NATURAL HISTORY

TRANSACTIONS

OF

NORTHUMBERLAND AND DURHAM.

VOL. IV. PART I.

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ERRATUM.

On page 158, second line below table 4, for "south-west," read "north-east."

NATURAL HISTORY

TRANSACTIONS

OF

NORTHUMBERLAND AND DURHAM.

I.—*A Catalogue of the Insects of Northumberland and Durham* [*Revision of Coleoptera*]. By THOMAS JOHN BOLD.

REMARKS.

IN presenting to the Society a revision of our Catalogue of Local Coleoptera, a few remarks may not be out of place to show the necessity for such an undertaking.

During the eighteen years which have elapsed since the completion of the Catalogue, a considerable number of other species have been found to inhabit our district. Notices of most of these,* with additional localities for many of the rarer species,† are recorded at intervals in the Transactions, but too much scattered to be either useful or interesting. It therefore appeared to to me very desirable that the whole should be brought together under one head. Not only was a revision necessary for these reasons, but for others no less cogent: at the date of publication (1852) species were not nearly so correctly determined as

* Trans. Tyne. Nat. Field Club, Vol. II., p. 335; Vol. III., p.p. 88 and 295; Vol. IV., pp. 54 and 175; Vol. V., pp. 52 and 221; Vol. VI., pp. 60 and 225; and continued in the Nat. Hist. Trans., Vol. I., pp. 131 and 318.

† Trans. Cl., Vol. III., p 90; Vol. IV., p. 55; Vol. V., p. 56; Vol. VI., p. 225; and Nat. Hist. Trans., Vol. I., pp. 134 and 315.

at the present time. Moreover, since then an immense change has taken place in the nomenclature of Coleoptera, which has rendered many of our specific names obsolete. I at first intended to make only a supplement to the catalogue, but on drawing together the additions, errors, and corrections, I found them to be so numerous, that the only way to avoid confusion was to rewrite the whole. This I have done in as concise a manner as possible, only admitting such matter as was absolutely necessary to render it a tolerably correct record of the beetle fauna of the two counties.

As will be seen by the table of families at the end of this revision, our fauna now contains one thousand five hundred and twenty species, about one half of that of Great Britain. The first catalogue contained eleven hundred and seventy-two, but it included a number of incorrectly determined species and varieties already in the list: deducting these, we find the number of additions to be upwards of four hundred, or more than one-third of the first census. Beyond any doubt many more remain to reward future explorers; for if we refer to the lucid yearly summaries in the "Entomologist's Annual," by my friend E. C. Rye, we will find that the Coleopterous fauna of the British Islands has, for the last nine years, been increasing at the rate of nearly sixty species annually; and as yet there are no signs of abatement. This we must recollect, too, is the work of a small band of workers, whose occupations leave them little leisure for such pursuits.

Having my collection arranged after the valuable synonymical catalogue of Mr. Waterhouse, I have, as a matter of convenience to myself, adopted it throughout this revision, introducing such alterations from those of E. C. Rye and G. R. Crotch as seemed to me necessary.

The catalogue by the latter gentleman is perhaps most in accord with modern continental ideas, but his omission of authorities is a serious drawback to its usefulness.

Most respectfully do I beg to thank those county gentlemen who have so kindly allowed me to visit their estates. More especially to the Right Hon. Sir William Hutt, Gibside; E. T.

Smith, Esq., M.P., Gosforth; and R. Burdon, Esq., Castle Eden, are my acknowledgements due. How very much our fauna has been enriched by their liberality the catalogue and revision testify. To my friends G. R. Waterhouse, Esq., E. C. Rye, Esq., and Dr. Power, of London; G. R. Crotch, Esq., of Cambridge, and Dr. Sharp, of Eccles, who have so kindly assisted me with types, and in the determination of difficult species, I am also under a deep sense of obligation, which I am proud to acknowledge, and for which I tender them my most earnest and grateful thanks.

Long Benton, Newcastle-upon-Tyne,
September, 1870.

ABBREVIATIONS NOT IN THE FIRST CATALOGUE.

Ent. Ann.—Entomologist's Annual.
Ent. Mon. Mag.—The Entomologist's Monthly Magazine.
Er. Ins. Deutsch.—Erichson, Insecten Deutschlands, Vol. III.
Faune Franc.—Faune Entomologique Francaise.
Kies. Ins. Deutsch.—Kiesenwetter, Insecten Deutschlands, Vol. IV.
Kz. Ins. Deutsch.—Kraatz, ditto ditto, Vol. II.
Nat. Hist. Trans.—Natural History Transactions of Northumberland and Durham.
Redt.—Redtenbacher, Fauna Austriaca, 2nd Edition.
Thoms. Skand. Col.—Thomson, Skandinaviens Coleoptera.
Trans. Berw. Cl.—Transactions of the Berwickshire Naturalists' Club.
Trans. Cl.—Transactions of the Tyneside Naturalists' Field Club.
W. C.—Waterhouse, Catalogue of British Coleoptera.

ADEPHAGA.

GEODEPHAGA.

CICINDELIDÆ.

CICINDELA, *Linn.*

1. *C. campestris*, Linn., Trans. Cl., I., 37.*

CARABIDÆ.

DEMETRIAS, *Bon.*

1. *D. atricapillis*, Linn., l. c.

Hartlepool and Marsden. Rare.

DROMIUS, *Bon.*

1. *D. linearis*, Oliv., l. c. 38.

2. *D. agilis*, Fab., l. c. 37.

Apparently rare.

3. *D. meridionalis*, Dej., Faune Franc. I., 36.

In woods. Gosforth, Gibside, Gilsland, &c. "Wallington," Dr. Power.

More plentiful with us than *agilis*, for which it generally is placed in collections.

4. *D. quadrimaculatus*, Linn., Trans. Cl. I., 38.

5. *D. quadrinotatus*, Panz., l. c.

6. *D. nigriventris*, Thoms.; *D. fasciatus*, l. c.

7. *D. melanocephalus*, Dej., l. c.

METABLETUS, *Schaum.*

1. *M. foveola*, Gyll., l. c.

Hetton Hall, Belford; Whitley, Marsden, &c.

* Throughout this revision, if not stated to the contrary, the species must be considered common or moderately common when no localities are appended.

LABIA, *Latr.*

1. *L. chlorocephala*, Ent. Hefte., l. c.

TARUS, *Clairv.*

1. *T. basalis*, Gyll., Trans. Cl., II., 257.

"Rare. On the moors near Twizell," P. J. Selby, Esq.

SCARITIDES.

CLIVINA, *Lat.*

1. *C. fossor*, Linn., l. c. I., 39.
2. *C. collaris*, Herbst., l. c.

DYSCHIRIUS, *Panz.*

1. *D. angustatus*, Ahr.; *D. jejunus*, Dawson.

Very rare. Banks of Irthing.

2. *D. thoracicus*, Fab.; Thoms., Skand. Col. I., 188.

Not uncommon near Whitley. In the burrows of *Bledius arenarius*.

3. *D. æneus*, Dej., Trans. Cl., II., 257.

"Cambois, Mr. John Scott." "Hetton Hall, near Belford," W. B. Boyd, Esq.

4. *D. globosus*, Herbst.; *D. gibbus*, l. c. I., 39.

Not unfrequent on the sea coast and elsewhere.

CARABIDES.

NOTIOPHILUS, *Dum.*

1. *N. aquaticus*, Linn., l. c. 54.
2. *N. palustris*, Duft.; *N. tibialis*, l. c.
3. *N. biguttatus*, Fab., l. c.; *N. 4-punctuaus*, l. c. 55.
4. *N. substriatus*, Wat.; *N. punctulatus*, Faune Franc. I., 9.

Much rarer with us than the other species.

ELAPHRUS, *Fab.*

1. *E. cupreus*, Duft., Trans. Cl. l. c. 54.
2. *E. riparius*, Linn., l. c.

BLETHISA, *Bon.*

1. *B. multipunctata*, Linn., l. c.

Has only occurred at Prestwick Carr.

LEISTUS, *Frohl.*

1. *L. spinilabris*, Fab.; *L. spinibarbis*, l. c. 53.

2. *L. fulvibarbis*, Dej., l. c.; *L. janus*, l. c.

3. *L. montanus*, Steph. Ill., Mand. I., 64, pl. IV., fig. 5.

"Cheviot," G. R. Crotch, Esq.

4. *L. ferrugineus*, Linn.; *L. spinilabris*, Trans. Cl. I., 53.

5. *L. rufescens*, Fab., l. c.

NEBRIA, *Latr.* (HELOBIA, *Cat.*).

1. *N. brevicollis*, Fab., l. c.

2. *N. Gyllenhalii*, Sch.; *H. nivalis*, l. c. 54.

CALOSOMA, *Weber.*

(*C. sycophanta*, Linn.).

When the old chapel, at the Tyne Bridge End, at Newcastle, was pulled down, a living specimen of this fine insect was found amongst the rubbish, and was for many years in the collection of the late Mr. Richard Wingate. Most likely it had been brought by some of the shipping.

CARABUS, *Auct.*

1. *C. catenulatus*, Scop., l. c. 51.

2. *C. monilis*, Fab., l. c. 52.

"Twizell," P. J. Selby, Esq.

3. *C. arvensis*, Fab., l. c. 52.

On heaths. Not common, but widely spread.

4. *C. granulatus*, Linn., l. c.

5. *C. nitens*, Linn., l. c.

6. *C. violaceus*, Linn., l. c.

7. *C. glabratus*, Payk., l. c.

On the Cheviots. "Hetton Hall, near Belford," W. B. Boyd, Esq.

8. *C. nemoralis*, Müll., l. c.

CYCHRUS, *Fab.*

1. *C. rostratus*, Linn., l. c. 51.

CHLÆNIADES.

LORICERA, *Latr.*

1. *L. pilicornis*, Fab., l. c. 50.

BADISTER, *Clairv.*

1. *B. bipustulatus*, Fab., l. c. 51.

2. *B. humeralis*, Bon., l. c. (*Trimorphus.*)

Rare. Meldon Park, Castle Eden Dene, and near Haydon Bridge.

LICINUS, *Latr.*

1. *L. depressus*, Payk., l. c. 51.

Very rare. Sea coast near Castle Eden and Hartlepool.

CHLÆNIUS, *Bon.*

1. *C. nigricornis*, Fab., Faune Franc. I., 57.

Rare. Shores of Talkin Tarn.

FERONIADES.

POGONUS, *Dej.*

1. *P. chalceus*, Marsh., Trans. Cl. V., 52.

Rare. Banks of the Wansbeck near North Seaton.

PATROBUS, *Dej.*

1. *P. excavatus*, Payk.; *P. rufipes*, l. c. I., 38.

Common. Specimens from the moors and hills are smaller and darker than those found in woods, &c.

2. *P. assimilis*, Chaud.; *P. lapponicus*, l. c. IV., 175.

"Wallington," Dr. Power.

My own local examples—recorded as above cited—prove to be small dark specimens of *excavatus*.

PRISTONYCHUS, *Dej.*

1. *P. terricola*, Herbst., l. c. I., 40.

Common in cellars, &c. I have also taken it on the ballast heaps, near South Shields.

SPHODRUS, *Clairv.*

1. *S. leucopthalmus*, Linn., l. c. 40.

CALATHUS, *Bon.*

1. *C. rotundicollis*, Dej.; *Amphyginus piceus*, l. c.
2. *C. cisteloides*, Panz., l. c. 39.
3. *C. flavipes*, Fourc.; *C. fulvipes*, l. c.
4. *C. mollis*, Marsh., l. c. 40; *C. fuscus*, var. l. c.
5. *C. melanocephalus*, l. c. 39.
6. *C. micropterus*, Duft., l. c.

Rare. Hedgehope and Cheviot, Mr. J. Hardy.

TAPHRIA, *Bon.*

1. *T. vivalis*, Ill.; *Synuchus nivalis*, l. c. 40.

ANCHOMENUS, *Anct.*
(PLATYNUS, ANCHOMENUS, AND AGONUM, *Cat.*).

1. *A. angusticollis*, Fab., l. c.
2. *A. prasinus*, Fab., l. c. 41.
3. *A. albipes*, Fab., l. c.
4. *A. oblongus*, Fab., l. c. 41.
5. *A. marginatus*, Linn., l. c.

Prestwick Carr, sands near South Shields, and at the mouth of "Meggy's Burn" on Blyth Sands.

6. *A. ericeti*, Panz., l. c. V., 52.

Rare. "Muckle Moss," V. R. Perkins, Esq.

7. *A. parumpunctatus*, l. c. I., 41.
8. *A. viduus*, Panz., l. c.

"Twizell," P. J. Selby, Esq.; "Newcastle," G. Wailes, Esq.

9. *A. mæstus*, Duft., l. c. 42; *A. versutus*, l. c.

10. *A. pusillus*, Schaum; *A. atratus*, W. C.
In woods. Rather uncommon.

11. *A. fuliginosus*, Panz.; *A. atratum*, Trans. Cl. I., 42; *A. piceum*, l. c.

12. *A. micans*, Nicol., l. c.

13. *A. picens*, Linn.; *A. picipes*, l. c. 43.

14. *A. quadripunctatus*, Deg., l. c. 42.
A single specimen, taken at Long Benton, is the only known British example.

OLISTOPHUS, *Dej.*

1. *O. rotundatus*, Payk., l. c. 43.

PTEROSTICHUS, *Auct.*
(PŒCILUS, ABAX, PLATYSMA, PTEROSTICHUS, STEROPUS, OMASEUS, ARGUTOR, AND PLATYDERAS, *Cat.*).

1. *P. puncticeps*, Thomson; *P. cupreus*, l. c. 44.
Front of head distinctly punctured; hind tibia with about ten bristles on its inner side.

2. *P. pauciseta*, Thomson; *P. versicolor*, l. c.
Front of head smooth; hind tibia having only about six bristles on the inner side.
The last is by far the most abundant with us.

3. *P. striola*, Fab., l. c. 46.

4. *P. niger*, Ill., l. c.

5. *P. parumpunctatus*, Germ., l. c. 45.

6. *P. madidus*, Fab., l. c.

7. *P. æthiops*, Panz., l. c.
Rare. Cheviot, Twizell, and Lanchester. "Rothley," Dr. Power.

8. *P. orinomus*, Steph., l. c. 44.
Rare. Cheviot, South Shields, and Langley Common.

9. *P. melanarius*, Ill., l. c.

10. *P. nigrita*, Fab., l. c.

11. *P. minor*, Sahlb.; *A. anthracinus*, l. c.
Very rare. Prestwick Carr.

12. *P. vernalis*, Panz., l. c. 43.

13. *P. strenuus*, Panz.; *A. erythropus*, Marsh., l. c.

14. *P. diligens*, Sturm.; *A. pullus*, Gyll.; *A. strenuus*, Daws., Trans. Cl. I., 43.

15. *P. ruficollis*, Marsh., l. c.
On the sea coast. Not rare.

STOMIS, *Clairv.*

1. *S. pumicatus*, Panz., l. c. 45.

BROSCUS, *Panz.*

1. *B. cephalotes*, Linn., l. c.

AMARA, *Bon.*
(AMARA, BRADYTUS, AND CURTONOTUS, *Cat.*).

1. *A. obsoleta*, Dej.; *A. ovata*, Schaum, Ins. Deutsch. I., first part, 523; Trans. Cl. V., 221.
Very rare. On the sea coast, near Cullercoats.

2. *A. similata*, Gyll.; Schaum, l. c. 522.

3. *A. eurynota*, Panz.; *A. acuminata*, l. c. 532.

4. *A. trivialis*, Gyll., l. c. 531.

5. *A. lunicollis*, Schio., l. c. 528,

6. *A. communis*, Panz., l. c. 526.

7. *A. familiaris*, Duft., l. c. 533.

8. *A. lucida*, Duft., l. c. 534.
Sea banks, near Whitley. Very rare.

9. *A. tibialis*, Payk., l. c. 534.
Bents, near South Shields.

10. *A. plébeja*, Gyll., l. c. 521.

11. *A. ingenua*, Duft., l. c. 536.
"Newcastle," G. Wailes, Esq.
This is probably *A. fusca*, Dej., Schaum, l. c. 537.

12. *A. bifrons*, Gyll., l. c. 546.
Not uncommon. Mostly found on the sea coast.

13. *A. consularis*, Duft., l. c. 507.
Rarely met with in our district.

14. *A. apricaria*, Fab., l. c. 506.

15. *A. fulva*, Deg., l. c. 505; *B. ferrugineus*, Trans. Cl. I., 47.
Sands at South Shields, &c. Common.

16. *A. aulica*, Panz.; Schaum, l. c. 511; *C. piceus*, Trans. Cl. I., 48.

17. *A. convexiuscula*, Marsh.; Schaum, l. c. 512.
Not uncommon about the ballast heaps near South Shields.

HARPALIDES.

ANISODACTYLUS, *Dej.*

1. *A. binotatus*, Fab.; Schaum, l. c. 566.
Rare. Banks of Irthing.

DICHOROTRICHUS, *Duval.*

1. *D. pubescens*, Payk.; *Ophonus pubescens*, Trans. Cl. I., 49.

HARPALUS, *Lat.*

1. *H. puncticollis*, Payk.; *O. puncticollis*, l. c. 48.

2. *H. ruficornis*, Fab., l. c.

3. *H. æneus*, Fab., l. c.

4. *H. tenebrosus*, Dej.; *H. litigiosus*, l. c. IV., 175.
Very rare.

5. *H. latus*, Linn.; *H. limbatus*, l. c. I., 48.

6. *H. tardus*, Panz.; *H. rufimarius*, l. c.
Hetton Hall, Twizell, and Newcastle.

STENELOPHUS, *Meg*

1. *S. vespertinus*, Ill., l. c. V., 53.
Near Ryton, V. R. Perkins, Esq.

BRADYCELLUS, *Er.*

1. *B. placidus*, Gyll.; *Trechus placidus*, l. c. I., 49; *T. dorsalis*, var., l. c.

2. *B. cognatus*, Gyll., l. c. II., 259.

Rare. A mountain species.

3. *B. distinctus*, Dej., l. c. V., 221.

Apparently very rare.

4. *B. rufulus*, Dej., *B. Verbasci*, l. c. 53.

5. *B. harpalinus*, Dej.; *T. fulvus*, l. c. I., 49 (in part).

6. *B. collaris*, Payk.; *T. collaris*, l. c. II., 259; *T. ruficollis*, l. c. I., 49.

7. *B. similis*, Dej., l. c. I., 49.

TRECHIDES.

TRECHUS, *Clairv.*

1. *T. micros*, Herbst.; *Blemus micros*, l. c. 50.

In rejectamenta on the banks of streams.

2. *T. longicornis*, Sturm., l. c. (*Blemus*).

The only local examples known to me of this very rare insect are three, which I took amongst rejectamenta, on the banks of the Irthing, in June, some years ago.

It is represented in Mr. Selby's collection* by *T. micros*.

3. *T. lapidosus*, Daws., l. c. II., 259 (*Blemus*).

Rare. Banks of streams and sea coast. I took it on the shore at Tain, in Ross-shire, also.

4. *T. rubens*, Fab.; *B. paludosus*, l. c. I., 50.

Rare. Hetton Hall, Long Benton, Winlaton Mill, and by the Irthing.

5. *T. minutus*, Fab.; Schaum, l. c. 640.

6. *T. obtusus*, Er., Trans. Cl. VI., 225.

7. *T. secalis*, Payk.; *Epaphius secalis*, l. c. I., 50.

* To G. R. Crotch, Esq., I am indebted for many corrections in this collection, which is now in Magdalene College, Cambridge.

ÆPYS, *Leach.*

1. *Æ. marinus*, Ström.; *Æ. fulvescens*, l. c. II., 260.

2. *Æ. Robinii*, Lab., Faune Franc. I., 151 (*Trechus*).

Very local, and confined to the sea coast. Both species occur in company.

BEMBIDIADES.

CILLENUM, *Cust.*

1. *C. laterale*, Sam., Trans. Cl. I., 55.

TACHYS, *Zieg.*

1. *T. Fockii*, Hum., l. c. VI., 225; Nat. Hist. Trans. I., 315.

2. *T. quadrisignatus*, Duft., Nat. Hist. Trans. I., 83; l. c. 318.

3. *T. bistriatus*, Duft.; Schaum, l. c. 745; *B. scutellare*, Trans. Cl. IV., 54.

All taken on the margins of the pools on the sands near South Shields. Single specimens only of the two last have occurred.

I omit *B. incurvum*, Trans. Cl. II., 266, which no longer exists in Mr. Hardy's collection.

BEMBIDIUM, *Lat.*

1. *B. obtusum*, Sturm., Trans. Cl., II., 266.

2. *B. quinquistriatum*, Gyll., l. c.

3. *B. rufescens*, Guér., l. c.

4. *B. biguttatum*, Fab., l. c. 265.

5. *B. æneum*, Germ., l. c. 266.

Very rare on the sea coast, but plentiful inland in damp places on the banks of pools, streams, &c.

6. *B. guttula*, Fab., l. c.

7. *B. Mannerheimii*, Sahlb., Nat. Hist. Trans. I., 131.

Rare. Amongst leaves at Gosforth. I also took it at Tain, Ross-shire.

8. *B. femoratum*, Sturm., Trans. Cl. II., 264.

9. *B. Anglicanum*, Sharp, Ent. Mon. Mag. VI., 132; *B. femoratum, var.*, Trans. Cl. II., 265.

Banks of the Irthing and other streams on the western border of our district.

10. *B. Bruxellense*, Wesm., l. c. II., 264.

Somewhat rare, but widely spread.

11. *B. concinnum*, Steph., l. c. 265.

12. *B. littorale*, Oliv.; *B. rupestre*, l. c.

13. *B. lunatum.*, Duft., l. c.

14. *B. saxatile*, Gyll., l. c. 264.

Our local specimens are all of the dark variety.

15. *B. obsoletum*, Dej.; *B. tricolor*, l. c.; *B. neglectum*, Dawson; *B. testaceum*, W. C.

16. *B. decorum*, Panz., Trans. Cl. II., 262.

17. *B. stomoides*, Dej.; *B. rufipes*, l. c.

Banks of streams, but very rarely.

18. *B. monticola*, Sturm., l. c.

19. *B. brumipes*, Sturm.; *B. nitididum*, l. c.

20. *B. Stephensii*, Crotch; *B. affine*, Steph.

Distinct from, and much rarer than, *brunnipes*.

21. *B. tibiale*, Duft.; *B. fasciolatum*, Trans. Cl. II., 262.

22. *B. atrocæruleum*, Steph.; *B. fasciolatum, var. b.*, l. c. 263.

23. *B. prasinum*, Duft., l. c. 262.

24. *B. obliquum*, Sturm., l. c. 265.

Very rare. Gosforth only.

25. *B. nigricorne*, Gyll.; Thomson, Skand. Col. I., 204.

This rare boreal insect was taken in our district by George Wailes, Esq. One of the original specimens, by the kindness of G. R. Waterhouse, Esq., now ornaments my collection.

26. *B. lampros*, Herbst., Trans. Cl. II., 261.

27. *B. Schuppelii*, Dej., l. c. IV., 54.

Amongst grass on the margins of streams. Has only been found on our western and northern borders.

28. *B. gilvipes*, Sturm., l. c. II., 261.

29. *B. pusillum*, Gyll., l. c.

30. *B. doris*, Panz., l. c.

Taken on the Till, by Mr. J. Hardy.

31. *B. quadriguttatum*, Fab., l. c.
Local, but not rare.

32. *B. bipunctatum*, Linn., l. c.

33. *B. punctulatum*, Drap., l. c.

34. *B. pallidipenne*, Ill., l. c. V., 53.
Blyth Sands, sparingly.

35. *B. paludosum*, Panz., l. c. II., 260.

TACHYPUS, *Meg.*

1. *T. flavipes*, Linn., l. c.

2. *T. pallipes*, Duft., l. c.
Banks of the Till, and not rare on those of the Irthing, in June.

HYDRADEPHAGA.

DYTISCIDÆ.

HALIPLIDES.

HALIPLUS, *Lat.*

1. *H. elevatus*, Panz., l. c. I., 59.

2. *H. fulvus*, Fab., l. c.

3. *H. flavicollis*, Sturm, Deutsch. Faun. VIII., 150.
In ponds, &c. Not uncommon.

4. *H. variegatus*, Sturm., Trans. Cl. III., 88.
Very rare.

5. *H. affinis*, Steph.; *H. cinereus*, l. c. I., 60.
Ouseburn, Heaton, Gosforth, &c. Not common.

6. *H. ruficollis*, Dej., l. c.

7. *H. fluviatilis*, Aubé., l. c. III., 89.

8. *H. obliquus*, Fab., l. c. I., 59.

9. *H. confinis*, Steph.; *H. lineatus*, Aubé.
Gosforth, Marsden, and plentiful in Talkin Tarn.

10. *H. lineatocollis*, Marsh., Trans. Cl. I., 60.

PELOBIADES.

PELOBIUS, *Schon.*

1. *P. Hermanni*, Fab., l. c. I., 64.
"Once near Newcastle, by Mr. Hewitson," G. Wailes, Esq. Has not since been met with. A doubtful native.

HYDROPORIDES.

HYPHYDRUS, *Ill.*

1. *H. ferrugineus*, Linn.; *H. ovatus*, l. c.

HYDROPORUS, *Clair.*

1. *H. inæqualis*, Fab., l. c. 63.

2. *H. quinquelineatus*, Zett., Nat. Hist. Trans. I., 318.
Prestwick Carr and Gosforth Lake. September.

3. *H. reticulatus*, Fab., Trans. Cl. l. c.
Apparently rare. I have only seen two or three local specimens.

4. *H. geminus*, Fab., l. c. II., 268.
Pond at Gosforth, but very rare.

5. *H. duodecimpustulatus*, Fab., l. c. I., 60.

6. *H. depressus*, Fab.; *H. elegans*, l. c.
We have two varieties (species?) of this insect: a large dark one inhabiting "tarns," or small lakes, in hilly districts; the other a smaller pale one, which is found in every stream in the district.

7. *H. Davisii*, Curt., l. c. 61.

8. *H. assimilis*, Payk., l. c. 60.

9. *H. septentrionalis*, Gyll., l. c. 61.

10. *H. rivalis*, Gyll., l. c.

11. *H. parallelogrammus*, Ahr., l. c.

12. *H. novemlineatus*, Steph., l. c. III., 88.
Prestwick Carr. "Rothley Lake in plenty," Dr. Power.

13. *H. confluens*, Fab., l. c. I., 63.

14. *H. dorsalis*, Fab., l. c. 61.

15. *H. latus*, Steph., l. c.
Rare. Ouseburn and Devil's Water. I took a fine series in an open drain on a moor near Lanercost.

16. *H. erythrocephalus*, Linn., l. c. 62.

17. *H. rufifrons*, Duft., l. c. II., 335.
Boldon Flats. Not uncommon.

18. *H. planus*, Fab., l. c. I., 62.

19. *H. pubescens*, Gyll., l. c. 61.

20. *H. xanthopus*, Steph., l. c.

21. *H. obsoletus*, Aubé.; D. Sharp, Ent. Mon. Mag. VI., 81.
A single specimen, from Gosforth.

22. *H. memnonius*, Nicol., Trans. Cl. l. c.

23. *H. piceus*, Steph.; *H. Gyllenhalii*, l. c. II., 267.
Rare with us. I found it very abundant at Tain, Ross-shire, in September.

24. *H. monticola*, Sharp, l. c. 84; *H. melanarius*, Trans. Cl. III., 88.
Rare. In mossy holes on the moors. The only true *melanarius* that I have seen were taken in the south of England, by Dr. Power.

25. *H. parallelus*, Sharp, l. c.
Two specimens, from the north of Northumberland.

26. *H. celatus*, Clark; D. Sharp, l. c. 83.
Taken on Cheviot, by Dr. Sharp.

