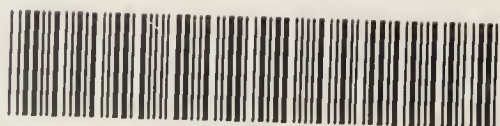


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PAPERS



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ORCADIAN PAPERS:

BEING

SELECTIONS FROM THE PROCEEDINGS

OF THE

ORKNEY NATURAL HISTORY SOCIETY,

FROM 1887 TO 1904.

EDITED BY

M. M. CHARLESON, F.S.A. SCOT.

STROMNESS :

PRINTED FOR THE SOCIETY BY WILLIAM RENDALL.

1905

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PREFACE.

IN presenting this volume to the public, it may be necessary to explain that the Papers of which it is composed were all written for, and read before, the meetings of the ORKNEY NATURAL HISTORY SOCIETY within the past seventeen years.

It is now sixty-eight years since the Society was instituted, and during that time a great many papers on a wide variety of subjects have been written by its members or by friends interested in the objects of the Society. The members of the Society regret that they have lost trace of all the earlier papers. Some of these were from the pen of the late Dr. Clouston, the first President, and could they now be found would doubtless prove of great value and interest. The contributions in later years have, however, been preserved, and for some time past a wish has been expressed to secure a permanent record, in book form, of a number, at least, of these papers.

In making the selection for publication, the Society has kept in view a very generally expressed desire that the book should be, as far as possible, Orcadian in character. The subjects will therefore be found to be more or less local, while the writers, with one exception, have been resident in Orkney. It was no easy matter for the Committee in charge to decide what articles should be included in the volume,

and what should be left out. The exigencies of space prevented some very interesting papers from being selected, while others were excluded on the ground that they had already appeared in pamphlet form.

The papers are published in the order in which they were read to the Society.

We have to acknowledge our indebtedness to Messrs Gurney & Jackson, London, for permission to use the illustrations of Birds from Saunders' "British Birds."

STROMNESS, June, 1905.

CONTENTS.

	PAGE
PREFACE,	v.
List of Illustrations,	viii.
Introduction,	ix.
<hr/>	
The Trap Dykes of Stromness and Neighbourhood, . .	i
The Ruins of Breckness: Prehistoric and Modern, . .	12
The Oyce of Firth,	25
Manufacture of Straw Articles in Orkney,	32
Glaciation in Orkney,	43
Observations on Some Birds in the Mainland of Orkney, .	58
Habits of Birds frequenting Sule Skerry,	69
The Migration of Birds as observed from Sule Skerry, .	92
A Chambered Mound near Breckness, Stromness, Orkney, .	112
The Identification of Birds,	120
<hr/>	
APPENDIX.—Sule Skerry and the Stack,	155

LIST OF ILLUSTRATIONS.

	PAGE
Portraits of Office-bearers from 1837 to 1874,	<i>Frontispiece.</i>
Ancient Chair in Stromness Museum,	xvi.
Bishop Graham's Coat of Arms,	18
Pass by Ro. Sawrey,	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 4em; margin-right: 10px;">}</div> <div style="text-align: left;"> <i>Facing</i> 24 </div> </div>
Pass by Tho. Salkins,	
Order by Rt. Overton,	
Order by Robert Overton,	
Letter from Bishop Graham to his Son, David,	
Plan of Sule Skerry,	70
Hooded Merganser,	123
The Scaup Duck,	125
The Common Scoter,	127
The Surf-Scoter,	129
The Harlequin Duck,	131
The Buffel-headed Duck,	133
The Red-crested Pochard,	135
The King-Eider,	137
Brünnich's Guillemot,	139
The Ivory Gull,	141
The Curlew-Sandpiper,	143

INTRODUCTION.

ON 28th December, 1837, a number of gentlemen met in Stromness under the presidency of the Rev. Charles Clouston, of Sandwick, with the object of forming a Natural History Society for the County of Orkney. The want of such an organisation had long been felt. The Islands opened up a splendid field for scientific research, in which the most enthusiastic devotee could not fail to find ample scope for his labours. The opportunities of observing bird life and of forming a comprehensive collection of the birds frequenting these northern latitudes were unique. The geology of Orkney presented a field of research which had hitherto received scant attention, though it merited exhaustive enquiry; and the Islands teemed with relics of the past. All these considerations weighed with the promoters of the Society. They felt that the time had come for a crusade in the scientific arena of the north. They, themselves, were eminently qualified not only to place the Society on a sure basis but to promote the interests of science and induce others by their example to follow in their footsteps and carry on the work which they had begun.

The outcome of this meeting was the formation of "THE ORKNEY NATURAL HISTORY SOCIETY," which had for its object "the promoting of natural science by the support of a museum and by any other means in its power." It was destined to have a long and prosperous existence, and to be an important factor in promoting and stimulating scien-

tific research in the county. At the meeting in question the rules of the Society were submitted and adopted, and it says a good deal for the promoters that, in the main, they have survived the ravages of time, and stand at the present day very much as they did when framed.

The meeting of 28th December, 1837, after adopting the Constitution, next proceeded to the election of office-bearers, some of whom were long connected with the Society, and did it lasting service.

The first election of honorary members took place at the same meeting, the minute of which contains the following names :—George Anderson, Esq., Inverness; Peter Anderson, Esq., Inverness; Dr. Copland, London; Frederic Dundas, Esq., M.P. for the county of Orkney; Dr. Hibbert; Samuel Laing, Esq., younger, of Papdale; Dr. Patrick Neill, Edinburgh; Dr. John Pollexfen, Edinburgh; Dr. Login, of the Honourable East India Company's Service; Eric Sinclair, Esq., Wick; William Traill, Esq., of Woodwick; and Rev. George Young, Whitby. Honorary members were elected by the Society from time to time, and among the gentlemen selected for this distinction are to be found many eminent in science, including Hugh Miller.

A Society so auspiciously inaugurated could not fail to attract the attention and elicit the support of the public, and in this connection the hopes of the directors were not disappointed. Their first care was to secure a suitable repository for any objects that might be donated to the museum, and at the following meeting we find that it was decided to take "Mrs. Flett's large room" at a rent of two guineas per annum. Here it was arranged that three of the committee should be in attendance at certain stated

times to receive donations, and we find from the records that the plan worked admirably, and that at the end of the first year of the Society's existence the directors were in a position to report favourably on the work accomplished during that period. In the first annual report, printed in Edinburgh, the donations to the museum are referred to as follows:—"To commence with *Geology*. In this department there are now in the museum 500 specimens, many of which are rich and interesting. They are from Upper Canada, Norway, France, Italy, England (chiefly Yorkshire), Burdiehouse, near Edinburgh, Brora in Sutherlandshire, Banniskirk in Caithness, and from Kirkwall Bay, Sandwick, North Dyke, Quoyloo Quarry, Skaill Quarry, Sandwick Glebe Quarry, Clumley and Stromness West Shore, in Orkney. The Orkney specimens are mostly fishes, and about a hundred in number.

"In *Mineralogy* the specimens, including duplicates, amount to nearly 400. About thirty varieties of these are indigenous to Orkney, and nine to the Fair Isle.

"In *Zoology* little as yet has been done, except in the Ornithological department. In that department, however, sixty specimens have been received. This number, it is true, is inconsiderable, compared with the full set of Orkney birds which, including male and female, amounts to nearly 300; but certainly cannot be considered so when it is kept in mind that the season had considerably advanced before arrangements could be made to secure the services of active friends. Now, the directors may mention, there are individuals in various parts of the county who have this department fully in view, and who, it is expected, will be able to enrich it much by the time of next Annual

Meeting. In connection with the ornithology, it may be right to notice that the directors have secured about 200 specimens of birds' eggs—some from the South of Scotland, but the greater part from these Islands.

“In *Botany*, the collection of land plants is already creditable, amounting to upwards of 600 specimens, mostly all labelled, and in excellent preservation. The truly handsome donation of Charles C. Babington, Esq., F.L.S., etc., and one of the honorary members of the Society, which arrived in safety from Cambridge a few weeks ago, has materially enhanced the value of this department. With regard to the Algæ or marine plants in your possession, it affords the directors extreme pleasure to speak in unqualified terms. The collection is truly excellent; and here it may be proper to mention that, while in no part of Britain are there greater facilities afforded for making splendid assortments of algæ than in Orkney, in no local society, perhaps, are there more ardent cultivators of this branch of natural science than a few connected with our infant Institution. The Rev. Charles Clouston, Dr. Pollexfen, Miss Watt of Skail, and Mrs. Traill of Woodwick, have all rendered important service to science as regards the algæ of our shores. From the three first, most valuable donations of marine plants have been received, and the last mentioned has kindly promised a variety of duplicates from her very extensive collection.

“In *Conchology*, there are about a hundred different species in the museum; a few of these are from the shores of the county, but the most of them are from foreign parts.

“Of miscellaneous articles, a considerable number has been received. Many of them are curious, and tend to illustrate the customs of distant nations and tribes.

“With regard to *Antiquities*, the directors have some important notices. Of the 80 coins presented to the Society, many are considerably ancient. But what they regard of still greater interest is the small collection of local antiquities which they have been enabled to make. Of these they may enumerate the following :—Part of a Scandinavian battle-axe from Shetland; a mallet of granite, beautifully polished, recently found by Mr. Magnus Smith, in an ancient grave at Dounby in Sandwick; a small circular copper ornament and a boar’s tusk found in a tumulus at Stenness; fragments of burnt bones, with ashes intermixed, and also without ashes in other instances, found by the directors in tumuli at Upper Lyking, and in one of the tumuli an urn at one end of the grave and a quantity of burnt unmixed bones at the other.”

It will thus be seen that the Society made a good beginning with its museum. The progress was equally good in the following year, and the directors in the second annual report felt themselves in a position to say that “they hesitate not to congratulate the members on its highly animating prospects, and to express their confident belief that the museum will, in a few years, occupy an honourable place among provincial repositories of the diversified and interesting works of the Almighty and Adorable Creator.”

That the directors were not too sanguine, the records of succeeding years can bear testimony. In 1854 the directors deemed it expedient to vacate “Mrs. Flett’s large room” for more commodious premises, and their choice ultimately fell on a room in the Commercial Hotel, to which the collection, now a large one, was transferred. But it was not destined to lie there long, the proprietor intimating in

1855 that the Society could no longer have the use of it. The matter was discussed at the annual meeting held on 14th February, 1855, when it was decided to erect a museum, and accordingly a committee was appointed "to look out for a site, and to enquire as to the probable cost of building." This committee reported to subsequent meetings of the Society with the result that the site on which the museum now stands was selected, and steps were taken to raise the necessary funds to proceed with the building. In this the Society received the cordial support of the Magistrates and Town Council, and in due time the members were enabled to proceed with the building, which was finished in 1858. The collection was then removed to the new premises, in which it has reposed ever since. It has been added to from time to time in all its departments, especially in that set apart to ornithology, and it stands now as a monument of the zeal and energy which members and friends have devoted to its interests in the past, and of the success which has followed their labours to create and foster an interest in natural science on the part of the community at large. To help on this work they have also from 1839 down to the present day given to the public many papers on scientific subjects, which have had a large circulation, chiefly through the medium of the press.

The Rev. Charles Clouston, LL.D., L.R.C.S. Edin., was elected President on the formation of the Society in the year 1837, and continued to hold that office until the year 1885, when, on account of failing health, he asked to be relieved, and the Society reluctantly accepted his resignation after forty-eight years' faithful service. The Rev. James Ritchie, Free Church minister, Stromness, was elected

his successor, and during the twelve years he occupied the chair, from 1885 to 1897, the Society made extensive improvements on the museum, the only one of its kind in the county, and which is now in excellent condition. Mr. Ritchie was an active office-bearer of the Society for the long term of twenty-three years, and a member until the time of his death, which took place on 9th May, 1899.

Mr. John D. Turner presided over the deliberations of the Society for two years, 1897-1899, and was followed by Mr. M. M. Charleson, F.S.A. Scot., who has for the last six years conducted its business.

The Society has been no less fortunate in securing the services of energetic gentlemen for the onerous duties of Secretary. The Rev. William Stobbs was the first elected, and continued to record its proceedings for twenty-six years, from 1837 to 1863. Mr. William Ross, writer, then took over the duties, which he discharged for seven years in a faithful manner. The Rev. James S. Nisbet, who had succeeded Mr. Stobbs in the pastorate of the United Presbyterian Church, succeeded Mr. Ross as Secretary of the Society, and on his resigning, in 1874 the Rev. James Ritchie took up the duties, which he discharged until 1885, when, as stated, he was elected President. Mr. John B. Rosey succeeded the Rev. James Ritchie, and acted for three years, resigning in 1888, when Mr. S. Brown was elected. Mr. Brown held office until 1893, when, on his departure from Stromness, he was succeeded by Mr. J. B. Smith, who was followed by Mr. William Rendall. In 1901 Mr. Brown returned, and was re-elected Secretary, which position he still holds.



ANCIENT CHAIR IN STROMNESS MUSEUM.

ORCADIAN PAPERS.

THE TRAP DYKES OF STROMNESS AND NEIGHBOURHOOD.

BY REV. JAMES RITCHIE.

THE principal Trap Dyke in this locality is that which goes by the name of the Stacks of Netherton. It crops up first on the seashore a hundred yards or thereby west of the Rocket House, and runs out seaward through the centre of Hoy Mouth, in a west by south-west direction, or thereby, as if pointing to Cape Wrath. Looking landward, it runs in the direction of the farm house of Citadale. At very low tides it can be traced outwards for about a hundred yards continuously; but it looks more picturesque at about half tide, when the tops merely of the higher parts of it appear above the water in a slightly irregular line, like so many huge stepping-stones planted in the sea. It varies in height and thickness, but near the shore end it must be six feet at least above the ordinary rocks, and four or five feet in thickness. It is extremely hard, and this circumstance, with the fact that it stands end on to the heaviest seas, will account for its remaining erect when the more fragile strata around it have been swept away. When broken, it exhibits a very dark grey colour, and a cindery structure characteris-

tic of all rocks of volcanic origin. Along each side of the dyke there is commonly a band of a reddish yellow colour in the ordinary flagstone, which has been altered in structure and in colour by the intense heat of the molten trap when it was thrust up from beneath.

Again, anyone walking along the shore of Cairston from the building-yard eastward, will cross a trap dyke a little less than a quarter of a mile from the building-yard. This dyke is in some places three feet thick, in others rather less. It rises only slightly above the other rocks, and in several places it is on the same level with them. At the shore end it runs up into the face of the steep rocky bank, standing there some nine feet in height, and as all the ordinary rock on its seaward side has been removed, that side of the dyke is exposed to view for six or seven yards. Raised thus above the sea, and long exposed to the weather, especially to the action of rain water, it has become altered in character, has assumed a rusty red colour and become porous and brittle in substance. The rest of the dyke is of the ordinary type, and at the other end it disappears under the sand of the bay.

It occurred to me to mark particularly the direction in which this dyke ran from the Cairston shore, when I was greatly interested to find that, like the Netherton dyke, it pointed to the farm house of Citadale. The question at once arose, can this second dyke be merely an easterly extension of the first one? It showed the same colour, the same hardness, the same band of red on each side, and it ran in the same direction. I inferred that if it were the same dyke it would be found crossing the Inner Holm, which lies in its path. Going round to the east side of the

Holm, I found it readily, rising out of the sand and running into the Holm at the cave in which, in olden times, smuggled goods, I have been told, were often hidden away until they could be conveniently disposed of. This cave no longer exists. The roof of it has been removed, and a few steps built into the bank now land you on the top of the ancient trap on the shore. The cave, doubtless, owed its origin to the trap.

Proceeding to the west side of the Holm, I found the dyke there also, standing about two feet in height and stretching down into the harbour. It occupied the line of the old slip, in fact was utilised for that purpose, having been formed into a slip by stones built over and behind it. No trace of it now remains, as the new slip, which is broader and higher than the old, has been built right over it, a fact which may prove rather tantalising to future enquirers, and which forms a very good illustration of the difficulties that sometimes attend investigations of this kind.

But a more interesting question now arose as to the opposite side of the harbour—Will the trap be found traversing the granite, or, will the granite have obliterated the trap? I had observed that the dyke ran towards the south end of the harbour, where the shore is not so fully built over. I proceeded thither, and just beyond the last house on the seaward side of the street, I found a very singular arrangement of the granite. There is here a deep depression in the rock, and as seen from the street there are two very distinct rents in the granite running along the bottom of the depression. Raised granite is often rent and cracked, but not commonly in this fashion. The two rents are very marked; they run in straight lines, parallel to each

other, about six feet apart, and pointing to the inner Holm. The space betwixt these two rents is not occupied by solid granite, nor is there any appearance of trap; but it is filled by angular masses of various rocks, jammed in together, some of them granite, some resembling granite imperfectly crystalised, and along with these, a goodly proportion of a rock of which I have retained a specimen. At first I was inclined to think that this rock might be altered or baked trap, trap changed in structure and colour from being brought into contact with the granite while the latter was still intensely hot. Having no certain means of determining this point here, I sent specimens of it and of the trap to a friend in Edinburgh, who was fortunate enough to get the opinion of Professor Geikie, of the Geological chair in the University. He only examined them with a hand lens, but he was satisfied that the rock was quartzite or baked sandstone, and that it had no connection with the trap dyke.

That point being settled, the question still remains as to the character of this gap in the granite filled in with altered sandstone and other rocks. Does it indicate the line which the trap dyke once took, though now no longer present? I will not enter upon this question now, but may notice four points that must be taken into account in discussing it. (1) According to trustworthy geologists, granite may be of any age up to the time of the New Red Sandstone or even later. (2) This trap dyke traverses our lower Old Red Sandstone from its base upwards. (3) The granite is in immediate contact with the Old Red at the Life Boat House and elsewhere, and incloses in its upper surface, as in a matrix, a vast number of water-worn stones and blocks, just where the Old Red Conglomerate ought to be. (4) The gap

in the granite referred to is of the very width, and occupies the very position in which the trap dyke would be expected to be found.

Apart from this question altogether, it is perfectly plain that the dyke at Cairston is an extension of that at Nether-ton, but I have not been able to trace it eastward beyond the point already referred to.

The other trap dykes do not seem to require more than a bare notice, because we see only a small section of each of them, and they all present the same general characteristics. At the point of Breckness there is a line of upbreaking of the rocks, without trap, one of four or five such lines of upbreaking betwixt Ness and Breckness, all pointing toward Hoy. Rounding the point of Breckness thirty yards or thereby, we come upon a trap dyke proper, of no great thickness, level with the rocks, and running up into the land in the direction of the farm of Crafen. I hesitate to say that I have seen the same dyke many miles to the eastward. In driving to Kirkwall, I observed a trap dyke crossing obliquely a burn close to the public road at a bridge near the farmhouse of Rinniebister, in the neighbourhood of Wideford Hill. Trap dykes often extend for miles in the same direction, some of them being more than fifty miles long. Can this one, so far east, be the same dyke as at Breckness? It is of the same thickness, and appears to come from the same direction. It may not be in the same mathematical line, but we know that they do not observe an absolutely straight line, but an irregular one, with frequent lateral dislocations, as may be seen both at Cairston and at Nether-ton.

At Yesnaby there is another dyke, running up the face of the steep rocks near Yesnaby Castle and thence stretch-

ing close inshore on the level of the ordinary rocks below, in the direction of Hoy Head. The only other dyke I have seen is at Costa Head, in Evie. Level with the Old Red Sandstone rocks, with the remains of the *Cocosteus* lying exposed on their surface, the trap dyke appears, three or four feet in thickness, and pointing in the direction of the northern end of the opposite island of Rousay. I may add, that in Cairston, a little beyond the trap dyke, there is a deposit of very hard structure and greyish white colour on the surface, which does not seem to take the form of a dyke, but appears to be a deposit of porphyry, a rock of somewhat similar origin to trap, and at Deerness, just opposite Copinsay, there is a considerable deposit of porphyry of a dark brown colour, with crystals of felspar, in large white quadrangular patches on the dark surface.

Returning to the trap dykes, we may enquire into their probable age, though here our calculations cannot lead us to any very definite conclusions. The Old Red strata were undoubtedly subject to great alternate elevations and depressions during their accumulation, and therefore trap may have been intruded among them at any stage. But it is understood that the era of the Old Red was one of comparative tranquility so far as the volcanic forces were concerned, and that these forces were extremely active, both at the beginning and at the close of that era, as we have only the Old Red deposits in this quarter, the question of age is virtually narrowed to the alternative enquiry whether the trap rocks originated at the beginning or at the close of that system. There are two considerations that seem to show that the trap was deposited, not earlier at least than the close of the Old Red period. (1)

There is no superficial deposit of trap, so far as I can learn. If the intrusion had taken place at the commencement of the period, we should have found an overflow. But (2) a more decisive fact is the compact structure of the trap itself. All irruptions of molten matter from beneath contain particles of water in their composition. These particles, on reaching the surface, expand into innumerable little globes of steam, turning the mass into pumice stone. But if the molten trap is so far beneath the surface that the weight of rock above is at least as great as the expansive force of steam below, no steam at that depth is formed, the trap does not become porous; but remains compact in structure. Now all these dykes are very compact and hard, and we may therefore infer, that when they were intruded into the strata, a vast depth of rock lay over them, probably as great as the Hoy masses at present, before the greater part of it was removed, in process of time, by denudation.

If the trap dykes were deposited at the close of the Old Red era, we may reasonably expect them to furnish us with some indication of the processes by which the land attained its present configuration. Comparing the strata at Dunnet Head, Hoy, Black Crag, and other points, we may assume that the whole of what is now Orkney formed, at one period, along with Caithness, one continuous range of strata under water, and possibly thereafter one continuous tract of land above it, though now broken up into a large number of separate islands. The present arrangement of land and water is somewhat complex; and I think it might help one to remember it, and to understand better the forces that determined it, if we were to take some point in the sea, not far from Hoy Head, and from that point draw

three concentric semicircles along the leading waterlines, the first including the West Mainland, Flotta, and Walls, the second embracing Rousay, Shapinsay, Deerness, and South Ronaldshay, and the outer semicircle including Westray, Eday, and Stronsay. Then from the same centre let radii be drawn across these semicircles; one out through Water Sound, a second to Auskerry, south of Stronsay, a third to the south-east side of Sanday, and a fourth to the north of Rousay and North Ronaldshay. Both the circles and the radii pursue the great waterways. Only, it is not with the circles we have now to do, but merely with the four radii intersecting them.

I may here observe, that the upheaval of granite is always accompanied by the elevation of the land, while the upheaval of trap, in the form of dykes, seems to have been concurrent with the depression of the land. Where there have been many active volcanoes (as in South America at present), there may be found whole mountain ranges of trap and basalt, like the Pentland range in the Lothians, or the Sidlaw hills in Strathmore. But where the movements of the land have been more leisurely and gradual, while the granite strikes along the land ridges, the trap seems to strike along the water lines, in a locality such as ours.

We can understand how this might be brought about if we think what might happen when our lower Old Red was partly deposited, and was still under water. The water, percolating the soft or the sandy strata till it reached the surface of the intensely hot granite underneath, would expand into steam were it not for the weight of material overhead. As the water increased until the expansive force of the steam exceeded the weight overhead, the

strata, buoyed up, would begin to rise, and this process of elevation would go on till the soft and overstrained strata gave way, either at the summit of elevation, or along the weaker lines from the summit outwards, like the four or five rents, or volcanic vents as they are called, on our own shores, already alluded to. Through these vents thus opened, the steam would escape, and the water in turn would rush in, causing, when expanded into steam, a further upheaval, and this process would continue until the surface of the granite below became comparatively cool, the strata settled down to their former position, the rents closed hard, twisting the strata, or were slowly filled up by crystallized materials of various sorts, additional strata were deposited above, and a long period of quiet followed.

At the close of the Old Red period, when the strata had been completed though still under water, a much more serious disturbance took place. By the re-awakened volcanic forces, large areas were raised high above the water. The strata were now of immense thickness and firmly consolidated, and the imprisoned steam and gases could not find vent so readily as before. Along the weaker lines the strata at length broke down everywhere in long irregular rents, falling in, on both sides of the rents, upon the molten matter below, and by their immense weight, forcing the lava up to the surface, filling every rent and crevice, and cooling and hardening before it had time to crystalize into granite. The crushed and shattered upper rocks, after much unquiet, were gradually removed by denudation, and after the lapse of ages, the Old Red Sandstone, in our quarter, took the form we are now so familiar with, that of the Orkney Islands.

Part of what I have thus written is ascertained fact, but the greater part is, of course, mere conjecture, and given for purposes of illustration. Let us now, however, return to the facts of the case. We have, in connection with this parish, three separate trap dykes. It would be absurd to suppose that the vast volcanic forces that produced them, were restricted to our parish in their action. These dykes are the result of far-reaching rents in the strata, rents that traversed the whole district in olden times, and gave shape and form to our islands. And it is surely a very remarkable and significant fact that, if we were to pursue the lines which these several trap dykes indicate, we would be led along the great leading water ways that separate our northern islands. Thus, the dyke at Breckness would bring us to the dyke at Rinniebister, and thence to the south point of Shapinsay, where a geological map, I have seen, shews trap of the same kind and running the same way, and thence to Aukerry, thus traversing the greater part of the water line from Finstown to Aukerry. The Netherton trap dyke leads us first to Cairston, and thence north-east to the south-east side of Sanday, traversing the water line from Finstown to Start Point. The Evie dyke points through the north end of Rousay, to the north of North Ronaldshay, another prominent water line, while the dyke at Yesnaby points to Hoy Head, determining the western boundary of the islands. The map I have referred to shews a line of trap from Hoy Head, running in the direction of Water Sound, another great water line. It shows also deposits of the same trap at the Old Man of Hoy, and at a point on the coast near Melsetter, which may have determined the line of the south-west boundary of the

islands, a line pointing across the Pentland Firth to Stroma and Duncansbay Head.

Should these views be corroborated by more extended researches all over the islands, what increased interest would gather around the trap deposits in our neighbourhood! We should see in them the memorials and relics of a period in the dim, remote past, when the waters, which had held the field for unknown ages, were at last violently agitated, as the land looked up from beneath their surface, and rose at least fifteen hundred feet into the sky, in all directions rending and sinking, or rising and settling, until it finally took the form and outlines it still retains. Of the events of that epoch of terrific convulsion, it is surely something to be able to say that we have still beside us in the Trap Dykes of Netherton and Cairston, of Breckness and Yesnaby not merely the contemporaries and witnesses of these events, but remains of one of the actual though passive agents which brought them about.

THE RUINS OF BRECKNESS: PREHISTORIC AND MODERN.

By W. G. T. WATT, OF SKAILL.

THESE ruins are situated on a low-lying and flat promontory in the township of Outertown and parish of Stromness. They face Hoy Mouth, always in a state of commotion owing to the strong tide running to and fro through it, and which, in a westerly gale, with the tide meeting the full roll of the great Atlantic waves, is probably one of the grandest sights in Orkney. But to add to the grandeur of this, there are, immediately across the sound, the lofty hills of Hoy, bleak, black, and barren, with rugged cliffs against which the great waves dash and fall off in huge volumes of foam. A bold, beautiful landscape and sea piece to look at! Then to the north-west of the ruins are the dark, beetling cliffs of the Black Crag, 360 feet high, which gives shelter to the township from the cold north wind; while the green fields and well cultivated land round about form a pleasant contrast to the bold cliff scenery and boisterous sound. In winter the scene has peculiar charms, but in summer the effect is even greater, the whole surrounding landscape and, as a rule, less turbulent ocean being then lit up and mellowed by the bright and most exquisite colouring of the sunset, which is not surpassed even by “the glorious tropical” sunsets which I have had the pleasure of witnessing. On the

whole, a more romantic or picturesque spot for a dwelling would be difficult to find in Orkney.

I have frequently observed that the broch builders invariably pitched on a site not only suitable for natural defence but one that likewise had pleasant surroundings, so we are not surprised to find at Breckness the remains of a large and most interesting broch. I recently inspected the ruins, and came to the conclusion that the broch must have had an interior diameter of over 30 feet, with walls at least 16 feet thick. We may suppose that, looking to the measurements of other brochs, notably those of the broch at Mousa in Shetland, the one at Breckness was 50 feet or more in height, and no doubt similar to other buildings of the kind in the matter of its interior plan, all brochs having been designed very much alike. They were dry-built circular towers, on an average between 40 and 50 feet high, with an external diameter of about 55 feet, and walls from 12 to 15 feet thick. The outer and inner walls were well built, the intervening space being filled in with loose rubble work.

The entrance to a broch is generally about S.E., and the passage that runs through the thickness of the wall to the interior court is between 5 and $5\frac{1}{2}$ feet high, and about 3 feet wide. On the right hand side at the inner end there is generally a guard chamber. Off the court also are one or more small chambers in the thickness of the walls. From the ground floor a narrow stair leads to galleries. Light to the stairs and galleries is received from small windows looking into the court, but no windows, so far as I know, look outside from the external wall. In the case of the Broch of Burwick, however, which I partially

excavated in 1881, I am inclined to think that above the passage over the doorway there has been a chamber with a small peep-hole or out-look. Around the top of the tower may have been a landing with parapet, from which the inhabitants could assail an enemy with comparative impunity.

