford, 1893.
From the Club.

Fox (Howard) and Teall (J. J. H., F.R.S.). On a Radiolarian Chert from Mullion Island. With Note on the Radiolaria in the Mullion Island Chert, by Geo. Jennings Hinde, Ph.D. [From the 'Quarterly Journal of the Geological Society,' vol. xlix. pp. 211—218.] 8vo. 1893. *From Mr. G. J. Hinde, Ph.D.*

Gené (Joseph). Description de quelques espèces de la collection zoologique de Turin. pp. 10. *From Professor Newton, F.R.S.*

Gadeau de Kerville (Henri). Note sur un Hybride Bigénère de Pigeon Domestique et de Tourterelle à collier. [Extrait du Bulletin de la Société des Amis des Sciences naturelles de Rouen, pp. 153—163.] 8vo. 1886. *From Professor Newton, F.R.S.*

Gregory (J. W., F.G.S.). The Physical Features of the Norfolk Broads. [From 'Natural Science,' vol. i. pp. 347—355.] 8vo. 1892. *From the Author.*

Gurney (J. H.). On the Collection of Raptorial Birds in the Norwich Museum. [From 'The Ibis' for July, 1893.] pp. 14. 8vo.
From the Author.

Hinde (George Jennings, Ph.D.). On Annelid Remains from the Silurian Strata of the Isle of Gotland. [Bihang till K. Svenska Vet.-Akad. Handlingar, Band 7.] pp. 28. 8vo. Stockholm, 1882. *From the Author.*

——— Description of a new Species of Crinoids with Articulating Spines. [From the 'Annals and Magazine of Natural History,' March, 1885.] 8vo. *From the Author.*

Hinde (George Jennings, Ph.D.). On Beds of Sponge-Remains in the Lower and Upper Greensand of the South of England. [From the 'Philosophical Transactions of the Royal Society,' 1885, pp. 403—453.] 4to. *From the Author.*

——— On the Organic Origin of Chert. [From the 'Geological Magazine,' October, 1887, pp. 436—446.] 8vo. *From the Author.*

——— On some new Species of Uruguaya, Carter, with Remarks on the Genus. [From the 'Annals and Magazine of Natural History' for July, 1888.] pp. 12. 8vo. *From the Author.*

——— On a true Leuconid Calcisponge from the Middle Lias of Northamptonshire, and on detached Calcisponge Spicules in the Upper Chalk of Surrey. [From the 'Annals and Magazine of Natural History' for Nov. 1889, pp. 352—358.] 8vo. *From the Author.*

——— On a new Genus of Siliceous Sponges from the Lower Calcareous Grit of Yorkshire. [From the 'Quarterly Journal of the Geological Society' for February, 1890, pp. 54—61.] 8vo. *From the Author.*

——— Notes on Radiolaria from the Lower Palæozoic Rocks (Llandeilo-Caradoc) of the South of Scotland. [From the 'Annals and Magazine of Natural History' for July, 1890, pp. 40—59.] 8vo. *From the Author.*

——— On Palæosaccus Dawsoni, Hinde, a new Genus and Species of Hexactinellid Sponge from the Quebec Group (Ordovician) at Little Métis, Quebec, Canada. [From the 'Geological Magazine,' February, 1893.] 8vo. pp. 3. *From the Author.*

——— Note on a Radiolarian Rock from Fanny Bay, Port Darwin, Australia. [From the 'Quarterly Journal of the Geological Society' for May, 1893, pp. 221—226.] 8vo. *From the Author.*

Hinde (George Jennings, Ph.D.), and Holmes (W. Murton). On the Sponge-Remains in the Lower Tertiary Strata near Oamaru, Otago, New Zealand. [From the 'Linnean Society's Journal—Zoology,' vol. xxiv. pp. 177—262.] 8vo. *From Mr. G. J. Hinde, Ph.D.*

Ibis (The), a Quarterly Journal of Ornithology. Edited by Philip Lutley Sclater, M.A., Ph.D., F.R.S. Sixth Series, vol. v. nos. 2—4; vol. vi. no. 1. 8vo. Lond. 1893—4. *From Mr. G. F. Bueton, F.Z.S.*

Labouysse (Dr. Alain). Lettre sur les Oiseaux de la Province de Constantine. pp. 32. roy. 8vo. *From Professor Newton, F.R.S.*

Lartet (M.). Note sur un Humérus fossile d'Oiseau, attribué à un très-grand Palmipède de la section des Longipennes. [Extrait de l'Académie des Sciences, tome xliv.] pp. 5. sm. 4to. 1857. *From Professor Newton, F.R.S.*

Liverpool Geological Association. Transactions. Vol. xiii. 1892—93. 8vo. Liverpool, 1893. *From the Association.*

Liverpool. Geological Society. Proceedings. Vol. vii. part 1. 8vo. Liverpool, 1893. *From the Society.*

London. Geologists' Association. Proceedings. Vol. xiii. nos. 2—5. 8vo. London, 1893. *From the Association.*

London. Geologists' Association. List of Members. February, 1894. 8vo. *From the Association.*

——— Excursion to Norwich, the Bure Valley, Cromer, and Lowestoft. By H. B. Woodward, F.G.S., Clement Reid, F.L.S., and J. H. Blake, F.G.S. pp. 16. 1893.
From Mr. H. B. Woodward, F.G.S.

London. Geological Society. Quarterly Journal, nos. 193—195. 8vo. 1893. *From Col. Feilden, F.G.S.*

London. Linnean Society. Journal—Zoology, nos. 151—155. 1892-93. 8vo. *From Mr. J. H. Gurney, F.Z.S.*

——— Journal—Botany, nos. 198—205. 8vo. 1892—93.
From Mr. J. H. Gurney, F.Z.S.

London. Royal Geographical Society. The Geographical Journal, including the Proceedings of the Royal Geographical Society. 1893. 2 vols. roy. 8vo. Lond. 1893.
From Mr. H. G. Barclay, F.R.G.S.

——— The Journal of the Royal Geographical Society. Vols. 39–50. 12 vols. Lond. 1869—80.
From Mr. H. G. Barclay, F.R.G.S.

London. Royal Microscopical Society. Journal of the Royal Microscopical Society; containing its Transactions and Proceedings, etc. April, 1893 to February, 1894. roy. 8vo. Lond. 1893—94. *From the Society.*

London. Royal Institution of Great Britain. Proceedings. Vol. xiv. part 1. 8vo. Lond. 1894. *From the Royal Institution.*

Manchester Geological Society. Transactions. Vol. xxii. nos. 12, 15, 8vo. Manchester, 1893—94. *From the Society.*

Marine Biological Association of the United Kingdom. Journal. Vol. ii. no. 4; vol. iii. no. 1. 8vo. Lond. 1892—93.
From Professor Newton, F.R.S.

Montagu (George, F.L.S.). Ornithological Dictionary; or Alphabetical Synopsis of British Birds. 2 Vols. in 1. 8vo. Lond. 1802. *From Professor Newton, F.R.S.*

New Zealand. Transactions and Proceedings of the New Zealand Institute. Edited and published under the Authority of the Board of Governors of the Institute, by Sir James Hector, K.C.M.G., M.D.., F.R.S. Vol. xxv. 8vo. Wellington, 1893.
From the Institute.

Normandy. Faune de la Normandie. Par Henri Gadeau de Kerville. I. Mammifères. roy. 8vo. Paris, 1888.
From Professor Newton, F.R.S.

Norway. The Norwegian North Atlantic Expedition, 1876—78. [In Norwegian and English.] Part 22. Folio. Christiania, 1893. *From Professor Newton, F.R.S.*

Contents :—

Zoology. Ophiuroidea. By J. A. Grieg. With 3 plates and 1 chart.

Nova Scotia. The Proceedings and Transactions of the Nova Scotian Institute of Science, Halifax, Nova Scotia. Second Series. Vol. i. part 2. 8vo. Halifax, N.S., 1892.
From the Institute.

Plymouth Institution and Devon and Cornwall Natural History Society. Annual Report and Transactions. Vol. xi. part 3. 1891—92. 8vo. Plymouth, 1893. *From the Institution.*

Russia. Bulletin de la Societé Impériale des Naturalistes de Moscou. Année 1893. 3 nos. 8vo. Moscou, 1893. *From the Society.*

Selby (Prideaux John). An account of two rare British Birds. [Pernis apivorus and Scolopax sabini.] pp. 3. 1832.
From Professor Newton, F.R.S.

Southwell (Thomas, F.Z.S.) and Harmer (Sidney F., F.Z.S.). Notes on a Specimen of Sowerby's Whale (Mesoplodon bidens), stranded on the Norfolk Coast. [From the 'Annals and Magazine of Natural History' for April, 1893, pp. 275—284.] 8vo. *From Mr. T. Southwell, F.Z.S.*

Staffordshire (North) Naturalists' Field Club and Archæological Society. Annual Report and Transactions. Vol. xxvii. 1893. 8vo. Stoke-upon-Trent, 1893. *From the Society.*

Stevenson (Henry) A List of the Birds of Norfolk. Reprinted from White's History and Directory of the County. pp. 10. 8vo. Sheffield, 1864. *From Mr. J. H. Gurney, F.Z.S.*

Stirling (E. C., M.D.) and Zietz (A.). Scientific Results of the Elder Exploring Expedition: Vertebrata. [From the 'Transactions of the Royal Society of South Australia,' vol. xvi. pp. 154—176.] 8vo. *From Professor Newton, F.R.S.*

United States of America. Annual Report of the Smithsonian Institution for the year ending July, 1891.
From the Smithsonian Institution.

——— Eleventh Report of the United States Geological Survey, to the Secretary of the Interior, 1889-90. By J. W. Powell, Director. Part I. Geology. Part II. Irrigation. imp. 8vo. Washington, 1891.

——— Monographs of the United States Geological Survey. Vols. xvii., xviii., xx. 4to. Washington, 1892
From the U.S. Geological Survey.

Vol. xvii. The Flora of the Dakota Group. By Leo Lesquereux. 1891.

Vol. xviii. Gasteropoda and Cephalopoda of the Raritan Clays and Greensand Marls of New Jersey. By R. P. Whitfield. 1892.

Vol. xx. Geology of the Eureka District, Nevada. With an Atlas. By Arnold Hague. 1892.

——— Bulletins of the United States Geological Survey. Nos. 82—86, and 90—96. 8vo. Washington, 1891—92.

——— Mineral Resources of the United States. By David T. Day. 1889—90 and 1891. 8vo. Washington, 1892—93.
From the U.S. Geological Survey.

——— North American Fauna. Published by Authority of the Secretary of Agriculture. No. 7. 8vo. Washington, 1893.
From Mr. J. H. Gurney, F.Z.S.

——— The Prairie Ground Squirrels, or Spermophiles, of the Mississippi Valley. By Vernon Bailey. Published by Authority of the Secretary of Agriculture. 8vo. Washington, 1893.
From Mr. J. H. Gurney, F.Z.S.

United States of America. American Museum of Natural History. Bulletin, vol. v. New York, 1893. *From the American Museum.*

——— Annual Reports of the Curator of the Museum of Comparative Zoology at Harvard College, for 1888—89 and 1891—92. 8vo. Cambridge, U.S.A., 1889—92.

——— Memoirs of the Museum of Comparative Zoology at Harvard College. Vol. iv. no. 10; vol. xiv. no. 3. 4to. Cambridge, 1876—93.

Vol. iv. No. 10. The American Bisons, living and extinct. By J. A. Allen. 1876.

Vol. xiv. No. 3. Reports on the results of Dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877—78), in the Caribbean Sea (1878—79), and along the Atlantic Coast of the United States (1880). 1893.

——— Bulletins of the Museum of Comparative Zoology at Harvard College. Vol. xxiii. nos. 4, 5; and vol. xxiv. nos. 1—7. 8vo. Cambridge, U.S.A., 1892-93.

——— Eleventh Annual Report of the Board of Trustees of the Public Museum of the City of Milwaukee. 1892—93. Milwaukee, 1893. *From the Board of Trustees.*

——— California State Mining Bureau. Eleventh Annual Report of the State Mineralogist. 1892. 8vo. Sacramento, 1893. *From the Bureau.*

Whitaker (W., F.R.S.). On Maps showing the Area of Chalk available for Water Supply in the London Basin. [From the 'Transactions of the Sanitary Institute,' vol. xiii.] pp. 6. 8vo. 1892. *From the Author.*

Whitaker (W., F.R.S.), Skertchly (S.B.J., F.G.S.), and Jukes-Browne (A. J., F.G.S.). The Geology of South-Western Norfolk, and of Northern Cambridgeshire. 8vo. Lond. 1893. *From the Director General of the Geological Survey.*

Williams (Charles, F.R.C.S., Ed.). A Case of Filaria sanguinis hominis noeturna. pp. 20. 8vo. Norwich, 1893. *From the Author.*

Woodward (A. Smith, F.G.S.). Notes on the Sharks' Teeth, from British Cretaceous Formations. [From the 'Proceedings of the Geologists' Association,' February, 1894, pp. 190—200.] 8vo. *From the Author.*

——— Note on a Tooth of Oxyrhina from the Red Crag of Suffolk. [From the 'Geological Magazine,' February, 1894, pp. 75—76. 8vo. *From the Author.*

Year-Book of the Scientific and Learned Societies of Great Britain and Ireland; comprising lists of the Papers read during 1892. 8vo. Lond. 1893. *Purchased.*

Yorkshire Naturalists' Union. Transactions, part 18. 1892. Leeds, 1893. *From the Union.*

Zoologist (The): a Monthly Journal of Natural History. April, 1893, to March, 1894. 8vo. Lond. 1893—94. *From Mr. G. F. Burton, F.Z.S.*

Proc.

ADDRESS.

Read by the President, T. Southwell, F.Z.S., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Twenty-fifth Annual Meeting, held at the Norwich Museum, March 27th, 1894.*

Ladies and Gentlemen—In vacating the chair to which you did me the honour to elect me a second time twelve months ago, it becomes my duty to give an account of my stewardship; but I think that such an auspicious occasion as the twenty-fifth anniversary of the birth of our Society calls for more than the ordinary notice, and offers a fitting opportunity to review, not only the work of the past year, but also to take a retrospective glance at our doings throughout the quarter of a century, during which we have been in existence,—to consider in fact to what extent we have justified our existence as a Society, and how far we have succeeded in carrying out the five fundamental "objects," which, to keep fresh in our memory, we print on the fly-leaf of each number of our 'Transactions.'

In March, 1869, some few individuals interested in Natural Science met together to consider in what way they could best render each other mutual assistance in the pursuit of their favourite study, and induce others to take an interest in what to them had proved a source of so much enjoyment; the result of this conference was that a meeting was held in the Museum on the 30th of the same month, at which the twenty gentlemen then present decided on the formation of the Norfolk and Norwich Naturalists' Society. A code of Rules was adopted and Officers chosen, and on the 27th April, 1869, in this room, the first regular meeting was held,

under the presideney of our exeellent friend, the late Rev. Joseph Crompton, than whom no more suitable guide and eounsellor to a young Soeiety eould have been found. The words of wisdom which he then addressed to us have always been in my mind. He impressed upon us the interdependence, the one upon the other of all the various braneheş of Natural Sciene, and emphasized the important lesson that although we could not expect to tread with distinetion more than one of its many paths, we must from the first dismiss from our minds the slightest indifferenee towards the studies of others, for eaeh tended to throw light upon the other. The Geologist could not determine his fossils without a knowledge of say Conehology, and the Botanist could not have a proper understanding of the flora of a distriet without knowing something of its soil, for whieh he would have to seek the assistanee of the Geologist; he told us that we were about to engage in the "glorious exeitement of a glorious pursuit," but that we were not to forget we were all students, and that we must gather many facts before "the fire of patient investigation applied to them" would yield in our erueible "the little shining globule of truth." I think we have been to a great extent mindful of this exeellent adviee, and the result has been a united Soeiety, mutually interested and instructed by eaeh other's work.

At the end of the first year we numbered 119 members, of whom I rejoiee to say 31 are still with us, although the hand of death has removed some whom we valued most—amongst them our first President, who for two years, to use his own expression, "roeked the eradle" of the Soeiety—and I will, now that we are of full age, with your permission, eonsider very briefly what reeord we ean show for the years that are past, and this I will do, not in any spirit of vainglory! but I trust you will pardon me if my feelings of honest pride in a Soeiety in whieh I take so mueh interest should render themselves more evident than may appear quite seemly.

One of the first things whieh we set ourselves to do was the eompilation of aeeurate lists of the Fauna and Flora of our County, and I think we may look with satisfaetion upon the result, for although there are some classes both of animals and plants with

which we have not yet dealt (notably the Marine Invertebrata and the Mosses and Lichens), still we have published 13* excellent lists which we have endeavoured to keep up to date by means of appendices at the end of the five-yearly volumes, and, in addition to these, many observations on rare species will be found scattered throughout the pages of our 'Transactions.' Since we have kept these records, 8 Mammals,† new to the County, have been made known, 16 species of Birds,‡ also many species of Fishes, Insects, and Plants.

Another feature which will be observed in the five thick volumes which we have published, is the series of Memoirs of deceased Norfolk Naturalists, among whom are, Lilly Wigg, Richard Lubbock, William Arderon, F.R.S., Samuel Woodward, S. P. Woodward, John Scales, J. H. Gurney, and C. B. Rose; where possible, these memoirs are illustrated by portraits, that we may know what manner of men these pioneers of Norfolk Natural History were; there are also shorter notices of Blyth, Whitear, Sheppard, Hoy, Girdlestone, Hamond, Marsham, Dawson Turner, Bryant, Pitchford, and others, besides more or less full obituary notices of those who have been taken from us. We regard this as a very important part of our duty, and would that we knew more of some of the men in the humbler walks of life who, a century or more ago, devoted the brief hours which they could spare from the shuttle, not only to the cultivation of plants, the love of which they had probably inherited from their Dutch predecessors, but also to the more serious

* These in the order in which they were contributed are as follows:—1, Mammalia and Reptilia: 2, Marine, and Land and Fresh Water Shells; 3, Fungi; 4, Fishes: 5, Lepidoptera: 6, Flowering Plants and Ferns; 7, Diatomaceæ; 8, Hemiptera: 9, Hymenoptera; 10, Marine Algæ, Norfolk Naiadaceæ, &c.; 11, Birds; 12, Coleoptera: 13, Ichneumons.

† Namely:—The Ringed Seal, Red Field Vole, Lesser Shrew, Bank Vole, Pilot Whale, Grey Seal, Sowerby's Whale, and Bearded Seal.

‡ Namely:—Ortolan Bunting, Golden Eagle, White's Thrush, Wall Creeper, Eastern Golden Plover, Grey-capped Wagtail, Sabine's Gull, Roseate Tern, Icterine Warbler, Barred Warbler, Serin Finch, Lesser Grey Shrike, White Wagtail Caspian Plover, King Duck, and Siberian Pectoral Sandpiper.

study of botany as then understood,—one of them having been the first to raise Lycopodium from its spores—and, as has been truly said, it is not improbable that their researches and example first incited to similar pursuits the distinguished botanists, for which, at a later period, the County of Norfolk became noted.

It would be tiresome to review too minutely the published work of the Society, but the very full "Meteorological Notes" for the past twenty-three years, must be possessed of value, and the highly interesting series of twenty unpublished letters from Gilbert White, addressed to Robert Marsham, F.R.S., of Stratton Strawless, and that gentleman's replies, which, through the kindness of the latter's great-great-grandson, the late Rev. H. P. Marsham, and the late Professor Bell, we were the means of first publishing, are certainly deserving of mention. It has been our object whilst not altogether rejecting papers of more general interest, to confine ourselves as much as possible to matters of local interest, such as would reasonably be looked for in the 'Transactions' of a local Society.

Nor have we been unmindful of the duties enjoined in Sections I. and II. of our code of "objects," namely, of striving to procure protection for indigenous birds and plants, and discouraging the practice of destroying rare and occasional ornithological visitors, and I think on the occasion of the remarkable second visitation of Pallas's Sand Grouse, our influence was successfully employed with the Norfolk landowners and occupiers in inducing them to attempt the solution of the interesting problem as to whether or not this remarkable species would establish itself with us; the result was not a success, but before legislation was introduced for that purpose the good feeling of the Norfolk sportsmen had commenced the experiment by ceasing to molest the flocks which were scattered over the County, and on the occasion of the visit of a migratory Bustard to the haunts to which this species had so long been a stranger, one member of our Society used his utmost endeavours to prevent its molestation, whilst another member supplied it with a mate, and but for the setting in of weather of great severity, it is impossible to say what might have been the result of the interesting experiment. I think we may be pardoned if we feel both pride

and pleasure in recording these acts, so worthy of imitation, but alas ! of such rare occurrence.

Our efforts have also been directed to the abolition of the cruel practice of trapping the supposed enemies of the game preserver, but so deep is the prejudice against so called "winged vermin," that I fear hitherto we have met with little success, except that perhaps the Barn Owl is regarded with somewhat less disfavour; but so long as the hateful pole-trap or the steel-fall is in use in one single instance, common humanity demands that we should denounce the practice. In another direction, although we have not been in a position to offer pecuniary assistance as a body, the excellent work done by the Breydon Bird Protection Society, and by Colonel Feilden at Wells, where some of us have seen the late all but extinct colony of shore-breeding birds restored to somewhat of its former numbers, has been mainly the work of our members, and possibly not a little owing to our influence. We also did our best to induce those in authority to render really effective the Bill which was introduced into Parliament last Session, with a view to protect the eggs of certain species of birds, and which was unfortunately rejected by the House of Commons in consequence of the amendments of the Lords, who reconstructed the Bill, on the only lines on which it is thought by us, and by many of those who have studied the subject deeply, that it can be effectually worked. I venture to think that it would be very much to the advantage of the promoters of a measure so excellent in its intention as the Bill referred to, to consult with Societies such as our own, as to the principles on which a really workable Act of Parliament (the want of which is so painfully evident in many parts of the country) should be based, and I cannot but regret the uncompromising spirit in which the Bill was withdrawn.

Thus after twenty-five years our Society is full of activity, and to borrow the words of the President of the British Association (Dr. Burdon-Sanderson), "looking back with satisfaction to what it has accomplished in its youth, and forward to an even more efficient future."

Coming to the year just brought to a close, the event which calls

for first mention is the establishment of a section of our Society at Great Yarmouth. Although contemplated at its formation, no such extension had hitherto taken place, there is therefore cause for much congratulation that our intentions are at length bearing fruit. On the 15th June last, four of our members attended a public preliminary meeting held at Yarmouth, on the invitation of Mr. F. Danby Palmer, when it was unanimously resolved to establish a section of the Norfolk and Norwich Naturalists' Society in that town; the Rev. C. J. Lucas was chosen Chairman, Mr. F. Danby Palmer, Treasurer, and Mr. A. Patterson, Hon. Secretary, and mainly through the active exertions of these gentlemen, a goodly number of members was speedily enrolled. On the 24th October, with some other Norwich members, I had the pleasure of attending the first monthly meeting of the section, on which occasion the chairman of the section did me the honour to invite me to deliver an opening address.* Up to this time our promising offset has been working with great activity, and now I am happy to say numbers eighty-eight members. I am deeply gratified that this extension, of what I believe to be our usefulness, should have taken place during my year of office. One laudable object which the Yarmouth Society has at heart is the establishment of a museum worthy of the town, the nucleus of which already exists in the miscellaneous collection in the Toll House, and to which Lord Hastings's generous donation of birds will be a material help. In furtherance of this object, I am informed that the Corporation has recently voted the sum of £650.

At the last annual meeting, I expressed a hope that the excursions, which had been rather neglected for the past year or two, would be revived with somewhat of the ardour of former times, and I think, that, favoured by the glorious weather which we enjoyed in the exceptional summer of 1893, the members who took part in our outings did not regret having done so. Sure I am, that all who on the invitation of Professor Newton, and Mr. Sidney Harmer, visited Cambridge on Whit Monday, the 22nd of May, 1893, will long remember with pleasure, not only the attractions of the

* See p. 535.

University Institutions freely opened for their inspection, but also the very great kindness and courtesy of all those who left nothing undone which could tend in any way to make the visit a success.

A party of twenty left Norwich at 7.50 a.m., and were joined by about twelve others, who came in by trains from the directions of Ipswich and Lynn, making altogether thirty-two members and their friends. The morning was wet at starting, which, after the long-continued drought, was rather a matter of congratulation than otherwise, but on reaching Ely the rain had come to an end, and at Cambridge the weather was found to be most delightful, and thus it continued during the remainder of the day. The beautiful patches of furze and broom along the line and covering some of the waste land were in full bloom, and presented really magnificent masses of colour. The gleaming waters of Ring Mere seen in the distance, shortly after passing Roudham Junction, showed that the severe drought had not exhausted the supply of water in this favourite resort of the Little Grebe.

On arriving at the Fitz-William Museum, at 11.30, the party were met by Professor Newton, and Mr. S. F. Harmer, and under the guidance of Mr. Montague James, were shown some of the most interesting of the works of art and antiquities contained in these well-known collections; after which they proceeded to the Antiquarian Museum, the treasures of which, particularly the local Saxon remains, were kindly displayed to them by Baron von Hügel, who gave most interesting particulars of the peculiar features possessed by many of them, and of the circumstances under which they were discovered. The time thus passed quickly until luncheon,—which at the request of Mr. S. J. Hickson, who took upon himself all the trouble of the excellent arrangements—was served in the hall of Downing College, most kindly granted for the occasion by the Master, Dr. Hill, who presided, and welcomed the Society in very flattering terms. After luncheon followed a delightful ramble in the beautiful grounds of Downing College, and taking leave of the Master, the party were conducted to the new Laboratory Buildings, and the Museums of Zoology and

Botany, through which they were conducted by Professor Newton, Mr. Harmer, Mr. Shipley, and others. In the Museum of Zoology, Professor Newton exhibited an interesting series of species of birds which have become extinct in recent times, and made some remarks upon the probable causes which led to their extinction. He then brought to the notice of the party certain Fen birds, and gave a few particulars of the partial reversion of this interesting district to somewhat of its former condition after the great flood of 1852, when the Redshank, Black-headed Gull, and Black Tern once more for a brief time returned to their old breeding haunts; and exhibited some eggs of the latter bird, which were taken in Feltwell Fen in 1853. Mr. D. Sharp, the curator in Zoology, exhibited some beautiful preparations. showing the stridulating organs of Ants, which had been shown at a recent *soirée* of the Royal Society. The botanists experienced a rich treat at the hands of Mr. F. Darwin, and witnessed some interesting experiments then in progress, exhibiting the absorption of water by plants and their exhalation of oxygen. The Botanical Museum under his charge is small at present, but its contents are of peculiar interest, and the modes of preparation the most recent and perfect known. It would occupy too much space to enumerate the objects of interest in the biological laboratory, but special mention must be made of the treat which Professor Liveing had prepared for those who accompanied him through the Chemical section. Starting from the basement, in which are powerful steam engines for working the air pumps and dynamos, he conducted the party through room after room fitted with every appliance for chemical study and research, and pointed out many ingenious devices for minimising the discomfort produced by large numbers of students working with sulphuretted hydrogen and other evil-smelling compounds, and courteously answered all inquiries concerning the apparatus, &c. Much interest was excited in the room where Professor Liveing was carrying on his researches on the spectrum, and he permitted those present to inspect the gratings used by him for this purpose, ruled with 14,000 to 17,000 lines to the inch. In one part of the physical laboratories students were at work determining the co-efficient of expansion of glycerine,

whilst in other parts experiments were being performed with the spectroscope and with Wheatstone's Bridge. A very interesting modification of Joule's apparatus for determining the mechanical equivalent of heat was explained. They also inspected the magnificent collection of apparatus in the Cavendish Laboratory, some of which is of historical interest, as for example, the mechanism devised by Maxwell for showing the probable constitution of Saturn's ring, Babbage's calculating machine, and the coil used by the Committee of the British Association for determining the value of the Ohm. In the Lecture Hall, Professor J. J. Thomson showed some beautiful effects produced by sending electrical discharges through coils of wire surrounding flasks, which contained gases in a highly rarified condition.

Tea and coffee were served in the hall of Magdalene College, on the invitation of Professor Newton, who conducted those who wished to the Pepys Library, where they had an opportunity of inspecting the famous "Diary," which possesses a revived interest in the light of the recent publication of a fuller edition of this remarkable work, and a walk along the "Backs," which were looking their best in all the glory of the tender spring foliage, lighted up by brilliant sunshine, and thence to the railway station, ended a day which will long remain fresh in the memory of those who shared in the kindness and hospitality of all who took so much trouble to make their visit both a source of pleasure and profit.

On the 22nd June, a party of members and their friends visited the beautiful woods at Hempstead near Holt, on the invitation of Mr. Hugh Gurney Barclay. Under the guidance of Samuel Fowle, who has for many years been the guardian of this lovely tract of woodland, interspersed with heath and water, and in parts a very paradise of ferns, they spent a pleasant time in exploring its beauties till obliged to take shelter from a thunderstorm, which brought that part of the proceedings to a close; but the satisfaction with which the much needed shower was regarded, and the beauty of the subsequent evening, fully atoned for the ramble in the woods being somewhat curtailed. The chief botanical find was *Pyrola minor*, and the remarkable disappearance of *Scutellaria minor* which

Mr. Geldart and myself had observed in great abundance in one particular spot on a former visit, excited some surprise and no little regret, as it is the only habitat of this plant in Norfolk known to Mr. Geldart.

The third excursion was made on the 27th July, to Dilham and Honing, under the guidance of the Rev. J. A. Laurence. The party drove from Worstead Station to Honing, and were met by Mr. Laurence, who conducted them through the Honing Common Severals, where they found a rich profusion of bog plants. The soil was more than damp, but the botanists were rewarded by the beauty of the floral gems which surrounded them, and which are seldom seen by any but those who specially search for them. All three species of Sun-dew were found, and some late blooms of the *Epipactis*, as well as early ones of the if possible still more beautiful Grass of Parnassus, but owing to the peculiar season of drought and subsequent rains through which we have passed, the plants were, as a rule, much dwarfed and altogether irregular in their season of flowering. Passing along the North Walsham and Dilham Canal, which was crossed at the Dilham Lock, the party were kindly received by Major Anderson, who placed his boat at their disposal for a visit to the Broad, which was very lovely, the profusion of aquatic vegetation being very great, White Water Lilies, Water Soldier, Frog-bit, and many other water plants being in abundance, whilst the banks were resplendent with Purple Loose-strife, and richly coloured *Ranunculus lingua;* masses of a late-flowering *Caltha*, which seems to belong to the whole of the course of the River Ant were very conspicuous, and a curious form of *Potamogeton* was observed by Mr. Geldart. Returning to Dilham, a pleasant drive through the fertile country covered with splendid crops of corn and roots terminated at North Walsham, where, after tea at the King's Arms, the party took the train for Norwich, having enjoyed a very charming afternoon in the country.

One other excursion was made, namely, on the 26th October, to Mr. Charles Middleton's Brick Works, at Hellesdon, to inspect a very fine early Neolithic flint implement, which had recently been found there, and the pit from which it was supposed to have been

derived ; but as Mr. Harmer has contributed a paper on this subject, which will be printed in our 'Transactions,' I need only add that though we were unable to date back the evidence of man to the preglacial gravel, we had ample proof of his hospitality in the present day, as evinced by the kind reception we met with from Mr. Middleton, and had, in other respects, a very enjoyable visit.

The meetings during the past year have been well attended, and the papers read, fully up to the average of interest. Those which are to be printed will speak for themselves, I need not, therefore, occupy your time by enumerating them, but I think Mr. Mayfield's contribution to our knowledge of Norfolk Earth Worms, is deserving of special mention, having reference to a class of animals, the study of which, although now becoming popular, has, until recently, been much neglected. Our special thanks are also due to Mr. Patterson, whose notes from Yarmouth, read almost monthly, have always been so full of interest. Mr. Bidgood sent us a paper on *Tolypellopsis stelligera*, a rare form of Chara, from Hickling Broad, which treated of its habits of growth and reproduction ; but his observations not yet being complete, we hope for a further communication on the same subject at some future time. The same may be said of a paper on the Flora of the Færoe Islands and its origin, by Mr. Geldart. I am happy to say that the latter gentleman, who read on April 27th, 1869, the first paper before the Society, still maintains his interest, and was one of the most valued contributors during the past year. I had also myself the honour of addressing you in the first year, and both Professor Newton and Mr. J. H. Gurney, who were contributors to the second part of our 'Transactions,' are also contributors to the twenty-fifth.

During the past year we have elected 27 new members, and have lost 8, leaving the present number of members 268, or an increase of 19 over the previous year. We have also the pleasure of electing two new Honorary Members, Professor Robert Collett, of the University of Christiania, in Norway, and Mr. E. T. Newton, F.R.S., the latter in recognition of his researches in the vertebrate remains of the Forest-bed series which have added so immensely to our knowledge of the fossil fauna of these interesting deposits. We

have to lament the loss of two members by death, Mr. R. M. Stedman, who never took an active part in our proceedings, and Mr. T. Roberts, who was a constant attendant at the monthly meetings, and frequently exhibited interesting specimens which came into his hands in the way of business; he was a most skilful taxidermist, very observant, scrupulously exact, and the ready kindness with which he imparted his experience to others will cause his loss long to be felt by working ornithologists.

Financially, as we have just heard from the Treasurer, we are in a good position, and the contributions to our Library have been numerous and valuable, for which we are chiefly indebted to Professor Newton, Mr. Hugh Gurney Barclay, and Mr. Geoffrey Fowell Buxton.

The closing duty of my year of office, otherwise so enjoyable, is the only one which has occasioned me any anxiety. I need only mention that, by the Laws of our Society, the President is "invited," and I fear expected, to supplement the business portion of his address by some more or less original remarks of his own. Should he not be a specialist, as happens to be my case, this may prove a difficult task. I must, therefore, ask your forbearance if I choose a subject which may savour perhaps as much of Archæology as of Natural Science; what I have to say, however, shall have a strictly local bearing.

I do not think we all of us fully realise what an exceedingly interesting part of the country we inhabit; geologically, the County of Norfolk offers many most difficult problems, its Fossil fauna and flora are exceptionally rich and suggestive, and have been worked out with great care, whilst its surface, although not presenting any of the extremes of mountain and glen to be found in some parts of our favoured island, is remarkably diversified, and possesses beauties and physical peculiarities little dreamed of by the unobservant, and not even appreciated to the full by some of us who have passed our lives in their midst. The late Mr. Stevenson, in the introduction to his 'Birds of Norfolk,' has admirably portrayed the very marked features which characterise the "Districts" into which he has divided the County of Norfolk, and so accurate are his descriptions

that nothing can be added to the general outlines which he has sketched with such a masterly hand; but I think we may profitably spend the brief half-hour allotted to us in trying to realise the picture presented by some of these highly interesting tracts of country before drainage and enclosure had reduced their area, and shorn them to a great extent of their natural wildness. I own, the material at our disposal, out of which to reconstruct the picture is small indeed, and therefore, if only for that reason the more precious; but it may be that a fine line introduced here and there will enable us with greater ease, mentally, to recall to some extent a condition of things which has passed away never to return.

This dearth of early records as to the state of the County of Norfolk in times past is remarkable, for surely a tract of country so diversified as to call forth Fuller's oft-quoted remark that all England might be constructed out of it, "not only as to kinds but degrees thereof," or as Spelman puts it in his *Icenia*, "Huntingdon is rather hilly; Cambridgeshire is entirely campagne; Suffolk well furnished with woods; and Norfolk partakes of all these several features," * must have been possessed of great diversity of surface, and we know with such attractions it could not fail to become the resort of countless hosts of feathered fowls and four-footed beasts, whilst its abundant waters must have teemed with fish innumerable.

"Could the England of 1685," says Macaulay,† "be by some magic process, set before our eyes, we should not know one landscape in a hundred, or one building in ten thousand, ... many thousand square miles which are now rich corn-land and meadow, intersected by green hedgerows, and dotted with villages and pleasant country seats, would appear as moors overgrown with furze, or fens abandoned to wild ducks, ... many breeds now extinct or rare, both

* All the extracts given here from Sir Henry Spelman's *Icenia*, are from a MS. English translation, made by the late Rev. George Munford, author of 'An Analysis of the Domesday Book of Norfolk,' and of 'Local Norfolk Names,' which was kindly lent me by his son, the Rev. E. E. Montford, of Swanton Abbot.