27. *H. discretus*, Fairm.; Schaum, Ins. Deutsch. I., 2nd part, 64; *H. nigrita*, Sturm.; Thomson, Skand. Coleop. II., 24; *H. pubescens*, Thomson, l. c. IX., 79.

28. *H. nigrita*, Fab. ; Aubé. ; Erichs. ; Schaum, l. c. ; *H. glabellus*, Thomson, l. c. IX., 80.

Dr. Sharp separates (l. c. 82) the old *nigrita* of our collections into two species, giving the above synonyms.

Having myself taken both in some plenty in several widely separated localities, always finding them in company, and in nearly equal numbers, I cannot think them to be more than male and female of one and the same species.

They frequent small streams, wells, &c.: the runner from a spring on the moors is a favourite locality.

29. *H. melanocephalus*, Gyll., Trans. Cl. III., 88.

On moors, &c. Not uncommon. Specimens in Mr. Hardy's collection are from the summit of Cheviot.

30. *H. elongatulus*, Sturm. ; T. J. Bold, Ent. Mon. Mag. IV., 284.

A male, taken by myself on a moor east of Lanercost, is the only British specimen known of this species.

31. *H. tristis*, Payk., Trans. Cl. II., 267.

Abounds in mossy holes on the moors.

32. *H. umbrosus*, Gyll., l. c. 325.

Gosforth. Somewhat rare.

33. *H. angustatus*, Sturm., l. c. I., 61.

34. *H. obscurus*, Sturm., l. c. II., 268.

35. *H. vittula*, Er., l. c. III., 88.

36. *H. incognitus*, Sharp, l. c. 84.

Rare. I have seen nine local specimens.

37. *H. palustris*, Linn., Trans. Cl. I., 61.

38. *H. lineatus*, Oliv., l. c. 62.

39. *H. granularis*, Linn., l. c. II., 268.

40. *H. pictus*, Fab., l. c. I., 64.

41. *H. lepidus*, Oliv., l. c. 63.

DYTISCIDES.

ACILIUS, *Leach.*

1. *A. sulcatus*, Linn., l. c. 66.

DYTISCUS, *Linn.*

1. *D. marginalis*, Linn., l. c.
2. *D. punctulatus*, Fab., l. c.

COLYMBETES, *Clairv.*

1. *C. fuscus*, Linn., l. c. 64.
2. *C. pulverosus*, Sturm., l. c.
   Rare with us.
3. *C. exoletus*, Forst., l. c.
4. *C. bistriatus*, Bergst., l. c. II., 268.
   "In a moss on Whitsunbank Hill," Mr. J. Hardy.

ILYBUS, *Er.* (COLYMBETES, *Cat.*)

1. *I. ater*, Deg., l. c. I., 66.
2. *I. obscurus*, Marsh., l. c.; *C. sex-dentatus*, Nat. Hist. Trans. I., 318.
3. *I. fenestratus*, Fab., Trans. Cl. l. c.
   "Twizell," P. J. Selby, Esq.
4. *I. guttiger*, Gyll., l. c. II., 269.
5. *I. angustior*, Gyll., l. c.
   "In a moss, Whitsunbank Hill," Mr. J. Hardy.
6. *I. uliginosus*, Linn., l. c. I., 66 (*fuliginosus*).

AGABUS, *Leach.* (COLYMBETES, *Cat.*)

1. *A. arcticus*, Payk., l. c. IV., 54.
   In some plenty near Whittingham, by G. Wailes, Esq., and on Cheviot, by Mr. J. Hardy.
2. *A. dispar*, Bold, l. c. I., 277; *A. uliginosus*, Payk.
   Boldon Flats and elsewhere. Not uncommon.
3. *A. femoralis*, Payk., Trans. Cl. I., 65.

4. *A. congener*, Payk., l. c. IV., 55.

Taken near the top of Cheviot, by Mr. J. Hardy.

5. *A. Sturmii*, Gyll., l. c. I., 65.

6. *A. chalconotus*, Panz., l. c.

7. *A. maculatus*, Linn., l. c.

8. *A. didymus*, Oliv.; *C. vitreus*, l. c.

"Twizell," P. J. Selby, Esq.

9. *A. paludosus*, Fab., l. c.

10. *A. bipunctatus*, Fab., l. c.

11. *A. guttatus*, Payk., l. c. 64; *C. fontinalis*, l. c. II., 268 (large female *var.*).

12. *A. fontinalis*, Steph.; Steph., Illust. Mand. II., 66.

I have two local specimens of this species, where taken I had omitted to note.

The dentate anterior claw of the male separates this species at once from *guttatus*: it is also a somewhat larger insect.

13. *A. unguicularis*, Thomson, Skand. Col. IX., 101 (*Eriglenus*); *C. affinis*, Trans. Cl. I., 65.

14. *A. tarsatus*, Zett.; Thomson, l. c. II., 64.

A single specimen, taken at Long Benton.

15. *A. bipustulatus*, Linn., Trans. Cl. I., 65.

LACCOPHILUS, *Clairv.*

1. *L. minutus*, Linn.; *L. hyalinus*, l. c. 60.

GYRINIDÆ.*

GYRINUS, *Geoff.*

1. *G. minutus*, Fab., l. c. 67.

Not common with us.

2. *G. urinator*, Ill., l. c.

Very local. Ouseburn only.

3. *G. natator*, Linn., l. c.

* The carefully accurate paper on this family [Ent. Mon. Mag. V., 52] by Dr. Sharp may be advantageously consulted by the student.

4. *G. bicolor*, Payk., l. c. VI., 60.

Rare. "Hall Kettles, or Hell Kettles," Rev. R. Kirwood.

5. *G. distinctus*, Aubé., Faune Franc. I., 221.

Very local, but plentiful when met with.

6. *G. marinus*, Gyll., Trans. Cl. I., 66; *G. colymbus* (?) Nat. Hist. Trans. I., 319, *var.*

7. *G. opacus*, Sahlb.; Schaum, Ins. Deutsch. I., 2nd part, 143.

Scotswood and elsewhere. Either rare or overlooked.

ORECHTOCHILUS, *Lacord.*

1. *O. villosus*, Fab., Trans. Cl. I., 67.

BRACHELYTRA.

ALEOCHARIDÆ.

AUTALIA, *Leach.*

1. *A. impressa*, Oliv., l. c. II., 96.

2. *A. puncticollis*, Sharp; T. J. Bold, Ent. Mon. Mag. VI., 108.

Two specimens taken on Cheviot, by Mr. James Hardy, in July.

3. *A. rivularis*, Gr., Trans. Cl. l. c.

FALAGRIA, *Leach.*

1. *F. sulcata*, Payk., l. c. 95.

2. *F. thoracica*, Steph., l. c.

Very rare.

3. *F. obscurus*, Grav., l. c.

BOLITOCHARA, *Mann.*

1. *B. lunulata*, Payk., l. c.

2. *B. obliqua*, Er., l. c.

PHYTOSUS, *Curt.*

1. *P. spinifer*, Curt., l. c. 73.

Amongst algæ on the sea coast. Not rare.

2. *P. balticus*, Kz.; *P. nigriventris*, l. c. III., 296.

On the sea coast, but less common than its congener. Most of my specimens were taken beneath tufts of the sea-rocket.

OCALEA, *Erich.*

1. *O. rufilabris*, Sahlb.; *O. picata*, l. c. II., 94.

Rather rare. Amongst leaves in woods and in fungi. "Wallington," Dr. Power.

2. *O. badia*, Er., l. c. IV., 175.

Rare. Banks of Devil's Water and Irthing, generally in rejectamenta.

ISCHNOGLOSSA, *Kz.*

1. *I. rufopicea*, Kz.; *I. corticalis*, l. c. VI., 225; *Phlœopora corticalis*, l. c. II., 88.

Very rare. Whitsunbank Hill and Saltwell.

2. *I. corticina*, Er., l. c. VI., 225.

A single example, from Gosforth Woods.

LEPTUSA, *Kz.*

1. *L. fumida*, Er., l. c. V., 52.

2. *L. ruficollis*, Er., l. c.; *Homalota rufescens*, l. c. II., 81.

HAPLOGLOSSA, *Kz.*

1. *H. pulla*, Gyll., Nat. Hist. Trans. I., 319.

Rare. Long Benton. On the flowers of heath, Gibside Woods.

2. *H. nidicola*, Fairm.; *H. pulla*, Kz. Ins. Deutsch. II., 80.

Very rare. Banks of the Irthing.

3. *H. erythroceras*, St.; *H. prætexta*, Trans. Cl. V., 221.

Very rare. Long Benton. May.

ALEOCHARA, *Grav.*

1. *A. ruficornis*, Grav., l. c. II., 74.

Rare. In woods. Gosforth, Ravensworth, and Lanercost.

2. *A. fuscipes*, Fab., l. c. 73.

3. *A. lanuginosa*, Grav., l. c. 74; *A. brevipennis*, *var.*, l. c. IV., 175.

4. *A. obscurella*, Grav., l. c.

5. *A. grisea*, Kz., Nat. Hist. Trans. I., 319.
Rare. Amongst algæ on the sea coast.

6. *A. algarum*, Fauv.; *A. Kirbii*, Trans. Cl. VI., 60.

7. *A. mœsta*, Grav., l. c. II., 74.

8. *A. bilineata*, Gyll., l. c. IV., 175.
Somewhat rare, and confined to the sea coast.

9. *A. nitida*, Grav., l. c. II., 73.

10. *A. morion*, Grav., l. c. 74.

MYRMEDONIA, *Er.*

1. *M. limbata*, Payk., Kz. Ins. Deutsch. II., 125.
Not uncommon on the Irthing, generally in company of *Formica flava*.

2. *M. canaliculata*, Fab., Trans. Cl. II., 96.

ILYOBATES, *Kz.*

1. *I. nigricollis*, Payk., l. c. V., 225.
I have taken it on the sea coast, beneath dead leaves in Gibside Woods, and on a moor near Lanercost. The specimens from the latter locality are scarcely more than one half as large as those from the others.

CALLICERUS, *Curtis.*

1. *C. obscuris*, Gr.; *Hom. callicera*, l. c. II., 80.

2. *C. rigidicornis*, Er.; *Ilyobates forticornis*, Nat. Hist. Trans. I., 131.
Very rare. Seghill Dene. June.

ISCHNOPODA, *Steph.*

1. *I. longitarsis*, Steph., Trans. Cl. II., 93 [*Calodera*].

2. *I. rubicunda*, Er., l. c. 94 [*Calodera*].
Not common. Ravensworth Woods, banks of Devil's Water, and Irthing, in rejectamenta.

TACHYUSA, *Er.*

1. *T. constricta*, Er., l. c. 88.

Abundant on the banks of the Irthing, Till, and on the Devil's Water at Dilston, in June and July.

2. *T. scitula*, Er., Kz. Ins. Deutsch. II., 153.

Banks of Irthing, but very rare. Till, Mr. J. Hardy.

3. *T. flavitarsis*, Sahlb., Trans. Cl. II., 90; *T. cærulea*, l. c. 88; *T. leucopa*, W. C.

Banks of streams. Not uncommon.

4. *T. umbratica*, Er.; *T. foveolata*, Trans. Cl. II., 88.

5. *T. uvida*, Er., l. c.

Rare. Marsden, Mr. J. Hardy.

6. *T. sulcata*, Kies., l. c. V., 226.

Rare. Sea coast near Hartley, in October.

OCYUSA, *Kz.*

1. *O. maura*, Er.; *Oxypoda maura*, l. c. II., 335.

2. *O. picina*, Aubé, l. c. V., 53.

Both species rare. The first at Gosforth, and the other at North Seaton and Whitley.

OXYPODA, *Mann.*

1. *O. spectabilis*, Märk.; *var. O. ruficornis*, l. c. III., 295.

Very rare. In fungi. Gosforth Woods and Wooler. October.

2. *O. lividipennis*, Mann; *O. luteipennis*, l. c. V., 222; *Hom. lividipennis*, l. c. II., 86.

3. *O. opaca*, Gr.; *O. umbrata*, l. c. 74.

4. *O. longiuscula*, Gr., l. c. 75.

5. *O. lentula*, Er., l. c. 76.

"Wooler, South Shields, and near Ravensworth," Mr. J. Hardy.

6. *O. umbrata*, Grav., *O. brevicornis*, l. c.

7. *O. exoleta*, Er.; *O. præcox*, l. c. VI., 226.

Near South Shields, but very rare.

8. *O. alternans*, Grav., l. c. II., 75.

Frequents fungi in woods.

9. *O. rupicola*, Rye, Ent. Mon. Mag. III., 66.

Two specimens, taken on Cheviot, by Mr. J. Hardy.

10. *O. sericea*, Heer.; *O. nigrinus*, Trans. Cl. VI., 226.

South Shields and elsewhere. Not uncommon.

11. *O. pallidula*, Sahlb.; *O. testacea*, l. c. II., 75; *O. annularis*, l. c. 295.

12. *O. brachyptera*, Steph., Illust. Mand. V., 128.

Somewhat rare. Tynemouth, on the Irthing, &c.

HOMALOTA, *Mann.**

1. *H. currax*, Kz., Trans. Cl. VI., 226; D. Sharp, Trans. Ent. Soc. London, 1869, p. 94.

Banks of Till, Ouseburn, Devil's Water, and Irthing.

2. *H. insecta*, Thoms.; D. Sharp, l. c. 97.

Broadstruther Burn, near Wooler, Mr. J. Hardy.

3. *H. pavens*, Er.; D. Sharp, l. c. 98; *H. sulcifrons*, Wat. Cat.; *Tachyusa frontalis*, Trans. Cl. II., 90.

Somewhat rare. In woods, &c.

4. *H. cambrica*, Woll.; D. Sharp, l. c. 100; *H. velox*, Nat. Hist. Trans. I., 319.

Rare. Whitley Sands. "Wooler district," Mr. J. Hardy.

5. *H. planifrons*, Wat., Trans. Cl. VI., 226; D. Sharp, l. c. 102.

Rare. Sands near South Shields.

6. *H. labilis*, Er., Nat. Hist. Trans. I., 131; D. Sharp, l. c. 113.

Blyth and Whitley Sands. "Banks of the Wansbeck," Dr. Power.

7. *H. carbonaria*, Sahlb.; D. Sharp, l. c. 114; *Tachyusa carbonaria*, Trans. Cl. II., 92; *Hom. ripicola*, l. c. III., 296.

* The "Revision of the British Species of *Homalota*," by Dr. Sharp, above cited, is quite indispensable to the student of this most difficult genus.

8. *H. plumbea*, Wat., Trans. Cl. VI., 226; D. Sharp, l. c. 114.
Rare. Sea coast near Hartley.

9. *H. luridipennis*, Mann., Nat. Hist. Trans. I., 131; D. Sharp, l. c. 117.
Not uncommon. Long Benton, Banks of Irthing, &c.

10. *H. londinensis*, Sharp, l. c. 118.
Rare. Team side, near Ravensworth, Mr. J. Hardy.

11. *H. hygrotopora*, Kz., Trans. Cl. VI., 226; D. Sharp, l. c. 120.
Banks of streams, &c. Not rare.

12. *H. elongatula*, Grav.; Trans. Cl. II., 80; D. Sharp, l. c. 121; *H. autumnalis*, Hardy, Trans. Cl. II., 83.
Very abundant throughout the district.

My types of *H. autumnalis*, named by Mr. Hardy, were determined by Mr. Jansen to be *H. gregaria* and *H. occulta.* I have since examined Mr. Hardy's series and find that (although allied species are included) the bulk of the specimens are to be referred to *H. elongatula.* Into this error he may have been led by Erichson comparing *autumnalis*, in shape and size, with small specimens of *H. elongatula.*

13. *H. volans*, Scriba; D. Sharp, l. c. 122.
Quite as common as *H. elongatula*, and, like it, generally distributed.

14. *H. clavipes*, Sharp, l. c. 124.
One specimen, from Henhole, taken in June, by Mr. J. Hardy.

15. *H. tibialis*, Heer.; D. Sharp, l. c. 125; *H. nivalis*, Trans. Cl. II., 77.
Abundant on the summit of Cheviot, &c.

16. *H. gregaria*, Er., Trans. Cl. III., 296; D. Sharp, l. c. 126.
A most abundant species.

17. *H. vestita*, Grav.; D. Sharp, l. c. 128; *H. sericans*, Trans. Cl. II., 83.
Exceedingly abundant amongst decaying algæ on the sea shore.

18. *H. oblongiuscula*, Sharp, l. c. 130; *H. oblonga*, W. C.
Rare. Banks of the Team, Mr. J. Hardy.

19. *H. vicina*, Steph., Trans. Cl. VI., 226; D. Sharp, l. c. 133.
Common throughout the district.

20. *H. pagana*, Er., Trans. Cl. V., 222; D. Sharp, l. c. 136.
Rare. Ouseburn Dene and elsewhere.

21. *H. graminicola*, Grav., Trans. Cl. II., 77; D. Sharp, l. c. 137.
Abundant in damp places in woods, &c.

22. *H. Halobrectha*, Sharp, l. c. 139; *H. maritima*, Trans. Cl. VI., 227; *H. algæ*, *var.*, l. c. II., 78.
Beneath sea weed. Common.

23. *H. algæ*, Hardy, Trans. Cl. II., 78; *H. puncticeps*, l. c. VI., 226; D. Sharp, l. c. 140.
With the foregoing, but less common.
Mr. Hardy's name, being founded on a good description, and published in 1851, must supersede Herr Thomson's *puncticeps*, which dates from 1852.

24. *H. occulta*, Er., Trans. Cl. VI., 227; D. Sharp, l. c. 143.
One local female in my own collection.

25. *H. fungivora*, Thoms.; D. Sharp, l. c. 144.
Three males in my own collection, and Mr. Hardy has specimens from the Team side, near Ravensworth.

26. *H. picipes*, Thoms.; D. Sharp, l. c. 145; *H. gemina*, Trans. Cl. VI., 227.
Rare. I have three local specimens.

27. *H. excellens*, Kz.; D. Sharp, l. c. 146.
Rare. North end of Whitley Sands. October.

28. *H. monticola*, Thoms., Trans. Cl. III., 296; D. Sharp, l. c. 147.
Rare. Near Washington, and at Gosforth. "Wallington, in fungi," Dr. Power. August. October.

29. *H. subglabra*, Sharp, l. c. 149.
Rare. Seghill Dene, in July.

30. *H. cæsula*, Er.; D. Sharp, l. c. 159; *H. angusta*, Trans. Cl. II., 84.

"Under sea weed and stones at South Shields and Marsden, in March," Mr. J. Hardy.

31. *H. fallaciosa*, Sharp, l. c. 157.

"Sweethope," Dr. Power.

32. *H. circellaris*, Grav., Trans. Cl. II., 81; D. Sharp, l. c. 160.

In moss, &c. Very abundant.

33. *H. immersa*, Er., Trans. Cl. II., 80; D. Sharp, l. c. 165.

Somewhat rare. Generally found beneath bark, &c., in woods.

34. *H. eremita*, Rye, Nat. Hist. Trans. I., 319; D. Sharp, l. c. 169.

Whitley Sands, rarely. "Top of Cheviot, Henhole, &c., common," Mr. J. Hardy.

35. *H. curtipennis*, Sharp, l. c. 173.

Two examples from Henhole in June, by Mr. J. Hardy.

36. *H. analis*, Grav., Trans. Cl. II., 84; D. Sharp, l. c. 175.

Very common.

37. *H. brunnea*, Fab., Trans. Cl. II., 82; D. Sharp, l. c. 184.

On low herbage in woods, and in fungi. Common.

38. *H. subænea*, Sharp, l. c. 187.

Banks of the Irthing, &c., in rejectamenta, &c.

39. *H. ænicollis*, Sharp, l. c. 189.

Frequents cut grass, garden refuse, &c. Long Benton, Gosforth, Heaton, &c. "Wallington," Dr. Power.

40. *H. xanthoptera*, Steph.; D. Sharp, l. c. 189; *H. socialis*, Trans. Cl. II., 83.

In fungi, at sap of felled trees, &c. Common.

41. *H. valida*, Kz.; D. Sharp, l. c. 192.

Rare. Two males and one female, taken at Gosforth, are in my collection.

42. *H. succicola*, Thoms.; D. Sharp, l. c. 193; *H. euryptera*, Trans. Cl. VI., 227.

Gosforth and elsewhere; but it is by no means common in our district.

43. *H. trinotata*, Kz.; D. Sharp, l. c. 195, Trans. Cl. VI., 227.

In vegetable refuse, &c. Abundant.

44. *H. xanthopus*, Thoms.; D. Sharp, l. c. 196.

Rare. I have taken it at Gosforth, in June, and on the coast near Hartley, in September.

45. *H. fungicola*, Kz.; D. Sharp, l. c. 199; *H. nigricornis*, Trans. Cl. VI., 227.

Gosforth, in fungi, but not common. August. "Wallington," Dr. Power.

46. *H. ignobilis*, Sharp, l. c. 200.

Two males, also from Gosforth, in August. "Wallington, in fungi," Dr. Power. "Langleyford and Dunstanborough," Mr. J. Hardy.

47. *H. sodalis*, Er., Trans. Cl. VI., 227; D. Sharp, l. c. 205.

Gosforth, but rarely.

48. *H. gagatina*, Bau.; D. Sharp, l. c. 206.

Rare. Seghill Dene. July.

49. *H. nigricornis*, Thoms.; D. Sharp, l. c. 209; *H. Thomsoni*, Trans. Cl. VI., 227.

Rare. Gosforth and Hartley. "Wallington, in fungi," Dr. Power.

50. *H. angusticollis*, Thoms.; D. Sharp, l. c. 210.

Rare. Seghill Dene. July. "Wallington," Dr. Power.

51. *H. corvina*, Thoms.; D. Sharp, l. c. 212; *H. lepida*, Trans. Cl. VI., 228.

Rare, and local.

52. *H. sericea*, Muls., Trans. Cl. III., 296; D. Sharp, l. c. 225.

Not common. "Wallington," Dr. Power.

53. *H. atricolor*, Sharp, l. c. 230; *H. inconspicua*, W. C.
Generally distributed, and abundant.

54. *H. nigra*, Kz., Trans. Cl. VI., 227; D. Sharp, l. c. 234.
In vegetable refuse, &c. Very common.

55. *H. germana*, Sharp, l. c. 235.
With the preceding, and nearly as common.

56. *H. sordidula*, Er.; D. Sharp, l. c. 238.
"Sweethope," Dr. Power.

57. *H. marcida*, Er.; D. Sharp, l. c. 240.
"Wallington," Dr. Power.

58. *H. intermedia*, Thoms.; D. Sharp, l. c. 242.
"In fungi, at Wallington," Dr. Power.

59. *H. longicornis*, Grav., Trans. Cl. II., 86; D. Sharp, l. c. 243.

An abundant species. Occurring both on the sea coast and inland.

60. *H. macrocera*, Thoms.; D. Sharp, l. c. 244.
In cut grass, &c. Long Benton.

61. *H. lævana*, Muls.; D. Sharp, l. c. 246.
"In dung, Wallington," Dr. Power.

62. *H. cinnamoptera*, Thoms.; D. Sharp, l. c. 247.
"Wallington," Dr. Power.

63. *H. villosula*, Kz., Trans. Cl. VI., 226; D. Sharp, l. c. 249.
Somewhat rare. Long Benton, Saltwell, &c.

64. *H. atramentaria*, Gyll., Trans. Cl. VI., 278; D. Sharp, l. c. 250; *H. cauta*, Trans. Cl. II., 85.

In dung, &c. Abounds everywhere.

65. *H. setigera*, Sharp, l. c. 251.

Very rare. Whitley Sands. August. "Wallington," Dr. Power.

66. *H. parva*, Sahlb.; D. Sharp, l. c. 253.
Not uncommon.

67. *H. melanaria*, Sahlb.; D. Sharp, l. c. 254.
In vegetable refuse, cut grass, &c. Common.

68. *H. pygmæa*, Gr.; D. Sharp, l. c. 257.
Not common.

69. *H. aterrima*, Grav., Trans. Cl. VI., 228; D. Sharp, l. c. 256.
Common.

70. *H. muscorum*, Bris.; D. Sharp, l. c. 259; *H. picipes*, Trans. Cl. VI., 228.
Also abundant. "Wallington," Dr. Power.

71. *H. pilosiventris*, Thoms.; D. Sharp, l. c. 260.
Rare. "Wallington," in August, Dr. Power.

72. *H. fusca*, Sahlb.; D. Sharp, l. c. 261; *H. laticollis*, Trans. Cl. VI., 228.
In cut grass, &c. Not uncommon.

73. *H. orbata*, Er.; D. Sharp, l. c. 264.
Very rare. In cut grass near Benton Bank, in July.

74. *H. fungi*, Grav.; D. Sharp, l. c. 265; *H. hygrophila*, Hardy, Trans. Cl. II., 86.
In moss, dead leaves, cut grass, &c., and so abundant as to be a perfect pest to the collector.

75. *H. clientula*, Er., Trans. Cl. VI., 228; D. Sharp, l. c. 267.
With the preceding, but much less common.

PLACUSA, *Er.*

1. *P. infima*, Er., Nat. Hist. Trans. I., 319.
Rare. Gosforth.

PHLŒOPORA, *Er.*

1. *P. reptans*, Grav., Trans. Cl. II., 87.
Beneath bark of decaying pine trees.

OLIGOTA, *Mann.*

1. *O. atomaria*, Er., Gen. et Sp. Staph., 180.
"Hetton Hall, near Belford," W. B. Boyd, Esq.

2. *O. inflata*, Mann.; *O. atomaria*, Trans. Cl. II., 73.
In moss, &c. Common.

ENCEPHALUS, *Westw.*

1. *E. complicans*, Westw., l. c. 72.
Rare. Gosforth, Cramlington, and near Swalwell.

GYROPHÆNA, *Mann.*

1. *G. gentilis*, Er., l. c. V., 222.
In fungi. Common.

2. *G. affinis*, Sahlb., l. c.
In fungi. Rather uncommon. "Wallington," Dr. Power.

3. *G. nana*, Payk., l. c. II., 72.
Gosforth, Greencroft, &c.

4. *G. congrua*, Er.; *G. fasciata*, W. C.
In fungi. Gosforth. Rare.

5. *G. lævipennis*, Thoms., Nat. Hist. Trans. I., 319.
In fungi. Abundant.

6. *G. minima*, Er., Trans. Cl. V., 222.
In fungi. Gosforth and elsewhere. Not rare.

7. *G. manca*, Er.; Kz. Ins. Deutsch. II., 361.
Very rare.

AGARIOCHARA, *Kz.*

1. *A. lævicollis*, Kz., Trans. Cl. V., 54.
Rare. North Seaton. September. "Ravensworth," Mr. J. Hardy.

MYLLÆNA, *Er.*

1. *M. dubia*, Er., Trans. Cl. II., 71.
Rare. Langleyford and Gosforth.

2. *M. elongata*, Matth.; Kz. Ins. Deutsch. II., 370.
"Wallington," Dr. Power. "Wooler district," Mr. J. Hardy.

3. *M. brevicornis*, Matth.; *M. gracilis*, Trans. Cl. II., 71.
In damp places. South Shields, Ravensworth Woods, on the Derwent, &c.

GYMNUSA, *Kars.*

1. *G. variegata*, Kies.; Kz. Ins. Deutsch. II., 374.
Rare. Banks of Irthing. "Near Wooler," Mr. J. Hardy.

TACHYPORIDÆ.

HYPOCYPTUS, *Schüp.*

1. *H. longicornis*, Payk., Trans. Cl. II., 65.
In fungi, &c.

2. *H. læviusculum*, Mann.; *H. anisotomoides*, W. C.
In moss, &c. Gosforth, Long Benton, &c.