Thus you may picture the Broch of Breckness. We have no certainty as to the period when brochs were erected, or what race of people inhabited them, though it is generally supposed that they were Pictish; but one thing is certain, they are of great antiquity, and the fact of the sea having encroached on the hard rocks of Breckness and carried away more than half of the Broch there, notwithstanding that it is a good deal sheltered from the fierce attacks of the Atlantic by the skerry of Braga and an out-lying promontory, is sufficient proof of its great age. From what I can gather, there is no doubt the Norsemen found the brochs peculiar buildings of defence on their arrival in this country about the ninth century. In Norway, I understand, no brochs or remains of brochs have been discovered. I have never heard of any relics being found in the broch at Breckness, but a few years ago I came on a skeleton in the bank close to the broch. It lay full length in a grave, the sides of which were built with small sea-worn stones, and which was covered with flat shore stones. Nothing was found in the grave by which to form any opinion as to the time when the interment had been made, but no doubt it was an ancient grave. There may be a number of such graves about the same place, as a broch when in ruins was a favourite spot for the people of early times to bury their dead in, but as a rule it was by

cremation, the ashes being placed in small cists similar to those found in tumuli.

To bring the subject of the ruins down to more modern times, I have every reason to suppose that the Moodies, who acquired Breckness in the early part of the 16th century, had there a house of some consequence, but whether they were the builders of it or not I am not in a position to say. The lands of Breckness were purchased from the Moodies by George Graham, youngest son of Geo. Graham of Inchbrakie, Perthshire, a cadet of the noble and ancient family of Montrose. He was educated at St. Andrews, and studied for the church, as many of the younger sons of influential families did at that time. Episcopacy being in the ascendancy, lucrative appointments in the church were to be had, and young Graham was one of the lucky ones who, no doubt through family interest, was soon appointed parson at Scone, and some short time afterwards ordained Bishop of Dunblane, from which he was translated in 1615, to the See of Orkney, where he remained until 1638. He disclaimed Episcopacy by a formal document signed at Breckness, 11th Feb., 1639, in the following terms, viz.—

“To all and sundry whom it effeirs, to whose knowledge these presents shall come, specially to the Reverend and honourable members of the future Assembly to be holden at Edinburgh, the twelfth day of August, 1639. Me, Mr. George Graham, sometime pretended Bishop of Orkney, being sorry and grieved at my heart that I should ever for any worldly respect have embraced the order of Episcopacie, the same having no warrand from the Word of God, and being such an order as hath had sensibly many fearful and evil consequences to many parts of Christendom, and particularly within the Kirk of Scotland, as by doleful and deplorable experience this day is manifest, to have disclaimed, like as I by the tenor hereof doe altogether disclaim and abjure all Episcopal power and jurisdiction, with the whole corruptions thereof,

condemned by lawful Assemblies within the said Kirk of Scotland in regard the same is such an order as is also abjured within the said Kirk be virtue of that National Oath which was made in the years 1580 and 1581, promising and swearing by the great Name of the Lord our God, That I never while I live, directly or indirectly, exercise any such power within the Kirk, neyther yet shall I ever approve or allow the same, not so much as in my private or publike discourse : But on the contrary shall stand and adhere to all the Acts and Constitutions of the Assembly holden at Glasgow, the 21 of Novemb. 1638 last by-past : and shall concur to the uttermost of my power, sincerely and faithfully, as occasion shall offer in execution of the said Acts, and advancing the work of Reformation within this Land, To the Glory of God, the peace of our country, and the comfort and contentment of all good Christians, as God shall be my help. In testimonie of which premises I have subscribed these presents *At Breckness* in Stromness, the eleventh day of February, the year of God 1639 years, before these witnesses, Master Walter Stuart, Minister at Shoutronnaldshay, Master James Heynd, Minister at Kirkwall, Master Robert Peirson, Minister at Firth, and Master Patrick Graham, Minister at Holme, my son."

This document was duly laid before the General Assembly at Edinburgh on 17th August, 1639, and as it was a total renunciation by him of Episcopacy, he was simply deposed, his private estates of Myreside and Gorthy in Perthshire, and Rothiesholm, Græmeshall and Breckness in Orkney not being interfered with.

It is clear that Graham was actuated by purely selfish motives in entering the church, and that when he saw his property in danger of being taken from him at the time Episcopacy was abolished, he did not hesitate to denounce the church he had cherished and fostered so long.

He went south and dwelt, probably at Myreside, in Perthshire, where he lived a quiet life, as no further mention is made of him in political or ecclesiastical affairs, and died about 1643-4, aged (circa) 80. It is said he was "a man of small stature but of great mind." His writings

are able, and I would draw your attention in particular to his quaint and clever style in replying to the demands of the magistrates of Edinburgh, *vide* Peterkin's Rentals of the County of Orkney.—No. III., p. 12, 13, and 17.

His great hobby, however, appears to have been house building, for he built the mansion houses of Græmeshall in Holm, Skaill in Sandwick, and Breckness in Stromness. The latter he erected in 1633 as a summer residence, and he seems to have taken more interest in this building than in any of the others, as it was on a larger scale and more ornamented with carved freestone.

The ruins as they now stand do not show the original size of the place, for there are evident signs of extensive out-buildings which I am inclined to think formed part of the older house of Breckness. It, however, was, as may be seen, an ordinary two storied house of the 17th century style. The ruins as they are at present form a semi-quad-range. One part 27 feet long by 24 feet wide runs northward, while the south gable of this portion runs into another 41 feet long by 21 feet wide, lying about E. and W. The east gable of the south house and the east side of the north run on a line and form the front, the entrance or main door-way being about the centre. The whole length of the frontage is about 50 feet. The side walls have been about 20 feet high and 2 feet 6 inches thick, and along the top a heavy moulding of freestone ran, the put stones at all the gable ends having either a clam shell or a rose sculptured in alto-relievo similar to those quartered in the coat of arms. The roofs have been high, with a sharp slope. The gables have the characteristic crow steps of the 17th and 18th centuries. The windows were narrow,

with freestone mouldings round them. The side facings and lintel of the door-way are of freestone with heavy mouldings, and above it was richly sculptured on freestone, Bishop Graham's Coat of Arms, viz.—Quarterly, first and fourth, three escallops of the first, with chess-man on the fourth, second and third, three roses barbed and seeded.



FIG. I.—BISHOP GRAHAM'S COAT OF ARMS.

Above the shield is a scroll with motto, which I am unable to decipher, and over that a Bishop's Mitre, and above that

again the letter "B" for Bishop, and below the shield a "G" on each side, standing for "George Graham." This was surrounded by a handsome moulding of freestone, which had above it the date 1633. The arms are nearly the same in all respects as those of the present Duke of Montrose, with the exception of the chess-man, and a slight difference caused thereby in the third and fourth quartering, which may have been given effect to for distinction, or the chess-man may have been a part of his wife's family arms.* She was Marion, daughter of Sir Robt. Crichton of Clunie, by Isobel Borthwick, his third wife. The stone with the coat of arms and most of the mouldings I removed a few years ago to Skail, and erected a porch on the east side, on which I placed them. This was done for their preservation. Had they been allowed to remain at Breckness much longer, they would certainly have been destroyed, as parts of the walls subsequently fell in. On entering by the front door, which is about 5 feet 10 inches high and 2 feet 10 inches wide, and turning to the left, there is a room 15 feet long by 18 feet 6 inches broad, and between 8 and 9 feet high, and in the gable end there are two large archways, both at first sight like two fireplaces, the one 7 feet wide forming a recess 5 feet 4 inches deep, and the other 8 feet wide and the same depth as the former, which is the fireplace. The chimney vent is a large one, and some little distance up there is a stout beam which, according to tradition, was used for the support of a bullock or other animal while being roasted; and this may quite well have

* Since this paper was read Mr. Watt finds that the chess-rook is derived from the arms of Smyth of Braco who substituted an escallop for one of the chess-rooks.

been the case for the fireplace is large enough to hold and roast an ox of the present day, let alone the indigenous Orkney ox of 1633, which was "a peerie beastie"; and as the Bishop was given to great hospitality, it would often be all required for his numerous friends and retainers. Under the staircase at the west corner of the kitchen there has been a door leading into a room, likely the dining room or hall, the size of which was about 23 feet 10 inches long, 17 feet 6 inches wide, and 8 feet high. In it there is an arched fireplace 7 feet 6 inches wide, faced with freestone. On the right-hand side of the fireplace there are two small recesses or cupboards, and on the opposite side a window which looks out on the entrance of Hoy Sound, broad Atlantic, and distant hills of Sutherland; and there is another window 3 feet 9 inches high by 2 feet wide, commanding a beautiful view of the hills of Hoy. On the east end of the hall or dining room, and entering from it has been a room of 17 feet 6 inches by 12 feet 5 inches, and 8 feet high, with a small fireplace and a window of the same size as the others in the hall looking out on Hoy, also a small window 2 feet high by 1 foot 2 inches wide, in the N.E. corner of the gable.

From this room again there has been a door by which one could get direct to the kitchen, or to the stone stairs leading to the rooms above or out of the front door, which, so far as I can see, was the only outer door to the whole building, for the other outer door on the south side is of comparatively recent date. I am unable to give a plan of the rooms on the second flat, but fancy there must have been four or five.

Below the staircase, and off the passage leading from the

kitchen to the hall, there is a curious little closet with an outlook to the westward through a peephole 10 inches by 5 inches, cut out of a solid piece of freestone. It has been handed down from generation to generation by the old inhabitants of the township, that in this closet lived a noted and indispensable personage. He was none other than the famous Brownie of Breckness. There is no authenticated account of him, but it can be supposed that he was an uncanny looking little fellow, of small stature, with long arms and big head, and possessing, besides the power of "second sight," other qualifications needful in the case of one who, without doubt, acted as right hand help to the Bishop, not only in domestic affairs, but also as a faithful reporter of all the peccadillos of the folk in the surrounding district. It is also said that there is an underground passage leading from the house to the shore, and this passage no doubt Brownie was well acquainted with and took advantage of, when he had any secret mission to perform, as he could go and return without the inmates of the house knowing anything regarding his movements. It was therefore a case of Brownie here, Brownie there, Brownie everywhere, to the terror and consternation of the people for miles about.

Owing to the steepness of the roofs, the attics were commodious, and, doubtless, would have been portioned off for bed-rooms and keeping places.

The windows in the house were, as mentioned before, small and narrow, and they seem to have been strongly barred with iron, like prison windows at the present day. The outer door also was well secured from within.

Opposite the east gable, in the "ha' close," there was,

until within the last few years, a thick low building with a deep recess and an opening to it like an oven. It is said that this was the Bishop's oven where he had his bread baked, and I am disposed, from what I remember of its general appearance, to concur in this opinion.

In the middle of a small field between the house and sea, there is a "steethe," 39 feet by 18 feet, outside measurement, overgrown with grass, which, no doubt, was a chapel, and near it there are two stones, which, to judge by the distance between them, apparently mark a grave. There was, I understand, a burial-ground at Breckness, so this may be the place with the chapel in the centre. To the west or back of the present ruins of the main house, to judge from the existing foundations, there have been other houses which formed, with the ruins now standing, a quadrangle similar to that at Skaill at the present day.

In view of the interest attaching to them, I append copies and facsimilies of several documents in my possession, two of which are passes by Cromwell's officers in favour of John Graham of Breckness, the Bishop's son. The first, (fig. 2) signed by one "Ro. Sawrey," is dated at Kirkwall, 14 March, 1651, and runs as follows:—

THESE are to desire all officers and souldiers, by sea or land, under the commds of his Exelley. the Lord Generall Cromwell, to permit the bearer hereof, John Gream of Brackness, in the parish of Sandwicke, to passe to Brunt Island or Leith for his best Accomodation for the putting off of fower chaldron of Barlye, hee acting nothing that may be preduditiaall to the Army under the commde of the Commonwealth of England. Dated Kirkwall, March 14, 1651.

RO. SAWREY.

To all officers & souldiers by sea or land who these concerne.

The second (fig. 3) is dated at Kirkwall, 18th Oct. 1653, and is signed by "Tho. Salkins." The following is a copy :—

SUFFER this gent. the bearer hereof, John Grahame, to passe to Edenbor, with his servant and two horses, and backe again into Kirkwall into ye Isls of Orkney, without lett or molostation. Given under my hand att Kirkwall this 18th day of October 1653.

THO. SALKINS.

To all whom it may concerne.

Another manuscript of equal interest (fig. 4) is an order of protection in favour of John Graham and the inhabitants of Stromness, the date being 4 Mar. 1652, and the signatory "Rt. Overton." It reads—

I Desyr all Officeris & souldiouris under Command of his excelt. my Lord Generall Cromwell, to forbear to trubell or molest ye persouns, famiellis, goods, or geir of John Graham of Breknes & ye inhabitants of Stromnes, nor tak any of ther cornes, cattell, hors, or shep away, th[e]y acting nothing preuiditall to the commonwalth of England or Armie to them belonging.

Given under my hand at Kirkwall March 4th 1652.

RT. OVERTON.

To all officers & souldiouris whom these may conceirn.

The next document (fig. 5), of more general interest, is an order of date 2 Oct. 1654, by the "Commander in chief under Generall [Cromwell] of the forces on the North Syd Tay," and is signed by "Robert Overton." The original is somewhat blurred, but it would seem to read as follows :—

BY THE COMMANDER IN CHIEF UNDER GENERALL [CROMWELL]
OF THE FORCES ON THE NORTH SYD TAY.

Wheras upon good grounds it is to be suspected [the — — retaining] to a broken and scattred copasilie that many will this winter desert to the hilles and tack opportunities to do mischeiff as well to the contry and otherwayes: for preventing whereof it is hereby ordered that ye heritors and chief inhabitants of the severall and respective touns and parishes on this Syd Tay upon penalty of haveing ther cattell [taken

and the houses] in their bounds brunt; doe cause all susspitiones and stragling [persons to] be apprehendit and conveyet to the nixt garisone, there to be deteined [till] further order: And it is hereby requyred that the Commissioneris of the severall tounes and parishes aforsd. do caus this to be published the next markit and Lord's day after receipt in ther respective markit tounes and parish churches.

Datit at Aberdein the second day of octour 1654.

ROBERT OVERTON.

Considerable interest also attaches to a letter (fig. 6) from Bishop Graham to his son David Graham of Gorthie, who was closely related to, and an intimate friend of, the Great Marquis. The letter, a facsimile * of which recently came into my possession, is dated 11 March, but the year is not given. Probably, however, it was written in 1634. It runs—

SONE—I resaved your letier, and dois alow quhat ye heve done anent your teinds. I heve provydat for Blair his money, and send it with this berer to Edinburg, quhair I wold wis that he could caus resave it. I heve with it your band to Mungo, I purpose, God villing, to be thair before the terme to see quhat we may do for repaying Sir Johne: That sall be also if God ples provydet for at our cuming: our cais is wonderfull hard heir, our popill hes ettin the gretest part of the bestiall to save ye seid, yit for all that the half of all the countrie will ly ley, and of my aone labouring among the rest. I rest to meiting. With loving dewty to Ket and her son, your ffather,

GE., B. OFF ORCADD.

11 March.

* I am indebted for this letter to Miss Louisa Graeme, of the Inch-brakie family, who in her able work "Or and Sable," gives a graphic description of the last scene of David Graham's life.

I desire all officers & souldiers under command of his excellency
my Lord Generall Cromwell to forbear to buyeth or sell get
persons familieles woods or grey of the h. park of Bricknes &
the inhabitants of Stomnes nor take any of their fowles cattell
hous or ship away theye taking Nothing preiudiciall to the
common wealth of England or damage to them belonging
from vnder my hand, at Rwd-vall March 4 the 1628.

To all officers & souldiers
Whom there may concerne

R. OVERTON

FIG. 4.—ORDER BY RT. OVERTON.

Come I suppose you will not
 mind of the little thing at your end
 I shall probably be there for money &
 find it to be true & I doubt not of I
 would not be there and I shall be
 I shall be there to come to Wm. G.
 I am of course to be there before you
 come to see if we may do for you
 now I know you will be also if you
 will probably be at the end of the road
 it is better to be there of people for
 about the end of the year I shall be there
 I shall be there for the full of all the
 number of the year and of my own
 business I shall be there I shall be
 making it all for my little & for
 and for you

Your father
 Wm. G. Graham

11 Mar

FIG. 6.—LETTER FROM BISHOP GRAHAM TO HIS SON,
DAVID GRAHAM OF GORTHEE.

THE OYCE OF FIRTH.

By WILLIAM MACKAY, F.E.I.S.

IN order to treat this subject in a practical way, let us in imagination pay a visit to Finstown and there see with our own eyes the spot which this paper endeavours to bring under review. We set out, then, from Stromness, and proceeding on our way we are bound to observe that, though passing along an almost level road, we are at no time ten minutes' walk from salt water. So nearly, indeed, is the West Mainland bisected here, that a canal of about two miles long, cut from the Oyce of Firth to the Loch of Stenness, would form a water connection between Kirkwall Bay and Cairston Roads. When a stranger journeying from Stromness to Kirkwall crosses the water-shed at the dykes of Binscarth, he is astonished to find himself so soon again in close proximity to the sea, though only half way to Kirkwall. But more of this again. As we are not on an archæological expedition, we give only passing heed to those works of man, "hoary beyond tradition's breath," the Standing Stones and Maeshowe, which are to be seen on our left, but we rather concentrate our attention on, and give some consideration to, the work of a mightier and more aged hand as seen in the moraines and glacial drift which catch the eye all along our route, beginning with the knoll at Netherbigging, filling the whole district between Hobbister and Finstown with hummocks, and culminating in the twin

hillocks between, and partly through one of, which the public road passes on the opposite side of the valley from Binscarth house.

As the result of our cogitations on the why and wherefore of these rounded knolls that here dot the landscape, we arrive at the conclusion that they are the work of glaciers which swept with slow and silent yet irresistible force across the Orphir and Killilang Hills, and which during the latter part of the ice age deposited here those heaps of debris from the adjacent eastern hills. We do not fail to notice, also, that in the valley of Binscarth they are confined to the Finstown side of the valley, and that the whole of the opposite side has been brushed bare of excrescences as by the besom of a giant, thus proving that the direction of the ice flow has been from south or rather south-east to north-west.

Now let us wend our way down through the village and out the north road to the bridge. Taking our stand there, and directing our attention to the sides of the glen through which we have passed, we are struck with the terraced appearance of the hills on both sides. It is worthy of notice, too, that each successive terrace on the one side has a corresponding terrace on the other side of the valley. Further, it is remarkable that the dip of the strata on the north side is exactly the reverse of that of those on the south; so that one is given the impression that the edges of the strata on each side of the glen are the abrupt terminations of, at one time, continuous strata which then formed a great anticlinal curve; or, in plain words, that a hill once reared its head where now stretches the peaceful valley of Binscarth. And I am inclined to think this is no mere passing impression,

but really the only explanation of the facts of the case. That one of the "everlasting hills" has been swept bodily away from, and a deep depression left in, any place looks a bold assertion to make, but let us see what can further be said in confirmation of the theory.

We shall now walk round the shores of the Oyce itself. Everywhere there are traces of volcanic action as best seen in the trap dyke at the hillock near the bridge, and again on the north-west side near the banks of Binnaquoy. Perhaps not anywhere else in the county can the ebullition of the trap and its overflow be better seen than just below this hillock. The molten diabase has here spread over the sandstone and metamorphosed the immediately subjacent stratum, so that the latter is twisted and foliated into such shapes as to remind one of half opened books with the leaves crumpled. The trap itself is globular, and resembles bitumen. Our survey of the shores will convince us that the space now occupied by the Oyce has at one time been the scene of volcanic action. Now, what I wish to bring out is that this ebullition has so weakened the base and shaken the mass of the superincumbent strata that the entire bulk has been crushed on before the Herculean push of the advancing ice river : and that ever as the great glacier received fresh supplies and slowly but surely proceeded, it still further eroded the weakened strata so that the bed of the Oyce was hollowed out.

The Oyce has not always been what it now is,—an arm of the sea at high water and a stretch of mud and sand with low water. Beneath a few feet of surface sand and mud is a considerable depth of peat, under which there is marl to an unknown depth. The farmers in the neighbourhood

were used to dig this marl and therewith manure their fields. Some twenty years ago, when thus engaged, a farmer dug up the antlers of a stag and the bones apparently of the same animal *in situ*. A fresh water tarn then must have existed here which, in the course of time, after the retreat of the *mer de glace*, has been filled up by the creatures whose remains form the marl; then water plants have grown thereon and decayed, forming the layers of peat; and, lastly, the alluvium brought down by the burns has been deposited on the top of the peat. The fact of its now being at sea level is of course accounted for by the general subsidence which took place when the British Isles were separated from the continent of Europe.

Ramsay, in his "Physiographic Geology of Great Britain," ascribes to glacial action the scooping out of the depressions in which rest the waters of our Scottish lakes; and Geikie, the Duke of Argyle's feeble refutation notwithstanding, has established the geological truth that the Scottish hills are not *real* mountains or puckers in the earth's crust, but the results of glacial and other denudation, the mountains themselves having been hurled into the depths of the sea. Is it not pretty apparent that the existence of the Oyce of Firth is due to the same denuding agency? Nor is the scope of this agent's work traceable only here. Assisted by volcanic action in weakening the strata, it was the potent arm that ploughed the whole depression that, as has been already said, so nearly here divides the mainland. Diabase and trap are met with more or less all round the shores of the Bay of Firth; at Rennibister, on the beach below the churchyard, at the hillock and north-west side of the Oyce before mentioned, at the north shore near the boat-house of

Bunnyarow, etc. And if the bed of the bay were laid bare no doubt like traces would be found. Indeed, about 200 yards off shore from the battery, the water suddenly deepens several fathoms, and there is there a hollow equal probably in extent and similar in origin to the Oyce. Over the whole bay and right out to Shapinsay, in which island the same evidence of volcanic action is manifest, there have probably taken place feeble outbursts which have rendered the sandstone strata, perhaps afterwards deposited on the molten matter, specially susceptible of glacial denudation. At any rate the valley of Binscarth and the Oyce of Firth are no *Syncline* or even "fault" like that so apparent at Scapa; and from the evidence which the phenomena everywhere present, we are prepared to conclude that during the ice age, when a great part of the Northern Hemisphere was as Greenland still is, clutched in the embrace of the Frost King, the grinding, tearing, pushing force of the great continental glacier as it advanced from the Norwegian hills over the ground now covered by the North Sea, and across our islands, has swept before it the *anticline* which we assume to have existed here. That small elevation which we see behind Finstown is no doubt one of those *roches moutonnées* so common in the Swiss valleys and in the Highland glens; and its presence there is partly accounted for by the fact that diabase occurs in the burn of Bellaquoy which runs through the valley separating this elevation from the Heddle Hill.

As the ice age drew to a close, small local glaciers took the place of the sea of ice, and hence the moraine which is so patent to the eye all to the north-west of this *roche moutonnée*. Before ending the geological part of the paper,

I may add that terraced hills are a remarkable feature of Rousay scenery, conspicuously so immediately above Westness. The same gigantic power has there been at work. It has dragged along its relentless course, forcing before it the mountain mass that erewhile filled up Rousay Sound, leaving as wrack behind it the *roches moutonnées*, Gairsay and Eynhallow.

Now let us go on to consider the Flora of the Oyce. The land all round it is peculiarly rich in the variety, abundance, and luxuriance of its flora. This is due to the circumstances of its sheltered situation, the calm shores affording excellent ground for the production of salt-marsh plants; and its soil in some places being the results of "weathered" trap. To name all the flowers found in this neighbourhood would be to give almost the complete flora of the county with the exception of about a score plants, chiefly Alpine. The following list has been selected because it embraces those either that are rare in Orkney (such as the first eight) or that grow here more abundantly than I have seen them anywhere else. They are for this reason not arranged in orders:—

Sea Tassel *ruppia rostellata nana*, a variety not found elsewhere; Michalmas daisy, *aster tripolium*, found also at Rocks of Quendale, Rousay; wild strawberry, *fragaria vesca*, not elsewhere in Orkney except at Westness; wood germander, *teucrium scorodonia*, also found at Naversdale, used formerly as a cure for jaundice; the bugle, *ajuga pyramidalis et reptans*, very scarce; great wild valerian, *valeriana officinalis*, found also in Hoy; sea spurry, *spergula marina*, found at the Ayre and at head of Stromness harbour; jointed glasswort, *salicornia herbacea*, also found at

Swanbister and Peerie Sea; sea pearlwort, *sagina maritima*; sea campion, *silene maritima*; sea milkwort, *glaux maritima*; scurvy grass, *cochlearia officinalis*; mountain willow herb, *epilobium montanum*; wild angelica, *angelica sylvestris*; shepherds' needle, *scandix pecten veneris*; goose grass or cleavers, *galium aparina*; thrift or sea pink, *armeria maritima*; spreading fruited orache, *atriplex babingtoni*; the squill, *scilla verna*; common dog rose, *rosa canina*, (two varieties); bog pimpernel, *anagallis tenella*.

The Fauna of the district may be disposed of with the simple statement that the living creatures of all classes are, so far at least as I am aware, in no respect different from those of similarly situated localities in the county.

The only object of interest from an archæological point of view is the Picts' house near the bridge. When the hillock or mound which covers it was opened up some years ago the usual appearance of such structures was presented. The stone cists dug up in Firth a few years ago were not found so near the Oyce as to call for description in this paper.

With reference to the Etymology of the name, I just quote that given in "Tudor's Orkney and Shetland":—"Oyce, a lagoon formed by the erosive action of the sea (?) throwing an *ayre* or bar of shingle alone, or shingle and sand combined, across the head of a bay; Icelandic, *Oes*."

MANUFACTURE OF STRAW ARTICLES IN ORKNEY.

BY WALTER TRAILL DENNISON.

IT may at first sight be thought that a more uninteresting and insignificant subject on which to speak than straw could scarcely be chosen. Yet it will be found that the apparently insignificant things in nature become some of them the greatest bane, others the most essential blessings to mankind. As an example of the former, witness the invisible bacteria that are the propagators of disease and death in the animal and vegetable worlds. And in the beautiful stalk or straw, nourishing and supporting what is to man the "staff of life," we have a fair example of the latter. By a wonderful process of nature, flint and other unlikely substances are formed into a marvellous tube, firm yet flexible, and filled with vessels by which nutriment suited to the various conditions of growth is conveyed to flower and seed; and at the same time holding up, as if with feeble and yet loving hand, first the flower then the fruit to be kissed by the sun. But it is with the manufacture, not with the natural history, of straw we have to do. It is presumable that our subject may not be wholly uninteresting at least to Orcadians.

The Orkney peasantry of the last bygone two centuries lived in a poor country, destitute of wood, iron, and hemp from which to construct necessary implements and rope;

a country ground down by the tyranny and exorbitant taxations of greedy and unscrupulous rulers; a country whose inhabitants had neither the raw material from which to construct nor the means of purchasing necessary utensils, and it is certainly interesting to see how our forefathers adapted themselves to and overcame the sinister circumstances with which they were surrounded.

The materials from which articles of straw were made were principally bent, and the straw of black oats. Bent, after being cut, was loosely bound in rough sheaves and exposed to the open air to dry and wither. It was then firmly bound into neat sheaves, called baets, the legal size of which used to be two spans in circumference. Each baet was carefully plaited at the upper end, gradually tapering upwards till it ended in a cord which served the purpose of binding two baets together. Each pair of baets so fastened was called a "band of bent," twelve of which formed a thraive. From bent was made cords, always called bands, used in the manufacture of straw, the thickest being called tether bands, and the finest stül bands, that is stool bands. During the long winter evenings each ploughman was required to wind into cord one baet of bent. Such cords were spun by the fingers, and consisted of two coils or folds first twisted singly, then into each other, the tendency of each coil to untwist being dexterously used as a means of maintaining the two coils together when united.

The next raw material of our manufacture is common oat straw. For purposes of manufacture, the straw of the common Orkney black oat is the best, uniting in itself more than any other cultivated kinds the qualities of toughness and flexibility. The straw to be used is not threshed with

flails, as this would spoil it, but it is selected from the sheaves, held in a bunch between the hands, and beaten on some hard edge to remove all grain. Such straw is called gloy. From these two materials, bent bands and gloy, it will be seen that the Orcadians manufactured a large number of articles not only useful but absolutely necessary to them. In saying this, I am quite aware that heather was largely used instead of straw, but I confine myself to the latter material.