† Hist. vol. i. p. 281.

of quadrupeds and birds, were still common, ... the Badger made his dark and tortuous hole in the side of every hill, where the copsewood grew thick," . . . the Wild Cat and Yellow-breasted Marten were still present, "Fen Eagles preyed on fish along the coast of Norfolk. On all the downs from the British Channel to Yorkshire, large Bustards strayed in troops, and the marshes of Cambridgeshire and Lincolnshire were covered, during some months of the year, by immense crowds of Cranes. Some of these races the progress of cultivation has extirpated, of others the numbers are so much diminished that men crowd to gaze at a specimen, as at a Bengal Tiger or a Polar Bear."

Although even in 1685 it might still be said of some of its old resorts in this country,

"There stalks the stately Crane, as tho' he march'd in war,"

still, I fear this fine bird must have been growing scarce in England at that time; in other respects, the picture drawn by Macaulay is probably a fairly correct one, and would apply specially to the County of Norfolk, which was slow to change, and in which some species, for instance the Great Bustard, the Avocet, and the Ruff, lingered long after they had disappeared from other localities, and in fact, the latter bird can hardly even now be said to have quite deserted us in the breeding season. Of the extinction of the Bustard in Norfolk, and its attendant circumstances, through the researches mainly of Professor Newton and Mr. Stevenson, we possess a fairly full record; but there are some other species* which have vanished like a dream, we know not exactly how, nor precisely when, doubtless the event might have been predicted with tolerable certainty, but the observer was absent, and we simply woke up to the fact that their place knows them no more, and that is all. It is one of the objects of this Society to prevent a recurrence of so regrettable a circumstance.

In times past, vast tracts of heath-land spread over the county stretching far away over hill and dale, remains of which are still

* A remarkable instance of this is the Black Tern, which formerly bred in such vast numbers at Upton Broad, and other places. *Vide* 'Birds of Norfolk,' vol. iii. p. 314.

to be found notably by Thetford, Lynn, Wolferton, Holt, Kelling, and many other places, whilst Mousehold, which represents a mere fragment of its former extent, even now comes down to the very boundary of our old city, and a remnant of the primeval oaks of Thorpe still marks the site of the great wood, into which in 1474 John Paston, whose Goshawk was so damaged in transit as to render it only fit to "eyer" (breed from), proposed to "cast hyr . . . and a tarsell with hyr, for" says he, "I weit wher on is," which very suggestive passage seems to indicate that this forest-loving species, now one of the rarest visitors of its class to Norfolk, would at least find a suitable home in the wooded slopes of Thorpe.

There is an amusing letter written by Sir John Paston (No. 919 Gardner Edition) to Lord Fitzwalter, about the year 1490, which I venture to reproduce, as it is not only very interesting from a Natural History point of view, but introduces us to the typical Norfolk gamekeeper and his gallows-tree, as well as to some of his victims; it is couched in humorous language, and "humbly beseecheth your good lordshepe, your dayly servaunt and beedman, John Paston, more Kayteff than Knyght, that it may please you of your speeyall grace to dyrect ought your lettres, sygned with your hand and sealid with your seall, to the dreedfull man, Jamys Radcliff of Byllingforth, Sqwyer, fermour of your wareyn ther, ought of wheys wareyn no maner of man nor vermyn dare take on hym, for dought of your seyd dredfull [man], to take or carye awey eny of your game ther, for fere [of being] hangyd up among other mysdoers and forfaytours, as wesellis, lobsters [Stoats] polkattys, bosartys [Buzzards], and mayne currys,—that the seyd Jamys shall, upon the syght of your seyd wryghtyng, delyver, or cause to be delyverd, to your seyd besecher or to hys depute, delyverer of your seyd lettres, at hys fyrst syght of the same, vj. coupyll blake conyes or rennyng rabbettys, or some blake and some whyght to the seyd nombre, to store with a newe grownd of your seyd besechers at Oxenhed, more lyeke a pynnefold than a parke. And your seyd besecher shall daylye prey to God for the preservacyon of your noble estate longe t'endure."

This letter is interesting for the use of the name "Lobster" for

the Stoat, as well as for the mention of the Black variety of the Rabbit, which Sir John Paston was evidently desirous of introducing into his park at Oxnead. There is also a very early mention of Black Rabbits (although eighty years later than that just quoted) in the 'Household Book' of Thomas Kytson (see 'Gaye's History and Antiquities of Hengrave,' p. 190), where, under date of October, 1573, occurs the following entry: "For baiting my Mr. his horse at Brandon, &c. . . . For vj. Black Coney skins, to fur my Mrs. night gown iiijs, iiijd," which indicates that the fur of these animals was of considerable value even in the sixteenth century. It seems doubtful whether these Black Rabbits were identical with the Silver Greys found in the same neighbourhood in the present day, for a note in Salmon's Diary, dated 7th March, 1837, seems to indicate that the latter were of recent introduction, he says: "Walked across the Warren [Thetford] to see Mr. Gardiner's new stock of rabbits, they came from Lincolnshire, and are of silver-blue colour, the fur is considered of more value than the common grey. I recollect seeing the same sort exposed for sale in Boston market, where they are considered as the common sort."

Very beautiful were these vast tracts of open land, varying in appearance as the soil varied; here glorious masses of golden Gorse scented the air, or equally beautiful thickets of deeper tinted Broom lit up the landscape, interseeted by oases of short sweet grass, redolent of wild Thyme, which the rabbits shared with the half-wild, long-legged Norfolk sheep. There, as far as the eye could penetrate, stretched rolling hills purple with blooming Heather, set off by the ruddy bronze of the autumn-tinted Ferns, backed by the dark pine woods, and flecked with the shadows of the passing clouds—in the damp valleys, Cranberries trailed over the green Sphagnum and thickets of Bog Myrtle sent their clouds of yellow pollen into the air, which was alive with the wild cry of the Redshank, the bleating of the Snipe, or the complaint of the Lapwing, as it strove to decoy the intruder to a safer distance from its downy little ones. Over all beat the Harrier, seeking food for its sitting mate or callow young.

The blowing sands of Thetford and Brandon were then, as now, the strange nesting-place of the Ring Dotterel, one of our most common shore birds, and the Stone Curlew broke the silence of the night by its loud and musical whistle. In the singular Meres of Wretham Heath, and in the waters of Stanford and Merton, various species of Ducks and Grebes found suitable nurseries for their broods, and the Black-headed Gulls which also found nesting-places in the same district, lent the charm of their presence.

The great sheep-courses of Norfolk are thus referred to by Sir Henry Spelman, when speaking of the country about Methwold, Feltwell, &c., after stating that Methwold yields "most excellent Rabbits," he proceeds, "this part of the county is very excellent for feeding sheep, as is the rest of the west side. Most of the villages feed one, two, three, or sometimes four or five thousand; so you may see that the nobles of England, when complaining of the tax imposed on fleece, rightly affirmed that half the wealth of the kingdom consisted in its fleece."

Doubtless the state of things which I have been endeavouring to describe, remained with very little alteration till the latter part of the last and the commencement of the present century, when, from various causes, many thousands of acres of land were rapidly brought into cultivation, which had previously been waste or common. Macaulay estimates that a fourth part of England was, in the course of little more than a century, "turned from a wild into a garden." In the fifty years preceding 1822, the commons of three hundred parishes in this county, according to the 'Norfolk Remembrancer,' were enclosed, and the work had not then abated. The causes of this "land hunger" do not lie strictly within our province, but they are interesting to trace, and we have not far to seek for them.

The difficulty of communication at this period was so great, that a plethora of corn might exist in one part of the country, whilst an absolute scarcity reigned in another; the local wants were for the most part supplied by local production, and the "loaf" was good or bad in accordance with the condition of the corn sent to the miller—there was no foreign admixture to improve the sample.

The country passed through a long period of war, and provisions reached a famine price, accompanied by great distress. In December, 1795, according to the 'Norwich Remembrancer,' wheat sold in Norwich market for 112s. per quarter; in 1796 it reached 126s. per quarter, and fine flour 70s. per sack; in 1800 it varied from 120s. to 150s. per quarter, and flour reached 111s. per sack; in January, 1801, wheat sold at 146s., in February of the same year, 168s., in March, 180s., which appears to be the highest price recorded, and in the following June it had fallen to 120s. per quarter. In the ten years ending 1820, the average was still 87s. per quarter, from which time it has been steadily declining till the present day, when it probably does not pay to grow.*

With such high prices there was, of course, the strongest inducement to utilise every inch of land, and wastes were brought into cultivation which, under the then existing circumstances greatly enriched the farmer, but which in the present day can only be worked at a loss, and will doubtless soon revert to the warren and sheep walks from which they were reclaimed, that is if the scanty grass can be induced to re-establish itself on the blowing sand which it formerly held together.

There is an interesting passage in De Foe's 'Tour through Great Britain' (1769), which must call up very regretful feelings in the breasts of Norfolk Farmers of the present day:—"All the country from Holkham to Houghton," says he, "was a wild sheep walk, before the Spirit of Improvement seized its inhabitants; and this glorious spirit has wrought amazing effects; for, instead of boundless Wilds and uncultivated Wastes, inhabited by scarce any thing but Sheep, the country is all cut into Inclosures, cultivated

* In the discussion which followed the reading of this address, Mr. J. T. Hotblack called attention to the curious fact that the recent average of wheat in Norwich market has been 12s. a coomb of 18 stone, or £5 6s. 8d. per ton, whilst at the same time bran has been selling at £6 5s. per ton. Thus the farmer has had to give £1 per ton more for the offal than he has been able to obtain for the fine corn; in fact, the bran has been worth nearly as much, weight for weight, as the flour. Hay has been selling at £8 per ton, which is half as much again as the value of a ton of fine wheat, and more than the cost of an equal weight of the best bread.

in a most husbandlike manner, richly manured, well peopled, and yielding an Hundred Times the produce that it did in its former state. . . . The Farms are all large, and the Rents low; for the Farmers having been at great Expense in Improvements, they could not afford them without very long Leases; so that most of the Farms are lett at present at Rents under their value: add to this, a considerable Part of the Country belongs to Landlords, who have a Vanity in not raising their Rents. . . . Altogether the Farmers have managed to raise considerable Fortunes," &c.

How true all this was of the tenants on such estates as Holkham, Houghton, Raynham, and some others, who formed the aristocracy of their class, there are many still living who can testify.

It must not be thought that before the "Spirit of Improvement" just spoken of entered into men's minds, nothing but Rye and Sheep were produced in Norfolk; then, as now, the highlands bordering the marshes which fringe the seaboard of the county, were exceedingly productive of corn of fine quality, especially of barley. Spelman says the Burnhams "might be taken for the bower of Ceres," and launches into a long disquisition on the excellent barley produced about Hunstanton and Holme, of which he says "they make a British wine [beer] equal to that made of the fruit of the vine." We need not follow him in his learned remarks on the names and qualities of the beers produced both here and by the Greeks, of which the latter became so fond that they instituted a festival in its honour, which the Emperor *Anastacias* found it convenient to abolish, but his remark that "all the Emperors in the world will never abolish the love of beer," comes home to us as Englishmen.

And thus the "Breck District" became what it now is; but the planting of belts of fir trees on the light lands as a precaution against the wind, which even in the present day drifts the sand against the banks or hedgerows like driven snow, and cuts the young turnips as though a sharp frost had passed over them—the substitution of turnips and wheat for rye, together with closer cultivation, however much the agriculturist may glory in the

change, cannot be regarded by the Naturalist without a pang of regret, for it has brought about the extinction of the noblest feathered inhabitant of which our county could boast, and we have only the poor consolation of knowing that it was not till 1838, several years after it had disappeared from its other haunts in this country, that the last of the local race of Great Bustards perished from the land.

Even more marked in its outline and characteristics than the Breck District of which we have just been speaking, was that of the "Fens," which has, however, undergone far greater changes in modern times. Sharply defined on the whole, although its outline is much broken, the Fen-land commences near to Brandon, and its eastern boundary follows the high land in an irregular line to near the towns of Hockwold, Feltwell, Methwold, and Stoke Ferry, at which latter point it takes a sudden bend westward along the valley of the Wissey to Fordham, approaching nearly to the River Ouse, and after sending off a branch along the Nar Valley, is continued nearly up to the town of Lynn. To the west it merges in the great Cambridgeshire Fens, and includes the north-west corner of Norfolk, known as "Marshland;" the whole forming a portion of the Great Bedford Level.

Marshland contains some 57,000 acres of exceedingly fertile land, covered with a network of raised banks which have been thrown up, some in very ancient times, to reclaim the soil from the sea, or to protect it from incursions of the tides; it has abundance of drains, but no natural springs or rivers, and Spelman states that it was in his time destitute of Moles and Shrews—a distinction, however, which it certainly does not enjoy in the present day.

Of the true Fen there is very little left to enable any conception to be formed as to its appearance even, say, a century ago, much less in still earlier times, when the land was forest clad and inhabited by the Wolf, the Wild Boar and the Beaver, whilst giant Stags and herds of fierce Urus roamed its glades, and Cranes, and Pelicans, made their homes in its fastnesses. The trees have been swallowed up by the growing peat, which has also preserved the

remains of its vanished fauna. One little spot, however, at Wicken, in Cambridgeshire, no doubt fairly represents one of the aspects of the Fen before modern draining and cultivation had destroyed for ever its former characteristics; here unbroken tracts of Sedge (*Cladium mariscus*) clothe the wet soil, and the dead level is only relieved by an occasional clump of dwarf Sallows; the effect, however, is destroyed even here by the "loads," which convey the water to the draining mill, the tall chimney of which may be seen in the distance.

The Fauna and Flora of this district must have been exceptionally interesting; of the latter, doubtless, a fairly accurate conception can be formed, but of the former we have few indications. Whether the Crane ever bred in the Norfolk Fens in historic times is uncertain, but seems probable,* it appears, however, to have been by no means a rare species.† I think there can be no doubt the Grey-lag Goose was formerly a regular breeder in this county, as well as in the Fens of Cambridgeshire and Lincolnshire,‡ but when we come to the Bittern, there is no doubt on the subject—till their haunts were destroyed they were extremely plentiful, especially about Poppelot, but now this characteristic denizen of the Fens no longer

"Undulates her note
Like a deep-mouthed bassoon."

Its former haunts know it no more—but a man from that neighbourhood with whom Professor Newton conversed in 1853, assured him that his uncle had killed five Bitterns in one day's shooting, and that his grandfather used to have one roasted every Sunday for dinner. From the same source Professor Newton learned that the Herons, now nesting at Didlington, formerly resorted to the Sallow bushes and Sedges in Hockwold and Feltwell Fens for that

* See 'Birds of Norfolk,' vol. ii. p. 125.

† The Le Stranges of Hunstanton, entertaining the prior of Coxford, Sir Henry Sharbourne and others in the year 1520, dined off a Crane, six Plovers, and a brace of Rabbits. This bird is mentioned in the 'Household Book' five times, and is valued at precisely the same sum as the Curlew, varying from 4d. to 6d.

‡ *Op. cit.* vol. iii. p. 3.

purpose, a mode of nesting which they also had recourse to in times past in certain of the Reed-beds of the Broads. Redshanks and Ruffs of course abounded and lingered as long as there were suitable feeding grounds, and even returned in 1853, as Professor Newton has told us in his interesting paper (*vide infra*), after the great flood had temporarily restored the Fen somewhat to its former condition. Ducks, as may be imagined, were very abundant, and there were Decoys at Stow Bardolph, Hilgay, Methwold, Hockwold, and Lakenheath, where immense numbers of Shovellers, Pintails, Pochards, Gadwals, Wigeon, Teal, and Mallards were taken. A man named Wilson, generally known as "Old Ducks," was a great slaughterer of fowl, at a Decoy on Methwold "Severals," but one Williams, at the Lakenheath Decoy, seems to have been even more successful still.

The glory of the Fens were the various species of Harrier, these birds must have been especially abundant there, as they were also in the Broad district on the other side of the county. At Poppelot, so numerous were they, that it is even said the Fen-men amused themselves on a Sunday, at a public-house in the centre of the Sedge Fen, by pelting each other with their eggs! Now both the Sedge Fen and the birds which used to inhabit it are gone, but it is remarkable how tenaciously the Harriers held on; constant persecution, however, was too much for them, and first the Marsh Harrier, always far less numerous than the other two species, then the Hen Harrier, and finally Montagu's Harrier disappeared—the latter most reluctantly, for a long time clinging to one or two favoured spots, but now I fear quite restricted to the North-east portion of the county, where a pair or two of this and the Marsh Harrier may still be found in most years, but the Hen Harrier is exceedingly rare. The same fate awaited the Short-eared Owl, which followed in the wake of the Harriers. Another bird common in the Fens was the Grass-hopper Warbler, or "Reeler," as it was called by the Sedge-cutters; and yet another, a rarity of the first water, Savi's Warbler, was found breeding at Poppelot.

Speaking of the Fenland, which lies in the valley of the Ouse, Spelman says: "All these parts often suffer loss from the river

overflowing the marshes, but yet the gain annually is not small (from the fertilizing nature of the waters), besides the great abundance of fish and other water creatures (as wild-fowl that are there attracted). This river is as it were the Milky-way to many inland places; for by it they import and export largely, merchandise and the necessaries of life." But this is as nothing to his praises of Lynn, with his remarks on which earthly paradise, I must depart out of the Fens. "Lynn," says Spelman, "is so well provided by nature with esculents and drinks, that it may seem to be the store-house both of Ceres and Bacchus; for on its eastern side there is a great abundance of corn, eggs, Rabbits, and land birds; while on the western side there is a like abundance of cheese, butter, Oxen, Swans, and marsh birds; and in the neighbourhood of fish, on the one side sea-fish, and on the other, river and fresh-water fish; so that scarcely in all Britain, perhaps in all Europe, is so great an abundance of eatables to be met with in the like space."

Great is the temptation to follow the diversified and interesting coast line, but time will not allow, and I must restrict myself to only one or two points, and confine my remarks strictly to the times which are past. The white cliffs of Hunstanton claim a passing notice, for here, until the year 1821, nested the Peregrine Falcon, and many an eyas was obtained thence by the Falconer at the Hall, in the old courtyard of which, erect upon its base, may still be seen the skull of the Sperm Whale which, Sir Thomas Browne tells us, came ashore on the beach at Hunstanton, in June, 1626. That either the Guillemot or Razorbill bred in these cliffs within "historic times," I can obtain no certain evidence,* but it is far from unlikely that such was the case, and the name of "Foul-ness" applied to a part of the lighthouse hills, at Cromer, has a very suggestive sound.

The marshes at Salthouse must always remain sacred ground as the last breeding-place of the Avocet in Norfolk, and, perhaps, in England. Here, early in the present century, these birds nested in considerable numbers, frequenting the salt marshes

* *Cf.* 'Birds of Norfolk,' vol. iii., p. 275, note.

subject to inundation at high tides, and in 1853 I conversed with an old marshman on the spot, who assured me he had, "years ago,' gathered their eggs in abundance. The late Mr. Stevenson and Mr. Dowell have also had similar first-hand evidence, and "Clinker's" eggs seem, in the season, to have formed the staple ingredient of the puddings and pancakes of the poor of Salthouse. The egg of this bird, figured by Hewitson in his first edition, was from Norfolk, and possibly from this locality. The Avocet became extinct here as the result of persecution, and not from enclosure or drainage; it probably last nested at Salthouse, about the year 1825, and the marshes were not embanked till 1851. For many years stray examples visited their former home, but there is no evidence of their having succeeded in nesting there.

Fain would I linger over Horsey and its treasures, to which I have briefly alluded in the introduction to the second edition of Lubbock's 'Fauna of Norfolk'; to the Waxham Marshes and their ancient decoy; and to Breydon Water, which has so enriched the catalogue of Norfolk Birds, but I fear I have already departed too much from my original design, and must hasten to bring to a close this rambling and often irrelevant sketch, by a brief description of the magnificent stretch of marshes, of which the river Yare forms the southern boundary, as it pursues its sluggish course, for a distance of nine or ten miles between Reedham and Yarmouth. This great alluvial plain, comprising some 14,000 acres, forms roughly a triangle, of which the ridge of high land, running north for six miles from Reedham to Acle Bridge, constitutes the base, and the two sides are represented by the courses of the rivers Bure and Yare, each for a distance of about seven miles in a straight line, converging at Yarmouth, and enclosing a tract of country shown on Faden's fine map, surveyed in the years 1790—94, with but a single marsh-road winding along near its centre, from Halvergate to a point about half way between Reedham and Yarmouth, where it joins a similar track which follows the river bank from the former place; their joint course is then continued along the north banks of Breydon to the town of Yarmouth.

Marshall, in his 'Rural Economy of Norfolk'* speaking of this great level, significantly remarks that it is "tolerable in summer," and then relates his experience of a visit which he paid on the 17th June, 1782. Entering the marshes at Halvergate, he says, that for nearly the first mile they rode to their horses' knees in water! They then inspected a marsh mill, of which Faden's map shows only thirteen in the whole level (these doubtless altogether not equal in efficiency to one of the powerful steam mills which have supplanted them), and making a sweep towards the middle of the marsh, they returned to Wickhampton, where he states the entrance to the marsh was always free from water. This great expanse of marsh was, perhaps, the finest Snipe-ground in England, as many as seventy or eighty couple are there said to have fallen to one gun in a single day, and it formed the breeding-place of thousands of Ruffs and who can tell what other birds, for there is little known of it and its inhabitants in those days, when only the shepherds and sportsmen ever trod its splashy soil. Although perfectly treeless, this great plain was not one dead level, there were sufficient irregularities to render certain portions drier than others, and these "hills," as they were called by the marshmen, formed the nesting-places of the Ruffs, Redshanks, Snipes, and other marsh-loving species which frequented them in summer in large numbers, whilst on the wooded highlands to the north, along which the old Yarmouth road runs, the Herons had their homes, and at Acle and Mautby were celebrated Duck Decoys now no longer worked, and earlier still the Cormorants nested at Reedham.

How changed is all this in the present day! From Acle to Yarmouth an excellent road runs straight across the marshes, whilst a railroad takes much the same course, and a second line of railway follows very nearly the same route as the old river-side track I spoke of earlier. Large sums are expended annually on drainage, and all through the summer, and often far into the autumn, the flat rich marshes are dotted over with cattle and sheep innumerable, luxuriating in the rich herbage.

* Edit. 2, vol. ii. p. 276.

I feel that an apology is due for occupying your time with this imperfect sketch, and, indeed, the fact that it is of necessity so imperfect, is my only excuse for its production, for so little do we know of the former condition of this wonderfully diversified county of ours, and of its furred and feathered inhabitants, that this very paucity of knowledge confers a proportionate value on every scrap of information we can rescue from oblivion, and on us an almost sacred duty to preserve it for those who follow. It must not, and I think will not, be left for generations to come to reproach those of the present day in this matter, as we have to express our regret at the neglect of our predecessors, for the pages of the 'Transactions' of the Norfolk and Norwich Naturalists' Society will, I trust, not only continue to collect and treasure up the records of the past, which would, probably, otherwise be lost sight of, but will form a continuous history of the ever-changing conditions of the county, both physical and faunal, which will become more and more valuable as time renders the record more remote.

ADDRESS.

Delivered by the President, T. SOUTHWELL, F.Z.S., *to the Members of the Great Yarmouth Section of the Norfolk and Norwich Naturalists' Society, at their First Monthly Meeting, held on October 24th, 1893.*

I HAVE been asked to say a few words by way of an opening Address at this first meeting of our Society in Great Yarmouth, and I do so with very great pleasure, congratulating you and myself on the happy event which we are here to inaugurate.

When our Society commenced its existence, twenty-five years ago, it was contemplated to establish branches, or sections, in various parts of the county, or even of a more extended district, the better to carry out the work of investigating its Fauna and Flora; and it was hoped, by this means, we should be able to collect through the assistance of resident workers more complete and exact information than could otherwise be obtained. One of our rules provides for the appointment of local secretaries wherever it might be thought desirable, but hitherto, much to my regret, and I doubt not that of some other active members of the Society, a quarter of a century has passed without any such extension taking place, and I cannot help expressing my extreme satisfaction that it should happen during the year in which I have the honour to hold the office of President that my dream of the future should begin to assume a reality. This satisfaction is, if possible, enhanced by the first of these sections, soon I trust to be followed by others, being established in the Borough of Yarmouth, the capital of the east coast of Norfolk, and the chief town of a district with unprecedented traditions.

I had no difficulty in choosing the subject of my address to-night. Under ordinary circumstances, I might have dwelt upon the advantages to be derived from the formation of such a Society as we have met here to inaugurate, or on the methods by which we could best assist each other in carrying out the objects we have in view, but I will leave all this to other and more able exponents; it seems to me that my subject is clearly indicated, and that by calling to your recollection the examples of the distinguished naturalists which Yarmouth has produced in the past, I shall offer you the strongest possible incentive to emulate them in the future.

Has it ever occurred to you what a thrill is produced in the mind of every ornithologist by the utterance of the word Yarmouth, or even more so by the mention of Breydon Water! I think I can say of the one, that early in the present century such a little *coterie* of naturalists existed within its walls as were not to be found in any other provincial town in England, and of Breydon, that no spot of like extent has produced so many rarities and added so many species to the Avifauna of the British Isles, as that resistless centre of attraction to the weary migrant. Throughout Europe and perhaps the world, wherever bird-men do congregate, there are the names of Yarmouth and Breydon familiar. It is about these men and birds that, with your permission, I should like to say a few words at this first meeting of the Yarmouth section.

I have said that towards the end of the past century and during the first half of the present there lived at, or were attracted to, Yarmouth, a little knot of men possessed of rare powers of observation, and who have left their mark indelibly on the ornithology of the county. The first of these which claims our attention is Lilly Wigg, a man who employed the small amount of leisure which his duties—first as a shoemaker, then schoolmaster, and finally as a bank clerk—left at his disposal, in studying the natural productions within his reach, and so highly were his efforts appreciated that about the year 1800, he earned the distinction of Associate of the Linnean Society. Wigg was born in 1749, and died in 1828; his special study was Botany, more particularly the Marine Algæ, on one species of which his friend Dawson Turner bestowed his name;

but there is scarcely a department in Natural History with which he is not identified; he is credited with having detected at Yarmouth three excessively rare birds, namely, the Red-breasted Goose, Harlequin Duck, and King Eider, but the evidence is not quite satisfactory in either case. He seems to have had an unfortunate habit of consigning his rarities to the spit, and the Red-breasted Goose as well as a Ferruginous Duck were thus disposed of; we have, however, the satisfaction of knowing that the former proved very good eating! I think we must allow Wigg's reputation to rest chiefly upon his botanical skill, in which capacity Dawson Turner speaks of him as very shrewd and acute, and a good finder.

Of Dawson Turner himself it is needless for me to speak, his reputation is so well established as an accomplished scholar and antiquary, well versed in the science and literature of the day in which he lived, as to require no further mention; associated with him in the study of the natural history of the district, were Sir William Hooker and Mr. J. Penrice, and they kept a diary in common which contains many interesting notes on birds.

About the same period lived the Rev. William Whitear, joint author with the Rev. Revett Sheppard of the 'Catalogue of Norfolk and Suffolk Birds,' published by the Linnean Society in 1825. He was appointed to the living of Starston in 1803, and although not a Yarmouth man, spent a great deal of time at Winterton and Horsey. He left a 'Calendar,' from which extracts will be found printed in our 'Transactions' (vol. iii. p. 231), in which are most interesting accounts of his visits to the marshes at Winterton, Horsey Mere, and Breydon, in the years 1816 to 1819. In the former year, accompanied by his friend Mr. Brown of Yarmouth, he shot Avocets between Winterton and Horsey on the 2nd July, and took the eggs of the Black Tern. In the two succeeding years he also mentions finding the nests of Sheld-ducks in the same locality, and Shovellers were in such abundance that a gamekeeper named "Taylor had discovered 56 eggs that Spring," and his friend Mr. Youell of Yarmouth, another keen ornithologist, hatched some of these under a hen, but found the young difficult to rear. This

same Mr. Youell kept a common Scoter alive for several months feeding it on barley, seemingly not a very suitable food for a diving Duck. Whitear also mentions finding the Reeve breeding in the marshes and taking the eggs.

Another local name familiar to Norfolk Naturalists is that of Charles Stuart Girdlestone, two of whose letters to his friend the Rev. Richard Lubbock, and one to P. J. Selby, published in our 'Transactions' (vol. ii. p. 393), prove to have been a very shrewd observer; he was the son of Dr. Girdlestone of Yarmouth, and died in 1831. Writing to Selby, he tells him that "the Bearded Titmice plentifully breed with us, but their nests are difficult to discover. . . . . Bitterns also breed with us, but their eggs for the same reason are seldom found." . . . "The Avocet breeds at a place called Horsey, ... a most desolate place, and duty at Church is performed only once a month, and in winter the place is scarcely approachable." One cannot but regret that the three letters referred to are all that we have left from the pen of this talented naturalist, to whom his contemporaries were so much indebted, and in whose esteem he stood so high. Girdlestone appears to have been intimate with Colonel Hawker, the author of the 'Instructions to Young Sportsmen,' who about this time used to shoot at Horsey.*

* At the time the above was written I had not seen the recently published "Diary" of Colonel Peter Hawker. As on some other occasion I hope to have something to say about the local references in this most disappointing book, I will only now observe that he paid a fifth visit to Yarmouth on the 3rd March, 1824, when he states that he "received the greatest civility and hospitality from C. Girdlestone, Esq., who, being an excellent sportsman, proved to be a capital pilot and guide for every information." It was on the 6th of July, 1816, that Hawker paid his first visit to Mr. Rising at Horsey, and although he admits having killed "large numbers of almost every kind of sea and marsh birds" (without, however, giving the name of one of them), he concludes his account of the visit with the following remarkable words: "The circumstance that makes the birds so plentiful here cancels all the pleasure of the shooting, which is that fear of death deters strangers from hazarding their constitutions in such a pestilential climate. I came home ill, but was happy to escape as well as I did." Take heed all ye who in July, the most charming of all months in this always charming resort, incur so terrible a risk in the mistaken search for health!

In 1834 appeared the 'Sketch of the Natural History of Yarmouth and its Neighbourhood,' by the brothers Charles John and James Paget, the former of whom died in 1844, but Sir James is happily still with us, and the energy which resulted in what was at that time one of the best local Fauna and Floras known, has remained unabated throughout his long and distinguished career. This 'Natural History of Yarmouth' is even now an authority, and has, no doubt, formed the model of many subsequent works of the same nature, its completeness and accuracy render it a lasting monument of the industry of the two brothers, the elder of whom was only twenty-two years of age at the date of its issue.

The list of Birds was doubtless very complete at the time, as its compilers, in addition to their own observations, had the assistance of all their immediate predecessors and contemporaries; they speak of Girdlestone's "union of first-rate sporting accomplishments with the greatest ardour in the pursuit," giving him "advantages which none here have since equalled," and of the value of his excellent practical notes; other naturalists mentioned by them are D. and C. A. Preston, Mr. Miller, Mr. John Youell, and Captain Chawner of Alton, who for some time collected in Yarmouth. Hardly less complete no doubt was the list of plants found in the district, with regard to which they say, "probably no neighbourhood has been so completely investigated as this, which has had the good fortune to have been for nearly a century, the constant stage for the action of some inquiring mind. Long ago, Dr. Sims, Dr. Aikin, and Mr. Joseph Sparshall were engaged in the observation of our plants, by the feeble light which the science, then, comparatively speaking, in its infancy, afforded them." Then came Lilly Wigg, Mr. Mason, and Dawson Turner, and the "anxious desire" of the last "for the advancement of science afforded opportunities to almost every one of the first botanists of his time to study all the points of interest in this part of the county. Smith, Hooker, Borrer, Dillwynn, Merteus, Sowerby, and a host of other both foreign and native naturalists, . . . made this the scene of their accurate observation." Hence these two sections of the book should be as complete as the state of the knowledge at the time

could make them. Far different, however, was it with some other branches of the 'Natural History of Yarmouth,' which were singularly neglected; of the Fish, they say, all there mentioned had been "met with by the merest accident," and yet they indicate the very means, by a partial employment of which, under circumstances of great difficulty, a zealous member of our Society has been enabled greatly to extend the list. They also lament, as we do in the present day, that the study of the Mollusca and Crustacea should remain a "wide and unbeaten field of interest." Yarmouth naturalists have the greatest reason to be proud of the work so efficiently performed by those two ardent and devoted young men, and to be thankful for the legacy thus left to their successors.

Differing greatly in style, but even more valuable in some respects, are the 'Observations on the Fauna of Norfolk, more particularly on the District of the Broads,' by the Rev. Richard Lubbock, which appeared in 1845. Lubbock was not a Yarmouth man, but, like Whitear, he was so thoroughly associated with the Yarmouth men of the period, and so much of his time was spent on the Broads and Marshes in the Yarmouth district, that any record of the progress of ornithology in that neighbourhood would be incomplete without mention of his name. For nearly fifty years Lubbock's book has stood the test of time, and it is as fresh as on the day it was written; breathing of the open air, instinct with the true spirit of the sportsman and naturalist, it carries us into the field, and we seem to realise once more the teeming abundance of life which characterised the Broad district in the early days of the century. The Pagets in their introduction, and Lubbock in his charming book have filled in to some extent the details of the picture, which the stray observations of those whom I have mentioned earlier must have called to our mind's eye, and which, alas! will never again be presented to our bodily vision. It is pleasant to follow the dear old Rector of Eccles into the marsh with his gun, and trusty retriever, to flush the Bittern from the reed bed, or bring to bag the erratic Snipe, while the Moor Buzzard waits on and boldly claims its share of the sport; or to listen to his tales of

the prowess of that "celebrated destroyer of ducks 'old Thomas,' and his ancient piece 'Peggy.'" But these days are passed, the marshes are "dry as Arabia," and instead of Redshanks and Ruffs, we have Beeves and Hoggets, the old state of things has given place to the new, and however much we may regret the change in some respects, we can but rejoice at the smiling plenty which meets the eye as we roll smoothly along, borne by railway train through some of the richest marsh pastures in England.

In 1846, appeared in the 'Zoologist,' a Naturalists' Magazine of limited circulation, the admirable "Account of the Birds found in Norfolk," by the late Mr. John Henry Gurney, and Mr. W. R. Fisher; of the latter, to whom doubtless this list was largely indebted owing to his residence in Yarmouth, I am sorry to say I know but little, save that shortly after its publication he "followed the law" to London, and died there in the year 1889. Of the list itself it is impossible to speak too highly, and "Gurney and Fisher" were constantly quoted as the recognised authorities on Norfolk Birds, until the appearance of Stevenson's 'Birds of Norfolk,' the most complete and charming County History of Birds with which I am acquainted. Since the men of whom I have been speaking there certainly has been a great falling off of Yarmouth naturalists, and I fear field work has given place, in far too great a degree to mere collecting, but a few men of the old school have lingered almost to the present day; I need only mention Robert Rising of Horsey, T. J. Blofeld of Hoveton, S. N. Micklethwait of Hickling, F. F. Frere of Yarmouth, worthy representatives of the sportsmen naturalists who went before, and although I might name some still living who are not only excellent sportsmen, but good observers also, it must be confessed that both men and times are changed, and we shall never again enjoy certain of the advantages which they possessed, still in some respects we live in happier times than they ever dreamed of, seeing that we possess all their accumulated knowledge, far greater facilities of intercourse with kindred spirits, and above all, abundant, excellent, and cheap literature on almost every branch of Natural Science—these are now within the reach of each of us, and although our work may not be quite so attractive

as theirs, and may not offer quite such seductive hopes of fresh discovery, there is still abundant employment for our leisure hours, and ample reward in store for those who will seriously pursue any branch of the study of nature.

There was another class of men who were equally famous in their day as those we have already named, I refer to the professional gunners and the bird dealers, into whose hands most of the good things came. In the introduction to the second edition of Lubbock's 'Fauna,' I have spoken somewhat at length of this interesting class of men, and given some anecdotes culled from Mr. Lubbock's papers and other sources, both of their mode of life, the primitive apparatus used in their trade, and of the wonderful results they often achieved. Their knowledge of the haunts and habits of the wild-fowl which they pursued must have been very extensive, and nothing but the keenest love of sport could have induced them to undergo the hardships incidental to their chosen mode of life; I doubt not old Thomas felt as great a degree of pride in accomplishing a good shot under difficult circumstances as ever did Colonel Hawker or Sir Ralph Payne-Gallwey. In addition to the gunners were dealers and bird-stuffers, notable amongst whom were the two Harveys, and later on Durrant; a fabulous number of birds used to pass through these men's hands, and occasionally something turned up which they were unaccustomed to meet with, and which fetched a good price from the collectors. I regret also to be obliged to add that some of these men were unscrupulous enough to attempt to pass off birds or skins of foreign origin as local productions, and in some cases they were successful in doing so, a thing which I trust never happens with the dealers of the present day.