LEUCOPARYPHUS, *Kz.*

1. *L. silphoides*, Linn.; *Tachinus silphoides*, Trans. Cl. II., 67.

TACHINUS, *Grav.*

1. *T. humeralis*, Grav., l. c. II., 68.

2. *T. proximus*, Kz., Nat. Hist. Trans. I., 319.
Apparently very rare.

3. *T. pallipes*, Grav., l. c. 131.
Rare. Gosforth and Bothal, in fungi. October.

4. *T. rufipes*, Fab., Trans. Cl. II., 67.

5. *T. flavipes*, Fab., l. c. V., 54.
Banks of Irthing, but very rare.

6. *T. subterraneus*, Linn., l. c. II., 68.

7. *T. marginellus*, Fab., l. c.

8. *T. laticollis*, Grav., l. c.

9. *T. collaris*, Grav., l. c.

10. *T. elongatulus*, Grav., l. c.
Not common. Sea coast at Whitley. Banks of Wooler Water and Irthing. Twizell and Gibside.

TACHYPORUS, *Grav.*

1. *T. obtusus*, Linn., Trans. Cl., II., 66.

2. *T. solutus*, Er., Kz. Ins. Deutsch. II., 421.
Very rare. I have seen three local specimens only.

3. *T. chrysomelinus*, Linn., Trans. Cl. II., 66.

4. *T. hypnorum*, Fab. l. c.

5. *T. pusillus*, Grav., l. c.; *T. scitulus*, *var.*, l. c. VI., 228.

6. *T. humerosus*, Grav.; *T. ruficollis*, l. c. II., 67.

7. *T. transversalis*, Gr.; Erich., Gen. et Sp. Staph. 240.
Rare. "Henhole," Mr. J. Hardy.

8. *T. brunneus*, Fab., Trans. Cl. II., 67; *T. pyrrhopterus*, l. c.

LAMPRINUS, *Heer.*

1. *L. saginatus*, Grav., Nat Hist. Trans. I., 319.
Very rare. Sea coast near Whitley.

CONOSOMA, *Heer.*

1. *C. littorea*, Linn., Trans. Cl. II., 65.
Not rare, especially in rejectamenta on the banks of streams.

2. *C. pubescens*, Grav., l. c.

3. *C. immaculata*, Steph., l. c. V., 222.
In cut grass. Little Benton and Heaton. "Marsden," Mr. Perkins.

4. *C. obscuripennis*, Steph.; *C. phyrrhopterus*, l. c. II., 66; *C. lividus*, Er.

BOLITOBIUS, *Steph.*

1. *B. analis*, Payk., Trans. Cl. II., 69.

2. *B. cingulatus*, Mann., Kz. Ins. Deutsch. II., 443.
Rare. Gosforth Woods, and near Gilsland.

3. *B. formosus*, Grav. (?) Trans. Cl. II., 69.
"Rare. One specimen taken in a quarry near Fugar Bar," Mr. J. Hardy. November.

4. *B. castaneus*, Hardy and Bold; *Bryoporus castaneus*, Trans. Cl. VI., 228; *Br. Hardii*, Crotch.
A single specimen, taken at Long Benton.

5. *B. atricapillis*, Fab., Trans. Cl. II., 69.

6. *B. trinotatus*, Er.; *B. trimaculatus*, l. c.

7. *B. exoletus*, Er.; *B. angularis*, l. c.

8. *B. pygmæus*, Fab., l. c. 70.

MYCETOPORUS, *Mann.*

1. *M. splendens*, Marsh., l. c. 71.
Rare. In damp places in woods, &c.

2. *M. longulus*, Mann., l. c. 70.
Rare. Same localities as the foregoing.

3. *M. lepidus*, Grav., l. c. 70.
Not rare. In damp places in woods.

4. *M. nanus*, Er., l. c. VI., 228.
Rare. Sea coast near Whitley.

5. *M. tenuis*, Muls., Faune Franc. I., 492.
"Top of Cheviot," Dr. Sharp.

QUEDIADÆ.

QUEDIUS, *Leach.*

1. *Q. lateralis*, Grav., Trans. Cl. II., 31.
Rare. "Twizell," P. J. Selby, Esq. "Wallington," Dr. Power. I have taken it in fungi at Gibside and Gilsland.

2. *Q. 4-punctatus*, Thoms.; *Q. fulgidus, var. b.* l. c.
Not of frequent occurrence.

3. *Q. temporalis*, Thoms.; *Q. fulgidus, var. a.* l. c.
Very common everywhere. A variety is abundant in cellars, &c., at Newcastle, which is always piceous in colour, with the abdomen highly iridescent.

4. *Q. cruentus*, Oliv., l. c. V., 54.
Long Benton. Very rare.

5. *Q. impressus*, Panz., l. c. II., 32.

6. *Q. molochinus*, Grav., l. c.

7. *Q. frontalis*, Steph., l. c.

8. *Q. fuliginosus*, Grav., l. c. 33.

9. *Q. picipes*, Mann., l. c.

10. *Q. peltatus*, Er., Kz. Ins. Deutsch. II., 507.
Amongst fallen leaves in woods. Frequent.

11. *Q. umbrinus*, Er., Kz. l. c. 509.

In woods. Rare. I took it also at Tain, Ross-shire, in September.

12. *Q. ruficollis*, Steph.; *Q. nigriceps*, Kz. l. c. 510.

Gosforth Woods, &c., but rarely. In dead leaves.

13. *Q. maurorufus*, Grav., Kz. l. c. 512.

Not uncommon at Gosforth, Gibside, and in the woods near Gilsland. Also at Tain, Ross-shire.

14. *Q. suturalis*, Kz.; *Q. humeralis*, Trans. Cl. V., 222.

Long Benton, and Seghill Dene. Rare.

15. *Q. scintillans*, Gr.; *Q. fuscipes*, l. c. II., 34.

Very rare.

16. *Q. fulvicollis*, Steph., l. c. V., 222; *Q. lævigatus*, l. c. III., 296.

In woods, &c. Rare.

17. *Q. rufipes*, Grav.; *Q. semiobscurus*, W. C.

Has been met with on the sea coast near Hartley and South Shields, but is not common.

18. *Q. semiobscurus*, Erich.; *Q. semiæneus*, Trans. Cl. VI., 60.

Not uncommon: more especially on the sea coast.

19. *Q. attenuatus*, Gyll., l. c. II., 34.

Woods, &c. Not unfrequent.

20. *Q. boops*, Grav., l. c.

In moss, &c. Rather common.

21. *Q. auricomus*, Kies., Faune Franc. I., 540.

Banks of the Irthing in May, but very rare.

STAPHYLINIDÆ.

STAPHYLINUS, *Linn.*

1. *S. maxillosus*, Linn., Trans. Cl. II., 21.

2. *S. nebulosus*, Feb., l. c.

3. *S. murinus*, Linn., l. c.

Of very rare occurrence.

4. *S. latebricola*, Grav., l. c. 23.
Very rare. Twizell, P. J. Selby, Esq. Hetton Hall, Belford, W. B. Boyd, Esq.

5. *S. stercorarius*, Oliv., l. c. 22.
Rather uncommon. I took a fine series of it at South Shields in the nests of a *Myrmica*.

6. *S. pubescens*, Deg., l. c.

7. *S. erythropterus*, Linn., l. c.

8. *S. cæsarius*, Ceder., l. c.
Not of frequent occurrence.

OCYPUS, *Er.*

1. *O. olens*, Müll., l. c. 23.

2. *O. similis*, Fab., l. c. III., 296.
Rather rare with us. More plentiful about Lanercost.

3. *O. brunnipes*, Fab., l. c. II., 23.

4. *O. fuscatus*, Grav., l. c.
Occurring sparingly in widely separated localities.

5. *O. cupreus*, Rossi, l. c.

6. *O. ater*, Grav., l. c. 24.
Tynemouth, Hartley, and in profusion on the Wansbeck near North Seaton.

7. *O. morio*, Grav., l. c.

PHILONTHUS, *Leach.*

1. *P. splendens*, Fab., l. c. 25.

2. *P. intermedius*, Lac.; *P. chalceus*, l. c.
Very rare. Hartlepool, Mr. J. Hardy.

3. *P. laminatus*, Steph., l. c.

4. *P. succicola*, Thoms.; *P. carbonarius*, l. c.
In fungi, &c., in woods, and in vegetable refuse in gardens.

5. *P. tenuicornis*, Rey et Muls.; *P. punctiventris*, l. c. VI., 50.
A rare insect. I have taken it on wing in October.

6. *P. addendus*, Sharp, Nat. Hist. Trans. I., 320; *Ph. temporalis*, Trans. Cl. VI., 50.

A type of *P. addendus*, named by Mr. Crotch, appears to me to be quite identical with my specimens of *P. temporalis*.

7. *P. æneus*, Rossi, l. c. II., 25.

8. *P. scutatus*, Er., l. c. 26.

Sparingly, but generally spread over our district, and in east Cumberland. I have seen specimens from Perthshire, and I took it at Tain in Ross-shire.

9. *P. decorus*, Grav., l. c.

10. *P. politus*, Fab., l. c.

11. *P. lucens*, Mann., Kz. Ins. Deutsch. II., 582.
Very rare. Banks of the Irthing.

12. *P. umbratilis*, Grav., Trans. Cl. II., 27.

Widely spread but not common in our district: more plentiful on the Irthing about Lanercost.

13. *P. varius*, Gyll., l. c.

14. *P. albipes*, Grav., l. c.
Both rare and local with us.

15. *P. marginatus*, Fab., l. c. 26.

16. *P. sordidus*, Grav., l. c. 28.

17. *P. fimetarius*, Grav., l. c.

18. *P. cephatolus*, Grav., l. c.

19. *P. nigriventris*, Thomson, Skand. Col. IX., 147.
Banks of Irthing. Very rare.

20. *P. xantholoma*, Grav., Trans. Cl. II., 27.

21. *P. fucicola*, Steph., l. c. 28.
Rare. "Beneath sea weed at Marsden," Mr. J. Hardy.

22. *P. ebeninus*, Grav., Kz. Ins. Deutsch. II., 596; Trans. Cl. VI., 229.

23. *P. fumigatus*, Er., Kz. Ins. Deutsch. II., 599.
Banks of streams, &c. Common.

24. *P. sanguinolentus*, Grav., Trans. Cl. II., 29.
Rare. Mostly found on the sea coast.

25. *P. longicornis*, Steph., l. c. (*P. varians, var. C.*).

26. *P. varians*, Fab., l. c.; *P. bipustulatus, var.* l. c.

27. *P. debilis*, Grav., l. c. IV., 175.
Rare. Gosforth and South Shields.

28. *P. ventralis*, Grav., l. c. II., 30.

29. *P. discoideus*, Grav., l. c.

30. *P. thermarum*, Aubé; *P. splendidulus*, l. c.
Long Benton. Rare.

31. *P. micans*, Grav., l. c.
Rare. Twizell, Dunstanborough Castle, and Boldon Flats.

32. *P. rubripennis*, Steph.; *P. fulvipes*, l. c.
Rare. Twizell and Wooler Water.

33. *P. nigritulas*, Grav.; *P. aterrimus*, l. c. 31.

34. *P. puella*, Nordm.; *P. minax*, l. c.
Not of frequent occurrence.

35. *P. procerulus*, Grav. l. c. VI., 229.
Near Wooler, and sea banks north of Whitley. Rare.

XANTHOLINIDÆ.

XANTHOLINUS, *Dahl.*

1. *X. fulgidus*, Fab., l. c. II., 37.
Rare. Banks of Tyne, Derwent, and at South Shields.

2. *X. glabratus*, Grav., l. c.

3. *X. punctulatus*, Payk., l. c.

4. *X. ochraceus*, Gyll., l. c. 38.

5. *X. tricolor*, Fab., l. c.

6. *X. linearis*, Oliv., l. c.

LEPTACINUS, *Er.*

1. *L. parumpunctatus*, Gyll., l. c.
Not of frequent occurrence.

2. *L. batychrus*, Gyll., l. c. 39.
Also somewhat rare.

3. *L. pusillus*, Steph.; *L. linearis*, l. c.

OTHIUS, *Steph.*

1. *O. fulvipennis*, Fab., l. c. II., 36.

2. *O. læviusculus*, Kirby; *O. punctipennis*, Kz.
Rare. Near Hartley in October.

3. *O. melanocephalus*, Grav., l. c. 36.

4. *O. myrmecophilus*, Kies., Nat. Hist. Trans. I., 330.

BAPTOLINUS, *Kz.*

1. *B. alternans*, Grav.; *Othius pilicornis*, Trans. Cl. II., 37.

PÆDERIDÆ.

LATHROBIUM, *Grav.*

1. *L. brunnipes*, Fab., l. c. 40.

2. *L. elongatum*, Linn., l. c.

3. *L. boreale*, Hoch.; *L. geminum*, l. c. VI., 229.

4. *L. fulvipenne*, Grav., l. c. II., 40.

5. *L. multipunctatum*, Grav., l. c.
Rare. Banks of Derwent. Tyne, &c.

6. *L. angusticolle*, Lac.; *L. carinatum*, l. c. III., 46.
Rare. In rejectamenta on the Devil's Water and Irthing.

7. *L. quadratum*, Payk., l. c. II., 41.

8. *L. longulum*, Grav., Kz. Ins. Deutsch. II., 681.
Rare. Banks of Irthing.

CRYPTOBIUM, *Mann.*

[*C. fracticorne*, Payk., Trans. Cl. II., 39.]
The types in the Selby collection are *Philonthus nigritulus*.

STILICUS, *Lat.*

1. *S. rufipes*, Grav., l. c. 41.
Rare. Banks of the Derwent, Tyne, and at South Shields.

2. *S. affinis*, Er., l. c. 42.

3. *S. orbiculatus*, Payk., l. c. 43.
Much rarer than the preceding.

LITHOCHARIS, *Lac.*

1. *L. maritima*, Aubé., Ent. Mon. Mag. II., 1869.
Rare. Sea coast near South Shields.

2. *L. fuscula*, Mann., Nat. Hist. Trans. I., 132.
With the preceding, and quite as rare.

3. *L. ochracea*, Grav., Trans. Cl. II., 41.

4. *L. melanocephala*, Fab., l. c. III., 89.
Banks of streams. Not common.

5. *L. obsoleta*, Nordm., l. c. VI., 229.
Very rare. Near South Shields, in May.

STENIDÆ.

DIANÖUS, *Leach.*

1. *D. cærulescens*, Gyll., l. c. II., 43.
Rare. Ouseburn Dene. Wallington, Dr. Power. Near Wooler, Mr. J. Hardy.

STENUS, *Lat.**

1. *S. biguttatus*, Linn., l. c.

2. *S. guttula*, Müll., l. c. 44.

3. *S. bimaculatus*, Gyll., l. c.

4. *S. Juno*, Fab., l. c.

5. *S. bupthalmus*. Grav., l. c.

6. *S. atratulus*, Er., l. c.
Local. Apparently more plentiful on the sea coast than elsewhere.

7. *S. melanopus*, Marsh., l. c. 45.
Rather uncommon.

* The student may consult with advantage a most valuable descriptive paper on the "British Species of Stenus," by E. C. Rye, in the Entomologists' Monthly Magazine, Vol. I., p. 6 et seq.

8. *S. canaliculatus*, Gyll., l. c. III., 89.
In moss, &c. Somewhat rare.

9. *S. opacus*, Er.; *S. debilus*, Nat. Hist. Trans., I., 132.
Northumberland (?) G. R. Waterhouse, Esq.

10. *S. pusillus*, Kirby, Trans. Cl. II., 45.

11. *S. speculator*, Lac.; *S. boops*, l. c. 46.

12. *S. Rogeri*, Kz.; *S. sylvester*, Nat. Hist. Trans. I., 132.
Banks of streams, &c. Rare.

13. *S. Argus*, Grav., Trans. Cl. VI., 229.
Very rare.

14. *S. declaratus*, Er., l. c.
Not uncommon.

15. *S. crassus*, Steph.; *S. nigritulus*, l. c. II., 46.
Rare. Long Benton, Gosforth, and Budle Crag. "Wallington," Dr. Power.

16. *S. nigritulus*, Gyll.; *S. unicolor*, l. c. IV., 176.
Rare. I have several times taken it in the burrows of *Bledius arenarius*.

17. *S. laticollis*, Thoms.; *S. brunnipes*, l. c. II., 49.

18. *S. binotatus*, Ljunyh., l. c. 46.

19. *S. pubescens*, Steph., l. c. 47.

20. *S. pallitarsis*, Steph., l. c.; *S. plantaris*, l. c. III., 296.
Of occasional occurrence in several localities.

21. *S. bifoveolatus*, Gyll.; *S. nitidus*, l. c. II., 47.
Also somewhat uncommon.

22. *S. brevicollis*, Thomson, Skand. Col. III., 234.
"Banks of Till, and on Henhole," Mr. J. Hardy.

23. *S. rusticus*, Er.; *S. picipes*, Trans. Cl. II., 47.

24. *S. nitidiusculus*, Steph., l. c.

25. *S. gonymelas*, Steph., l. c. VI., 229.
Somewhat rare, and local.

26. *S. impressipennis*, J. Duv.; *S. proboscideus*, l. c. II., 48.

27. *S. glacialis*, Heer., Nat. Hist. Trans. I., 320.
One specimen on Cheviot in August, Mr. R. Hislop.

28. *S. impressus*, Germ., Trans. Cl. II., 47.

29. *S. pallipes*, Grav., l. c. 48.
"Rare. Gibside and Ravensworth Woods, in moss, Mr. J. Hardy. January."

30. *S. flavipes*, Steph., l. c.

31. *S. tarsalis*, Ljungh., l. c.
"In damp bogs. Taken at Twizell, by P. J. Selby, Esq."

32. *S. oculatus*, Grav., l. c. 49.

33. *S. fulvicornis*, Steph., l. c.
Rare. Ravensworth, Gibside, Gosforth, Hetton Hall, near Belford, &c.

34. *S. latifrons*, Er., Kz. Ins. Deutsch. II., 794.
Banks of Irthing. Rare. "Wooler district," Mr. J. Hardy.

OXYTELIDÆ.

BLEDIUS, *Leach.*

1. *B. subterraneus*, Er., Trans. Cl. II., 49.
Banks of Derwent, Devil's Water, Irthing, Till, and at Hetton Hall, near Belford. "Wallington," Dr. Power.

2. *B. arenarius*, Payk., Kz. Ins. Deutsch. II., 826.
Whitley Sands in plenty.

3. *B. opacus*, Block., Trans. Cl. II., 49.
Rare. Banks of the Derwent and Irthing. The late Rev. G. T. Rudd found it abundant at the estuary of the Tees.

4. *B. longulas*, Er., l. c. VI., 230.
Banks of the Irthing, and rather plentifully towards the north end of Whitley Sands.

5. *B. erraticus*, Er., Kz. Ins. Deutsch. II., 836.
Rare. Beneath stones in the bed of the Irthing, when the water was low, at St. Mary's Holme, near Lanercost.

PLATYSTETHUS, *Mann.*

1. *P. morsitans*, Payk., Trans. Cl. II., 50.

OXYTELUS, *Mann.*

1. *O. rugosus*, Fab., l. c. 51.

2. *O. sculptus*, Grav., l. c.

3. *O. luteipennis*, Er.; *O. nitens*, l. c.

4. *O. sculpturatus*, Grav., l. c.

5. *O. nitidulus*, Grav., l. c. 52.

6. *O. maritimus*, Thoms.; *O. flavipes*, l. c. 51.

Amongst algæ on the sea coast. Abundant.

7. *O. complanatus*, Er.; *O. pallipes*, l. c. 52.

8. *O. depressus*, Grav., l. c.

HAPLODERUS, *Steph.*

1. *H. cælatus*, Grav., Kz. Ins. Deutsch. II., 865.

Rare. A hill insect. I have only met with it on our western borders.

ANCYROPHORUS, *Kz.*

1. *A. omalinus*, Er., Kz. l. c. 889.

Banks of the Irthing. "Banks of the Wansbeck," Dr. Power.

2. *A. longipennis*, Fairm., Kz. l. c. 888; *Thinobius longipennis*, Nat. Hist. Trans. I., 320.

Banks of the Irthing. Mr. Crotch found it abundant at Yetholm.

TROGOPHLŒUS, *Mann.*

1. *T. arcuatus*, Steph.; *T. scorbiculatus*, Kz. l. c. 870.

Banks of streams. Very rare.

2. *T. riparius*, Lac.; *T. bilineatus*, Trans. Cl. II., 52.

3. *T. elongatulus*, Er., l. c. VI., 230.

Amongst algæ on the sea coast. Rare.

4. *T. fuliginosus*, Grav., l. c. II., 52.

Rare. Banks of the Till.

5. *T. corticinus*, Grav., l. c. V., 54.

Little Benton, and North Seaton.

6. *T. pusillus*, Grav., l. c. II., 53; *T. halophilus*, Nat. Hist. Trans. I., 132.

SYNTOMIUM, *Curt.*

1. *S. æneum*, Müll., Trans. Cl. II., 53.

COPROPHILUS, *Lat.*

1. *C. striatulus*, Fab., l. c.

Long Benton and sea coast, but not common.

HEMALAIDÆ.

ANTHOPHAGUS, *Grav.*

1. *A. alpinus*, Fab., l. c. 54.

Top of Cheviot, Hedgehope, &c. Not rare.

2. *A. testaceus*, Grav., l. c. 54; *A. caraboides*, l. c.

Abundant in woods. *A. caraboides* appears to have been founded on dark coloured examples of this species.

GEODROMICUS, *Redt.*

1. *G. nigrita*, Müll.; *G. plagiatus*, l. c. 55.

Rare on the Derwent and Irthing. "Rothley," Dr. Power.

LESTEVA, *Lat.*

1. *L. bicolor*, Fab., l. c.

2. *L. punctata*, Er.; *L. impressa*, l. c.

Not common, but widely distributed.

ACIDOTA, *Steph.*

1. *A. crenata*, Fab., l. c. 57.

"A pair from the woods, near Ravensworth Castle," Mr. J. Hardy.

2. *A. cruentata*, Mann.; *A. rufa*, Hist. Berw. Nat. Club, IV., 322.

Hetton Hall, near Belford, W. B. Boyd, Esq.

OLOPHRUM, *Er.*

1. *O. piceum*, Gyll., Trans. Cl. II., 57.

LATHRIMÆUM, *Er.*

1. *L. atrocephalum*, Gyll., l. c.

2. *L. unicolor*, Marsh., l. c. IV., 176.

DELIPHRUM, *Er.*

1. *D. tectum*, Payk., l. c. II., 58.

ARPEDIUM, *Er.*

1. *A. brachypterum*, Grav., l. c. 56.
Rare. Near the top of Cheviot and of Hedgehope.

PHILORINUM, *Kz.*

1. *P. subpubescens*, Steph.; *Arpedium subpubescens*, l. c. 57.
In the flowers of broom and furze. Not uncommon.

MICRALYMMA, *Westw.*

1. *M. marina*, Ström.; *M. brevipenne*, l. c. II., 53.
Sparingly on the sea coast in the fissures of shaly sandstone, crevices of limestone, beneath stones, &c.: often below high water mark.

CORYPHIUM, *Steph.*

1. *C. angusticolle*, Steph., l. c. VI., 60.
Rare.

HOMALIUM, *Grav.*

1. *H. læviusculum*, Gyll.; Thomson, Skand. Col. III., 213 (*Omalium*).

2. *H. riparium*, Thomson, l. c. 212 (*Om.*).
This and the preceding species are plentiful on the sea coast amongst algæ, generally occurring in company.

3. *H. rivulare*, Payk., Kz. Ins. Deutsch. II., 978 (*Om.*).
Common.

4. *H. fossulatum*, Er., Kz. l. c. 979 (*Om.*).
Of frequent occurrence.

5. *H. Allardi*, Fairm., Trans. Cl. VI., 230 (*Om.*).
Of occasional occurrence in several localities. Often crawling on the top of low walls.

6. *H. cæsum*, Grav., Kz. l. c. 981 (*Om.*).
In cut grass, &c. Abundant.

7. *H. oxyacanthæ*, Grav., Kz. l. c. 982 (*Om.*); *Omalium conformatum*, Hardy, Trans. Cl. II., 59.
With the preceding, and nearly as common.

8. *H. exiguum*, Gyll., Kz. l. c. 984 (*Om.*).
Rare.

9. *H. Abietinus*, Thoms., Skand. Col. IX., 318 (*Phlœonomus*); *Om. pusillum*, Trans. Cl. II., 61.
Beneath bark of felled pine trees. Not uncommon.

10. *H. concinnum*, Marsh., Kz. l. c. 991 (*Om.*).
Very common.

11. *H. vile*, Er., Kz. l. c. 993 (*Om.*); Trans. Cl. VI., 230.
In woods beneath bark, &c. Not uncommon.

12. *H. gracilicorne*, Fairm., Faune Franc. I., 642 (*Om.*).
Rare. Four specimens, from Gosforth Woods.

13. *H. florale*, Fab., Kz. l. c. 996 (*Om.*).
On flowers of *Umbelliferæ*, &c., but not common.

14. *H. iopterum*, Steph.; *Om. lucidum*, Kz. l. c. 995.
Rare. In cut grass, beneath bark, &c.

15. *H. striatum*, Grav., Kz. l. c. 1000 (*Om.*).
Rare. Gosforth, and Boldon Flats. "Wallington, in August," Dr. Power.

16. *H. inflatum*, Gyll., Kz. l. c. 1002 (*Om.*).
Rare. Ravensworth Woods, Mr. J. Hardy.

EUSPHALERUM, *Kz.*

1. *E. primulæ*, Steph., Trans. Cl. V., 54; *Anthobium triviale*, l. c. II., 61.
I have taken this insect plentifully at Gibside in the flowers of the common primrose. Mr. Hardy found it in the flowers of the guilder-rose and hawthorn.

ANTHOBIUM, *Leach.*

1. *A. minutum*, Fab., l. c. 63.

2. *A. torquatum*, Marsh., l. c.

3. *A. opthalmicum*, Payk., Kz. Ins. Deutsch. II., 1017.
Not unfrequent in flowers of broom, &c.

4. *A. sorbi*, Gyll., Kz. l. c. 1018.
Local. On low plants in woods, on the Irthing, and elsewhere.

PROTEINIDÆ.

PROTEINUS, *Lat.*

1. *P. ovalis*, Er., Trans. Cl. IV., 176.
Rare. Near Morpeth, Gosforth, &c.

2. *P. brachypterus*, Lat., l. c. II., 63.

MEGARTHRUS, *Kirby.*

1. *M. depressus*, Er., l. c. 64.

2. *M. sinuatocollis*, Lacord., l. c.

3. *M. affinis*, Miller; *M. Bellevoyei*, De Saulcy.

4. *M. denticollis*, Beck., Trans. Cl. II., 64.

PHLŒOCHARIDÆ.

PHLŒOCHARIS, *Mann.*

1. *P. subtilissima*, Mann., l. c. 54.
Under bark. Not uncommon.

MICROPEPLIDÆ.

MICROPEPLUS, *Lat.*

1. *M. porcatus*, Fab., l. c. 64.

2. *M. Staphylinoides*, Marsh., l. c. 65.
Rare.

3. *M. fulvus*, Er.; *M. Margaritæ*, Nat. Hist. Trans. I., 132.
Rather less rare than the preceding.

NECROPHAGA.

SILPHIDÆ.

SILPHIDES.

NECROPHORUS, *Fab.*

1. *N. humator*, Fab., Trans. Cl. I., 78.

2. *N. ruspator*, Er., l. c.; *N. microcephalus*, Nat. Hist. Trans. I., 132. *Small male var.*

3. *N. mortuorum*, Fab., Trans. Cl. I., 79.

4. *N. vespillo*, Linn., l. c.