The articles made from straw may be classified as follows :—The flexible, the semi-flexible, and the inflexible. The first to be noticed under the flexible, are straw and bent ropes and cords. The simplest and most primitive of these is the sookan, or, according to its older name, the wislin. The sookan is simply straw twisted together in one fold so as to form a loose cord, suitable only for temporary use. It is much used for tying straw into bundles, called hallows; and from the nature of its twist had to be wound round what it held together while being made, or else had to be wound up in a clue so as to preserve its twist. The sookan was once much used for making what was called strae büts. A fine loop of the prepared sookan was passed under the instep, the sookan being thereafter wound round the ankles and the lower part of the leg. Such straw boots formed the most comfortable part of a peasant's winter dress. He had no hard roads to negotiate, and with his straw-lined rivlins and straw boots could travel in comfort, the gentle friction of his feet on the soft ground or cold snow sending a genial glow over his whole frame. Clothed in his straw boots, the Orkney peasant sat for hours in miserably damp churches with greater warmth and comfort than ever came

from the French-topped boots or warming pan; and his rivlins bred no corns. How times do change! Fifty years ago, on a Sunday, when snow lay deep on the ground, forty men wearing straw boots were seen in an Orkney country church. This is remembered from the fact that, on his road home from church, an old Pharisee blazed forth in great indignation against the forty sinners who had desecrated the Lord's house by winding their legs in straw!

Next in our order comes the simmans. This is a strong straw rope formed of two cants twisted together, and spun by hand alone. When spun and "raked," that is stretched, it is then wound into large clews the width of a barn door. The great use of the simmans was to thatch the crop and the roofs of houses. A newly-thatched cottage, showing the bright warm colour of the straw ropes, formed in an Orkney landscape an object which, by contrast of colour, was gratifying to the eye. Very different is the aspect of cottages thatched with heather ropes, the eye being repelled by a grim, dingy roof and huge peat stack black as night. And yet, even here, nature is more tastefully ornamental than man, for on yon cottage, that seems roofed in a funeral pall, nature has done her best to compensate the ugly work of man's hand by covering the hut's low walls with her lovely green and yellow lichens. But if the Orkney peasant ever had any love of the beautiful, that quality must be driven out of him by glaring white lime and cold grey flagstone roofs. Most of the ropes and cordage required by the Orkney farmer were made either of hair or bent. The bent bands already noticed were made into ropes on a rude machine called the "tether-

garth.” Such ropes were used for tethering sheep and cattle, and as cables to small fishing boats. These cables were called boat tethers. Besides these thicker ropes, finer bent ropes or cords were applied to a great many uses, such as flail hoods, sheep shekels, halters, and what are now called head leathers for horses; while all parts of the farm-horse harness, from the clavo-band to the click-band, were formed of bent cord. The “sitherhips” (breeching) were formed by plaiting bent cord into a thin, broad belt. The maze was made by working the cord into a net, in which the sheaves were suspended on each side of the horse when bringing in the crop. On reaching the corn-yard, the upper edge of the outer side of the maze was lifted from the horns of the clibber and the net unfolded, allowing the sheaves to drop out. A very important part of horse harness, that is the collar, or the “wazzie,” was formed by twisting four thick folds of straw together, and, when properly made, I suspect the wazzie was much cooler for the horse than the modern collar with its absurd cape. The whole of the horse harness, except the breeching, and all the plough traces were made of bent ropes, which, if quickly worn, were easily replaced.

The next to be noticed are “flackies”—mats made of straw, and bound together with bent cord. Such mats were applied to many uses. In beds they occupied the place of the modern palliasse, and a small round mat was sometimes placed on the floor in front of the bed to protect the feet from the cold clay floor. Large flackies were sometimes used in stormy weather as an apology for inner doors; and smaller mats were used as door-mats in the more well-to-do houses. Flackies were almost always used

at kiln doors during the process of drying grain. Horse flackies were laid over the back of the horse to protect his back from the friction of the clibber, and his sides from the rubbing of the creels. Flackies were often fixed on the rafters, before laying on straw, when thatching house roofs.

Formerly, when rents were paid in kind, and grain had to be stored till summer, farmers not having lofts had to store their grain in what was called a "beek." Here again necessity was the mother of invention, and the Orcadian had recourse to his never failing helper, straw. Grain had to be preserved sweet and fresh in colour and smell, while its owner had no storage for the grain. In this dilemma the Orkney farmer constructed a "beek" in which to store his grain. To make a beek, a number of large flackies were sewn together so as to form a long web of straw matting. A spot of dry ground, generally in the cornyard, was chosen, and on it the web was unrolled, and set on edge. Both ends of the web were then made to meet, and when sewn together, you had a circular enclosure, within which, first a layer of "shillin' sids" (oat scrubs) was spread, and then a layer of straw. Into this enclosure the grain was poured, and as the grain gradually rose inside, the thin straw wall was supported and kept firm by simmans which was made to encircle it, and when the beek had been filled, the centre was raised with straw, covered with drawn straw, and thatched all over with the simmans, the top forming a handsome cone.

We next come to what I call the semi-flexible. The first to be noticed in this class is the miels-kaesie, at one time universally used in these islands instead of sacks. It was made of straw bound by bent cord in the same manner as,

but of a closer texture than, flackies, and took the form of a large and flexible straw basket of an oval shape. When filled, and its mouth laced close, it exactly resembles in shape the European cowry. The miels-kaesie derived its name from the fact that it was intended to hold a miel, that is a certain weight of bere. As a miel of malt was larger than a miel of bere, those intended for holding malt were called mawt-kaesies. By a jury court held at Kirkwall in 1826, the miel of bere was fixed at 116 lb 7 ozs.

When rent or the superior duty was paid, these kaesies were filled with grain, fastened to the clibber and suspended one on each side of the horse, and in this way conveyed to the place of shipment. Each kaesie was then weighed on the bere or malt pundler. It gives a glimpse of the primitive state of matters in bygone days to know that during the process of weighing, the pundler was hung from the middle of a long pole, each end of the pole resting on the shoulder of a man. The miels-kaesie was also used for carrying grain to and meal from the mill. In this case each horse carried a full kaesie on each side. The horses were made to travel in Indian file, each horse being tied to the tail of the horse in front of him. A man attended every pair of horses and saw to the proper balancing of their burdens, while the grieve or barn-man led the foremost horse. To see twenty or thirty horses with a huge hamper on each side, all marching in single file, was a picturesque sight. On arriving at the mill and the burdens being removed, the foremost horse was tied to the tail of the hindmost, and the horses were left in this position till their drivers were ready for home, additional fastening being unnecessary.

The next was the corn-kaesie, of the same texture as the

miels-kaesie. It was shaped like a barrel, and was used for holding dressed grain. These kaesies were of different sizes. Then comes the common kaesie used for carrying burdens on the back. Though different in size they were all of one mould. They were narrow and rounded at the bottom, gradually widening towards the top, which was finished by a stiff circular rim called the "fesgar," to give firmness to the basket. To the fesgar, at suitable distances from each other, were fastened the two ends of a bent rope called the "fettle." By this rope the kaesie was suspended from the shoulders of the bearer, while his arm was placed through the loop. When the journey was long the fettle was passed over both shoulders, but when the distance was short and speed in discharging was required, the fettle was twisted together and placed on one shoulder, so that the bearer could fling off his burden without delaying to bring the fettle over his head. These kaesies were used for almost every kind of burden, indeed young children were often carried in them by their mothers.

To the same class as the kaesie belong the cubbies, the names and uses of which are legion. Cubbies are slightly smaller than the kaesie, and vary in size according to use, while they are firmer in texture and of different shapes. There were the windo cubbie, from which the corn was gently dropped while being winnowed, the kiln cubbie, the sawin' cubbie, and the horse cubbie, the last mentioned being used as a muzzle for the horse's mouth while driving in the corn; and in addition, the hen cubbie, the ass cubbie, and the spoon cubbie. The spoon cubbie was generally hung at the side of the fireplace and held the family horn spoons, the handles being uppermost so as to be easily grasped when

required. And finally there were the sea cubbie and bait cubbie, the former for carrying fish and the latter for bait, both being of more open texture than the others mentioned.

Cubbies were always carried by the beggars who swarmed in the country before the introduction of the poor law. And to say a man would have to take to the cubbie and the the staff was equivalent to saying he would have to beg his bread.

Our next and last class is what I have called the inflexible. The first to be noticed in this division is a round foot mat, once much in vogue. It was circular in form, close and firm in texture. On one side the ends of the bent of which the mat was formed were made to rise above the surface, so that the upper side of the mat presented a kind of brush work, very effective for the purpose intended. But these mats were not durable, and are now little used. The next in this class is the luppie, once in universal use as a domestic basket, for holding all sorts of dry goods, such as eggs, meal, burstin, etc. They are now, I believe, wholly out of use. Luppies were round, barrel-shaped vessels, close in texture, and firm as a board. They varied in size from three feet to ten inches in height. They had a rim which encircled the lower end to protect the bottom, and two "lugs" on opposite sides at the top. The smallest of these luppies were used by housewives as work baskets. The work done on these luppies and on the straw stools was considered the finest and most durable. Small coils of straw, or, as they were called, gongs of straw, were firmly and closely laced one over the other until a large surface was obtained. The lacing cord was made of the strongest bent, and was the finest bent cord made, having

the protruding end of bent carefully clipped off. These cords were called stool bands.

We now come to the straw stools which, with the exception of some apologies for stools, were of three kinds. First, a sort of low round stool without any back. These were easily lifted to and from the fireside; and on an emergency, could be converted into luppies by turning them upside down. The next was what was called the low-backed stool, having a half circular back reaching to the shoulders of the sitter. These and the former were in most common use. Last and largest comes the high-backed or "heeded stül." This stool was at one time the easy chair of the Orkney cottage. Nowadays the lower part or seat of the stool is made of wood in the form of a square box with a foot fastened inside each corner. The top boards of this box project a little over the side, and form the seat of the chair. On each side of the seat box and about nine inches from the front, a thin slip of strong wood is nailed, the upper ends of the slips rising to the point at which the spring of the arched head begins, and from each of the front corners another slip of wood rises to a height of nine inches. From the top of these slips other slips run back to, and are fixed on, the side slips, and these horizontal slips are intended as elbow rests. From the top and back of this wooden frame rose the straw back of the chair. The head or hood of the stool was then formed by gradually contracting the back and sides of the straw work, while the front of the hood rose in the form of a wide arch. The seat box generally contained a drawer in which the goodman kept the bottle with his supply of snuff, along with the cottage library, often consisting of "Baxter's Saints'

Rest," the book of Proverbs, and a few dogeared and soot-stained chap books bought at the Lammas Fair. This is now regarded as the orthodox form of the old high-backed stool, but it wants the elegance of form and fine curvature of lines possessed by its ancient predecessor. Sometime towards the end of the first half of the eighteenth century a native of North Ronaldshay invented the wooden seat box, and, as nailing a few boards together took far less time than working the lower part in straw, the invention was universally adopted. Hitherto the lower part of the stool was quite round, and along with the seat wholly of straw. The side slips and elbow rests were entirely covered with straw and bent cord, so that no wood was seen in the stool save its four feet protruding a little below the edge of the straw work. This more ancient form of the stool was more elegant than its successor, and presented no sharp angles to the eye. The high-backed was generally the goodman's stool, the goodwife preferring to sit in the low-backed stool, from which her view of the whole room was uninterrupted.

GLACIATION IN ORKNEY.

By MAGNUS SPENCE, F.R.P.S.E.

ANY one looking, however superficially, at the general outline of the Orkneys, must have been struck by the nicely rounded hummocky appearance of its hills, the green, often fertile sea margins, valleys and plains; the lochs with their peculiar configurations; the mounds of angular stones and debris scattered over many plains and hill sides; the general trend of its sounds and fiords; the terraced and fluted hill-sides; the valleys strewn with moraine heaps; and the almost bare hill-tops, with a gradually increasing covering of clay as one descends. There is no doubt that the most active and important agent to give the county its present physical aspect was ice, during different periods and under varying conditions. The clay underlying most of the soil and peat of Orkney consists of firm, tough, tenacious, adhesive matter, mingled with stones which have been rubbed, smoothed, and striated. Shells are found amid the clays of Orkney and Caithness, as high as a hundred feet above sea level. The presence of shells, polished striated stones, and other features of our landscape have only been satisfactorily accounted for by the agency of moving ice.

Most geologists are now agreed that Great Britain, except the more southern portions, has been subjected to the eroding and abrading power of ice, during at least three periods, with long intervals of milder climatic conditions—

interglacial periods. The only periods I shall consider, meantime, are the maximum glacial period, which was the last of the great recurring epochs, when most of Great Britain was submerged under an ice sheet, and a later ice period of limited extent and local distribution.

The evaporated moisture, as every one knows, falls either in the form of rain or snow. When it falls above an ever varying line, called the snow line, it falls as snow; below, as rain. This snow line descends to the plains in Arctic Regions, and we know that in countries such as ours Arctic conditions prevailed at one time, from several causes which there is no time to particularise. As the snow became heaped on the hill-tops the pressure helped to convert the lower strata into ice. This accumulation could not go on *ad infinitum*. Relief had to be got somewhere. The pressure of the accumulating ice, and the force of gravitation, forced the ice cap to very slowly slide down the hill, till an increased vigorous climate prevailed. The lower hills and valleys were ultimately covered by an ice sheet which was nearly on a level with the highest hills of Scotland. The tops of some of the Grampians and other Highland chains alone rose above this general *mer-de-glace*. In whatever direction the ice proceeded at first, it finally moved in a southerly, easterly and westerly direction from the few higher mountain chains alone of England and Scotland. Meantime I am only concerned with that moving eastward, which crossed Aberdeen and the Moray Firth. No doubt a northern trend was given to this moving mass by hugging the shores of Banff and Aberdeen, and by the high grounds of the latter.

Another great ice sheet, of similar origin and of larger

dimensions, flowed from the highlands of Scandinavia, westwards, over the bed of the North Sea; and as this sea seldom attains a greater depth than 100 fathoms between this and Norway, the *mer-de-glace* must have replaced all the water and been grinding along its bed. These two immense sheets met there. To the south this sea was already blocked with ice from the the highlands of England and the Continent. The easier outflow seems to have been across Caithness, Orkney, and Zetland, and no doubt this, an easterly direction, was taken mainly owing to the influence of the much larger ice sheet of Scandinavia.

For a considerable time it was a puzzle to geologists how marine shells should be mingled with the boulder clay of Caithness, which was at first believed to have been carried there by ice moving north from the highlands of Sutherland. The difficulty about the shells was explained when it was proved that the ice moved from the sea across Caithness. That this was the direction has been abundantly proved by the striation of exposed beds of rock, which, especially on the lower grounds, are invariably grooved from S.E. to N. W. This great *mer-de-glace* then moved from the S.E., and owing to its immense pressure, and slow, steady movement, ground down the very ribs of the earth, producing an almost homogeneous clay that was deposited along the line of advance, sometimes, as in most of the East Mainland, grinding down the red sandstone and carrying it often for miles and depositing it as a tenacious reddish clay where grey flagstone alone underlies; in other places carrying red sandstone boulders, rounded and smoothed, to distances of considerable extent from their native beds. Boulders of red sandstone have been found in Westray which could

only have been carried there from the red beds of Eday, and by ice. They are also to be found to the N.W. of Deersound, where they have been carried from Deerness. In the West Mainland, again, the boulder clay consists of a yellowish, occasionally a bluish, clay, according to the nature of the rocks lying to the south-east, from which the clay was manufactured and carried. One has only to notice hills, as Bigswell, Wideford and Greeny, to see that this immense force—3000 feet thick—has pared and rubbed the three exposed sides to the quick; but on the lee side, the N.W., a tail of boulder clay, in some cases 100 feet in depth, has been left mingled and polished with striated stones, each one of which has its narrower end and longer axis pointing in the direction of the glacial movement. On the shore of Deerness there is a reddish boulder clay about 80 feet in depth, packed with smooth striated stones and shells. The reddish colour is owing to the colour of the sandstone from which it was manufactured. On the authority of Professor Heddle, St. Andrews, a boulder in Sanday has been carried from Norway. Messrs Peach and Horne state that blocks of foreign origin are to be found in the Orkneys, consisting of chalk-flints, felsite, limestones, etc.

Let me now consider what obstruction the hills of Orkney would offer to this great movement. The ice sheet has been computed to be 3000 feet thick, or twice the height of Hoy Hill. The rate of motion varied from four to eighteen inches per day. To glean these facts one must learn what is taking place at present in Greenland, where an ice sheet of large dimensions is yearly moving seawards, and calving its icebergs regularly and continuously, as did the one under consideration, during the glacial period. The

glacial ice rivers of the Alps, with their moraines and ground rivers, although teaching us many and valuable lessons, are mere pigmies to this enormous sheet, to which we are indebted for many pleasing features of our landscape. When this prodigious mass of ice met with any obstacle, as a hill, owing to the plasticity of the ice, which moves and adapts itself to the irregularities of the ground, much as treacle or tar would if pushed forward, it had little difficulty in overcoming the obstacle. In fact, if it were not for this viscosity of the ice, immense accumulations on mountains, like the Alps, would not move by the force of gravitation towards a lower level to be thawed, and to repeat its various phases of evaporation, condensation, and crystalization.

As this *mer-de-glace* moved forward, it carried in its bosom accumulations of debris and stones from beneath, but when it rounded hills like Hoy it pared down their sides, carrying away immense quantities of rubbish at different heights from their bases, according to the altitude of the hills. The ice, after rounding the hill, congealed again, with these innumerable tons of debris mingled, at least, throughout half its lower depth.

Terraced hill-sides is another feature of glaciation. Whenever the ice ploughed along the sides of hills, I have stated it carried away an immense quantity of debris. When the dip of the strata which constituted the hill was considerable, the abrading force of the ice was pretty generally distributed, rubbing off the harder and softer strata alike; but when the strata was nearly horizontal, this eroding giant cut down the softer beds of shale, etc., more readily than the harder ones—for every one must have noticed in several sections of the Old Red Sandstone series

the alternate hard and soft beds. The harder rocks would resist the eroding process more readily and leave platforms of hard beds. This would give the hill-sides a terraced, fluted appearance, which is just what one sees on some of the Rousay hills, especially Kierfield. The same is seen on Fitty Hill, Westray, where some of the hard beds are exposed—smoothed and striated for several hundred yards.

The lochs of Orkney may be considered in three classes:—
(1) Those formed by hollows in peat, and generally small;
(2) those where the water is dammed up in a hollow by boulder clay or moraine matter; (3) rock basins which have been entirely scooped out of the rock by the abrading power of moving ice. The small lochs of the first class are fairly numerous. Those of the second class are generally dammed up on the seaward side, as Græmshall Loch, Holm, Housby, Birsay, one or two of the Rousay lochs, etc. The third class comprises all the principal lochs in Orkney, viz.:—Lochs Stenness, Harray, Kirbuster, Orphir, Boardhouse, Hundland, and Swanney. The longer axis of each of these lochs runs in the same direction as the trend of the ice drift during the maximum glacial period. The explanation generally accepted is that when the ground was inclined at a relatively steep angle throughout the whole course of a glacier no rock basin could be formed. It was only when the relatively steep gradient was interrupted by comparatively level reaches that the conditions requisite for the excavation of loch basins were obtained.

When the lower portion of the ice sheet was deflected, as it would be by the Wasbister Hills in Sandwick, the abrasion would be all the greater, as we find in Loch Stenness where I understand the deepest part of the loch is west of the

Standing Stones. All the middle part of Loch Harray is very shallow, leaving in its upper and lower reaches two lochs of considerable depth, each with its longest axis in a north-westerly direction. The Kirbuster Loch, Orphir, is another very good example of the scooping power of the lower sections of the ice-sheet on its north-westerly trend, when it became contracted between the Wart Hill and Keelylang. The immense pressure of the congealed ice above, squeezing down on what was compressed between the hills below, exercised a grinding power of extraordinary energy. The loch of Boardhouse is another instance, where the ice became contracted between Kirbuster and Ravey Hills. Hundland and Swanney Lochs are other clearly marked instances.

If you take a glance at a map of Orkney and notice the trend of its principal sounds, you will notice that the most important ones run in a north-westerly direction. Hoy Sound, Enhallow Sound, the String, Holm Sound, etc., owe much of their present depths to this powerful eroding agency. The hills and valleys of Orkney were thrown into shape by other forces of nature long before the *mer-de-glace* of which I write acted on them; but much of the deepening and rounding process was done by the agency of ice. What a deepening power the ice contracted between Rousay and Evie would have we can scarcely conceive. Sometimes we find the deepest part of the sea in the immediate vicinity of high hills where, as in the island of Rum, the under currents of deflected ice have excavated a deep semi-circular collar round half the island. Round the north side of Stroma, where the island is—taking into consideration the height above the level of the bed of the Pentland Firth—

over 300 feet, the lower section of the ice, which would have been deflected considerably to the north, has channelled a semi-circle of deep water much deeper than the neighbouring bottom. In Scapa Flow the ice sheet had few interruptions till opposite Houton Head where it was very much contracted between Orphir and the Walls and Hoy Hills. Here, as we would expect, we find the deepest part of the Flow, which varies from 30 to 37 fathoms. The deepest part of this depression is where the largest deflection occurred, viz., near the coast of Hoy and Walls, which reaches 37 fathoms. Then, again, in the String the same takes place. The deepest water occurs near the highest land opposite Work Head, and where the deflection was greatest. The same occurs off Rerwick Head, St. Andrews, and Moul Head, Deerness. I need not multiply cases.

The portion of my subject which has given rise to most discussion and difference remains, viz., the gravel mounds, terminal moraines, etc., scattered over the valleys and lower hill-sides. The theory that icebergs, in shallow water, grounded here and there and left deposits of debris in various shapes, for a long time satisfied many geologists. But like many theories it has given place to one that is more reasonable, and explains difficulties which the former did not.

After a long continuance of Arctic climatic conditions during the ice period, a time came when the temperature was less rigorous, and when the snow which fell during winter was melted during summer. Then no more accumulations of snow were heaped on the hill-tops, and consequently no further movement of the great ice sheet we have

been considering took place. During the summer, under milder climatic conditions, the sun thawed the top; streams and rivers were formed on its surface, and as the ice-sheet was gradually reduced in thickness, a large amount of the debris which had been embedded in its matrix came to the surface to find its way along streams and channels to the different terminations of the ice-sheet. As the milder climatic conditions prevailed, the remnant of the great *mer-de-glace* would get broken up on the plains. For some time there would occur intermittent periods of advance and retreat. The streams on the surface of the ice were falling over the precipitous terminus and depositing mounds of mud and gravel. Many of the mounds spread over the low grounds of Stenness and Harray must have had such an origin. Not otherwise could they have maintained their rounded hummocky appearance. Others of a more shapeless structure and irregular formation are accumulations known as bottom-moraines. These ground moraines are simply the debris carried to the extremities of the ice by under currents—fluvial deposits from beneath the ice. Such a great change could not have supervened suddenly. Cold Arctic conditions would only slowly disappear; long after the ice sheet had vanished from the plain, snowfields and glaciers would linger in the higher regions and form local centres of ice radiation. The time once more arrived when the local glaciers succeeding the great *mer-de-glace* entirely disappeared and mild conditions intervened. To try to explain the causes of all these climatic conditions is a subject too involved and too elaborate to discuss in a short paper; but if anyone desires further information he will find it in "Climatology," by

the late Dr. Croll, the first who satisfactorily explained the interactions of warm and cold ocean currents.

Once more a period of something approaching an Arctic climate prevailed, but of small extent compared with the one I have been endeavouring to describe. This time all the elevations in the Highlands of Scotland were covered by an ice cap somewhat similar to the conditions obtaining at present in Switzerland. As, however, some doubt exists as to the relative time of these last local glaciers, I will quote from that admirable work by Dr. James Geikie, "The Great Ice Age":—"The youngest boulder clay of the Baltic regions, on the other hand, is the product of a much more restricted ice-flow. With what stage in the British series then was the great Baltic glacier contemporaneous? We can hardly doubt that our district ice-sheets and local glaciers were its equivalents in time. And as the advent of the great Baltic glacier was preceded by a well defined and long continued interglacial epoch, it is obvious that similar climatic changes must have been experienced in our islands. After the dissolution of the last great ice-sheet in Scotland—that, namely, underneath which our so-called upper boulder clay was accumulated—a long interglacial period must have supervened. When at last these milder conditions had passed away, an Arctic climate again prevailed—district ice-sheets and large local glaciers coming into existence in our mountain regions." Each hilltop of moderate elevation formed a centre of ice radiation. Small glaciers this time flowed down in all directions. Such centres as the Wart Hill, Orphir, Hoy hills, Stenness and Firth hills, Holm, etc., had each its own glaciers which carried the debris from the hill-sides to the valleys below.

When the small ice-sheets of uneven thickness came to the valleys the temperature was such as thawed in summer most of the winter accumulations. A position was then taken up by the ice beyond which the comparatively mild temperature did not allow it to advance. We know that both by the water under the ice, which carried great quantities of clay and stones to the terminus of the ice-sheet, and from the material dropped from the hill sides into the matrix of the ice, accumulations of debris were being continually heaped up. These you can best observe near the foot of the Stenness hills, at each side of the Holm hills, at the foot of Greeny Hill and elsewhere. They are terminal moraines, and differ from these mound-shaped accumulations which we have considered as being carried by the surface ice-rivers of the maximum *mer-de-glace* of a former period. I have already stated that the strongest evidence adducible that this county was immersed in, and abraded by an immense ice-sheet can, by careful observation, be seen on the surface of the rocks immediately underlying the boulder clay—striated surfaces from S.E. to N.W. That a milder interglacial period intervened cannot be demonstrated clearly, only by inference. The conditions, however, which preceded the Baltic glaciation, which was contemporaneous with our district glaciation, no doubt also preceded our last diminutive glacial epoch. The proof of the last minor glacial period is to be found in the striated surfaces which show lines radiating in all directions from the highest hill-tops. These have been shown by Messrs Peech and Horne in several instances in Shetland. The same gentlemen have observed them on the sides of the Hoy and Orphir hills, and their authority is unimpeachable.

Since these two glacial periods there has been considerable weathering of rocks by atmospheric agencies; but when allowance is made for all such, the hill shapes, valleys and lochs remain much as they were left by the mighty ice-giant which moulded them into shape, and gave the hills that mammillated and smoothed appearance so characteristic of these islands.

At the close of the glacial epochs which I have roughly sketched, the climate began to ameliorate, and most of the land was clothed with Arctic plants, a few of which may still be found on the Hoy Hills. Subsequently the climate became excessively wet and damp, and in every way favourable to the growth of those plants by which our peat bogs have been built up. Many of these are still with us, chief of which are the different species of *sphagnum*. As the present climatic conditions are unfavourable to the growth of peat bogs, and, leaving out the destruction of bogs by man for his domestic use, it is questionable if the denudation of bogs by rain does not more than balance the growth—for there is still a slight growth—of peat bog.

There are two conditions in connection with peat growth that require a word in passing—first, growth of forests; second, submergence of peat bogs. At one time trees grew in our bogs in considerable abundance. Sometimes they have been found at the bottom of the bogs, but more generally in the middle. The trees consisted of hazel, silver fir, different species of willow, etc., and must have extended in area so as to constitute small forests. The same holds good for the Lewis and other places on the west coast where trees refuse to grow at present. The main obstacle to the successful growth of trees is believed to be

exposure, and the salinity of the atmosphere. At the time when these forests flourished conditions must have been different from the present. But before pursuing this subject further we may revert to the other common observation, viz., that bogs are found beneath the present sea level. It is proved beyond doubt that the sea has on two occasions at least encroached on the land. Shortly after the glacial epoch we find sea beaches 100 feet above the present sea level in several places on the west coast of Scotland, and although there is no visible trace of these in Orkney, there is little doubt the same occurred. Peat beds below the present sea level unmistakably point to a period when the land stood considerably higher than it does at present. These changes of sea level have been repeated throughout geological times at long intervals. Now, a considerable rise above present sea level would connect Orkney with Scotland, and in all probability Orkney was so joined when the forests obtained.

One of the most interesting questions for us is: When did man appear on this ever changing scene? We often hear it said that the evolution of the world was a regular progressive evolution in which, when the process was completed with temperate climate and clothed with rich vegetation, man appeared. Now this was not the case. Science teaches us very differently, and her teaching is trustworthy and reliable. Man's early history on this world is a long unwritten one, and only decipherable from the remains of himself and his tools that are to be found scattered over various parts of this country. During a very long period of man's history he used tools made of stone only. Men of the Stone Age are naturally divided into two classes

—Palæolithic and Neolithic. The period of Neolithic man embraces the time subsequent to the last glacial epoch. As soon as the country was habitable, man again returned from the milder regions where he had been driven during the last severe glacial epoch, when his home was under the great *mer-de-glace* that covered all Great Britain except that portion south of the Thames. Man's tools are found all over the country in the shape of polished axes, hammers, arrow-heads, canoes, etc. Several of these have been found in bogs which show how early he reappeared on the scene. But Palæolithic man was of an earlier period, and led a ruder and more savage life. He lived during the interglacial period between the second and third great glacial epochs, and disappeared, so far as Great Britain is concerned, tens of thousands of years ago, when the final *mer-de-glace* enveloped his home. Here I must be allowed to make a digression to show where unmistakable traces of him have been found. In the limestone districts of England caverns more or less abound. These have been formed by rain-water which had become acidulated by rain absorbing carbonic acid from the atmosphere, passing over and sinking through the soil. In the course of long ages, the constant circulation of rain-water, and the consequent waste of the limestone, resulted in the formation of caves and winding galleries. I may instance the caves of Clapham in Yorkshire, Settle in Derbyshire, etc. These were occupied by man and wild beasts, but at the time of the third glacial epoch the boulder clay closed up the mouths of some of these caverns with their contents, to remain a sealed volume till the latter half of the nineteenth century. Much of the contents were preserved by the large accretions of stalag-

mites which had been formed by water dripping through the limestone. That man lived here has been sufficiently proved. The site of his old hearth with its charred remains; his stone implements of rude manufacture are there, along with skulls and bones. His implements and weapons were never ground and polished, but were merely chipped into shape, and are extremely rude.