And who were the customers to these men? There seems to have been a passion for collecting in Yarmouth, very intelligent collectors they were too, and I have recently seen a most interesting pamphlet of 165 pages, which appears to have been printed about the year 1795, and under the title of 'Museum Boulterianum,' is descriptive of the collections of one Daniel Boulter of Yarmouth; there were 4420 numbered lots, consisting of an infinite variety of objects, Quadrupeds, Birds, Reptiles, Eggs, Fishes, Crustaceans,

Starfish, Shells, Zoophites, &c., as well as minerals, antiquities, books, and prints. It is evident from the catalogue that Boulter must have been a person of considerable acquirements, and no mere dealer, although he attaches prices to the great bulk of the objects, making a delicate exception with regard to those—and they are many—which had been presented to him. Amongst those who had thus contributed to his collections were many distinguished persons, of which I may name, Astley Cooper, Sir Ashton Lever, J. D. Downes, noted as a falconer, John Ives, F.R.S., antiquary, and others.

Many of the objects in the Museum were of local interest, and would be valued in the present day far in excess of the modest prices he affixed to them. Who would not wish to become possessed of the "Tusk of an Elephant, five feet long, taken by a fisherman's net at sea," for five shillings; and modern geologists would like to see the "Large and fine specimen of Stag's Horn, taken out of a chalk-pit at Whitlingham," offered for the same price, as well as "Another, remarkably large, with part of the Skull," from the same locality. Charles J. Palmer, in his 'Perlustration,' says that Boulter lived in a house at the south-east corner of Row No. 35, facing the Market Place; the printed advertisement on the fly-leaf of the Catalogue gives the number as 19 Market Place; he was a member of the Society of Friends, a silversmith by trade, but also dealt in "natural curiosities, antiquities, coins, medals, curious books," &c. "During a long and useful life he made an extensive collection of 'natural and artificial curiosities,' together with some paintings, prints, drawings, and books. The whole he called the 'Museum Boulterianum,' and published a catalogue of it. He died in 1802, and was buried in the Friends' burial ground. His collections were then sold." Of what became of the contents of this remarkable museum I cannot find any record, but Palmer adds in a foot-note, "It is very much to be regretted that the opportunity thus offered was not embraced, of forming the commencement of a Town Museum; but at that time the war, money-making, and social enjoyments, were the only things thought of. He issued a tradesman's token of superior

workmanship, which is now very rare." We cannot but share Palmer's regret that this exceedingly interesting collection should have been dispersed, but, as he says, the taste in such matters was at an exceedingly low ebb just about that period.

I have already spoken of Charles Stuart Girdlestone, who seems to have possessed a good collection of birds, which at his death, with his books, and other objects of interest passed to his sister, the wife of Mr. John Baker, a solicitor in Yarmouth, more than once previously mentioned, who subsequently removed to London; but I am not aware what ultimately became of them. One of the birds, a Jack Snipe, killed on the 2nd July, 1825, was given by Mrs. Baker to Lubbock, who in turn gave it to the late Mr. Newcome of Feltwell, with whose collection it still remains in the possession of his son. Many Yarmouth killed birds passed into the collection of Mr. Edward Lombe of Melton, and are now in the Norwich Museum. The Rev. J. B. P. Dennis of Bury St. Edmunds, also by his own gun, and through his agent, old John Thomas, obtained a large number of Yarmouth rarities, most of which may now be seen at the Bury Museum; Mr. Clark of Saffron Walden also secured many for the Museum of that town, and the Booth Collection, now in the Brighton Museum, contains many East Norfolk rarities, as well as the Gurney collection at Keswick. The collections of Stephen Miller; Rev. C. W. Steward of Caistor; Rev. S. N. Micklethwait of Hickling; Mr. Robert Rising of Horsey; Mr. J. G. Overend of Yarmouth, and Mr. Stevenson have all been dispersed, but of late years, our Chairman, the Rev. C. J. Lucas of Burgh, Mr. W. W. Spelman, and Mr. Connop of Caistor, have each formed large collections, in addition to which many other rarities have gone to enrich collections in all parts of England.

I am happy to say that a large number of the rarest specimens which were contained in such of the collections as have been dispersed of recent years, have found a permanent home in the Norwich Museum, where they are open to the study and inspection of all who may be interested in them; and now that a museum has at length been formed at Yarmouth, I trust the first thought

of those who may become possessed of rare birds and beasts will be to make as perfect a local collection as possible at home, before allowing anything which is a desideratum here, to pass into the hand of strangers.

In looking through a list of Norfolk birds, I noted thirty-nine species of extreme rarity, obtained in the Yarmouth district, many of these had been met with only once or twice before they were recognised at Yarmouth, and nine of them, viz., the Caspian Plover, Broad-billed Sandpiper, Pectoral Sandpiper, Siberian Pectoral, White-winged Black Tern, Mediterranean Black-headed Gull, Red Crested Pochard, Buffle-headed Duck, and Steller's Duck, have all either been met with in no other locality in Great Britain, or were killed in the first instance in the Yarmouth district.

I trust I have not been tiresome in my imperfect remarks with regard to the days that are past, but that I may have succeeded in showing how surpassingly rich this eastern sea-board is in at least the section of ornithology, and how brilliant an example has been set us by our predecessors in the field; I would urge, more especially upon the rising generation, the desirability of taking up the systematic study of some particular branch of natural science; it adds immensely to the pleasures of life to possess some general acquaintance with the whole field of nature, and I would deprecate in the strongest terms anything like exclusiveness or the undervaluing of the work of their fellow-labourers, some reap the corn, some dress it; but if you wish to gain distinction, a very difficult thing to achieve in the present day, and to add to the sum of knowledge, it can only be done by the close study of some particular one out of the many branches into which natural science is divided, and it appears to me that there are at least two fields of research open to the Yarmouth naturalists, first, the fishes which so abound on our coast, and for the study of which Yarmouth offers peculiar facilities (I am sure my friend Mr. Patterson will support me in this); but more than any other I would commend to your attention the almost virgin field offered by the Marine Invertebrata, a class hitherto totally neglected. In a town noted for its Crustaceans, and sending out daily quite a fleet of boats for their

capture, it is astonishing how little we are acquainted with this extensive family, and I venture to predict that a few trips with the Yarmouth shrimpers, and a close investigation of the strange forms which their nets bring up, would not only astonish the tyro, but also do much to awaken in him a desire more closely to study a subject so full of interest. Who can say but that some day we may have a Marine Biological Station at Yarmouth, which may have a longer life and more useful career than the noted Yarmouth Aquarium.

I have said a good deal about collectors and collections, and I may at once state that I am not the one, nor have I the other, fortunately for me I am so circumstanced that, with the assistance of the Norwich Museum, and the great kindness of my many friends, I can always find abundant material for study and comparison, but a student can hardly pursue his subject without being to some extent a collector, all I wish to impress upon my hearers is that collecting should only be a means to an end, and always be kept subservient. Only a few weeks ago a friend told me that a neighbour of his in the country sent a message to him to the effect that he knew he was "fond of birds," would he come and shoot some Stone Curlews that had, after an absence of many years, returned to his farm. My friend, who has killed big game and little from the Equator to nearly the Pole, fortunately *is* "fond of birds" and the news that this fine species had returned to one of its old haunts, long deserted, delighted him as much as their destruction would have caused him regret, and I trust that we may all have the strength of mind to follow his example, and never to molest bird or beast without a good and sufficient reason.

Let me, in conclusion, congratulate you upon the formation of a section of the Norfolk and Norwich Naturalists' Society in Yarmouth, and express a hope that it may prove a means of intercommunication and mutual assistance between those desirous of becoming students of nature, a pursuit from which I can promise them a considerable accession of interest in all that surrounds them in health, and material for reflection in many an hour of enforced idleness should sickness overtake them.

I.

NOTES ON FILARIA SANGUINIS HOMINIS (NOCTURNA).

By Herbert D. Geldart, *Vice-President.*

Read 30th May, 1893.

For the objects which I exhibit to-night, I am indebted to the kindness of Mr. Charles Williams, F.R.C.S., who sent me one night in March last, at about eleven o'clock, twelve slides of freshly drawn blood taken from a patient who resided many years in India. In these twelve slides I counted over one hundred and fifty *Filariæ*, no doubt missing some, as when the blood lies unevenly on the slide it is rather difficult to distinguish them.

In one slide alone I counted thirty-five, and assuming that the whole of the blood was infested equally with the portion received, and estimating that portion as certainly not exceeding the $\frac{1}{20}$ of an ounce, and taking the weight of the patient at 10 stone 10 lbs., or 150 lbs., using the usual formula of $\frac{1}{15}$ of the weight of the body as the blood-weight, there would be just about half a million of these parasites moving in the patient's blood that night.

Filariæ in the state in which you have seen them this evening are asexual and apparently internally organless embryos of a Nematode worm known as *Filaria bancrofti*, named after Dr. Bancroft who first discovered the mature form at Brisbane—the mature female is a thread-like worm about three and a half inches long, the mature male being somewhat smaller—the embryos are from $\frac{1}{125}$ to $\frac{1}{90}$ of an inch in length, and are said to be $\frac{1}{3000}$ of an inch in breadth, their slimness enabling them to travel into the capillary blood vessels. As I show the embryo in slide No. 1, which contains (or rather contained, for some of the blood has been cleaned off) twenty *Filariæ*, it is still invested with the egg-covering (called its sheath) in which it was born, and in this state

it appears to be a blunt-headed worm with a sharply pointed tail, and its sheath is marked with transverse wrinkles. In this state it is extremely active, if pinched or hurt in trying to spread the blood more evenly, it knots itself up into a tight coil, then reversing itself with a spring it knots itself the reverse way, exactly as an earth-worm would do in similar circumstances; but with all its activity it does not seem to advance through the blood, for notwithstanding all its struggles, it remains in just about the same position in the field of the microscope, its movements get more sluggish as time goes on. I have seen one move gently after about twenty-four hours from the time the blood was drawn; but I suppose that the coagulation of the blood has much to do with this. As shown in slide No. 2, the embryo has divested itself of its sheath, which you see trailing behind it like a colourless folded riband. In this state the external structure of its head can be made out; from the blunt head projects a short proboscis, and from this proboscis projects a slender spicule. As explained by Dr. Manson, the great authority on the subject, the proboscis and spicule together constitute the tentative and boring apparatus of the embryo, by means of which it proceeds to its ultimate home in one of the lymphatic vessels of its human host, and Dr. Manson has published a diagrammatic figure in which he shows the proboscis as furnished with a lipped integument, which he considers acts as a kind of anchor, maintaining the ground won by the borer, and acting as a *point d'appui* for the next effort. I cannot distinguish any internal organs in this stage of the embryo; the whole cavity of the body seems filled with a granular mass.

The life history of this *Filaria* (*nocturna*) as worked out by Dr. Manson appears to be—starting with the embryo as seen in No. 1—that the embryo in its sheath which only appears in the blood from sunset to sunrise (when its intermediate host the Mosquito is active) is taken up with the blood by the female Mosquito (the male having no apparatus for piercing the skin) of a certain species described as a small dark brown insect without conspicuous markings on either body or legs; she is about $\frac{3}{10}$ of an inch in length, her head is small and dark, and she carries a proboscis $\frac{2}{3}$ the length of her body—having gorged herself with her first and only meal, the Mosquito retires to some dark and secluded place where she remains inactive for four or five days

digesting her meal and perfecting her eggs. When her eggs are mature, she goes to some pool of water to lay her eggs, when she has done so, she falls into the water and dies. Of the many embryo *Filaria* which she has swallowed, the greater part die and are digested with the blood; but a few survive, these undergo some changes within the Mosquito, they grow larger and stouter, the granular mass within them becomes clearer, and internal organs begin to be formed, they get rid of their sheath, and their head and boring apparatus become stronger and more developed, and the first use made of the borer is to enable the embryo to escape from the body of the Mosquito, and it then swims freely through the water; if in this state the embryos are swallowed by a man, they bore their way from the stomach into one of the lymphatic vessels of their host, and if he has had the ill luck to swallow two who develope into male and female *Filaria bancrofti*, the female begins to breed and pours forth from an orifice in her neck a stream of ovoviviparous embryos, that is to say they are born alive, but with their egg shells still about them, these make their way into the blood-vessels of their host, lying *perdus* somewhere, no one at present knows where, during the day, and swarming in all the blood-vessels during the hours of darkness, when the intermediate host, the Mosquito, is active. In the patient from whom this blood was drawn, it is supposed that only one pair of adult *Filaria* exist, or the embryos would be more numerous, in many cases there are more than one pair, for more than one pair have been removed from the same person, and then the embryos, instead of numbering half a million, amount to several millions. The fertile period of a female *Filaria bancrofti* continues a very long time: one case is recorded in which it lasted for thirty-two years. The consequences to the unfortunate host are very various, sometimes no harm whatever results, but in other cases very serious skin diseases, leprosy, and elephantiasis necessitating severe operations, have been clearly traced to the action of the parasites.

As to geographical distribution the parasite seems to girdle the globe within the tropics, in fact, wherever the peculiar species of Mosquito is present to distribute it. In West Africa a different kind of *Filaria* exists, *F. diurna* which appears in the blood during the day, and of which the Mangrove Fly, a small black fly

which bites by day, is the intermediate host. A third kind *F. perstans*, present in the blood both day and night has also been observed in Africa; but of this, at present, very little seems to be known.

Fortunately the parasite is not indigenous in this country, and but very few cases, and those exclusively in persons who have resided in hot countries, and have brought it here with them, have been seen; but in the district of Amoy Dr. Manson estimates that very nearly one eighth of the population are affected, and that no kind of occupation, except perhaps those of a seafaring character, secures exemption from *Filaria*.

II.

IRISH ROCK BIRDS.

By J. H. Gurney, F.L.S., V.-P.

Read 26th September, 1893.

The Great Saltee which is, in part, the subject of this paper is one of two Irish islands off the coast of Wexford, and can be reached from the mainland, with a good breeze, in half an hour. It is a lofty pile of granite, two hundred acres in extent, and I think I can say something about the Bird-life which is its marvel in the summer-time, to pass away half an hour this evening. But I must premise that a good deal has been written about it already, and I shall not repeat what has been already better said by Mr. Richard Ussher, who nearly lost his life on this island, in the 'Zoologist,' 1886, p. 88, and by Mr. Henry Seebohm in the 'Ibis,' 1890, p. 404.

The south-eastern side of the island, rising to 198 feet above the sea, is precipitous, though parts of it are amenable to an active

climber, but he must never let go his rope. This is the part which teems most with birds in this huge avine nursery :—Puffins (*Fratercula arctica*), Razorbills (*Alca torda*), Guillemots * (*Uria troile*), Herring Gulls (*Larus argentatus*), Lesser Black-backed Gulls (*L. fuscus*), Kittiwakes (*Rissa tridactyla*), Shags (*Phalacrocorax graculus*), and Cormorants (*P. carbo*).

The names here put down are in the order of their abundance, but in this hive Puffins are much the most numerous, there being at least 7000 pairs at the time my son and I visited the island, May 18th, 1893, and nearly all of them nesting. The hillsides are riddled with Puffin holes, and the sod so undermined as to give way upon very slight pressure from above. At the Farne Islands Puffin holes are generally about twelve inches below the surface, but here they are rather more, and nearly all of them are made by the Puffins, I have little doubt. It is beyond all question that Puffins are infinitely more numerous at Saltee Island than at the Farne Islands, or Flamborough Head, Bass, Ailsa Craig, or the Scilly group, but I cannot put the estimate as high as Mr. Seebohm puts it ('Ibis,' 1890, p. 405). It is evident their numbers are not always the same, *vide* Thompson's 'Natural History of Ireland,' (vol. iii. p. 233), and they may have been especially numerous at the time of Seebohm's visit, for he considers there were 60,000 in 1890. Mr. R. Barrington, who knows Saltee well, considers they are more numerous still at Skomer on the coast of Pembrokeshire ('Zoologist,' 1888, p. 368).

Outside the holes sit the demure Puffins, or, if indoors, they dash out helter-skelter tripping and catching at every obstacle, and are not fairly launched until they have the sea beneath them,—indeed, one which, after being carried some distance, was placed on the ground seemed quite incapable of rising again. In their windy homes it is very necessary for them to extend their webs to help

* I hope I may be pardoned for saying here that the statement about Norfolk in Yarrell's 'British Birds,' ed. 4 (vol. iv. p. 70), that "little more than forty years ago Guillemots bred at Cromer [in Norfolk]," made, I believe, on my authority, requires correction. It would be more accurate to say that judging from the highest point of the Lighthouse Hills being named "Foulness" on old maps, there can be little doubt of Gulls, probably Herring Gulls, having nested there.

steer, and they "come round" with a rudder formed of feet and tail together. My son saw a pied one, perhaps not an uncommon occurrence, but with this exeeption there was an absolute and identieal sameness in their bright uniforms, and quaint dapper little figures.

The Puffin's egg is generally a yard into her hole on a little grass, and quite brown from contact with the soil if mueh sat on, a knowledge of whieh fact will prevent the unnecessary taking of eggs which cannot be blown. If such are taken the little inhabitant is found to be thickly covered with black hair-like feathers above, and white below, and takes up nearly the whole of its domicile.*

On May the 18th no Puffins were hatched, nor Razorbills, nor Gulls, but some of the Herring and Lesser Black-backed Gulls had three eggs, while many of the Kittiwakes were still earrying nesting materials. This was early, for at Lambay the Kittiwake *does not arrive* until the end of May ('Irish Naturalist,' 1892, p. 116), but in this forward season at least three of them had an egg on the Saltees.

In a sense all these species breed together, yet it may be observed that they divide into eompanies, and eaeh cove and bay has a special attraction for some one or other of them. The noisy Herring and Lesser Blaek-backed Gulls are not on the eliff, but on the hill above, and a deafening babel they make as we seek the eggs to be found on the sheltered side of some eonvenient boulder.

The Oystercatcher nests above them or higher still, and the Greater Blaek-backed Gull whieh I did not see nests, Mr. Ussher tells me, highest of all, while the ledges are the property of the Razorbills (though one Razorbill had by mistake laid her egg in a Puffin's hole), and lower down are the Shags.

Many Cormorants and Shags also incubate from preference, or for safety, on an island rock called the "Makestone,"—synonymous in name with Megstone rock at the Farne Islands,—but the Rev. Professor Skeat is not able to throw any light on the derivation of these obscure names, nor is Professor Newton able to.

The Shag's untidy nest consists of all sorts of island grass or herbage, a herbarium in itself, or rather a rubbish heap. The chalky

* The soft parts of a nestling Puffin at Farne Islands, believed to be twenty-one days old, were as follows:—mouth, nearly white; cere, yellowish white; eye, nearly black; legs, a dull flesh colour in front, dark brown behind.

coating of its coarse eggs, which is not always dry, sometimes runs to the end and a deposit of it coagulates, but beneath the shell is green. Shags are fond of a cave, and sit close, treating stones thrown at them with the utmost composure, twisting their snake-like necks about with curiosity, as if to see whence the disturbing missile has come.

Their silky plumage ought to throw off moisture quickly, but Shags and Cormorants are fond of standing on a rock and spreading out their wings to dry, a habit I have observed in the Indian Darter or Anhinga at the Zoological Gardens. Their bottle-green plumage is very rich, but no Shag was to be seen with a crest in May, and all the Cormorants had lost the white feathers which give them such a speckled mane in spring, and the white thigh patches. Professor Newton views these gay feathers as a nuptial plumage ('Dictionary,' pp. 105, 106), but I think they are rather to be regarded as the emblem of early spring.

There are no Black Guillemots on the Saltees, though our eyes caught the buoyant flight of the Shearwater; but at a place along the coast, with Mr. Ussher's help and guidance, I saw seven or eight "Tysties" in very perfect attire, and noticed a Razorbill chase or play with one. They lay in crevices, and an active Paddy got one egg which was so hard to blow that probably it was a forsaken one.

Leaving the Rock Birds for the present let me now refer to a few of the more inland sorts,—though the life histories of all of them are told by Thompson in a standard work accessible to all,—for a visitor to Ireland is not unlikely to see something of novelty, especially if he be there in the breeding season, and have the guidance of such a friend as Mr. Ussher.

Two nests of considerable interest were the Grey Wagtail's (hen bird on, sitting close), and the Twite's on a heather-clad hill rising from the fine cliffs of Waterford. Again, it was a pretty sight to watch, in Mr. Ussher's grounds near Waterford, a Siskin feeding her young ones, "branchers," which had left the nest in a tall silver fir tree hard by; for these are species not to be seen in Norfolk.

The abundance of Corncrakes, an abundance caused by the humid climate, is striking to an East Anglian; they are so numerous that in a long evening's drive with Mr. Ussher we were scarcely ever out of hearing of their creaking notes, and their tameness has been dwelt upon in our 'Transactions' before (vol. iv. pp. 469, 678). I think

our members will bear me out in saying that it is a note not so much heard in Norfolk as it used to be; but Norfolk Corncrakes had "much decreased in numbers" even in Lubbock's time.

The Heron also is a much commoner bird in Ireland than in England, and many small Heronries are scattered about, one of them on Mr. Ussher's lake, where, on May the 14th, a young one could fly nearly as well as its parents. Another of seventeen nests was at Artramont in Beech trees under which the Herons had let drop a Garfish (*Acus oppiani*), a Pipefish (*Syngnathus acus*), a Crab, a small Flounder, a small Sole, and several Sticklebacks, besides six of their own young ones, one of which being fresh enough to skin, was found to contain a Beetle's wing.

The relative scarcity and abundance of Irish birds has been well treated of by our former President, Mr. Seebohm ('Ibis,' 1890, p. 397), and I will not trench on the ground he has occupied so acceptably beyond alluding to one group—the *Corvidæ*.

The Hooded Crow is pretty common in Co. Wexford in summer, and the Rooks which follow the plough are the tamest I ever saw, but the Raven is rare, and we only saw two, being, like Mr. Seebohm, too late for a nest.

The Chough is still common round the coasts, but its nests are very inaccessible. Never having seen but one, and that in Cornwall, I gladly accepted the invitation of an expert cliff-climber to accompany him to some well-known haunts, where we should be sure to meet with Choughs, and, if fortunate, nests as well. Accordingly, May 12th and 13th were devoted to searching the cliffs, and we met with three nests, only one of which contained eggs, and that was placed in the roof of a cavern, a situation almost inaccessible except by rope from above. My friend, who is as much at home on the cliffs as any professional, lost no time in making the attempt having first ascertained that the nest was occupied by firing a revolver at it. The bullet struck within a foot of the crevice where the nest was, and the occupant dashed out with all imaginable speed. A strong crowbar was now fixed in the ground at the top of the cliff, round which was twisted, but not lashed, a rope, and the end of it firmly held by two men while he descended. Meanwhile, the Choughs took themselves off and only witnessed from a distance the insertion of a pole into their cave provided with a little scoop net at the end of it, into which, by

a little sleight of hand, the eggs could be dexterously slid. Choughs' eggs are greyish white, spotted with pale brown, but Mr. Ussher does not consider that Irish eggs are equal to Spanish ones in beauty.

Another nest had been deserted three years, yet seemed intact and in excellent preservation. It was situated in the roof of a cavern twenty-five feet from the floor, and eighty feet from the entrance, close, damp, and dotted with tufts of Sea Spleenwort. This nest was quite a Jackdaw-like pile, twelve inches in diameter, but Mr. Jameson, who was one of our party, made it more; and inside it was seven, good measurement, and the depth of it twenty inches. It was composed of sticks, in the first place a foundation of gorse stems, beginning with thick ones and getting smaller, then heather stems of sizes were intertwined, and there was a fragment of moss and some bracken. In another nest, in Mr. Ussher's collection, were a stem of blackthorn and a piece of ash; doubtless, they pick up whatever comes handy, and for the lining they use wool. The Royal Osmunda Fern and the Seapink, which help to render Ireland's romantic cliffs so pretty, may contribute materials also.

III.

ON THE OCCURRENCE OF THE BEARDED SEAL *(PHOCA BARBATA)* ON THE NORFOLK COAST.

By T. Southwell, F.Z.S., *President.*

Read 31st October, 1893.

On the 10th December, 1892, Mr. H. Laver of Colchester, very kindly informed me that a living Seal, the species of which he could not recognise, was being exhibited in that town by a man named Hudson, from Lynn, but which from its hairy muzzle he suggested might be *Phoca barbata*. The description Mr. Laver gave me of the animal was briefly as follows:—Five to six feet long; sex, male; skin, black, with only a few hairs on the shoulders, which were otherwise quite bare; head remarkably narrow and flat, suddenly

falling off to a broad nose; fore flippers armed with strong claws, fully two inches long, curved, the third digit the longest; beard, long, curved, very abundant, and the individual bristles flat and smooth.

It had, when Mr. Laver saw it, evidently been captured some time as it was very gentle, and would allow any amount of handling; it seemed very intelligent and possessed great freedom of motion in its fore limbs. The man who was exhibiting the Seal expressed his intention of visiting Norwich on his way back to Lynn, and promised to communicate with me, but failed to do so, I therefore did not see the animal, but from one of the bristles which Mr. Laver sent me, and from his description, I was strongly of opinion that his suggestion as to its species was correct, although the bristle differed in length and curvature from those in my possession which I had obtained in the Dundee warehouses from undoubted skins of the Bearded Seal.

My endeavours to trace the man William Hudson who exhibited the Seal at Colchester, were for some time unsuccessful; but Dr. Plowright, of Lynn, learned that the animal had passed into the hands of a man named Williamson of that town, where it died early in February, 1893, and was buried in his garden in a bed subsequently sown with Onions. There could be no question as to the identity of this animal, for in addition to Hudson's statement as to his disposal of it, it was described to Dr. Plowright by its last owner as having "no hair on its back, in consequence of its having been kept in too small a box," and its whiskers were stated to be "six inches long."

At this stage of the proceedings I communicated with Mr. S. F. Harmer of the University Museum of Zoology, Cambridge, with the result that he agreed to purchase the animal for that museum, and after the crop of Onions had been harvested, the body was exhumed and sent to Cambridge. On the 13th October, 1893, Mr. Harmer sent me the skull for inspection, after comparing it with other skulls of the same species, and there is not the least doubt that the animal was a young male *Phoca barbata*. It is to be regretted that the skeleton after maceration, proved to be too imperfect to be worth articulating; but the skull and bones, Mr. Harmer informs me, will be preserved in the University Museum, and its history duly recorded in the catalogue.

The tale told by Hudson not being in all respects satisfactory, the Rev. S. E. Blomefield of Burnham Sutton (also Rector of Burnham Overy), was so kind as to make inquiries for me on the spot, and learned from a man named Rudd that he assisted by three others, Parr, Atkins, and Smith, captured this Seal in a creek in Overy Harbour by driving it into a strong net in which it became entangled, they then placed it in a donkey cart, and brought it home; afterwards they put it into a boat with water, and exhibited it in the neighbourhood; amongst others to Mr. Blomefield and his family. This account of the capture was subsequently confirmed through another source with some additional particulars of no importance, in reply to inquiries instituted by Colonel Feilden, of Wells. The precise date of capture I cannot ascertain; but it was some time before May, 1892. After some months Rudd sold the Seal to a man at Lynn known as "Tater Billy," who proves to be William Hudson.

In his memoir on the Seals in the Challenger Reports (vol. xxvi. part 2, p. 61) Sir William Turner points out that *Phoca barbata* differs externally from the other species of *Phoca* "in having a broader muzzle, in the middle digit of the manus being the longest, instead of the digits slightly decreasing in length from first to fifth,* and in possessing four and not two mammæ." To this may be added, as stated in my little book on the 'Seals and Whales,' that the mystacial bristles are "simply flattened hairs without the impressed pattern found in the bristles of the known British species," this latter I believe to be a good and ready mode of distinguishing this species. Of course the cranial characters afford the best mode of distinction; but these are not always available.

The capture of this animal off the coast of Norfolk is of great interest, as so far as is known it had not been previously met with in Britain; it is the fourth species of Seal which has been obtained in Norfolk waters, two of these species being the only examples of their kind known to the British Fauna.

I wish to record my indebtedness to Mr. Laver, Dr. Plowright, and the Rev. S. E. Blomefield for the very considerable amount of trouble they took in assisting me to trace and identify this interesting capture.

* Hence the name of "Square flipper" amongst the Sealers.

IV.

ON A REMARKABLE APPEARANCE OF FUNGI,

Of two species, in a Field on the Ryston Estate, near Downham, in West Norfolk, which had been until very recently under regular cultivation.

By Rev. J. M. Du Port, M.A.

Read 28th November, 1893.

The subject, to which this paper refers, partakes somewhat of the nature of ancient history, but the last few seasons have been so unpropitious for the development of fungi, especially of the larger sorts, that in the absence of any more recent subjects of interest in the domain of Mycology, I venture to offer these remarks as the record of an unusual phenomenon, and of one of which I have received no perfectly satisfactory explanation.

Four years ago, in 1889, there was a succession of dry and hot days in August, and this weather continued generally into September, with the exception of two days, on which rain fell heavily; all this was very unpropitious for the growth of fungi. But in October there were many days of gentle warm rain, culminating in a fall of nearly an inch on the 16th of that month in the district about Downham. Fungi of all kinds had hitherto been very scarce, but on the 18th Mr. Pratt, of Ryston Hall, called to tell me of a most copious growth, which had just sprung up in a recently formed plantation of Willows on his estate. We went together to examine this unexpected and plentiful development; the ground was literally covered with these fungi, so that one could scarcely put a foot down without crushing four or five of these "toadstools." Toadstools they undoubtedly were; whitish on the top, covered with a prodigious quantity of a glutinous substance, which almost poured from off them; they varied in size from one to three inches; the gills were very pale, and studded

with drops of a limpid fluid; the stems were covered, especially near the top, with small white scales, and were nearly as sticky as the caps.

My first impression was that these were all specimens of *Agaricus* (*Hebeloma*) *crustuliniformis*, of Bulliard; but I had never seen any specimens of this species (which in its usual form I knew very well) so glutinous as these; and on closer inspection the gills were seen to be as much as three lines broad, instead of being narrow and of only one line in breadth; the plants had also either very little smell, or a rather sweet one, like Cherry-laurel, instead of a smell like radishes. Being somewhat puzzled by these variations, I took some specimens to Dr. Plowright, of Lynn, who said he had no doubt that they must belong to the above-named species, and who showed me a figure of this species drawn by Persoon, with gills quite as broad as those in the specimens before us. The doubt about the smell was resolved by reference to a note of the Rev. M. J. Berkeley, in which it was described as above.

To remove all possible doubt, I sent specimens to several of the principal mycologists, both in England and in France, and these were, without exception, agreed in referring the specimens to the above-named species.

But the question remained, and still remains, unanswered, whence came this wonderful crop? The land on which they appeared had four years before been growing wheat, and Mr. Pratt, after referring to documents in his possession, informed me that the field was under regular cultivation in 1635, and had been so ever since. After the wheat crop had been removed in 1885, the land had been ploughed very deeply, so as to make a nursery for the trees which were wanted on the estate; it had all been dug over again in 1886—both processes being exceedingly unfavourable to the growth of the mycelium of the fungi—and then planted in strips ten yards wide with Willows, Oaks, *Abies douglasii*, Black Spruce, *Pinus cembra*, and Larch. The Willows had grown from cuttings taken from a plantation some two miles distant, and the labourers on the estate assured me that while they had often seen great "toadscaps" growing out of the tops of the Pollarded Willows, they had never seen any such as these growing on the ground about the Willows. The fungi could hardly have been in some undeveloped state in the ground, for more than two hundred

years of cultivation must have prevented their development, and none of the other strips of the plantation showed at that time any symptoms of fungoid growth.

A few days later I visited the spot again, there were not then quite as many of these fungi among the Willows, but in the strip planted with *Abies douglasii*, there was as remarkable a crop of *Agaricus* (*Hebeloma*) *mesophæus*, of Persoon, an allied species, generally found in fir-woods, but differing in marked characters from the first described fungus. In the strip of Oaks, which separated the Willows from the Firs, a few of both these species were to be found, but none of any other kind.

I can suggest no explanation, but I merely record the fact, that when land which had been under cultivation for two hundred and fifty years was planted with Willows and with Firs, there sprang up in three years' time, among the Willows, a fungus which had never been noticed there before; and among the Firs another species of fungus, found only in well-established fir-woods.

V.

ON THE GREAT FLOOD OF 1852–3 IN SOUTH-WESTERN NORFOLK.

By Alfred Newton, *Hon. Mem.*

Read 28th November, 1893.

It had long been my wish, on some fitting occasion, to furnish this Society with an account of the Great Flood, which at the beginning of the winter of 1852–3 laid under water so many thousands of acres in South-Western Norfolk, beside a not inconsiderable area in the adjoining counties of Suffolk and Cambridgeshire, and for a time had a very marked effect upon a portion of our Fauna. On last Whit-Monday, when some members of the Society honoured Cambridge by a visit, I took the opportunity of saying a few words

on the subject to those who happened to be present, in the Bird-room of the Museum of Zoology there, and our President has intimated to me that a fuller statement of the remarks I then made might be acceptable to the Society, if offered in a more formal way, and adapted for publication in its 'Transactions.'

The autumn of the year 1852 was one of the wettest that had been known for a long while, as I believe anybody may satisfy himself by referring to meteorological records. Here I will content myself with the statement which I obtained at the time from some official report, that the water-level at Denver Sluice rose from 13 feet 5 inches to 20 feet 1 inch, or upwards of six feet and a half; but, indeed, all the rivers in the Eastern Counties were swollen to an unwonted height, a height that few, if any, of the oldest men remembered. In the week beginning on the 14th of November in that year, my brother Edward and I went to London to see the funeral of the great Duke of Wellington, and we well recollect the water being out on both sides of the line of railway for several miles. This flood however was, as we afterwards heard, of short duration, and caused, I rather think, by the temporary stoppage, through some accident to the machinery, of one of the local pumping-engines, on the repair of which, a few days after, the water was soon disposed of in the ordinary way. I only mention this fact as being one of the results of the extraordinary rainy season of which we were having experience, and it must be borne in mind that this flood, one I believe of many others, in various places, had no effect whatever upon that of which it is my special business to treat, though the latter began while the former was at its height.

On the night of the 15th of November the right bank of the Little Ouse in the parish of Feltwell gave way, and a few days after the bank on the Lakenheath side also burst.* Through the breaches thus made the waters which had been so long accumulating rushed, flooding immediately a large extent of country, and at the end of a week covering about 20,000 acres of land in Southerey, Methwold, Feltwell, Hockwold, Lakenheath, and Mildenhall Fens.

* I did not at the time note the precise spots at which these breaches occurred, but Mr. Francis Newcome has kindly ascertained for me that the first was about a quarter of a mile below the foot-bridge leading to the new Church, and close to the Anchor Inn; while the second was about 200 yards above the Cross Water Stanch.

Such a flood indeed had not been known for some forty years, when the state of the Fen-country was very different from that of 1852, and it had been confidently expected that the recurrence of such a disaster to the agriculturists of the district had, from the recent improvements in the drainage, been rendered impossible. The extensive sheet of water formed in the way I have mentioned soon became the resort of a vast multitude of wild-fowl, which thronged thither in numbers so as to remind old fen-men, as they have told my brother Edward and myself, of the days of their youth.