NECRODES, *Leach.*

1. *N. littoralis*, Linn., l. c.

SILPHA, *Linn.* (OICEOPTOMA, SILPHA, AND PHOSPHUGA, *Cat.*)

1. *S. thoracica*, Linn., l. c.

2. *S. rugosa*, Linn., l. c. 80.

3. *S. dispar*, Herbst., l. c.
Rare. Prestwick Carr and South Shields.

4. *S. sinuata*, Fab.; *S. appendiculata*, l. c.
Rare. Prestwick Carr and Durham.

5. *S. opaca*, Linn., l. c.
Newcastle, Twizell, and Long Benton.

6. *S. tristis*, Ill., l. c.

7. *S. nigrita*, Creutz., l. c.

8. *S. obscura*, Linn., l. c.
Rare. Twizell, Marsden, and Durham.

9. *S. quadripunctata*, Linn., l. c. V., 54.
Rare. Taken at Gibside, by Mr. V. R. Perkins.

10. *S. lævigata*, Fab.; *S. polita*, l. c. I., 81.
Sea coast near South Shields and Marsden.

11. *S. atrata*, Linn., l. c.

CHOLEVIDES.

CHOLEVA, *Latr.* (CATOPS, *Cat.*)

1. *C. angustata*, Fab.; Murray, Annals and Magazine of Natural History for July, 1856.

This species has been split up into four by some of our modern Entomologists—*angustatus*, Fab.; *Sturmii*, Bris.; *intermedia*, Kz.; and *cisteloides*, Fröhl. My local examples are too few to show more than that we have the first and fourth, and the last is the most abundant.

2. *C. agilis*, Ill.; Murray, l. c.
Taken at Marsden, by Mr. J. Hardy.

3. *C. fusca*, Panz.; Murray, l. c.
Nearly all my specimens are from cellars.

4. *C. nigricans*, Spence; Murray, l. c.; *C. flavicornis*, Thomson, Skand. Col. IX., 346.
On the sea coast and elsewhere. Common.
Our local specimens all agree very well with Thomson's description of *C. flavicornis:* nevertheless, it appears to me very doubtfully distinct from *C. nigricans*, Spence.

5. *C. morio*, Fab.; Murray, l. c.
A rare species. Occurs in moss, &c., in shady woods. "Wallington," Dr. Power.

6. *C. longula*, Kell. [nec. Murray], Nat. Hist. Trans. I., 320.
Very rare. In decaying fungi at Bothal.

7. *C. nigrita*, Er.; Murray, l. c.
Not uncommon beneath dead birds, &c.

8. *C. grandicollis*, Er., Trans. Cl. VI., 61.

9. *C. Kirbii*, Spence, l. c.

10. *C. tristis*, Panz.; Murray, l. c.
The above three species occur in woods, beneath dead mammals and birds, and are all moderately abundant.

11. *C. chrysomeloides*, Panz.; Murray, l. c.
Beneath dead animals, but not common.

12. *C. Watsoni*, Spence; *C. fumatus*, Murray, l. c.
In dead leaves, moss, &c. Very abundant.

13. *C. fumata*, Spence; *C. scitula*, Murray, l. c.
The only local specimen known to me is one taken by myself, at Gosforth, in October.

14. *C. velox*, Spence; Murray, l. c.
In moss, dry leaves, &c. Very common.

15. *C. Wilkinii*, Spence; *C. præcox*, Murray, l. c.
With the preceding, but less common.

16. *C. anisotomoides*, Spence; Murray, l. c.
Damp places in woods, &c., but not abundant.

17. *C. sericea*, Fab.; Murray, l. c.
Abundant everywhere.

COLON, *Herbst.*

1. *C. dentipes*, Sahlb.; Sturm, pl. CCLXXXI. A.
A fine male, by sweeping low herbage, in a wood on the Irthing.

2. *C. brunneum*, Latr., Trans. Cl. I., 78; *C. serripes*, *var.*, Nat. Hist. Trans. I., 320.
A rare insect with us. Frequents dead leaves, &c.
The variety curiously simulates *serripes*.

SPHÆRITES, *Duft.*

1. *S. glabratus*, Fab., Steph. Manual, 113.
One Specimen, taken near Wooler, by Mr. J. Hardy.

SCYDMÆNIDÆ.

EUMICRUS, *Lap.*

1. *E. tarsatus*, Müll.; *S. tarsatus*, Trans. Cl. II., 191.
Rare. Long Benton, Durham, &c.

SCYDMÆNUS, *Latr.*

1. *S. scutellaris*, Müll.; Sturm, pl. CCLXIII. A.
A single local example, is in my own collection.

2. *S. collaris*, Müll.; Sturm, pl. CCLXIII. D.
In moss, &c. Not rare.

3. *S. pusillus*, Müll., Trans. Cl. II., 191.
"In hot-beds at Gilesgate Moor, Durham," Rev. W. Little. Mr. Hardy's examples of this species are all *S. collaris*.

4. *S. hirticollis*, Ill., l. c.
"In hot-beds at Gilesgate Moor, Durham," Rev. W. Little. All my local specimens belong to the next species, as probably do those of the Rev. W. Little, which I have not seen.

5. *S. fimetarius*, Thomson, Skand. Col. IV., 89 [*Euconnus*]; E. C. Rye, Ent. Ann. 1869, 35.

Not rare. On hot-beds at Long Benton and elsewhere.

ANISOTOMIDÆ.

HYDNOBIUS, *Schaum.*

1. *H. punctatissimus*, Steph., Trans. Cl. V., 54.

Very rare. "Saltwell," Rev. R. Kirwood. Long Benton. October.

ANISOTOMA, *Knoch.*

1. *A. rugosa*, Steph., Erich. Ins. Deutsch. III., 54.

I took a male and female of this fine insect on the Irthing, at a place called "the Coomb Crag," near Gilsland.

2. *A. dubia*, Kugel., l. c. 60.

By sweeping rough herbage in woods, &c. I once found some scores on the sea shore, near Whitley, in October: they were on a sandy slope, with heads to windward. Whence they came bothered me entirely. The fine variety *longipes*, Schmidt, was taken near Hartford Bridge, in May.

3. *A. ovalis*, Schaum, l. c. 67.

Not uncommon. It is often found on the tops of walls, beneath trees, especially after rain.

4. *A. calcarata*, Erich., l. c. 71.

Of occasional occurrence, but not common. "Wallington," Dr. Power.

5. *A. badia*, St., l. c. 74.

"Hetton Hall, near Belford," W. B. Boyd, Esq.

6. *A. ornata*, Fairm., Nat. Hist. Trans. I., 320; *Leiodes arenaria*, Trans. Cl. I., 74.

Rare. Gosforth and Marsden.

COLENIS, *Erich.*

1. *C. dentipes*, Gyll.; *Leoides aciculata*, Trans. Cl. I., 74.

By sweeping in woods, &c. Not rare.

LIODES, *Latr.*

1. *L. humeralis*, Fab., l. c. 75.

Woods, &c. Common.

2. *L. glaber*, Kug.; *L. abdominalis*, l. c.

In woods, &c. Apparently rare.

3. *L. orbicularis*, Herbst., Nat. Hist. Trans. I., 132.

In fungi, at Gosforth. Rare.

AMPHICYLLIS, *Erich.*

1. *A. globus*, Fab., l. c. 93.

Very rare. Gosforth and Long Benton.

AGATHIDIUM, *Ill.*

1. *A. nigripenne*, Fab., Trans. Cl. IV., 176; *A. globus*, l. c. I., 75.

Gosforth, Jesmond, Ravensworth, Whittle Dene, &c. "Wallington," Dr. Power. Family parties, of a score or more, are occasionally found beneath the bark of felled trees.

2. *A. lævigatum*, Erich., l. c. IV., 176.

Very rare. I have only one local specimen.

3. *A. atrum*, Payk., l. c. I., 75.

Rare. Ouseburn, Gosforth, Whittle Dene, Budle Crag, Carr's Hill, and on the Irthing.

4. *A. rotundatum*, Gyll.; *A. Lycogalæ*, l. c. II., 273.

In woods, &c. Somewhat rare. I found it also at Tain in Ross-shire.

5. *A. varians*, Beck., Erich. l. c. 102; *A. seminulum*, Trans. Cl. I., 76.

Frequents *agarici* growing on decaying trees, &c. Not rare.

6. *A. nigrinum*, Sturm, l. c. IV., 176; *A. staphylæum*, l. c. I., 75 (?); *Leiodes ferruginea*, l. c. 74.

A rare species, and which is sometimes found in fungi. It has been taken at Bothal, Gosforth, Gibside, and by the Irthing.

7. *A. clypeatum*, Sharp, Nat. Hist. Trans. I., 320; *A. mandibulare*, Trans. Cl. IV., 176.

Three specimens in *agarici*, at North Seaton.

8. *A. marginatum*, Sturm, Nat. Hist. Trans. I., 321; *A. pumilum*, Trans. Cl. II., 272.

Widely dispersed, but not common. It occurred to me also at Tain, Ross-shire.

SCAPHIDIADÆ.

SCAPHIDIUM, *Oliv.*

1. *S. quadrimaculatum*, Oliv., l. c. I., 76.

"Gibside," Mr. John Hancock. "Wood above Gibside," Mr. J. Kidson Taylor.

SCAPHISOMA, *Leach.*

1. *S. agaracina*, Oliv., l. c.

HISTERIDÆ.

HISTER, *Linn.*

1. *H. unicolor*, Linn., l. c. II., 165.

2. *H. neglectus*, Germ., l. c. 166.

Apparently very rare.

3. *H. cadaverinus*, Ent., l. c. 165.

4. *H. succicola*, Thoms., Nat. Hist. Trans. I., 321.

Not uncommon. Often found in fungi.

5. *H. carbonarius*, Ill., Trans. Cl. II., 166.

6. *H. purpurascens*, Herbst., l. c.

Very rare with us.

7. *H. bimaculatus*, Linn., l. c. 165.

8. *H. duodecimstriatus*, Sch., l. c. 166.

DENDROPHILUS, *Leach.*

1. *D. punctatus*, Herbst., Berw. Cl. Proc. IV., 321.

"Hetton Hall, near Belford," W. B. Boyd, Esq.

CARCINOPUS, *Mars.*

1. *C. pumilio*, Erich.; *Epierus 14-striatus*, Trans. Cl. III., 90.
Rare. Jarrow and South Shields.

SAPRINUS, *Erich.*

1. *S. rotundatus*, Ill., l. c. II., 167.
Rare. "Roker," Mr. W. Peacock.

2. *S. nitidulus*, Payk., l. c. 166.

3. *S. æneus*, Fab., l. c.

4. *S. virescens*, Payk., l. c. 167.
"Sea shore, Marsden," G. Wailes, Esq.

5. *S. rugifrons*, Payk.. l. c. IV., 176.
Sands at South Shields. Not uncommon.

6. *S. maritimus*, Steph., l. c. II., 166.

ONTHOPHILUS, *Leach.*

1. *O. striatus*, Fab., l. c. 167.

ACRITUS, *Le Conte.*

1. *A. minutus*, Payk.; *Abræus globosus*, l. c.

NITIDULIDÆ.

BRACHYPTERIDES.

CERCUS, *Latr.* (CATERETES, *Cat.*).

1. *C. pedicularius*, Linn., l. c. I., 84.

2. *C. bipustulatus*, Payk., l. c. 83.

3. *C. rufilabris*, Lat., l. c. 84.

BRACHYPTERUS, *Kug.*

1. *B. gravidus*, Ill., Erich. Ins. III., 130.
"Hetton Hall, near Belford," W. B. Boyd, Esq.

2. *B. urticæ*, Fab.; *Cat. urticæ*, Trans. Cl. I., 84.

3. *B. pubescens*, Erich., l. c. III., 296; *Meligethes subrugosus*, l. c. I., 83.

CARPOPHILIDES.

CARPOPHILUS, *Steph.*

1. *C. hemipterus*, Linn., l. c. 83.
Introduced.

NITIDULIDES.

EPURÆA, *Erich.* (NITIDULA, *Cat.*, IN PART.)

1. *E. æstiva*, Linn., Erich. Ins. Deutsch. III., 143.
On flowers, &c. Very common.

2. *E. melina*, Erich., l. c. 144.
Also on flowers, but very rare.

3. *E. deleta*, Erich., l. c.
In fungi, &c. Common.

4. *E. obsoleta*, Fab., l. c. 148; *Nitidula oblonga*, Trans. Cl. I., 82; *N. pygmæa*, l. c. II., 275.
Beneath bark of trees, &c. Common.

5. *E. parvula*, Sturm, Nat. Hist. Trans. I., 321; *N. pygmæa*, Trans. Cl. I., 82.
Beneath bark of Scotch pine. Somewhat rare.

6. *E. oblonga*, Herbst., Nat. Hist. Trans. I., 321.
Mr. Crotch took took this at Yetholm, but it is rather of doubtful occurrence in our district.

7. *E. pusilla*, Herbst., Trans. Cl. I., 82.
Beneath bark in woods, &c. Common.

8. *E. longula*, Erich., Erich. l. c. 154 (?).
My local specimens of this species, taken at Gosforth, were lost in the Post Office.

9. *E. florea*, Erich., Nat. Hist. Trans. I., 132.
Rare. Whittle Dene. June.

10. *E. limbata*, Fab., Erich. l. c. 157.
On fungi, a little to the west of Gilsland.

NITIDULA. *Fab.*

1. *N. bipustulata*, Linn., Trans. Cl. I., 82.

2. *N. flexuosa*, Fab., l. c. III., 89.
Sands at South Shields. Perhaps introduced (?).

3. *N. obscura*, Fab., l. c. I., 82.
Rare. "Tyneside," Mr. J. Hardy.

SORONIA, *Erich.* (NITIDULA, *Cat.*, IN PART.)

1. *S. punctatissima*, Ill., l. c. 81.

2. *S. grisea*, Linn., l. c.

OMOSITA, *Erich.* (NITIDULA, *Cat.*, IN PART.)

1. *O. depressa*, Linn.; *N. sordida*, l. c.

2. *O. colon*, Linn., l. c.

3. *O. discoidea*, Fab., l. c.

MELIGETHES, *Kirby.*

1. *M. rufipes*, Gyll., l. c. 83.
Apparently rare.

2. *M. lumbaris*, Sturm, l. c. V., 222.
Not common, but found in many localities.

3. *M. æneus*, Fab., l. c. I., 83.

4. *M. viridescens*, Fab., l. c.

5. *M. brunnicornis*, Sturm; *M. ochropus*, Nat. Hist. Trans. I., 321.
Rare. One specimen taken near Hartley, in May.

6. *M. pedicularius*, Gyll., Erich. Ins. Deutsch. III., 186.
Very rare.

7. *M. seniculus*, Erich., Trans. Cl. VI., 61.
Rare. On the Viper's Bugloss, Cambois. July.

8. *M. flavipes*, Sturm, l. c.

9. *M. picipes*, Sturm, l. c.; *M. erythropus*, l. c. I., 83.

10. *M. distinctus*, Erich., l. c. 203 (?).
Rare. Seghill Dene. May.

11. *M. erythropus*, Gyll., Erich. l. c. 205.

POCADIUS, *Erich.*

1. *P. ferrugineus*, Fab.; *Strongylus ferrugineus, et fervidus*, Trans. Cl. I., 82.
Rare. Twizell, Gibside, and near Gilsland.

CYCHRAMIDES.

CYCHRAMUS, *Kugel.*

1. *C. luteus*, Fab.; *Campta lutea*, l. c.
Rare.

2. *C. fungicola*, Heer., l. c. V., 55.
Common. On fungi in woods, &c.

PHALACRIDES.

PHALACRUS, *Payk.*

1. *P. corruscus*, Payk., l. c. II., 272.
South Shields, Mr. J. Hardy.

OLIBRUS, *Erich.*

1. *O. corticalis*, Panz., Berw. Cl. Trans. IV., 321.
Hetton Hall, near Belford, W. B. Boyd, Esq.

2. *O. æneus*, Fab., Erich. l. c. 115.
Rare. By sweeping, near Gilsland.

IPIDES

IPS, *Fab.*

1. *I.* 4-*guttatus*, Fab., Trans. Cl. I., 84.
Beneath bark of oak, bird-cherry, &c. Rare.

2. *I.* 4-*punctatus*, Herbst., l. c.
At sap of felled trees, &c. Not uncommon.

3. *I.* 4-*pustulatus*, Fab., l. c. II., 275.
On stumps of Scotch fir, &c. Not rare.

4. *I. ferrugineus*, Fab., l. c. I., 85.
In stumps of Scotch fir, and beneath bark of ditto. Common.

RHIZOPHAGUS, *Herbst.*

1. *R. depressus*, Fab., l. c.

2. *R. cribratus*, Gyll., l. c. VI., 230.
Rare. Houshel and Hartford Bridge.

3. *R. ferrugineus*, Payk., l. c. I., 85.

4. *R. parallelocollis*, Gyll., Nat. Hist. Trans. I., 133.
On the walls and tombstones of grave-yards. Not rare.

5. *R. dispar*, Payk., Trans. Cl. I., 86; *R. cylindricus*, l. c. 85.

6. *R. bipustulatus*, Fab., l. c. 86; *R. rufus*, *var.*, l. c. 85.

7. *R. cæruleus*, Waltl., l. c. II., 275.
Rare. Under the bark of alder, on the Derwent, Mr. J. Hardy.

TROGOSITIDÆ.

TROGOSITA, *Oliv.*

1. *T. mauritanica*, Linn., l. c. I., 85.
Imported in rice, corn, and other substances.

THYMALUS, *Lat.*

1. *T. limbatus*, Fab., l. c. 81.
Very rare. "Ravensworth," Mr. J. Hardy.

COLYDIADÆ.

SARROTRIUM, *Ill.*

1. *S. clavicorne*, Linn.; *S. muticum*, l. c. II., 196.
"Near Bamburgh Castle," W. C. Hewitson, Esq.

ANOMMATUS, *Wesm.*

1. *A. 12-striatus*, Müll., l. c. III., 89.
A single specimen, taken at Morpeth, is in my collection.

CERYLON, *Latr.*

1. *C. histeroides*, Fab., l. c. I., 86.
Beneath bark. Ravensworth, and near Gilsland. Rare.

MONOTOMA, *Herbst.*

1. *M. picipes*, Payk., l. c.

2. *M. rufa*, Redt.; *M. sub-4-foveolata*, Nat. Hist. Trans. I., 133.

Very rare. South Shields.

3. *M. longicollis*, Gyll., Trans. Cl. I., 86.

CUCUJIDÆ.

LÆMOPHLŒUS, *Erich.*

1. *L. ferrugineus*, Steph.; *Cucujus monilicornis*, l. c. 88.

Imported in grain, &c.

SILVANUS, *Latr.*

1. *S. frumentarius*, Fab.; *S. surinamensis*, l. c. 92.

Imported, but has become naturalised. In warm seasons it becomes so numerous in many grocers shops in Newcastle as to become a nuisance, rendering unsightly the sugar and dried fruits, among which it lives and breeds.

2. *S. bidentatus*, Fab., *S. unidentatus*, l. c.

Newcastle. Very rare.

NAUSIBUS, *Schaum.*

1. *N. dentatus*, Marsh., l. c. (*Silvanus*).

An imported species.

CRYPTOPHAGIDÆ.

ANTHEROPHAGUS, *Knoch.*

1. *A. nigricornis*, Fab., *A. silaceus*, l. c. 88.

Common. I once caught a *Bombus* which had a specimen of this insect firmly fixed by the mandibles to one of its hind legs.

2. *A. pallens*, Oliv., l. c.

Widely spread, but nowhere common. Dr. Power found this insect and its larva in the nest of a wild bee at Wallington.

CRYPTOPHAGUS, *Herbst.*

1. *C. setulosus*, Sturm, l. c. V., 222.

In dead leaves, cut grass, &c. Common.

2. *C. pilosus*, Gyll., l. c.

With the last, but not so common.

3. *C. saginatus*, Sturm, Erich. Ins. Deutsch. III., 354.

Not uncommon in warehouses, &c.

4. *C. umbratus*, Erich., l. c. 355.

I have a local specimen, which agrees tolerably well with Erichson's description.

5. *C. scanicus*, Linn., Trans. Cl. I., 86.

Very variable in size and colour. Very common.

6. *C. badius*, Sturm, Erich. l. c. 357.

Rare. Occurs in cut grass, &c.

7. *C. fuscicornis*, Sturm, Erich. l. c. 358.

A local specimen, confirmed by Kraatz and Rye, is in my collection.

8. *C. affinis*, Sturm, Trans. Cl. VI., 61; *C. subdepressus*, l. c. II., 335.

Not uncommon. Specimens sent to Paris were returned to me named *C. subdepressus*, Sturm.

9. *C. validus*, Kraatz; E. C. Rye, Ent. Mon. Mag. VII., 9; *C. fumatus*, l. c. VI., 257.

A rare insect, which occurs in warehouses in Newcastle, and near South Shields among decaying herbage.

10. *C. cellaris*, Scop., l. c. I., 86; *C. populi*, l. c.

Very abundant. Represents *C. populi* in Mr. Selby's collection.

11. *C. fumatus*, Gyll., Erich. l. c. 363.

Very rare. Two specimens, ♂, ♀, are in my own collection, and are both local.

This insect is closely allied to both *C. cellaris* and *C. validus*. It differs from the first in having the anterior thoracic tooth more developed, differently shaped elytra with short golden pubescence not disposed in striæ; and from *C. validus*, the more nearly quadrate thorax, and subcyathiform anterior tooth, readily separate it.

12. *C. acutangulus*, Gyll., Trans. Cl. II., 335.

Somewhat rare. Newcastle, Durham, &c.

13. *C. dentatus*, Herbst., l. c. I., 87; *C. fumatus*, l. c.

Mr. Hardy's and my own specimens of *C. fumatus* (l. c.) belong to this very common species.

14. *C. distinguendus*, Sturm, Nat. Hist. Trans. I., 133; *C. scutellatus*, Trans. Cl. I., 87.

A scarce insect, but taken in several localities. I have seen Mr. Hardy's types of *C. scutellatus*, which belong to this species. The loss of Mr. Wailes's type renders it very doubtful to what species the *C. scutellatus* of Newman should be referred. It is given as a doubtful synonym of *C. bicolor* in Mr. Waterhouse's catalogue.

15. *C. bicolor*, Sturm, Erich. l. c. 366.

Rare. Three specimens in my collection were taken at Long Benton, in March and April, crawling on the walls of an outhouse.

16. *C. serratus*, Gyll.; *Paramecosoma serrata*, Trans. Cl. III., 89 (1856).

In a wood near Washington. Very rare.

17. *C. vini*, Panz.; *C. abietis*, l. c. I., 87; *C. badius*, l. c. II., 335.

On whin, broom, and other plants: also in houses. Specimens sent to Paris for identification were named *C. badius*, Sturm.

18. *C. pubescens*, Sturm, l. c. V., 220.

On a withered fungus at Gosforth. Very rare.

PARAMECOSOMA, *Curtis.*

1. *P. melanocephala*, Herbst., Nat. Hist. Trans. I., 321.

Hartford Bridge, Briar Dene, and on the Irthing. Affects tufts of grass left on the bushes by floods.

ATOMARIA, *Steph.*

1. *A. fumata*, Erich., l. c. 133; *A. fimetarius*, Trans. Cl. I., 90; *A. peltata*, l. c. VI., 61.

Gosforth and Gibside. Lives in a small yellow fungus which grows on decaying stumps. Not rare.

2. *A. nana*, Erich.; *A. nigriventris*, l. c.

3. *A. umbrina*, Gyll., Erich. l. c. 380.
Very rare. I have only seen two local specimens.

4. *A. fuscipes*, Gyll., Trans. Cl. I., 70.
My specimens of *A. atra* are dark varieties of this common insect.

5. *A. pusilla*, Payk., l. c. II., 275.

6. *A. atricapilla*, Steph., l. c. 276.

7. *A. Berolinensis*, Kz., l. c. VI., 61.
Equally common with the last, of which it is probably only a variety.

8. *A. fuscata*, Schon., l. c.

9. *A. mesomelas*, Herbst., l. c. II., 276.
Local. Rough herbage on the bed of Gosforth Lake.

10. *A. munda*, Erich., l. c. VI., 61.
Very rare. Gosforth and Cullercoats. September.

11. *A. impressa*, Erich., l. c. 389.
Rare. Banks of river Irthing.

12. *A. nigripennis*, Payk., Trans. Cl. I., 90.

13. *A. apicalis*, Erich., l. c. VI., 62.
Common.

14. *A. analis*, Erich., l. c. 398; *A. atra*, Trans. Cl. I., 90.
Also common. Mr. Hardy's series of *A. atra*, named for him by one of the leading Entomologists of that day, must be referred to this species.

An examination of Mr. Selby's collection shows that his specimens of *A. ruficornis* (Trans. Cl. I., 90) do not belong to the genus Atomaria.

EPISTEMUS, *Westw.*

1. *E. globosus*, Waltl., l. c. II., 335.
Long Benton. Very rare.

2. *E. gyrinoides*, Marsh.; *E. globulus*, l. c. I., 73; et II., 272; *E. ovalum*, Erich., l. c. 402.

G. R. Crotch remarks (the Entomologist, September, 1866,) that the true *E. globulus*, Payk., is very rare, whilst this species is everywhere common.

MYCETOPHAGIDÆ.

MYCETOPHAGUS, *Helw.*

1. *M. multipunctatus*, Fab., Steph. Manual, 132.

A fine series from "corky fungus" on alder, near Wooler, in September, by Mr. J. Hardy.

TRIPHYLLUS, *Meg.*

1. *T. suturalis*, Fab., Trans. Cl. IV., 55.

In fungi. Common.

TYPHÆA, *Kirby.*

1. *T. fumata*, Linn., l. c. I., 90.

DERMESTIDÆ.

DERMESTES, *Linn.*

1. *D. vulpinus*, Fab., l. c. 94.
2. *D. murinus*, Linn., l. c. 93.
3. *D. lardarius*, Linn., l. c.

ATTAGENUS, *Latr.*

1. *A. pellio*, Linn., l. c. 94.

ANTHRENUS, *Geoff.*

1. *A. muscorum*, Linn., l. c.

"Gibside," G. Wailes, Esq.

BYRRHIDÆ.

BYRRHUS, *Linn.*

1. *B. pilula*, Linn., l. c. II., 164.
2. *B. fasciatus*, Fab., l. c.
3. *B. pustulatus*, Forst.; *B. dorsalis*, l. c.

CYTILUS, *Erich.*

1. *C. sericeus*, Forst., l. c.

MORYCHUS, *Erich.*

1. *M. æneus*, Fab., l. c. 165.
Rare. Langleyford, and on the banks of the Irthing.

SIMPLOCARIA, *Steph.*

1. *S. semistriata*, Fab., l. c.

HETEROCERIDÆ.

HETEROCERUS, *Bosc.*

1. *H. marginatus*, Fab., l. c. 269.

2. *H. sericans*, Kies.; *H. pusillus*, l. c.
Very rare. "Camboise," Mr. John Scott.

PARNIDÆ.

PARNIDES.

PARNUS, *Fab.*

1. *P. prolifericornis*, Fab., l. c. I., 67.

2. *P. auriculatus*, Ill., l. c.

ELMIDES.

LIMNIUS, *Erich.*

1. *L. tuberculatus*, Müll., l. c. 68; *E. lacustris*, l. c.

2. *L. troglodytes*, Gyll., E. C. Rye, Ent. Ann. 1867, 77.
"Rothley Lake," Dr. Power.

ELMIS, *Latr.*

1. *E. æneus*, Müll., Trans. Cl. I., 68.

2. *E. Volkmari*, Panz., l. c.

3. *E. parallelopipedus*, Müll., l. c.
In the Tyne, Irthing, &c. "Wansbeck," Dr. Power.