Contemporaneously with man lived several wild animals now only found in other latitudes and climates, chiefly tropical. The hyaena, mammoth, woolly rhinoceros, cave lions and cave bears—a group of animals now locally or totally extinct—lived with him. In several caves, as in Kent's Cave, outside which glacial action never took place, we find the remains of both Palæolithic and Neolithic man—the former associated with the animals I have mentioned. Above this, but always with a sharp and abrupt break, are the deposits in which the remains of the latter are found, with a very different assemblage of animal remains from his earlier prototype. These animals include the common indigenous European forms of our own day. In Orkney there are abundant remains of Neolithic man scattered over the islands, but the conditions favourable to the preservation of Palæolithic man leave no hope of direct proof that he ever lived here, although there is no doubt that during the last interglacial period, when the fauna and flora of these islands were semi-tropical, savage man roamed amid its forests and glens, living on such products of the chase as his rude implements could capture.

OBSERVATIONS ON SOME BIRDS IN THE MAINLAND OF ORKNEY.

BY JOHN G. H. MARWICK.

FOR a long time, at least twenty-five years, I have been a keen lover of birds of all kinds, from the common barn-door fowl to the rarest of species found in the Orkneys. Although often the mortal enemy of the feathered tribe, I have on not a few occasions spared lives which might have proved "sport" to many a tourist. I have frequently seen gulls and scarfs slaughtered in Stromness harbour, and in many cases left with a broken wing or beak to die a lingering and painful death. This was just for fun, but the element of cruelty, and we may say brutality, characterised such proceedings. To shoot a bird for the table, for natural history purposes, or even for sale, and to do so in a proper fashion is, in my opinion, legitimate, and the prerogative of man over the lower creation, but wanton killing and maiming cannot be too strongly condemned. The beauty of birds generally is a source of study to any lover of nature; their colours, forms, anatomy of wings, feet, and beak, their maternal instinct, the wonderful colouring of their eggs, their carefully constructed nests, their courage in defending their young, their migratory habits, their notes and language which may express anger, fear, love, hatred, hunger, and the like, their adaptability to circumstances, and many other things connected with birds and bird life,

go to show, in fact to prove, the existence of a wonderful Creator, whose ways are past finding out.

Twenty-five years ago I lived in Stromness. There I first became acquainted with tame birds and with a few of the more common wild birds. I have seen many snipe shot at the Millburn. Even on the market green I have seen snipe and plover shot, but the progress of the town has put an end to such practices.

At the Millburn and the North End, Stromness, red-shanks, sandlarks, and dunlins are very common, and at certain seasons of the year, generally winter and spring, flocks of plover and a few snipe may be seen. The seagull is always in evidence, and the same may be said of the cormorant and shag. The tern, heron, and northern diver have also been observed, while of the duck tribe I have seen the merganser (saw-bill), eider duck, teal, pochard, and stock duck.

Leaving the harbour and starting from the point of Ness for a walk round the shore, we meet some of the more timid and less approachable species of birds—the oyster-catcher, curlew, skua, black-backed gull, and occasionally a solan goose. Of course the season of the year makes a wide difference in one's observations regarding numbers, sex, habits, colours, haunts, etc. Passing on to the Black Crag, say in the end of May or beginning of June, the sight is one not to be forgotten. Thousands, one might say clouds, of gulls may be seen coming and going to and from their nests, which are here very numerous. The magnificent cliffs, with Hoy Head to the left, the Atlantic in front, barren heath and a cliff-bound coast to the right, and the picturesque little farms of Outertown behind, make a picture

either in storm or calm worthy of the attention of both painter and poet. Proceeding, we come to North Golton Castle, a huge mass of rock rising to a height of more than two hundred feet. This rock is narrow at the base and fairly wide at the top, on which a pair of the great black-backed gulls nested for years. Passing the millstone quarries of Yesnaby in Sandwick, we come to the Hole o' Rowe and Bay of Skail, and further on, Marwick Bay and Marwick Head, from which the cliffs fall away until we reach the Brough of Birsay, where the ornithologist has ample scope for a few notes. Here there is a place locally known as Wee-oy-Craig, and which, in the nesting time, presents a fine sight. Tier upon tier, you can see hundreds of nests, and you can also witness the depredations of the skua among the gulls.

On the north side of the Brough we meet with guillemots and puffins, which in my opinion prefer, at least in the mainland, a northern outlook, being numerous as far as Costa Head, but less plentiful along the other side of the mainland. Leaving the Brough and passing on towards Evie, we meet with the usual denizens of the cliff and an occasional *rara avis*. I got a beautiful specimen of the pomerine skua on the Brough, also a knot, and a gentleman told me he had seen a golden eagle on a pinnacle of rock near Costa Head. This magnificent head is sheer from the water's edge, rising to a height of fully 400 feet.

Proceeding along the Evie shore, divers, ducks, and gulls are numerous. From Tingwall along the Rendall shore to Firth shore, tisties, scarfs, eider ducks, curlews, redshanks, dunlins, and other birds are to be seen.

Here I may mention that, in August, 1898, I shot a

gannet on the school farm in Rendall. The bird, which proved a beautiful specimen, seemed unable to raise its flight on the land, although it got ample opportunity. Perhaps this bird, like some others, is unable to rise on land.

Large numbers of wigeons visit the Bay of Firth in winter, also the long-tailed duck and many others of the duck tribe; while an occasional flock of wild geese may be seen on Isbister Loch or the immediate vicinity, and swans often give a flying visit, and rest on the same loch.

Taking a general survey of bird life from my own neighbourhood (Rendall), from March to October I have observed many well-known birds, and from October to March we meet with an occasional visitor such as the robin, fieldfare, redwing, greenfinch, and several others. During summer and autumn the starling, blackbird, thrush, sparrow, linnet, wheatear, wagtail, and bunting are more or less in evidence. The lapwing, seagull, plover, and many more will also be seen or at least heard, and in the gloaming the "whirr" of the snipe, the "whapp" of the curlew, the "come home" of the grouse, the croak of the heron, the "crek-crek" of the corn-crake, the wigeon, wild duck, redshank, lapwing, and many more joining in the chorus, go to cheer the heart of the lonely traveller on a country road. Truly we may say—"What a world of merriment their melody foretells."

The Rev. Gilbert White, in his "Natural History of Selborne," devotes many letters to the habits of martins, swifts, and swallows, of which in this paper we have little to say. These birds are, so far as I know, rare, although some years ago a pair or two had nests under the eaves of the parish church in Birsay. The lapwing (green plover, teeack,

peewit) is, in my opinion, our most common bird of passage. Its eggs are much sought after as delicacies, and the flavour of its flesh is not to be despised. They come here about the end of February and leave in October, although I have seen an occasional straggler about Christmas—probably one that had been prevented from migrating by some wound. I have noticed, more than once, that a wounded lapwing is not allowed to associate with the flock, but is practically henpecked until it takes its departure. Herein lies a lesson for all sportsmen, to kill whatever they fire at, and not to shoot at senseless ranges where perhaps half a dozen birds, who are afterwards castaways, get a pellet or two each, and fly away seemingly unhurt, but are in future despised by their mates. In spring and autumn one may say the lapwing is shy, whereas in May and June it is a bold and fearless bird, defying the attacks of gulls and hawks. It will even come within a few feet of a dog or a boy, with a defiant whirr, in fact I have heard that it has been known to strike a boy on the head. What a lesson in motherly affection this beautiful bird affords us. This is also noticeable in its different cry after losing its eggs or young. Last year I took note of a few nests in Rendall. I found 298 eggs, and so far as I was able to discover, 170 birds were actually hatched, many of which would, of course, have fallen victims to gulls, and some to the weather. I may add here that robbing the nests was at one time quite common, but has not been prevalent in Rendall district for at least two years. I have been shown two nests with five eggs; this is very uncommon, and I have heard of one with six. I got a cream-coloured lapwing in Birsay a number of years ago. This is not very

common, and may be attributed to the same class of freaks of nature as white rooks, white starlings, etc.

The common snipe stays with us more or less all the year, but I am inclined to believe that many come here in October.

It is a common belief in Orkney that the land-rail or corn-crake stays with us during the winter, hiding in dykes and other places. It is said that one was found in a peat-stack in Hoy, and another in a bag of wool in the district of Marwick in Birsay. Both these cases are authenticated, but do not prove that the bird does not migrate. It is a custom in Orkney to spread wool in the grass after washing it. Probably the bird had got disabled, and was hurriedly packed into the bag, and was not found till the wool was taken out in the winter, or perhaps late autumn, for the purpose of "carding."

The Rev. Gilbert White maintained that the hirundines stayed in Britain in a benumbed state during winter, but on employing some men to explore various shrubs and cavities they failed to find any. As, however, swallows are not often seen in Orkney, this question need not be discussed. It is now almost a certainty that the hirundines migrate. The cuckoo cannot be called an Orkney bird, but it has been heard, and probably seen, at Muddisdale, Binscarth, Berstane, Blubersdale, and at other places in Orkney.

The following are extracts from letters I have received from Orkney naturalists, giving their observations on local birds. One, writing from Stromness in 1899 says—"Two spotted fly-catchers were in the garden a fortnight. Both the golden-crested and fire-crested regulus I have seen more than once; the great spotted wood pecker I have seen

once; the garden warbler, reed warbler, and stonechat I have seen often; the hawkfinch and crossbeak I have seen once; the cuckoo, the furzechat, and the ring-ousel several times; wood pigeon once."

The other writes—"I took the common scoter myself in 1896. I also found a nest of the red-necked phalarope on the mainland this year (1899); I believe it is the first that has been found on the mainland so far as I know. I took a whimbrel's nest in 1891 in the Kingsdale Hill; that also is the only one that has been taken here. I took the little owl in 1894 in Woodwick Dale. I have found the short-eared owl with eggs and three different sizes of birds. The food of the short-eared owl is principally voles. I have just once found a grouse in its nest. I would say that the short-eared owl is twice as numerous as the harrier. The raven and peregrine falcon are about the first to breed in Orkney, the corn bunting, red-necked phalarope, and stormy petrel about the last."

A word about the common starling, which is very much in evidence in the North End of Stromness. Although a very abundant species, few cases of more brilliant plumage are met with in Britain. The metallic glow and play of colours on the feathers of the head, neck, and back, are very beautiful. It can also be taught to say a few words, and many stories are told of its oratorical abilities. I noticed, several years ago, many starlings congregating among the reeds at the Loch of Voy. They gathered by tens and twenties, till their numbers were enormous. I happened to mention this fact to a Stromness naturalist, who would scarcely believe it, but Bishop Stanley furnishes the same evidence regarding the gregarious habits of starlings

among weeds in a dam in Wales. He says, "About an hour before sunset little flocks by twenties or fifties kept dropping in, their numbers increasing as daylight waned, till one vast flight was formed amounting to thousands, we might almost say to millions. Nothing could be more interesting or beautiful than to witness their graceful evolutions. At first they might be seen mounting high in the air like a dark cloud, which in an instant, as if by magic, became almost invisible, the whole body, by some mysterious watchword or signal, changing their course and presenting their wings to view edgeways, instead of exposing, as before, their full expanded spread. Again, in another moment, the cloud might be seen descending in a graceful sweep, so as to almost brush the earth as they glanced along. Then once more they are seen spiring in wide circles on high, till at length, with one simultaneous rush, down they glide with a roaring noise of wing till the vast mass buries itself, unseen but not unheard, amidst a bed of reeds projecting from the bank, for no sooner were they perched than every throat seemed to open itself, forming one incessant confusion of tongues."

The starling destroys the larvæ of many hurtful insects, and although doing some damage to fruit, is really a useful bird. I have seen three cream-coloured starlings—one in Stromness, one at Swanney in Birsay, and one in Rendall.

Many species in Orkney have decreased during recent years. Hawks, owls, ravens, lapwings, grouse, and several other birds are not so numerous as formerly. What is the cause of this decrease? I believe that hawks and owls are quite able to take care of themselves when perfectly fledged, as the former are in no case very easy of approach, and the

latter in the daytime not often seen. We must then blame the egg-collector for their scarcity, and perhaps heather burning after the prescribed limit.

In 1887 a great part of the heath on Hundland Hill, Birsay, was burned, and the charred remains of birds and eggs were much in evidence. Crows and gulls could be seen devouring what was left of the unfortunate birds. Another destructive fire took place in Harray some years ago: it extended, I was told, for a distance of five miles with similar results, destroying hundreds of eggs and many birds. Besides the destruction of eggs, one would naturally conjecture that even small fires in hills would, especially after nesting time, frighten birds from the locality.

All birds, according to the late Mr. Yarrel, may be divided into five great classes—*raptores* (prey-catchers), *insessores* (perchers), *rasores* (scratchers), *grallatores* (waders), *natatores* (swimmers).

Other naturalists have adopted other classifications, but as regards Orkney birds we will glance at the above classification and see what birds among these classes may be found in our neighbourhood. Each of these classes or orders is again divided into groups or sub-classes, these groups being then further sub-divided into families. Again, these families are made up of genera, and each genus of more or fewer species. These species—so many of them as compose any particular genus—all differ from one another more or less, but yet have a strong general resemblance or strong family likeness to each other. Many rare visitors are often seen and captured, but they can hardly find a place among observations on Orkney birds.

Looking at Order I., *Raptores*, we have the following:—

(1) *vulturidæ*, none; (2) *falconidæ*, golden eagle, osprey, gyrfalcon, (all rare), peregrine falcon, merlin, kestrel, goshawk, sparrow-hawk, hen-harrier; (3) *strigidæ*, barn-owl, short-eared owl, long-eared owl. Order II., *insessores*, is divided into four groups—*dentirostres* (tooth-billed), *conirostres* (cone-billed), *scansores* (climbers), *fissirostres* (cleft-billed). Although half the specimens of birds in Great Britain come under this order, the families of groups one, three and four are, owing principally to the lack of trees and hedges, very sparsely represented in Orkney.

Dentirostres—(a) *laniadæ*; (b) *muscipidæ*—spotted fly-catcher; (c) *merulidæ*—thrush, blackbird, ring-ouzel (rare), fieldfare, and redwing (winter visitors); (d) *sylviadæ*—wheat-ear, stonechat, robin, reed-warbler, garden-warbler, golden-crested regulus; (e) *paridæ*; (f) *ampelidæ*; (g) *motacillidæ*—wagtail; (h) *anthidæ*—rock-pipit.

2. *Conirostres*—(a) *alauidæ*—skylark; (b) *emberizidæ*—yellow hammer, common bunting, snow bunting; (c) *fringillidæ*—sparrow, greenfinch, hawkfinch, linnet, mountain linnet; (d) *sturnidæ*—starling; (e) *corvidæ*—raven, crow, hooded crow, rook, jackdaw (rare).

3. *Scansores*—(a) *picidæ*—great spotted wood-pecker; (b) *certhiadæ*—wren; (c) *culculidæ*—cuckoo.

4. *Fissirostres*—swallow, martin, (both rare).

Order III.—*Rasores*—(1) *columbidæ*—rock-pigeon, wood-pigeon; (2) *phasianidæ*—pheasant (rare); (3) *tetraonidæ*—common grouse, quail (rare), partridge (rare); (4) *struthionidæ*—none.

IV.—*Grallatores*—(1) *charadriidæ*—golden plover, lapwing, dotterel, sanderling (?), oyster-catcher, ringed ~~*~~ plover, turnstone (rare); (2) *gruidæ*; (3) *ardeidæ*—common heron, spoonbill (very rare); (4) *scolopacidæ*—woodcock, common snipe, jack-snipe, curlew, whimbrel, dunlin, red-

? doubtful

x. hardly birds

shank, sandlark, ruff (rare), knot (rare); (5) *rallidæ*—land-rail, water-rail, moor-hen; (6) *lobipedidæ*—coot, red-necked phalarope. V.—*Natatores*—(1) *anatidæ*—wild goose, brent goose, wild swan, common shieldrake, wild duck, teal, wigeon, and more usually in salt water, eider duck, velvet scoter, common scoter, pochard, long-tailed duck, golden-eye, red-breasted merganser, goosander; (2) *colym-*
bidæ—great crested grebe, little grebe, great northern diver, red-throated diver, black-throated diver; (3) *alcadæ*—common guillemot, black guillemot, little auk, puffin, razorbill; (4) *pelicanidæ*—cormorant, shag, gannet; (5) *laridæ*—common tern, Arctic tern, Sandwich tern, black-headed gull, kittiwake, common gull, herring gull, great black-backed gull, lesser black-backed gull, common skua, Richardson's skua, pomarine skua, ivory gull (very rare), glaucous gull, Iceland gull, (both rare), Manx shearwater (rare), stormy petrel, fulmar petrel, fork-tailed petrel (very rare). ?

* *Sclavonia Gube*

O. Freshwater.

+ + Gadwall

? as to its being rare.

HABITS OF BIRDS FREQUENTING SULE SKERRY.

BY JAMES TOMISON.

THE birds of Sule Skerry may be divided into three classes—(1) the residents; (2) the regular visitors; and (3) the occasional visitors.

I.—The residents. This class is represented by the great black-backed gull, the herring gull, the shag, or green cormorant, and meadow pipit.

The great black-backed gull is one of the handsomest birds of the *laridæ* family, but owing to its destructive propensities amongst small birds, rabbits, and occasionally young lambs, a continual warfare has been waged against it for years by farmers and game-keepers, until now it is almost entirely banished to the outlying parts of the country. Before the lighthouse was erected on Sule Skerry, large numbers of this species frequented the island, but the lightkeepers found them such arrant thieves that they reduced their numbers considerably. There are still about twenty pairs resident on the island all the year round, and they seem to find plenty of food either on land or at sea. Their breeding time is in May, and sometimes as late as June. When their young are hatched, the parents are continually on the lookout for food, and I have often seen them swoop down and seize young rabbits. Frequently they make desperate efforts to capture the old rabbits, but never successfully. They lay three eggs



PLAN OF SULE SKERRY.

in a nest composed of withered grass, and the process of incubation lasts about four weeks.

A small colony of herring gulls stays on the island all the year round, but in summer vast flocks of them are in evidence when the herrings are on the coast. Only the residents remain to breed, and about a dozen pairs annually rear their young and spend their whole time in the vicinity. Some of the young must emigrate to a more genial climate, giving wider scope to their talents, for although rarely disturbed, their numbers are not increasing. They lay three eggs early in May, and sit about four weeks. When hatched, the young immediately leave the nest, and are so like the surrounding rocks in colour that when they lie close it is almost impossible to discover them. When hunting for food for their offspring, the gulls are almost as great a pest as their cousin, the great black-backed, and more audacious thieves.

The most numerous of the residents are the scarfs. In summer and winter they are always on the island, and apparently there is an abundant supply of suitable food in the vicinity, for they never go far away. During winter they congregate on the rocks in large flocks or colonies, and have got so accustomed to man's presence that they only fly when one approaches within a few yards of them. In very stormy weather they seek refuge in some sheltered spot, and more away from the coast line, far enough to be safe from the encroaching waves, and only when frightened by any one approaching too near do they choose what is, in their opinion, the lesser of two evils, and seek safety in flight. With the advent of spring they, like all other birds, turn their thoughts to the poetry of love. Their compara-

tively homely winter dress gradually changes to one more appropriate to this sentiment, and more in harmony with the imposing surroundings. Early in the year their plumage assumes a greener tint, and the graceful tuft or crest on the top of the head becomes more and more prominent. This crest practically disappears about the end of June, and seems to be a decoration in both sexes only during the nuptial season. Usually they manage to get through with their love making and selecting of partners by the middle of March, after which the operations of nest building are undertaken. In 1896 I observed one pair who had this work completed as early as February. However, if their intention was to steal a march on their neighbours the result was not encouraging, as shortly thereafter a heavy sea scattered the result of their labours, and let us hope they profited by the lesson, and remembered ever afterwards that there is a time for everything, nest building included.

In Orkney we associate a scarf's nest with some almost inaccessible cliff, but such is not the case on Sule Skerry for the simple reason that there are no cliffs. The nests are built all over the island, but principally near the coast line, and the sociableness of their disposition shows itself in this matter too, that they tend to crowd their nests together in certain selected spots, which they return to year after year. One place in particular, a patch of rough rocky ground from forty to fifty yards square, I have named the scarf colony on account of its numerous population during the breeding season. Here in 1898 I counted fifty-six nests, which had decreased this year (1899) to forty three. I have also got nests under large stones over 200 yards from the sea, and when taking down one of the wooden huts erected

for the workmen at the time the lighthouse was under construction, two nests with four eggs each were found under the floor, which had been laid on beams, giving sufficient space with an access at either end. These nests must have been built in March before the workmen came to the island. As to materials used for nest building, these are principally sea-weed and grass, but the scarf is not very particular as to such trifling details, and uses anything that will suit the purpose on hand. I have found pieces of ordinary rope, even wire rope, and small pieces of wood used, and a very common foundation is the skeleton of a rabbit which has died during the winter. During building operations I have observed that one bird builds and the other brings the materials. After all has been completed three, four, and sometimes five eggs are laid. Three is the most common number, and next four. Five is rare. The earliest date on which I have found an egg was on the 5th of April, 1886, the usual time being about the end of April. If a nest is destroyed they don't waste time mourning over it, but start at once to make a new one. On the 2nd of June, 1898, every nest on the scarf colony was washed away by a heavy land sea. At that time incubation was, in some cases, near completion. But in spite of that, as soon as the weather improved, nest-building was at once started and in a fortnight there were as many as ever; but the number of eggs did not come up to the ordinary standard, two being the prevailing number. During incubation the one bird relieves the other periodically. It is a common thing to see one come in from the sea, sit down at the edge of the nest, and hold a long palaver with its mate. The sitting bird then gets up and flies out to sea the other taking its place.

When the young come out of the egg they are entirely naked, a dark sooty colour, and particularly ugly. Towards the end of the first week of their existence a coating of down begins to grow, followed by feathers in about three weeks. As near as I can say from observation, the bird is fully fledged in five weeks from the time of hatching.

The only other residenter is the tit-lark or moss-cheeper. It is the only small bird that remains on the island all the year round. It nests generally in May, and lays five or six eggs. It is said that two broods are raised in the season, but I have never noticed that here. Towards the end of summer they are to be seen in considerable numbers, but in September and October the island is visited by kestrels, who soon thin them down.

II.—The regular visitors are—puffin, razor-bill, common guillemot, black guillemot, oyster-catcher, tern, eider duck, kittiwake, stormy petrel, curlew, snipe, turnstone, and sand-piper. In this list I have advisedly placed first the puffin, or tammynorie, or bottlenose, or coulterneb, or pope, or sea-parrot, for he is a well-known and well-named bird. In point of interest it undoubtedly takes the leading place amongst all our feathered friends. Its remarkable appearance, activity, assertive disposition, and regularity in habits compel the attention of the most careless observer. At one time puffins were much in demand for food. An old history of the Scilly Islands says that in 1345 the rent of these islands was 300 puffins. In 1848, on account of the the bird having got scarcer, and consequently more valuable, the rent was fifty puffins. We are also led to understand that the younger birds, being plump and tender, were more highly esteemed than their more elderly and tougher

relatives. The outstanding feature of this curious bird is its beak, the prominence of which is due to its enormous size compared with the size of the body, and its brilliant colours—blue, yellow, and red. For a long time it was considered a puzzle that occasional dead specimens found washed ashore in winter had a very much smaller beak, and were destitute of bright colours. It has now been ascertained that the outer sheath is moulted annually, being shed on the approach of winter and replaced at the return of the breeding season.

To give any idea of their numbers on Sule Skerry is an almost impossible task, for when they are on the island they are hardly ever at rest. The air is black with them, the ground is covered with them, every hole is tenanted with them, and the sea is covered with them. They are here, there, and everywhere. They first make their appearance early in April, and spend from eight to twelve days at sea before landing, coming close in round the island in the forenoon and disappearing at night. Before landing they fly in clouds round the place, and after having made a survey to see that all is right, they begin to drop in hundreds, till in half an hour every stone and rock is covered. They do not waste time, but start at once to clear out old holes and make new ones, and for burrowing they can easily put a rabbit in the shade. Those who are not engaged digging improve the shining hour fighting, and for pluck and determination they are hard to beat. They are so intent on their work that I have often seized the combatants, and even then they were unwilling to let go their hold of each other, but when they do, it is advisable for the person interfering to let go also if he would avoid a rather

unpleasant handshake. They arrive off the island at almost the same time every year. The exact dates for the past four years are :—1896, first seen 15th April, landed on the 20th; 1897, first seen 14th April, landed on 22nd; 1898, first seen on the 8th April, landed on the 18th; 1899, first seen 7th April, landed on the 16th.

After spending a few hours on the island they all disappear, and don't usually land again for two days, but when they do come back a second time there is no ceremony about their landing. They come in straggling flocks from all points of the compass, and resume the digging and fighting. They continue in this manner, never remaining ashore all night till the first week of May. They spend very little time on the construction of their nests, which consist merely of a few straws. The greater number burrow in the dry, peaty soil, and their holes will average at least three feet under ground, but there are also an immense number that lay amongst loose rocks and stones on the north side of the island. The eggs laid there are always clean and white until the young bird is hatched, but those laid underground in a day or two get as brown as the soil, and seem more like a lump of peat than an egg. During the time of incubation, which lasts a month, those not engaged hatching spend their time fishing and resting on the rocks, and as a pastime, indulge in friendly sparring matches.

One easily knows the young are hatched by seeing the old birds coming in from sea with herring fry or small sand eels, which are carried transversely in their bills, and from six to ten at a time. The sole work of the parent birds for the next three or four weeks is fishing and carrying home their "takes" to the young. Very little time is given to

nursing. They just remain long enough in the hole to get rid of their burden, and then go to sea again. As the young ones grow, the size of fish brought ashore increases. At first it is small sand eels from $1\frac{1}{2}$ inches to 2 inches long, but at the end of a fortnight small herrings and moderately-sized sand eels are the usual feeding. I noticed an old bird fly into a hole one day with a bigger fish than usual, and to see what it was, I put in my hand and pulled out both birds. The tail of the fish was just disappearing down the young one's throat, but I made him disgorge his prey, and found it to be a sand eel 8 inches long. How that small bird could spare room for such a dinner is really wonderful.

At first the young are covered with a thick coating of down, and probably the appearance at this stage has given rise to the name "Puffin," meaning "a little puff." In a fortnight the white feathers on the breast begin to show, and they are fully fledged in four weeks, when they at once take to the water. As soon as they go afloat, young and old leave the place, and about the middle of July one can easily see that their numbers are decreasing, the end of August usually seeing the last of them. This year, however, one solitary bird remained carrying fish ashore till the 6th of September. If they all laid at one time, and brought out their young together, they would be away in July, but accidents will happen even in the case of the puffins, and their first laying often gets stolen or broken, which necessitates another effort. Of course this means delay, and while the young one is alive the parents will not desert it.

There is a considerable colony of razor-bills on the island. Their time of arrival is about the same as that of the puffin,

but they make no commotion when they come. They seem to slip ashore, and always keep near the coast line, ready to fly to sea when any one approaches. They begin laying towards the end of May, and lay one egg on the bare rock usually under a stone, but in some cases on an exposed ledge. During incubation one bird relieves the other, for if the egg were left exposed and unprotected the black-backed gull would very soon appropriate it. Some authorities say that the male bird brings food to its mate, but I have never observed that, though I have watched carefully to see if such were the case. The young ones remain in the nest, or, to speak more correctly, on the rock, for about two weeks if not disturbed, and I have seen a young one remain ashore until covered with feathers, which would mean about four weeks from the time of hatching. They all, young and old, leave early in August. I am sorry to say they are becoming scarcer every year, chiefly on account of their shyness and fear of man.

The common guillemots are scarce. Their great haunt in this vicinity is the Stack, four miles away. There they are to be seen in myriads on the perpendicular side of the rock, facing the west. Only two or three pairs take up their abode on the island, in fact their numbers scarcely entitle them to be called Sule Skerry birds. The few young ones I have seen are carried to the water as soon as hatched, at least they disappear the same day.