It was extremely characteristic of our excellent old friend, the late Edward Clough Newcome, who for prudence and foresight in regard to all kinds of field-sport surpassed any one I have ever known, that no sooner did news of the first bursting of the river-bank reach him (and this I think was within twenty-four hours of the event) than he knew what the effect would be, and wrote at once to a boat-builder at Lynn for a new punt, and to a gun-maker at Birmingham for a new swivel-gun, each, I need scarcely say, to be of the best kind made. This I am bound to mention thus early, for had it not been for Mr. Newcome's love of sport, and his giving us opportunities of accompanying him in some of his almost daily excursions—pursued as they were in all sorts of weather—my brother and I should never have witnessed the wonderful and interesting sights which the Flood afforded, and we should have remained in ignorance of much that it will be always a pleasure to remember. As it was, we were able to realise many of the scenes of which we had heard, or were hearing, for I ought here to state that we then made the acquaintance of William and Daniel Spencer, both of Feltwell, whose great-grandfather and grandfather had been gamekeepers to the Clough family, and being themselves thatchers by trade, had from boyhood thoroughly known the Fen-country.* It was our habit to write down at night what we had heard during the day from men who had such information to give, though we never let them know we were

* In 1852-3, Sedge (*Cladium mariscus*) was still procurable in some quantities, and its admirable properties for thatch were still appreciated. It made the relations of the thatcher to the Fen-country very close—much closer than would now appear to be likely. Reeds were not very abundant, and therefore not greatly used, in the district.

mentally noting what they said, and after some practice it became pretty easy to judge whether the evidence offered was worthy of credit or not. In the case of these two men, who were brothers, and I should say that one was fifty-three and the other forty years old at the time, it certainly was, for quite independently of each other their testimony was mutually corroborative.*

The varying force and direction of the wind naturally produced great changes in the depth of the sheet of water thus formed, sometimes making the difference of a foot or more in the course of the day, and affording ever-changing feeding-grounds to the birds, which flocked to the shallows formed as the wind drove the flood from one district into another. Unless it blew very hard there was seldom any ground left quite free from water, or indeed was there anything at all elevated about the expanse but the holts, droves, stacks, and gates. All the Fens except one were soon frequented by gunners, the number of whom kept increasing weekly, until they abounded so as to interfere considerably with one another's success. On Hockwold Fen alone none were allowed to go, Mr. Newcome keeping it for his own shooting, and there consequently the fowl enjoyed comparative freedom from molestation, a privilege of which they were not slow to avail themselves.

My brother and I had not the opportunity of witnessing the extraordinary sight presented by the inundated district until the second week in February; but at that time the superficial extent of the Flood was very nearly as great as at any other, although the water may not have been quite so deep. On the 9th of February, 1853, we, with Mr. Newcome, went by boat from Feltwell, along Sam's Cut—the "Twenty-foot" as it used to be commonly called—to beyond the decoy at Hilgay.† The drove alongside of this channel was nearly all above water; and, being the highest eminence for some little distance, was strewn with gates, cart-wheels, and

* Most of the curious facts told us by these men have been published in 'The Birds of Norfolk,' for I lent Mr. Stevenson our 'Hearsay Book,' that he might avail himself of whatever he found in it.

† Mr. Francis Newcome has kindly suggested to me that this might rather have been the decoy at Methwold which was not far off (see Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 548); but I think it better to leave the name as written by me at the time. Whichever of the two decoys it was is really immaterial, seeing that they were so near each other.

portions of farming implements, together with large quantities of litter and fodder, washed out of neighbouring farm-yards. The lower storeys of all the houses near, not very many in number, were quite unfit for habitation, many of them having two feet of water over their floor. Most of the inhabitants had taken refuge in the neighbouring villages, not only on that account, but because the foundations had been injured, and the buildings were in an insecure and even dangerous state. We did not see any great variety of birds upon that day, but among them I find we noticed one Peregrine Falcon, two Merlins, several pairs of Stonechats, three Lesser Redpolls, one Tree-Sparrow, several Magpies, a trip of fifteen Golden Plovers, large flocks of Lapwings, two Herons, a flock of eighteen Teal, and one of about three hundred Wild Ducks at the decoy, one Wild Goose (species undetermined), and large flocks of either Herring or Lesser Black-backed Gulls, or of both.

The succeeding day (10th February) we accompanied Mr. Newcome, again by boat, on Feltwell and Hockwold Fens. There we saw among other birds—one Mealy Redpoll, a flock of Lesser Redpolls (these on the alder trees in the holts) large flocks of Lapwings, a pair of Teal, a flock of eleven Wigeons, several flocks (amounting to about one hundred birds) of Pochards, one Black-headed Gull, and large flocks of either Herring or Lesser Black-headed Gulls or of both.

The next day (11th February) we made another trip in the same direction, seeing several Redwings, large flocks of Lapwings, two Snipes, a pair of Wild Ducks, one Teal, a pair of Wigeons, a flock of thirteen Pochards, a flock of Black-headed Gulls, a flock of what we supposed to be Common Gulls, several Greater Black-backed Gulls, and a flock of about five hundred consisting of both Herring and Lesser Black-backed Gulls. Both these last days were stormy and cold, and the birds were consequently very restless. A great part of our time was passed on one or other of the droves, or under the shelter of a peat-stack, while Mr. Newcome was endeavouring, with but poor success, if I remember right, to stalk fowl in his punt. On one occasion, so as not to interfere with his proceedings, we had to stop for some time in open water, and to stay the boat from drifting with the wind we cast out a grapnel. On hauling it in before going on, we found that our anchorage had been a Swedish turnip.

The following week my brother Edward revisited the district; but in the meanwhile a sharp frost had set in, and in nearly all parts the Flood was frozen. From our old 'Register' I find that on the 15th of February, on the borders of Feltwell Fen, he observed the following:—one cock Yellow Hammer (singing), three Snipes, a flock of about one hundred Wild Ducks, a flock of about twenty Teal, two Wigeons, a flock of about one hundred Pochards, as well as a flock composed apparently of Common, Herring and Lesser Black-backed Gulls. On the 16th, on the borders of Feltwell and Hockwold Fens he saw a Peregrine Falcon, several Redwings, a Lesser Redpoll, five Snipes, a flock of Wild Ducks and Teal, and a flock of Gulls mixed as before; while on higher ground there were Skylarks by the thousand, and two Quails were shot. On the 17th there was a very heavy snowfall, and a high wind which kept drifting it all day; but in the same tract of country he saw a Peregrine Falcon, another Quail,* a flock of seven Lapwings, three Snipes, a Heron, and a flock of Gulls. On that night and until nearly noon on the next day (18th February), the snow-storm continued, but then my brother saw in the same district about twenty-five Common and one Jack Snipe, eight Herons, two Waterhens, seven Wild Ducks, two Little Grebes, and a flock of Common Gulls. The succeeding night was one of the coldest that had been felt in England for several years.†

Our next visit to the district was about a month later, when the Flood had undergone a visible diminution; yet there was not much difficulty in getting a flat-bottomed boat about, though it had to be dragged over such places as the Corkway and Black Dyke droves. On the 15th of March, in or on the borders of Feltwell and Hockwold Fens, there were noticed, among other commoner birds it must be understood, a Merlin, a flock of Golden Plovers, two Snipes, and many pairs of Wild Ducks and Teal. On the 16th, on the Fens just named, there were seen a Peregrine Falcon, a flock of Lesser Redpolls, a flock of Ring-Plovers, nine Herons, about thirty Snipes, eight Coots, many pairs of Wild Ducks and Teal, a flock of eight or nine Pintails, many flocks of Wigeons, and a

* This Quail was found almost covered over by the drifting snow, and it could not have stirred from its shelter, under a turnip-leaf, since the beginning of the storm.

† At Elveden the thermometer was registered at 6·5° F.

Brent Goose, the mate of which had been killed two days before by Mr. Newcome—together with large flocks of Common and Black-headed Gulls, and a flock of Gulls of which we could not determine the species. During these two days the weather was very severe for the season, and very stormy.

A period of six weeks passed before we again visited the Flood; but during that time the influence it exerted by attracting birds was manifest in all the neighbourhood, and Wild Ducks and Teal were often seen, even so far off as Elveden and its vicinity. By the month of May the water had very much decreased in extent; and, there being then scarcely any place over which a boat could be rowed, the gunners were almost entirely kept to the ditches. At this time there was, however, more water left in Hockwold Fen than in any other part of the district. On the 5th of May, I there saw, beside some of the ordinary summer migrants, Whinchats and the like, that had now returned, three Redshanks, one of which was a cock, to judge by its song and actions characteristic of the breeding season, a bird that we took for a Wood-Sandpiper, a pair of Bar-tailed Godwits, of which one was killed, a pair of what we supposed to be Black-tailed Godwits, a pair of Shelddrakes, a flock of five Mallards, a flock of two hundred Black-headed Gulls, of which we found a nest with an egg in it, and a flock of eight Arctic Terns, one of which was shot. The next day (6th May) among other birds we saw three Redshanks, and found a nest containing a single egg,* a pair of apparently Wood-Sandpipers, a pair of Dunlins, and a pair of Godwits, of which species we could not be certain, five Mallards as before—the Ducks were doubtless on their nests not very far off, a pair of Teal, and a flock of about one hundred Black-headed Gulls. A few Skylarks were also seen, for the first time by me, the condition of the ground having now become suitable to them.

About the 4th of May, Mr. Newcome had shot a Turnstone, and about the 9th he killed an adult male Eared Grebe in extremely fine plumage, both on Hockwold Fen, and a short time after some Common Terns. On the 15th of the same month a nest of the Black-headed Gull with two eggs was taken in Feltwell Fen.

On the 21st of May my brother and I were again with

* On or about this day another nest with three eggs was found, we were told, in Methwold Fen.

Mr. Newcome on Hockwold Fen, where we saw several of our summer birds, as Spotted Flycatchers and House Martins, which had at that time hardly shown themselves at Elveden, as well as a flock of about fifteen Ring Plovers, two pairs of Redshanks, one Snipe, several Wild Ducks, one Teal, four pairs of Black Terns, and about one hundred Black-headed Gulls. A company of five Ruffs was also seen by my brother. About this time the water was rapidly decreasing in extent under the influence of drying winds and a hot sun.

Our next visit was on the 3rd of June, when one could walk dry shod over most of the ground. On that day were observed nearly all the ordinary passerine birds of the locality and season, beside one Redshank, one Snipe, a flock of sixteen Herons, a Little Grebe and its nest, and a flock of about two hundred Black-headed Gulls, many nests of which we saw, though they had all been robbed of their eggs. These nests were on what had been, if I remember right, an oat-stubble of the preceding autumn, and at the time of their making on the margin of the flood, but when we saw them the water was far off. On the preceding day Mr. Newcome had seen, as he told us, a Gannet flying over Hockwold Fen; and we afterwards learnt from him that on the 8th of June three nests of the Black Tern, two with three and one with two eggs, were taken in Feltwell Fen. Three of these eggs, one from each nest, he was so kind as to give to us, and I was able to show them—undoubtedly the last that were laid in West Norfolk—to the members of the Society on their recent visit to Cambridge. The two others he kept for himself, and they are still in the collection he made.

A fortnight later we again visited what had been the scene of the Flood, now a thing of the past. On the 16th of June we saw in Feltwell Fen thirteen Herons, four Snipes, a Redshank, and some two hundred Black-headed Gulls, together with a nest containing two eggs of the last. The next day, in the same Fen, we saw a pair of Harriers, presumably Montagu's, the same flock of Black-headed Gulls, and three Redshanks in Hockwold Fen, one of which my brother Edward, watching from the top of a straw-stack, saw go on to her nest, and walking up she rose at his feet from her four eggs, which were hard sat upon. This nest was on what had been a wheat-stubble, hand-reaped, fully nine inches or a foot high, and much over-grown with weeds. The following day, being the 18th

of June, we again saw the Harriers and Gulls as before, and with this day ended our experience of the whole affair.

I have already incidentally mentioned that the effect of this flood in attracting birds to the neighbourhood was perceptible at some distance, but it must be remembered that the whole country was, so to speak, saturated during that autumn and winter. Even so late as the 4th of June much of the low part of Wangford Warren, to the eastward of the Brandon and Barton-Mills road, was under water, and on that day my brother and I saw a Redshank on that warren close to the mere on the Brandon boundary* which by its actions showed that it had young—one, indeed, of which I myself heard, though we failed to find more than their foot-prints on the wet mud. That a Redshank should breed on that ground was a thing wholly unexpected by us, and to the best of my belief, a thing quite unknown to the warrener to have happened for many years before.

To sum up, I may remark *first*, that the ordinary and, in modern days, scanty bird-population of the Fens was, for a time, banished by the flood, its place being taken by species which had not been seen there for very many years; and *next*, that some of these species—as the Redshank, the Black Tern, and the Black-headed Gull—which had not been known to breed in the district for a long while, were tempted by the restoration of an old condition of things, to essay the occupation of their ancient homes, and the rearing of progeny. That their attempt would fail was manifest from the beginning, for the farmers could not be expected to put up with the loss of their crops, and the draining of the flood was only a question of time. Personally, I cannot be otherwise than grateful for having seen its different phases, as thereby I can the better imagine what the early state of the Fen-country must have been like, however great be the difference between the scenes presented to my eyes, and those described by Pennant or the author of the *Liber Eliensis*—with neither of which can the preceding account be compared except unfavourably.

* This is the mere on which, in former days, Black-headed Gulls used habitually to breed (see Stevenson and Southwell, 'Birds of Norfolk,' vol. iii. p. 323, note). They attempted to breed in the same year also on Wretham and Roudham Heaths (*tom. cit.* p. 326), but I think did not succeed in doing so.

VI.

ON THE AGE OF A FLINT IMPLEMENT RECENTLY FOUND AT HELLESDON.

By F. W. Harmer, F.G.S.

Read 30th January, 1894.

In October last, Mr. Middleton, the proprietor of the Hellesdon brick yards, invited the members of this Society to inspect an implement which had recently been found at that place, and the bed of gravel from which it was supposed to have been taken. An excursion was accordingly arranged for the 26th October, as the matter seemed an important one. If the implement had been found in a bed of gravel, it must have been of palæolithic and not of neolithic age, but no palæolithic gravels were known to exist in that locality, and such deposits occur in this district in association with river valleys only. The Hellesdon brick yards are, however, not within the valley of the Wensum, but are situated on the table land which separates that valley from those of the Bure and its tributaries. The only gravels known to occur on the Hellesdon plateau are the marine pebble beds of the Bure Valley series, and if it could be proved that the implement in question came from them, it would carry back the antiquity of man in East Anglia to a period vastly more remote than that which is indicated by discoveries hitherto made.

The various deposits of the Glacial period to be met with in the immediate neighbourhood of Norwich are, in descending order, as follows :—

Upper Glacial.	The Cannon Shot Gravels of Mousehold, Poringland, etc.
	The Chalky Boulder Clay of Middle and South Norfolk.
Middle Glacial.	The Sands which underlie the Chalky Boulder Clay and form the great heaths to the North of Norwich.
Lower Glacial.	The Norwich Brick Earth, which occurs over the whole district North of the City, and which thickens out into the Contorted Drift of the Cromer Coast.
	The Bure Valley Marine Gravels, which underlie the Norwich Brick Earth.

The late Mr. Searles V. Wood and I have classed the Bure Valley Gravels as the lowest horizon of the Glacial Series. Mr. H. B. Woodward and some of his colleagues of the Geological Survey regard them as belonging to the Crag period, but the difference between us is not material to the present inquiry. We all agree that these beds are newer than the Norwich Crag and Chillesford Clay, and older than the Norwich Brick Earth.

The evidence which has been up to the present time obtained as to the Antiquity of Man in Britain carries it back without any question into early postglacial times. Primæval man certainly coexisted in this country with the Mammoth, the Woolly Rhinoceros, the Cave Bear, and the Reindeer, at a period when the climate still retained some of the arctic severity of the Glacial Epoch. Mr. Skertchley, who mapped the country round Brandon for the Geological Survey, contended that some of the implement bearing beds of West Norfolk were overlaid by Chalky Boulder Clay, but the evidence was by no means free from doubt, and has never been accepted as conclusive by geologists generally. It is impossible that man could have existed in any part of East Anglia, while it

was covered, as Greenland now is, by an ice sheet of great thickness, the southern margin of which is shown by the extension of the Chalky Boulder Clay to have reached nearly as far as the Thames Valley, but when the long winter of the Glacial period began to pass away, and the ice melted over a great part of the area, shrinking, as we know it did, into the valleys of the Wensum, the Yare, and the Waveney, because we find at the very bottom of those valleys occasional masses of Boulder Clay, then it possibly was that palæolithic races, following the retreating ice, began to find their way hither. If the Brandon Gravels are older than any part of the Chalky Boulder Clay, it must be, I think, than that part of it which was formed during the latest part of the Upper Glacial period.

The mountain districts of Great Britain, as for example, Scotland, Wales, and the Pennine Hills, have undergone a second glaciation at a time considerably later than that of the Great Ice Age, and separated from it by a period of comparative warmth, but the return of these subglacial conditions has left little if any trace of its existence in Norfolk. In regarding the Chalky Boulder Clay therefore as one of the latest horizons of the Glacial period, I follow Mr. Searles V. Wood in classing such deposits as the so-called Upper Boulder Clay of Lancashire, which contains Molluscan fauna of a very recent character, both as to the species and the condition of the shells, as postglacial.

When we arrived at Hellesdon we found that it was the opinion of Mr. Middleton and his son that the implement had been taken from the bed of Gravel underlying the Lower Glacial Brick Earth. There is no doubt whatever as to the geological age of these beds. The structure of the country at Hellesdon is perfectly clear and simple. The Lower Glacial Brick Earth occurs over the whole neighbourhood at the same horizon, and is everywhere underlaid by the Bure valley gravels. When standing at the pits and looking northwards one can see where the Lower Glacial beds pass under the Middle Glacial sands of the higher country, and this can also be seen by consulting a geological map of the Norfolk Drifts.

The gravels in question are, therefore, without question of the age of the Bure valley beds, and if it could have been proved that the implement had been taken from them, it would have carried back the Antiquity of Man in East Anglia at one stride from the end to the beginning of the Glacial period, from postglacial, or at

the earliest, the most recent portion of the Upper Glacial deposits, to the earliest part of the Lower Glacial, to an horizon which Mr. Woodward even regards as preglacial.

Unfortunately we could find no evidence at all in support of this hypothesis. On the contrary, the evidence is almost conclusive in the opposite direction.

On questioning the workmen, we found that the implement was not found *in situ* in the gravel, but lying on a heap of stones a short way off. An illustration that such evidence is of no value was ready to our hand, for although the bulk of the stones had evidently been taken from the pit of Lower Glacial gravel, we found mixed with it one or two fragments of brick, which certainly were not of Lower Glacial age. There is exactly as much evidence, however, neither more nor less, for the preglacial age of the brick as for that of the implement. It is true that the workmen stated that they had on a former occasion found a similarly shaped stone in the gravel, but no importance can be attached to such a statement.

The evidence that the implement could not have been found in these beds is very strong. It will be seen from the excellent photograph taken by Mr. Bidwell, a copy of which is here given, that the implement is rather of a neolithic than a palæolithic type. Sir John Evans says it is neolithic. Mr. Prestwich thinks it may be palæolithic, but that it has a very neolithic appearance. It is not polished or ground, but it has been most carefully chipped, is quite symmetrical in shape, and was evidently made by a very skilful workman. I have very little doubt myself that it is of neolithic age. There are several very similar neolithic flints in the Norwich Museum, and moreover, we were informed that there is supposed to be in the next field to that in which the Hellesdon brick yards are situated, the remains of a Neolithic tumulus, and from this possibly the flint implement originally came.

It may be further pointed out that the Bure valley gravels are marine, containing at Belaugh, Crostwick, Aylsham, and elsewhere marine shells. These beds were probably deposited by the waters of a bay which extended over a great part of Norfolk, and as far south as Halesworth in Suffolk. It has never been suggested by any one, except the Editor of Punch, that palæolithic men had boats, but even he seems to think they did not venture out of sight of land!

The pebbles of which the Bure valley beds are composed are, at Hellesdon and elsewhere, water-worn and rounded, but the implement shows no sign of wear, as it certainly would have done had it been imbedded in a deposit of marine gravel, and finally, the pebbles are of a dark red colour, being deeply stained with oxide of iron, while the implement is of a grey colour, and shows very slight signs of being stained at all.

It may be thought I have taken unnecessary pains to slay the slain, but it is worth taking some amount of trouble to show that there is no evidence whatever for this supposed discovery.

Some time ago, it was asserted on no better evidence than that of the present case, that *Tellina balthica* had been found in the Norwich Crag, and it took us years, and cost us no end of labour to persuade geologists that such could not have been the case. It was only at last by the merest accident that we were able to discover how the mistake originally arose.

VII.

NOTES ON NORFOLK EARTHWORMS.

By Arthur Mayfield.

Read 30th January, 1894.

Few members of the animal kingdom have been more neglected by the British student of Natural History than the Earthworms, and their allies, the aquatic Worms and Leeches. The proof of this lies in the fact that more than half of the British species have been discovered within the last five or six years. One explanation of this neglect may be the absence of a suitable English handbook, to guide those who might be inclined to take up the subject; another may be that Earthworms are difficult to preserve, and present an unattractive appearance in a cabinet.

The case has been different on the Continent, for of the twenty-five species now recognised as inhabitants of the British Isles, eighteen were collected and described by Continental naturalists. Darwin, it is true, has left us an interesting treatise upon the subject of Earthworms, but that work seems to deal almost entirely with their habits and uses, and gives us no idea of the variation and distribution of species. Lately, however, the study of Earthworms has been taken up by the Rev. Hilderic Friend, F.L.S., to whom our present knowledge of their distribution is mainly due, and we may look forward to the advent of a Handbook of British Earthworms from his pen, which will smooth the way of any future student. It was in answer to a public invitation in 'Science Gossip,' from Mr. Friend, that I commenced in the summer of 1892, a search for worms in Norfolk, and it was through his kindness that I was enabled to identify the specimens found.

In this paper I shall, beside enumerating the Norfolk species, give a short description of them, so that they may be recognised by any one who may have a desire to continue the search.

The principal features of Earthworms, by means of which they

may be identified, are, (1) Their colour and size; (2) The girdle or *clitellum*, an organ possessed by adult specimens only, and which is an organ of reproduction; (3) The two segments which form the head. Of these two segments (which are not counted in determining the position of the girdle), the first, the *prostomium*, contains the mouth, and is inserted in the second, the *peristomium*, which embraces it, either totally or partially.

The British Earthworms are included in the four following genera:—

(*a*) Lumbricus. The prostomium inserted so as to divide the peristomium into two parts. The setæ, or bristles, arranged in four close pairs upon each segment behind the peristomium. Surface, iridescent. Mucous, colourless.

(*b*) Allolobophora. Prostomium only partially inserted in the peristomium. Bristles arranged in four pairs, sometimes separated. Some species exude a yellow and fœtid fluid when touched. Surface not iridescent.

(*c*) Dendrobæna. The insertion of the prostomium irregular. The bristles have a tendency to be arranged in eight rows along the body of the worm. Small worms inhabiting rotten wood and other vegetable matter.

(*d*) Allurus. Segments behind the girdle four-sided, having a pair of bristles at each angle.

1. Lumbricus terrestris, Linn. The Common Worm, Lob-worm or Dew-worm. Girdle upon segments 32—37. Length, about 5 inches. Colour, greyish-white, with a pink or brown tint in front of the girdle. This worm is not so common as has generally been supposed; in fact, it is said that in some parts of England it is rarely seen. It has been confused with *Allolobophora longa*, the Bluenose, which equals it in size. However, it may be easily distinguished from this latter species by its lighter colour, and by the position of the girdle, which in *A. longa* occupies segments 28—35. The Common Earthworm is plentiful about Norwich, and is found in gardens and fields.

2. L. rubellus, Hoffm. The Red Worm. Girdle on segments 27—32. Colour, red. Length, about 3 inches. This species is rather uncommon in Norfolk. It frequents meadows and damp hedgebanks. I have found specimens at Earlham, Hellesdon, and Old Lakenham.

3. L. PURPUREUS, Eisen. The Purple Worm. Girdle on segments 28—33. Colour, reddish-brown. Iridescence, very brilliant. The size of this worm is very variable. In gardens, on a dry soil, it seldom exceeds 2 inches in length, but, in meadows at Colney and Old Lakenham, I have seen specimens measuring 3½ inches. It is a very active worm, almost rivalling the Square-tail in the quickness of its movements. It is very common about Norwich.

4. L. RUBESCENS, Friend. The Ruddy Worm. Girdle on segments 34—39. Colour, dark brown. Length, 4 inches. This worm was first found in the summer of 1890, in the neighbourhood of Bradford, Yorks, by the Rev. Hilderic Friend. Since that time it has been taken in ten other counties of Great Britain. The Norfolk specimens were mature and very fine, and were found in a meadow by the river at Colney, in August, 1892.

5. ALLOLOBOPHORA LONGA, Ude. The Long Worm or Bluenose. Girdle on segments 28—35. Colour, blackish, darkest in front of the girdle. Length, 5 or 6 inches. Common in damp meadows, especially where the soil is chalky. Abundant along the banks of the river at Earlham and Hellesdon.

6. A. PROFUGA, Rosa. The Fugitive Worm. Girdle on segments 30—35. Colour, pink in front of the girdle, bluish behind, last four or five segments yellow. Length, 3 inches. I have taken two specimens near Norwich, (1) under grass upon river bank near the "Gatehouse" Inn, Earlham; (2) under moss upon a tree overhanging the river at Costessey.

7. A. TURGIDA, Eisen. The Turgid Worm. Girdle upon segments 28—34. Colour, yellow and flesh-coloured. Very sluggish. Usually found in a torpid condition. It exudes a yellow fluid when touched. Length, 3 inches. Very common in gardens and hedgebanks. Earlham, Heigham, Thorpe, Colney.

8. A. MUCOSA, Eisen. The Mucous Worm. Girdle upon segments 26—32. Colour, in front of girdle pink, lighter coloured behind. Exudes a colourless slime. Length, 2½ inches. Common in meadows. Colney, Earlham, Lakenham.

9. A. CHLOROTICA, Savigny. The Green Worm. Girdle on segments 29—37. Colour, dirty green, girdle pink. Length, 2½ inches. Generally found coiled up at roots of grass in meadows. Very common. Some specimens which I found at Earlham were

remarkable in having the last four or five segments very much smaller than those immediately before, giving the tail a very curious, stunted appearance.

10. A. FŒTIDA, Savigny. The Brandling. Girdle on segments 27—32. Striped alternately with bands of yellow and brown. Exudes a yellow, fœtid fluid. Found in manure heap and decayed garden refuse. Earlham, Thorpe, Hellesdon.

11. DENDROBENA ARBOREA, Eisen. The Tree Worm. Girdle on segments 27—31. Colour, pink before the girdle and on the tail, other part greyish-white. Length, 1½ inches. This little worm inhabits rotten tree-stumps. Nearly every bit of rotten and damp wood that I have examined has produced at least two or three specimens. Earlham, Costessey, Lakenham, Caistor, etc.

12. D. SUBRUBICUNDA, Eisen. The Gilt tail. Girdle on segments 26—32. Colour, similar to the last species. Length, 2 inches. It exudes a yellow fluid, having an odour similar to that of Hedge Woundwort. Among dead leaves at Costessey; in decayed garden refuse at Norwich and Earlham.

13. D. EISENI, Levinsen. Eisen's Worm. Girdle on segments 24—32. Colour, reddish-brown, iridescent. Length, 1½ inches. This worm resembles a *Lumbricus* in appearance. I took one specimen from a tree-stump at Stratton Strawless, and several from dead leaves at Costessey.

14. ALLURUS TETRAEDUS, Savigny. The Square-tail. Girdle upon segments 22—26. Colour, dark brown. This is a very active little worm, about 1 or 1½ inches long, inhabiting very damp places. Common. A yellow variety, *var. luteus*, is about as plentiful as the type at Old Lakenham.

VIII.

NOTES ON THE HERRING FISHERY OF 1893.

By T. Southwell, F.Z.S., *President.*

Read 27th February, 1894.

The Herring Fishery of 1893, at Yarmouth and Lowestoft, is universally admitted to have been one of the most disastrous on record for all concerned. The spring fishery was slightly more productive at Yarmouth than usual, but at Lowestoft little more than half the quantity of fish were brought in compared with the previous season, and there were great complaints as to the badness of the trade, which by some was attributed to combination on the part of the buyers. There were fewer boats at the fishery, only sixteen, I believe, the bulk of the fleet having gone west to the Mackerel Fishery.

The midsummer voyage was the one bright feature in the year, especially at Lowestoft, the fish appeared in unusually large shoals opposite that town and Yarmouth, and were of excellent quality; unfortunately large supplies mean low prices, but taken all together, the voyage must have been fairly remunerative, and to some few very profitable. At Lowestoft, in the month of June, 1,208 lasts were landed.

The autumn home voyage commenced early, and there were considerable deliveries at Yarmouth in September, before the fish were sufficiently good in quality to be fit to cure; but towards the end of October they improved greatly, and both price and delivery were very satisfactory, until the 18th of November, when following a lovely cloudless day, with a fine south-west breeze, at about 6.30 in the evening, a sudden gale of wind from the north-east set in, which lasted with great severity till the 20th, when it gradually abated, and on the 21st it had quite blown itself out, but the destruction was terrible. A correspondent of the 'Eastern Daily Press' writes: "Fortunately the number of victims was small at Yarmouth, compared with elsewhere, and it is remarkable that the

death roll was so small, only two fishermen being drowned. The damage done, however, to property was enormous, and its effects will be felt for a very long time. Hardly a boat came through the gale unscathed, and the record of the losses sustained was an almost interminable list of vessels lost, or of damage done to nets, gear, masts, and rigging." From Lowestoft, says the same correspondent: "Tempted by the fineness of the weather, a larger number than usual of the drifters were at sea, and hardly one of them escaped severe damage and loss of gear. All through the Sunday, and early part of Monday, the gale continued, and it was not until the end of the week that the full tale was told. It was found that one boat, the 'May,' had gone down with her crew of nine hands, and that isolated cases of loss of life brought the total up to fourteen useful lives lost. Besides this, much suffering was endured at sea through broken limbs, and other severe injuries at the hands of the sea." The loss of gear, both at Yarmouth and Lowestoft, was estimated at many thousand pounds; the Scotch fleet at once took their departure, and many of the home boats were compelled to "make up," it being impossible to supply all of them with nets, in place of those they had lost. The result was that at Yarmouth, in the month of November, only 3,792 lasts of Herrings were landed, against 7,682 lasts in the corresponding month of the previous season, and at Lowestoft only 2,168, compared with 4,586 lasts in 1892.

The fishing never recovered from the effects of the gale, and was very slack indeed until its close in the middle of December, the shoals having been broken up and dispersed by the bad weather, which continued very unsettled, the final result being that in December Yarmouth and Lowestoft made returns of 695 and 448 lasts respectively, as compared with 1,229 and 772 lasts in the previous season. The prices during this latter period ruled higher, but the quantity was so small, and those who participated in them comparatively so few, that there was no opportunity of retrieving the losses already incurred.

It sometimes happens that although bad for one or more sections of the numerous classes interested in the Herring Fishery, the season may still have proved satisfactory to others, but I fear that of 1893 must be pronounced equally profitless to all those immediately concerned, and through them to the still more

numerous army of workers, who look to this important industry as the chief harvest of the year.

From Yarmouth there were 154 home and 149 Scotch boats engaged in the Herring Fishery, manned by 2,732 men and boys; the total catch for the year being 16,184 lasts (as compared with 17,237 lasts in 1892), 3,509 lasts of which were landed by the Scotch boats. From Lowestoft there were 185 home and 81 Scotch boats, employing some 2,313 men and boys, with a return of 8,157 lasts (as compared with 9,110 lasts in 1892), making a grand total 24,342 lasts for the two ports. It is always very difficult to estimate the average value of the year's catch, and particularly so in a season like that which is just passed; the prices fluctuated very considerably, and in September and October the fish were of very poor quality; in November and December things were better in all respects, but the improvement, for the reasons already stated, came too late to help up the average to any great extent; perhaps £6 per last may be taken as an approximate value, this would represent a sum of £146,052, or a loss of £38,384, and a falling off of 2,006 lasts as compared with the season of 1892, to which must be added the great destruction of boats and gear.

My thanks are due to Mr. W. J. Nutman, the Borough Accountant of Great Yarmouth, and to the Harbour Master of Lowestoft, for their kindness in furnishing me with returns of the Herrings landed at their respective ports.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1893.

		Yarmouth. Lasts (13,200)	Thousands (1320)	Hundreds (132)	Lowestoft. Lasts (13,200)	Thousands (1320)	Hundreds (132)
	January	—	—	—	—	—	—
	February	—	—	—	—	3	3
Spring	March	31	2	1	143	9	1
	April	54	5	4	418	7	8
	May	5	7	5	30	1	8
Mid-Summer	June	930	7	8	1208	5	5
	July	44	7	4	3	4	4
North Sea	August	666	1	8	32	4	2
	September	2774	4	6	78	5	4
Autumn Home Voyage	October	7188	7	9	3624	6	1
	November	3792	5	7	2168	1	1
	December	695	3	1	448	9	1
	Yarmouth	16,184	3	3	8157	7	8
	Lowestoft	8157	7	8			
	Total	24,342	1	1			

IX.

SOME ADDITIONS TO THE NORFOLK AND NORWICH MUSEUM IN THE YEAR 1893.

By Thomas Southwell F.Z.S., *President.*

(Hon. Curator—Vertebrata.)

Read 27th February, 1894.

By a deed, dated April 17th, 1893, the Trustees of the "Norfolk and Norwich Museum" transferred their collections to the Corporation of Norwich, and the institution which for seventy years had been known by the above title, and which had grown to its present magnitude under private management, supported entirely by voluntary subscriptions, became the "Norwich Museum," under the Public Libraries Act of 1892, the governing body for the future being composed jointly of Members of the Corporation and citizens, presumed to be specially qualified to control the technical working of such an institution. It was not, however, until the 31st December, 1893, that the management of the Museum passed out of the hands of the old committee, and on the 1st of January, 1894, it commenced its career as the "Norwich Museum." In closing their last Annual Report the Committee, after stating that during the period of the Museum's existence as private property it had grown from a small beginning to its present dimensions, entirely from private gifts, the Report concludes as follows: "Should the second period of the Museum's history, under its greatly improved conditions, be in proportion to the past advance, it may confidently be asserted that the citizens of Norwich will at no distant date be in possession of a Museum second in extent and value to no local Museum in this, or, perhaps, it may even be said, in any other country." In view of the rapidly increasing collections and the beautiful and spacious home which is rapidly approaching completion for their reception, I do not think the anticipations foreshadowed in the Report are unduly sanguine.

During the year 1893 the additions to the collections have been both numerous and important, more especially in the departments which come within the scope of these notes, which have been enriched by the presentation of a large number of British and foreign Mammals and Birds, the gift of the Right Hon. Lord Hastings, of Melton Constable, among them many specimens of local interest and great rarity—as well as some very beautiful and valuable additions to the ethnological collection, in the form of South Sea implements of state and war, antique arms, and various articles of domestic use.

In the section Mammalia may be mentioned about forty British and foreign Mammals from Lord Hastings, all exceedingly well mounted and in excellent preservation, amongst which are a large case containing a Tiger attacked by an Indian Python, a Himalayan Bear, Striped Hyæna, hybrid between a Dog and a Jackal, a young Wild Boar, six adult and one young Kangaroos, Porcupine, two species of Agoutis, Armadillo, &c. Mr. W. M. Crowfoot is also the donor of a very fine skull of an adult Hippopotamus from the Niger district.

The collection of Birds of prey has, through the munificence of Mr. J. H. Gurney, been enriched by a considerable number of additions, four of which are new to the Museum; with regard to the most noteworthy of these Mr. Gurney has kindly furnished me with the following notes.

Haliaëtus vociferoides, Des Murs, the Sea Eagle of Madagascar, an island form very distinct, and a bird of which the late Mr. Gurney had long wished to obtain an example, was received through Mr. A. Boucard. Although *H. vocifer*, its nearest ally, is by no means a rare bird; *H. vociferoides* is very scarce in European collections, three in Paris, two in Leyden, one in Frankfort, and the present example, and a head in our own Museum, being, I believe, all that are known.

Microhierax melanoleucus, Blyth, for two examples of this valuable little Hawk we are indebted to the generosity of Mr. C. B. Ricketts, of Foochow, China.

Heliodilus soumagnei, Gr., is a very valuable addition to the collection of Owls, it was forwarded from Madagascar by the Rev. J. Wills, who for many years has befriended the Norwich Museum. This specimen was procured in the forest of Imerina,

and as it is the only one with which Mr. Wills has met, must be either very rare or very local.

Scops sibutuensis, recently described by Dr. Sharpe from two skins collected in the Philippines, the co-type of which we have acquired, is extremely close to *S. elegans*, an example of which was presented to the Museum two years ago by Mr. Seebohm. We have also received two specimens of the British Osprey, from New Guinea, valuable for locality; and a very dark brown *Limnaëtus gurneyi*, apparently adult, of which species we had only immature examples; and to Mr. D. L. Thorpe we are indebted for a nestling of *Archibuteo ferrugineus*, from Assinaboia, N. America.