4. *E. subviolaceus*, Müll., Erich. l. c. 531.
Whittle Dene. June. "In the Wansbeck," Dr. Power.

5. *E. cupreus*, Müll., Trans. Cl. I., 68.

Tyne, Irthing, and Ouseburn. "In the Wansbeck," Dr. Power.

6. *E. nitens*, Müll., l. c. III., 89.

In the Tyne, near Close House, &c. "Plentifully in the Wansbeck," Dr. Power.

MACRONYCHUS, *Müll.*

1. *M.* (*?*) *parumoculatus*, Hardy, T. J. Bold, Ent. Mon. Mag. VII., 35; *Hydrochus parumoculatus*, Trans. Cl. II., 270.

Newcastle, (?) Mr. J. Hardy.

GEORYSSIDÆ.

GEORYSSUS, *Latr.*

1. *G. pygmæus*, Feb., Erich. l. c. III., 502.

Banks of streams. Common.

HYDROPHILIDÆ.

HYDROCHUS, *Germ.*

1. *H. brevis*, Herbst, Trans. Cl. II., 270.

Rare and local. My Gosforth locality has been destroyed.

2. *H. elongatus*, Fab., l. c.

Rare. Boldon Flats.

HELOPHORUS, *Fab.*

1. *H. rugosus*, Oliv.; *H. fennicus*, l. c. I., 69.

2. *H. nubilus*, Fab., l. c.

3. *H. aquaticus*, Linn., l. c.

4. *H. granularis*, Linn., l. c.; *H. viridicollis*, l. c.

5. *H. obscurus*, Muls.; *H. griseus*, l. c.

All our local specimens are of the dark type. Mr. Crotch in his catalogue unites the insects known as *granularis*, *griseus*, and *obscurus*: if of one species, it must vary greatly in size and colour.

6. *H. dorsalis*, Marsh., Nat. Hist. Trans. I., 321.
Rare. Briar Dene, in May.

OCTHEBIUS, *Leach.*

1. *O. exculpatus*, Müll., Trans. Cl. I., 69.
2. *O. pygmæus*, Fab., l. c.
3. *O. bicolon*, Steph., l. c. II., 270.
4. *O. rufimarginatus*, Steph., l. c. III., 89.
Rare. "Wansbeck," Dr. Power.

HYDRÆNA, *Kug.*

1. *H. palustris*, Erich., G. R. Crotch, Proc. Ent. Soc. Lond., 19th Nov., 1866.
Rare. "Wansbeck," Dr. Power. Gosforth.
2. *H. riparia*, Kug., Trans. Cl. I., 70.
3. *H. nigrita*, Müll., l. c.
4. *H. gracilis*, Müll., l. c. III., 89.
5. *H. angustata*, Sturm, G. R. Crotch, l. c.
"In the Wansbeck," Dr. Power.
6. *H. atricapilla*, Wat.; *H. flavipes*, Steph.
"Abundant in the Wansbeck," Dr. Power.
7. *H. pulchella*, Germ., G. R. Crotch, l. c.
8. *H. pygmæa*, Wat.; *H. minutissima*, Trans. Cl. I., 70.
In the Tyne. "Wansbeck and Hartburn," Dr. Power.

LIMNEBIUS, *Leach,*

1. *L. truncatellus*, Thunb., l. c.; *L. ater*, l. c.; *L. papposus*, l. c. II., 271 (immature).
2. *L. nitidus*, Marsh., l. c. I., 70.
Whitburn, Long Benton, and Gosforth. "Rothley Lake and Wansbeck," Dr. Power.

LACCOBIUS, *Erich.*

1. *L. minutus*, Linn., l. c. 71; *L. colon*, l. c.

HYDROBIUS, *Leach.*

1. *H. fuscipes*, Linn., l. c.

PHILHYDRUS, *Solier.*

1. *P. melanocephalus*, Fab., Thoms. Skand. Col. II., 96.
"Rothley Lake," Dr. Power.

2. *P. nigricans*, Zett., Trans. Cl. VI., 230; *P. melanocephalus*, l. c. II., 271.
"Whitsunbank Hill," Mr. J. Hardy. Also at Gosforth.

3. *P. marginellus*, Fab., l. c.
On moors, &c. Common.

ANACÆNA, *Thomson.*

1. *A. globulus*, Payk., l. c. I., 71 (*Laccobius*).

2. *A. variabilis*, Sharp, Ent. Mon. Mag. VI., 255; *Laccobius Marshami*, Trans. Cl. I., 71.
In ponds. Common.

CHÆTARTHRIA, *Wat.*

1. *C. seminulum*, Payk., l. c. II., 271.
"Winlaton Mill," Mr. J. Hardy.

SPHÆRIDIADÆ.

CYCLONOTUM, *Erich.*

1. *C. orbiculare*, Fab., l. c. I., 73.
Twizell, Gosforth, &c.

SPHÆRIDIUM, *Fab.*

1. *S. scarabæoides*, Linn., l. c. 71.

2. *S. bipustulatum*, Fab.; *S. marginatum*, l. c.

CERCYON, *Leach.*

1. *C. obsoletum*, Gyll., Murray, Ann. and Mag. Nat. Hist., August, 1853.
"Twizell," P. J. Selby, Esq. Long Benton. Rare.

2. *C. hæmorrhoidale*, Fab., Trans. Cl. I., 72.

3. *C. hæmorrhoum*, Gyll., Murray, l. c.
Long Benton. Very rare.

4. *C. laterale*, Marsh., Trans. Cl. III., 295.

5. *C. marinum*, Thoms.; *C. aquaticum*, l. c.

6. *C. flavipes*, Fab., l. c. 89.

7. *C. littorale*, Gyll., l. c. I., 72.

8. *C. depressum*, Steph., Id. Manual, 93.
Very rare. I have only seen two or three local specimens.

9. *C. unipunctatum*, Linn., Trans. Cl. I., 72.

10. *C. quisquilium*, Linn., l. c.

11. *C. melanocephalum*, Linn., l. c.

12. *C. plagiatum*, Erich., l. c. III., 295.

13. *C. pygmæum*, Ill., l. c. I., 73.

14. *C. centrimaculatum*, Sturm, l. c. II., 335.

15. *C. anale*, Payk., l. c. I., 73.

MEGASTERNUM, *Muls.*

1. *M. boletophagum*, Marsh., l. c. (*Cercyon.*)

CRYPTOLEURUM, *Muls.*

1. *C. atomarium*, Fab., l. c. (*Cercyon.*)

LAMELLICORNES.

PLEUROSTICTI.

CETONIADÆ.

CETONIA, *Fab.*

1. *C. floricola*, Herbst; *C. ænea*, l. c. V., 222.
"Near Stranton," Rev. R. Kirwood.

RUTELIDÆ.

ANOMALA, *Köppe.*

1. *A. Frischii*, Fab.; *A. Julii*, l. c. II., 176.

PHYLLOPERTHA, *Kirby.*

1. *P. horticola*, Linn., l. c. 175.

MELOLANTHIDÆ.

MELOLANTHA, *Fab.*

1. *M. vulgaris*, Fab., l. c.

2. *M. hippocastani*, Fab., Nat. Hist. Trans. I., 133.
Long Benton, and in the woods below Gilsland. In the latter locality not uncommon.

RHIZOTROGUS, *Lat.*

1. *R. solsticialis*, Linn., Trans. II., 175.
"Ramparts, Tynemouth Castle," G. Wailes, Esq.

SERICIDÆ.

SERICA, *Muls.*

1. *S. brunnea*, Linn., l. c.

HOPLIADÆ.

HOPLIA, *Ill.*

1. *H. philanthus*, Sulz., Erich. l. c. 707.
Abundant on our western border, and about Lanercost.

LAPROSTICTI.

GEOTRUPIDÆ.

GEOTRUPES, *Latr.*

1. *G. stercorarius*, Linn., Trans. Cl. II., 168.

2. *G. putridarius*, Erich., l. c. III., 297.
More abundant with us than the foregoing, of which it may be only a variety.

3. *G. sylvaticus*, Panz., l. c. II., 168.

COPRIDÆ.

ONTHOPHAGUS, *Latr.*

1. *O. nuchicornis*, Linn., l. c. IV., 55.
Very rare. South Shields.

APHODIADÆ.

APHODIUS, *Ill.*

1. *A. erraticus*, Linn., l. c. II., 168.
2. *A. subterraneus*, Linn., l. c.
3. *A. fossor*, Linn., l. c. 169.
4. *A. scybalarius*, Fab., l. c.
5. *A. fœtens*, Fab., l. c.
6. *A. fimetarius*, Linn., l. c.
7. *A. ater.*, De Geer, l. c. 170.
8. *A. constans*, Duft., Erich. l. c. 811.
Near Hartley, in April. "Wallington," Dr. Power.
9. *A. granarius*, Linn., Trans. Cl. II., 170; *A. tristis*, l. c. IV., 176; *A. melanopus*, l. c. 170, *var.*
Meldon Park, South Shields, &c. Rare.
10. *A. putridus*, Creutz., Trans. Cl. V., 55; *A. uliginosus*, l. c. II., 171.
11. *A. subalpinus*, Hardy; *A. lapponum*, l. c. 170; *A. hæmorrhoidalis*, l. c. 169.
12. *A. fœtidus*, Fab., Erich. l. c. 817.
Both numbers 11 and 12 are hill species, frequenting the dung of sheep; the latter much the rarest.
13. *A. sordidus*, Fab., Trans. Cl. II., 171.
14. *A. rufescens*, Fab., l. c.
15. *A. lividus*, Oliv., Nat. Hist. Trans. I., 133.
Rare. Heaton and Long Benton.
16. *A. inquinatus*, Fab., Trans. Cl. II., 172.
17. *A. conspurcatus*, Linn., l. c.

18. *A. pusillus*, Herbst, l. c. 171.

19. *A. merdarius*, Fab., l. c. 172.

20. *A. prodromus*, Muls., l. c. 173; *A. punctatosulcatus*, l. c. VI., 230 (small variety).

21. *A. contaminatus*, Herbst, l. c. II., 174.

22. *A. rufipes*, Linn., l. c. 172.

23. *A. luridus*, Fab., l. c. 173.

24. *A. depressus*, Kug.; *A. nigripes*, l. c. 172.

ÆGIALIA, *Latr.*

1. *Æ. sabuleti*, Payk., l. c. 174 (*Psammodius.*)

2. *Æ. arenaria*, Fab.; *Æ. globosa*, l. c.

LUCANIDÆ.

SINODENDRON, *Hllw.*

1. *S. cylindricum*, Linn., l. c. 167.

STERNOXI.

ELATERIDÆ.

ARGYPNIDES.

LACON, *Germ.*

1. *L. murinus*, Linn., l. c. 178.

ELATERIDES.

ATHOUS, *Esch.*

1. *A. niger*, Linn., l. c. 180.

2. *A. hæmorrhoidalis*, Fab., l. c.

3. *A. vittatus*, Fab., l. c.

Not abundant with us.

4. *A. longicollis*, Oliv., Nat. Hist. Trans. I., 321.

Rare. The only local example known to me is a female, taken near Gibside, by Mr. J. K. Taylor.

LIMONIUS, *Esch.*

1. *L. cylindricus*, Payk., Trans. Cl. II., 177.

2. *L. minutus*, Fab., l. c. IV., 55.
Widely spread, but not common.

MELANOTUS, *Esch.*

1. *M. fulvipes*, Herbst, l. c. II., 178.

ELATER, *Linn.*

1. *E. balteatus*, Linn.; *Ampedus balteatus*, l. c. 177.
Moors, &c. Not common.

CRYPTOHYPNUS, *Esch.*

1. *C. maritimus*, Curt.; *Cardiophorus* (?) *maritimus*, l. c. 180.
Banks of rivers. Rare.

2. *C. riparius*, Fab., l. c. 178; *C. rivularis*, l. c.

3. *C. dermestoides*, Herbst; *C. 4-pustulatus*, l. c.; *C. tetragraphus*, Kies. Ins. Deutsch. IV., 366.
In the gravel on the borders of streams. Common.

Beyond any doubt, *C. tetragraphus* is only a colour variety of this species having the spots on the elytra obsolete. Both occur in company, and I can see no difference in sculpture or form.

4. *C. 4-pustulatus*, Fab.; *C. quadrum*, Trans. Cl. II., 178.
Banks of Till, in cut grass at Whitley, and at Hetton Hall, near Belford.

CORYMBITES, *Lat.*

1. *C. castaneus*, Linn., l. c. V., 222.
Rare. Sea coast near Hawthorne Dene, Rev. R. Kirwood.

2. *C. pectinicornis*, Linn., l. c. II., 179.

3. *C. cupreus*, Fab., l. c.

4. *C. tessellatus*, Linn., l. c.
Not common.

5. *C. quercus*, Gyll.; *Card. rufipes*, l. c. 180; *Card. testaceus*, l. c.; *Card. equiseti*, l. c. 179 (Selby's collection).

6. *C. impressus*, Fab., Kies. l. c. 292.
On the birch, near Gilsland. Rare.

7. *C. holosericeus*, Fab., Trans. Cl. II., 177 (*Diacanthus.*)

AGRIOTES, *Esch.*

1. *A. lineatus*, Linn., l. c.

2. *A. obscurus*, Linn., l. c.

3. *A. sputator*, Fab., l. c.

4. *A. acuminatus*, Steph., l. c. V., 55.
Prudhoe, Gosforth, and on the Irthing. Not common.

5. *A. pallidulus*, Ill. (?); *Adrastus limbatus*, l. c. II., 176.

DOLOPIUS, *Esch.*

1. *D. marginatus*, Linn., l. c.

ADRASTUS, *Esch.*

1. *A. limbatus*, Fab., Kies. l. c. 239.
Not common.

CAMPYLIDES.

CAMPYLUS, *Fisch.*

1. *C. linearis*, Linn., Trans. Cl. II., 176.

MALACODERMI.

ATOPIDÆ.

DASCILLUS, *Latr.*

1. *D. cervinus*, Linn., l. c. (*Atopa.*)

CYPHONIDÆ.

HELODES, *Latr.* (CYPHON, *Cat.*)

1. *H. pallidus*, Fab., l. c.

2. *H. marginatus*, Fab., l. c.

3. *H. lividus*, Fab., l. c.

CYPHON, *Payk.*

1. *C. coarctatus*, Payk.; *C. griseus*, l. c. 182.

2. *C. nitidulus*, Thoms., Nat. Hist. Trans. I., 322.

3. *C. fuscicornis*, Thoms., l. c.

4. *C. pallidiventris*, Thoms., l. c.

5. *C. variabilis*, Thunb.; *C. pubescens*, Trans. Cl. II., 182; *C. nigriceps*, Nat. Hist. Trans. l. c.

Most of our local examples of this commoner have black heads; from them the true *C. nigriceps* may be at once separated by its glossy, widely and more strongly punctured elytra.

6. *C. padi*, Linn., Trans. Cl. II., 182; *C. immunis*, l. c.

Not common.

7. *C. pallidulus*, Boh.; *C. ochraceus*, Nat. Hist. Trans. I., 133.

Long Benton, Gosforth, &c. Rare.

HYDROCYPHON, *Redt.*

1. *H. deflexicollis*, Müll., Kies. l. c. 419; *Elodes pini*, Curtis.

Banks of streams. Rare.

EUBRIADÆ.

EUBRIA, *Redt.*

1. *E. palustris*, Germ., Trans. Cl. II., 182.

"Upon *Samolus valerandi* in a ravine a little to the north of Castle Eden Dene," Rev. W. Little.

LAMPYRIDÆ.

LAMPYRIS, *Geoff.*

1. *L. noctiluca*, Linn., l. c.

Has occurred in various localities: southward, from Hetton Hall, near Belford, to Brancepeth, in Durham; and from the sea coast, near Castle Eden Dene, westward, to the Chopwell Woods.

TELEPHORIDÆ.

TELEPHORUS, *Schäff.*

1. *T. abdominalis*, Fab.; *T. cyaneus*, l. c. 183.

2. *T. rusticus*, Fall., l. c.

3. *T. lividus*, Linn., l. c.; *T. dispar*, l. c.

4. *T. pellucidus*, Fab., l. c.

5. *T. nigricans*, Fab., l. c.
Our local specimens are all the *var.* (?) *discoidens*, Steph.

6. *T. lituratus*, Fall., l. c.

7. *T. figuratus*, Mann., Nat. Hist. Trans. I., 133.

8. *T. bicolor*, Fab., Trans. Cl. II., 184.

9. *T. clypeatus*, Ill., l. c. 182.

10. *T. flavilabris*, Fall., l. c. 184 (*Ragonycha.*)

(RAGONYCHA.)

11. *T. fulvus*, Scop.; *R. melanurus*, l. c.

12. *T. translucidus*, Lap.; *T. pilosus*, l. c. 183.
Rare.

13. *T. fuscicornis*, Oliv., Nat. Hist. Trans. I., 133.
Rare. Whittle Dene, and Gosforth.

14. *T. limbatus*, Thoms.; *R. testacea*, Trans. Cl. II., 185.
I have not seen any local examples of the *T. testaceus*, Linn.

15. *T. pallidus*, Fab., l. c. 184 (*Ragonycha.*)

16. *T. paludosus*, Fall., l. c. (*Ragonycha.*)

(PODABRUS.)

17. *T. alpinus*, Payk., l. c. (*Podabrus.*)

MALTHINUS, *Latr.*

1. *M. flaveolus*, Payk., l. c. 185.

MALTHODES, *Kies.* (MALTHINUS, *Cat.*)

1. *M. biguttatus*, Linn., l. c.

2. *M. mysticus*, Kies., Nat. Hist. Trans. I., 322.

3. *M. atomus*, Thoms.; *M. brevicollis*, Trans. Cl. II., 186.
Rare.

4. *M. fibulatus*, Kies., Id. Ins. Deutsch. IV., 552.
Very rare. Hartford Bridge. May.

5. *M. pellucidus*, Kies., Nat. Hist. Trans. I., 322; *M. minimus*, Trans. Cl. II., 185.

Not common, but widely spread over the district.

6. *M. dispar*, Germ., Kies. l. c. 547.

Rare. Gosforth, and on the Irthing. "Hetton Hall, near Belford," W. B. Boyd, Esq.

7. *M. minimus*, Linn.; *M. sanguinolentus*, Trans. Cl. II., 185.

MELYRIDÆ.

MALACHIUS, *Fab.*

1. *M. æneus*, Linn., l. c. 186.

Rare. "Stockton," *Hogg's Stockton*. "Newcastle," A. Hancock, Esq.,

2. *M. bipustulatus*, Linn., l. c.

DASYTES, *Fab.*

1. *D. nobilis*, Ill.; *D. viridis*, l. c.

"Durham," Mr. T. Bungey. A very doubtful native.

2. *D. subæneus*, Schön.; *D. æratus*, l. c.

Rare. Winlaton Mill, Gibside, and Whittle Dene.

BYTURIDÆ.

BYTURUS, *Latr.*

1. *B. tomentosus*, Fab., l. c. I., 84.

2. *B. fumatus*, Fab., l. c. V., 223.

Not of frequent occurrence.

TELMATOPHILUS, *Heer.*

1. *T. caricis*, Oliv., Nat. Hist. Trans. I., 322.

Borders of the Lake at Gosforth. Rare.

2. *T. typhæ*, Fall., Thoms. Skand. Col. V., 244.

"Wallington," Dr. Power.

3. *T. Schönherri*, Gyll., l. c.

Seghill Dene. Rare.

CLERIDÆ.

TILLUS, *Oliv.*

1. *T. elongatus*, Linn., Trans. Cl. II., 186.
Ornsby's Durham.

CLERUS, *Geoff.*

1. *C. formicarius*, Linn., l. c. 187 (*Thanasimus.*)

ENOPLIADES.

NECROBIA, *Steph.*

1. *N. violacea*, Linn.; *N. quadra*, l. c.
2. *N. rufipes*, Fab., l. c.
3. *N. ruficollis*, Fab., l. c.

PTINIDÆ.

PTINIDES.

GIBBIUM, *Scop.*

1. *G. scotias*, Fab., l. c. 188.

NIPTUS, *Boield.*

1. *N. hololeucus*, Fald., l. c. (*Ptinus.*)

When our catalogue was published this insect was confined to the towns: it has now become completely naturalised, and has spread to the remotest villages.

2. *N. crenatus*, Fab., l. c. (*Ptinus.*)

PTINUS, *Linn.*

1. *P. fur*, Linn., l. c. 187; *P. sexpunctatus*, l. c.
2. *P. germanus*, Fab.; *P. rufipes*, l. c.

Very rare. I have a female taken in Newcastle; and it is in Mr. Selby's list of insects taken at Twizell.

ANOBIADES.

OCHINA, *Sturm.*

1. *O. hederæ*, Müll.; *O. ptinoides*, Steph. Manual, 202.
On ivy. Not uncommon about Gilsland and Lanercost.

PTILINUS, *Geoff.*

1. *P. pectinicornis*, Linn., Trans. Cl. II., 188.
Durham, Sunderland, Ravensworth, and Long Benton.

PRIOBIUM, *Crotch's Cat.*

1. *P. castaneum*, Fab., l. c. (*Anobium.*)

ANOBIUM, *Fab.*

1. *A. domesticum*, Fc.; *A. striatum*, l. c. (the Death Watch.)
2. *A. paniceum*, Linn., l. c. 189.

ERNOBIUM, *Thoms.*

1. *E. molle*, Linn., l. c. (*Anobium*); *A. abietis*, l. c. (Selby's collection.)

BOSTRICHIDÆ.

RHIZOPERTHA, *Steph.*

1. *R. pusilla*, Fab., l. c.
An introduced species.

I omit *R. cincta*, l. c., as the description does not enable me to refer it to any known species, being founded on colour only.

LYCTIDÆ.

LYCTUS, *Fab.*

1. *L. canaliculatus*, Fab., Thomson, l. c. V., 204.
On oak wood. Rare.

CIOIDÆ.

CIS, *Latr.*

1. *C. boleti*, Scop., Trans. Cl. II., 190.
2. *C. festivus*, Panz., l. c.
Ravensworth, Seghill Dene, and by the Irthing.
3. *C. bidentatus*, Oliv., l. c.

OCTOTEMNUS, *Mell.*

1. *O. glabriculus*, Gyll.; *Cis nitidus*, l. c.

HETEROMERA.

BLAPTIDÆ.

BLAPS, *Fab.*

1. *B. mucronata*, Latr.; *B. obtusa*, l. c. 196; *B. mortisaga*, Hist. Berw. Cl. IV., 322.

Common, and has been found in plenty down some of our deepest coal mines.

DIAPERIDÆ.

SCAPHIDEMA, *Redt.*

1. *S. ænea*, Payk., Trans. Cl. II., 196 (*Platydema.*)

Rare. Near Axwell Park, and Ryhope Dene.

ULOMIDÆ.

TRIBOLIUM, *Mac. L.*

1. *T. ferrugineum*, Fab., l. c. (*Stene.*)

Imported in sugar, &c.

GNATHOCERUS, *Thumb.*

1. *G. cornutus*, Fab., l. c. (*Uloma.*)

Probably introduced, but quite common in bakehouses, &c.

PALORUS,

1. *P. depressus*, Fab., Steph. Manual, 322 (*Hypophlæus.*)

In shops, &c. Introduced.

ALPHITOBIUS, *Steph.*

1. *A. diaperinus*, Panz., Redt. Fn. Aust. 606 (*Heterophagæ.*)

In shops, &c., no doubt imported. In appears to find a congenial climate in some of our deep hot coal mines, where it abounds in the stables. It has probably been introduced in some of the horses' food.

TENEBRIONIDÆ.

TENEBRIO, *Linn.*

1. *T. obscurus*, Fab., Trans. Cl. IV., 55.

2. *T. molitor*, Linn., l. c. II., 196.

The larvæ of this genus from the *meal-worms* of the bird fanciers.

HELOPIDÆ.

HELOPS, *Fab.*

1. *H. striatus*, Fourc., l. c. 195.

"Gibside," Mr. John Hancock.

CISTELIDÆ.

ISOMIRA, *Muls.*

1. *I. murina*, Linn.; *Cistela murina*, l. c.; *C. castanea*, l. c. (Selby's collection.)

LAGRIADÆ.

LAGRIA, *Fab.*

1. *L. hirta*, Linn., l. c. 192.

TETRATOMIDÆ.

TETRATOMA, *Fab.*

1. *T. fungorum*, Fab., l. c. I., 88.

"Twizell," P. J. Selby, Esq. Hetton Hall, near Belford, W. B. Boyd, Esq.

2. *T. ancora*, Fab., l. c.

In Mr. Wailes's collection.

MELANDRYADÆ.

ORCHESIA, *Latr.*

1. *O. micans*, Panz., l. c. VI., 62.

"Bred from *Polyporus radiatus*, growing on alder, near Wooler," Mr. J. Hardy.

2. *O. minor*, Walker, l. c. II., 195.

Near Gilsland, Swalwell, and at Morpeth. "Rothley," Dr. Power.

HALLOMENUS, *Panz.*

1. *H. numeralis*, Panz., Thoms. Skand. Col. VI., 311.
Rare. Long Benton.

CARIDA, *Muls.*

1. *C. flexuosa*, Payk., Trans. Cl. VI., 62.
"In *Polyporus radiatus*, growing on alder, near Wooler," Mr. J. Hardy.

MELANDRYA, *Fab.*

1. *M. caraboides*, Linn., l. c. II., 195.

PYRRHOCHROADÆ.

PYRRHOCHROA, *Fab.*

1. *P. rubens*, Fab., l. c. 191.

ANTHICIDÆ.

ANTHICUS, *Payk.*

1. *A. floralis*, Linn., l. c.

2. *A. quisquiliarius*, Thoms., Nat. Hist. Trans. I., 322.
Perhaps the male of *floralis*?

MORDELLIDÆ.

MORDELLIDES.

ANASPIS, *Geoff.**

1. *A. frontalis*, Linn., Trans. Cl. II., 192.

2. *A. rufilabris*, Gyll., Thoms. Skand. Col. VI., 301.
Has been taken in several localities by myself, and at Wallington by Dr. Power.

3. *A. pulicaria*, Costa; *A. forcipata*, Muls.
Either very rare with us, or overlooked.

4. *A. fasciata*, Forst., Trans. Cl. II., 193.
Rare, but has been taken in widely separated localities.

* See a valuable paper on this genus in the "Entomologist" for March, 1865, by G. R. Crotch, Esq.

5. *A. ruficollis*, Fab., l. c. 192.

6. *A. thoracica*, Linn., l. c. IV., 55.
Apparently rare in our district.

7. *A. subtestacea*, Steph.; *A. flava*, l. c.
Rather uncommon.

8. *A. melanopa*, Forst., l. c. II., 192.

RHIPIPHORIDES.

RHIPIPHORUS, *Fab.*

1. *R. paradoxus*, Linn., l. c. 193.
Not common.

MELOIDÆ.

MELOË, *Linn.*

1. *M. proscarabæus*, Linn., l. c.

ŒDEMERIDÆ.

ISCHNOMERA, *Steph.*

1. *I. melanura*, Linn., l. c. 194.
Sunderland, and on wing near South Shields.

ŒDOMERA, *Oliv.*

1. *Œ. lurida*, Marsh., l. c. (*Ischnomera.*)
"Durham," *Ornsby's Durham*, 205.

SALPINGIDÆ.

SALPINGUS, *Ill.*

1. *S. ater*, Payk., l. c.
Not common.

2. *S. æratus*, Muls., Nat. Hist. Trans. I., 323.
"Yetholm," G. R. Crotch, Esq. This locality is a very little way out of our district; no doubt some of my "border" friends will turn it up ere long.

3. *S. castaneus*, Panz.; *S. immaculatus*, Trans. Cl. II., 194.
Rare.