Black guillemots or tysties are plentiful. Their time of arrival is about the middle of March, but they are rarely seen ashore before the end of April. Their nests are to be found in some out-of-the-way crevices or under stones, and are not easily discovered on account of their extraordinary

watchfulness and care not to be caught on or near their nests. They lay two eggs, and the young are fully feathered before going afloat. They remain about the island till the end of September.

The first of all the visitors to arrive are the oystercatchers. They first put in an appearance about the end of February, when their well-known cry denotes that the long, dreary winter is over. They spend their time till the end of March chiefly feeding along the coast line, but after that time they pair and are seen all over the island. About the end of May they lay three eggs in a nest composed of a few small stones and when the young are hatched the noise of the old birds is perfectly deafening on the approach of an intruder; and even when no one is annoying them the clamour they make almost amounts to a nuisance. On calm, quiet nights it is hardly possible to get sleep with them, and one feels inclined to get out of bed and shoot them down wholesale. The young leave the nest as soon as hatched, and are rarely seen, for on hearing the warning cry of the parent bird they at once hide amongst the long grass, or under stones, and on one occasion I got a pair some distance under ground in a rabbit's hole. They all leave the island during the first half of September, but this year I noticed one on the 1st of October. Whether it was one of the regular visitors, or merely one resting on the passage south, I cannot say, but am inclined to believe the latter.

Next to puffins in numbers are the terns—the Arctic terns. They are also like the puffin in the regularity of their arrival at the island. When first seen they are flying high up, and continue doing so for a day or two, only resting at

night. In 1896 they arrived May 13th; 1897, May 14th; 1898, May 15th; 1899, May 12th.

There are several varieties of terns scattered all over the British Isles, but in the north the most numerous are the Arctic and common tern. The latter rarely visits the island.

There are certain localities where the terns take up their abode, and they stick closely to the same ground year after year, never by any chance making a nest twenty yards outside their usual breeding ground. In this way one knows exactly where to find their nests. They begin to lay in the first week of June, but I have found eggs on the last day of May. They lay two eggs, and sometimes three. When the young are hatched the parents are kept busy supplying them with food, which consists chiefly of sand eels and herring fry. Their method of fishing is to hover over the water, not unlike the way a hawk hovers when watching its prey, and when they see a fish make a dart on it, rarely if ever failing to make a haul. They also prey on worms when it is too stormy for fishing at sea. On a wet evening, when the worms are having an outing, the terns are to be seen in hundreds all over the island, hovering about six feet above the ground, every now and again making a dart down, and when successful, flying home with its catch to the young. No time is lost, for the old bird seldom alights when handing over the worm. It swoops down to where the young ones are standing with outstretched necks and bills, gaping, screaming out to let their whereabouts be known, then off again for more. When the young are able to fly they accompany their parents over the island, and occasionally do a little hunting on their own account.

About the first of August the young are fully fledged. Young and old then assemble from all parts of the island to a piece of bare, rocky ground on the north-east corner, which they make their headquarters for about ten days, flying out to sea for food, but always returning at night. About the 15th of August they all disappear, and are seen no more until the following May.

The island is the headquarters of a large colony of stormy petrels. It is not an easy matter to fix the exact date of their arrival, for they are never seen during the day, and only come out of their holes at night. They are first seen in the latter end of June, when, on a fine clear night between 11 p.m. and 1 a.m., one can see them flitting about close to the ground, very like swallows in their movements. They begin to lay in July, and their nests are to be found under stones and in rabbit holes. About the only way to find them is to listen for their peculiar cry, which they keep up at intervals the whole night through—that is to say, all the time darkness lasts, for when they are here the night is of short duration. An old writer (Armstrong) says—"They go into holes like mice, and when they are taken a quantity of yellow oil falls from their bills. It has been said that they hatch their young by sitting on the ground about six inches from the eggs and turning their heads towards them, making a cooing noise called 'gur-le-gug' day and night till they are hatched." This writer is quite right about the oil falling from their bills when the birds are taken in the hands, and an evil smelling compound it is, intended, I suppose, as an act of hostility with the view of regaining freedom. But that they hatch their eggs by sitting six inches from them I do

not believe, and the dozens of them I have unearthed were always sitting *on* the egg. If captured during the day, they seem quite dazed when released, and at once fly into some dark place. Like their arrival, their departure is not easily fixed, but I think it is during September. Young birds have been got on the lantern at night as late as the end of September, but never in October.

On the 12th of September, 1898, I caught a fork-tail petrel in the light-room. The balcony door was open, and it came fluttering in, attracted by the light. Whether this species breeds on the island I cannot say, this being the only one I have seen. It is, however, quite possible, for Mr. Harvie-Brown found a colony nesting on North Rona, an island forty miles further west. It breeds regularly on St. Kilda. In his Manual, Mr. Saunders says—"In 1847 it was found breeding in St. Kilda, and later investigations have shown that further colonies exist on North Rona and several islands in the outer Hebrides, while ere long the species will be found nesting on some of the inner islands." The specimen I got is supposed to be the first caught in Orkney, and it is possible, according to Mr. Saunders' theory, that they may be found nesting on Sule Skerry on some future occasion. It is a little larger than the stormy petrel—an inch longer—and very much the same in colour, the principal distinction being the considerably forked tail, from which it gets its name.

The eider duck is a regular visitor, and a considerable flock make Sule Skerry their headquarters for about eight months in the year. They are first seen in March fishing off the island, but they very rarely land before the end of April. In May they may be seen ashore every day, but always

near the water, ready to pop in if alarmed. They are very shy and difficult to approach. In June the duck and drake both come ashore and select a place for their nest, and that is the only occasion on which the drake takes a part in the hatching process. So far as my observation goes, I have never seen him approach his mate during the month of incubation.

The nest is built sometimes on a bare rock, but more commonly amongst grass, and consists of coarse grass for a foundation, the famous down only being added as the eggs are laid. Five and six is the common number found in one nest. From the time it begins to sit until incubation is completed, the duck never leaves the nest unless disturbed, and will only fly to sea if driven off. If approached quietly, it will allow one to stroke it, and doesn't seem afraid. There are always one or two nests close to the house, and though I have watched them closely at all hours, night and day, I have never seen the birds go away for food, nor have I seen their undutiful spouses bring any to them. I will not venture to say that the duck lives a month without sustenance, but am strongly inclined to that belief. When frightened away, it only goes a short distance, and returns immediately so soon as the cause of its fright has been removed. The whole inside of the nest is lined with down, which seems to be intended only for the purpose of keeping the eggs warm. It is certainly not intended to form a cosy nursery for the young, as they leave for the sea a few hours after birth, and do not return. Unless the down is removed before the young are hatched it is useless, for it gets mixed up with the egg shells, which are always broken into very small pieces. Some birds when hatched leave about half

of the egg shell whole, but in the case of the eider duck the shells are all broken and left in the bottom of the nest. After leaving the nest the young birds rarely come ashore again, but remain afloat, feeding along the edge of the rocks on mussels and crustaceans. The old birds disappear in October, but some young ones remain till the end of November.

Few kittiwake gulls visit the island, but these come regularly, and take up their abode in the same ground year after year. They arrive in April, and about the first of May begin nest-building, a work which keeps them employed for about three weeks. They begin laying about the end of May, and lay three eggs. The young are fully grown before leaving the nest, and are fed by both the parent birds. They all leave the island about the end of August, and not even a straggler is seen again till the following spring.

I have now gone over all the birds that breeding purposes bring to Sule Skerry, and come next to the regular winter visitors, consisting of the curlew, the snipe, the turnstone, and common sandpiper.

About a dozen curlews or whaups make the island their home for about nine months of each year. They leave about the end of May, and return in August, remaining on the island all winter and spring. Their number always keeps about the same—from twelve to fifteen. They have the same characteristics as those found elsewhere, namely, their extraordinary alertness and peculiar cry; but I must say they are distinctly less shy than is usually the case in other parts of the country. They are never disturbed in any way, and the result is that, if any one wished, it would

be an easy matter to get within gunshot of them. Their chief food is worms and insects, of which there is a plentiful supply on the island.

When the curlews leave the island, a few whimbrels take their place, and remain about six weeks. They breed in Orkney and Shetland, but though they remain on the island most of the breeding season, I have never yet found a nest. I have spent many an hour watching them from the light-room with the glass to see if they were sitting, and have gone over the ground where they are most frequently seen, but could never find an egg or any attempt at nest building. It is very like the curlew in general appearance, only much smaller, the former being from 21 inches to 26 inches, and the latter 16 inches to 18 inches long, the average length of the bills being $5\frac{1}{2}$ inches and $3\frac{1}{4}$ inches respectively.

The snipe leaves the island in May and is absent about four months, usually returning in October. None, so far, have ever nested on Sule Skerry, and they all leave for that purpose. There are a considerable number of them resident during the winter, being more numerous some years than others. They sometimes get killed by dashing against the lantern at night, but it is not often they fly so high.

The turnstone always spends the winter on the island, arriving about the end of August or first of September, and from then on till April it spends its time feeding on insects. Referring to this bird, the Rev. C. A. Johns, in his book on British Birds, says—"In size it is intermediate between the grey plover and the sanderling, being about as big as a thrush. The former of these birds it resembles in its disposition to feed in company with birds of different species,

and its impatience of the approach of man." On Sule Skerry it is in no way afraid of man, but rather the opposite, for it depends a good deal on the lightkeepers for its livelihood in stormy weather. Whenever the lightkeepers go to feed their hens, the turnstones gather from all parts of the island and sit round at a respectful distance—about a dozen yards—waiting for their share, which they get regularly every day, and seem to enjoy it very much. The lightkeepers also very often turn over big stones to enable the hens to feed on the insects which are there in immense quantities. The turnstones have learned the meaning of this operation, and whether the hens are present or not, they soon gather round for a feed when one retires a short distance. A few specimens of the common sandpiper always accompany them, but they feed more amongst the seaweed along the coastline, and are more afraid of the approach of man.

We come now to Class III.—the occasional visitors. These are—the wild goose, the mallard or stock duck, the teal, the widgeon, the Iceland gull, the Slavonian grebe, the heron, the kestrel, the hooded crow, the rook, the lapwing, the golden plover, the redshank, the corncrake, the water-rail, the fieldfare, the redwing, the snow-bunting, the starling, the song thrush or mavis, the blackbird, the water wagtail, the stonechat, the woodcock, the skylark, the twite or mountain linnet, the robin, the swallow, the black-headed gull, and the little auk.

Wild geese pass the island on their way south in October, but very rarely rest. Occasionally a flock will hover round for some time, but the sight of a human habitation scares them away, and they continue on their way in the direction of Cape Wrath. Last October half a dozen were

seen resting on the island one morning about 8 o'clock. They seemed to be feeding in one of the fresh water pools, but all they would find there would not fatten them. Sule Skerry is a very likely place for them to call at, as it is right in the track when on their way to and from Iceland and Faroe, but perhaps the island being inhabited causes them to give it a wide berth. At anyrate very few of them ever honour it with a visit.

The mallard pays the island frequent visits during the winter, two and three at a time. They never stay long, for there is very little feeding for them. They are particularly shy, resting only on the most outlying parts, and seem continually on the watch.

Teals and wigeons are not common. Of the former one sees a specimen or two every winter, while of the latter only two have visited the island, and that was in March, 1897, when they stayed a few days. In November, 1895, an Iceland gull arrived on the island and remained till the end of February following. It got fairly tame, sitting the greater part of the day near the house on the watch for any scraps of meat thrown out. Hopes were entertained that it intended remaining permanently on the island, but on the approach of the breeding season it departed. Last year (1898) one stayed for a week in November, while this year another was seen on the 23rd of November. This one was fishing in company with some common gulls, and occasionally flew over the island quite close to the tower, but I did not see it alight, nor was it seen again on any of the following days.

The common heron every year spends a day or two on the island, generally in October and November, but seems

from home. It wanders about in search of food, but apparently does not find very much. When leaving the island they always, without exception, fly in the direction of Cape Wrath, but where they come from I cannot say, never having noticed them arriving.

The hooded crow is an annual visitor, generally in November, but sometimes comes for a short visit in April. Two or three is the common number at one time, but in November, 1897, there were thirteen on the island for over a week. There is, however, not much food for them, and on that account their visit is soon over. A few rooks call about the same time. Every year in April the lapwings make the island a resting place, staying from a week to a fortnight. The place does not seem to suit them for nesting purposes, for I have never seen them make any attempt at nest building. After resting and renewing their strength, they seek out some more hospitable part of the country. Small flocks of the golden plover also rest on the island on their passage north in March and April, and again on their way south in October and November, staying from eight to twelve days. There are also a few straggling visitors during the winter.

The common redshank is a frequent visitor, staying perhaps a week at a time, but never nests on the island. In 1896 a corncrake's well-known song was heard during the greater part of June. It was heard again the following season, but never since. The bird, however, is occasionally seen in summer. The only way I can account for its silence is that goats and rabbits never allow the grass to grow to any length, and thus there is no cover for it. I think most ornithologists are now satisfied that this bird

emigrates to a warmer climate every year on the approach of winter. Whether such is the case or not I do not feel prepared to say, but from my experience of Sule Skerry I am quite satisfied it is only a summer visitor and does not remain on the island all winter.

The water-rail pays the island a visit every winter, and I do not think there is any fear of its being taken for the corncrake. They are a little like one another in shape, but are two distinct species, and easily recognised. In October and November the island is visited annually by considerable numbers of fieldfares, redwings, blackbirds, rock-thrushes, starlings, and woodcocks. They generally stay from a week to a fortnight, and are more numerous some years than others. Water wagtails are rare visitors, seen at various times of the year. Stonechats are also rare visitors, only staying a few days in May. The skylark, so common everywhere else, is a very rare visitor, and is only seen or heard once or twice during the summer months. Robin redbreast is always seen in the fall, and generally stays a few weeks if the weather is moderate. The twite or mountain linnet, pays an occasional visit in summer, and stays for some time, but I have never yet found a nest, and cannot say if it breeds on the island. In June every year a few sparrows spend a fortnight on Sule Skerry. Snow buntings almost deserve the name of regular winter visitors, for from October to March they are seldom long absent. Last September I got a bird which I knew to belong to the grebe family, but could not be sure of its proper name, and I sent it to Mr. Harvie-Brown for identification. He informed me that it was a Slavonian grebe, a bird not very common in this part of the country. In November, 1897, I found a dead specimen of the little auk.

Though not a Sule Skerry bird, the solan goose deserves notice in this paper. The Stack, distant four and a half miles, has been their chief breeding place in Orkney for ages, and every year it is tenanted by immense numbers. The rock is 140 feet high, rising perpendicularly on the west, but sloping gradually from the water to the summit on the east side. It is on this slope that the solans congregate, and no other bird is allowed to trespass on their preserves. In May, June, July, and August their numbers are so vast that anyone seeing the rock at a distance would imagine it were painted white or composed of chalk. Sule Skerry, however, is too far removed to allow of one forming any idea of their numbers, but looking at them with the glass one sees the rock simply covered, and apparently as many flying about as resting. Lewis men visit the place annually in August, and carry away a boat load of young birds. Last year they came up to the rock, but there was too much surf for a landing, and as the weather was threatening, they headed for the Sutherlandshire coast. That night the wind blew half a gale, and fears were entertained that it would prove too much for them, for their boat was small and hardly powerful enough to be so far from home, but a few days later they again approached the rock, but failed to negotiate it, and after waiting about an hour they made sail for home, and did not return. The weather certainly favoured the solans on these occasions. I have never seen a solan resting on Sule Skerry; they even carefully avoid flying across the island, though they fish in immense numbers all round, and sometimes within forty or fifty yards of the shore. They usually begin to arrive in the vicinity about the end of January, and their numbers continue to increase until the

end of April, when they take possession of the rock, and from then until the end of August their name is legion. When the young are fledged, they gradually disappear, and from the first of December till the last days of January they are not to be seen.

Their breeding places in Scotland are the Bass Rock, Stack of Sule Skerry, North Barra, Boreray, St. Kilda, and Ailsa Craig. I have never heard it stated how many young birds the Lewis men take in a season from the Stack, but their annual supply from North Barra amounts from 2000 to 3000; and in Professor Wilson's "Voyage round Scotland," referring to St. Kilda, he says:—"From a calculation made of the number of gannets consumed by each family in a year on this island, it appeared that the total secured, not taking into account a large number which could not be reached for various reasons, was 22,600."

Thus they go on year after year, a fraction of that great feathered multitude which has come and gone since the earliest ages, and will probably continue to come and go as long as the world lasts, some silently arriving and departing, others heralding their coming and going with wildest clamour. On this subject, and speaking of the northern isles, Thomson, the poet, says:—

"Where the northern ocean, in vast whirls,
Boils round the naked, melancholy isles
Of farthest Thule, and the Atlantic's surge
Pours in amongst the stormy sounds,
Who can recount what transmigrations there
Are annual made? What nations come and go?
And how the living clouds on clouds arise,
Infinite wings! till all the plume-dark air
And rude resounding shores are one wild cry."

THE MIGRATION OF BIRDS AS OBSERVED FROM SULE SKERRY.

By JAMES TOMISON.

THE migration of birds is a big subject for a short paper, that is if we were to refer to all the British birds, but I intend merely to mention a few facts relating to those that visit Sule Skerry. A large number under the heading of British Birds have little right to be classed as such. Strictly speaking there is but one British bird, peculiar to this kingdom, and found native nowhere else, that is the red grouse. The rest may be said to be characteristic of the whole Palearctic region, stretching right away to Japan, while some go as far south as the Victoria Nyanza, and further to the Transvaal, and others breed as far north as Grinnel Land, within 8 degrees of the Pole. Of this miscellaneous troop of residents and visitors, regular and irregular, there are nearly 400, and of that number 70 are known as Sule Skerry birds, some resident all the year round, some resident in winter, and some stragglers driven out of their course in stormy weather during the season of migration. Thirteen only are known to breed on the island :—the green cormorant, the great black-backed gull, the herring gull, the kittiwake, the Arctic tern, the puffin, razor-bill, common guillemot, the black guillemot, oyster-catcher, eider duck, stormy petrel, and meadow pipit.

The green cormorant, or shag, or still better known in

Orkney as the scarf, is resident all the year round. It belongs to the family of pelican-like birds of which there are three members on the British list—the shag, common cormorant, and gannet or solan. They can be distinguished from all other birds by having their four toes all joined together by a web. The shag is found all round the coasts of Great Britain, throughout Europe and northern Asia, and in Japan. It breeds in India and Burma, and is believed to extend to Australia. It occurs in Arctic America on the Atlantic side, but has not been recorded from the Pacific side of North America.

The common cormorant has never been observed on the island, but the other member of this family, the solan, is one of our most common birds. They breed in immense numbers on the Stack. Although it occurs on all our coasts, the breeding places are confined to a few colonies, the only one in England being on Lundy Isle. In Scotland they breed on the Bass Rock, Stack of Sule Skerry, North Barra, Boreray in St. Kilda, and Ailsa Craig. In Ireland the principal breeding place is the Little Skellig, off Kerry, and a small colony exists on the Bull Rock, off Cork. In the autumn large numbers of them wander south, but a few remain over the winter. They are found all over the world, but do not go very far north nor very far south.

There are fifteen different species of gulls on the British list, and of these six can be classed as Sule Skerry birds,—the great black-backed gull, lesser black-backed gull, herring gull, common gull, glaucous gull, Iceland gull, black-headed gull, and kittiwake. The great black-backed gull is resident all the year round, and never seems to go far away even in search of food. It breeds on the most outlying

parts of the island, and when the young are hatched the parent birds are continually on the watch for anything in the shape of animal food to satisfy the almost insatiable craving of their brood.

About a dozen pairs of herring gulls annually make their nests on the island, but when fish are plentiful—in the months of June, July, and August—large flocks are to be seen fishing all round, and when tired or gorged with food they spend a few hours resting on the rocks. This gull breeds in all parts of Great Britain where suitable places for nesting are available. It breeds also throughout northern Europe down to the coasts of northern France, and in America as far south as 40 N. on the Atlantic side, and on the west side it is known from the Yukon river to California.

The common gull resembles the preceding bird very much in colour, but is much smaller. It is a more northern bird in the breeding season, and there is no record of its nest being found in England. It is found all over northern Europe in summer, but is rare in Iceland. There is only one instance of its capture in North America, a young bird having once been obtained in Labrador. A few are observed every year at Sule Skerry in summer, but they only remain for a very short time.

The lesser black-backed gull is also a summer visitor. It is similar in plumage to the great black-backed gull, but very much smaller. It is much more numerous than its larger relative, and breeds plentifully all round the Scottish coast, more especially on the west side. It does not nest on Sule Skerry, but is common in Orkney and Shetland. In winter most of them go south as far as the Canaries and the coast of Africa.

The glaucous and Iceland gulls are of one family, and very much alike in plumage, the difference between them being chiefly in size. The former is the larger of the two, and is more common in this country, but they are both winter visitors from the Arctic regions, and there is no record of their nesting in the United Kingdom. Every winter numbers of glaucous gulls visit Orkney and Shetland, and a few are seen on Sule Skerry, but the Iceland gull is rarer, and only a straggler now and again is seen. The breeding ground of this species is well within the Arctic circle, in Greenland, Jan Mayen Island, and Baffin's Bay. The glaucous is about the same size as the great black-backed gull, and may be recognised by the white tips of its wings. The Iceland gull is a little smaller than the herring gull, but they can easily be distinguished by the tips of the wings, those of the former being white and the latter black. Young birds of the glaucous and Iceland species are common in winter. They are very pale ashy brown in colour, both above and below, while the back and wings are mottled with broken bars of pale brown.

The kittiwakes arrive in March, and about a dozen pairs make their nests in the most suitable places they can find. They spend an abnormally long time over this work. Shortly after their arrival they pair, and each pair takes possession of a ledge of rock where they sit billing and cooing day after day from the middle of April till the end of May, occasionally doing a little work at nest building. In August and September large flocks visit the island on their way to the sunny south. They are quite common in this country all the year round, but immense numbers come to breed, more especially in the northern portion of the kingdom. They

are found in the Arctic from the farthest point yet reached by man down to the north-west of France, and on both sides of North America. In winter, most of those breeding in high latitudes resort to the Mediterranean and the coasts of Africa.

The terns are purely summer visitors, and never remain over the winter. They always arrive about the same time every year, from the 12th to the 16th May. There are thirteen members of this family known as British, but on Sule Skerry we only see the Arctic and common terns. When the young are fully fledged and able for a long flight, they all take their departure in a body, generally about the 1st of September. They are known to breed in latitude 82 N., and all over northern Europe. In winter they are found on the coasts of Africa and Brazil, very often far south of the equator.

The auk family is well known in the north, and all its members visit Sule Skerry, viz., the puffin, razorbill, common guillemot, black guillemot, and little auk. They are all birds of the northern hemisphere, and are never found south of the equator. Of this family the puffin is the most common on Sule Skerry. In fact it might be called *the* bird of the island, and in May and June one would be inclined to think that all the Tammies in the world made Sule Skerry their headquarters. No bird is so regular in its time of arrival in the spring. Every year they appear early in April, and for a fortnight the sea all round the island is black with them. Then about the 20th they land, and at once set to work to dig out holes in which to lay their one solitary egg. This egg is laid in the first fortnight of May, and after a month's patient sitting the young bird

comes into existence, and by the end of another month it is fully fledged and ready for its home on the deep. As soon as the young are ready to take the water, parent and child leave this vicinity, for during the six years I have been on Sule Skerry I never yet saw a young bird swimming near the island, and I have carefully watched for this. The great bulk of them leave towards the end of July and the first week of August, but some linger on till September. Every year they dwindle down from thousands to two or three, and towards the end the old birds seem to be in a hurry to get the young ready for the road, for they devote their whole energies to fishing and carrying supplies ashore. Early in the season I often notice that, after having satisfied the cravings of their offspring, they spend a considerable time pruning their feathers, but at the end of the season there is no time for this, and when they have delivered over one supply, they, without a moment's pause, again proceed to sea. The reason why they are not all ready about the same time is owing to the fact that the first laying often comes to grief in some way, and a short time must elapse before they are ready to lay again. Large colonies are found breeding in various localities in the United Kingdom, particularly on the west coast from the Scilly Isles northwards; also from the north coast of Scandinavia, the Faroes, Iceland, to the north coast of France. In winter they visit the Mediterranean and the west coast of Africa down almost to the equator. A few stragglers are seen in British waters in winter, but this is unusual.

The razor-bills are fairly numerous on Sule Skerry, and arrive about the same time as the puffins, and take the same time to rear their young. They generally lay under stones,

but often on a ledge of rock without making any nest whatever. They are like the puffins in the manner of rearing their young, that is, they feed them on the rocks till they are nearly fit for flight. They are more numerous on the west coast of Ireland than anywhere in Scotland. In winter they mostly migrate to the Mediterranean and the Canaries.

The common guillemot is much more plentiful than the razor-bill, and is found breeding in vast numbers on all suitable cliffs throughout the United Kingdom. It is also found all over northern Europe and in North America. They are always found nesting on practically inaccessible cliffs, and as there is nothing of that kind on Sule Skerry, very few nest there, generally three or four pairs on the most unapproachable places they can find. There is another species of this bird known as the bridled guillemot, but it is so like the common guillemot that it is hardly recognised as a distinct species. The only difference is that the former has a white ring round the eye and a white line which runs down the ear coverts. The guillemot is also a migrant, but numbers of them remain in British waters throughout the winter. At this season they have a different plumage, being much whiter, and some people run away with the idea that it is another species.

The black guillemot or *tystie* is by no means so numerous as the preceding birds of this family, and, strange to say, it is the only one which lays two eggs. All the others lay only one, and yet they are more numerous than any other sea bird. The scarf, for instance, lays three, four, and five, but even with that number of a family every year they do not outnumber the guillemots round our coasts. The black guillemot is more of a resident in this country, and can be

seen nearly all the year round, its plumage in winter being much whiter all over. Those nesting on Sule Skerry leave in October, but an occasional one is seen now and again throughout the winter. They are found breeding in the Baltic, the White Sea, on the coasts of Denmark and Scandinavia, the Faroes, and southern Greenland. In winter they visit the German and French coasts.

The last member of this family is the little auk or rotche. This bird is purely a winter visitor to the United Kingdom, though specimens in summer plumage have been observed, but up to the present date no authentic instance of its breeding within British waters has been recorded. They are of fairly common occurrence in Orkney, but are not often seen at Sule Skerry. I have found two dead specimens on the island, one having killed itself on the lantern, and in January, 1901, I observed a flock of about twelve a short distance out at sea. Its breeding range is Greenland, Spitzbergen, Noza Zembla, Franz Joseph Land, and northern Iceland. In the winter it is found in the North Sea and Atlantic, and has been known to extend as far south as the Canaries.

In the British list there are ten species of geese, but only one of these has been seen on Sule Skerry—the barnacle goose. Every year we see a flock of them passing north in April, and again in October they call on their way south. Sometimes a few of them rest on the island, but only for a very short time. They are found in large flocks all down the west coast of Scotland and England, more particularly in the Solway Firth. They are also found on the east coast, but not in such numbers, their place being taken on that side by their relation, the brent goose, the commonest of

all geese that visit our shores in winter. Nothing is known so far of the breeding home of the barnacle goose. It may breed in Iceland and Greenland, but there is as yet no proof of the fact, so the man who finds its nest with a dozen eggs will find a prize worth looking after. They have been bred in confinement in this country. In ancient days it was firmly believed that it was produced from rotten wood, or from fruits which had fallen from the trees into the sea, but the scientists of the present day cannot swallow that theory.

The duck family is a pretty large one, and there are no less than thirty different species registered as British. Of that number Sule Skerry can claim six—the mallard, teal, wigeon, long-tailed duck, eider, and red-breasted merganser. The mallard is the commonest of all ducks in this country, and though it was more plentiful in former days, there are still many places where it is extremely numerous, but it is very rare with us, and only a pair once or twice during the winter are seen. It is found throughout all Europe, including the Mediterranean countries, and across the temperate portions of Asia, wintering in India and China. In America it breeds in the temperate latitudes, and wanders south in winter as far as the Gulf of Mexico and Panama.

The teal is another very common British bird, and nests in most parts of the country, but large numbers go north in the breeding season to Iceland and all northern Europe. We see one now and again in the autumn, winter and spring, but they do not find our island a hospitable place, for their visits are always of short duration, and few and far between.

The wigeon visited us once four years ago, when a pair were seen sitting on a pool of water for a few hours. They

breed in the north of Scotland regularly every year, but in winter they migrate to the English lochs and fens, where they occur in immense numbers. Their great breeding ground is in the Arctic regions from Iceland to Siberia. In America it is found in Alaska, and occurs as far south as California.

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The long-tailed duck paid us a visit in October, 1901, for the first time, when a young bird was foolish enough to rest on a pool of water near the tower. It did not attempt to fly, and we captured it after an exciting hunt. This species is another purely winter visitor. It has been reported breeding in Shetland, but this has not been confirmed. In winter it is very plentiful all along the Scottish coasts, and flocks of them may be seen any day from October to March in Hoy Sound.