Lord Hastings has contributed eighty-seven species of British Birds; unfortunately the localities of the bulk of these are unknown, but there are a number of specimens of very great interest, such as Ruffs, Black-tailed Godwits, Avocets, Woodcocks, with three nestlings of the latter taken at Melton Constable, all of which were killed in this county, during their breeding season, as shown by the dates marked inside the cases. There are also excellent specimens of the following species, some of which have Norfolk localities indicated; viz., Night Heron, Bittern, Spoonbill, White-tailed and Golden Eagles, Kite, Peregrine Falcon, Harriers, Goshawk, Nutcrackers, Stone Curlew, Dotterel, Little Ring Plover, Wood Sandpiper, Great Snipe, Whooper, Bewick's Swan, Long-tailed Duck, Smew, Black Guillemot, Iceland and Glaucous Gulls, and some very beautiful albinoes and varieties. We are also indebted to Colonel Feilden for a lovely specimen of Sabine's Gull, from York Factory, Hudson's Bay; to Mr. Bazett Haggard for skins of the *Didunculus*, and other birds from Samoa; to Mr. Whitaker for a pair of Black Terns, killed at Blakeney, and to Messrs. Mackley Brothers for a cross between a male Bullfinch and a female Common Linnet, produced in their famous song-bird breeding establishment. But the most interesting addition to the collection of British Birds is a female Great Bustard, the companion bird to the male which was acquired by the Museum last year, and to which I alluded in my notes for 1892, as then in the possession of a lady in London. The history of this bird is fully set forth in the third volume of the 'Birds of Norfolk,' p. 401, up to the date of the publication of that work, it is therefore only necessary to add that after the death of the widow of the late Dr. Beverley R. Morris it passed

to her daughter, Mrs. Sanders, from whom it was purchased by subscription, and presented to the Museum. The Norwich Museum thus possesses, including a female in the Lombe collection, two males and five females of the old Norfolk and Suffolk race of Bustards, which there is reason to hope will be displayed in the new Museum in a manner worthy of their beauty and rarity.

The additions to the Oological, Entomological, and Botanical collections have also been numerous, as well as to the Geological collection, the most interesting contribution to which has been a portion of the skull of a Musk Ox, from Trimingham, presented by Mr. A. F. Buxton, which has been figured in the 'Quarterly Journal of the Geological Society.'

It is hoped that at no distant date the contents of the old building, which is crowded to excess, may be removed and re-arranged in the Castle, which is being rapidly prepared for their reception.

X.

VARIETIES AND DISTRIBUTION OF THE HERRING (*CLUPEA HARENGUS*, LINN.).

By C. Stacy-Watson.

Read at Yarmouth Section, January 16th, 1894.

"Of all fish in the sea, Herring is King." So sang an ancient poet, and it is as true to day as then.

The study of the habitat of this fish of all food fishes, is not only very interesting, but most important, on account of its enormous value as a cheap and nutritious food for the population.

Up to the present time, although great Herring fisheries in different parts of the world have existed for centuries, nevertheless

our positive knowledge of the habitat and life history of this fish is very meagre, and we have to pick our steps with great care amongst the various statements made concerning it, testing all, when possible, by actual examination in order to obtain the truth.

The time at my disposal to-night will not permit of my taking more than a cursory glance at the phase of the subject which I have been asked to treat upon, viz., some of the more marked varieties of the Herring, their distinctive characters and distribution. And in doing so I desire to acknowledge my indebtedness to the Fish Commission of the United States of America, and many friends on both sides of the Atlantic, for information which, but for their kindness, would have been beyond my reach.

Kroyer, the famous Dutch ichthyologist, in deploring the scanty knowledge possessed regarding fish, remarked in his work 'The Fish of Denmark:' "How desirable it is to gain more insight into the natural history of fish is strikingly illustrated by the Herring, as many points in its mode of living are still unexplained, and many fabulous accounts are transmitted from one generation to another."

Professor Forsteck of Kiel, in a letter to me, dated October 17th, 1876, says: "Up to the present we know very little about (1) commencement and close of spawning time, (2) places where spawn is deposited, their depth, temperature, degree of salinity of bottom; (3) the act of spawning, (4) the grounds to which the Herrings retire after spawning, (5) the varieties, (6) the growth of the fish, (7) the age at which it spawns first."

Here then is food for thought, a fine hunting ground for our operations, and one that will yield most interesting and profitable results.

At one time it was thought there was but one race of Herrings whose home was under the ice-covered waters of the Arctic regions, where, protected from their natural enemies, they were supposed to multiply, until finding themselves overcrowded, large contingents of them would, in martial array, annually migrate southward, and in their progress, divide into sections and battalions, visiting, on their way, various fishing grounds, where the fishermen would intercept and capture them. This view has, or ought to have been, exploded long ago.

Considerable light has been shed upon this point of late years by scientific and observant practical men, and to some extent the distinctiveness of the various tribes and their favourite haunts have been established; with your indulgence we will rapidly pass in review some of these various local races, beginning with those in the more distant seas.

On the north-west coast of America, in the Alaska waters, there lives a variety of Herring, which periodically visits the spawning ground in the summer months, when the Indians put forth to capture them; they are said to be very numerous, and to swim in such large shoals that they break up the surface of the water. On the east coast of the United States of America, off the shores of Carolina, there exists a beautifully proportioned though small Herring, rich in quality and much prized as a dainty food, it is known as the "Carolina Roe Herring" on account of its fine roe.

At the mouth of the James River swims a Herring which delights to take a draught of *fresh* water; it is found disporting itself some distance up the red waters of the river, where it seems to spend some portion of its existence away from the sea; it is not known why it seeks the fresh waters, but I incline to the belief that it does so to escape its deep water enemies. Its appearance is quite distinct from the South Carolina Herring.

Off the Potomac River in Chesapeake Bay, a little to the north of James River, there are said to be five distinct varieties, viz., (1) the Branch Herring, (2) the Common Glut Herring, (3) the Poplar Back (backs yellow poplar), (4) Dun Bellies (sides have a yellowish appearance, as if gold dust had been sprinkled over them and rubbed in); (5) May Flipper (appears in May), "a small delicious Herring, so called because it jumps and flips higher out of the water than any others."

Coming further northward we find in Massachusetts Bay and contiguous waters, at a distance of from fifty to one hundred and fifty miles off, there are two distinct schools, one consisting of small Herrings which frequent the inshore grounds, and a larger Herring which keeps to the more distant waters; they both put in an appearance in the months of April and May.

Off the coast of Main, to the north of Massachusetts, again two varieties are found, which with undeviating regularity appear on the grounds, one about the middle of July, remaining about

a month, and the other two months later, staying also about a month.

Gloucester (about twenty miles off).—A school of very large Herrings is preceded by one of smaller-sized fish in April and May. It is thought that each of these forms part of the same schools that visit the Massachusetts Bay, and from their similarity may be classed with them.

In the waters surrounding Nova Scotia and Newfoundland are to be found very large framed Herrings, coarse in flesh and rank in taste, long and lanky; also a large, fine, powerful fish with abundance of fat similar in appearance to those frequenting the Iceland and Lofloden waters.

Enclosed Waters.—In the river Niagara (*fresh water*) are to be found Herrings about 14 in. to 15 in. long, fine thick shoulders and back, with which you may tickle your palate at the restaurants in Toronto, where they are served fresh in portions.

Coming to this side of the Atlantic, in the Pollen, an inland sheet of water but slightly salt, access to which is gained through the narrow, short fjord, almost dry when the tide is out, called Borgefjord, from the Polar Sea, lives a very distinct tribe of Herrings, large fine fish; they are said never to leave those waters, but propagate their species there; Herrings of all growths are found amongst them.

Iceland and Lofloden Isles.—In the waters washing these shores, early in the month of May, swims a large, powerful Herring, coarse of flesh, with a strong smell, a striking contrast to our Yarmouth fish. They spawn on the Lofloden coast the latter part of May, but the Iceland ones do so a little earlier.

In the White Sea (Bay of Soraka) exists a tribe of Herrings under its ice-covered waters, which are only comeatable by the fishermen making holes in the ice through which they let down their nets to capture these White Scaites.

In the fjords of Sweden and Denmark, large masses of Herrings congregate, probably in search of food and quietude from their enemies during their spawning time. They are of a very mixed kind, from small Herrings of about 5 inches to 13 inches long.

Baltic and Kattegat.—These waters are visited by Herring at regular periods, distinctive in character; whilst off the coast of France, as has been noted by Cuvier and Valenciennes, there

are two tribes of Herrings, each of which has its separate home in certain basins of the sea and never intermingle.

Ireland (West coast).—In September and October a large and good quality of Herring pays Donegal Bay a periodical visit, and remains almost unmolested for the want of more activity among the fishermen. On the east coast also, in Wicklow Bay, in July, a fair-sized fat Herring, full of oil, without milt or roe, is caught in small numbers. It may be of interest to note here that I have taken from the inside of these fish, after they have been in salt four or five days, small semi-transparent live Worms, of a spiral form.

At Ballantrae, on the Ayrshire coast, Herrings have been known to visit the same spawning ground, almost to a day, for the last three hundred years. Opinions differ as to where these Herrings come from, some say from Loch Fyne, others from the Irish Channel (*i.e.* the North Channel). I lean to the latter opinion as the most reasonable, believing the fish come in from the deeper waters of the Atlantic to spawn, and although they are met with a little further north, viz, at Saltcoats, prior to appearing off Ballantrae, the reasonable conclusion to arrive at is, that the fish, feeling themselves burdened with milt and roe, are less active, and therefore seek the safer waters of the Firth of Clyde and contiguous Lochs, away from their rapacious enemies, and there await the eve of their delivery, when they proceed to the banks and deposit their ova. This takes place about the 20th to the 25th of February. They are fine specimens of a well-moulded Herring, beautifully scaled and of large size, one such measured 13 inches long, 7 inches girth, and weighed 12 ounces.

Lewis Islands, Barra.—There are two varieties of Herring on the Atlantic side of Barra Head; large fish, devoid of oil, supposed to be on passage, they are intercepted by the fishermen during the month of May and June; it is not known where they spawn, and at this period have little or no roe or milt. When it does happen to exist, such fish are considered of inferior quality. On the east side of the island (*i.e.* in the Minch) the Herrings found are poor and small.

Stornoway.—Off the Butt of Lewis, in the blue waters of the Atlantic, Herrings, rich in oil, but small as compared with the Ballantrae fish, are captured in large numbers.

Off the north coast of Scotland, between Cape Wrath and

Pentland Firth, called the Scrabster fishing, between the 1st of January and end of March, Herrings are being caught; in the early part of the fishing they are of a large size, whilst during the latter part a smaller fish has taken the place of the others. Another and different school visits these same waters about the 15th of May, this is called the summer fishing. The bottom is rocky, and the influence of the Gulf Stream is perceptible in these waters, producing a plentiful supply of Crustacea, to which is attributed the fine quality of these Herrings. The spawning takes place in June and July.

Coming round to the east coast from two to twelve miles off shore at Wick, during the same period of winter, a precisely similar Herring to that caught off Scrabster is found, and it is well to note that here also the bottom is rocky, Crustacea plentiful, and the temperature favourable. During the summer fishing, which begins here in June, and lasts until the 1st of September, a good quality large fish is found, rich in fat and of good flavour. The spawning begins in July, and continues throughout August; during this period no food is found in the stomachs of the fish.

Opinions vary as to the time the Herring developes milt and roe, but it is believed they shed their spawn after eighteen months of age. Off the coast of Aberdeenshire, viz., the Fraserburgh, Peterhead, and Aberdeen fishings, a fine Herring, somewhat larger than those further south, visits the grounds; here the waters are deep, with rapid tides and a favourable temperature of 54 to 55 Fahr., but in the upper reaches of the Moray Firth the fish are smaller. On the Wick, Fraserburgh, Peterhead, and Aberdeen fishing grounds excellent fishings are frequently experienced simultaneously, the fish in the shallower waters and soft bottom being of an inferior quality and small, whilst those found in the deeper waters and rapid currents are larger, stronger, and firmer fleshed. The quantity and quality of the food is influenced by the temperature of the water, and the quality and condition of the fish are affected by the food. Animalculæ, Crustacea, spawn, and even the young of their own species have been found in their stomachs, but we have no certain knowledge of what constitutes their favourite food.

You will doubtless begin to wish to get closer home, we will, therefore, come at once to the Herrings which our hardy

fishermen delight to take, and whilst giving due weight to the important fishing grounds in other parts, we will nevertheless claim for the Yarmouth fisheries the pre-eminence, and endorse the declaration made by Sir H. Spelman, that "here is the noblest fishery for Herrings in Europe."

Spring Herrings.—These fish put in an appearance the 1st week in March, about fifty miles E.N.E. of the South Crossing Sands, and slowly move in a south-westerly direction, so that at the close of the fishing, about the middle of May, they are last seen about fifteen miles off Lowestoft high light. It is yet an open question as to whether they are a distinct variety, some contending that they return and are what are afterwards known as the midsummer Herring; they are very lean and thin, from 8 inches to 11 inches long, an occasional fish is found containing roe just forming, and it is thought they are young fish of about three to five months' growth. Where they hide themselves when lost sight of is only a matter of conjecture, some fishermen hold the opinion that they bury themselves in the sand or mud at the bottom, in support of which they state they have brought them up with the dredge-net when trawling for Soles; also that on other occasions they have with the drift-net brought them up covered with mud. This statement, however, is so at variance with the hitherto disclosed habits of this fish, that I venture to doubt its correctness; that shoals of Herrings may occasionally swim near the bottom in search of food, or to elude their enemies and be netted, with traces of the bottom soil upon them, is possible, but that they inter themselves in the mud or sand and remain there for weeks or months, until a period for their resurrection arrives, is to me very doubtful, my firm belief is that they disappear into the neighbouring deep waters, returning to the home of their nativity, when fully matured, for the purpose of spawning at the regular period.

Midsummer Herrings.—These are found on nearly the same grounds, but not quite so distant. They are met with in the first week of June, some five to six weeks after the spring Herrings have departed. They work their way southward in towards the shore, so that in the second week in July they are within a few miles of Southwold beach, where they bid the fishermen farewell, and depart for haunts still unknown to man. At the

commencement of the fishing the quality is poor, but rapidly improves in size and fatness, declining again as the end of the fishing draws near. They are rarely ever found with milt or roe, but contain a large bladder of black oil; the skins and flesh are very tender, and when salt is applied, they shrink to such an extent that they are not recognisable as the same fish a few hours afterwards. During the last week in July a similar fish is met with at from ten to eighty miles off the Tyne, they have a black gut and smell rank, turn bad very quickly, and are minus milt and roe.

Early in August, on the same grounds, a large, full, healthy fish, firm in flesh, and containing milt and roe, succeeds those just described; during the same period from Huntly Foot to Scarborough (*i.e.* Whitby Rock buoy), about four miles off the shore, a large, soft, mazy, dry fish, with roe and milt, is taken during the middle and latter part of August. Further south, from ten to fifty miles off Flamborough Head, extending seaward towards the tail of the Dogger Bank, a large, powerful, firm, sound-fleshed healthy, full fish, is caught in September and October. At the same time there are to be found on the Dimlington grounds, about ten miles off shore, in about eight fathoms depth of water, sandy bottom, a soft, tender, mazy fish, large size, with a white, hard roe and leathery milt. Coming nearer home, off Cromer (*i.e.* between Cromer Knole and the north end of Hasborough Sand), there is a similar fish as just described, also at Farne Island and Rock Buoy grounds. During the same period on the Well Bank, and to Winterton Shoal, a large, strong, sound, full-roed fish swims, coming to within about twenty-two miles E. by N. off Yarmouth. During the latter part of October, and in November, a thick, solid-fleshed round Herring, of very fine quality, is captured; also the celebrated Black-Nose Herring, so called from the tips of their noses being of a deep purply black; a delicious-flavoured fish, and much sought after by lovers of Herrings.

We have still one other variety to mention, viz., the incomparable Longshore Herring, which for beauty, symmetry, and flavour, is unequalled throughout the world; it is food for gods. To live without partaking of these fish when in season is to lose half the pleasure of existence. To Yarmouth belongs the excellency of all Herrings.

XI.

METEOROLOGICAL NOTES, 1893.

(From observations taken at Blofield and Brundall, Norfolk.)

By Arthur W. Preston, F. R. Met. Soc.

Read 27th February, 1894.

January.

The severe frost which set in on Christmas Eve, 1892, continued with but little intermission until the 21st. Snow fell in considerable quantities on New Year's Day and following days, and remained on the ground, with several fresh additions, until the 22nd. Some severe frosts were experienced at times, the thermometer (in screen) falling to 8.2 degrees on the 4th, 9.4 degrees on the 5th, and 12.8 degrees on the 16th. These are readings which occur only in our coldest winters. The last week was mild and humid, with frequent falls of rain, though at no time exceptionally heavy. Much cloud prevailed throughout the month, and winds were mainly north-westerly and light in force.

There was considerable resemblance in the weather generally with that of the previous January, as will be gathered from the following :—

	Jan. 1892.	Jan. 1893.
Maximum Temperature	53.0	52.2
Date	29th	30th
Minimum Temperature	8.0	8.2
Date	10th	4th
Mean Temperature...	34.6	34.0
Mean at 9 a.m.	34.6	33.9
Number of days with Snow	9	12
Number of nights with Frost	28	27

In January 1892, snow laid on the ground from the 6th to the 22nd, and in 1893 from the 1st to the 22nd. There was, however,

a marked difference in the public health between the two occasions, the death rate in Norwich for the four weeks in January 1892 being respectively 33, 31, 40 and 45, against 24, 25, 27 and 25 in 1893. It is somewhat remarkable that, with the exception of 1890, every January from 1885 to 1893 inclusive has been colder than the average.

February.

The weather throughout the month was changeable, but for the most part exceedingly mild for the season. The mean temperature was higher than in any February since 1885, and about one degree in excess of the average. There were frequent storms of wind and rain, but although rain fell on many days, the only heavy fall was on the 21st, when 0.63 in. was measured. There was but little frost, which was more remarkable from the fact of the two preceding months having been abnormally cold. The barometer oscillated much, some deep depressions crossing the country; that on the 21st was an unusually deep one with a minimum here of 28.73. The barometer also fell below 29 ins. on the 26th. These were the only two occasions throughout the winter upon which low barometrical readings were registered.

March.

For bright sunshine and warm days there have been few Marchs to surpass that of 1893. The thermometer exceeded 50 degrees on every day but five, and 60 degrees on six days. The readings on the 24th (65.2), 30th (67.0), and 31st (67.5) have not been equalled in March since 1884, when the thermometer reached 68 degrees on the 16th. The mean temperature of the month (44.6), nearly 4 degrees above the average, was higher than in any March since 1882, although 1884 was almost as warm. The nights of the second half of the month were, however, exceedingly cold, the screened thermometer falling below the freezing point on every night from the 17th to the 31st, while on the grass 10 to 12 degrees of frost were recorded on many occasions. This, combined with an almost complete absence of rain during the last fortnight, had the effect of somewhat checking vegetation, which was becoming abnormally forward. At the close of the month it was quite a fortnight later than in 1882, and a week later than in

1884, although it was considerably forwarder than in any year since the last named date.

It is but rarely that the month of March is so genial as that of 1893. Particularly of late years has it been exceptionally cold. In 1883 the mean temperature was 35.4 degrees; and in 1892, 36.6 degrees. In 1887 and 1888 it was also nearly as cold. On the other hand it has been even warmer in some years than the month under review: the mean temperature in 1830 (in Suffolk) having been 48.1 degrees; in 1834, 45.3 degrees; in 1841, 48.1 degrees; in 1842, 45.3 degrees; in 1846, 45.4 degrees; in 1854, 45.1 degrees.; in 1859, 47.7 degrees; and in 1882, 45.7 degrees. In 1841 the thermometer rose above 60 degrees on sixteen days, and there were only two nights with frost throughout the month.

April.

In 1892, for the sixth time in succession, we had to record an April with a deficient mean temperature, but the April of 1893 will be long remembered for its warmth and bright sunshine, as well as for its almost unbroken dryness. It was the warmest April since 1874, and the driest for more than half a century. The contrast between it and the two previous Aprils is well illustrated by the following figures:—

		1891.	1892.	1893.
Temperature—	Maximum	64.0	75.0	72.0
	Minimum	25.0	24.0	30.2
	Mean daily maximum	48.9	54.5	58.7
	Mean daily minimum	36.9	35.3	38.1
	Mean of month	42.2	44.9	48.4
	Mean 9 a.m.	41.2	47.4	51.4
	Number of days temp. above 60 deg.	2	8	13
	Relative humidity	89	78	71
Rainfall—	Total	1.25	2.24	0.10
	Number of days with Rain ...	15	13	3
	Number of days with Snow ...	0	5	0

In London, and at many inland stations, some very high temperatures were recorded. At Cambridge 80 to 84 degrees was registered on some days, but on the east coast a cool sea breeze tempered the heat on many of the warmest days. It has been said by many that no such April has before been recorded in the

East of England during the present century; but while admitting that such seasons are "few and far between," there are instances upon record of a very similar character. The late Orlando Whistlecraft (who died in February, 1893) in his register of the weather extending from 1827 to 1892, reports the weather of April, 1840, in the following terms, which might almost be taken as referring to the same month in 1893:—

"April, 1840.—The unusual heat of the latter part of this month will long be remembered, for we find no other instance on record of so great heat at this early period of the year. The continuance of violent drought also throughout the month is a striking feature of this period. The constant brightness and clearness of every day after the 11th, combined with a very high temperature, brought on all verdure in haste, causing the landscape at once to flash into summer beauty, and constituting the earliest spring for eighteen years past. Most trees were in full leaf about the 23rd day, and the Oak, Ash, and Elm, were unfolding their foliage by the 30th; the Hawthorn showing its flowers on the 29th and 30th. The effects of the drought are now becoming great in many parts of the country. Temperature:—maximum (26th) 80 degrees, minimum (10th) 27 degrees, mean 51.8; rainfall .08 inches."

Again, in April, 1844, the same writer says:—"This month was most splendid and magnificent for fineness, brightness, and warmth, beyond any recorded. It was the earliest season upon record, and the continued blue skies and splendid sunshine will be long remembered. The month was perfect summer throughout. Every tree in leaf by the end, and the Hawthorn opening. Temperature:—maximum (26th) 78 degrees, minimum (8th) 33 degrees, mean 54.09 degrees; rainfall .30 inches."

April, 1865, was very similar, the mean temperature being 52.4 degrees, and the rainfall, 0.53 inch.

Much has been said about the flowering of the Hawthorn in April, 1893. This phenomenon is no doubt unusual, but not unprecedented, it being recorded in April in 1822, 1840, 1854, 1874, and 1882; in the last named year it was observed in full flower on April 28th by the writer. In many years, however, it is very much later. In 1837, June 5th is the earliest date recorded, and in 1855 and 1887, May 26th. Not only was the

Hawthorn in bloom in April, 1893, but what is still a rarer occurrence, the Lilacs and Laburnums also opened their flowers.

The drought at the close of the month was becoming very serious in the country. The total fall of rain for the year from January 1st to April 30th was 5.22 ins. This, although considerably below the average, is in excess of 1884, when it was only 4.95 ins. ; and in some other years recently it was almost as little, as will be seen from the following.

Total Rainfall, January 1st to April 30th :—1884, 4.95 ins. ; 1885, 7.36 ins. ; 1886, 5.83 ins. ; 1887, 5.30 ins. ; 1888, 7.92 ins., 1889, 6.31 ins. ; 1890, 7.22 ins. ; 1891, 5.38 ins. ; 1892, 6.96 ins. ; 1893, 5.22 ins.

May.

This was the third month in succession which yielded less than an inch of rain. After a shower on the 1st not a drop fell until the 17th, the weather during the chief part of this period being brilliantly fine and sunny. A welcome rain occurred on the night of the 21st—22nd, when 0.63 was ganged, this being the heaviest fall recorded since February 21st. The drought however returned the following day, and there was no further downfall during the month except some trifling showers on the 30th and 31st. The earliness of vegetation this year was most remarkable. All trees were in full leaf by the middle of the month, the Dog Rose in bloom by the 16th (in 1891 it did not commence flowering until the closing days of June), and before the end of the month ears of Wheat were to be found.

June.

This was the fourth month of drought, for with the exception of a thunderstorm on the 4th, during which 0.47 inch of rain fell, there was no deposition of moisture whatever till the 19th. The first week was cool for the season, the exposed thermometer falling below the freezing point on the 1st and 3rd. On the 12th very warm weather set in, and on the 19th the temperature reached 83.7 in the shade, which was the highest recorded in June for five years past. The fourth week was somewhat unsettled, with thunderstorms at times, but the last four days were again fine and warm. The persistency of the fine weather during the week

ending the 19th was very remarkable, there being no cloud whatever during the whole of the period. This continued sunshine and drought completely baked the surface of the soil, and the effect on vegetation was most disastrous.

July.

The first week was exceedingly fine and warm, culminating in an excessively hot day on the 8th, when the thermometer stood above 85 degrees in the shade from 11 a.m. to 3.30 p.m. This was the warmest day for eight years past, but the thunderstorm which occurred the same evening broke up the weather, and the remainder of the month was unsettled and showery, with no excessive heat. The mean temperature of the month was in fair agreement with the average, and it was the warmest month since 1887. The rainfall was also about the average, although in West Norfolk it was considerably in excess. Thunderstorms occurred on the 8th, 9th, 12th, 17th, and 26th. The total rainfall for the year to the end of July was 4 inches deficient, but the amount registered during the last twenty-three days of July was equal to that which fell between March 2nd and July 7th, a period of over eighteen weeks.

August.

The warm and dry weather, which had hitherto been the prevailing characteristic of 1893, continued almost throughout August, the heat increasing as the month advanced. Maxima of 79.6 degrees were recorded on the 8th, 77.8 on the 11th, 78.4 on the 14th, 82 on the 15th, 85 on the 16th, 87 on the 17th, and 90 on the 18th. The last named reading was the highest since the 11th of August, 1884, when 93.4 degrees was recorded at Hillington, 91 at Norwich, and 90.9 at Cromer. The night temperatures were also abnormally warm; for whereas during the last five years there has been no night on which the thermometer did not fall to at least 60, during August on five occasions the minimum was above 62, and on the nights of the 17th, 18th, and 20th, it was 64, 64.2, and 64 respectively. The mean temperature of the first twenty-one days was 66.4, or about 5 degrees above the average; but the last week being decidedly cooler,

reduced the month's mean to 63.9 or about 3½ degrees above the average. August, 1893, was thus the warmest month since July, 1887, and warmer than any August since 1884, which was decidedly an even hotter month. The rainfall, 1.83 ins., was less than recorded in any August since 1885. Thunderstorms occurred on the 5th, 10th, and 18th, but considering the unusual heat of the last named day, the storm following was less severe than might have been anticipated.

September.

Up to the 26th this month may be said to have been almost rainless, only about a quarter of an inch of rain having been gauged, such quantity being made up of trifling falls of 0.08 inch and less. The weather during this period was exceedingly fine and pleasant with many hot days, the thermometer exceeding 70 degrees on seven days, and reaching 78 degrees on the 6th. An unusually cold wave passed over the country on the 23rd, the maximum for that day being only 52.6 degrees, but it was not accompanied by any downfall, and the weather was fine and bright, though cool for the season. On the evening of the 27th, after a close, calm day a most violent thunderstorm occurred, accompanied by a deluge of rain and hail, though of short duration. 0.58 inch of rain fell in less than an hour, which was about equivalent to the total fall for the months of March and April last. The lightning was exceptionally vivid and frequent, and the peals of thunder almost continuous. The total deficiency of rain for the first nine months of 1893 was upwards of 6 inches.

October.

This month was a great contrast to October, 1892, when 7.62 ins. of rain fell, and the temperature did not once touch 60 degrees. This year the total rainfall was only 1.47 inches, or about half the average, and the temperature reached 60 degrees and upwards on fourteen days, and 65 degrees and upwards on four days. The mean temperature of the month was about 2 degrees above the average. Slight snow fell on the 31st. The greater part of the month was an extraordinary protraction of summer weather.

November.

This was the first wet month since October, 1892; but notwithstanding the heavy downfall of the latter part of the month, the year's rain was then still 7 inches below the average. The temperature was medium, and there were not many frosts. The weather was at times exceedingly stormy and boisterous, and the disastrous gale from the north on the 18th was the most severe experienced on this coast for many years.

December.

This was, on the whole, a very mild month, the mean temperature being nearly 2 degrees above the average, and 4 degrees warmer than the previous December. The month came in with a brief spell of winter and a fall of snow which remained on the ground until the 3rd, when a rapid thaw set in, and mild stormy weather ensued with hardly a frost until the 30th, on which day, and the following, a sharp rime frost occurred. The second and third weeks were very boisterous, with disastrous gales at times, that on the 12th (from the south) being nearly as severe all over the country as the great northerly gale of November 18th. The thermometer exceeded 50 degrees on four days, and on the 13th the unusually high maximum of 56 degrees was attained. The barometer fluctuated much, and the range was remarkably large, the lowest reading on the 20th (28.66 inches) being the lowest since November, 1891, and only nine days later it attained a higher elevation (30.73 ins.) than on any occasion since February, 1890. The rainfall was again deficient, although the humid state of the atmosphere on many days made it appear as if more rain had fallen than was actually gauged. The Christmas holidays will be memorable for the magnificent, cloudless, spring-like weather which prevailed throughout, Boxing Day being more in keeping with the close of February than the winter solstice.

The Seasons.

The following tables show the mean temperature and rainfall for the four seasons, together with those of the six previous years, and of a twenty-year approximate average :—

TEMPERATURE.

Seasons.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	20-year average.	Departure of 1893 from average.
	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.
Winter (Dec. to Feb.)...	35.8	35.5	37.4	38.9	33.9	37.0	36.5	37.8	- 1.3
Spring (Mar. to May) ...	43.3	43.5	46.5	46.8	44.0	44.9	49.1	46.2	+ 2.9
Summer (June to Aug.)	61.4	57.7	59.9	58.6	58.9	58.3	61.2	60.2	+ 1.0
Autumn (Sept. to Nov.)	46.9	49.3	49.2	50.2	50.9	48.8	50.0	49.5	+ 0.5
Year	47.0	46.9	48.0	48.0	47.7	46.9	49.6	48.4	+ 1.2

RAINFALL.

Seasons.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	20-year average.	Departure of 1893 from average.
	in.	in.	in.	in.	in.	in.	in.	in.	in.
Winter ...	5.83	4.42	4.14	4.80	3.10	6.36	5.80	6.45	— 0.65
Spring... ...	5.14	5.83	7.09	5.14	6.64	5.10	1.61	5.15	— 3.54
Summer ...	4.04	8.52	9.57	9.61	9.39	10.20	5.37	7.10	— 1.73
Autumn ...	7.68	7.00	8.94	6.87	7.00	11.15	6.10	8.50	— 2.40
Year	20.52	25.65	29.82	25.96	28.35	31.05	19.66	27.20	— 7.54

It will be seen from the above that the temperature of the winter was, for the third year in succession, below the average. The spring was nearly 3 degrees above the mean, and was very considerably warmer than any other in the series. The summer gave a mean of 0.2 degrees lower than that of the "Jubilee" summer of 1887, but was from 2 to 3 degrees warmer than any other summer since that date. The autumn was also in excess of the average. Each of the four seasons was deficient in rainfall, the spring quarter being the driest, with only 5.15 of rain, or 3.54 inches below the average. The summer's rainfall was not much more than half of the amount recorded in each of the previous five summers, all of which were wet.

Year.

As may be expected from the foregoing description of the months and seasons, the final results for the whole year 1893 give a very marked departure from the average, both for temperature and rainfall, the former being largely in excess, and the latter abnormally deficient. The excess in temperature was 1.2 degrees,

and as much as 1.6 degrees above the warmest of the six preceding years. In fact we have to go back to 1884 for a year as warm. January was the only cold month, all the other months were equal to, or in excess of, the average, many of them largely so. The deficiency in rainfall at Brundall was 7.54 inches. This deficiency was, however, less in the western portions of the county. January, February, and November were the only three months which gave a rainfall slightly in excess of the average. All the other months were abnormally dry. In fact the great feature of the year was the drought, which commenced on March 2nd, and continued till June 22nd, when it slightly broke up, but was followed by no unusual excess of rain, as sometimes happens after a dry season. During this period of one hundred and thirteen days, rain was recorded on twenty-one days only, and on some of these the amounts gauged were most trivial. The total for the period was 1.82 inches, of which 0.63 fell on May 21st, and 0.47 on June 4th. A second dry period (although it can hardly be called a drought) set in on August 5th, and continued till September 26th, during which period of 52 days only 1.21 inches of rain fell. Another unusual circumstance was the complete absence, during the period March to October inclusive, of any one single day which could be called a "wet day," according to the popular acceptance of the term, *i.e.*, continuous rain from early in the morning until late in the afternoon. The total year's rainfall was the least since 1864. The number of gales recorded during the year was fifteen, nearly all of which occurred during the months of November and December.

It should be mentioned that owing to change of residence the instruments from which the observations were taken (which are the same as during the previous six years) were, in April, removed from Blofield to Bradestone House, Brundall, where they are now exposed in a situation which could hardly be improved upon. The distance of removal was only one mile, and the two stations are practically in sight of each other. Under these circumstances there is no reason why the observations from the instruments in their present situation should not be looked upon as a continuance of the previous records.

1893.

Month.	BAROMETER.					THERMOMETER.					HYGRO-METER.	CLOUD.	RAINFALL.		WIND.								
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Relative Humidity, 9 a.m.	Estimated proportion 9 a.m.	Inches.	No. of days.	Direction.								Mean estimatd force
															N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	
Jan. .	30.40	4, 19	29.56	29	30.037	52.2°	30	8.2°	4	34.0°	93	7.7	2.34	25	2	4	1	3	3	4	5	9	2.5
Feb. .	30.44	4, 5	28.73	21	29.691	56.0	18	24.4	6	40.2	88	6.8	2.24	19	0	4	0	5	2	6	8	3	3.4
March	30.47	25	29.55	16	30.113	67.5	31	27.8	20, 21	44.6	77	4.4	.54	10	0	3	2	5	2	5	8	6	2.5
April	30.54	8	29.82	29	30.184	72.0	24	30.2	3	48.4	71	4.5	.10	3	1	9	9	5	1	1	4	0	2.7
May .	30.47	6	29.61	18	30.058	72.0	12	38.6	1	54.3	74	5.3	.97	7	4	6	3	3	6	1	3	5	3.3
June .	30.42	7	29.27	23	30.003	83.7	19	36.0	1	58.4	73	6.1	1.11	7	1	8	9	0	2	4	4	2	3.1
July .	30.27	28	29.55	12, 20	29.887	87.8	8	45.0	28	61.4	77	6.8	2.43	17	1	1	8	1	3	4	3	10	2.6
Aug. .	30.30	28	29.61	21	30.012	90.0	18	44.8	29	63.9	77	5.9	1.83	17	5	0	1	3	5	8	4	5	2.8
Sept. .	30.33	12	29.27	30	29.835	78.0	6	37.2	24	56.6	80	6.7	1.15	13	4	3	0	0	3	8	7	5	2.7
Oct. .	30.41	23	29.17	4	29.860	66.2	1	31.0	30	51.0	87	6.0	1.47	18	2	0	1	0	2	13	7	6	2.9
Nov. .	30.40	12, 21	28.92	17	29.934	56.8	17	28.0	1	42.4	91	7.1	3.48	24	4	10	0	2	2	6	2	4	3.5
Dec.	30.73	29	28.66	20	29.953	56.0	13	21.4	3	39.4	94	6.9	2.00	21	1	0	0	1	12	10	2	5	3.6
Means					29.964					49.6	82	6.2											2.9
Extremes & Totals	30.73	Dec. 29th	28.66	Dec. 20th		90.0	Aug. 18th	8.2	Jan. 4th				19.66	181	25	48	34	28	43	70	57	60	

XII.

FAUNA AND FLORA OF NORFOLK.

Part XIII. Ichneumons.

By J. B. Bridgman, F.L.S., *Vice-President.*

Read 31st October, 1893.

I present this list of the Ichneumons of Norfolk with a great deal of diffidence, in fact had it not been for the solicitation of our President I much question if I should have ventured to do so, feeling how imperfect, comparatively speaking, it is, being the first contribution to this section of Hymenoptera published for the County of Norfolk. Parasitic Hymenoptera have been much neglected in this country, especially the Ichneumons, owing, no doubt, in a great measure to the fact of there being no handbook on the subject in the English language, the only native works we have are parts of the 'British Entomology,' by J. Curtis, and 'Illustrations of British Entomology,' by J. F. Stephens, the former giving some beautiful illustrations of Ichneumons, with sometimes short descriptions; the latter a mass of abridged translations from Gravenhorst, but neither of them, especially the latter, of much use to the student.