4. *S. foveolatus*, Liungh, Thoms. Skand. Col. VI., 331.

"Hetton Hall, near Belford, and at Graden, Roxburghshire," W. B. Boyd, Esq. "Near Wooler," Mr. J. Hardy.

RHINOSIMUS, *Lat.*

1. *R. ruficollis*, Linn., Trans. Cl. II., 193.

2. *R. viridipennis*, Steph., l. c.

3. *R. planirostris*, Fab., l. c. 194.

RHYNCOPHORA.

BRUCHIDÆ.

BRUCHUS, *Linn.*

1. *B. rufimanus*, Schön., l. c. 197.

Introduced.

ANTHRIBIDÆ.

ANTHRIBUS, *Fab.*

1. *A. albinus*, Linn., l. c.

The older Entomologists were wont to find this in plenty at Gibsibe, but none have been taken for many years past.

ATTELABIDÆ.

APODERUS, *Oliv.*

1. *A. coryli*, Linn.; *A. Avellanæ*, l. c. 198.

"On hazel in Castle Eden Dene," *Ornsby's Durham*, 204.

ATTELABUS, *Linn.*

1. *A. curculionides*, Linn., l. c.

Rare. Near Gilsland, and at Twizell.

RHINOMACERIDÆ.

RYNCHITES, *Herbst.*

1. *R. betulæ*, Linn., l. c.

2. *R. megacephalus*, Germ., l. c.

"Durham," *Ornsby's Durham.* Mr. J. Hardy has taken this insect not unfrequently in Berwickshire.

3. *R. nanus*, Payk., l. c.

Not common.

4. *R. planirostris*, Fab.; *R. uncinatus*, Thomson, Skand. Col. VII., 36.

Also somewhat rare, but from several localities.

5. *R. conicus*, Ill., Trans. Cl. II., 198.

Rare.

6. *R. pauxillus*, Germ., l. c.

Very rare.

7. *R. germanicus*, Herbst, l. c.

8. *R. cupreus*, Linn., l. c. 199.

The specimens in Mr. Selby's collection are correctly named.

APIONIDÆ.

APION, *Herbst.*

1. *A. craccæ*, Linn., l. c.

"On *Vicia cracca* in fields above Swalwell, opposite Axwell Park," Mr. J. Hardy. I have not seen Mr. Hardy's specimens: my own prove to be the next species but one, *cerdo*.

2. *A. pomonæ*, Fab., l. c. 200.

In Mr. Selby's Twizell collection.

3. *A. cerdo*, Thomson, Skand. Col. VII., 87.

On *Vicia cracca*. Bothal, Gosforth, Gibside, and on the banks of the Irthing. "Hetton Hall, near Belford," W. B. Boyd, Esq.

4. *A. subulatum*, Kirby, Trans. Cl. II., 200.

5. *A. vorax*, Herbst, l. c. 204.

6. *A. ervi*, Kirby, l. c. 202.

7. *A. ononis*, Kirby, l. c. 204.

8. *A. Gyllenhali*, Kirby, l. c.

Very rare.

9. *A. Spencii*, Kirby, l. c. 202.

10. *A. æthiops*, Herbst, l. c. 204.

11. *A. punctigerum*, Germ., l. c. 202.

12. *A. pisi*, Meg., l. c. 204.

13. *A. platalea*, Germ.; *A. afer*, l. c. 203.

14. *A. loti*, Kirby, l. c.

15. *A. seniculum*, Kirby, l. c. 200.

16. *A. virens*, Herbst, l. c. 202.

17. *A. striatum*, Marsh., l. c.

18. *A. immune*, Kirby, l. c.

19. *A. sorbi*, Herbst, l. c.
Very rare.

20. *A. æneum*, Fab., l. c. 201.

21. *A. radiolum*, Marsh., l. c.

22. *A. carduorum*, Kirby, l. c.

23. *A. onopordi*, Kirby, l. c.

24. *A. violaceum*, Kirby, l. c. 200.

25. *A. frumentarium*, Linn., l. c.

26. *A. cruentatum*, Walt., l. c. 201.

27. *A. miniatum*, Schön.; *A. sanguineum*, l. c.
The *A. sanguineum* of Mr. Selby's collection proves to be the above species. I do not know of any other local specimens.

28. *A. humile*, Germ., l. c. 200.

29. *A. marchicum*, Herbst, l. c.
Apparently rare.

30. *A. affine*, Kirby, l. c.

31. *A. rufirostre*, Fab., l. c. 201.
Very rare.

32. *A. pallipes*, Kirby, l. c.
Also rare.

33. *A. viciæ*, Payk., l. c. 203.

34. *A. flavipes*, Fab., l. c.

35. *A. nigritarse*, Kirby, l. c.
Not common.

36. *A. assimile*, Kirby, l. c.

37. *A. fagi*, Linn., l. c.

38. *A. trifolii*, Linn., l. c.
Rare.

39. *A. varipes*, Germ., (?) l. c.
Very rare.

OXYSTOMA, *Dum.*

1. *O. ulicis*, Forst., l. c. 199.

BRACHYDERIDÆ.

CNEORHINUS, *Schön.*

1. *C. geminatus*, Fab., l. c. 305.
2. *C. exaratus*, Marsh., l. c.

STROPHOSOMUS, *Bill.*

1. *S. melanogrammus*, Forst.; *S. coryli*, l. c. 204.
2. *S. obesus*, Marsh., l. c. 205.
3. *S. retusus*, Marsh., l. c.
4. *S. faber*, Herbst, l. c.
5. *S. limbatus*, Fab., l. c.

SCIAPHILUS, *Schön.*

1. *S. muricatus*, Fab., l. c.

TANYMECUS, *Germ.*

1. *T. palliatus*, Fab., l. c. 206.

SITONES, *Germ.*

1. *S. griseus*, Fab., l. c. 207.
2. *S. flavescens*, Marsh., l. c.
3. *S. suturalis*, Steph., l. c. 206.
4. *S. sulcifrons*, Thumb., l. c.
5. *S. tibialis*, Herbst, l. c. 207; *S. crinita*, l. c.
6. *S. regensteinensis*, Herbst, l. c. 206.

7. *S. puncticollis*, Steph., l. c.

8. *S. lineatus*, Linn., l. c.

9. *S. lineellus*, Gyll., Nat. Hist. Trans. I., 323.

Rare. Sea banks north of Whitley. "Hetton Hall, near Belford," W. B. Boyd, Esq.

10. *S. hispidulus*, Fab., Trans. Cl. II., 206.

11. *S. meliloti*, Walt., l. c. VI., 62.

Rare. On Melilot trefoil (*Melilotus officinalis*) at South Shields, and near Hartley.

12. *S. humeralis*, Steph., l. c. II., 207.

Rather uncommon, but widely distributed.

POLYDROSUS, *Germ.*

1. *P. undatus*, Fab., l. c.

2. *P. micans*, Fab., l. c.

3. *P. pterygomalis*, Schön., l. c.

4. *P. cervinus*, Linn., l. c. 208.

CLEONIDÆ.

CLEONUS, *Meg.*

1. *C. sulcirostris*, Linn., l. c.

ALOPHUS, *Schön.*

1. *A. triguttatus*, Fab., l. c. 209.

LIOPHLŒUS, *Germ.*

1. *L. nubilus*, Fab., l. c. 208.

A large number of specimens were taken at Benton, feeding on the ivy.

BARYNOTUS, *Germ.*

1. *B. obscurus*, Fab., l. c.

2. *B. Schönherri*, Zett., Nat. Hist. Trans. I., 323.

Of occasional occurrence in meadows, &c.

3. *B. mœrens*, Fab., Trans. Cl. II., 208.

TROPIPHORUS, *Schön.*

1. *T. mercurialis*, Fab., l. c. 209.

HYLOBIUS, *Germ.*

1. *H. abietis*, Linn., l. c.

LIOSOMUS, *Steph.*

1. *L. ovatulus*, Clairv., l. c.

[*Procas picipes*, Marsh., l. c. 216, was inserted on Mr. Selby's authority, but in his collection it is represented by other species.]

PHYTONOMUS, *Schön.* (HYPERA, *Cat.*)

1. *P. punctatus*, Fab., l. c. 210.

2. *P. polygoni*, Linn., l. c.
Rare.

3. *P. rumicis*, Linn., l. c.
Also rare.

4. *P. plantaginis*, De Geer, l. c.

5. *P. nigrirostris*, Fab., l. c.

6. *P. trilineatus*, Marsh., Ann. and Mag. Nat. Hist., 1844.
Not unfrequent.

7. *P. variabilis*, Herbst, Trans. Cl. II., 211.

8. *P. suspiciosus*, Herbst, l. c.

LIMOBIUS, *Schön.*

1. *L. dissimilis*, Herbst, l. c. 209.
Not common.

OTIORHYNCHIDÆ.

PHYLLOBIUS, *Schön.*

1. *P. calcaratus*, Fab., l. c. 211.

2. *P. alneti*, Fab., l. c.

3. *P. pyri*, Linn., l. c.

4. *P. argentatus*, Linn., l. c.

5. *P. maculicornis*, Germ., l. c. 212.

6. *P. oblongus*, Linn., l. c.

7. *P. pomonæ*, Oliv., l. c.

8. *P. uniformis*, Marsh., l. c.

9. *P. viridicollis*, Fab., l. c.

TRACHYPHLŒUS, *Germ.*

1. *T. scaber*, Linn., l. c.

Rare. Tunstall Hill, South Shields, and Hetton Hall, near Belford.

2. *T. scabriculus*, Linn., l. c.

Very rare. "Marsden," Mr. J. Hardy.

OMIAS, *Schön.*

1. *O. hirsutulus*, Fab., l. c. 213.

2. *O. Bohemanni*, Schön., l. c.

"Near Swalwell," Mr. J. Hardy.

BARYPEITHES, *Duv.*

1. *B. sulcifrons*, Schön., l. c. (*Omias.*)

Taken in the north of Northumberland, by Mr. J. Hardy.

OTIORHYNCHUS, *Germ.*

1. *O. atroapterus*, De Geer, l. c. 214.

2. *O. raucus*, Fab., l. c. 215.

"Twizell," P. J. Selby, Esq.

3. *O. ligneus*, Oliv., l. c. 214.

4. *O. maurus*, Gyll., l. c.

Taken, by Mr. J. Hardy, on the Cheviot range.

5. *O. picipes*, Fab., l. c. 213.

6. *O. sulcatus*, Fab., l. c.

Rare. Twizell and Newcastle.

7. *O. rugifrons*, Gyll., l. c. 214.

8. *O. ovatus*, Linn., l. c.

9. *O. muscorum*, Bris., Nat. Hist. Trans. I., 323.

On Melilot trefoil, at South Shields and Hartley.

ERIRHINIDÆ.

PISSODES, *Germ.*

1. *P. pini*, Linn., Trans. Cl. II., 215.

2. *P. notatus*, Fab., l. c. VI., 63.

"Sunderland," Rev. R. Kirwood. Probably introduced in some of the Scotch timber-laden ships. I have seen another species of this genus, which had come with "pit props" (small larches and Scotch pines) from Norway. It was *P. Gyllenhali*, Schön., which a collier was exhibiting alive in a toy microscope as "*the Norway wood-louse!*" He had found it in the colliery wood yard, and valued it exceedingly.

MAGDALINUS, *Germ.*

1. *M. carbonarius*, Linn., l. c. II., 215 (*Magdalis.*)
"Near Gibside" (?).

2. *M. atramentarius*, Marsh.; *Magdalis aterrima*, l. c. 216.

ERIRHINUS, *Schön.*
(NOTARIS, DORYTOMUS, AND ERIRHINUS, *Cat.*)

1. *E. nereis*, Payk., l. c. 217.

"Twizell," P. J. Selby, Esq. The specimens in Mr. Selby's collection are correctly named.

2. *E. acridulus*, Linn., l. c. 216.

3. *E. bimaculatus*, Fab., l. c.

Has occurred at Twizell, near Gilsland on willows, and to the Rev. R. Kirwood.

4. *E. vorax*, Fab.; *D. longimanus*, l. c.
Apparently rare.

5. *E. costirostris*, Schön., l. c. III., 90.
Gosforth Woods. Very rare.

6. *E. maculatus*, Marsh., l. c. II., 217.

7. *E. tæniatus*, Fab., l. c.
"Castle Eden Dene," *Ornsby's Durham.*

8. *E. salicis*, Walton, Ann. Nat. Hist., 1844.
"Hetton Hall, near Belford," W. B. Boyd, Esq.

9. *E. majalis*, Payk., Trans. Cl. II., 217.
Twizell, and Castle Eden Dene.

10. *E. pectoralis*, Panz.; *D. melanopthalmus*, l. c. 216.

11. *E. agnathus*, Schön., l. c. 217.
On willows, near Axwell Park.

12. *E. tortrix*, Linn., l. c. 216.
Twizell and Durham.

GRYPIDIUS, *Schön.*

1. *G. equiseti*, Fab., l. c. 217.

ELLESCHUS, *Meg.*

1. *E. bipunctatus*, Linn., l. c. 218.
Specimens are in Mr. Selby's collection.

ANTHONOMUS, *Germ.*

1. *A. pomorum*, Linn., l. c.

2. *A. ulmi*, De Geer, l. c.

3. *A. pedicularius*, Linn., l. c.

4. *A. rubi*, Herbst, l. c.

The *var.* (?) *comari* appears to me not unlikely to prove a distinct species. It occurs plentifully in our district, and so far as my experience goes always on one plant, *Comarum palustre*.

BALANINUS, *Germ.*

1. *B. villosus*, Fab., l. c. 219.
Rare. The specimens taken were found on the hazel.

2. *B. brassicæ*, Fab., l. c.

MICCOTROGUS, *Schön.*

1. *M. picirostris*, Fab.; *M. cinerascens*, l. c.
Very rare. "Marsden," Mr. J. Hardy.

ANOPLUS, *Schüp.*

1. *A. plantaris*, Herbst, l. c.

OBCHESTES, *Ill.*

1. *O. quercus*, Linn., l. c.

2. *O. scutellaris*, Fab., l. c. 220.

3. *O. fagi*, Linn., l. c.

4. *O. rusci*, Herbst; *O. bifasciatus*, l. c.

TACHYERGES, *Schön.*

1. *T. salicis*, Linn.; *T. capreæ*, l. c.

2. *T. stigma*, Germ., l. c.

3. *T. saliceti*, Fab., l. c.

RAMPHUS, *Clair.*

1. *R. flavicornis*, Clair.; *R. pulicarius*, l. c. 199..

ORTHOCHÆTES, *Müll.*

1. *O. setiger*, Germ., l. c. II., 221.
Twizell, Hartley, and Durham.

BARIDIADÆ.

BARIDIUS, *Germ.*

1. *B. T-album*, Linn., l. c. 229.

CRYPTORHYNCHIDÆ.

CRYPTORHYNCHUS, *Ill.*

1. *C. lapathi*, Linn., l. c. 221.

MEGACETES, *Thoms.* (CÆLIODES, *Cat.*)

1. *M. quercus*, Fab., l. c. 222.

2. *M. ruber*, Marsh., l. c.

3. *M. rubicundus*, Payk., l. c.

4. *M. 4-maculatus*, Linn.; *C. didymus*, l. c.

CÆLIODES, *Schön.*

1. *C. fulignosus*, Marsh.; *C. guttula*, l. c.

2. *C. geranii*, Payk., l. c.
"Twizell," P. J. Selby, Esq. "Wallington," Dr. Power.
Mr. Hardy records it from Axwell Park, Gibside, and Hartlepool. His specimens I have not seen.

3. *C. exiguus*, Oliv., E. C. Rye, Ent. Annual, 1866, 102.
My specimens, taken in plenty on *Geranium slyvaticum*, were kindly determined for me by my friend, E. C. Rye, Esq.

OROBITES, *Germ.*

1. *O. cyaneus*, Linn., Trans. Cl. II., 227.
Not common.

ACALLES, *Schön.*

1. *A. ptinoides*, Marsh., Nat. Hist. Trans. I., 323.
Gibside. Very rare.

HYDRONOMUS, *Schön.*

1. *H. alismatis*, Marsh., Trans. Cl. II., 218.

LITODACTYLUS, *Redt.*

1. *L. leucogaster*, Marsh., l. c. 221 (*Pachyrhinus.*)

PHYTOBIUS, *Schmidt.*

1. *P. comari*, Herbst, l. c. (*Pachyrhinus.*)
On *Comarum palustre*, Prestwick Carr. Rare.

2. *P. 4-tuberculatus*, Fab., l. c. 222 (*Pachyrhinus.*)

3. *P. notula*, Schön.; *P. canaliculatus*, W. C.; *R. inconspectus*, Trans. Cl. II., 226.
Rare. Prestwick Carr and Gosforth.

RHINONCUS, *Schön.*

1. *R. pericarpius*, Fab., l. c. 225.

2. *R. subfasciatus*, Gyll.; *R. tibialis*, l. c. 226.

3. *R. castor*, Fab., l. c.
Rare. Gibside, near Gilsland, and Hetton Hall, near Belford.

4. *R. inconspectus*, Herbst, Thoms. Skand. Col. VII., 243.
Very rare. South Shields.

CEUTHORHYNCHUS, *Schön.*

1. *C. assimilis*, Payk., l. c. II., 223.

2. *C. erysimi*, Fab., l, c.

3. *C. contractus*, Marsh., l. c.

4. *C. ericæ*, Gyll., l. c. 224.

5. *C. litura*, Fab.; *C. ovalis*, l. c.

6. *C. pollinarius*, Forst., l. c.

7. *C. viduatus*, Gyll., Thoms. l. c. 262.
Rare. Banks of the Irthing.

8. *C. quadridens*, Panz.; *C. Boraginis*, Trans. Cl. II., 224.

9. *C. rugulosus*, Herbst, l. c.
Rare.

10. *C. asperifoliarum*, Steph., l. c. 225.

11. *C. echii*, Fab., l. c.
Rare.

12. *C. marginatus*, Payk., l. c.

13. *C. sulcicollis*, Gyll., l. c. 223.

14. *C. cyanipennis*, Ill., Thoms. l. c. 274.
Near Gilsland, Long Benton, Gosforth, Hetton Hall, near Belford. I also met with it at Tain, Ross-shire.

CEUTHORHYNCHIDEUS, *Du V.* (CETHORHYNCHUS, *Cat.*)

1. *C. horridus*, Fab., Trans. Cl. II., 225.
Very rare. Westoe.

2. *C. troglodytes*, Fab., l. c.

3. *C. terminatus*, Herbst, Nat. Hist. Trans, I., 323.
Rare.

4. *C. melanarius*, Steph., Trans. Cl. II., 224.
"Durham," *Ornsby's Durham.*

5. *C. nigrinus*, Marsh., l. c. 223.
Rare. Wooler Haugh.

6. *C. versicolor*, Bris.; *C. quercicola*, Nat. Hist. Trans. I., 323.
Rare. Heaton, and Little Benton.

7. *C. floralis*, Payk., Trans. Cl., II., 224.

8. *C. pyrrhorhynchus*, Marsh., l. c.
Not common.

POÖPHAGUS, *Schön.*

1. *P. sisymbrii*, Fab., l. c. 225.

CIONIDÆ.

CIONUS, *Clairv.*

1. *C. scrophulariæ*, Linn., l. c. 226.

2. *C. blattariæ*, Fab., l. c. 227.
"Durham," *Ornsby's Durham.*

3. *C. pulchellus*, Herbst, l. c. (*Cleopus.*)

NANOPHYES, *Schön.*

1. *N. lythri*, Fab., l. c. V., 55.
Heaton Burn, Spindlestone Pond, and Hetton Hall, near Belford. Frequents *Lathrum salicaria.*

GYMNETRON, *Schön.*

1. *G. beccabungæ*, Linn.; *G. niger*, l. c. II., 227.
Widely spread, but not abundant.

2. *G. labile*, Herbst; *G. tricolor*, l. c. 228.

MECINUS, *Germ.*

1. *M. pyraster*, Herbst; *M. semicylindricus*, l. c.

CALANDRIDÆ.

SITOPHILUS, *Schön*,

1. *S. granarius*, Linn., l. c. (*Calandra.*)

2. *S. oryzæ*, Linn., l. c. (*Calandra.*)
Imported in rice, wheat, &c.

HYLESINIDÆ.

HYLASTES, *Erich.*

1. *H. ater*, Payk., l. c. 229.

2. *H. opacus*, Erich.; *H. piceus*, l. c.
Apparently rare.

3. *H. rufus*, Marsh., l. c.; *H. palliatus*, Nat. Hist. Trans. I., 323; *H. angustatus*, Trans. Cl. II., 229.

BLASTOPHAGUS, *Crotch Cat.*

1. *B. piniperda*, Linn., l. c. 230 (*Hylurgus.*)

HYLESINUS, *Fab.*

1. *H. crenatus*, Fab., l. c.

2. *H. fraxini*, Fab., l. c.

3. *H. vittatus*, Fab. (?); *H. sericeus*, l. c.
"Gibside." Mr. J. Hardy.

PHLŒOPHTHORUS, *Woll.*

1. *P. rhododactylus*, Marsh., l. c. (*Hylesinus.*)

SCOLYTUS, *Geoff.*

1. *S. destructor*, Oliv., l. c. III., 90.

2. *S. intricatus*, Ratz., l. c. IV., 55.
Rare. Little Benton.

TRYPODENDRUM, *Steph.*

1. *T. domesticum*, Linn., l. c. II., 231.

TOMICUS, *Latr.*

1. *T. chalcographus*, Linn., Trans. Cl. VI., 231.
"Sunderland," Rev. R. Kirwood.

2. *T. bidens*, Fab., l. c. II., 231.

3. *T. villosus*, Fab., l. c. III., 90.
Gibside, in oak bark. August.

LONGICORNES.

CERAMBYCIDÆ.

CERAMBYCIDES.

AROMIA, *Serv.*

1. *A. moschata*, Linn.; *Callichroma moschata*, Thoms. Skand. Col. VIII., 13.

A female, taken on the wing, near Corbridge, was brought to me alive, and is now in my collection.

CALLIDIADES.

CALLIDIUM, *Fab.*

1. *C. alni*, Linn., Trans. Cl. II., 232.
"Gibside," G. Wailes, Esq.

CLYTIDES.

CLYTUS, *Fab.*

1. *C. arcuatus*, Linn., l. c.
Two specimens only have occurred in the district.

2. *C. arietis*, Linn., l. c.

OBRIADES.

GRACILIA, *Serv.*

1. *G. pygmæa*, Fab.; *G. minuta*, l. c. 335.
Two specimens were taken near Sunderland, by my friend, W. Peacock, Esq., one of which he kindly placed in my collection.

LAMIADÆ.

LAMIADES.

MONOCHAMUS, *Muls.*

1. *M. sutor*, Linn., Thoms. l. c. 89.
"Mr. Dinning caught a fine specimen of this insect just as it alighted from a flight down Grey Street, Newcastle, and it is now in my collection," V. R. Perkins, Esq.

ACANTHOCINUS, *Latr.*

1. *A. ædilis*, Linn., Thoms. l. c. 79.
This insect is frequently taken alive in Newcastle, generally on the Quayside, a locality which strongly indicates its introduction by the shipping—most probably from Scotland or Scandinavia.

LIOPUS, *Serv.*

1. *L. nebulosus*, Linn., Trans. Cl. II., 233.

POGONOCHERUS, *Lat.*

1. *P. hispidus*, Linn., l. c.

2. *P. dentatus*, Cr. Cat.; *Lamia pilosa*, Gyll. Ins. Sv. IV., 67.

Near Gilsland, on oak hurdles. Rare.

SAPERDIDES.

SAPERDA, *Fab.*

1. *S. scalaris*, Linn., Trans. Cl. II., 233.

"Langley's pastures, on the willow," *Ormsby's Durham*, 205.

TETROPS, *Kirby.*

1. *T. præustus*, Linn., l. c.

"Gibside," G. Wailes, Esq.

STENOSTOLA, *Muls.*

1. *S. ferrea*, Schr., l. c. (*Phytœcia.*)

"Near Gibside," Mr. J. Hardy.

LEPTURIDÆ.

LEPTURIDES.

RHAGIUM, *Fab.*

1. *R. inquisitor*, Fab., l. c.

2. *R. bifasciatum*, Fab., l. c. 234.

TOXOTUS, *Serv.*

1. *T. meridianus*, Linn., l. c.

Not common.

PACHYTA, *Serv.*

1. *P. octomaculata*, Fab., l. c. 235.

STRANGALIA, *Serv.*

1. *S. quadrifasciata*, Linn., l. c. 234 (*Leptura.*)

Widely spread, but not common.

2. *S. armata*, Herbst; *S. elongata*, l. c.

3. *S. melanura*, Linn., l. c. 235.

GRAMMOPTERA, *Serv.*

1. *G. lævis*, Fab., l. c.

2. *G. ruficornis*, Fab., l. c.

EUPODA.

DONACIADÆ.

DONACIA, *Fab.*

1. *D. crassipes*, Fab., l. c.
"Prestwick Carr," G. Wailes, Esq.

2. *D. bidens*, Oliv.; *D. cincta*, l. c.

3. *D. dentipes*, Fab., l. c.
"Meldon Park," G. Wailes, Esq.

4. *D. sagittariæ*, Fab., l. c. 236.
"Prestwick Carr," G. Wailes, Esq.

5. *D. linearis*, Hoppe, l. c.

6. *D. typhæ*, Brahm., l. c.

7. *D. hydrocharidis*, Fab., l. c.
"Prestwick Carr," G. Wailes, Esq.

8. *D. sericea*, Linn.; *D. proteus*, l. c.

9. *D. comari* (*Ahrens*), Suffr.; *D. aquatica*, W. C.
Not uncommon, especially in mossy holes on the moors.

CRIOCERIDÆ.

LEMA, *Fab.*

1. *L. cyanella*, Fab., Trans. Cl. II., 236 (*Criocerus.*)

2. *L. melanopa*, Linn., l. c. (*Criocerus.*)

CLYTHRIDÆ.

CLYTHRA, *Leach.*

1. *C. quadripunctata*, Linn., l. c. 247.

LAMPROSOMA, *Lacord.*

1. *L. concolor*, Sturm, l. c. 300 (*Oomorphus.*)
Rare. Bothal.

CRYPTOCEPHALIDÆ.

CRYPTOCEPHALUS, *Geoff.*

1. *C. aureolus*, Suff.; *C. sericeus*, l. c. 246.
Not common.

2. *C. hypochæridis*, Linn.; *C. similis*, l. c.
"Marsden," John Hancock, Esq.

3. *C. moræi*, Linn., l. c.
"Castle Eden Dene," G. Wailes, Esq.

4. *C. lineola*, Fab., l. c.
"Castle Eden Dene," *Ornsby's Durham.*

5. *C. minutus*, Fab., l. c. 247.
"Newcastle," G. Wailes, Esq.

6. *C. labiatus*, Linn., l. c.

CHRYSOMELIDÆ.

CHRYSOMELA, *Linn.*

1. *C. staphylæa*, Linn., l. c. 248.
2. *C. varians*, Fab., l. c. 247.
3. *C. haemoptera*, Linn., l. c.
4. *C. marginata*, Linn., l. c. 248.
5. *C. fastuosa*, Linn., l. c.
6. *C. polita*, Linn., l. c.
7. *C. lamina*, Fab., l. c.
8. *C. hyperici*, Forst., l. c.
9. *C. didymata*, Scr.; *C. geminata*, l. c.

LINA, *Redt.*

1. *L. ænea*, Fab., l. c. 247 (*Melasoma.*)
"Durham," *Ornsby's Durham.*

PHRATORA, *Redt.*

1. *P. vulgatissima*, Linn.; *P. unicolor*, l. c.
2. *P. vitellinæ*, Linn., l. c.