The most common of all ducks in our locality is the eider or dunter. This is purely a maritime bird, and except in the breeding season, is rarely seen ashore. Several of them remain in the vicinity of the island for most part of the year, but the majority of them go south before the stormy weather sets in. They return in the early spring, long before the nesting season begins, and spend their time fishing in all weathers. Towards the end of May they land in pairs, and select the site for their nests. After that the male bird never approaches his mate during the whole process of incubation. The first egg is laid on the bare ground, but immediately afterwards a small quantity of down is deposited round it, and so on as each egg is laid a little more down is added, until its laying capacity is exhausted. The usual number of eggs is five, but six is not uncommon. As soon as the young are hatched, they follow the parent

bird to the sea, and I have frequently watched them struggling along over the rocks, very often losing sight of their mother, but a peculiar croak given by her gives them a clue to her whereabouts, and they soon find their way to her. They are, in the matter of colour, very like their surroundings, and on the approach of danger they at once flatten themselves on the rocks and are almost invisible. It is amusing to watch their first launch into the sea. They seem as much at home as if they had had years of experience, and almost without exception they dive under water to explore the unknown. The male birds assume the plumage of the female at the end of June, but in the first of winter they again don their more showy dress of black and white.

The red-breasted merganser is common along all the coasts of Scotland, but is only a winter visitor to England. One single specimen visited the island last year, and thereby got classed as a Sule Skerry bird. It breeds in Orkney and Shetland, and can be seen summer and winter, though more numerous in winter.

The petrel family is a very interesting one, but owing to their peculiar habit of only appearing at night they are not generally well known birds. Of course they are seen during daylight occasionally, and usually their appearance is the forerunner of bad weather. This is really the case, but the fact is the bad weather is at hand ere they show up. They love darkness rather than the light, and when the sun is hidden behind the clouds and the surroundings are gloomy, they rise on wing and are seen flitting about. Of this family there are some ten members on the British list, but so far only three have been seen at Sule Skerry—the fulmar, the fork-tail petrel, and the stormy petrel.

The fulmar is often called a gull, but it has no claim to be classed as such unless we take its plumage into consideration. No bird is more thoroughly oceanic in its habits. It lives exclusively at sea, often at great distances from the land, and only visits some isolated ocean rock to rear its young. It is a daylight bird, and in this respect does not resemble the other members of the family, such as the petrels and shear-waters. Its great breeding haunt in this country is St. Kilda, but of late years it has been found nesting in Westray and several places in Shetland. Numbers of them were seen passing Sule Skerry last spring and early summer, perhaps on their way to some suitable nesting haunt in Orkney. They have great power of wing, and will follow a steamer going fifteen miles an hour, against a wind of still greater speed, with such ease that only an occasional flap of their wings is observable.

The fork-tail petrel has been captured twice on Sule Skerry, in September, 1899, and September, 1901. It breeds on St. Kilda and the Outer Hebrides. So far, I have been unable to find its nest, but, being on the island in the breeding season, one would naturally infer that it was there for that purpose. It is a most difficult matter to find their nests, for they lay under stones and in burrows, and though I have spent hours hunting for a nest, I have always been unsuccessful. The two captured were attracted by the light at night, and rested on the lantern. It is found all over the Atlantic and Pacific Oceans, inhabiting the temperate waters of the northern hemisphere.

The stormy petrel, or Mother Carey's chicken, is a smaller bird than the preceding one, and is found all round the British coasts. It arrives at Sule Skerry about the 1st of

June, but until an hour after sunset it is never seen, and though there are several hundreds of them, no one would know they are there unless by watching for them at night. They lay their one solitary egg in June or July, and in October the young are fully fledged and ready for their home on the deep. When caught they emit an evil-smelling oily fluid. This is peculiar to all the petrels, even the fulmar. I have often heard that they have been used as a candle simply by drawing a cotton thread or rush through the body, and lighting the projecting end. I tried this, but failed miserably. The wick certainly did burn for a minute or so while saturated with the oil after being drawn through the bird, but there was not a sufficient supply of oil to keep the light going to be of any use.

This completes the list of our web-footed birds, and we will now take up those that spend most of their time on the land. A great many of them, though unable to swim, derive a considerable part of their living from the sea, some being known as waders, and for that purpose nature has endowed them with abnormally long legs, while others watch the ebb and flow of the tide, and when the rocks are bare find plentiful supplies of food in the shape of marine insects and shell-fish of different kinds. Of this class the heron is the most prominent. It breeds throughout the kingdom, generally in large heronries in trees, but sometimes on the sea cliffs. It does not go much farther north than Shetland, and is a summer visitor mostly in the north. Every year a few call at Sule Skerry on their way south in the fall, and sometimes stay a week.

The *scolopacidæ* family consists of thirty-seven different species, and of that number Sule Skerry claims eight—the

curlew, whimbrel, wood-cock, snipe, jack-snipe, dunlin, purple sandpiper, and redshank.

Of these, the curlew, snipe, jack-snipe, and purple sandpiper are winter residents, and all leave in the spring for more suitable localities in which to rear their young, returning every year in August and September. The woodcock is an occasional visitor, chiefly during the autumn migration, but also occurs through the winter. This bird is resident in Great Britain, but immense numbers visit us in spring and autumn, some coming to nest and others giving a passing call on their way to Scandinavia. It is almost unknown in the Faroes and Iceland, and is not found in America. *

The dunlin is a summer visitor, generally for a short time in June. The redshank comes and goes the whole year round, but does not nest on the island. In September we sometimes see considerable flocks passing south. It is said to be rare on the Outer Hebrides, but common everywhere else in Scotland, England, and Ireland.

The *charadriidæ* is a well-known family, and most of its members visit Sule Skerry—the golden plover, ringed plover, lapwing, turnstone, and oyster-catcher.

The golden plover and lapwing are spring and autumn visitors. The ringed plover occasionally spends a few days on the island in summer. The oyster-catcher comes in February and stays till October, rearing its family every year on the island.

The turnstone is one of our favourite birds, and stays all winter on the island, never deserting it under any circumstances. Every day it can be seen busy at the curious habit from which it derives its name—turning stones in search of food. Up to the present there is no authentic record of its

*Has been reported from Newfoundland
Quebec. Rhode Island (?) New Jersey.
Pennsylvania & Virginia (see. The
Birds of America 18358)*

breeding in the United Kingdom, and every year in April our friends leave us for the north. In May we see flocks resting on outlying rocks; these are birds from the south, and are much wilder than those we may call our own birds. At this season their plumage is much brighter in colour, and it is only after having fulfilled the law of nature by reproducing their species that they don the more sombre dress of winter. They breed within the Arctic Circle, in Iceland and all northern Europe. In August and September they all wander south, some as far as the Cape of Good Hope.

The biggest family of birds we have is the *passeridæ*, or perching birds, numbering no less than 137, but of that large number we can only claim 27—the song thrush, redwing, fieldfare, blackbird, ring-ousel, wheatear, whinchat, robin, willow warbler, wren, white wagtail, meadow pipit, pied fly-catcher, swallow, house martin, house sparrow, chaffinch, lesser redpoll, twite, corn bunting, yellow bunting, snow bunting, starling, jackdaw, hooded crow, rook, and sky-lark. With the exception of the meadow pipit these are all casual visitors, and occur only on the spring or autumn migrations. The meadow pipit is a resident all the year round, and rears its young on the island, but in the autumn we see some strangers of the same species. The redwing and fieldfare are only winter visitors to this country, and sometimes arrive in October and November in immense flocks. I have seen hundreds of them round the lantern at night, some sitting on the rails and trimming paths, and others flying round about. In the morning after a rush like this we find large numbers lying dead at the base of the tower, having killed themselves by striking against the dome and windows. Blackbirds and thrushes usually accompany them.

Sometimes we come across a rare bird, that is to say a species not often seen in the locality. Last September I caught a pied fly-catcher. This bird is quite common in England, and nests there, but is not of frequent occurrence in Scotland, and is rarely seen in Orkney.

Rooks and hooded crows are resident in Orkney all the year, but large numbers come north every spring, some of them staying for the breeding season, others merely giving a passing call. A few jackdaws very often accompany a large flock of rooks, and their nests are occasionally found in Orkney. Most members of the crow family nest very early in the season, and they are generally found leading the way at migration time. No member of the family is resident on Sule Skerry, but we are favoured with a friendly visit every year, chiefly in spring. On the 3rd of March, 1901, over 100 appeared on the island. They were, I have no doubt, attracted by the light, for there were none to be seen the previous night, and at day-break every place was alive with them. The greater number were rooks, with a few hooded crows and one jackdaw. The majority of them left the same day, but a few remained as long as they could find anything to eat. On the 11th of the same month twelve rested for a few hours, and again on the 23rd over 100 were seen for about an hour. In the autumn we see a few stragglers on their way south. The range of the crow family may be said to extend over the whole world, and it is said that, go where you will, you will find a Scotsman, a crow, and a Newcastle grindstone.

In *The Annals of Scottish Natural History* for January, 1903, Mr. Wm. Eagle Clark, F.L.S., makes the following reference to three birds which I sent him for identification.

Two of the birds were got at Sule Skerry and the other in Stromness harbour :—

“Greenish Willow Warbler (*Phylloscopus viridanus*)*.—A fine adult male example was killed at the lantern of the Sule Skerry Lighthouse on the night of the 5th September, and was forwarded to me in the flesh by Mr. James Tomison, the keeper. A Garden Warbler (*Sylvia hortensis*) was captured at the same time. Sule Skerry is a rocky islet lying some forty miles west of Hoy, Orkney, and nearly the same distance N.E. of Cape Wrath.

This eastern species has only once previously been known to occur in the British Isles, a female specimen having been obtained on the 5th September, 1896, by Mr. Caton Haigh on the N.E. coast of Lincolnshire. It is also the fifth recorded occurrence of the bird in Western Europe, it having been captured on three occasions in Heligoland—once in the autumn and twice in the spring migration.

The Scottish specimen is an unusually fine example, the wing measuring 2.6 inches, and is in brilliant plumage, having just completed the moult. In it the third primary is the longest, the fourth being next, while the second is intermediate between the sixth and seventh—a feature described as rare in the “Catalogue of Birds” (British Museum), vol. v. page 45, where that quill is said to be usually intermediate between the seventh and eighth. The figure of this species in Lord Lilford’s “Coloured Illustrations” is not satisfactory: the tarsus as there represented is much too short, the bill is neither long enough nor sufficiently robust, and in colour the under surface is too yellow and lacks the greyish tint which is somewhat conspicuous on the flanks. The figure in the Supplement to Mr. Dresser’s “Birds of

* This proved to be the Northern Willow Warbler
Phylloscopus borealis, Au. Sc. N.H. Eagle

Europe" (plate 651, fig. 1) is a little better in these respects, but the lower parts are too much washed with green. As compared with other British members of the genus, *viridanus* may be described as being stout-billed, long-legged, and short-toed. In other respects it is a decidedly green Willow Warbler, with a pale bar across the wing, a conspicuous superciliary stripe, and the under surface greyish white delicately washed with sulphur-yellow.

This species has only been recognised as a regular member of the European avifauna during recent years, having formerly been recorded under the name of *P. plumbeitarsus*, an allied species now proved to be Asiatic and not European. The Greenish Willow Warbler is a summer visitor to Russia, where it occurs as far to the north-west as the Government of Olonetz, and eastwards to the Urals and the northern shores of the Caspian. In Asia it is found during the nesting season in the Altai, Turkestan, Kashmir, and probably throughout the higher Himalayas; and in winter it is widely distributed in India and is found in Ceylon. Its eggs are, I believe, unknown.

It is perhaps not quite so rare a bird in the spring and autumn in Western Europe as it is at present supposed to be. It is much liable to be overlooked from its general resemblance to the Common Willow Warbler, and it says much for Mr. Tomison's perspicacity that he recognised his capture as something new to him. The fact that it has twice occurred in spring in Heligoland indicates a return movement on the lines of the autumn emigration, and would also seem to imply that the bird is of more frequent occurrence.

The whole of the circumstances surrounding the occurrence

of this little bird on that remote Orcadian rock brings prominently to our notice how little we really know of what is passing along our shores during the periods of migration; how much may, and does, yearly escape our attention; and also the extent to which the little knowledge we possess comes to us by the merest chance.

The specimen is now in the British Collection in the Edinburgh Museum of Science and Art.

Lesser Whitethroat (*Sylvia curruca*).—A fine adult male was killed at the lantern of the Sule Skerry Lighthouse on the night of the 17th of September last, and was forwarded to me in the flesh. This species undoubtedly occurs annually on the Scottish coasts as a transient migrant, especially on the eastern seaboard, when proceeding to and fro between its Scandinavian summer haunts and its African winter retreats. It seems, however, to escape detection in quite a remarkable manner during these migrations, and Mr. Tomison's capture is a welcome as well as an interesting addition to our scanty knowledge on the subject. Although, there can be little doubt, it is a bird of double passage, yet all our information refers to its occurrence on the autumn journey, during which it has been recorded for Shetland on four occasions (Saxby), North Ronaldshay twice (Allan Briggs), once Barra (MacGillivray), once for Aberdeenshire (Sim), and twice at Berwick (Bolan); while one seen by Dr. Hamilton in West Inverness-shire, on the 10th of August, 1880, was either a transient visitor or an emigrant summer bird. It is a local summer visitor to the Solway area, and there are one or two reliable records of its having nested elsewhere in Scotland.

Sooty Shearwater (*Puffinus griseus*).—A female specimen

was captured in Stromness harbour on the 16th of October and forwarded to me by Mr. James Tomison, who had correctly identified it.

This Shearwater appears to be of extremely rare occurrence in the Scottish seas; and there are very few records indeed of its visits, all of which, so far as we know of them, appear to have been confined to the south-eastern section of the coast. It is a new bird to the fauna of the Orkneys; and though it has not been detected in the Shetlands, has occurred in the Faroes." *

* The Lesser Whitethroat and the Sooty Shearwater are now in the Museum of the Natural History Society, Stromness.

A CHAMBERED MOUND

NEAR BRECKNESS, STROMNESS, ORKNEY.

By M. M. CHARLESON, F.S.A. Scot.

IN the summer of 1900, by the kind permission of W. G. T. Watt, Esq. of Skail, I commenced the excavation of a large mound on the farm of Westerleafea, near Breckness, in Outertown, Stromness.

There was no room for doubt as to the artificiality of the mound, which, apart from its symmetry and surroundings, had previously supplied a neighbouring farmer with a quantity of material for building purposes, these operations, more properly depredations, leaving a gap on the south side of the mound in which several upright slabs of some size were noticeable. At this point we began the excavation, and before long struck a low wall between two upright slabs which projected from it and which were 6 feet apart. In the middle of this wall, that is, between the two upright slabs, an opening was found, and this led to a passage running inwardly for a few feet, and roofed over with large transverse slabs. At the inner end of this passage, the interior wall branched sharply to right and left, and in following it up on the right we found that it extended first in an easterly and then in a northerly and westerly direction, ending in a large recess which subsequently proved to be of equal height with the wall exposed. The outline of the structure being thus far laid bare, the excavation was carried on in a downward direction, beginning at the entrance.

At a depth of five feet from the surface of the mound a floor was discovered, together with a lateral recess off the east side of the building. This floor, however, proved to be secondary, for, at a depth of a foot, another and evidently primary one was found, the debris between the two consisting of black unctuous earth intermixed with animal remains. Almost in line with, and four feet from, the entrance we noticed a large slab on the floor, which, on being raised, revealed a square-built cavity full of black earth, having a single slab for its base. The recess on the east side was next cleared of its contents, consisting of black earth reduced to the consistency of mud, and animal remains, few of which survived handling. Contrary to expectation, this recess extended downwards beneath the level of the floor, and diverged in a north-easterly direction from the axis of the chamber, while the back wall was acutely constricted in the middle of its length. The walls of the recess converged towards the top, which was formed of slabs laid across, and near which its width was reduced to about one half by the breadth of the lintel and the thickness of the superincumbent masonry. In the recess off the north side of the chamber were found a fragment of rude pottery, evidently part of the base of a vessel, and the tine of a deer-horn. The walls of the chamber and recess last mentioned were beehive in form and dry built, the lower portions of the former being here and there formed of slabs set on edge and resting on the floor. The walls of the recess, it may be added, showed traces of the action of fire.

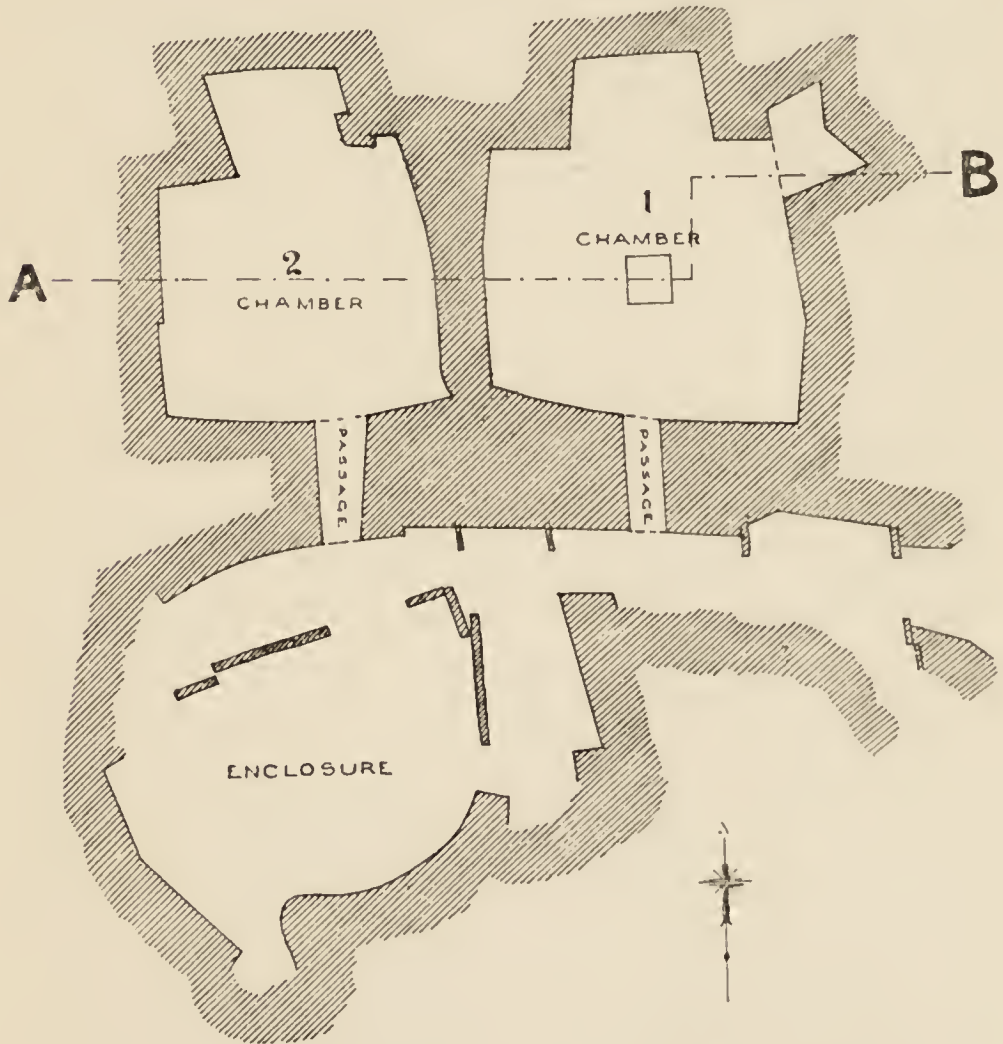
At this point the excavation had to be abandoned, and was not resumed until the summer of 1902, when we exhumed the wall on the west side, beginning, as before, at

the entrance, from which it diverged to the west for a few feet, with an inward tendency, and then trended to the north and east until it joined the recess off the north side of the chamber at the point where the excavation had been stopped in 1900. The remaining debris was then removed, together with the secondary floor, the primary one being also raised, but without revealing relics of any kind. The wall on this side showed no traces of convergence.

The chamber being now clear of its contents, which consisted throughout of compacted earth intermixed with stones, we found that it took the form of an irregular square with a passage and recesses off the south, east and north sides respectively. The extreme length from north to south was 9 feet, and from east to west 9 feet 10 inches, the greatest height being 5 feet. The entrance passage, the floor of which was paved and which faced the south, measured 4 feet in length, $1\frac{1}{2}$ feet in height, and $1\frac{1}{2}$ in breadth. The recess on the east side was about $5\frac{1}{2}$ feet from top to bottom, about 3 feet in greatest length and breadth respectively, and 2 feet square at the opening, while that off the north side measured $3\frac{1}{2}$ feet in length and $4\frac{1}{2}$ in breadth. The cavity in the centre of the chamber was about $1\frac{1}{2}$ feet each way and 1 foot in depth.

But the excavation was not finished. We concluded that the chamber brought to light did not exhaust so large a mound, although no trace of any passage which might lead to other chambers could be found. Accordingly, we cut trenches at different points, and were rewarded for our trouble by unearthing a wall which ran almost parallel with that on the west side of the chamber already discovered, and which, on being followed up to the north, led to a

recess similar to that which distinguished the north side of the other building, with this difference, that there was a depression in the angle leading to it, together with another in its east side, the former extending the full height of the wall and the latter having a lintel 6 inches from the floor ;



Ground Plan of Chambers in the Mound at Breckness.

thereafter the wall trended to the west, south and east, being broken on the south side by the entrance passage, which, together with the chamber itself and the lateral recess on the north side, were afterwards cleared, but without revealing any animal remains, relics, or traces of a secondary

floor; even the raising of what floor there was produced the same negative results.

We had now a chamber closely resembling the one already brought to light, so closely, indeed, as to make the resemblance striking, and it wanted only the addition in the second instance of a lateral recess and floor cavity to bring the two into the category of twins. The wall on the east side, it may be said, showed traces of convergence as well as the walls of the northerly recess, which bore evidence of the action of fire. The wall, however, on the west side, like the corresponding one in the other chamber, did not assume the beehive form, the converging portion, no doubt, having given way, while the wall on the south side fell away considerably from the perpendicular, to the extent, I should say, of 45° at the top. As in the other case also, the lower sections of the walls at several points were constructed of slabs set on edge, a practice adopted evidently to economise labour, if not material. In length the chamber measured 8 feet, in breadth 9 feet, and in greatest height about 4 feet, while the entrance passage was 4 feet in length, from $1\frac{1}{2}$ to 2 feet in breadth, which increased inwardly, and fully 1 foot in height. The recess off the north side measured $3\frac{1}{2}$ feet in greatest length, about 4 feet in width, not including that of the depression, which was 6 inches. The height of this recess, as has been said, corresponded with that of the adjacent wall.

The exterior wall facing the south was then exposed, giving a frontage of fully 26 feet. It curved outwardly at the west end, and at a distance of 7 feet from the eastern extremity it formed into a recess which, with the assistance of projecting slabs, had at the ends a width of 2 feet, the

length being $4\frac{1}{2}$ feet and the height 2 feet. The section of the wall forming this recess converged and was indented in this length. Two other slabs 2 feet in height, 1 foot broad, and 4 feet apart, projected from the wall between the entrance to the chambers. There were four slabs projecting from the exterior wall, the two in the middle being noted at the commencement of the excavation in 1900.

The whole area comprising the south side of the mound was next examined, with interesting results, a low irregular wall somewhat circular in outline and with an opening in the middle being found to extend from a point about 6 feet from the west end of the front wall to within 9 feet of its centre, while within the enclosure thus formed, about 3 feet from the front wall and almost parallel with it, were four large slabs set on edge and about 2 feet in height, there being a break of 3 feet between them opposite the entrance to the chamber last excavated. From the easterly end of this line of slabs also two others of equal height extended outwardly towards the end of the circular wall already referred to, leaving a space 2 feet wide between the two. A little to the east of the enclosure referred to we unearthed a segment of a wall lying about north and south and 2 feet from the front wall of the structures, while to the east of that again were 2 upright slabs in line with and 2 feet from the projecting slab forming the east end of the recess in the front wall. We found that the whole area was paved. In excavating the enclosure a fragment of rude pottery, evidently part of a straight-lipped vessel, was found, together with a rude implement of claystone measuring $12\frac{1}{2}$ inches in length, about 3 inches broad, and $1\frac{1}{2}$ inches thick; one end was truncated and the other bevelled

from both sides and slightly rounded. The stones forming the floor of the inclosed area were lifted, but no additional relics were found.

On the west side of the mound was a depression, $2\frac{1}{2}$ feet by $1\frac{1}{2}$ feet, with slabs forming the sides and ends; but, as it was opened some time before I began the excavation, I can give no account of it beyond recording its existence, and the statement made to me that it had been a cist.

It will, I think, be seen from the foregoing description that although the chambers excavated bear some resemblance to those structures occasionally met with in Orkney, which have been regarded as sepulchral, and are distinguished by a dry built chamber on the beehive principle, a passage leading to it, and one or more latteral cells, the present group must, I think, be regarded as dwellings. There is an entire absence of human remains, the bones found being those of animals, including the skull of a dog. The relics, although meagre, are interesting, and point clearly to human occupation, but apart from this the features of the chambers themselves are such as to lead one to the same conclusion. In the case of the chamber first excavated, the recess off the east side might have been a well; and in this connection I may say, that on the occasion of a recent visit I observed it full of water, while that on the north side of this chamber, to judge by the condition of the walls, had evidently been used as a fireplace. The cavity in the floor also seems significant, but the use to which it might have been put is not apparent. The other chamber also, to judge by the traces of fire in its northerly recess, had a fireplace. The entrance passages are low and narrow, and one would think unsuitable for giving free

access to the chambers. No doubt they are so, if we consider them in relation to the requirements of the present day.

One is at a loss what to make of the enclosure fronting the chambers. Had the outworks been complete, a theory might have been suggested, but unfortunately they suffered considerably from the operations referred to in the beginning of the paper. As to the age of the structures we cannot even hazard a guess, although from the presence of the stone implement they must be assigned to a remote period, not, it should be remembered, because the implement is made of *stone*, but because the *type* is an ancient one. The implement, however, cannot be taken as giving an adequate idea of the culture of these mound dwellers, nor can the pottery aid us in this matter. We must rather take the chambers themselves as the criterion, and in doing so we come to the conclusion that, although built on a definite plan, with great uniformity and some ingenuity, the civilisation of the builders was not of a high order; but however this may be, they were keenly alive to their personal safety, the dwellings being constructed in such a way as to be easily defended from the inside, while, in selecting a site, they took care that they had a good view of the surrounding country and of the not far distant sea.

THE IDENTIFICATION OF BIRDS.

BY H. W. ROBINSON, LANCASTER.

THE subject of identification is a large one, and so I cannot deal with it anything like fully, but can only touch upon the fringe of the subject, and will try to show some of the differences between birds which resemble one another, although I fear without diagrams to illustrate these differences my subject will be a difficult one to grasp, but I will do my best to make myself clear to you.

The difference between some of the rarer foreign visitors and our British species is often so slight that many rare birds, I am sure, are overlooked by shooters, and go into the pot—truly rather an untimely end for a rare bird. So many gunners unfortunately look upon a duck simply as a duck, or a wild goose as a wild goose, without troubling to examine the bill or to determine what sort of a duck or goose it really is. A friend of mine who has shot numbers of geese in Ireland, had not the slightest idea as to their species. From his vague description they might have been any of the larger grey geese. On asking him to point out the bird to me in my collection, he immediately dropped on a Chinese goose! I then gave up the task as hopeless. I could give numerous other cases, some far worse than this, and have repeatedly heard scaup and tufted duck called wigeon. In the museum of a certain large town in Lancashire are two mallard drakes, the ordinary common wild duck, labelled in large letters for the benefit of the ignorant,

male and female, and also for the benefit of the same people a fine pintail drake is labelled wigeon, although there are many wigeon, not only in the same room, but even in the same case. The labels on these birds are screwed on to their stands, so cannot get changed in cleaning or moving them about. A short time ago two snow geese, birds which have never been shot in England or Scotland, and only about three times in Ireland, were shot in the latter country by a local pot-hunter. Certainly he sent one to be stuffed, but the other he gave to a friend, who plucked, cooked, and ate it! Surely a case of eating the goose that laid the golden eggs, as its skin would have been worth far more than its weight in gold. It is a pity that the glossy ibis shot here in Stromness not long ago was not acquired for the museum. The lad who shot it only got the princely sum of one shilling for it.

But I must get on with my subject, and will commence with the swans. The mute swan or tame swan is easily identified from the others by his bill being dark chesnut in colour at the sides and towards the base, instead of yellow; and by the black tubercle or knob at the base of the same organ. I call it the tame swan, as those seen are as a rule tame birds, although there is no reason why the bird should not be found in this country wild, and breeds in quite a wild state as near our shores as Denmark and southern Sweden. Indeed, on Loch Stenness on one occasion I counted 27 of these birds.