Previous to 1829 the literature relating to Ichneumons was in the same unsatisfactory condition, or perhaps even worse, than that of most other branches of Natural History at the end of the last century and beginning of the present, being little if any better than a mass of Linnean descriptions; but in 1829 Gravenhorst published his 'Ichneumonologia Europæa,' a truly marvellous work, in three thick octavo volumes; this work, although over sixty years old, is still the standard, and his general arrangement remains the same, nor has another complete work on the subject been since undertaken, nothing but a mass of scattered monographs.

Wesmael in 1844 published his 'Tentamen Dispositionis Methodicae

Ichneumonum Belgii,' this was the first great work on the subject after that of Gravenhorst's, it treated only of the latter's first family, or rather genus as it was then, Ichneumon, he subdivided it into many genera, from structural differences, and in that state the family still remains, with very little alteration; he afterwards published several papers, which may be looked upon as additions to this work, as well as a monograph entitled 'Revue des Anomalons de Belgique.' Holmgren began in 1856 to publish monographs of several of the families, viz., 'Monographia Tryphonidum Sueciae'; 'Conspectus Generum Pimpliarum Sueciae,' 1860; 'Monographia Ophionidum Sueciae,' 1861; 'Ichneumonologia Suecica,' part i. 1864, part ii. 1871, part iii. 1889, the latter part not appearing till after his death; 'A Monograph of the Genus Campoplex,' 1872; 'Dispositio methodica Exochorum Scandinaviae,' 1873; 'Dispositio methodica Mesoleiorum Scandinaviae,' 1876. Foerster, in 1850, published a monograph of the genus *Pezomachus*, Gr., dividing it into several genera, and describing many species; he also published a synopsis of the families and genera of Ichneumons, monographs of the genus of *Campoplex*, and of the families and genera of *Stilpnoides* and *Plectiscoides*. Taschenberg, in 1863 and 1865, published monographs of the German *Pimplides* and *Cryptides*, giving tables of the genera and species. Professor Thomson, in 1869, published the first part of his 'Opuscula Entomologica,' the eighteenth part appeared a few months ago; this work contains monographs of insects, and among them those of most of the families and genera of which this paper treats; these are the principal works on this subject, but there are a great many other papers scattered among the various Continental journals, it can therefore easily be seen that a careful study of this branch of entomology cannot be carried on without considerable difficulty, on account of the scattered nature of its literature. In the earlier part of this century we have in this country had some good workers at this order, as we find from the lists they have left behind them; I need only mention the names of Curtis, Stephens, Haliday, and later of Desvignes. At the present time I know of but one earnest worker, the Rev. T. A. Marshall, and to him I am deeply indebted for very much assistance; there are at present but few collectors. Mr. Billups, of London, and Mr. Bignell, of Plymouth, have bred and captured large quantities of Ichneumons, as I can testify, from

the many hundreds of insects I have named for them, and I am much indebted to both for many specimens.

In naming the insects I have had very great advantages, for while Professor Thomson was preparing several of his monographs, he wrote and asked me to send him my species, especially doubtful or unnamed ones, this I was only too glad to do, so that at one time or another a great many of my insects have been to Sweden, and have been returned named, or the names corrected when necessary, and my best thanks are due to him for the very great trouble he has taken with them. Also at the request of Dr. Holmgren I sent some species to him, and in fact they were with him at the time of his death, but were subsequently returned to me. In looking through the accompanying list, it will be seen that generally speaking the localities given are very few in number, this arises in the first place from want of time preventing my going far from home, and the almost invariably bad weather on the Bank Holidays, when I could get further afield; secondly, I found that if a good hunting-ground were discovered it mattered not how often it was visited, something fresh was almost sure to be taken, my two favourite places were Brundall and the lanes at Earlham, sweeping the herbage by the sides of the ditches, and the banks beneath the hedges, and I don't think I ever went to either place without meeting with something new. I also took many in dull weather by beating the hedges into an old umbrella, but this will not do when the sun shines, as the insects are far too active to be caught thus. I have to thank several entomologists in this and other counties for much help in the shape of insects; my friend, Mr. Atmore, of Lynn, has given me many he has bred or boxed when out after Lepidoptera, also to Messrs. Thouless, Norgate, Laddiman, and Dr. Wheeler are my thanks due for local specimens, and to Mr. J. E. Fletcher, for Ichneumons bred from Sawflies, also Messrs. Porritt, Elisha and J. W. Cross; but, above all, my thanks are especially due to Mr. W. H. B. Fletcher, of Worthing, who has sent hundreds of parasites, with the names of hosts from which they were bred; in those cases where I have had bred Ichneumons, whether from this county or not, I have added the name of the host and the entomologist from whom I received them, after the locality.

I have, in many instances, taken only a single specimen, or two,

or three at the most, but I have not thought it necessary always to note this, for I do not consider it a proof that an insect is scarce because I have only met with one or two examples, as their active and retiring habits render them very difficult to capture; on several occasions I have, at the same time and place, taken two or three specimens of an insect, and never afterwards met with it again. Some years ago I bred several specimens of *Eurycproctus nigriceps* from the cocoons of the Hawthorn Sawfly, which I had collected from the hedges round Norwich during the winter months, but although I always secured all the cocoons I met with, I have never either bred or taken it since that one spring. I have taken very few of the larger members of the genera of *Ichneumon* and *Amblyteles*, but I think most likely the list of these would be largely increased if the breeders of Lepidoptera saved the parasites they breed from the different species of Hawk-moth larvæ and from the Diurnal Lepidoptera.

I have not in this list followed any particular arrangement of the species, for the best of reasons that there is no arrangement to follow, each author dividing his insects into groups, and almost invariably in a different manner; I have in one genus followed the example of the Rev. T. A. Marshall in his catalogue of British Ichneumons, and arranged them alphabetically, which I believe is quite as good as any other plan.

Some of the monographers have divided certain of the genera into innumerable sub-genera, Foerster for instance in his 'Synopsis der Familien und Gattungen der Ichneumonen' has made 538 genera of these five families, and out of which no less than 417 were new ones of his own concoction, and to give some idea of his sub-divisions, he put five of Holmgren's genera into a family (36 Tryphonidæ) and subdivided it into the modest number of 114 genera, of which 109 were new; he also divided some of the genera into a great many species, in *Atractodes*, Gr., he described 160 species, and out of these 150 were new species, and in the genus *Exolytus* he described 188 species, and of these 186 are new; Thomson has put these two genera together, under the head of *Atractodes*, thus making the very respectable number of 318 species according to Foerster; Thomson himself only describes 25 species in his monograph of the same genus of which 14 are new; it is rather confusing to a beginner to find nearly

200 species made out of the varieties of a single one, and these variations so very slight as to be, one might say, almost puerile; as a fit subject for this splitting up business I would call attention to *Phygadeuon fumator*, Gr., this has been considered a very variable insect; some little time ago I began to separate the specimens in my own collection, and I found I could make 17 distinct varieties or species (whichever you please to call them) of the females and 24 of the males, all of which would make far better species than the majority of those of Foerster. I have not only separated them but I have tabulated them, and made sketches plain and coloured, of the distinguishing points, and I have very little doubt some are good species, but following the previous custom in this country I have included them all under the head of *P. fumator*, Gr.

Some of the larger genera, which have in recent times been broken up into many sub-genera, I have left in their former state, such as *Phygadeuon*, *Cryptus*, and *Limneria*.

There is a peculiar habit found in the cocoons of *Limneria kreichbaumeri* (these are oval, palish brown, with a paler central zone), which I have not met with in any other of these families; the cocoons have the power of leaping a considerable distance in the air; they are semi-transparent, and by holding them up to the light, between the finger and thumb, it can easily be seen how this is accomplished, the larva first bends itself into something the shape of a U, it then presses its head and tail against the opposite side of the cocoon, it looks as if it were blowing itself out, it gradually becomes more and more rigid, till at length the pressure against the opposite side is not sufficient to keep the body bent when the head and tail suddenly release themselves and fly out straight, hitting the other side of the cocoon a sharp rap, and up they go; when held in the fingers the tap may be distinctly felt and heard. I have not seen the explanation of this peculiarity noticed before. A few quotations are taken from Paget, and Stephens, but these are few. I have still a great many species unnamed, which I have not been able to identify, not a few I have very little doubt are at present undescribed, and, as far as I am concerned, are likely to remain so, as want of time has compelled me to give up entomology.

PUPIVORA.

Ichneumonidæ.

Ichneumonides.

Oxypygi.

Chasmodes motatorius, Fab. Very common.

Ichneumon consimilis, Wesm. A single female at Cromer, end of May.

,, lineator, Fab. Two males bred from larvæ found under bark at Brundall.

,, impressor, Zett. Lynn, bred by Mr. Atmore from *Gortyna flavago*.

,, derasus, Wesm. One male at Eaton in July.

,, bilineatus, Gmel. A common parasite of *Abraxas grossulariata*.

,, molitorius, Lin. Recorded by Paget.

,, languidus, Wesm. Two males at Eaton and Earlham, July and August.

,, vaginatorius, Lin. Common.

,, confusorius, Gmel. Males are common, females less so.

,, tempestivus, Holm. Monsehold; Yarmouth, Mr. Thouless.

,, gracilentus, Lin. A single female at Earlham, August.

,, luctatorius, Lin. Common.

,, macrocerus, Thom. A male at Brundall, kindly named by Professor Thomson for me.

,, latrator, Fab. Not uncommon. Earlham, Brandall, Cromer.

,, insidiosus, Wesm. One female at Brundall, August.

,, primatorius, Forst. Mr. Thouless took a female of this fine species on Mousehold.

,, emancipatus, Wesm. A male in the neighbourhood of Norwich.

,, cessator, Müll. "Norfolk in June," Stevens.

,, gemellus, Gr. Heigham, Earlham, Brundall, Lynn. Appears to be generally distributed, but not common.

ICHNEUMON SATURATORIUS, Lin. Earlham, Brundall, and Lynn, by Mr. Atmore.

„ BIMACULATORIUS, Panz. A single female at Brundall in September.

„ NIGRITARIUS, Gr. Sparham, Mr. F. Norgate; "Norfolk," Stevens.

„ CURVINERVIS, Holm. Norwich.

„ FUGITIVUS, Gr. A male at Norwich. I believe *fugitivus* is only a variety of *fabricator*.

„ LANIUS, Gr. Not uncommon in the neighbourhood of Norwich.

„ HERACLIANA, Bridg. I took a female at Lynn. Mr. Fletcher bred them from *Depressaria heracliana*

„ LEUCOMELAS, Gmel. Not uncommon. Mousehold, Earlham.

„ VESTIGATOR, Wesm. Norwich.

„ LEPIDUS, Gr. Males at Brundall and Norwich.

„ ANATOR, Fab. Two females, Norwich.

„ BILUNULATUS, Gr. Common.

„ OCHROPUS, Gmel. Norwich.

„ RIDIBUNDUS, Gr. A male at Eaton in July.

„ PLAGIATOR, Wesm. Eaton.

„ ALBICINCTUS, Gr. Very common.

„ DECEPTOR, Gr. "Norfolk," Stevens.

„ EXPECTATORIUS, Panz. "Norfolk," Stevens.

AMBLYPYGI.

AMBLYTELES PALLIATORIUS, Gr. Mousehold, Brundall.

„ ARMATORIUS, Forst. Norwich.

„ ORATORIUS, Fab. Two males on Mousehold in September.

„ VADATORIUS, Rossi. Mr. Thouless took a female.

„ OCCISORIUS, Fab. Common.

„ NEGATORIUS, Fab. "Norfolk," Stevens.

„ CASTIGATOR, Fab. Common.

„ MESSORIUS, Gr. Two females at Earlham.

„ FUNEREUS, Foure. A single male at Eaton.

„ ALTICOLA, Gr. Not uncommon.

Trogus lutorius, Fab. This fine species has been taken by Mr. Laddiman, also by Mr. Atmore, at Lynn.

,, alboguttatus, Gr. "Norfolk in June," Stevens.

Platyuri.

Platylabus rufus, Wesm. Lynn, Mr. Atmore, and bred from *Cabera pusaria*.

,, pedatorius, Fab. Common.

,, viridipennis, Gr. Norwich, and by Mr. Thouless.

,, dimidiatus, Gr. Mousehold.

,, pactor, Wesm. Earlham.

Apæleticus inclytus, Wesm. Earlham, in July; Lakenham, Mr. Thouless.

Pneustici.

Herpestomus nasutus, Wesm. Earlham, August.

,, furunculus, Wesm. Earlham, Eaton, Mousehold; August, September.

,, intermedius, Wesm. Eaton, August.

These last three are probably only varieties of the same species.

,, striatus, Bridg. Eaton, Earlham, Brundall.

Colpognathus celerator, Gr. Lynn, Mr. Atmore.

Dicœlotus pumilus, Gr. Mousehold in June.

,, cameroni, Bridg. Heigham, Earlham; August.

Centeterus opprimator, Gr. Common at Brundall.

Trachyarus corvinus, Thoms. A single male at Earlham in July.

Phæogenes semivulpinus, Gr. Norwich, Brundall. Common.

,, planifrons, Gr. Brundall, August.

,, stimulator, Gr. "Norfolk, June," Stevens.

,, calopus, Wesm. Common.

,, varicolor, Wesm. Gunton, August. *P. intermedius* (Wesm.) is a variety of this species, and was taken at the same time and place.

,, fulvitarsis, Wesm. Common.

,, bellicornis, Wesm. Brundall and Earlham, in May and September. The legs of these are paler than those described, but I believe they are only varieties of this species.

Phlogenes nanus, Wesm. Eaton.
" ischiomelinus, Gr. Common.
" trepidus, Wesm. Hethersett, Wroxham, in May.
" impiger, Wesm. Earlham; August, September.
" argutus, Wesm. Eaton, Earlham. Common.
" collaris, Gr. Eaton, July.

Oiorhinus pallipalpis, Wesm. Eaton, Earlham, Mousehold. Not uncommon in the Autumn.

Æthecerus longulus, Wesm. Earlham in August. I described this species as *Phygogenes formosus*, but Professor Thomson says it is *Æ. longulus*.
" discolor, Wesm. A single female at Earlham in September.
" nitidus, Wesm. Earlham, Lakenham, Heigham, Gunton. Lynn, bred by Mr. Atmore from *Cosmia diffinis*.
" dispar, Wesm. Common.

Ischnus nigricollis, Wesm. Norwich.

Epitomus parvus, Thoms. Taken occasionally in the neighbourhood of Norwich.

Heterogastri.

Alomyia debellator, Fab. The male is very common, but the female is rarely seen.

Cryptides.

Stilpnus gagates, Gr. Brundall, July.
" pavonle, Scop. Eaton, July.
" blandus, Gr. Norwich occasionally; June, August.

[Note.—I have used the generic names *Phygadeuon* and *Cryptus* in their broad sense, in later years they have been divided into numerous subgenera, but for the purpose of a list I think the Gravenhorstian divisions the better.]

Phygadeuon caliginosus, Gr. Sparham, Mr. F. Norgate.
" nigrita, Gr. Earlham, Eaton; September.
" flavimanus, Gr. One male, Mousehold, July.
" dumetorum, Gr. Common. July, August. Professor Thomson returns this species to me, "n. sp.," but it agrees exactly with Gravenhorst's description.

PHYGADEUON DUMETORUM, Tasch. A male taken at Brundall in May was named thus for me by Professor Thomson.

,, VARIABILIS, Gr. Common in May.

,, FUMATOR, Gr. Very common. This species is very variable, both in colour and structure, most probably there are several species included under this head; Thomson has separated and named several, but as his descriptions are so short it is quite impossible to be certain as to the identity of the insect. I think I have identified the three following species.

,, INFLATUS, Thom.
,, SCAPOSUS, Thom. } Norfolk.
,, DIMIDIATUS, Thom.

,, TROGLODYTES, Gr. Common. This is only a variety of the male of *P. fumator*.

,, JEJUNATOR, Gr. Common. This is the male of *P. abdominator*.

,, JEJUNATOR, Gr. Var. 1. Common. Thomson says this is the male of *Aptesis microptera*, an insect I have never met with in the county.

,, AEREUS, Gr. Common.

,, BREVITARSIS, Thom. Earlham, Wroxham; August, September.

,, NITIDUS, Gr. Earlham, Eaton, Heigham; September.

,, OVATUS, Gr. Earlham, August.

,, EXIGUUS, Gr. Norwich, not uncommon.

,, BREVIS, Gr. Earlham, August.

,, IMPROBUS, Gr. Two males taken at Earlham in September, I believe to be this species.

,, HOPEI, Gr. Lakenham, September.

,, VAGABUNDUS, Gr. Common.

,, CINCTORIUS, Fab. Mr. Thouless took a female at Acle.

,, QUADRISPINUS, Gr. Brundall, October.

,, GRAMINICOLA, Gr. Brundall, Lakenham.

,, ABDOMINATOR, Gr. Eaton.

,, JUCUNDUS, Gr. Very common. Thomson says this is the male of *Aptesis nigrocincta*.

PHYGADEUON ARRIDENS, Gr. Common. This is the male of *P. probus*.

" OVIVENTRIS, Gr. Earlham.

" ERYTHRINUS, Gr. Norwich, Horning Ferry, Foxley Wood by Mr. Thouless.

" BRACHYURUS, Thom. Earlham, June.

" FLAVOPUNCTATUS, Bridg. Mousehold, October.

" PERSPICILLATOR, Gr. Earlham, July; Lynn, bred by Mr. Atmore from *Trachea piniperda*.

" ? ROTUNDIPENNIS, Thom. Mousehold, August.

" NANUS, Gr. Earlham.

" SPERATOR, Gr. Felthorpe.

" LACTEATOR, Gr. Earlham, Brundall; July, August.

" HERCYNICUS, Gr. Eaton, Heigham, Brundall; July, August.

" SUBTILICORNIS, Gr. Heigham, June.

" PARVULUS, Gr. Brundall, Heigham Osier Car. Lynn, Mr. Atmore.

CRYPTUS VIDUATORIUS, Fab. Norwich.

" LUGUBRIS, Gr. Heigham, Brundall, Horning Ferry.

" TARSOLEUCUS, Schr. Common.

" MOSCHATOR, Fab. Common. Bred by Mr. W. H. B. Fletcher from *Acronycta myrica*.

" PARVULUS, Gr. Heigham, Brundall.

" ANATORIUS, Gr. Mousehold, August.

" STOMATICUS, Gr. Eaton, Earlham; June.

" TITILLATOR, Gr. Eaton, June.

" DIANÆ, Gr. Bawsey Heath, Mr. Atmore.

" OBSCURUS, Gr. Very common.

" HOSTILIS, Gr. Earlham; July, September.

" PORRECTORIUS, Fab. Eaton; July, September.

" ANALIS, Gr. Common.

" PEREGRINATOR, Lin. Norwich, Brundall, Cromer; June, August.

" ORNATUS, Gr. Eaton, Brundall; May, August.

" AMŒNUS, Gr. Norfolk, bred by Mr. Laddiman.

" MIGRATOR, Fab. Common.

" CIMBICIS, Tschek. Norwich, bred from *Trichiosoma betuleti*.

CRYPTUS PYGOLEUCUS, Gr. Common. This is the male of *Agrothereutes hopei.*

„ CARNIFEX, Gr. Brundall; July, September. Mr. Porritt has bred this from reeds.

„ ELEGANS, Desviges. Brundall; July, October.

„ ANTENNATUS, Bridg. Eaton in April. I took two females on the same day, and have never met with it since.

„ INCUBITOR, Stroem. Norwich. Has been bred from *Saturnia carpini.*

„ SIGNATORIUS, Fab. Norwich. Bred from perforated Bramble sticks, collected in the neighbourhood of the city during the winter months.

MESOSTENUS OBNOXIUS, Gr. Brundall. This is a parasite of *Zygæna filipendulæ*, which is not uncommon in the marshes.

NEMATOPODIUS ATER, Brisch. Norwich. The males are common, but I have never taken the female.

HEMITELES BIANNULATUS, Gr. Brundall, May.

„ SUBANNULATUS, Bridg. Earlham, September. Has been bred from *Gelechia mulinella* (W. Fletcher).

„ HADROCERA, Thom. Earlham, July.

„ FULVIPES, Gr. Common. Bred from cocoons of *Apanteles congestus;* and from *Cymatophorus or* (W. Fletcher).

„ SUBMARGINATUS, Bridg. Mousehold. Bred from cocoons of *Apanteles congestus.*

„ RUFIPES, Bridg. Earlham, June.

„ AREATOR, Panz. Common. Bred from *Trichiosoma betuleti*, also from *Coleophora fuscedinella*, *Eupœcilia ambiguana* (W. Fletcher).

„ BICOLORINUS, Gr. Common.

„ ÆSTIVALIS, Gr. Common.

„ CINGULATOR, Gr. Common.

„ ? ABERRANS, Gr. Brundall, June. A male I believe to be this species.

„ CHIONOPS, Gr. Earlham, Eaton; May, August, September.

„ SORDIPES, Gr. Aylsham. Bred also from *Cynips kollari.*

„ SIMILIS, Gr. Common.

HEMITELES OBSCURUS, Bridg. Eaton. I bred two specimens from Spiders' eggs.

,, TIBIALIS, Bridg. Earlham. Two females in September.

,, CONFORMIS, Gr. Lynn. Bred by Mr. Atmore from *Lithocolletis frolichiella*.

,, SCABRICULUS, Thom. Eaton, July.

,, CASTANEUS, Tasch. Earlham, July. Mr. Bignell has bred it from *Trichiosoma betuleti*.

,, INIMICUS, Gr. Eaton, Earlham.

,, PICTIPES, Gr. Earlham, July.

,, FURCATUS, Tasch. Not uncommon. It has been bred by Mr. Atmore from *Gracillaria auroguttella*; by Mr. J. E. Fletcher from *Gracillaria phasianipennella*; and Mr. W. H. B. Fletcher from *Coriscium cuculipennellum*.

,, OXYPHINUS, Gr. Earlham, September.

,, INCISUS, Bridg. Earlham, Heigham; July, September. Bred from *Laverna epilobiella* (W. Fletcher).

,, BALTEANUS, Thom. Heigham Osier Car, August.

,, VARICOXIS, Tasch. Earlham, July.

,, IMBECILLIS, Thom. Common.

,, FLORICOLATOR, Gr. Earlham, Lakenham.

,, STAGNALIS, Thom. Brundall, and Heigham Osier Car. Bred from Spider's nest. This species I considered *varitarsus* (Gr.) with which description it agrees exactly.

,, FRAGILIS, Gr. Generally distributed, has been bred from Spiders' nests.

,, RUFICAUDATUS, Bridg. Wroxham, Earlham; July.

,, GYRINI, Parfitt. Brundall, May. Mr. Parfitt bred this from the cocoons of *Gyrinus*. Thomson says this: *H. argentatus* (Gr.).

,, FORMOSUS, Gr. Earlham; June, July.

,, GRACILIS, Thom. Common. Norwich, Brundall. Bred from Spiders' nests.

,, VALIDICORNIS, Thom. Eaton, September.

,, MIXTUS, Bridg. Brundall.

ORTHOPELMA LUTEOLATOR, Gr. Common. Bred from the Rose galls, *Rhodites elegantria*.

CATOGYLPTUS MANGERI, Gr. Brundall, Horning Ferry. I have only taken one male and a female, the former in June, the latter in September.

AGROTHEREUTES ABBREVIATOR, Fab. One female on Mousehold in August.

„ HOPEI, Gr. Common. The male of this is *Cryptus pygolencus*. Bred from *Eupœcilia ambiguana*, *Psyche intermedietta* (W. Fletcher).

APTESIS NIGROCINCTA, Pz. Eaton, Mousehold.

HEMIMACHUS PICEUS, Bridg. Mousehold, August.

„ RUFIPES, Bridg. Norwich, July.

„ OVATUS, Bridg. Brundall, September.

„ RUFOTINCTUS, Bridg. Felthorpe, June. These four species are all males, and no doubt belong to some of the Pezomachus group.

PEZOMACHUS TENER, Fst. Norwich, not uncommon.

„ ZONATUS, Fab. Common. Bred from Spiders' nests (*Agelena brunnea*).

„ TIMIDUS, Fst. One female taken at Norwich, I believe to be this species.

„ NIGRITUS, Fst. Earlham, Eaton, Brundall.

„ SPINULA, Thom. One male, Norwich.

„ POSTHUMUS, Fst. Mousehold.

„ COSTATUS, Bridg. Norwich. Not uncommon.

„ RUFULUS, Fst. Common.

„ CORRUPTOR, Fst. Common. Bred from *Psyche intermedietta* (W. Fletcher).

„ OCHRACEUS, Fst. Common.

„ MANDIBULARIS, Thom. One male in September.

„ DISTINCTUS, Fst. Mousehold.

„ INTERMEDIUS, Fst. Norwich. Common.

„ MÜLLERI, Fst. Mousehold.

„ INCERTUS, Fst. Norwich. Common.

„ FAUNUS, Fst. Norwich. Common.

„ JUVENILIS, Fst. Eaton.

„ XYLOCHOPHILUS, Fst. Brundall, Horning Ferry.

„ ANALIS, Fst. Common.

„ AGILIS, Fst. One male only.

„ VIDUUS, Fst. Three females. Norwich.

PEZOMACHUS HORTENSIS, Gr. A male taken at Brundall (named by Thomson).

„ TRANSFUGA, Fst. Common. Bred from Spiders' nests (*Agelena labyrinthica*), (Marshall).

„ RUFOCINCTUS, Gr. Common. Bred from *Hyponomeuta padellus*, *Laverna epilobiella* (W. Fletcher).

„ DETRITUS, Fst. Mousehold. Bred from the cocoons of *Apanteles congestus*, but unfortunately only female insects.

„ VAGANS, Gr. Buckenham. I have bred three males and three females from a Spider's nest I took at Wimbledon.

„ TONSUS, Fst. Mousehold. Females bred from cocoons of *Apanteles congestus*.

„ FASCIATUS, Gr. Common. Bred from *Apanteles* cocoons, and from Spiders' nests (*Agelena labyrinthica*).

„ IMPOTENS, Fst. Earlham, one female in July.

„ INSOLENS, Fst. Lynn. Bred from *Coleophora fuscedinella* (Atmore), and from *Coleophora ribicella*, *Talaphora pseudobombycella* (W. Fletcher).

„ AVIDUS, Fst. I took one male in Heigham Osier Car.

„ ANGUINUS, Fst. Norwich.

ASCHISTUS ?——. Thom. With this name Thomson returned a male I had bred from *Coleophora caespititiella* from Mousehold, it is the male evidently of one of the Pezomachus group. Mr. Atmore has bred this male also from the same host collected at Lynn. I think this must be a MS. name as I cannot find the genus described anywhere; I may have overlooked it.

OPHIONIDES.

ENISCOSPILUS MERDARIUS, Gr. Norwich. Bred from *Trachea piniperda* (Norgate).

„ RAMIDULUS, Lin. Heigham Osier Car.

OPHION OBSCURUM, Fab. Sparham (Norgate). Bred from *Agrotis tritici* (W. Fletcher).

„ LUTEUM, Lin. Common. Has been bred from *Dianthoecia capsincola*.

„ MINUTUM, Brischke. Norwich.

Ophion distans, Thom. Norfolk (Laddiman).

Anomalon xanthopus, Schr. Lynn. Bred from *Trachea piniperda* (Atmore).

„ cerinops, Gr. Brundall. Sparham (Norgate).

„ clandestinum, Gr. Lynn. Bred from *Eupithecia valerianata* (Atmore).

„ perspicuum, Wesm. Lynn. Bred from *Chleora lichinaria* and *Trachea piniperda* (Atmore).

„ ? anomelas. Lynn. Bred from *Retinia turionana* (Atmore).

„ ? procerum, Gr. Lynn (Atmore).

Agrypon flaveolatum, Gr. Lynn. Has been bred from *Bryophila perla* (W. Fletcher) and *Brephos notha*.

„ tenuicorne, Gr. Lynn. From *Phycis roborella* (Atmore), also from *Gelechia nneviferella* (W. Fletcher).

„ canaliculatum, Rtz. Lynn. Bred from *Tortrix decretana* (Atmore); also from *Thera variata* (Billups), *Diurnea fagella* (W. Fletcher), and *Scoparia coarctella* (Porritt).

Trichomma enecator, Rossi. Lynn. Bred from *Tortrix decretana* (Atmore); also from *Phlœodes tetraquetana* (Elisha).

Opheltes glaucopterus, Lin. I took a female of this fine species at Brundall; it is parasitic on the large Sawflies, *Cimbex sp.*

Paniscus cephalotes, Holm. Norfolk.

„ ocellaris, Thom. Norfolk.

„ testaceus, Gr. Common.

Parabatus virgatus, Gr. Norfolk; Foxley Wood (Thouless). Has been bred from *Cabera pusaria* (W. Fletcher).

„ tarsatus, Brischke. Lynn. Bred from *Eupithecia extensaria* and *Eupithecia absynthiata* (Atmore). Norwich.

„ nigricarpus, Thom. Lynn (Atmore).

Campoplex falcator, Thunb. Norfolk. Bred from *Pygæra bucephala* (Norgate).

„ angustatus, Thom. Lynn. Bred from *Cabera pusaria* (Atmore).

„ facialis, Holm. Norwich.

CAMPOPLEX BUCCULENTUS, Holm. Cromer in August.
,, XENOCAMPUS, Fst. Drayton (Thouless).
,, TEREBRATOR, Fst. Earlham, May.
,, LEPTOGASTER, Holm. Eaton, May.
,, ANCEPS, Holm. Heigham Osier Car, August. Bred from *Peluria comitata* (Bignell).
,, DISCLUSUS, Fst. Earlham, September. Bred from *Eupithecia expallidata* (W. Fletcher).
,, ERYTHROGASTER, Fst. Very common.
,, CONFUSUS, Fst. Norwich.
,, ZONELLUS, Fst. Lynn. Bred from *Eupithecia pulcheilata* (Atmore).
,, TENUIS, Fst. Eaton, Earlham; July.
,, SUBOLICITA, Fst. Felthorpe, June.

CYMODUSA LEUCOCERA, Holm. Monsehold, Eaton; October.

THYMARIS FASCIATA, Bridg. Mr. Thouless took a single specimen in the neighbourhood of Norwich, this is the only specimen I have seen of this genus taken in England.

SAGARITIS ERYTHROPUS, Thoms. Brundall; May, July.
,, ZONATA, Gr. Common.
,, ANNULIPES, Tschek. Brundall, June.
,, BRACHYCERA, Thom. Earlham, July.
,, AGILIS, Holm. Earlham, July.
,, ? MACROCERA, Thom. Eaton, August.
,, FASCIATUS, Bridg. Horning Ferry, June.

CASINARIA ORBITALIS, Gr. Brundall, Sparham (Norgate). Bred from *Zygena trifolii* (W. Fletcher).

LIMNERIA ABERRANS, Gr. I took a male at Earlham in June.
,, ALBIDA. Gmel. Common. Bred from *Eupithecia absynthiata* (Atmore).
,, APOSTATA, Gr. Lynn. Bred from *Depressaria assimilella* (Atmore).
,, ARGENTATA, Gr. Earlham, August.
,, ARMILLATA, Gr. Not uncommon.
,, BARRETTII, Bridg. Earlham; July, August.
,, BICINGULATA, Gr. Earlham, August.
,, BRISCHKEI, Bridg. Common.
,, CARNIFEX, Gr. Mousehold.
,, CHRYSOSTICTA, Gr. Earlham, July.

LIMNERIA CONSOBRINA, Holm. Eaton, July.

,, CONCINNA, Holm. Norwich, August.

,, COXALIS, Brischke. Lynn (Atmore). This is only the second time it has been recorded as having been taken in England, the other was from Colchester.

,, CRASSICORNIS, Gr. Earlham. It has been bred from *Plusia interrogationis* and *Grapholitha campoliana* (W. Fletcher).

,, CRASSIUSCULA, Gr. Earlham. Has been bred from *Acronycta alni*, *A. psi*, and *Limacodes asellus*.

,, CURSITANS, Holm. Not uncommon. August, September.

,, CYLINDRICA, Brischke. Brundall. Has been bred from *Gelechia inopella* (W. Fletcher).

,, DISPAR. Gr. Earlham, September.

,, DOLOSA, Gr. Not uncommon. Brundall, Heigham Osier Car; July, October. Bred from *Lasiocampa quercifolia* (Laddiman).

,, DORSALIS, Gr. Heigham Osier Car, Horning Ferry; June, August.

,, ELISILE, Bridg. Mousehold, Earlham; August, September. Has been bred from *Gracillaria tringipennella*, *Coleophora discordella*, *Bedellia somnulentella*, and *Gelechia rilella* (W. Fletcher). It was originally bred from either *Ornix scoticella* or *Nepticula aucupariella* (Elisha).

,, ENSATOR, Gr. Very common. Bred from *Gelechia instabilella*, *Gel. notatella*, *Gel. proximella*, *Phoxopteryx laetana*, *Grapholitha minutana*, *Lampronia quadripunctella* (W. Fletcher and Atmore).

,, ERYTHROPYGA, Holm. Norwich, Brundall; June, July.

,, ERUCATOR, Holm. Brundall. Has been bred from *Phycis nimbella* (W. Fletcher).

,, EXAREOLATA, Rtz. Earlham. Bred from *Eupithecia assimilata* and *Eu. pulchellata* (W. Fletcher).

,, FAUNUS, Gr. Very common.

,, FEMORALIS, Gr. Norwich. I bred this from *Coleophora lineolella*. It has also been bred from *Col. therinella*, *Col. alcyonipennella* (W. Fletcher), and *Col. solitariella* (Bignell).

LIMNERIA FENESTRALIS, Holm. Mousehold. Has been bred from *Choreutes sciutillulana* (Boden).

„ FULVIVENTRIS, Gmel. Neighbourhood of Norwich, May and June.

„ GENICULATA, Gr. Lynn (Atmore).

„ GRACILIS, Gr. Mousehold, Earlham. Has been bred from *Gracilaria stigmatella* and *Coriscium cuculipennellum* (W. Fletcher, Bignell).

„ HYDROPOTA, Holm. Brundall, July.

„ INTERRUPTA, Holm. Common. Has been bred from *Peronia maccana* (W. Fletcher).

„ KREICHBAUMERI, Bridg. Brundall. Thomson in 1887 named this species *Spudastica petiolaris*, but as my name was published in 1882 I claim priority. Bred from *Taeniocampa instabilis* by Bignell, W. Fletcher, and Boden.

„ LATUNGULA, Thom. Brundall in July. Bred from *Laverna epilobiella* and *Gelechia anthyllidella* (W. Fletcher).

„ LONGIPES, Müll. Norwich, Lynn; July.

„ LUGUBRINA, Holm. Earlham, June. Bred from *Gelechia næviferella* (W. Fletcher).

„ MAJALIS, Gr. Very common.

„ MOLESTA, Gr. Lynn (Atmore). Bred from *Cutoptria fulvana* (W. Fletcher).

„ MUTABILIS, Holm. Norwich. Common.

„ NOTATA, Gr. Harford Bridges, Norwich, July.

„ PAGANA, Holm. Earlham in June.

„ PALUDICOLA, Gr. Felthorpe, June.

„ RUFICINCTA, Gr. Brundall, Earlham, Aylsham. Bred from *Pterophorus plagiodactylus* (W. Fletcher).

„ RAMIDULA, Brischke. Lynn (Atmore). Bred from *Retinia pinivorana*, also from *Retinia buoliana* (W. Fletcher).

„ RETICULATA, Bridg. Brundall, Sparham (Norgate). Bred from *Grapholitha ustomaculana* in June and July (W. Fletcher).

„ RUFIVENTRIS, Gr. Eaton, Heigham Osier Car, Brundall; July, August.

Limneria robusta, Woldst. Earlham, Lynn (Atmore).

,, tibialis, Gr. Norwich. Bred from *Coleophora limicolella;* bred also from *Swammerdamia cyacanthella* (W. Fletcher).

,, tumidula, Gr. I took one specimen at Aylsham, this may be a variety of *L. ensator.*

,, vestigialis, Rtz. I have bred this species from various localities from the Willow galls *Nematus gallicola;* also bred from *Phytotoma ochropoda* (J. Fletcher).