PRASOCURIS, *Lat.* (HELODES, *Cat.*)

1. *P. aucta*, Fab., l. c. 250.
2. *P. marginella*, Linn., l. c.
3. *P. phellandrii*, Linn., l. c.
4. *P. beccabungæ*, Ill., l. c.

GALERUCIDÆ.

ADIMONIA, *Laich.*

1. *A. tanaceti*, Linn., l. c. 237.
2. *A. capreæ*, Linn., l. c. 138.
3. *A. cratægi*, Forst., l. c. (*Galeruca.*)
   Specimens are in the Selby collection.

GONIOCTENA, *Redt.*

1. *G. viminalis*, Linn.; *C.* 10-*punctata*, l. c. 249.
   "Durham," *Ornsby's Durham.*
2. *G. olivacea*, Forst.; *C. litura*, l. c. 258.
3. *G. pallida*, Linn., l. c. 249 (*Chrysomela.*)

GASTROPHYSA, *Chev.*

1. *G. polygoni*, Linn., l. c.
2. *G. raphani*, Fab., l. c.

PHÆDON, *Lat.*

1. *P. tumidulum*, Steph., l. c. 250.
2. *P. betulæ*, Sy., l. c. 249.
   Very rare.
3. *P. cochleariæ*, Oliv.; *P. Betulæ* (in part), l. c.
   Not uncommon.

GALERUCA, *Fab.*

1. *G. lineola*, Fab. l. c. (*G. lythri.*)

Specimens, named *G. lythri*, are in the Selby collection: those standing in it as *G. linolea* were referred by G. R. Crotch, Esq., to *G. tenella.*

2. *G. calmariensis*, Linn., l. c.

"Hetton Hall, near Belford," W. B. Boyd, Esq. The specimens in the Selby collection do not belong to this genus.

3. *G. tenella*, Linn., l. c. 239.

4. *G. sagittariæ*, Gyll.; *G. xanthomelæna*, l. c. 238.

Apparently rare.

5. *G. nymphæ*, Linn., l. c.

6. *G. viburni*, Payk., l. c.

AGELASTICA, *Redt.*

1. *A. halensis*, Linn., l. c. 237.

CALOMICRUS, *Steph.*

1. *C. circumfusus*, Steph., l. c. 239.

"Prestwick Carr," G. Wailes, Esq.

LYPERUS, *Geoff.*

1. *L. betulinus*, Fourc.; *L. rufipes*, l. c.

2. *L. flavipes*, Linn., l. c.

HALTICIDÆ.

GRAPTODERA, *Chevr.*

1. *G. longicollis*, All., (?) Nat. Hist. Trans. I., 324.

2. *G. oleracea*, Linn., (?) Trans. Cl. II., 241.

I enter two species of this genus with some doubt, as I have never been able to take more than one, which frequents heather on the moors, and is not uncommon. Local examples were compared with specimens of *G. longicollis*, named by M. Allard, and were found to be identical; yet, strange to say, that writer does not mention the very strongly marked sexual characters.

The *male* is glossy blue-green, subcylindrical, the elytra sparingly punctured, and the first joint of the tarsi broadly dilated.

The *female* is very variable in colour (blue, blue and golden green, &c.), generally larger, more convex and rounded laterally, the knob on the anterior angle of the thorax more produced, the elytra somewhat uneven, rather opaque from having the surface very finely granulated, with punctures as in the male, and the first joint of the tarsi only slightly dilated.

Mr. Selby records the second species for Twizell, and Mr. Hardy gives it as found on *Helianthemum.* What these really are remains to be proved hereafter.

CREPIDODERA, *Chev.*

1. *C. transversa*, Marsh., l. c. 240.

2. *C. ferruginea*, Scop.; *C. exoleta*, l. c.

3. *C. rufipes*, Linn., l. c. 241.

4. *C. helxines*, Linn., l. c.

Although stated to be very common with us on willows, yet I have never seen a local specimen.

5. *C. aurata*, Marsh., Thoms. Skand. Col. VIII., 221.

On willows. Common. This is probably the *C. helxines* of most of our local collections.

6. *C. Modeeri*, Linn., Trans. Cl. II., 241; *Plectroscelis chrysanthemi*, l. c. 245.

MANTURA, *Steph.*

1. *M. rustica*, Linn.; *M. semiænea*, l. c. 245.

BATOPHILA, *Foud.*

1. *B. rubi*, Payk., l. c. 240 (*Apthona.*)

2. *B. ærata*, Marsh., l. c. (*Apthona.*)

"Hetton Hall, near Belford," W. B. Boyd, Esq. The types in the Selby collection are *Plectroscelis dentipes.*

APTHONA, *Chev.*

1. *A. cærulea*, Payk.; *A. pseudacori*, l. c.

"Prestwick Carr and Twizell," (Wailes and Selby.)

2. *A. cyanella*, Redt.; *A. atrocærulea*, l. c.

"Hartlepool," Mr. J. Hardy.

PHYLLOTRETA, *Foud.*

1. *P. undulata*, Kuts., Thoms. Skand. Col. VIII., 195.

Very common in fields and gardens.

This species, and not *P. nemorum*, is the "turnip-fly" of our district. Its smaller size, and nearly black legs, readily separate it from the latter.

2. *P. nemorum*, Linn., Trans. Cl. II., 239.

Rare, at least so far as my own experience goes. In this species the tibia and tarsi are wholly yellow.

3. *P. tetrastigma*, Com.; *P. vittata*, l. c. 240.

4. *P. brassicæ*, Fab.; *P. quadriguttata*, l. c. 239.

Not common, but has been taken in several localities.

PLECTROSCELIS. *Latr.*

1. *P. dentipes*, Gyll.; *P. concinna*, l. c. 245; *Haltica nigroænea*, l. c. 239; *H. ærata*, l. c. 240.

2. *P. aridella*, Payk., l. c. 245.

Rare. "Wooler Haugh," Mr. J. Hardy.

THYAMIS, *Steph.* (LONGITARSIS, *Cat.*)

1. *T. holsatica*, Fab., l. c. 243.

Newcastle and Twizell, (Wailes and Selby.)

2. *T. anchusæ*, Payk.; *Longitarsis anchusæ*, Thomson, Skand. Col. VIII., 1866.

"Sweethope. Rare," Dr. Power.

3. *T. brunnea*, Dufts.; *L. luridus*, Trans. Cl. II., 243; *L. parvulus*, l. c.; *L. pulex*, l. c.

Common, and very variable in colour.

The types of *L. nasturtii* in the Selby collection are varieties of this species.

4. *T. lurida*, Scop., E. C. Rye, Ent. Ann. 1869, 57.

"Sweethope," Dr. Power.

5. *T. lævis*, Duft.; *L. apicalis*, Trans. Cl. II., 242; *L. flavicornis*, l. c. VI., 62.

Not uncommon.

6. *T. jacobeæ*, Waterh.; *L. tabidus*, l. c. 241.

On Ragwort. Very common.

7. *T. femoralis*, Marsh.; *T. exoleta*, W. C.; *L. pratensis*, Trans. Cl. II., 242.

Not common.

8. *T. ochroleuca*, Marsh., l. c.
Occurs sparingly on the sea coast.

9. *T. gracilis*, Kuts., E. C. Rye, Ent. Ann. 1867, 97.
"Sweethope," Dr. Power.

10. *T. Reichei*, Allard, Ess. Mon. 132, 80 (*Teinodactyla.*)
Banks of the Irthing, near Gilsland. Rare.

11. *T. pusilla*, Gyll., Trans. Cl. II., 243.
Grassy places in woods, sea banks, &c. Common.

12. *T. suturalis*, Marsh., Allard, Ess. Mon. 114, 62 (*Teinodactyla.*)
Rare. Occurs most frequently on the sea banks.

13. *T. thoracica*, Allard; *T. fuscicollis*, W. C.; *L. thoracicus*, Trans. Cl. II., 242; *L. nasturtii*, l. c.
Abundant, and very variable in colour.
The *L. nasturtii* of the Selby collection were found to be only varieties of *L. brunnea:* those in my own collection were dark small examples of *T. thoracica*, Allard.

14. *T. atricilla*, Gyll., l. c. 241.
Not uncommon.

15. *T. Foudrasi*, Cr. Cat.; *L. atricapilla*, l. c. VI., 62.
Hartley and Gosforth. Rare.

16. *T. melanocephalus*, Gyll., l. c. 241; *L. femoralis*, l. c. 242.
Not uncommon.

PSYLLIODES, *Latr.*

1. *P. napi*, Ent. Heft., l. c. 244.
Widely dispersed, but not common.

2. *P. chrysocephala*, Fab.; *P. erythrocephala*, l. c.
In gardens, &c., not uncommon, where it often renders the leaves of the radish very unsightly.

3. *P. marcida*, Ill., l. c.
A coast species, which frequents the sea-rocket (*Cakile maritima*), and is abundant.

4. *P. cuprea*, Ent. Heft; *P. Spergulæ*, l. c.
Mostly confined to the sea banks, and is not rare.

5. *P. affinis*, Payk., l. c.; *P. atricilla*, W. C.

Local, but abundant when found. Frequents the bitter-sweet (*Solanum dulcamara.*)

6. *P. picina*, Marsh., l. c.

Rare. Mostly occurs by single specimens.

APTEROPEDA, *Chev.*

1. *A. orbiculata*, Marsh., l. c. 246 (*Sphæroderma*); *A. graminis*, W. C.

In woods. Frequent.

MNIOPHILA, *Steph.*

1. *M. muscorum*, Ent. Heft; Trans. Cl. II., 246.

Among moss, in damp places on moors, &c.

SPHÆRODERMA, *Steph.*

1. *S. cardui*, Gyll., l. c.

On thistles. Common.

2. *S. centaureæ*, Steph.; *S. testaceus*, l. c. 245.

On knapweed. Common.

As the two insects are confined to the plants above stated, the adoption of their names will obviate all confusion.

CASSIDIDÆ.

CASSIDA, *Linn.*

1. *C. viridis*, Linn.; *C. rubiginosa*, l. c. 237.

2. *C. sanguinolenta*, Fab., l. c.

Very rare.

3. *C. obsoleta*, Ill., l. c.

Not common.

4. *C. equestris*, Fab., l. c.

Specimens are in the Selby collection.

PSEUDOTRIMERA.

EROTYLIDÆ.

TRIPLAX, *Payk.*

1. *T. æneus*, Payk., l. c. 250.

TRITOMA, *Fab.*

1. *T. bipustulata*, Fab., Steph. Manual, 133.
"Dilston," G. Wailes, Esq.

COCCINELLIDÆ.

HIPPODAMIA, *Muls.*

1. *H.* 13-*punctata*, Linn., Trans. Cl. II., 254.
"Meldon Park, Twizell, and Durham."

COCCINELLA, *Linn.*

1. *C. obliterata*, Linn.; *C. livida*, l. c.

2. *C. bipunctata*, Linn., l. c. 253.

3. *C.* 11-*punctata*, Linn., l. c.

4. *C.* 7-*punctata*, Linn., l. c. 252.

5. *C.* 5-*punctata*, Linn., l. c.
Borders of streams. Not uncommon.

6. *C. hieroglyphica*, Linn., l. c. 253.
Rare.

7. *C. variabilis*, Ill., l. c.; *C. impustulata*, l. c.; *C. globosa*, l. c. 254; *Chilocorus renipustulatus*, Berw. Cl. Trans. IV., 322.

8. *C.* 18-*guttata*, Linn., Trans. Cl. II., 253.
On firs. Common.

9. *C. oblongoguttata*, Linn., l. c. 252.
Also on firs. Not rare.

10. *C. ocellata*, Linn., l. c.
Occasionally. Mostly on the sea coast.

11. *C.* 14-*guttata*, Linn., l. c. 251; *C. biseptemguttata*, l. c.
On willows, by the Till, Devil's Water, and other streams. Not rare. There are no representatives of *C. biseptemguttata* in the *Selby* collection.

12. *C.* 22-*punctata*, Linn., l. c. 252.
(*C. decemgutta*, l. c., does not exist in the *Selby* collection,

and, as there is no appearance of it ever having done so, it is omitted.)

MICRASPIS, *Redt.*

1. *M.* 12-*punctata*, Linn., l. c. 251 (*Coccinella.*)

"Twizell and Durham." This species is correctly named in the *Selby* collection.

EXOCHOMUS, *Redt.*

1. *E.* 4-*pustulatus*, Linn.; *Chilocorus bipustulatus*, l. c.; *C. bipustulatus*, Berw. Cl. Trans. IV., 322.

SCYMNUS, *Kug.*

1. *S. discoideus*, Ill., Thoms. Skand Col. VIII., 389.

On firs. Common.

2. *S. mulsanti*, Wat., Trans. Cl. VI., 62; *S. limbatus*, II., 254.

On the sea banks. Not uncommon.

3. *S. pygmæus*, Four.; *S. parvulus*, l. c.

"Hartlepool," Mr. J. Hardy.

4. *S. nigrinus*, Kug., l. c.

Beaten out of Scotch fir at Gosforth. "Hetton Hall, near Belford," W. B. Boyd, Esq.

5. *S. ater*, Kug., l. c. VI., 62.

Sea banks near Blyth and Hartley. Rare.

6. *S. lividus*, new sp.

Suboval, convex, slightly shining, somewhat densely covered with short griseous pubescence, finely and evenly punctured, livid testaceous, the head and claws black, thorax and suture obscurely fuscous. Length, half a line.

Smaller, more oval, much more finely and evenly punctured than *S. discoideus*, to small pale examples of which it bears a superficial resemblance.

I have seen only one specimen of this insect, which I took on the sea banks near Hartley in April, and with which no description known to me fully agrees.

RHIZOBIUS, *Steph.*

1. *R. litura*, Fab., Trans. Cl. II., 255.

COCCIDULA, *Kug.*

1. *C. rufa*, Herbst, l. c.; *C. scutellata*, l. c.

ENDOMYCHIDÆ.

ENDOMYCHUS, *Panz.*

1. *E. coccineus*, Linn., l. c. 251.

MYCETÆA, *Steph.*

1. *M. hirta*, Marsh.; *M. fumata*, l. c. I., 89.

ALEXIA, *Steph.*

1. *A. pilifera*, Müll., Nat. Hist. Trans. I., 133.
Whittle Dene, in June. Rare.

CORYLOPHIDÆ.

CLAMBUS, *Fisch.*

1. *C. minutus*, Sturm, Trans. Cl. IV., 176.
In rejectamenta on the banks of streams, &c.

2. *C. armadillo*, De Geer, l. c. I., 76, et II., 274.
On hot beds, &c. Common.

3. *C. pubescens*, Redt., Nat. Hist. Trans. I., 324.
Seghill Dene, in May. Rare.

COMAZUS, *Fairm.*

1. *C. dubius*, Marsh.; *Clambus enshamensis*, Steph. Manual, 107.
Rare. Sea coast, near Hartley. July.

TRICHOPTERYGIDÆ.*

TRICHOPTERYX, *Kirby.*

1. *T. thoracica*, Sturm, pl. CCCXXII., fig. 4.
I have seen two local examples only.

* The Rev. A. Matthews, M.A., whose knowledge of these minims is unrivalled, kindly named for me our local species of this most difficult family, which contains the smallest of our indigenous beetles, many of them not larger than the full stop which closes this sentence.

2. *T. atomaria*, De Geer, l. c. fig. 3.
Common.

3. *T. fascicularis*, Herbst, Erich. Ins. Deutsch. III., 19.
Very rare.

4. *T. lata*, Motsc., Rev. A. Matthews, Ent. Mon. Mag. I., 174.
Gosforth and elsewhere. Rather uncommon.

5. *T. grandicollis*, Mann., Erich. l. c. 20.
Rare. I have only seen two local specimens.

6. *T. sericans*, Mann., Rev. A. Matthews, l. c. 175.
Also very rare.

7. *T. picicornis*, Mann., l. c.
I have six local specimens.

8. *T. Chevrolatii*, Allib., l. c. II., 241.
Rare.

9. *T. Montandonii*, Allib., l. c.
Very rare.

NEPHANES, *Thoms.*

1. *N. Titan*, Newm.; *N. abbreviatella*, Thoms. Skand. Col. IV., 101.
Also very rare.

PTILIUM, *Erich.*

1. *P. foveolatum*, Allib., Rev. A. Matthews, l. c. 242.
Rare.

2. *P. concolor*, Sharp, Nat. Hist. Trans. I., 324.
"Yetholm. Common," G. R. Crotch, Esq.

PTENIDIUM, *Erich.*

1. *P. punctatum*, Gyll., Thoms. l. c. 109.
Amongst algæ on the coast, and once at Long Benton.

2. *P. nitidum*, Heer; *P. pusillum*, Erich. Ins. Deutsch. III., 35.
In woods, &c. Common.

3. *P. evanescens*, Marsh.; *P. apicale*, l. c. 36.
On hot beds, &c. Common.

4. *P. formicetorum*, Kraatz, Zoologist, 7975.
Very rare.

5. *P. Vankoviezii*, Matthews, Ent. Mon. Mag. VII., 152; *P. intermedium*, Wank.
A single specimen only.

LATHRIDIIDÆ.

HOLOPARAMECUS, *Curtis.*

1. *H. singularis*, Beck.; *H. depressus*, Trans. Cl. I., 91.
Newcastle and Sunderland.

LATHRIDIUS, *Ill.*

1. *L. lardarius*, De Geer, l. c. 92.
2. *L. angusticollis*, Humm., l. c.
3. *L. nodifer*, (Westw.) Steph., l. c. V., 55.
Within the last few years this curious creature has become quite common with us.
4. *L. minutus*, Linn., l. c. I., 92; *L. testaceus*, l. c.
5. *L. transversus*, Oliv., l. c.

CORTICARIA, *Marsh.*

1. *C. punctulata*, Marsh.; *C. pubescens*, l. c.
2. *C. crenulata*, Gyll., l. c. 93.
Not common.
3. *C. denticulata*, Gyll., l. c. VI., 62.
4. *C. fulva*, Chev.; *C. linearis*, l. c. I., 93.
5. *C. serrata*, Payk., l. c. VI., 62.
6. *C. cylindrica*, Mann.; *C. borealis*, l. c. III., 89.
Sea banks. Not rare.
7. *C. ferruginea*, Marsh., l. c. I., 93; *C. elongata*, W. C.
8. *C. gibbosa*, Payk., Trans. Cl. I., 93.
9. *C. fuscula*, Gyll.; *C. transversalis*, l. c.

PSELAPHIDÆ.

PSELAPHINA.

PSELAPHUS, *Herbst.*

1. *P. Heisei*, Herbst, Denny, Mon. p. 55, pl. IX., fig. 2.
Near Hartley and Gilsland. Rare.

BRYAXIS, *Leach.*

1. *B. fossulata*, Reich., Denny, l. c. p. 37, pl. VIII., fig. 1.
Banks of the Irthing. Rare.

2. *B. hæmatica*, Reich., Denny, l. c. p. 38, pl. VIII., fig. 2.
With the last. Also rare.

3. *B. juncorum*, Leach, Trans. Cl. II., 96.
Common.

BYTHINUS, *Leach.*

1. *B. glabricollis*, Denny, (?) l. c. 97.
"In moss from the Ravensworth Woods," Mr. J. Hardy.

2. *B. puncticollis*, Denny, l. c.
Not uncommon.

3. *B. bulbifer*, Reich., l. c.
In moss, &c. Not rare.

4. *B. Curtisii*, Leach, l. c.
"In moss from Gibside," Mr. J. Hardy.

5. *B. securiger*, Reich., l. c.
Ravensworth and near Gilsland.

EUPLECTUS, *Leach.*

1. *E. nanus*, Reich., Faune Franc. I., 366.
Common.

2. *E. minutus*, Marsh., Steph. Illust. Mand. V., 97.
"Durham," *Ornsby's Durham.*

APPENDIX.

PHLŒOPHILUS, (*Wat.*) *Steph.*

1. *P. Edwardsii*, (Wat.) Steph., Trans. Cl. I., 89.
Rare.

ASPIDOPHORUS, *Latr.*

1. *A. orbiculatus*, Gyll., l. c. II., 165.
Rare.

MURMIDIUS, *Beck.*

1. *M. ovalis*, Beck., Ent. Ann. 1870, 119.
Found alive, many years ago, in Bengal rice.

PHLŒOBIUS.

1. *P. griseus*, Cr. Cat.
Taken in Sunderland by my friend Mr. W. Peacock.

During the time this revision has been in the press, the following seven species have been added :—

1. *Bolitochara lucida*, Grav., Kraatz, Ins. Deutsch. II., 39.
Wooler, Castle Eden, Gilsland, &c. In *agaricis*.

2. *Aleochara bipunctata*, Oliv., l. c. 91.
Long Benton. Very rare. June.

3. *A. villosa*, Mann., (?) l. c. 94.
Long Benton. One specimen only.

4. *Gyrophæna*, n. sp. (?); *G. lucidula*, Trans. Cl. V., 54.
Not *lucidula*, probably new? Near *nana*, but much smaller. North Seaton, in *agaricis*.

5. *Homalium brevicorne*, Erich., Gen. et Spec. Staph., 884.
From fungi on alder, near Wooler, Mr. J. Hardy.

6. *Cholera coracina*, Keln., Murray, Ann. Mag. Nat. Hist. July, 1856.
Near Wooler. Very rare, Mr. J. Hardy.

7. *Atomaria ruficornis*, Marsh., Woll. Trans. Ent. Soc. Lond., 1857.

Long Benton. in June, but very rarely.

NOTE.—The above will increase the number of our local species to one thousand five hundred and twenty-seven. Of these a few, perhaps half-a-dozen, are from places (Talkin Tarn, Lanercost, and Yetholm) not within, but very close to our limits. This I have done to record the occurrence of very rare insects, or of species which are certain to be found in our district when similar localities are examined.

LIST OF THE FAMILIES, NUMBER OF SPECIES IN EACH, AND INDEX.

II.—*Report on a Collection of Annelids dredged off Northumberland and Durham.* By W. C. McIntosh, M.D., F.L.S.*

Sponges, zoophytes, molluscs and crustaceans may be preserved by drying, and the majority of the species successfully identified thereafter without much trouble, but the study of the annelids can only be carried out by their preservation in spirit, which ought to be of the strongest and purest description; and the specimens require frequent changing, especially if large. Above all, only one or two should be put into each bottle of spirit on the collecting-ground. Nothing is more common than to find, for example, *Terebellæ*, which have been grouped in a bottle, converted into a brownish pulp, in which even the individuals are scarcely distinguishable. No doubt with care such may be identified by the aid of the curious chitinous hooks and bristles, but the condition of the specimens for all other purposes is most unsatisfactory.

For an opportunity of examining the present collection I am indebted to Mr. G. S. Brady, the President, who kindly offered me the use of the specimens some time ago.

The Turbellarians are represented by a few Planariæ, amongst which the widely distributed *Eurylepta vittata* of Montagu is conspicuous. It is very abundant on our southern coasts and the Channel Islands, between tide-marks. Two swimming Nemerteans, the *Planaria angulata* of O. F. Müller, and the *Ommatoplea pulchra* of Dr. Johnston, occur in the deep water off Tynemouth; and the beautifully banded *Meckelia annulata* of Montagu was procured in the Whitburn boats. This species is found amongst the tidal rocks as well as in deep water, and in this case the ventral white longitudinal line was present.

The only representative of the marine leeches is *Pontobdella muricata*, from Berwick Bay.

It would appear, from the following list of the Annelida, that the specimens had chiefly been procured by dredging, and therefore many of the common littoral forms are wanting. I do not

* This collection consisted chiefly of specimens obtained during the several dredging expeditions conducted under the direction of the Tyneside Naturalists' Field Club.

know that any marked features, as regards the distribution of the species, are elicited by an examination of this collection; but the water off Tynemouth is certainly rich in the rarer forms, such as *Nychia cirrosa*, *Ophiodromus vittatus*, *Sabellides octocirrata*, *Pista cristata*, and *Trichobranchus glacialis*. Some of these are especially characteristic of the deep water (with a muddy bottom) off the western coasts of the Hebrides and the Shetland Islands, and they are less frequently met with on our eastern coasts.

A specimen of *Lepidonotus squamatus* had forced itself when alive into the tube of *Protula*, so that in the preserved condition its appearance was very much altered.

In the following list:—

A. Refers to the deep water off Tynemouth (twenty-five fathoms), occasionally from forty to fifty miles S. and S.E.

B. Five to six miles off Marsden: twenty to thirty fathoms.

C. Near Holy Island: twenty-five to thirty-five fathoms.

D. Thirteen miles off Seaham: twenty to thirty fathoms.

E. Coast of Durham.

	A.	B.	C.	D.	E.
Euphrosyne foliosa, *Aud. & Ed.*	...	*	...	...	...
Aphrodite aculeata, *L.*	...	*	...	...	...
Lepidonotus squamatus, *L.*	...	*	...	...	...
Nychia cirrosa, *Pall.*	*	...	...	...	...
Harmothoë imbricata, *L.*	...	*	...	...	...
Polynoë longisetis, *Gr.*	*	*	...	...	...
Halosydna gelatinosa, *Sars*	...	*	...	...	...
Sthenelais boa, *Johnst.*	*	...	...	...	...
Pholoë minuta, *Fabr.*	*	...	...	...	...
Nephthys cœca, *Fabr.*	...	...	*	...	...
Notophyllum polynoides, *Œrst.*	...	*	...	...	...
Ophiodromus vittatus, *Sars*	*	...	...	...	...
Syllis armillaris, *Müll.*	*	...	...	*	...
Notocirrus scoticus, *McI.*	*	...	...	...	...
Nereis pelagica, *L.*	...	*	...	...	...
Leodice norvegica, *L.*	*	...	...	...	...
Nothria conchylega, *Sars*	*	...	...	...	...
Hyalinæcia tubicola, *Müll.*	*	...	...	...	...
Goniada maculata, *Œrst.*	*	...	...	*	...
Eone nordmanni, *Mgr.*	*	...	...	...	...
Glycera capitata, *Œrst.*	*	...	...	...	...
Glycera goësi, *Mgr.*	*	...	...	...	...
Aricia cuvieri, *Aud. & Ed.*	...	...	*	...	...
Scoloplos armiger, *Müll.*	...	...	...	...	*

	A.	B.	C.	D.	E.
Ophelia limacina, *H. R.*	...	...	*	..	...
Eumenia jeffreysii, *McI.*	*	...	...	...	...
Ephesia gracilis, *H. R.*	*	...	...	...	...
Trophonia plumosa, *Müll.*	*	...	...	...	...
,, glauca, *Mgr.*	...	...	...	*	...
Scolecolepis cirrata, *Sars*	...	...	*	...	...
Cirratulus cirratus, *Müll.*	*	...	...	...	...
Capitella capitata, *Fabr.*	*	...	...	...	...
Ammochares ottonis, *Grube*	*	...	...	...	...
Amphictene auricoma, *Müll.*	...	*	*	...	...
Amphicteis gunneri, *Sars*	...	*	...	...	...
Sabellides octocirrata, *Sars*	*	...	...	...	...
Amphitrite cirrata, *Müll.*	*	...	...	...	...
Terebella figulus, *Dalyell*	...	...	...	...	*
,, littoralis, (tubes)	...	...	...	...	...
Nicolea zostericola, *Œrst.*	...	...	*	...	...
Pista cristata, *Müll.*	*	...	...	...	...
Thelepus circinnatus, *Fabr.*	...	...	*	...	...
Trichobranchus glacialis, *Mgr.*	*	...	...	...	...
Terebellides strœmii, *Sars*	...	...	*	...	...
Sabella penicillus, *L.*	...	...	...	...	*
Chone infundibuliformis, *Kröyer*	*	...	...	...	...
Protula protensa, *Gr.*	...	*	...	...	...
Filigrana implexa, *Berk.*	...	*	...	...	...