The whooper swan is of the same size as the mute, but the knob on the bill is wanting, and its sides and base are coloured bright yellow instead of chesnut.

Bewick's swan is exactly like the whooper, only very much

smaller, having a total length of $3\frac{3}{4}$ feet as compared with the 5 feet of the whooper. In both these species the head is triangular in shape, distinguishing them again from the mute swan.

The six species of British geese may be divided into two groups—the grey geese, comprising the greylag, pink-footed, bean, and white-fronted geese, and the black geese, namely, the two remaining species, the barnacle and the brent. All these geese have a nail on the end of the bill, the colour of which is useful in identifying them. By the following table the grey geese may be identified at a glance :—

Greylag,.....White nail,.....Pink legs.

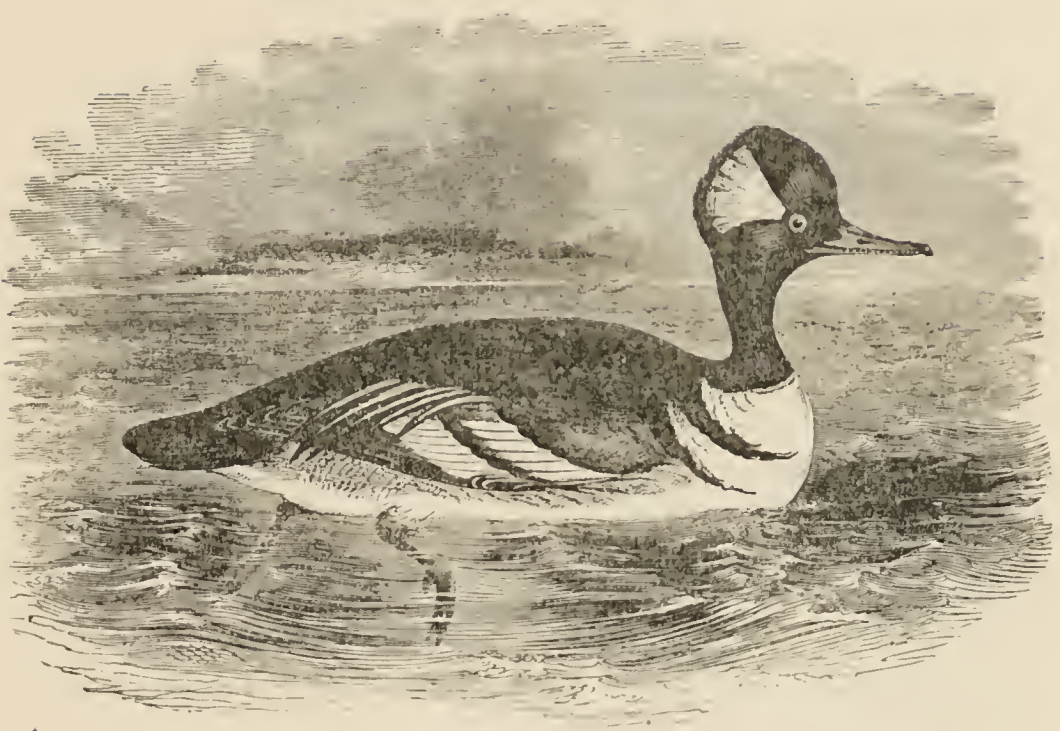
Pink-footed,.....Black nail,.....Pink legs.

Bean,.....Black nail,.....Orange-yellow legs. . .

White-fronted,White nail,.....Orange-yellow legs.

The white-fronted cannot easily be confused because of the patches of white feathers at the base of the bill and on the forehead. The greylag, the largest of the four, is easily identified by the white nail; the bean by the black nail and orange-yellow legs, and the pink-foot by the black nail and pink legs. The bean and the pink-foot are often mixed up, especially in the young birds. I have seen the young bean goose with pink legs, which makes it so much like the pink-footed species that it would be quite excusable if anyone did so mistake it. However, the bill of the bean is comparatively long, and is crossed by an orange band, that of the pink-foot being very short and crossed by a pink band.

In the black geese, the barnacle has the head and neck black and white, the head and neck of the brent being black with only a few white feathers on the neck—merely a speck. These are all the true British geese.



THE HOODED MERGANSER.—*Mergus cucullatus* (Linnaeus).

Among the foreign visitors likely to be met with is the Canadian goose, which is like an enormous barnacle, measuring 3 feet 2 inches in length as compared with 2 feet 2 inches, and weighing as much as 18 or 20 lb, as compared with the $4\frac{3}{4}$ to $5\frac{1}{2}$ lb of the barnacle. The Egyptian goose is easily recognised by the green speculum, or green feathers on the wing. There is a doubt as to its being a goose at all, it being nearer allied to the sheld-ducks than to the geese. The snow geese are pure white throughout, with the exception of the primaries or long wing feathers, which are jet black.

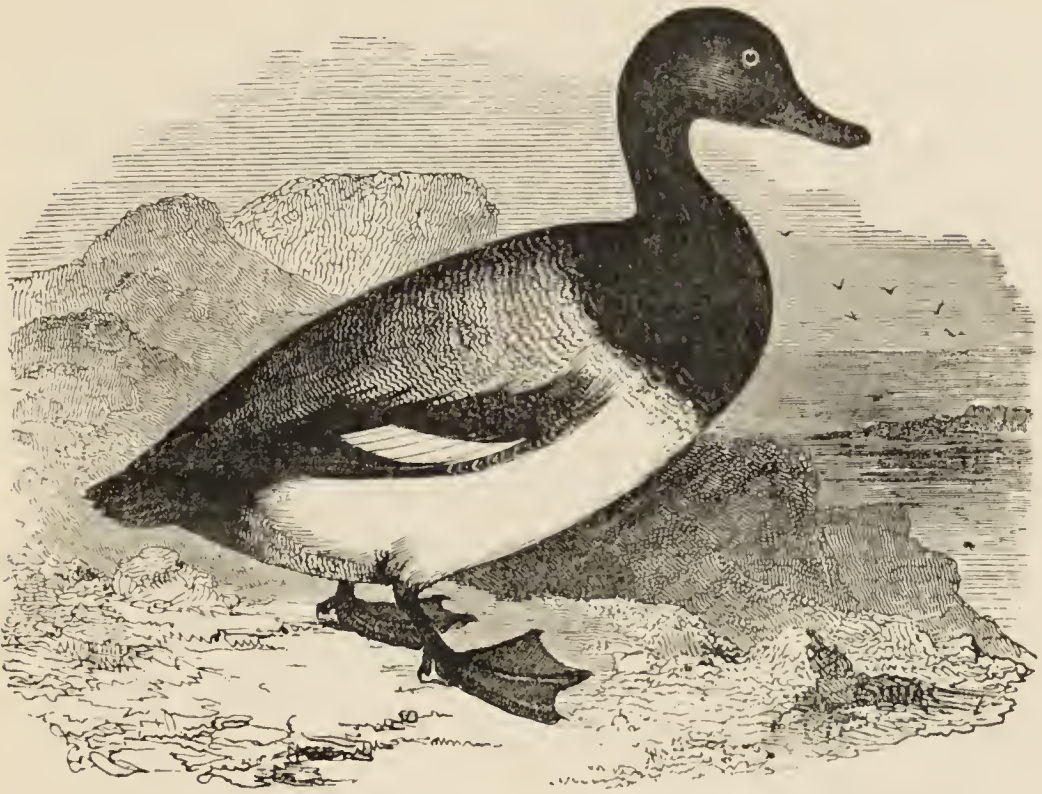
The smew duck may easily be mistaken when on the water for a black guillemot in winter plumage, only it dives with a jump like the scarf and merganser, which the black guillemot does not. The drake has a white crest, and both sexes are very light coloured, almost white. Of course

when handled the smew cannot be mistaken, and has a serrated or toothed bill like the merganser.

The hooded merganser drake is easily identified by his enormous expanded crest, which is black in front and white behind.

The gadwall may be known by its white speculum or wing feathers, which are greenish purple in the common wild duck or mallard. The female gadwall might easily be confused with the female pintail, but the gadwall has the white speculum whereas in the pintail it is greenish-purple. The pintail, moreover, is very long in the neck.

In the teals, the rare American blue-winged teal may be recognised by the pale blue feathers on the wing, which in this case form not the speculum, as is usually the case, but the wing coverts. The American green-winged teal is very much like our British teal, but the drake may be identified by having a white crescentic band on each shoulder in front of the wing, and by the absence of the broad edging of white on the scapulars. Between the females of the two species I can see no difference whatever. The American wigeon is a good inch larger than our species. The drake has the crown to forehead white instead of cream-coloured, and the rest of the head brown with black spots, instead of being a deep chesnut colour. Moreover, a patch of bright green extends from behind the eye down the neck. In the female the crown is black with a white border, instead of brown with black spots as in our species. The pintail is easily recognised by his long tail, the two central feathers being greatly elongated and almost black in colour. His long neck also betrays him at once, with its brown stripe running down the back and its two white stripes running down the



THE SCAUP DUCK.—*Fuligula marila* (Linnaeus).

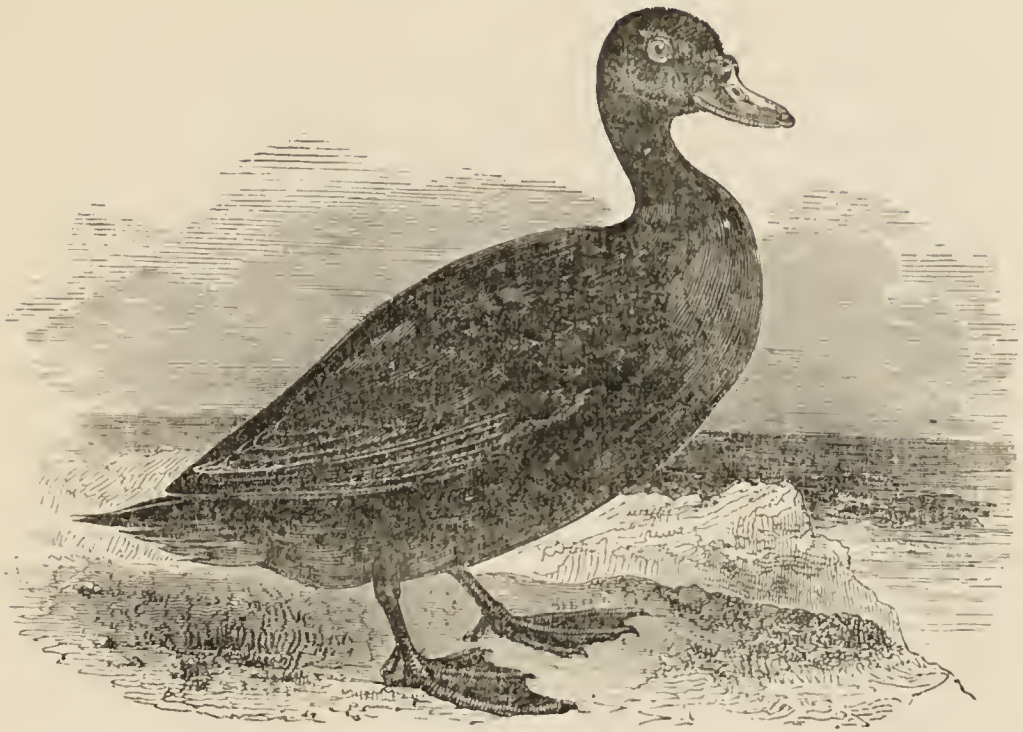
front, one on either side. The female can only be confused with one other duck, as I have already stated—the female gadwall, it being identified from it by the greenish-purple speculum, which is white in the gadwall. The shoveller, both male and female, can easily be recognised by their shovel-like bills, which are very marked and very ugly to say the least of them. The ruddy shell-duck is smaller than the common species, and is known by its rusty tinge, which makes the bird look as if it had fallen into the rusty-coloured water coming from some iron fields.

This connection with iron-ore reminds me of rather a joke I had one day a few winters ago. Early one morning I shot a teal duck which I did not find until mid-day, it having fallen into an open field-drain filled with this rusty-coloured water, which had stained its plumage red. I dried

it carefully and showed it to several local naturalists, who had never seen anything like it before, and for the life of them could not put a name to it. It was quite new to them, and of course must be something very rare indeed. They looked rather "had" when I told them the truth concerning it. This ends the surface-feeding ducks.

Among the diving ducks the scaup drake is easily recognised by his large dark green head, and the duck is unmistakable by the conspicuous white patches on either side of the bill. The lesser scaup, an American species, is so much like a small specimen of the common scaup, that it may have occurred often in the country and been overlooked. The head of the drake, however, has a purple sheen instead of being dark green. The duck is almost identical with the common scaup duck, only 2 or 3 inches smaller, measuring but 15 or 16 inches in length, instead of 18 inches, the length of the common scaup duck. The tufted duck can hardly be confused with any other species because of its small size, the drake being at once known by his purple black head surmounted by a small tuft. The female is very much like a small scaup duck without the broad white markings at the base of the bill, there only being a narrow fringe of white feathers here. She also has a slight tuft. The white-eyed pochard or ferruginous duck is recognized at once by the white eyes. In the red-crested pochard both male and female are crested, the crest of the male being erect and very bushy and appearing almost golden in colour when the sun is upon it, that of the female being smaller and duller in colour.

The common scoter is black throughout, the velvet scoter having a pure white speculum which is very con-



THE COMMON SCOTER.—*Ædemia nigra* (Linnaeus).

spicious in flight. The rare surf-scoter has no white speculum, but has a large white patch on the back of the neck, and another round white patch on the forehead. The female of the surf-scoter is very much like that of the common scoter, but may be distinguished from it by a white patch behind the ear. This bird has several times been observed in Orkney, but is unapproachable; still I know of six having been shot and identified in Orkney during the last fourteen years. The golden-eye is too well known to need any description. However, the young male may be distinguished from the adult female by having a yellow band on the beak. The buffel-headed golden-eye drake has the feathers on the head and neck puffed out, they being of a violet colour with green and bronze reflections. In the female the crown is black, with a white stripe on the cheek and ears. It is a much smaller species than

our British golden-eye. Barrow's golden-eye, another North American bird, is said to have visited Orkney. The head, crest, and neck of the male are of a dark glossy blue colour, and the female may be identified by having a white ring round the neck.

The harlequin duck, which is very common in Iceland, is unmistakable, being covered with black, white, and chesnut lines, bars, and stripes of varying length and width. The striking tubercle or knob at the base of the bill of the king eider distinguishes it at once from any other duck. The female, however, is very much like that of the common eider, but is lighter in colour, being more of a reddish-brown colour than the common species. Specimens of this bird have several times been observed in Orcadian seas among flocks of the common eider. Sheller's eider I need not describe, as it is rare anywhere except in the regions round the pole.

Brünnick's guillemot is an Arctic species which occurs, I am sure, fairly often in Orkney and Shetland, but is overlooked. It is very much like the common species, but is larger by two inches, measuring 17 inches instead of 15; it is darker coloured on the upper parts than the common guillemot, and last, but not least, has a thicker and stronger bill.

The next bird which I shall describe, of which you have a specimen in your museum, and which is a very rare bird, is the eared grebe. It is most difficult to identify it from the Slavonian grebe, which is a fairly common species locally. The great difference is as follows—in the eared grebe the beak is tip-tilted, whereas in the Slavonian species it is curved downward. The eared grebe is badly



THE SURF-SCOTER.—*Edemia perspicillata* (Linnaeus).

named, as the ears on the Slavonian are far more pronounced in summer than in the so-called eared grebe. The great crested grebe is identified by his greater size, measuring from 19 inches in the female to $22\frac{1}{2}$ inches in the male, as compared with 13 inches and 14 inches in the eared and Slavonian species respectively. In summer the crest at once marks the bird. The red-necked grebe is liable to be confused with the great crested, but may be identified by having the base of the bill yellow instead of carmine, the bill being also much thicker than in the crested species. Moreover, the male has a total length of only 18 inches instead of $22\frac{1}{2}$ inches. The American pied-billed

grebe is hardly likely to be met with, its white bill with the black band across its centre, however, easily distinguishes it.

The white-throated northern diver, an Arctic species, might easily occur in Orkney. It may be identified from its cousin, the great northern, as follows :—

By the bill being yellowish-white instead of black.

By the lower mandible being curved instead of straight.

By 8 lines on the throat band instead of 12.

By 10 lines or less on the neck band instead of 18.

The black-throated diver is distinguished from the great northern by its smaller size, 24 to 27 inches as compared with 32 to 35 inches, and by having only one white band on the throat instead of two. The fork-tailed petrel may be distinguished from the stormy petrel, of course, by its forked tail. The other petrels as Wilson's, Bulwer's, the capped, the dusky, the collared, and the frigate, I think I need not describe as they are of such rare occurrence that I do not think they will be met with here.

The great fulmar I think you are all acquainted with. The Manx shearwater is fairly common here in the summer, so I will not enlarge upon it. The sooty shearwater, an extremely rare bird, of which you have a specimen in the museum, shot in the harbour on October 16th, 1902, is sooty black in colour throughout, unrelieved by any white whatever. The great shearwater is ashy-grey as to its upper parts and white on the under parts, the primaries and tail being almost black. The rare levantine shearwater, rarer even than the sooty, resembles the Manx, but has the under tail coverts and shanks dusky brown instead of white as in the Manx.

The black-browed albatross is a foreign species which has



THE HARLEQUIN DUCK.—*Cosmonetta histriónica* (Linnaeus).

been observed in Orcadian seas several times, but never near the coast. You have a foreign shot specimen of this bird in your museum.

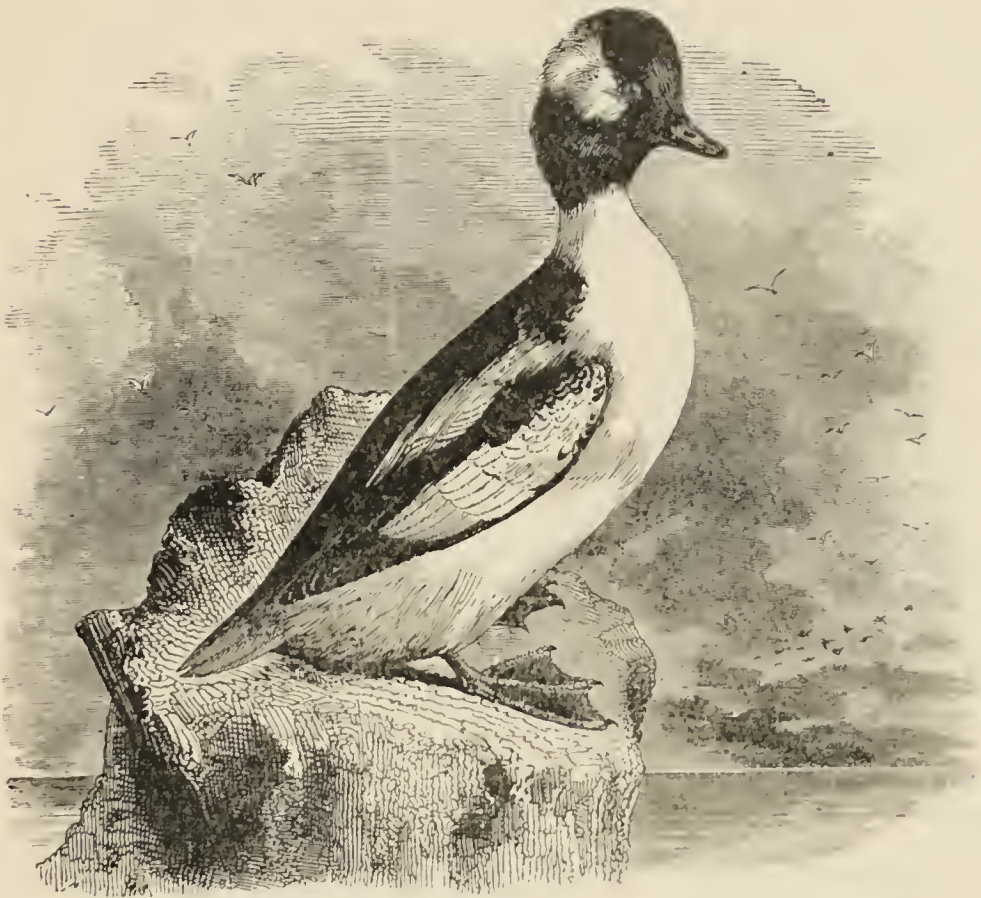
The little gull is very much like the black-headed, but is fully 6 inches shorter in length, measuring only $10\frac{1}{2}$ inches instead of $16\frac{1}{2}$ inches. The laughing gull will never be met with. The masked gull has the black on the head in summer plumage, only extending to just behind the eye. In winter plumage it is harder to identify from the black-headed, but it not only has a black spot behind the eye as

in this species, but also one beneath the eye. Bonaparte's gull may be identified from the other hooded gulls by having a black beak and carmine-red legs and feet. In Sabine's gull the dark brown on the head and neck ends in a jet black collar on the neck.

Ross's gull, the most beautiful of all the gulls, has a coal-black collar round its white neck, and a beautiful deep tint of rose-red on the breast and under parts. The kittiwake may be at once identified from all the other gulls by the rudimentary hind toe, which is remarkably small and clawless. The yellow-legged herring gull is at once seen to be distinct from the common herring gull by its bright yellow legs and feet, which of course are pink in the common species. The lesser black-backed gull has yellow legs, and the greater black-backed, pink legs and feet. The Iceland gull in plumage resembles the herring gull, but differs from it in having no black on the wings whatever. The plumage of the glaucus gull is the same as that of the Iceland, but the bird is much larger, measuring 32 to 34 inches as compared with 22 inches. The wings when closed hardly reach to the end of the tail in the glaucus, giving it a heavy, solid appearance, whereas in the Iceland they project two inches beyond the tail, giving this bird a large expanse of wing.

The plumage of the rare ivory gull is pure white, the legs and beak being black. This bird is very rare in Great Britain, but has been shot three or four times in Orkney; indeed, I believe I am right in saying that one exists in a private collection here in Stromness.

The four species of skuas may readily be distinguished by the following table :—



THE BUFF-NECKED DUCK.—*Clangula albeola* (Linnaeus).

Richardson's is 20 inches long, and the two central tail feathers are 3 inches longer than the rest.

Pomatorhine is 21 inches long, and the two central tail feathers are 4 inches longer than the rest.

Buffon's is 22 inches long, and the two central tail feathers are 9 inches longer than the rest.

The great is 24 inches long, and the two central tail feathers are less than 1 inch longer than the rest.

The only two which are likely to be confused are Richardson's and the pomatorhine. But in the pomatorhine the closed wings reach beyond the extreme end of the tail, instead of only beyond the shorter outer feathers of the tail as in Richardson's.

The common tern is distinguished from the Arctic by the black tip to its carmine bill, that of the latter being carmine throughout. The little tern measures but 8 or 9 inches, as compared with 14 or 15 in the common and Arctic, a great difference in size which marks the species at once. The Sandwich tern, which nests in the Faroe Isles, is larger than the Arctic and common species, and may be distinguished from them by the closed wings reaching beyond the tail, instead of as far as the end of the tail and no farther, as in these two species. The roseate tern has the under parts beautifully tinged with deep rose pink. The gull-billed tern is known by the gull-like angle on the lower mandible and by the long hind toe. The Caspian tern is recognised by its large size, being from 21 to 22 inches in length. The black tern is rare north of the Humber, and is, as its name implies, a dark-coloured bird. It is a small species, measuring but 9 to 10 inches in length. The six other species of tern said to have occurred in Great Britain I will not deal with.

The little crake is 8 inches, and Baillon's crake 7 inches in length as compared with the 9 inches of the spotted crake and the 11 inches of the corn-crake. These small crakes are rare summer visitors to our country, and owing to their skulking habits, are very seldom seen, and, when they are seen, being usually mistaken for the young of the duck or water-hen, or some other marsh bird, so that probably the little crake and Baillon's breed in Britain in fair numbers every year, although they are so seldom met with.

The gallinules I will not say anything about, as most, if not all, of those shot and captured in our country are escaped birds from some private water. Mr. Bishopp, of



THE RED-CRESTED POCHARD.—*Fuligula rufina* (Pallas).

Oban, showed me one in March, 1903, which had been shot in Orkney, and which was the purple gallinule.

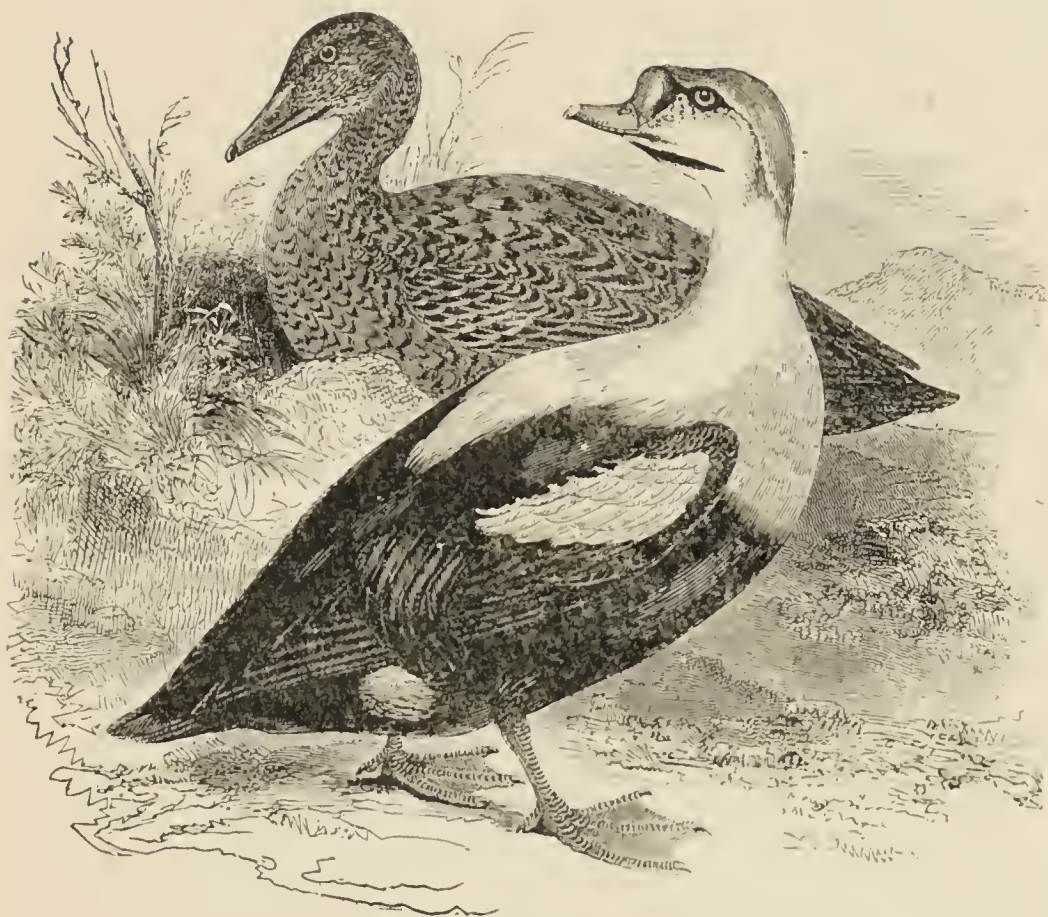
The common crane is said to have been seen from time to time in Orkney and Shetland. Its general colour is bluish-slatey grey, and it has a bare oval patch on the crown coloured red. The cheeks and neighbouring parts are white, and the sides of the head are greyish white. The tertiaries and some of the secondaries are formed into plumes. The total length of the bird is from $4\frac{1}{2}$ to 5 feet, and its weight about $9\frac{1}{2}$ lb.

The demoiselle crane is an extremely rare species. The only two specimens that have occurred in Great Britain

during the last seventy years were at East Mainland, Orkney, on May 14th, 1863, one of them being shot. The general colour is grey, the crown pale ash colour, the rest of the head and neck and also the breast plumes being black. A tuft of white feathers behind the eye serves to distinguish the bird apart from anything else. Its length is 3 feet. I have described these two species at length, as reports are constantly occurring that the birds have been seen in Orkney.

The herons, I am afraid, I cannot deal with, as time forbids. I will, however, mention the squacco heron, the latest occurrence of which bird in Great Britain was in Orkney, on September 7th, 1896. It may be identified by the white plumes on the head, each plume having a black central line on its upper part.

The white stork sometimes visits Orkney from Holland and Sweden, and I rather think one was seen near Stromness during the winter of 1903-4. The bird is pure white with the exception of the wing coverts, primaries, and secondaries—that is, the larger wing feathers, which are black. It is 3 feet 8 inches in length, and the bill, legs and feet are bright red in colour. The black stork is relieved at the breast with white, the black plumage having blue, green and bronze reflections; the bill, legs and feet are orange-red. The glossy ibis is a rare bird in Scotland, and the one shot at Stromness during the winter of 1903-4 makes the eighth occurrence in Scotland, including one I myself saw on the Island of Tiree, in the Inner Hebrides, on February 21st, 1901. Its general colour is reddish brown throughout, heavily glossed on the upper parts with purple and green. The bill is shaped like that of the curlew, and is black in



THE KING-EIDER.—*Somateria spectabilis*.

colour. The spoonbill is almost pure white throughout ; the expanded tip of the bill, which gives the bird its name, makes its identity unmistakable.