,, virginalis, Gr. Neighbourhood of Norwich.

Canidia pusilla, Rtz. Earlham in July.

,, trochantella, Thom. Earlham, October.

,, exigua, Gr. Gunton, Brundall; July.

,, subcincta, Holm. Eaton, July.

Nemeritis macrocentra, Gr. Lynn (Atmore). Bred from *Ptycholoma lecheana*, also from *Scoparia coardella* (Porritt).

Meloboris gracilis, Holm. Brundall. Bred from *Elachista luticomella* (W. Fletcher).

Cremastus interruptor, Gr. Yarmouth (Griffiths). Bred from *Cochylis zephyrana* and *Eupœcilia atricapitana* (W. Fletcher).

Atractodes vestalis, Hal. Common.

,, gilvipes, Holm. Lakenham in May.

,, exilis, Hal. Norwich; May, July.

,, bicolor, Gr. Norwich; May, July.

,, properator, Hal. Common.

,, splendens, Gr. Brundall, July.

,, compressus, Thom. Wroxham, June.

Exolytus levigatus, Gr. Common. This is a very variable insect. Foerster and Thomson have made many species of the varieties.

Mesochorus tenuicornis, Thom. Lakenham, August.

,, politus, Gr. Eaton, July.

,, nigripes, Rtz. Lakenham, June.

,, pectinipes, Bridg. Earlham, May.

,, vitticollis, Holm. Eaton, Wroxham; June. Has been bred from *Xylina rhizolitha* (Bignell), *Chrysocoris festaliella* (W. Fletcher).

MESOCHORUS TESTACEUS, Gr. Brundall, May.
" SYLVARUM, Hal. Common. July, August. Bred from *Paronea maccana*.
" CRASSIMANUS, Holm. Eaton, August.
" VITTATOR, Zett. Common. Lynn. Bred from *Nola cucullatella* (Atmore).
" ? TENUISCAPUS, Thom. Brundall, May.
" STIGMATICUS, Thom. Earlham, Sparham (Norgate). Bred from *Acronycta ligustri* (Cross).
" PECTORALIS, Rtz. Mousehold, Earlham. Bred from the cocoons of *Apanteles congestus* and *zygenarum*.
" TACHYPUS, Holm. Norwich, Salhouse. Bred from *Eupithecia lariciata* (W. Fletcher).
" CONFUSUS, Holm. Common. Has been bred from *Lycaena alsus* (W. Fletcher).
" CONVEXICOLLIS, Thom. Norwich. I bred this from a leaf-rolling larva I took off a Hazel bush.

APERILEPTUS ALBIPALPUS, Gr. Earlham, July.

PLECTISCUS SPILOTUS, Fst. Eaton; May, June.
" EURYSTIGMA, Thom. Earlham, September.
" ? MELANOCERUS, Fst. Buckenham.

IDIOXENUS ERYTHROSTOMUS, Gr. Aylsham, May.
" MEDIATOR, Schiödte. Brundall, July.

PROCLITUS GRANDIS, Fst. Earlham, September.

EUSTERINX OBSCURELLA, Fst. Earlham, May.

PORIZON HOSTILIS, Gr. Brundall. I have only taken a single female.
" HARPURUS, Schr. Eaton.

THERSILOCHUS CARINATUS, Bridg. Lakenham, July.
" JOCATOR, Fab. Common.
" RUFIPES, Holm. Earlham, end of August and September.
" TRIANGULARIS, Gr. Norwich, Hethersett; May, June.
" VERSUTUS, Holm. Earlham; August, September.
" MODERATOR, Lin. Norwich; May, June.
" FLAVICORNIS, Thom. Eaton. I bred this species from galls of *Nematus gallicola*.
" ? MORIONELLUS, Holm. Brundall, June. The flagellum has thirteen joints.

Collyria calcitrator, Vill. Common.

Exetastes osculatoria, Fab. Earlham; June, July.

" calobatus, Gr. Earlham, September.

" illusor, Gr. Harford Bridges, July.

" albitarsus, Gr. Norwich. Common. Gravenhorst described this insect twice over, *Meniscus murinus*, Gr., is the same species and therefore a synonym.

" guttatorius, Gr. Monschold.

Banchus falcator, Fab. Norwich. Not uncommon.

Scolobates auriculatus, Fab. I took one specimen at Brundall in June.

Tryphonides.

Mesoleptus testaceus, Fab. Norwich.

" cingulatus, Gr. Common.

" typhæ, Gr. Common.

" fugax, Gr. Norwich, Felthorpe.

" marginatus, Bridg. Brundall, May.

" macrodactylus, Holm. Horning Ferry, June. I described this in error as a new species under the name of *scutellatus*.

" sulphuratus, Gr. Brundall, August.

" ? gracilis. Holm. I recorded an insect I took at Horning Ferry as probably this species, but it is not so, it is a new species, and comes next *vulneratorius*, but has the face and abdomen differently marked. Mr. Atmore has also taken it at Lynn.

Catoglyptus fortipes, Gr. Norwich, Brundall; June.

" fuscicornis, Gmel. Lynn, June (Atmore). *E. Waltoni* (Curt.) is the male of this species.

Rhæstus bipunctatus, Bridg. Earlham, May.

Euryproctus nigriceps, Gr. Norwich. I bred several some years ago from cocoons of *Trichiosoma betuleti*, and have never met with it since.

" sinister, Brischke. Earlham, September. Bred from *Eriocampa varipes* (J. Fletcher).

" minutus, Bridg. Brundall, May.

Eurytroctus atomator, Müll. Norwich, Brundall, Buckenham Ferry; June, October.
,, geniculosus, Gr. Heigham, Brundall; July, August.
,, albopictus, Gr. Brundall; July, August.
Prionopoda stictica, Fab. Mousehold, July.
,, glaber, Bridg. Norwich, July.
Perilissus filicornis, Gr. Very common.
,, variator, Müll. Common.
,, vernalis, Gr. Common.
,, subcinctus, Gr. Very common.
,, limitaris, Gr. Common.
,, pictilis, Holm. Norwich. Has been bred from *Phyllotoma melanopyga* (J. Fletcher).
,, gorskii, Rtz. Norwich, Lynn (Atmore); July.
,, pallidus, Gr. Brundall, Horning Ferry; June, July.
,, scotopterus, Gr. Earlham, June. I described this as *P. fumatus*, n. sp., overlooking Gravenhorst's description.
,, bucculentus, Holm. Lynn (Atmore), in June.
Eclytus ornatus, Holm. Earlham, September.
,, ? fontinalis var., Holm. I took this off Ling on Mousehold; the spiracles of the first segment of the abdomen project, and the prothorax is not pale marked.
Mesoleius sanguinicollis, Gr. Brundall, Cromer.
,, hæmatodes, Gr. Heigham Osier Car.
,, furax, Holm. Norwich.
,, aulicus, Gr. Norwich.
,, dubius, Holm. Norwich.
,, canin.e, Bridg. I bred a pair from larvæ of *Eriocampa limacina* from Pear trees in a Norwich garden.
,, vigens, Holm. Earlham, August.
,, ? parvus, Holm. I took a specimen at Earlham in August I believe to be this species.
,, filicornis, Holm. Eaton, Mousehold, Brundall.
,, ? transfuga, Holm. Lynn. Has been bred from *Camponiscus luridiventris* (J. Fletcher).
,, virgultorum, Gr. Eaton; June, July.
,, multicolor, Gr. Norwich.

Mesoleius unifasciatus, Holm. Earlham.
„ ? dorsalis, Gr. I took one female at Earlham.
„ rufonotatus, Holm. Earlham.
„ difformis, Holm. Norwich, Salhouse.
„ pedatus, Bridg. I took this female at Brundall in September.
„ ignavus, Holm. Norwich.
„ ? leptogaster, Holm. Brundall.
„ calcaratus, Bridg. Norwich, Brundall.
„ ? erythrogaster, Holm. Brundall. This is a male and Holmgren describes the female only.
„ armillatorius, Gr. Brundall. This I described as *M. scutellatus*, n. sp., but I believe now it is a variety of this species.
„ rufolabris, Zett. Common.
„ hamulus, Gr. Norwich, Lynn (Atmore).
„ semicaligatus, Gr. Common.
„ insolens, Gr. Common.
„ testaceus, Fab. Norwich.
Saotus compressiusculus, Thom. Eaton, June.
Trematopygus atratus, Holm. Lynn (Atmore). Has been bred from *Crœsus varians*.
„ ? procurator, Gr. Buckenham Ferry.
Dyspetus prærogater, Gr. Common in the autumn.
Otoblastus luteomarginatus, Gr. Norwich.
Tryphon elongator, Fab. Norwich. Common.
„ rutilator, Lin. Common.
„ trochanteratus, Holm. Common.
„ vulgaris, Holm. Norwich.
„ signator, Gr. Common.
„ ephippium, Holm. Lakenham, Eaton.
„ bicornutus, Holm. Cringleford, Brundall, Felthorpe; July, August.
„ confinis, Holm. Brundall, September.
„ mitigosus, Gr. I bred this from a Sawfly larva taken off Ash at Earlham.
„ albipes, Gr. Earlham in July. Brischke says this is a *Trematopygus*, it appears to me to be a true *Tryphon*.

Grypocentrus bipunctatus, Bridg. Earlham, June.
,, albipes, Ruthe. Lakenham, Earlham. Bred from *Fenusa pumilio*.
,, anomalus (Brischke). Earlham, Brundall.
Lathrolestus unguliaris, Thom. Norwich.
,, marginatus, Thom. Mousehold
Rhlestus lativentris, Holm. Earlham.
Adelognathus chrysopygus, Gr. Earlham.
Monoblastus laevigatus, Holm. Norfolk. Bred from *Eriocampa ovata* (J. Fletcher).
,, ? neustrile, Rtz. Brundall.
,, caproni, Bridg. Earlham.
Polyblastus varitarsis, Gr. Common.
,, ? stenhammari, Holm. Lynn (Atmore).
,, pastoralis, Gr. Brundall.
,, marginatus, Holm. ? Var. Brundall.
,, carinatus, Holm. Earlham.
,, pinguis, Gr. Common.
Erromenus brunnicans, Gr. Earlham.
,, frenator, Gr. Brundall, Eaton, Poringland.
Acrotomus lucidulus, Gr. Lynn (Atmore).
Cteniscus erosus, Holm. Lynn (Atmore).
,, lituratorius, Lin. Earlham.
,, sexcinctus, Gr. Common.
,, triangulatorius, Gr. Lynn (Atmore).
,, apiarius, Gr. Bawsey Heath, Lynn (Atmore).
,, pictus, Gr. Norwich, Lynn (Atmore).
,, bimaculatus, Holm. Brundall.
,, limbatus, Holm. Brundall.
,, limbatellus, Holm. Eaton, Brundall.
,, dahlbomi, Holm. Horning Ferry.
,, hostilis, Holm. Lakenham.
Exyston cingulum, Gr. Not uncommon.
Spilcophaga vesparum, Curt. Norwich. Bred from *Vespa vulgaris* (Dr. Chapman).
Colpotrochia elegantula, Sch. Common.
Triclistus holmgreni, Bohn. Lynn. Bred from *Tortrix decretana* (Atmore).
,, nitifrons, Thom. Mousehold, Bawsey Heath (Atmore).

Triclistus pubiventris, Thom. Earlham.
,, podagricus, Gr. Lynn (Atmore).
,, ?globulipes, Desvig. Lynn (Atmore). Bred from *Pœdisca semifuscana*.
,, niger, Bridg. Earlham.
Metacœlus mausueter, Gr. Norwich.
Exochus nigripalpus, Thom. Common.
,, flavomarginatus, Holm. Norwich, Brundall, Lynn. Has been bred from *Eudorea truncicollella* (W. Fletcher).
,, consimilis, Holm. Bawsey Heath (Atmore). Has been bred from *Homœosoma nimbella* (W. Fletcher).
,, tibialis, Holm. Mousehold, Earlham, Brundall. Bred from *Gelechia populella* (W. Fletcher).
,, woldstedti, Holm. Earlham.
,, albicinctus, Holm. Felthorpe.
Chorinæus cristator, Gr. Common. Bred from *Tortrix decretana* (Atmore).
,, funebris, Gr. Common. Bred from *Eupœcilia augustana* (W. Fletcher).
,, talpa, Hal. Common.
,, flavipes, Bridg. I took a single specimen on Mousehold in August, 1872.
Orthocentrus anomalus, Gr. Eaton, Earlham.
,, affinis, Zett. Common.
,, ?longicornis, Holm. Brundall, Earlham. Two males I have taken either belong to this or are a n. sp.
,, flaviceps, Gr. Mousehold, off Ling in July.

[Note.—I have several other species of this genus, but from the great difficulty there is in identifying these very small Ichneumons I prefer to leave the doubtful species out of the list.]

Bassus lætatorius, Fab. Common.
,, varicoxa, Thom. Mousehold.
,, nemoralis, Holm. Common.
,, annulatus, Gr. ?Var. Mousehold.
,, bizonarius, Gr. Buckenham Ferry, August.
,, lateralis, Gr. Brundall, Lynn (Atmore).
,, cinctus, Gr. Eaton.

Bassus exsultans, Gr. Lakenham, Heigham Osier Car, Mousehold.
,, pictus, Gr. Norwich. Common.
,, pumilus, Thom. Eaton.
,, strigator, Gr. Common.
,, nigritarsus, Gr. Mousehold, Eaton, Brundall.
,, areolatus, Holm. Heigham, Brundall, Buckenham Ferry.
,, pulchellus, Holm. Common.
,, cognatus, Holm. Common.
,, dorsalis, Holm. Mousehold, Heigham Osier Car, Brundall.
,, signatus, Gr. Brundall, Eaton, Mousehold.
,, festivus, Fab. Cringleford.
,, hygrobius, Thom. Brundall.
,, obscuripes, Holm. Earlham, Buckenham Ferry.
,, elegans, Gr. Brundall.
,, holmgreni, Bridg. Brundall, Felthorpe.
,, tibialis, Bridg. Thomson says *B. flavipes* (Holm.), it may be, but I do not think so. This was taken by Mr. Norgate, I believe, in the county.
,, insignis, Gr. Earlham, Buckenham Ferry, Lynn (Atmore).
,, pulcher, Holm. Lakenham, Earlham, Brundall.
,, ornatus, Gr. Bawsey Heath (Atmore).

Metopius micratorius, Fab. I took one specimen at Brundall, it is also recorded by Paget.

Pimplides.

Rhyssa persuasoria, Lin. Norwich, Sparham (F. Norgate).
Ephialtes imperator, Kreichb. } Norfolk. Bred from *Saperda*
,, tuberculatus, Foure. } *populnea* (Thouless).
Perithous mediator, Fab. Norwich.
,, divinator, Rossi. Norwich.
Pimpla examinator, Fab. Norwich.
,, turionellæ, Lin. Common. Has been bred from *Tortrix costana* and *Eupœcilia ambiguana* (W. Fletcher).
,, rufata, Gmel. Norfolk (Norgate).
,, flavonotata, Holm. Brundall, Norwich.
,, scanica, Vill. Common.
,, instigator, Fab. Common.

Pimpla opacellata, Desvig. Norwich (Wheeler).
,, occulatoria, Fab. Earlham.
,, graminellæ, Schr. Common. Bred from *Plusia festuca* (Cross).
,, didyma, Gr. Common.
,, stercorator, Fab. Earlham. Has been bred from *Eupœcilia flaviciliana* (W. Fletcher).
,, brevicornis, Gr. Common. Bred from *Melanippe hastata* and *Eupœcilia flaviciliana* (W. Fletcher).
,, similis, Bridg. Earlham, Brundall. Has been bred from *Ephippiphora scutulana* (W. Fletcher).
,, sagax, Rtz. Lynn. Bred from *Retinia turionana* (Atmore).
,, detrita, Holm. Common.
,, pomorum, Rtz. Drayton (Thouless).
,, roborator, Fab. Norwich.
,, diluta, Rtz. Brundall, Lynn (Atmore).
,, punctiventris, Thom. Mousehold. Bred from *Coleophora inflata*, *Col. pititiella*, *Laverna epilobiella*, *Euchromia flammeana*, *Eupœcilia atricapitana*, *Eup. flaviciliana* (W. Fletcher).

Polysphincta varipes, Gr. Brundall. May.
,, subrufa, Bridg. Lynn (Atmore).

Acrodactyla degener, Hal. Norwich, Brundall.

Clistopyga incitator, Fab. Norwich.
,, rufata, Holm. I took a single female of this handsome insect at Brundall several years ago.

[Note.—I have not added the hosts of *Glypta* because they were published in Vol. v. page 72 of the 'Transactions.'

Glypta monoceros, Gr. Brundall.
,, ceratites, Gr. Common. Has been bred from *Euchromia flammeana*.
,, vulnerator, Gr. Lynn (Atmore), Norwich
,, haesitator, Gr. Mousehold, Lynn.
,, teres, Gr. Norwich.
,, mensurator, Fab. Eaton.
,, incisa, Gr. Earlham.
,, bifoveolata, Gr. Common.

Glypta resinanæ, Rtz. Lynn (Atmore).
,, flavolineata, Gr. Eaton, Brundall.
,, flavipes, Desvig. Lynn (Atmore).
,, trochanterata, Bridg. Mousehold, off Ling, in June.
,, pictipes, Tasch. Lynn (Atmore). ? Dark variety. Earlham.
,, genalis, Möll. Lynn (Atmore).

Lycorina triangulifera, Holm. Lynn. Mr. Atmore captured a male in May 1887. I have only seen one other British specimen.

Schizopyga circulator, Panz. Norfolk. Not uncommon. *S. tricingulatus*, Gr., and *S. analis*, Gr., are the two sexes of *S. circulator*, Panz.

Lampronota nigra, Gr. Bawsey Heath (Atmore).
,, caligata, Gr. Bawsey Heath (Atmore), Earlham.

Lissonota variabilis, Gr. Lynn. Bred from *Penthina picana* (Atmore), and *Eulorea angustea* (W. Fletcher).
,, parallela, Gr. Earlham.
,, bellator, Gr. Very common. Has been bred from *Botys asinalis* (Billups).
,, commixa, Holm. Not uncommon.
,, cylindrator, Vill. Very common.
,, insignita, Gr. Eaton. Bred from *Cleodobia angustalis* (W. Fletcher).
,, sulphurifera, Gr. Common.
,, femorata, Holm. Brundall, Earlham.
,, linearis, Gr. Mousehold.
,, leptogaster, Holm. Rather plentiful in the autumn round Norwich, Strumpshaw.
,, carbonaria, Holm. Lynn. Bred from *Retinia turionana* (Atmore), has also been bred from *Crambus salinellus* and *C. contaminellus* (W. Fletcher).
,, transversa, Bridg. Earlham.
,, ? unicincta, Holm. Brundall, Eaton, Earlham.
,, errabunda, Holm. Brundall.
,, vicina, Holm. Earlham.
,, ? dubia, Holm. Lynn (Atmore).

Meniscus setosus, Foure. Sparham (Norgate).
,, agnatus, Gr. Earlham.

Meniscus impressor, Gr. Common.

„ suborbitalis, Gr. Brundall, Mousehold. Has been bred from *Luperina testacea* (W. Fletcher).

Phytodietus segmentator, Gr. Norwich, Lynn, Wroxham. Has been bred from *Tortrix decretana* (Atmore).

„ coryphæus, Gr. Common. Bred from *Peronea hastana*, *Plat falcula*, *Phlæodes tetraquetrana* (Atmore).

„ obscurus, Desvig. Common.

Cryptopimpla blanda, Gr. Buckenham Ferry, Earlham.

Œdimopsis scabriculus, Gr. Not uncommon. Bred from *Tortrix costana* (W. Fletcher).

Stilbops vetula, Gr. Earlham, May.

Zylonomus pilicornis, Gr. Earlham.

„ securicornis, Holm. Earlham.

XIII.

FAUNA AND FLORA OF NORFOLK.

Additions to Part I., Mammalia (Third List).

By Thomas Southwell, F.Z.S.

Read 27th February, 1894.

The close of the fifth volume of our 'Transactions,' offers an opportunity of bringing up to date such of the county lists as may require revision or extension, and although I have very little to add to the section which has been committed to my charge, still as that little is of considerable interest, and as it is ten years since the last supplementary list was published, it may be well to record here the few additional notes of interesting occurrences during that period.*

* See Trans. Norfolk and Norwich Nat. Soc. vol. i. p. 71, and vol. iii. p. 657.

It can hardly be expected that any considerable additions will be made to our local Mammalian Fauna, and the only direction in which it is likely to be extended is in that of the Cheiroptera. I think it highly probable that a closer study of these animals by one who has more time and better opportunities to devote to it than have fallen to my lot, would be rewarded by the discovery of two if not three species of Bat which have not yet been detected in this county; the Serotine, Hairy-armed, Daubenton's, and Whiskered Bats should be looked for. The Common Dolphin is also conspicuous by its absence, but the only other direction in which we can hope to meet with new species is from wandering Cetaceans, and a special watch should be kept on the Seals which are so frequently captured on our shores.

The two species new to the list are marked by a *.

Meles taxus. Badger.

Two Badgers have been taken in Norfolk since my last list, both, probably, escapes; the first was shot by a keeper in Holkham Park, in January, 1893, and the second was taken alive at Whitlingham, near Norwich, on the 30th November, 1893, and is, I believe, still living in the possession of the captor, Mr. J. Matthews, Junr., of the Hall Farm, Whitlingham, at the time of my writing this.

* Phoca barbata. Bearded Seal.

The occurrence of this fine species on the Norfolk coast is of considerable interest, and it is, I believe, the first undoubted instance in which it has been found in British waters. The example in question, a young male, was captured alive at Burnham Overy, and after being exhibited about the country for some months died at Lynn early in February, 1892; it was eventually purchased for the University Museum of Zoology, Cambridge, where its skeleton is preserved. It is remarkable that this species and *Phoca hispida* should only have been taken on the Norfolk coast. Full particulars of this event will be found in the present volume of our 'Transactions,' p. 555.

Halichærus gryphus. Grey Seal.

An old female was captured at Wells on the 28th February, 1892, as recorded by Colonel Feilden in our 'Transactions,' vol. v. p. 419. The skull is preserved in the Norwich Museum.

* Mesoplodon bidens (M. P. Gervais). Sowerby's Whale.

A female of this interesting species was captured in the surf, at Overstrand, on the 18th December, 1892, from which a full-grown fœtus was taken. Both were purchased by the Hon. W. Rothschild for his museum at Tring. The only previously known English example of this species was stranded at Spurn Point, in September, 1885 (Ann. and Mag. Nat. Hist., 1886, p. 58). Full particulars of this Norfolk specimen, with an illustration, will be found in the 'Annals and Magazine of Natural History,' ser. 6, vol. xi., April 1893, and in vol. v. of our 'Transactions,' p. 377.

Delphinus albirostris. White-beaked Dolphin.

Experience has proved that this species is far from uncommon on our coast in its spring and autumn migrations.

XIV.

FAUNA OF NORFOLK.

Additions to Part IV., Fishes (Third List).

By John Lowe, M.D., F.L.S.

Read 30th January, 1894.

For the main details of this, the third list* of Norfolk Fishes, I am indebted to Mr. Arthur Patterson, of Yarmouth, and to Mr. Southwell, who has sent many notes on the capture of rare species. Mr. Patterson has kept a keen eye on the Fishes of Yarmouth, and has not only largely enriched the local list, but has added eleven if not twelve species which are new to the county

* The previous lists will be found printed in the 'Transactions' of the Society for 1873-4, vol. i. p. 21; and in vol. iii. p. 677, 1884.

fauna. These are *Capros aper*, *Sebastes norvegicus*, *Gobius parnelli* and, possibly though not certainly, *G. ruthensparri*; *Aphia pellucida*, *Gadus pollachius*, *Motella cimbria*, *Gadus minutus*, *Hippoglossoides limandoides*, *Zeugopterus punctatus*, *Pleuronectes cynoglossus*, and last, but perhaps the most interesting discovery, the lovely little *Manrolicus pennantii*.

The workers in this department of natural history are so few, that our Society is to be congratulated on having so intelligent an observer, who has such excellent opportunities of observation as Mr. Patterson possesses at Yarmouth, and it is to be hoped that he will continue to evince the same interest in these pursuits that he has hitherto done.

Those species which are new to the List are marked with a *.

Mullus surmuletus (L.). Surmullet.

One weighing barely 2 lb. was caught amongst others at Yarmouth. "Now very rare at Yarmouth."—A. P.

Pagellus owenii (Günth.). Spanish Bream.

Mr. Gurney's specimen of this rare fish in the Norwich Museum is erroneously ascribed by the late Mr. Day ('Fishes of Great Britain and Ireland,' vol. i. p. 41) to *P. erythrinus*. I had carefully examined it at Mr. Gurney's request, and had no doubt whatever of its being the Spanish Bream. Mr. Southwell has kindly re-examined it, and comes to the same conclusion. It does not appear that Mr. Day ever saw the specimen.

* Sebastes norvegicus (C. and V.). Bergylt.

This is another species, the detection of which in our waters, we owe to the vigilance of Mr. A. Patterson. On April 29th, 1894, he sent to Mr. Southwell, for the Norwich Museum, a very pretty specimen, measuring $5\frac{3}{4}$ inches in length, which had been taken off Yarmouth by a shrimper.

Cottus scorpius (var. *Grænlandicus*).

"Mr. Patterson has obtained several very beautiful specimens of this variety at Yarmouth, one of which is in the Norwich Museum. I have seen others from Cley and Wells."—T. S.

Cottus bubalis (Euphr.). Bubalis.

Mr. A. Patterson (Trans. vol. v. p. 324) records the capture of first Yarmouth specimen which he has met with, April 7th, 1891,

but he calls it "Bubalis, *or* Father-Lasher," as though they were synonymous.

TRIGLA HIRUNDO (L.). Tubfish.

Mr. A. Patterson sends me a note of the capture of this fish at Yarmouth. It had previously been only recorded from the Norfolk estuary.

TRIGLA PŒCILOPTERA (C. and V.). Little Gurnard.

"Steindacher, in 1867, observed that *T. pœciloptera* (C. and V.) is identical with *T. corax* (Bon.), and *T. capensis* (C. and V.) and with the young of *T. hirundo;* an observation which was confirmed by Professor Lütkin in 1876" (Day's Brit. Fishes). The first Norfolk specimen was taken by me in May, 1873; Mr. Patterson has recently found others at Yarmouth.

BRAMA RAII (Bl.). Ray's Bream.

Mr. Hamon L'Estrange sends me a note on the capture of one at Hunstanton, October 12th, 1893. It was found alive on the beach by a fisherman. It weighed 5 lbs. 14 ozs., and measured 23.5 inches (*vide* Trans. Norfolk and Norwich Nat. Soc. vol v. p. 421). "One taken off Palling on October 30th, 1885, was sent to Mr. Gunn, of Norwich. It weighed 5½ lbs."—T. S.

LAMPRIS LUNA (Risso). Opah.

A specimen taken at Yarmouth, Oct. 17th, 1891, was 38 inches in length, and weighed 51 lbs.—A. P. (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 325). Mr. Southwell writes with reference to the same example: "On October 16th, 1891, a very beautiful specimen of this fish, 24 inches long, was taken alive in the breakers near Caistor, Gt. Yarmouth, and passed into the possession of Mr. J. R. Nutman of that town, for whom it was preserved."

"'The Norfolk Remembrancer,' under date April 30th, 1810, p. 113, says, 'A very rare and curious fish called the Opah, or King Fish, found on Mundesley beach.'"—T. S.

XIPHIAS GLADIUS (L.). Sword-fish.

Mr. A Patterson informs me that one 9 ft. long was caught in a Mackarel net, and landed at Lowestoft, September 18th, 1893.

"A Sword-fish, taken at Hunstanton in 1861, is now preserved in the collection at Hunstanton Hall."—T. S.

* Gobius ruthensparri (Euphr.). Double-spotted Goby.

Mr. A. Patterson has recorded the capture of this species in Shrimp nets at Yarmouth (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 324). His claim for it as the first recorded Norfolk specimen is rendered doubtful by Mr. Day having pronounced my *G. pusillus* to be the same as *G. ruthensparri*. I think, however, that the two are quite distinct, and that *G. pusillus* is a good species.

Gobius niger (L.). Rock Goby.

Mr. A. Patterson mentions the capture of three specimens, at Yarmouth, in Shrimp nets (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 228).

* Gobius parnelli (Day). Speckled Goby.

This fish which is new to the Norfolk Fauna was taken by Mr. Patterson, May 7th, 1890; he has since found several other specimens.

* Aphia pellucida (Moreau). Transparent Goby.

On June 9th, 1890, a specimen of this fish, which is also new to Norfolk, was brought to Mr. A. Patterson. Several others were afterwards found. The species was determined by Dr. Günther (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 228).

Callionymus lyra (L). Gemmeous Dragonet.

It is worthy of note that the colours of this fish are much less vivid in the Norfolk estuary than elsewhere. This is probably due to the large amount of alluvial matter brought down by the Ouse, preventing the action of light.

Cyclopterus lumpus (L.). Lump-fish.

A fine specimen was brought alive to me at Lynn, December 11th, 1884; it weighed 17 lbs.

Atherina presbyter (Jen.). Atherine.

"Generally plentiful in Lowestoft basins in midsummer. As a rule rare at Yarmouth, one now and again turning up in Smelt nets."—A. P.

There can be no doubt it is plentiful in summer along some parts of the east coast, contrary to the expressed opinion of Montagu and Yarrell as to its absence.

Mugil chelo (Cuv.). Lesser Grey Mullet.

A small specimen of this fish, taken on Breydon, was sent by Mr. A. Patterson to Mr. Southwell who ascertained its identity.

Labrus maculatus (Bloch). Ballan Wrasse.

A specimen of this fish, taken at Cley-next-the-Sea, on November 11th, 1893, was sent to Mr. Southwell for identification by Mr. Pashley, of Cley.

* Gadus pollachius (L.). Pollack.*

Mr. Patterson mentions the occurrence of numbers of this species at Yarmouth every spring. "They take a bait freely, and are locally known as 'Pinnikin Coles.'" This fish has not been previously recorded in Norfolk. Large ones are rarely taken by Cod-liners (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 229).

Gadus merlangus (L.). Whiting.

Mr. Patterson sends a note of one taken at Yarmouth, March 29th, 1891. "The largest on record." It weighed $7\frac{1}{4}$ lbs.

Gadus morrhua (L.). Cod.

Mr. Day, in his work on British Fishes, has a curious note on what might be considered a Norfolk example of this species. "The contents of their stomach are almost infinite (*sic*)—from one captured in Lynn Deeps, on Midsummer Eve, 1626, and brought to the Vice-Chancellor of Cambridge, was taken a book in three treatises" (vol. i. p. 279).

* Gadus minutus (L.). Power Cod.

Mr. Patterson sends me a note of another example, 4 inches long, taken in a Shrimp net off Yarmouth, February 12th, 1893. He recorded the first Norfolk specimen, which he found at Yarmouth, April 6th, 1890, in the 'Transactions' of that year, vol. v. p. 228.

* Motella cimbria (Nilss.). Four-bearded Rockling.

Found among the refuse of the draw-nets, on Yarmouth beach, 23rd May, 1889. Subsequent specimens were verified by Mr. Southwell (Trans Norfolk and Norwich Nat. Soc. vol. v. p. 229). This is new to the Norfolk Fauna.

Motella tricirrata (Nilss). Three-bearded Rockling.

Two examples occurred at Yarmouth in 1882 and 1890, and are recorded by Mr. Patterson in the 'Transactions,' vol. v. p. 229.

A male, 14 inches long, was sent by Sir Edward Newton from Lowestoft, to Mr. Southwell, on January 19th, 1894.

Raniceps trifurcatus (Flem.). Lesser Forkbeard.

Two additional examples of this rare species are recorded as having been found at Yarmouth by Mr. Patterson in 1891 (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 324).

Rhombus levis (L.). Brill.

Mr. Patterson met with (February 13th, 1892) a perfect albino of this species which was brought into Yarmouth. Both sides were white, the extreme edge of the fins merging into yellowish grey. Length 15 ins. (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 326.)

Rhombus megastoma (Nilss.). Sail Fluke.

"A small specimen, about 5 inches long, was taken in Shrimp nets at Yarmouth, May 3rd, 1893."—A. P. This is the second recorded in Norfolk.

* Hippoglossoides limandoides (Günth.). Long Rough Dab.

A fine specimen, 16 inches long, was obtained by Mr. A. Patterson from a Yarmouth fishmonger. It was taken off the Norfolk coast on January 18th or 19th, 1891 (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 229). It is new to the Norfolk Fauna.

* Zeugopterus punctatus (Coll.). Muller's Top-Knot.

A specimen, $7\frac{1}{2}$ inches in length, by $4\frac{1}{2}$ inches in width, was brought (June 11th, 1890) by a shrimper to Mr. A. Patterson. This, the first observed Norfolk specimen, is now in the Norwich Museum (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 229).

Pleuronectes platessa (L.). Plaice.

Although not an extremely large fish, one, of which Mr. A. Patterson sends me a note, is worth recording. It weighed 10 lbs. 12 ozs., and was taken at Yarmouth, November 7th, 1892.

Solea aurantiaca (Günth.). Lemon Sole.

Mr. A. Patterson sends me a note of the capture of this fish at Yarmouth. It had been previously recorded only from the Norfolk estuary.

* Pleuronectes cynoglossus (Moreau). Pole or Craig Fluke.

On February 11th, 1892, Mr. A. Patterson met with a specimen of this fish, which he forwarded to Dr. Günther, who confirmed its identity. It measured 18 inches in length. Two others, which measured 9 and 10 inches, were sold on March 14th, 1892 (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 324). Not previously recorded as a Norfolk fish.

* Maurolicus pennantii (Day). Pearlsides.

I agree with Mr. Southwell in thinking that "Pearlsides," given by Yarrell, is preferable to Argentine as a trivial name for this fish, as the latter is apt to create confusion with the Hebridal Smelt *Argentina sphyræna*. A specimen of this lovely fish was found in some draw-net refuse on Yarmouth beach, on April 1st, 1889, by Mr. A. Patterson. Three others were found under similar circumstances near the Britannia Pier, by Mr. J. B. Beckett, of Yarmouth, on February 24th, 1890. "Another freshly dead specimen was picked up on Scratby beach, by Mr. W. Tomkins, in March, 1893; it was $1\frac{1}{2}$ inches long."—A. P.

Thymallus vulgaris (Nilss.). Grayling.

Mr. A. Patterson writes, October, 1893: "A Mr. Pearson informed me that Grayling having been introduced into the Wensum, near Fakenham, have become numerous and a complete nuisance, bullying the trout and monopolizing their habitats."

Clupea alosa (L). Allis Shad.

"One taken at Yarmouth, April 27th, 1893, weighed $4\frac{3}{4}$ lbs."—A. P.

Clupea finta (Cuv.). Twait Shad.

"One taken in a draw-net off Yarmouth, April 19th, 1893, was 17 inches long, and weighed $4\frac{3}{4}$ lbs."—A. P.

A previous capture of a smaller one on Breydon is recorded in the 'Transactions,' vol. v. p. 324.

Sygnathus acus (L.). Greater Pipe-fish.

The following note is worth recording in reference to this species which abounds in the Norfolk estuary: "Acus item apud nos non vulgaris pisces est, nisi circa phanum Botolphi, quod nostri *Boston*, quasi *Botolphis toune* diceres . . . Hornbeke nostri dicunt

a corneo quod habet rostro" (Dr. Caius "de canibus Britannicis," fol. 26, 1570).

Nerophis æquoreus (L.). Ocean Pipe-fish.

Mr. A. Patterson found one washed up on the beach at Yarmouth; the first taken in that locality (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 230).

Orthagoriscus mola (Bl. Schn.). Sun-fish.

"A small Sun-fish, weighing two stone, which had been captured at Lynn, was taken to Mr. Lowne, of Yarmouth, on September 2nd, 1887, and Mr. Pashley, of Cley, informs me that on November 11th, 1893, a much larger one, 5 ft. 5 in. in length, and weighing sixteen stone, was brought to him, which had been taken the same day on the beach at Cley-next-the-Sea."—T. S.

Galeus vulgaris (Flem.). Tope.

Mr. Patterson sends me a note of a small one, 11 in. long, caught at Yarmouth. It is remarkable that so few of this species occur at Yarmouth, while they abound to such an extent in the Norfolk estuary at Hunstanton, where the late Mr. Cresswell used to catch them in great numbers and of large size.