The grey plover when young may easily be mistaken for a golden plover, as it has invariably golden spots upon it. The presence of a small hind toe in the grey plover, which is absent in the golden plover, however, at once distinguishes it. The head in the grey plover, again, is larger than that of the golden.

So many snipe of record weight are shot nowadays which are not common snipe at all but great snipe, that I have compiled the following table by which the five species may readily be identified :—

Jack Snipe,—12 feathers in the tail; total length of bird, 8 to $8\frac{1}{2}$ inches.

Sabine's Snipe—12 feathers in the tail; total length of bird, 11 inches.

Common Snipe—14 feathers in the tail; total length of bird, $10\frac{1}{2}$ to 11 inches.

Great Snipe—16 feathers in the tail; total length of bird, 12 inches.

Wilson's Snipe—16 feathers in the tail; total length of bird, 11 inches.

The last-named has probably never occurred in Great Britain, but is a common bird in America. Sabine's is also a very rare species, only having occurred six times. It is probably only a dark-coloured variety of the common species. Only the other day in a sporting paper I saw it stated that although on the mainland of Scotland the average weight of the common snipe was but $4\frac{1}{2}$ oz., in Shetland it was nothing unusual for them to weigh 7 oz. or more.

The sandpipers and small waders are such a large family that I can only describe the differences between a few of them. The dunlin we all know. The knot is something like a large dunlin, but is lighter in colour, and is almost or quite twice the size of this bird. The curlew-sandpiper is also very much like the dunlin in size as well as in plumage, but is distinguished from it by the white upper tail coverts. The bill, moreover, is occasionally curved towards the tip. Its nesting haunts are undiscovered, and its eggs unknown, with exception of a couple brought back by Mr. Popham from the Yenesei River in Siberia, a few years ago. The purple sandpiper is distinguished from the curlew-sandpiper by its yellow legs, the latter having black legs. It is also



BRÜNNICH'S GUILLEMOT.—*Uria Bruennichi*, (E. Sabine).

distinguished from the dunlin by its darker colour and heavier build. The little stint is like a small dunlin in appearance, but is only $5\frac{1}{2}$ to 6 inches in length. Its legs are black instead of olive-green, and the beak is shorter than the dunlin's, and last but chiefly, the under parts are pure white without a spot or dusky tinge. Temminck's stint is our smallest shore bird, measuring from 5 to $5\frac{1}{4}$ inches in length. It may be recognised from the other stints by having the outer tail feathers white. The rare American stint has olive-brown legs. The American pectoral sandpiper is 8 to 9 inches in length, and has occurred

in Orkney once—on August 26th, 1889, at Westray. The Siberian pectoral sandpiper, Bonaparte's and Baird's sandpipers I will only mention by name. The sanderling, which is almost white in winter, may easily be distinguished from the knot, purple sandpiper and dunlin by the total absence of a hind toe. The buff-breasted and Bartram's sandpiper, and also the red-breasted snipe, which, by the way, is not a snipe at all, but a sandpiper, are not likely to be met with, so it is no good wasting any time over them. The common sandpiper is a summer visitor to our shores; the spotted sandpiper, a rare American visitor, is easily identified from the last-mentioned by its spotted breast. The green sandpiper is known by its olive-green legs, dark green upper beak, and by a broad white streak over the eye. The solitary sandpiper is not likely to be met with, and the wood sandpiper differs from the green species by the white spots on the back and on the scapulars being very much larger than in the latter, the green species.

All the sandpipers can swim and dive well, as indeed can all the waders, although the popular supposition is that only web-footed birds have this accomplishment. The redshank is only too well known, and has probably had more bad language hurled after it than any other bird living, the curlew even being a bad second in this respect. The spotted redshank is a rarer bird, being slightly smaller and darker in colour than its noisy and much-blessed cousin, and is very much more spotted than this species, the secondaries, moreover, being barred with white and dusky bars. In summer, however, it may easily be recognised, being sooty black on the upper parts and covered with large white spots, its under parts being purple in colour. The green-



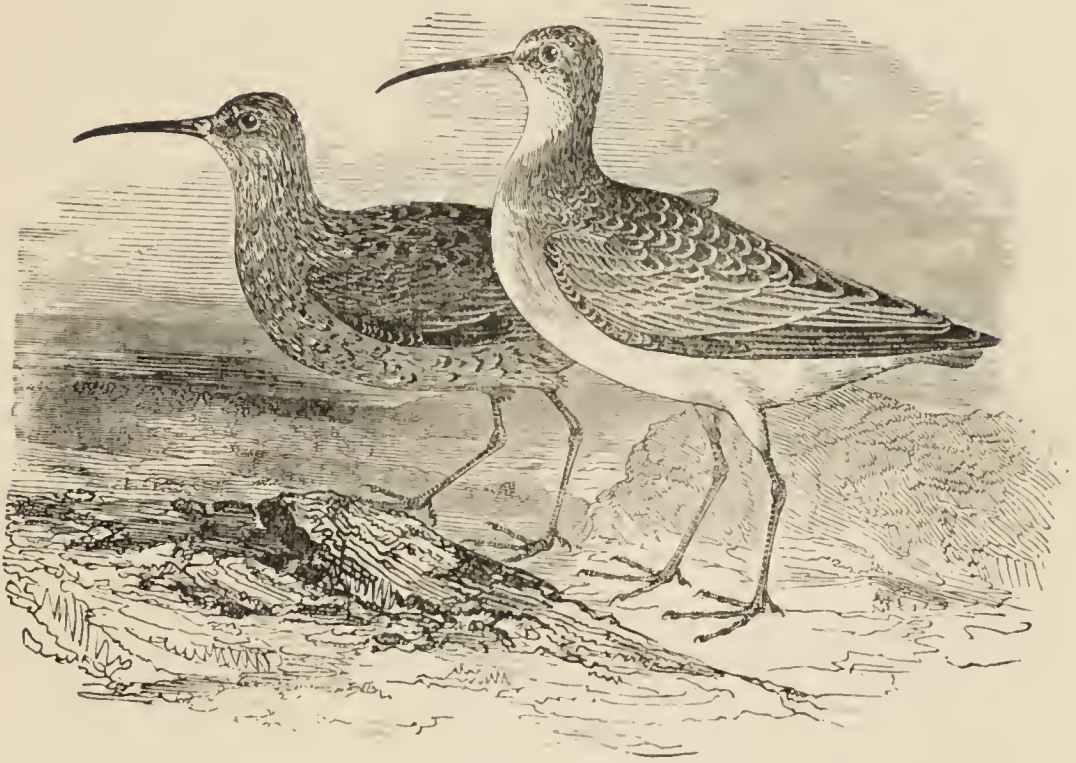
THE IVORY GULL.—*Pagophila eburnea* (Phipps).

shank is larger than the redshank, and stands much higher on the legs, which are olive-green in colour. The bar-tailed godwit may be known by its long concave bill, which turns upwards instead of downwards as in the curlew. The black-tailed godwit stands very high on the leg, and has the bill long and perfectly straight. The tail is black with a white base, and is also narrowly tipped with white. That feathered hooligan, the curlew, the largest of our British waders, needs

no description. The whimbrel is like a small curlew, but darker in colour. It differs from the curlew in having a yellowish-white streak down the centre of the crown, and a streak of the same colour over the eye. This bird, unlike the curlew and most of the waders, which migrate by night, performs its migration by day. The Eskimo curlew is smaller even than the whimbrel, being but 14 inches in length as compared with the 16 to 17 inches of the whimbrel; and the 21 to 25 inches of the curlew. The feet, moreover, are dark green instead of slatey-blue, as in these two species. Like the whimbrel, it has the longitudinal pale band down the centre of the crown.

The ruff cannot be mistaken for any other bird in his striking summer plumage, the ruff which gives him his name distinguishing him at once. The colour of this ornamental ruff is never the same in any two individuals; it varies from purple-black to pure white, through all the tints of brown, chesnut and yellow, and all the stages of spotting, barring and streaking. The female or reeve is much smaller, and somewhat resembles a bar-tailed godwit, apart from the beak, which is short and straight.

The phalaropes are known at once by their coot-like feet, in body being like a sandpiper. The red-necked is the rarer species of the two, and may be identified from the grey phalarope by the bill being long and slender, and tapering to a point without widening in any way. The bill of the grey species, on the other hand, widens towards the tip very perceptibly. The American oyster-catcher differs from the common species in having the eye bright yellow instead of carmine; it is, moreover, a larger bird. The black-winged stilt need not trouble us, the legs, however,



THE CURLEW-SANDPIPER.—*Tringa subarquata* (Güldenstädt).

are extremely long, and vermillion in colour, the total length of the bird being 14 to 15 inches.

The avocet I must describe, as a gentleman of my acquaintance once found one in his hen-run, keeping it alive for a few days; and when it eventually died, he hung it up in a tree to breed maggots for fishing! Truly an awful end for a rare bird. The bill is concave, much more so than in the bar-tailed godwit, and very long. The upper parts of the head and the back of the neck are glossy black, the rest of the plumage being white, with the exception of the scapulars, the primaries and coverts, and the smaller wing coverts, which are black. The legs are very long, and like the feet, of a greyish-blue colour, the latter being slightly palmated. The length of the species is 18 inches.

The thick-knee, stone curlew or great plover is almost

confined to Norfolk and Suffolk, and is nocturnal in its habits. It may easily be recognised by the thickened knees, which give the bird its name, and by its extremely large eyes. The cream-coloured courser is, as its name implies, of a creamy colour, the primaries being black. A white streak passes over the eye to the back of the neck, and a black streak from the eye meets the white one at that point. The collared pratincole is easily recognised by a black stripe which passes from the base of the bill to the eye, from the eye down the side of the neck, and then joining that from the other side, thus forming a black necklace round the front of the neck. The great bustard is unmistakable owing to its large size and heavy build, measuring from $3\frac{1}{2}$ to 4 feet in length. The little bustard is smaller, measuring but from $1\frac{1}{2}$ to $1\frac{3}{4}$ feet, and is, moreover, a much rarer species. Macqueen's bustard is an Asiatic species, which we need not trouble with, beyond saying that it may be identified by the pale blue neck, and by the plumes on the back of the same.

PART II.

To show the mistakes often made even by competent men in identifying birds at a distance, and to show what it is to jump at conclusions, I will give two instances, made in one day by the natural history editor of a certain sporting paper, given up entirely to shooting, fishing and natural history, whom I met one day taking observations at a certain place on the east coast of Scotland. A large gaggle of semi-domesticated Canada geese were floating on the tide about a mile away, having come down from a private lake about three miles distant. He knew that these Canada geese were kept there, but nevertheless in the next issue of his paper he mentioned that he had seen a large flock of barnacle geese at this place on this day. About a mile north of these geese, some floating on the shallow water on the edge of the sands and others squatting and standing on the sands themselves, was a large flock of mallard. In his paper he called them scaup, and remarked on the large proportion of adult drakes present. An experienced fowler would have known at once, even if he could not distinguish the species by their plumage, that the ducks were mallard, on account of the fact that some of them were sitting and squatting on the mud, diving ducks never taking up such positions. But because the drakes had green heads he called them scaup; to have called them what they were was not good enough "copy" for his paper: scaup were much rarer birds to this arm-chair naturalist, and would appeal more to his arm-chair readers, most of whom probably had never seen a scaup outside a museum.

I will now try to give a few hints on identifying fowl at a distance. The surface-feeding ducks feed by night, going to and from their feeding grounds night and morning, spending the day usually at sea, or resting and sleeping on the mud banks and ooze. On the other hand, the diving ducks feed by day and rest by night, as also do the brent geese as a rule. The pochard, however, is an exception, and is the only diving duck that feeds by night, his food, which consists of green weeds, being as easily found by night as by day. The mergansers, or fish-eating ducks, and the other diving ducks which feed on shell-fish and living crustaceans, would have difficulty in finding their food by night, and so feed by day. Of course there are exceptions, and I have in hard weather several times seen the pochard feeding by day, and heard the surface-feeding ducks like the mallard and wigeon cracking mussels within a few yards of me at night during hard weather when all fresh water was frozen over and they had nothing else to eat. Grey geese also feed by day, on grain stubble, grass, etc., and as a rule rest at sea throughout the night. Sheld-ducks feed at all times, as also do the waders, the former waiting for the mussel beds to uncover, and the latter for the mud flats to become bare.

Gulls on water can always be told from ducks or other fowl, as they carry their sterns high, giving them a concave appearance when on the water. A pack of wigeon on the water shows dark, whilst one of mallard shows speckled, the green heads of the males being seen at a great distance with a good glass. Ducks seen on the mud are invariably mallard, wigeon, or teal, or some rarer surface-feeding ducks. They can be distinguished from geese, which never squat

on the mud, nor sleep with their heads turned and resting on the back. Mergansers swim very low, and never dive all at once; moreover, their scraggy crests and snake-like necks betray their species at once. The goosander is usually found on inland waters, his dark green head and rose coloured breast, as well as the serrated or toothed bill render him unmistakable. The female is very much like a female merganser, but is larger, being as large as the male merganser.

The smew, as I have already said, might easily be mistaken for a black guillemot in winter, but his mode of diving betrays him at once, as he jumps clean out of the water like a scarf. The pochard always feeds on inland waters, the heavy body and thick brown head serving to distinguish it, as well as its coming up with its beak full of weeds. The pochard drake may also be distinguished from the mallard drake, apart from his reddish-brown head, by his heavier appearance and squat figure. Tufted ducks appear black and white on water, a great deal of the latter colour showing. Scaup ducks show brown, the white patches on either side of the bill being very conspicuous, the drakes showing white on the back, the head being heavy and green in colour. Golden-eye shows bluish-grey on water, and should there be an old drake present it cannot be mistaken. But the old drakes are very often seen alone and singly; the bushy green head, white spot below the eye, and white and black body readily distinguishing them from any other duck.

Eider ducks look like large mallard ducks, but their greater length of body distinguishes them at once; the drakes cannot be mistaken, but are rather difficult to see on

water. Common scoters of course show black. Velvet scoters are readily distinguished by the white patch on the wing, which is very conspicuous in flight, the rest of them showing black. Long-tailed ducks can at once be distinguished by the long tails of the drakes. Pintails also have long tails, but their bodies are long and narrow, and their necks extremely long, as compared with the rounder body and shorter neck of the long-tailed duck.

Scaup, golden-eye and tufted ducks are often under water all at once, but the last-mentioned jump clean out of the water to dive, which the scaup and golden-eye never do, at least at sea, although occasionally they take a small jump on calm inland lochs. Mergansers, goosanders, smews, grebes and the cormorants also jump clean out of the water to dive.

The grebe may be known by its remarkably small head, which gives the bird the peculiar appearance in flight of being headless. The great northern diver and his two cousins sink like submarines, and often swim along with only the head and neck showing. Grebes can also do this, and I have occasionally seen the cormorant and shag do it, but not often. Of course, when wounded many of the diving ducks only put up the end of their bill to breathe. Guillemots and razorbills may be known from ducks by their white throats and breasts, and by their long bills. If a bird is seen dropping into the sea as if shot it is a tern, or, if a large bird, a gannet.

Grey geese are hard to identify at a distance, either flying or resting, indeed it is impossible to do so. They may be recognised by an expert, however, from their calls when winging their way overhead. The flute-like call of the grey

lag, the harsher monosyllabic cry of the bean, the cackling clauk of the pinkfoot, the laughing clank-a-lank of the white-fronted, the music of the brent like that of hounds in full cry, and last of all the awe-inspiring calls of the hell-hounds, the barnacle geese—all these can be recognised by an expert, and by an expert alone.

Once heard the music of a pack of geese can never be forgotten. The crash of voices and the deafening roar of many beating pinions as a pack of several thousand geese takes wing are never-to-be-forgotten sounds and scenes. The speed at which wildfowl fly is tremendous, far faster than one would think, their flight being very deceptive, as indeed is the flight of all birds. Swallows, for instance, in their lightning-like evolutions, only fly from 15 to 25 miles an hour, which is much slower than the ordinary flight of a rook, and homing pigeons only fly at the rate of 33 miles an hour on a twelve hours' journey, 40 miles an hour on a one hour's journey, 48 miles an hour on a ten minutes' journey, and 52 in a one minute's flight. Compared with this the flight of wildfowl is terrific, 100 to 150 miles an hour being less than the top speed for ducks when in flight with a strong wind behind them helping them on. Plovers and godwits indeed can attain the lightening speed of 240 miles an hour, or four miles a minute, with a strong wind behind them, and the spire-tailed swift, roosting in Ceylon, could reach the Himalayas, 1,200 miles distant, before sunset! The speed of birds is a very interesting subject which I have studied a good deal, but I am afraid space will not permit me to put these statistics before you.

At the end of March all the grey geese in the Hebrides collect in one place in the outer islands, before taking their

departure for their nesting haunts within the Arctic circle. To behold this vast concourse of geese is one of the sights of a lifetime, and is worth travelling a hundred, indeed many hundred, miles to see. There they stood, this vast host of superb birds, packed together into a huge phalanx, filling the air with their talk, the noise being deafening. Suddenly the din becomes terrific, and up into the air rises a magnificent old gander. The king of the grey lags has started the flight. Up and up goes this grand old leader, and sixty thousand voices salute him. As he soars higher and higher the salute dies away, and soon there is dead silence save for the rustling of innumerable wings. Suddenly out of the silence a beautiful flute-like note floats down from the ethereal blue above. It is the call of his majesty to his subjects. Scarce has it died away than it is answered by the mighty chorus of sixty thousand throats, and at the same moment a company of geese rise into the air, and fifty pairs of pinions are winging their way upwards to join their king. Up, up, they go in great circles into the blue vault of the heavens, until they look no larger than dark molecules poised in azure space. Then with their leader at their head they strike off their line of flight, almost north-north-east. As they go, they gradually assume the wedge-like formation, with three single birds in a string at the apex of the triangle. In three minutes they are out of sight. The royal salute arouses me from my reverie, and as I look up I see the king of the geese like a speck above me, descending in great spirals to rejoin the thousands on the ground. After a few minutes' rest, he launches himself into the air again and soars upwards. Again the royal salute crashes out, followed by deep silence; again the

beautiful flute-like note drifts down to the assembled multitude, and two hundred birds rise upwards to be directed on their long flight. Again and again his majesty returns, until all are gone but about three hundred old veterans. As he returns for the last time these three hundred old paladins meet him in the air, and with their sovereign at their head, wing their way to the eternal ice around the pole, not to return to our shores until the following October.

I have never witnessed the coming of the geese to our shores in any numbers, but their arrival on the shores of Loch Leven, on October 7th, 1883, is splendidly described by Mr. J. G. Millais, who was lucky enough to be present on this and upon other occasions. His description is doubly interesting to you here, as doubtless many of you remember him during the time he spent in Stromness. His description is as follows :—

“The first occasion was in October 1883, when, lying off in a boat close to the Inch (the long flat island which is their regular winter home) I heard the first “honk” of the season, coming from away up in the vast expanse of the blue heaven. For a long time nothing could I see, until at last a tiny speck appeared in the sky, as far up as the eye could reach, and, watching intently, I saw it grow into the form of a goose that was slowly descending in great spirals. This bird was followed at regular intervals by others of the tribe subdivided into little parties of from six to ten individuals. The leader was evidently some old barren bird who had perhaps guided the great army of geese annually from their summer home in the Arctic wastes down to their winter abode in the south. She seemed to occupy a long time—quite an hour—in making her descent, and kept up

the whole time an incessant reiteration of goose talk, which was doubtless perfectly understood by the great company which followed her down the spiral tract. Each little family party was led by an old bird—doubtless one or other of the parents—who kept calling to the other leaders all the time. In this descent the birds seemed to hardly beat their wings at all, but to be simply soaring down from the clouds. The prime leader came down immediately above the loch, and while she was preparing to alight, there were still small companies evolving themselves from the blue expanse, until at last there must have been 1,500 birds actually on the wing, all in process of descent, and all following one another at regular intervals. By and by, when the leading geese had settled, the parties at the rear seemed to straggle more, and longer intervals occurred between them; yet they kept coming in all day as I roamed round and about the lake, till by the evening, when I disturbed the company, there must have been two or three thousand geese sitting on the island. These great flocks always remain for a few days on Loch Leven, and then away they go, distributing themselves in favourite localities throughout the south-east of Scotland, all except five or six hundred, which remain on the lake until the following spring. They are nearly all pink-footed geese, with a few grey lags and bean.”

As I have already stated, about the end of March all the geese, with the exception of a few grey lag, which still remain to breed in the more out-of-the-way places in Scotland, all but these few pairs, together with innumerable hosts of other wildfowl, depart from our shores for their breeding grounds. North, south, east, and west, they go, to all the corners of the earth, but by far the greater majority to the silent north,

where amidst those silent solitudes carpeted with Arctic flowers, they hatch their eggs and rear their broods of young, which in the following autumn, when the grip of winter makes itself felt in those grim and dreary solitudes, will stream over to our warmer shores in countless thousands. Many leave their bones in the trackless Arctic wastes, food for the blue, silver, arctic, and other foxes; many die from the effects of their long journey, and many old campaigners have performed their last migration also, the migration of death; but still the younger generation fills their places, and by a wonderful instinct find their way from their Arctic summer home through the pathless heavens to our shores, to delight the heart of the naturalist and the wildfowler during another winter. So ends my subject.

APPENDIX.

SULE SKERRY AND THE STACK.

IN presenting as an appendix the following descriptive notes on Sule Skerry and the Stack, the publishers hope that by so doing readers may be enabled to form a better conception of this small island with its border of jagged rocks, and the adjacent Stack, in respect that a portion of this work, by Mr. James Tomison, light-keeper, has been devoted to birds and bird life on Sule Skerry.

Long before the advent of a lighthouse on the island, the late Mr. Joseph Dunn, naturalist, who for a number of years acted as curator of Stromness Museum, was in the habit of making periodical visits to Sule Skerry, in company with other gentlemen, to collect wild birds and wild birds' eggs, many of which were placed in the Museum. On several of these occasions a local steamer was chartered, and at other times a sailing vessel was employed to convey the excursionists to and from the island. In more recent years the collection in the Museum has been largely increased through the kindness of Mr. Tomison in sending ashore from Sule Skerry, whenever opportunity offered, birds to complete the collection.

The position of Sule Skerry is put down as $59^{\circ} 4' 45''$ north latitude, and $4^{\circ} 24'$ west longitude. It is $32\frac{1}{2}$ miles from Hoy Head (near Stromness), and $33\frac{1}{2}$ miles from

Cape Wrath, the nearest land to it being Fairaird Head in Sutherlandshire, $30\frac{3}{4}$ miles distant.

The island lies in the open ocean, right in the track of vessels trading round our rock-bound coasts, as well as in that of the many sail plying between British and foreign ports. The extreme length of the island is 900 yards, or a little over half a mile. As the coast-line is very irregular, running out in long narrow points, it is difficult to convey to the reader's mind a correct idea of its breadth. The greatest breadth, taken at right angles to its length, is 450 yards, but at one point it is less than 100 yards from sea to sea. Right round is a border of jagged rocks, which, owing to the low level of the island, is swept by the Atlantic billows, and is consequently entirely bare, presenting a very uninviting appearance to anyone contemplating an evening walk. Inside this border, and beyond the reach of the heaviest ocean billow, there is a considerable deposit of mossy soil, ranging from two or three inches to over four feet deep, which in summer produces an abundant crop of rough grass, affording excellent feeding for goats and rabbits. The total superficial area is about 35 acres, of which about 12 acres are covered with soil. At different parts there are basins which, being full of salt water, look like little inland lakes. The centre of the island is its highest part, attaining a height of 45 feet; and here, surrounded by vegetation, the lighthouse stands.

There are two goes or landings at Sule Skerry, one lying east and the other S.S.E., which in ordinary weather afford tolerably safe landing places, for should one prove inaccessible, the other would in all probability be quite safe to allow of the relief being made. There are occasions, how-

ever, when neither of these landings can be used on account of stormy weather, and it is then that a more exciting method of relieving the light-keepers has to be resorted to. At such times a derrick about 24 feet in length is used, the lower end of which is fixed into the rock, while it is supported at an angle of about 45 degrees over the cliff by stays; and by an arrangement of blocks and tackle the supplies for the lighthouse are raised out of the boat, which lies at a safe distance from the rocks, to the summit, whence they are removed to the lighthouse. In like manner also is the light-keeper, whose turn it is to go on duty, landed, and he very frequently gets a thorough wetting in his passage from the boat to the shore.

Of the two landings mentioned, that to the east—in the smaller goe—is preferred, where there is a small concrete pier and a crane which is more easily worked than the one at the other goe. At the latter a landing can only be effected by means of an iron ladder set up against the side of the goe. Rails are laid from the landings to the base of the tower, and on these trucks laden with the stores landed from time to time are drawn. The east landing is at the mouth or entrance of a goe formed by the action of the sea cutting through strata softer than the surrounding rocks. This goe lies nearly east and west, and in two places it has tunnelled underneath the rocks. This tunnel at one time may have been of considerable length, but a process of decay seems to have been going on, and doubtless it will ultimately vanish. At present it consists of what might be called two bridges about twelve feet broad. Soft strata seem to run across the island at this place, for exactly opposite the sea is boring its way through, and although the two goes are

not yet joined, there is no doubt in the distant future this union will take place.

The island is cut up in a similar manner in several places, three of which are worthy of notice. At the east end there is a channel from 12 to 20 feet broad running nearly north and south, and dividing off a part which adds at least 200 yards to the extreme length of the island. West from this about 100 yards there is a tunnel right through underneath the ground, and at low water one can walk from end to end, a distance of 60 to 80 yards. The inside measurements of this tunnel or cave are:—width, 10 ft. to 15 ft., length, 15 ft. During a storm in winter the sea rushes through with tremendous force. Again to the west of the lighthouse there are two goes, one opening to the S.E. and the other to the N.W., directly opposite each other, and only separated by about 30 yards of rock and soil. At the upper end of each are incipient caves, which show that the sea is quarrying away at the bottom, and when it gets in a considerable distance the rocks overhead will tumble down for want of support. This is particularly marked in the south goe; at the upper end there are some hundreds of tons of rock overhanging, with apparently very little support. In fact they overhang so much that one feels a little doubtful about standing beneath them. An extra heavy sea at no very distant date will loosen their hold and shorten the space between the two goes. In addition to the landings mentioned there are some half a dozen other places where landings are occasionally made as necessity requires.

The lighthouse, the erection of which by the Northern Lighthouse Commissioners was begun in the year 1892, is situated on the highest part of the island, and is painted

white, which renders it very conspicuous during the daytime. It is elevated about 120 feet above high water mark, and at night shows a flashing light all round the horizon, the characteristics being group flashing, showing three flashes in 30 seconds. The light is equal to 90,000 candle power, visible eighteen miles, and was first lighted in the autumn of the year 1895. It is attended by four light-keepers, three of whom are always on the island, and one at the shore station in Stromness. They are relieved every fortnight by the Northern Lighthouse Commissioners' tender "Pole Star."

Life on Sule Skerry is very lonely; but the routine of the keepers is such that they have no time to weary, the lens alone requiring the attention of two men for about six hours daily, and they are well provided with books, papers and magazines with which they while away their leisure hours. Since the establishment of the lighthouse on Sule Skerry the island has, under its keepers, become anything but the dreary place it was to begin with. They have imported rabbits, which have increased abundantly, and they have also a number of goats and poultry, which thrive on it and give a supply of good milk and fresh eggs.

The seals, that frequented the island before the advent of the lighthouse and keepers, seemed to resent the company of workmen and keepers alike, and for a time left the island altogether, but recently they have begun to put in an appearance and come back to their old haunts, notwithstanding the powerful light and the presence of man. Sule Skerry would thus appear to be a good place for the study of natural history in many forms, and the light-keepers who turn their attention to this science appear to find interesting matter, especially during the migratory season.

The **STACK** is a bold rock surrounded by deep water, $4\frac{1}{2}$ miles S.W. by W. from Sule Skerry, and rises to a height of 120 feet above high water mark. On approaching the rock from the south, and while still in the distance, it has the appearance of a ship under sail. This pinnacled rock is the home of the solan goose, and in the breeding season has a very lively appearance, being practically white with birds. At one time these birds were much sought after by adventurous men, both from Orkney and the distant Lewis, who made periodical visits to the rock in small boats in search of them. Many tales of daring adventure and hair-breadth escapes are told in connection with these excursions, but since the passing of the Wild Birds Protection Acts the practice has ceased. Yet this bold rock still remains a menace to the mariner should he unhappily be driven too close to its dangerous crags during misty weather, and when the friendly rays of Sule Skerry are unobservable.