Lamna cornubica (Cuv.). Porbeagle.

This species was first described by Dr. Caius from a specimen stranded between Lowestoft and Pakefield, February, 1570. In addition to four examples previously recorded, Mr. Southwell tells of one he saw in Norwich market, and he has heard of several others. Mr. Patterson writes that one taken at Yarmouth, September 30th, 1893, measured 6 ft. 6 in. in length. He also mentions a seven-foot specimen in Yarmouth fish market, October 17th, 1891 (Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 326).

Alopecias vulpes (Günth.). Thrasher.

'The Eastern Daily Press,' September 30th, 1879, has an account of one landed at Lowestoft. It weighed half a ton, and its tail was 10 feet long, and 6 inches wide.

"In 'Land and Water' for November 22nd, 1884, mention is made of a Thresher Shark which was caught off Palling by some 'Longshore Herring fishers, on October 2nd, 1884, it was said to measure 6 feet in the body, the tail also being 6 feet long."—T. S.

Læmargus borealis.

"A Greenland Shark, 15 feet long was captured in shallow water off Caistor, Great Yarmouth, on November 11th, 1885. It was afterwards exhibited at Yarmouth. On January 21st, 1892, another, 13 ft. 2 in. long, was captured by some Lynn fishermen and landed at the Purfleet Quay; and on July 12th of the same year, the Overstrand fishermen captured yet another, which had got into shallow water. This last measured 10 feet in length, and I believe was purchased for the Hon. W. Rothschild's Tring Museum."—T. S.

XV.

FAUNA AND FLORA OF NORFOLK.

Additions to Part XI., Birds (Second List).

By J. H. Gurney, F.L.S. and Thomas Southwell, F.Z.S.

Read 30th January, 1894.

The second section of our List of the Birds found in Norfolk was presented to the Society in February, 1887, in the following supplement we have only enumerated those species which are either new to the County or from their rarity are deserving of special mention, and can be added, if thought desirable, in MS. to the former list. There are a few species, such as the Russian Bullfinch and Scarlet Grosbeak, which have been met with apparently in a wild state, but which we have not thought it advisable to include, on the other hand, owing to the careful supervision exercised in preparing our previous list, we have not found it necessary to omit any species therein enumerated,* the addition,

* We should mention, however, that in the light of Mr. Dresser's article on "*Lanius excubitor* and its Allies" (see 'Ibis' for 1892, p. 374), we do not feel justified in retaining Pallas's *Lanius major*, but as this variety was not numbered consecutively in the List, its removal does not affect the total number of species claimed as having been procured in this County.

therefore, of the eight new species marked with a *, namely the Red-breasted Flycatcher, White Wagtail, Two-barred Crossbill, Caspian Plover, Siberian Pectoral Sandpiper, Greater Shearwater, Ruddy Sheld duck, and King Eider, to the 288 enumerated in the former list, brings the total number of species known to have occurred in the County of Norfolk up to the very considerable total of 296 species.

Scops Owl (*Scops giu*).

Colonel Feilden records the occurrence of a male of this rare bird in the 'Zoologist,' 1891, p. 315, which was shot at Walsingham Abbey, by one of Mr. Henry Lee Warner's keepers, on the 21st May, 1891, and on June the 1st of the same year a second example was killed in a market garden, at Martham. On the 18th November, 1892, another, a female, was obtained near Holt.

* Red-breasted Flycatcher (*Muscicapa parva*, Bechst.).

Yet another rare migrant has to be added to those already recorded from Cley; on the 13th September, 1890, Mr. Ogilvie shot a female Red-breasted Flycatcher there. The plumage resembled that of an immature bird, but Mr. Gunn, from an examination of its ovary, considers it adult (see Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 197).

Icterine Warbler (*Hypolais icterina*).

A male example of this rare warbler was shot at Wells, on the 4th September, 1893, by Mr. N. H. Joy.

Barred Warbler (*Sylvia nisoria*).

On the 10th September, 1888, Mr. George Power obtained a second specimen of this bird on Blakeney Point, within a short distance of the spot on which the previous example was killed on 4th September, 1884.

Waxwing (*Ampelis garrulus*).

In January and February, 1893, there was a rather considerable incursion of these birds, and several were killed in Norfolk, as well as in other parts of England.

* White Wagtail (*Motacilla alba*).

Of this species we could not speak with certainty in our previous list, but by the occurrence of two male examples at Great Yarmouth, on the 24th April, 1888, and another on the 1st May, the matter is placed beyond a doubt.

Lapland Bunting (*Plectrophanes lapponicus*).

The months of October and November, 1892, were memorable for an unprecedented visit of Lapland Buntings, some account of which has already been given in our 'Transactions.' The incursion of these hardy northerners was first noticed on October the 13th, by that vigilant ornithologist, Dr. Power, at Cley, but the greater number were seen on the Caistor Denes, near Yarmouth. Here they met with such an inhospitable reception at the hands of the bird-catchers and bird-dealers, that fifty-six were netted or shot.

The autumn of 1893 brought some more to the same places, and the first was again noticed by Dr. Power on September 14th, but happily not many were taken.

Cirl Bunting (*Emberiza cirlus*).

Two males, now in Mr. Connop's collection, were netted on Breydon marshes, on the 29th January, 1888, during severe frost.

Ortolan Bunting (*Emberiza hortulana*).

Mr. Gurney shot an Ortolan Bunting at Cley, on 5th September, 1889, it is a young bird, resembling Dresser's figure ('Birds of Europe,' vol. iv. pl. 215), but rather more streaked; and on the 15th September, 1892, a young male in similar plumage was killed by Mr. Gunn at the same place.

Serin Finch (*Serinus hortulanus*).

In our former list (Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 279) we spoke guardedly of this species as a Norfolk Bird, but the late Mr. Stevenson, in our 'Transactions' (vol. iv. p. 392), recorded the occurrence of a second specimen seen by him in the flesh, which was netted by a bird-catcher on the North Denes, Yarmouth, on the 5th February, 1887, thus establishing the claim of this diminutive Finch to be included in the list of visitors to this county.—S.

* Two Barred Crossbill (*Loxia bifasciata*).

On the 1st September, 1889, a male example of this bird was shot at Burgh, near Great Yarmouth, although strictly speaking the spot on which it occurred was within the geographical boundary of Suffolk, I think it may fairly be claimed for this county, as it was in a tract of country known as Lothingland, running up into Norfolk, and several miles north of the southern boundary of the latter county; a flight of a few yards, too, would have carried it into undoubted Norfolk ground. This species has previously been recorded for Suffolk. Others were obtained about the same time in Yorkshire, and again later in the year both in Yorkshire and at Croydon.—S.

Nutcracker (*Nucifraga caryocatactes*).

A female of this species, now in Mr. Connop's collection, was killed at Hanworth about the 8th November, 1888. One was shot in Lincolnshire about two days previously, viz., on November 6th.

Hoopoe (*Upupa epops*).

A male Hoopoe was picked up dead at Walcot, on the 18th April, 1892, and taken to the Rev. Maurice Bird, of Brunstead. It was apparently uninjured, and had doubtless fallen a victim to the exceedingly cold and rough weather which had prevailed during the previous week. Mr. Bird also mentions that a single Hoopoe was seen by the Rev. F. S. Thew, at Swafield, on the 7th and again on the 9th of May, 1890; he had previously seen one in the same place in 1888.

Roller (*Coracias garrulus*).

On the 28th September, 1892, a young Roller was killed at Burgh, near Yarmouth, and preserved by Mr. Lowne.

Pallas's Sand Grouse (*Syrrhaptes paradoxus*).

The startling irruption of this singular bird into this country in the year 1863, was ably chronicled by the late Mr. Stevenson; but the second visitation, in the year 1888 (of which a detailed account by one of the writers of this list, will be found in the 'Zoologist' for 1888), greatly exceeded in numbers that previously recorded. There seems little doubt that a flock of fifteen or twenty of these birds was also seen by Mr. Boult at Winterton, on

the 21st May, 1867, in which year examples were obtained near Modena and in Ireland.

Crane (*Grus communis*).

A female was shot at Halvergate, near Yarmouth, on 29th of May, 1888.

Bustard (*Otis tarda*).

Migratory flocks of these birds occasionally visit this country, a remarkable instance of which occurred in 1891, when a female Bustard, which had been previously wounded, was found dead on the marshes at Stiffkey, on the 19th January. For the particulars of this irruption see 'Zoologist,' 1891, p. 103. A female example was also killed in a barley field at Cossey, near Norwich, on the 2nd February, 1894.

* Caspian Plover (*Ægialitis asiatica*).

A beautiful male specimen of this bird was shot at Great Yarmouth, on 22nd May, 1890; when killed it was in company with another bird of the same species, which escaped, and was no more seen. This interesting bird was purchased for the Norwich Museum ('Birds of Norfolk,' vol. iii. p. 382).

Avocet (*Recurvirostra avocetta*).

Mr. Patterson reports that three Avocets were seen on Breydon, on 15th June, 1891, and on the 12th October of the same year one of these birds was shot at Stiffkey. Two were also seen by Mr. Bird at Hickling, on April 23rd, 1893.

[Sabine's Snipe.

A second example, so far as the county of Norfolk is concerned, of this variety was shot by Mr. Upcher, at Hockwold, on the 5th August, 1889. It was alone when found.]

Broad-billed Sandpiper (*Limicola platyrhyncha*).

A specimen killed on September 5th, 1891, on a marsh to the north of Breydon, and preserved by Mr. Cole for Mr. Connop's collection ('Zoologist,' 1891, p. 396).

Pectoral Sandpiper (*Tringa maculata*).

One shot on the Bure marshes, near Yarmouth, on 8th September, 1887, now in the possession of Mr. R. W. Chase ('Zoologist,' 1887,

p. 433). Three others have been since procured at Yarmouth, one on the 9th September, 1890, and two on the 12th and 13th of the same month ('Zoologist,' 1891, p. 136, also Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 203).

* Siberian Pectoral Sandpiper (*Tringa acuminata*, Horsfield)

On the 29th August, 1892, an example of this interesting bird was shot on Breydon, by Mr. T. Ground, of Birmingham, in whose possession it now is; it proved to be a female by dissection, and probably adult. Another specimen of this bird, which there is every reason to believe was killed near Yarmouth, in September, 1848, was found in the Norwich Museum, labelled *Tringa maculata* (see Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 364).—S.

Whiskered Tern (*Hydrochelidon hybrida*).

The Rev. J. G. Tuck observed a bird of this species in the shop of Mr. Howlett, of Newmarket, who stated that he had secured it with other birds from the neighbourhood of Dersingham, where it was killed about 10th October, 1890. Mr. Harting confirmed Mr. Tuck's identification. The bird was purchased by Hon. W. Rothschild, for the Tring Museum. This species has only been known to occur in Norfolk on one previous occasion.

Sandwich Tern (*Sterna cantiaca*).

Four of these birds were obtained at Cley and a fifth at Yarmouth, all in the month of October, 1891. Mr. Pashley informs us that seventeen of these birds were obtained at Cley, all in September, 1893. Two pairs are believed to have bred there ('Zoologist,' 1894, p. 88).

Sabine's Gull (*Xema sabinii*).

A young male, quite immature, was shot at Hickling, while consorting with Lapwings, on 6th October, 1889. Colonel Feilden also records in the 'Zoologist,' for 1892, p. 423, the capture of an immature female of this species, on the 16th October, 1892, in the shore nets at Wells.

Little Gull (*Larus minutus*).

On the 2nd April, 1888, a Little Gull, with pure black head, and in very lovely plumage, was shot at Hickling ('Zoologist,' 1889, p. 16). It is now in Mr. Connop's collection.

Iceland Gull (*Larus leucopterus*).

A young bird was shot at Yarmouth, on December 6th, 1892, and another at Scratby on the 28th of the same month. I am indebted to Mr. Smith and Mr. Lowne for an opportunity of measuring these birds, which have been often confounded with small Glaucous Gulls. Another was shot at Harwich, and still another at Flamborough. Mr. Southwell has lately examined a young Iceland Gull in the Dennis collection at Bury, which there is every reason to believe was shot at Yarmouth in 1848, and therefore the first known Norfolk specimen.—G.

* Greater Shearwater (*Puffinus major*).

On December 22nd, 1892, a Greater Shearwater was picked up at Caister, and brought to Mr. Smith; it is a very fine specimen, dark above and pure white beneath.—G.

Fork-tailed Petrel (*Oceanodroma leucorrhoa*).

A Fork-tailed Petrel, in the possession of Mr. B. Dye, killed near the North Battery, Great Yarmouth, on the 6th January, 1891, was received by him in the flesh that day.

Black Guillemot (*Uria grylle*).

A young bird was picked up alive at Cromer, on the shore, in 1892, and another, also alive, on November 23rd, 1893. The Rev. Julian Tuck also received what he believes to be an adult from Hunstanton, which was killed there on the 8th of January, 1894.

Eared Grebe (*Podicipes nigricollis*).

An example, still in summer plumage, was shot at Salthouse, on 21st August, 1888; another was seen on Rockland Broad, by Messrs. Edward and W. H. Bidwell, on July 28th, 1892.

Night Heron (*Nycticorax griseus*).

A specimen in immature plumage, killed at Weybourne, about first week in July, 1887. On the 30th June a pair had been liberated by Lord Lilford, at Lilford Hall, and it is possible that one of these may have wandered to Weybourne.

Little Bittern (*Ardetta minuta*).

A Little Bittern was shot at Runham, near Yarmouth, on 10th October, 1889. On the 3rd July, 1893, two males in full plumage

were shot at Rollesby. They were discovered by the marsh mowers, but no nest was found.

Black Stork (*Ciconia nigra*).

On the 23rd April, 1888, a nearly adult example was killed at Salthouse ('Zoologist,' 1889, p. 17). This bird is now in Mr. Connop's collection.

* Ruddy Shield-duck (*Tadorna casarca*).

A young male, which had been shot, was washed ashore at Snettisham, on September 13th, 1892. Eighteen others were obtained on various parts of the British coast, which in the opinion of Mr. F. M. Ogilvie, who wrote a very good paper about them, probably came from Southern Russia, where it breeds. On August 24th, 1893, a female was shot at Salthouse, somewhat faded but not showing any signs of confinement, now in Mr. Connop's collection. A good many of these ducks are said to be bred in confinement in Holland, and our principal dealers generally have them in stock, but all sold by Castang and Cross are bone-pinioned, as I am assured.—G.

* King Eider (*Somateria spectabilis*).

Three undoubted examples of this bird have been procured in Norfolk, all at Hunstanton. The first, a young male, now in the Norwich Museum, was killed in the middle of January, 1888, and two others, both of which, through the kindness of Dr. Whitty, I had the opportunity of examining in the flesh, were killed in the same locality, one, a young female, on 3rd November, 1890, the other an adult female, on the 15th of the same month (see Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 58).—S.

XVI.

FAUNA AND FLORA OF NORFOLK.

Additions to Part VIII., Hemiptera (Third List).

By James Edwards, F.E.S.

Read 27th March, 1894.

The following is a list of the species of Hemiptera, of which the occurrence in Norfolk has been verified since the publication of the General List (Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 700), and the first Supplement (*op. cit.* vol. iv. p. 702).

Scolopostethus puberulus, Horv. One male taken under debris of Reeds, &c., at Horning, 11th April, 1889.

Berytus montivagus, Fieb. Mousehold Heath, July, 1887 (Thouless); Thetford, August, 1888.

Monanthia ampliata, Fieb. Ketteringham Common, August, 1889; Wretham, June, 1891 (Thouless).

Anthocoris confusus, Reut. Generally distributed.

Piezostethus cursitans, Fall. Under bark of a dead Ash tree, Horning, 20th June, 1889.

Acetropis gimmerthalii, Flor. This is the insect previously recorded as *Miris holsatus*. The latter species does not occur in Norfolk, so far as one knows at present.

Lopus gothicus, var. superciliosus, D. and S. Horsford (Thouless).

Lygus viscicola, Put. East Carlton.

Atractotomus mali, Mey. Off Apple, garden, Earlham Road.

Liburnia quadrimaculata, Sign. Booton Common; Ranworth, July, 1890; Flordon Common, September, 1890.

„ fuscovittata, Stal. Roydon Fen, 2nd October, 1890.

Allygus commutatus, Fieb. Trowse, Arminghall, Brooke Wood, by beating Elm. The name *communitatus* (*ante*, vol. iii. p. 715), should read *modestus*, Fieb.

Paramesus phragmitis, Boh. Ranworth, August, 1889.

Thamnotettix striatulella, Edw. Roudham Heath, 4th August, 1890.

Limotettix 5-notata, Boh. Ranworth, 18th September, 1890.

Cicadula opacipennis, Leth. Ranworth, 24th July, 1890.

Zygina hyperici, H.-S. Swanniugton, 30th July, 1891. On *Hypericum perforatum*.

Typhlocyba pruni, Edw. Off wild Plum, Arminghall.

Aphalara calthæ, Lin. Wretham Heath, 4th August, 1890.

The occurrence of the following species in our Fauna is more or less noteworthy.

Heterogaster urticæ, Fab. (Phygadicus). Off Nettles on the sand-hills at Holkham, 3rd August, 1891.

Salda morio, Zett. Ranworth, July, 1890 (Champion).

Calocoris ticinensis, Mey. Ranworth, August, 1889.

Zygimus pinastri, Fieb. (Hadrodema). Off Scotch Fir at Attlebridge, 30th July, 1891.

Conostethus roseus, Fall. Drayton Drewray, common in sandy places, 27th June, 1889. On the 18th June, 1891, I beat from Sallow at Horning a female *Conostethus* which I cannot separate from *roseus*.

Ranatra linearis, Lin. Hickling Broad, 5th June, 1890.

Corixa atomaria, Ill. (affinis, Leach). Horsford Heath, 30th April, 1890; Wretham Heath, May, 1890.

,, selecta, Fieb. This is the correct name for the insect previously recorded as *Stali*, Fieb. There never was any question as to the distinctness of our insect, but it turns out that Fieber's *Stali* was the same as his *lugubris*.

,, semistriata, Fieb. Horning, 11th April, 1889.

Centrotus cornutus, Lin. In hedgerows, Ketteringham, June, 1891 (Thouless).

Issus coleoptratus, Geoffr. Common on Ivy growing in a hedgerow at Swanton Morley, September, 1891.

LIBURNIA DENTICAUDA, Boh. Kettcringham Common, August, 1889, one male.

,, LINEATA, Perris. Off long grass on a dry bank at Arminghall, 2nd July, 1889.

CICADULA CYANÆ, Boh. (*ante*, vol. iv. pp. 703, 727). The insect thus recorded is not the true *cyanæ* of Boheman, but a distinct species, which I have recently described under the name of *livida*.

XVII.

FAUNA AND FLORA OF NORFOLK.

ADDITIONS TO PART VI., FLOWERING PLANTS AND FERNS (* FIFTH LIST).

BY HERBERT D. GELDART.

Read 27th March, 1894.

THIS list of additions to the Flora of the County includes one plant not previously recorded in Great Britain, viz., *Mentha rotundifolia* var. *bauhini*, discovered by Mr. F. Long, of Wells, who seems to have observed for some time one patch of Mint differing from any other with which he was acquainted; on being sent to Mr. Arthur Bennett it was named as above.

Goodyera repens has been found in good quantity by Miss Barnard in the "nc" division; as this plant is already lost in the

* The lists to which the present list is supplementary are, "Flowering Plants and Ferns," Section I. and II. (Trans. Norfolk and Norwich Nat. Soc. vol. ii. pp. 74-110 and pp. 229-242), "Norfolk Naiadaceæ and Characeæ" (vol. iii. pp. 379-383), "Additions and Corrections" (vol. iii. pp. 719-729), and "Flowering Plants and Ferns" (vol. iv. pp. 711-727).

locality in "e" first published, it seems desirable not to indicate the exact locality. On the occasion of the Society's excursion to Dilham and Honing I found two *Potamogetons*, which I could not place; on sending them to Mr. Arthur Bennett he named them "*P. lucens*, approaching var. *acuminatus*," and "*P. prolongus*," but the latter, at all events, seems at first to have puzzled even him; both these plants have already been recorded for the "e" division.

I am sorry to have to record the extinction of *Asplenium viride* in its only locality in the county. Mr. Spalding writes: "I went a short time ago to Bungay, and walked three miles to see the Fern once more. The old outhouse had a new water-trough put up, the wall was perfectly dry, and had been for months, therefore every plant of *viride* was dead, in fact had disappeared altogether."

SECTION I.

DICOTYLEDONOUS PLANTS.

Ranunculaceæ.

Ranunculus hirsutus, Curt.
b, parvulus, Linn. . . . — nc. — —
Aylsham, H. D. G.

Violaceæ.

Viola reichenbachiana, Bor. . . . . — nc. — —
Felbrigg, H. D. G.

Caryophyllaceæ.

Saponaria vaccaria, Linn. . . . . — nc. sc.
Aylsham (casual), Mrs. Gurney Hoare.
Stoke (do.) H. D. G.

Arenaria tenuifolia, Linn.
c, hybrida, Vill. . . . — — sc. —
Croxton, H. D. G.

Leguminiferæ.

Trifolium agrarium, Linn. . . . . e. — — —
Sydestrand (casual), H. D. G.

Vicia angustifolia, Linn.
b, Bobartii, Forst. . . . — ne. — —
Sheringham, H. D. G.

Compositæ.

Centaurea nigra, Linn.
b, decipiens, Thuill. . . . — ne. — —
Holkham, F. Long.

Crepis setosa, Hall, fil. . . . . e. — — —
Rockland (casual).

Taraxacum officinale
var. lævigatum . . . . — ne. — —
Wells, F. Long.

Orobanchaceæ.

Orobanche minor, Sm.
b, flaveseens, Reuter . . . e. — — —
Moulton, Mr. Bidwell.

Pinguiculaceæ.

Utricularia intermedia, Hayne . . . e. — — —
Dubeck-in-Thirne, Rev. C. Davie.

Labiatæ.

Mentha rotundifolia, Linn.
var. Bauhini . . . . — ne. — —
Hindringham, F. Long.

Ajuga reptans, Linn. . . . . — ne. —
Metton, H. D. G.

Chenopodiaceæ.

Suæda maritima, Dum.
b, procumbens, Syme. . . — — — w.
Brancaster, H. D. G.

SECTION II.

MONOCOTYLEDONOUS PLANTS.

Orchidaceæ.

Goodyera repens, R. Br. . . . . — nc. — —

Juncaceæ.

Juncus lamprocarpus, Ehr.
b, nigritellus, Auct., Ang. . . . c. — — —
Southrepps, H. D. G.

Typhaceæ.

Sparganium neglectum, Beeby. . . . . — nc. — —
Hempstead, H. D. G.

Cyperaceæ.

Carex flava, Linn.
c. lepidocarpa (Tausch.) . . — — sc. —
Roydon (Diss), H. D. G.

Gramina.

Bromus erectus, Huds. . . . . c. — — —
Southrepps, H. D. G.
,, tectorum, Linn. . . . . — — sc. w.
Thetford (casual), H. D. G.
Lynn (do.), Dr. Plowright.
,, arvensis, Linn. . . . . — — sc. —
Thetford (casual), H. D. G.

XVIII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Recent Occurrence of the Great Bustard (Otis tarda) in Norfolk.—In submitting these brief notes on the recent occurrence of the Great Bustard in Norfolk, I have much pleasure in alluding to the valuable treatises on the life history of this noble-looking bird, as an indigenous species of this County, that have been presented to us by our local ornithologists, especially Messrs. Stevenson and Southwell, to whom ornithologists in general owe a debt of gratitude. Many of the Members of this Society, I feel sure, have formed the acquaintance of and feel great interest in the magnificent group of these birds so fittingly preserved in the Norwich Museum, representing as they do the last killed examples of the indigenous race of Norfolk birds, the last of the race or "drove" of which ceased to exist about the year 1838, since which period, up to the present time, the Great Bustard, as a migrant only, has on rare occasions been reported to have been seen in this county, and in one or more instances has been captured; these were always, I think, female birds. The minds of local ornithologists were greatly exercised by the appearance of a grand male bird in Feltwell Fen, near Brandon, in 1876, and the many unsuccessful attempts that were made to induce the stranger to take up his abode here, by giving it a companion, and the great efforts put forth by a late President of this Society (Mr. H. M. Upcher) to protect the illustrious visitor, must be fresh in the memory of all interested in the subject.

With reference to the bird herewith exhibited, the following are the notes I made at the time it passed into my hands:—Saturday, February 2nd, 1894, 2 p.m. Two young men called upon me at my shop; one having a frail in his hand. He said: "I have a curious bird here that I killed yesterday, and want you to tell me the name of it." The next instant I had the pleasure of seeing before me this beautiful specimen. The

captor also informed me that he and a companion were on Costessey Common, the previous afternoon about three o'clock, when he saw the bird in an adjoining barley stubble field, it was racing the Crows (Rooks) about (all local people call Rooks Crows); in this particular incident also I feel sure he must be mistaken, it being probably the reverse, and that the Rooks were mobbing the Bustard, it, however, soon after took wing and flew direct over him as he lay behind the hedge, at about twenty-five yards distance, when he fired at it (his gun being loaded with No. 5 shot), bringing it to earth by smashing one wing,—on examining the bird he seemed to me to have given it the contents of the second barrel. It had probably commenced to run after the first shot, and its captor to make sure of it fired again, shooting it through the head; the bird was (so I was afterwards informed) exhibited at the village public-house, examined, and commented upon; and I am inclined to think myself very lucky in securing the bird in a perfect state, without the loss of any of its beautiful plumage, as many people take interest only in beautiful birds by plucking its feathers out for ornamentation.

In cleaning and examining the plumage of the bird, I found the basal portion of its feathers, and the intervening coating of down, of a lovely rose-pink colour. I have previously noticed in examples of the Great Bustard this same colouring, which would quickly fade were it not protected from the light, therefore the same rose-tints are still retained in specimens, even after they have been preserved a great number of years; I found this to be the case with three fine examples (two adult males and a female) that I reset in position a few years ago, and which were killed on Salisbury Plain about the year 1822. Although Yarrell and other authors notice this rose-tint in the under feathers of this species, no intimation had previously been given, that I am aware of, that it exists in the plumage of the Lesser Bustard, *Otis tetrax*, until I recorded the fact that it did so. I have examined three or four fresh-killed Norfolk specimens of that species, and made remarks on the circumstance, in a paper I read at the Science Gossip Club, in 1875, and published in the 'Zoologist' for that year, page 4340. Whether or not this rose-tint prevails in that of the Third British Species, the Macqueen's Bustard, I am unable to say.

The Great Bustard killed on the 1st of February is a female, and, by the richness of its plumage, I should judge to be an adult bird, it weighed exactly 8 lbs., which is rather less than the average given for this sex, 9 and 10 lbs. being usual. The weight of the male is from 30 to 36 lbs. This example was in good condition, and rather fat, both internally and externally. Its stomach was large, being distended with the contents, and measured $4\frac{1}{4}$ inches by 3 inches. It was filled with green food, and five flat pieces of flint and pottery, which had been swallowed by the bird to act as grindstones, possibly these fragments of pottery will assist in giving us a clue as to the particular country the stranger came to us from; Mr. Gurney suggested to me either Spain or Germany. The contents of its stomach were packed in quite tight, the entire mass weighing $5\frac{1}{2}$ ounces, it consisted principally of Turnip leaves, Trefoil, and three or four different kinds of herbs. In referring to my notes on the Little Bustard I find the contents of the stomach of that bird were precisely the same. On completing the dissection of its internal organs I stripped the sternum of its fleshy covering, the keel of which presented a great depth, and the flesh of two colours. In utilizing the meat for the table I had it simply roasted, no dressings whatever with it, I found it simply delicious, full rich flavour, reminding me somewhat of a mixture of red grouse and pheasant, which I found was exactly my impression when eating a Little Bustard, but the meat of the greater bird seemed richer, there was certainly more of it.

The eyes were of a light brown colour, with deep bluish-black pupil; upper mandible, brownish horn; lower mandible, pale horn, except tip, which was dark horn; legs, pale greyish brown; toes, shade darker; claws, dark horn. Total length, beak and tail included, $31\frac{1}{2}$ inches; wing, from carpal joint to tip, $18\frac{1}{2}$ inches; full expanse of wings, 5 feet 6 inches; bill—along ridge of upper mandible, $1\frac{1}{2}$ inches; from outer edge of nostril to tip, $1\frac{1}{16}$ inches; from gape to tip, $2\frac{5}{8}$ inches.

The colour of its tongue and inside mouth was dirty flesh, eye circle greyish brown, the naked skin at gape of a greyish flesh. The first primary was $1\frac{5}{8}$ inches shorter than the second, the second and third were equal in length, and longest in the wing; tail, $9\frac{1}{2}$ inches; tibia, $7\frac{1}{2}$ inches; tarsus to sole of foot, $5\frac{1}{2}$ inches;

Tropic Bird *(Phaëton æthereus)* found dead at Cradley, Herefordshire.

middle toe and claw, $2\frac{1}{4}$ inches; inner toe and claw, $1\frac{3}{8}$ inches; outer toe and claw, $1\frac{3}{8}$ inches.

On dissection the sex proved to be a female; ovary, rather small and nearly black in colour, and showing no particular development of the eggs; from the appearance it presented I should imagine it to be a barren bird, the ovary having the same appearance as that of a female pheasant when assuming the plumage of the opposite sex.

Since writing the above it may be of interest to add that the female Great Bustard, so many years preserved at Riddlesworth Hall, and killed at Cavenham, in Suffolk, see 'Birds of Norfolk,' vol ii. p. 37, was sold by auction on the 6th of April, 1894, and fetched the sum of £46.—T. E. Gunn.

Occurrence of the Tropic Bird in England. Professor Newton states that occasionally, perhaps through violent storms, Tropic Birds (*Phaëton*, Linn.) wander very far from their proper haunts, which, as their name implies, are the Southern Indian, Pacific and Atlantic Oceans. A case instancing the justice of his remarks, is that of the specimen here depicted (*Phaëton æthereus*), which was picked up dead at Cradley, near Malvern, in Herefordshire, forty years ago, on the farm of a Mr. Yapp. It was for many years in the possession of the late Mr. John Walcott, of Worcester, and from him passed to Mr. W. H. Heaton, of Reigate, who kindly permitted the present writer to acquire it.

Some further account of this interesting waif will be found in Mr. Edwin Lee's "Birds of the Malvern District," in the 'Transactions of the Malvern Naturalists' Field Club,' reprinted with Notes by E. Newman, in the 'Zoologist,' 1871, p. 2666, and additional comments thereon, 'Zoologist,' 1876, p. 4766. The evidence tends to show that we have a genuine case of a wanderer, borne, as Professor Newton suggests, by weather disturbance to the soil of England; nor is this the only occurrence, for Leigh, in his 'Natural History of Lancashire' (1700), describes another, "found dead on the sea coast," and gives a figure copied from Willoughby.

Professor Newton, in the 'Encyclopædia Britannica,' cites both these instances, and another at Heligoland, remarking that "these

birds fly to a great distance from land, and seem to be attracted by ships."—J. H. Gurney.

Hybrid Sparrow (*Passer montanus* X *P. domesticus*).—At our January meeting the President exhibited, on behalf of the Rev. Julian Tuck, a hybrid between the House and the Tree Sparrow, shot in the early part of that month by Mr. Tuck's brother, in a farm-yard near Bury St. Edmunds. About a dozen House Sparrows, in ordinary garb, fell to the same discharge. Compared with a similar hybrid recorded in our 'Transactions,' vol. iv. p. 522, the parentage of which was known, as it was bred by the late Mr. Otty, of Norwich, the two agree well, though the black on the throat is of much less extent. This black patch must have increased with age in Mr. Otty's bird, as in 1887 the Rev. H. A. Macpherson saw it alive, and merely noted that the black was more extended than in a Tree Sparrow; but when it died, about a year afterwards, it covered the upper part of the breast.

Both hybrids show, to some extent, the peculiar Tree Sparrow's chest-patch, of black surrounded with white, but Mr. Otty's has it the most. His bird has red, or rather rufous, predominating on the crown over grey, but in Mr. Tuck's these colours are evenly mixed; both alike clearly, I think, indicating hybridism, as in a pure Tree Sparrow it would be nothing but red.

This cross has only been obtained in a wild state twice, one in France (Suchetet, 'Les Oiseaux Hybrides,' vol. iii. p. 275), and one in Cumberland ('Fauna of Lakeland,' p. lxxxi.), and it has very rarely been produced in captivity. The Tree Sparrow has bred once, if not oftener, with the Italian Sparrow, *Passer cisalpinus*, Suchetet, *l.c.* p. 278.—J. H. Gurney.

The Growth of Eels.—Last September we emptied a small lake in the grounds of Tostock House, of about half an acre in extent, which had not been cleaned since 1853, and took out 500 loads of mud, which was three feet deep. The water was pumped out by a fire-engine in about twelve hours. Many hundreds of small Dace and Roach got smothered in the mud, as also did some of the Perch, but we saved plenty of "bait" for the Pike ponds.

When this lake was stocked, in 1853, about fifty small Eels were put in, which came up in a barrel from the fens. Only two Eels

were now found—the Broad-nosed Eel or Grig (*Anguilla latirostris*), weighing 7 lb. and 6 lb., a most unusual size for this variety, according to Yarrell, who gives the maximum as 5 lb. The extreme length was 3 feet 7½ inches and girth 9 inches. This supplies a good record for age and weight. I sent the largest to the Museum of the Royal College of Surgeons, where the skeleton is preserved. —W. H. Tuck.

Suffolk Coleoptera.—The list of Norfolk Coleoptera compiled by Mr. Edwards is a most valuable addition to the county Fauna. I wish that a similar one could be given for Suffolk. I am no coleopterist, but as I spend much time in field work I naturally come across many specimens, which I send to my friends, and in my exploration of Wasps' and Bees' nests I have found a great number of inquiline or parasitic beetles.

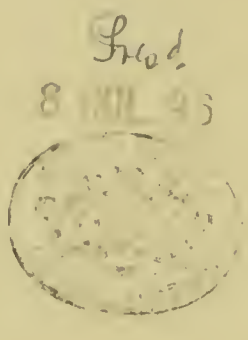
The following are my most important captures in 1892—3:—Metabletus foveola, Pterostichus madidus, Bradycellus distinctus, Helophorus brevipalpis, Myrmedonia limbata (*Vespa vulgaris*), Homalota (species not yet determined), Quedius puncticollis (*Vespa germanica*); Q. mesomelinus, and one from a nest of Bombus subterraneus, believed to be new to Britain, and not yet identified; Philonthus albipes, P. politus, Stenus unicolor (*Bombus muscorum*), Choleva nigricans, C. grandicollis, C. nigrita, Cryptophagus punctipennis, C. pubescens, C. setulosus, C. scanicus, Dorcus parallelopipedus (*Bombus lapidarius*); Metaecus paradoxus—one August 2nd, 1893, three August 3rd, three August 6th, all in nests of Vespa vulgaris, the only place I find them; Otiorhynchus scabrosus, Phyllotreta vittula.

In the general list I had Notiophilus substriatus, Amara acuminata (in sandpit), Trechus obtusus, Bembidium biguttatum, Philonthus lepidus, Lathrobium elongatum, Prognatha quadricorne, Necrophorus vestigator, Silpha lævigata, Hister marginatus (in flood refuse), Brachypterus pulicarius, Mysia oblongoguttata, Chilocorus similis, Exochomus quadripustulatus, Hippodamia mutabilis, Mycetophagus quadripustulatus, M. quadriguttatus (?) (both from Beech fungi, latter immature), Triphyllus punctatus, Rhyncolus chloropus, Serica brunnea (at light), Phyllopertha horticola (swarming on Troston Heath, May, 1893), Ptilinus pectinicornis, Cossonus linearis (in wood of black poplar), Erirhinus tortrix, Magdalinus aterrima,

Prionus coriarius, Callidium variabile, Saperda carcharias (on sallow), Polyopsia præusta, Strangalia quadrifasciata (by the borders of the Waveney), S. armata, Leptura livida, Criosceris asparagi (swarming in a garden at Bury, July, 1893).

It will be noticed that there are several in this short list which are not returned for Norfolk, especially among the inquilines.

I am greatly indebted to my friends, Mr. E. A. Butler, F.E.S., of London, and Mr. Frank Norgate, of Bury, for valuable aid in determining many of the species named.—W. H. Tuck.



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CONTENTS.