III.—*Catalogue of the Echinodermata of Northumberland and Durham.* By George Hodge. (Plates I.–III., V.)

Several years have elapsed since I was requested to prepare a catalogue of the Echinoderms of our coast. Year by year some progress has been made, but other duties having distracted my attention, the fulfilment of my promise has been unavoidably delayed; still the work was not one that could be hurried, as unfortunately these animals had been almost neglected by our local naturalists, thus causing me to have to rely much on my own observations, it being necessary that I should collect and note for myself on as many points of our coast line as practicable, for it appeared probable that even on such a comparatively unvaried shore as reaches from the Tees to Berwick Bay, there might be differences to record. Living as I have done for several years on the coast of Durham, my opportunities for dredging and shore-hunting there have been all that could be desired, and so far as this particular locality (Seaham) is concerned, I do not apprehend any species have been overlooked: south of this I have never collected. Fortunately, the northern part of our district was well investigated in 1862–3 and 1864 during the dredging expeditions of those years, when much valuable information and a number of species were obtained:* but for these expeditions, the long stretch of coast from the Tyne to Holy Island must have remained unexplored, so far as my personal experience was concerned, with the exception of sundry visits to Cullercoats during 1866.

So far as I am aware, our much valued and talented friend, the late Mr. Alder, was the only one amongst us who systematically collected the Echinoderms of our coast. The Rev. A. M. Norman, Mr. G. S. Brady, and Mr. Robert Embleton (of Beadnel) have, it is true, collected from time to time, but they have not given any special attention to these captures; for although Mr. Norman may be said to be our authority on these animals, his observations have been more particularly confined to the Shetland Seas, and I shall have to draw largely upon the most valuable observations he has published thereon. All of these friends have assisted me with information, for which I would here record my obligations. The late Mr. Alder kindly furnished me with a list of species which he had taken, or knew had been taken, on the Northumberland coast: his list comprised twenty-nine species. Starting with it as my foundation, I have confirmed the names which he gave me,† and have added thereto (assisted by Messrs. Norman and Brady) other fourteen species. The total number of species known at this time to inhabit our sea is therefore forty-three, viz.:—

Crinoidea	1
Ophiuroidea	12
Asteroidea	11
Echinoidea	10
Holothuroidea	9
	43‡

* See reports of deep sea dredging on the coasts of Northumberland and Durham, in Nat. Hist. Trans. for 1864.

† Excepting *Thyonidium commune*, which see.

‡ I have adopted Mr. Norman's very excellent plan of summarising.

Contrasting this with the results given by Mr. Norman of the dredgings in the Shetland Seas, we are very far behind. He records—

Crinoidea	2
Ophiuroidea	14
Asteroidea	17
Echinoidea	15
Holothuroidea	14
	62*

Or nineteen more than we are able to do. Still, considering the extent of ground, and the varying and great depths they dredged over, with those extraordinary influences which tend to produce a superabundance of animal life in these seas, as compared with our own, we cannot fail to fall far short. It is probable, however, that the list here given may compare favourably with the catalogues from other localities of a similarly restricted character.

I am far from being satisfied with the state in which I am obliged to leave the *Urasters* (*Asterias*). Several "forms" have utterly defied my repeated attempts to define where one species may be said "to begin" and another "to end." Hundreds of specimens have been collected and examined during the last few years. Sometimes it was thought they could be "split up" in consequence of marked differences which appeared important, at another time a doubt would occur, upsetting previous conclusions. I fear, therefore, like other observers, I must leave them much as I find them, and avoid what undoubtedly would be a great evil—the setting up of specific distinctions which a more extended knowledge might subsequently upset. There are two or three very characteristic *variations* which commonly occur on our coast. These will be described as varieties of *Asterias rubens;* for until we can accurately fix a reliable and undeviating standard of specific characters, it is surely best to allow a margin for variation of species, which occurs to a greater or lesser degree amongst most animals. Bearing upon the question of the

* There may perhaps be a doubt about one of these species, *Asterias hispida.*

discrimination and determination of species, some observers have endeavoured to establish specific characters from the variations in the form of the pedicellariæ. In many instances these peculiar organs undoubtedly afford most valuable assistance, for even in the Urasters in several species those found on one are quite distinct from those found on another, still they so far resemble those of allied *genera*, that it would be unwise to base *specific* character on such slight grounds alone, even admitting the constancy of form which exists in the pedicellariæ of certain genera and species. We have still much, if not everything to learn, respecting these organisms, and until we know more of their character and use, we must not attempt to base specific differences upon a greater or smaller number of serrations upon the jaw-like appendages. Specific differences, that rest upon so fine a distinction, surely cannot be of much value to the student.

Although this is scarcely the place to discuss the probable use of the pedicellariæ in the economy of the animal, it may nevertheless be desirable that they should have a brief notice. Various have been the conjectures recorded upon this puzzling question. Some naturalists have assigned to them a similar office to that of the "avicularia" or "birds-heads" of the Polyzoa, "being intended to seize minute animals and to hold them till they die and decompose as baits to attract clouds of infusoria, which, multiplying in the vicinity of the urchin, may afford it an abundant supply of food."* This is scarcely likely, for it is doubtful whether these animals prey upon *infusoria;* if they do, where would be the necessity for the powerful dental apparatus with which several of them are provided? And, further than this, as recorded in this catalogue, the writer has dredged numbers of urchins (*E. esculentus* and *E. neglectus*) on the coast of Northumberland; these, on being cleaned, were found to be filled with small particles of marine algæ which had been "grazed" from a weedy bottom, where the animals had congregated in immense numbers. Again, those who are disposed to favour Mr. Gosse's idea, might be asked to account for the absence of

* Gosse. Evenings at the Microscope, p. 346.

pedicellariæ upon certain starfishes, whilst species closely allied possess these organs: these without pedicellariæ have precisely similar habits, and doubtless live upon the same food. This may be exemplified in *Asterias violacea* and *Solaster papposa*, both of which are found upon our rocks. The former is abundantly supplied with these organs, the latter is entirely without them. Forbes, in his "History of British Starfishes," makes frequent allusions to the feeding of these animals: in many cases, animals of considerable magnitude have been observed to be their food.* We must therefore, I think, seek for the functions of these organisms in a different direction; for with the evidence which can readily be adduced relative to the food of starfishes and urchins, it is unsatisfactory to assume they feed upon beings which no one can prove to be their prey. In the case of the *Spatangidæ*, however, there must be a reservation, not with reference to pedicellariæ assisting in procuring food, but as to the food itself, for they undoubtedly imbibe an immense number of minute animals, possibly including infusoria. It is probable, however, that rhizopods form the principal part of *their* food, a Spatangus from Shetland (in the possession of the Rev. A. M. Norman) having been found to contain an incredible number of the shells of these animals, and when we remember they are both found on the same kind of bottom, this is easily accounted for. With these facts before us we cannot, I think, regard the pedicellariæ as a sort of "avicularia," but may they not very properly be regarded as a modified form of tentacles? Sensitive as they are in the highest degree, they may be so many "organs of touch," performing in the urchin (where they appear to attain their highest development) somewhat similar functions to the "pinnated cirrhi" of the *Ophiuroidea*, and, in a minor degree, similar duties amongst the *Asteroidea*, disappearing altogether in the *Holothuroidea*. But, with this theory, we have still to account for their absence in certain genera of the *Asteroidea*; for example, *Solaster*, *Porania*, and *Cribrella*.

The classification and nomenclature employed in the following

* See Hist. Brit. Starfishes, pp. 86, 88, 134, &c.

catalogue are those most carefully elaborated by the Rev. A. M. Norman, and proposed by him in a valuable paper published in 1865.* Unfortunately, other duties have prevented Mr. Norman from giving us the concluding paper on the Echinoidea and Holothuroidea then promised. His recent paper on Shetland Echinoderms† in part fills up this blank, although a local list, however good, cannot prove so valuable to the student as a monograph; let us hope Mr. Norman may yet find time to conclude what he so ably planned and partly carried out. Naturalists, familiar only with the classification and nomenclature of Forbes, will observe the difference of this system. As to its soundness, I do not feel myself competent to decide; but it may be asked, why are *Ophiothrix*, *Ophiocoma*, *Ophiopholis*, and *Amphiura* (all of which Forbes grouped together under the genus *Ophiocoma*), placed between *Antedon* (*Comatula* of Forbes) and *Ophiura*, instead of the last named genus immediately following *Antedon* and the first named after *Ophiura?* I cannot help thinking all ends would have been served by leaving *Ophiura* where Forbes placed it, and following on with the several genera formed out of *Ophiocoma*.

I have frequently to allude to the depth at which the various species are found, and I find, on looking over what is here recorded, that thirty to forty-five fathoms is considered "deep water." I would ask my readers to bear in mind, that on the coast of Northumberland and Durham *this is really deep water*. It is doubtful whether we could touch fifty-five fathoms between our coast and the Dogger Bank. My remarks must therefore necessarily have only a *local* meaning; for after the recent deep Atlantic dredgings, any dredging on *our* coast "in deep water" sinks into insignificance.

* On the Genera and Species of British Echinodermata. Ann. and Mag. Nat. Hist. Series 3, Vol. XV., page 98.

† Last report on dredging among the Shetland Isles. Brit. Ass. Report for 1868, p. 312.

Class. ECHINODERMATA.

Order I. CRINOIDEA.

Family. ANTEDONIDÆ.

Genus. ANTEDON, *Fréminville.*

1. Antedon rosaceus (*Linck*). (Rosy Feather-star).

Comatula rosacea, Forbes. Brit. Starfishes (1841), p. 5.

Cullercoats, rather rare, J. A. Embleton and Beadnel Bays, not rare, R. E. Off Dunstanborough and Seaham, G. H.

This is one of the rarest of our starfishes. Messrs. Alder and Hancock have obtained specimens from the Cullercoats fishing lines, and Mr. Embleton has taken it in Embleton and Beadnel Bays. When dredging off Dunstanborough Castle in July, 1864, in company with the Rev. A. M. Norman and Mr. D. O. Drewett, we obtained three specimens from a rocky ledge in about twenty-five fathoms. This, taken in connection with Mr. Embleton's remark, "not rare," leads me to suppose it is local in its habitat: certainly it is *very rare* on the Durham coast; for, so far as I am aware, only one specimen has been taken (by Mr. G. S. Brady and myself) off Seaham, in about thirty fathoms.

Order II. OPHIUROIDEA.

Family. OPHIURIDÆ.

Genus. OPHIOTHRIX, *Müller and Troschel.*

1. Ophiothrix fragilis (*Müller*). (Common Brittle-star).

Asterias fragilis, Müller. Zool. Dan. III., p. 28. Pl. XCVIII.

Ophiocoma rosula, Forbes. Brit. Starfishes, p. 60.

Ophiothrix rosula, Forbes. Trans. Linn. Soc., Vol. XIX. (1845), p. 151.

Very common all along the coast, Seaham to Holy Island, G. H. Common, J. A.

This is perhaps the commonest, but at the same time one of the handsomest of our "brittle-stars." It is very abundant on the rocky portions of our coast, and is taken from low-water mark to thirty-five fathoms, and even deeper water, according to the nature of the bottom. On the Durham coast its peculiar habitat is about twenty to twenty-five fathoms: from this depth large masses of *Alcyonium digitatum* are brought up by the fishing lines: these in many cases are covered with this species of brittle-star, which possibly preys upon the zoophyte. In its young state it is very plentiful on the sponges, which encrust the dark tidal caverns found in our Magnesian Limestone rocks.

GENUS. AMPHIURA, *Forbes.*

1. AMPHIURA FILIFORMIS (*Müller*). (Thread-rayed Brittle-star).

Ophiocoma filiformis, Forbes. Brit. Starfishes (1841), p. 40.

Amphiura filiformis, Sars. Bidrag til Kundsk. om Middlehavets Littoral Fauna, p. 84.

Northumberland and Durham coasts, frequent from deep water, G. H.

This species is generally distributed along our coast, and in considerable numbers. It is seldom indeed that a dredge comes up from a suitable bottom (mud and sand) without fragments of the rays being obtained: owing however to its excessive fragility, it is rarely obtained in a perfect state. It is abundant off Seaham in about twenty-five to thirty fathoms. I have never obtained it from the fishing lines, the principal medium by which we have been made acquainted with so many forms of marine life from our sea: it is not surprising, therefore, that it should, during so many years, have escaped notice, though it is by no means uncommon. The Rev. A. M. Norman was the first to record its presence on the Durham coast, having obtained fragments from the stomach of haddocks. It was next dredged off Seaham in twenty-five to thirty fathoms on a soft bottom, in August, 1861. Since this time it has invariably occurred in dredging from a similar depth and bottom. With us it appears to be found only in water of about this depth, never having taken it within twenty-five fathoms. Owing to the extraordinary length and delicacy of the rays, and the readiness with which they are severed from the small fleshy disc, I have never yet obtained a really perfect specimen.

2. AMPHIURA CHIAJII (*Forbes*).

Amphiura Chiajii, Forbes. Trans. Linn. Soc., Vol. XIX. (1845), p. 151. Pl. XIV., figs. 14–18.

Amphiura Chiajii, Sars. Bidrag til Kundsk. om Middlehavets Littoral Fauna, p. 86. Pl. I., figs. 8–10.

Amphiura Chiajii, Lütken. Addit. ad hist. Ophiu. Forste Afdeling (1858), p. 56. Pl. II., fig. 11.

Rather rare on our coast, G. H.

This species is sometimes taken along with the preceding. It may be readily distinguished from *A. filiformis* by the presence of six distinct circular scales, one occupying the centre of the disc (on the dorsal surface), the others being arranged round it. It was found for the first time on this coast in dredgings from twenty-five to thirty fathoms off Seaham in 1862. Since then it has been occasionally taken in an imperfect condition in the same locality. It was also obtained in Berwick Bay, during the dredging expedition of 1864.

3. AMPHIURA ELEGANS (*Leach*). (Gray Brittle-star.)

Ophiura elegans, Leach. Zool. Misc., Vol. II. (1815), p. 57.

Ophiocoma neglecta, Forbes. British Starfishes (1841), p. 30.

Amphiura neglecta, Forbes. Trans. Linn. Soc., Vol. XIX. (1845), p. 150.

Common within tide marks, J. A.

Common between tide marks, under stones, and amongst the roots of *Corallina officinalis*. It is found of larger dimensions on the Northumberland than on the Durham coast. Several examples have also occurred from twenty to thirty fathoms, both from the fishing lines and dredged. These are usually of a much lighter colour than those found between tide marks, but do not differ in other respects. This species would thus appear to have a wide distribution.

4. Amphiura Ballii (*Thompson*). (Ball's Brittle-star).

Ophiocoma Ballii, Forbes. Brit. Starfishes (1841), p. 35.

Ophiocoma Goodsiri, Forbes. Brit. Starfishes (1841), p. 57.

Amphiura Ballii, Sars. Bidrag til Kundsk. om Middlehavets Littoral Fauna, p. 98.

Cullercoats, deep water, not uncommon, J. A.

Very common all along our coast in ten to twenty-five fathoms, usually inhabiting the crevices and holes of stones which are brought up from that depth. On the Durham coast, the perforated Magnesian Limestone from deep water contains large numbers. It is a remarkably handsome species, the transverse bands contrasting in a pleasing manner with the ground colours of the rays. Remarkably fine specimens were dredged near the Farne Islands during the expeditions alluded to.

Genus. OPHIOCOMA, (*Agassiz.*)

Ophiocoma nigra (*Müller*). (Granulated Brittle-star.)

Asterias nigra, Müller. Zool. Dan. III., p. 20. Pl. XCIII., figs. 1–4.

Ophiocoma granulata, Forbes. Brit. Starfishes (1841), p. 50.

Embleton Bay, not uncommon, R. E. Berwick Bay, rare. Off Dunstanborough (twenty-five fathoms), very abundant. Seaham, rather rare, G. H.

This species is as rare on some parts of our coast as it is common on others. During the several years I have collected on the Durham coast (Seaham) I have scarcely obtained a dozen specimens. In Berwick Bay it is rare, but off Dunstanborough it is certainly "at home." My experience of this spot, so famous for starfish, is only of about three hours duration; but during that short period, we dredged more brittle-stars than one ordinarily sees in as many years. From what the Rev. A. M. Norman, Mr. Drewett, and myself could judge (from the "behaviour" of the dredges), there is a narrow scarp of extremely rough ground, which runs out to the north-east (or thereabouts) about three miles off the castle: this spot is literally "alive" with *Ophiothrix fragilis*, and *Ophiocoma nigra*. Each time the dredge came up there were scores upon scores of these species writhing and twisting amongst the zoophytes, &c., with which the net was filled.

Genus. OPHIOPHOLIS, *Müller and Troschel.*

1. Ophiopholis aculeata (*Müller*). (Daisy Brittle-star.)

Asterias aculeata, Müller. Zool. Dan. III., p. 29. Pl. XCIX.

Ophiocoma bellis, Forbes. Brit. Starfishes, p. 35.

Ophiopholis aculeata, Lütken. Addit. ad hist. Ophiuri Forste Afdeling (1858), p. 60. Pl. II., figs. 15, 16.

Embleton Bay, rare, R. E. Cullercoats, deep water, rather rare, J. A. Seaham, rather rare. Berwick Bay, rather rare. Holy Island, between tide marks (one specimen). Off Dunstanborough (twenty-five fathoms), frequent, G. H.

This beautiful species, although generally distributed, is somewhat rare on this coast. I have only obtained from twelve to twenty specimens at Seaham, although the fishing lines and dredge have afforded constant opportunities of procuring it. During a couple of hours spent in searching Holy Island rocks, in July, 1865, a single specimen was found near low water mark—the only instance in which I have obtained it within tide marks on this coast. Its usual habitat is a depth of from fifteen to thirty fathoms on a rough bottom, and usually associated with *Ophiothrix fragilis* and *Amphiura Ballii.* When dredging off Dunstanborough Castle, on the occasion just alluded to, no less than ten specimens were obtained in about three hours, two or three of which were finely coloured and of large size, each ray measuring over three inches, which gives nearly seven inches from tip of one ray to the tip of that opposite. The largest specimen in my collection from the Durham coast only measures four inches.

Genus. OPHIURA, (*Lamarck.*)

1. Ophiura lacertosa (*Pennant*). Common Sand-star.

   Asterias lacertosa, Pennant. Brit. Zool., Vol. IV., p. 63.

   Ophiura texturata, Forbes. Brit. Starfishes (1841).

Embleton Bay, not uncommon, R. E. Cullercoats, not common, J. A. Durham coast, fifteen to thirty fathoms, frequent, G. H.

This fine species is frequently brought up by the dredge and fishing lines, usually from a sandy bottom. Immature individuals are often found in shallow water (six to fifteen fathoms) associated with *O. albida,* for which they may be mistaken : mature forms are rarely found except in deep water (twenty to forty-six fathoms). A specimen in my collection measures nine inches from tip to tip.

2. Ophiura albida (*Forbes*). Lesser Sand-star.

   Ophiura albida, Forbes. Brit. Starfishes (1841).

Embleton Bay, rare, R. E. Cullercoats, not uncommon, J. A. Farne Islands and Berwick Bay, twelve to forty fathoms, frequent. Durham coast, six to twenty-five fathoms, very common, G. H.

This generally distributed species is very common on the Durham coast. It has frequently happened that in one morning I have had from fifty to seventy specimens brought me by a fisherman, which he had picked off his hooks. It is also obtained in great abundance by the dredge in from six to twenty fathoms ;

beyond this depth it is not so frequently met with. It is by far the commonest of the sand-stars.

3. Ophiura affinis (*Lütken*).

Ophiura affinis, Lütken. Addit. ad hist. Ophiu. Forte Afdeling (1858), p. 45. Pl. II., fig. 10.

Ophiura Normani, Hodge. Trans. Tyneside Nat. Field Club (1863), Vol. V., p. 296. Pl. XVI.

Durham coast, six to twenty-five fathoms, common. Berwick Bay and Farne Islands, twelve to forty fathoms, frequent, G. H.

This recent addition to our fauna was made known in the Tyneside Transactions for 1863, under the name of *Ophiura Normani*. It was however subsequently discovered that Lütken, the Danish naturalist, had taken it two years previously, and named it *O. affinis*. It is a pretty and interesting species, which had escaped notice on our coast, although common. Remarkably fine specimens were obtained in Berwick Bay during the several dredging expeditions under the auspices of the British Association. The Rev. A. M. Norman has specimens from the Clyde, and also from Shetland.

4. Ophiura squamosa, *Lütken*.

Ophiura squamosa, Lütken. Addit. ad Ophiu. Forste Afdeling (1858), p. 46. Pl. I., fig. 7.

Cullercoats, very rare, J. A. Berwick Bay, twenty-five to forty fathoms, rare. Durham coast, very rare, G. H.

This is undoubtedly the rarest of our sand-stars. It was first recorded as British in the dredging reports for 1863, although, as then stated, it was known to Mr. Alder and myself from two specimens which we had previously obtained from the fishing lines—he at Cullercoats—myself at Seaham. Mr. Norman has since informed me he had a single specimen from the dredging expedition of 1862. It was not taken during the last trip, although operations were mostly confined to the spot near to which nine or ten specimens were obtained in 1863.

ORDER III. ASTEROIDEA.

FAMILY. ASTROPECTENIDÆ.

GENUS. ASTROPECTEN, (*Linck.*)

1. ASTROPECTEN IRREGULARIS (*Pennant*). Butthorn.

Asterias irregularis, Pennant. Brit. Zool., Vol. IV., p. 61. Pl. 57.

Asterias aurantica, Müller. Zool. Dan. III., p. 3. Pl. LXXXIII. (but not *A. aurantiaca* of Linnæus.)

Asterias aurantiaca, Forbes. Brit. Starfishes (1541).

Astropecten Mülleri, Müller and Troschel. Weigmann's Archiv., 1844, X., p. 181.

Deep water, frequent, J. A. Holy Island, Dunstanborough, Cullercoats, Whitburn, Seaham, G. H.

This species appears to be generally distributed along our coast, being frequently brought up by the dredge and fishing lines from moderately deep water (twenty to thirty fathoms). It is a handsome form, remarkable for the regularity and beauty of its species. Mr. G. S. Brady obtained two monstrosities; in each specimen one of the rays, at about a third of the distance from the tip, is bifurcated, each portion presenting all the regularity of the other rays: one of these specimens measures four inches from tip to tip, an unusually large size for this coast. Mr. Brady obtained these varieties at Whitburn. One of them presents an important variation of the spines forming the "paxillæ," which on the dorsal surface of those usually obtained are agglomerated together in the form of little beads, which lie side by side in a single row, and form an elevated margin round each ray. In the specimen under consideration from each of these "paxillæ" are produced one to four small spines of a conical form: some of the rays have these spines more strongly developed than the others. I incline to think this is a species distinct from *A. irregularis*, but do not feel justified in separating it until I have had an opportunity of examining the variety in a living state. The variation is so considerable that I cannot reconcile myself to the idea that it is merely an abnormal growth of the "paxillæ" characteristic of the well known species.

Genus. LUIDIA, (*Forbes.*)

1. Luidia Sarsii (*Düben* and *Koren*).

Luidia Sarsii, Düben and Koren. Afversight af Kongs. Vetensk Akad. Förh 1844, p. 113.

Luidia Savignyi, Düben and Koren. Skand. Echinod., p. 254. Pl. VIII., figs. 23, 24 (but not *L. Savignyi*, Audouin).

Luidia Sarsii, Sars. Bidrag til Kundsk. om Middlehavets Littoral Fauna, p. 102.

Not uncommon, J. A. Berwick Bay and Seaham, rather rare, G. H.

Somewhat rare on the Durham coast, odd specimens only being occasionally taken by the dredge at Seaham, all rather small. It however appears to be common off Cullercoats; for in the autumn of 1866, when staying there, I obtained numerous very fine specimens, many of them of large size, certainly much finer than any I had obtained from other localities. The fishermen brought large numbers in upon their hooks; owing however to the rapidity with which this species dismembers itself, only a limited number were obtained in a perfect condition.

Family. SOLASTRIDÆ.

Genus. SOLASTER, (*Forbes.*)

1. Solaster papposus (*Linnæus*). Sun-star.

Solaster papposa, Forbes. Brit. Starfishes, p. 112.

From fishing lines and within tide marks, common, J. A.

Often taken by the dredge on the Durham coast in ten to twenty-five fathoms. On the rocky parts of our shores it is also frequent between tide marks. It is a very handsome species:

carefully preserved specimens present the most beautiful arrangement of spines (on the under surface) of any species with which I am acquainted.

2. Solaster endeca (*Linnæus*). Purple Sun-star.

Solaster endeca, Forbes. Brit. Starfishes, p. 109.

Fishing boats, not uncommon, J. A. Rare at Seaham, frequent at Cullercoats, G. H. Whitburn, G. S. B.

Rather rare at Seaham; during the last ten years I have not obtained more than five or six specimens. At Cullercoats it is frequently brought in by the fishing lines: I have remarkably fine specimens from that locality.

Genus. GONIASTER, (*Agassiz.*)

1. Goniaster phygianus (*Parelius*). Knotty Cushion-star.

Asterias phygiana, Parelius. Act. Nidras. IV. Pl. XIV., fig. 2.

Goniaster equestris, Forbes. Brit. Starfishes, p. 125.

Goniaster Abbensis, Forbes. Ann. Nat. Hist., Vol. XI. (1843), p. 28. Pl. VI.

Deep water, rare, J. A.

The trawling boats, fishing in deep water far out at sea, frequently bring in numbers of this species: a few years ago it was considered rare on our coast. The pedicellariæ are very peculiar, no fleshy stem being visible; neither do they, as in neighbouring forms, originate from the investing skin of the starfish, but issue from oblong slits in circular plates forming portions of the hard integument: these plates are similar to those supporting the spines, both being fringed with minute tubercles: these characters are best seen on the under surface, where a row of pedicellariæ runs down each side of the avenues, each being placed in a slightly oblique position. On removing one of the pedicellariæ a large cavity is disclosed, frequently the tenth of an inch long by about half that breadth: this opening communicates with the inside of the *Goniaster.* The forceps vary in size, sometimes attaining nearly the eighth of an inch; they are stout, compact, and slightly concave.

Genus. CRIBRELLA, (*Agassiz.*)

1. Cribrella sanguinolenta (*Müller*). Eyed Cribrella.

Asterias sanguinolenta, Müller. Zool. Dan. Prod., No. 234.

Cribella oculata, Forbes. Brit. Starfishes (1841), p. 100.

Embleton Bay, not uncommon, R. E. Cullercoats, within tide marks, not uncommon, J. A. Durham coast, within tide marks, and also from low water to six fathoms, frequent. Holy Island, within tide marks, common, G. H.

A generally distributed species: larger specimens are obtained within tide marks on the Durham coast than from a few fathoms depth. I have there never taken these in deeper water than about six fathoms, but on the Northumberland coast it appears to have a greater range. There are two or three varieties, possibly however age may have to do with the difference in appearance; their respective dimensions favour this opinion.

Family. ASTERIADÆ.

Genus. STICHASTER, (*Müller and Troschel.*)

1. Stichaster roseus (*Müller*).

Cribella rosea, Forbes. Brit. Starfishes (1841), p. 106.

Stichaster roseus, Sars. Oversigt af Norges Echinodermer (1861), p. 86.

A single specimen of this beautiful species was taken in Beadnel Bay, some years ago, by Mr. Embleton. Another specimen was taken during the dredging expedition of 1862 also on the Northumberland coast. I have never heard of its occurrence on the Durham coast. I think it may be safely considered our rarest starfish.

GENUS. ASTERIAS, *Linnæus.*

1. ASTERIAS RUBENS, (*Linnæus.*) Common Cross-fish.

Uraster rubens, Forbes. Brit. Starfishes (1841), p. 83.

Fishing boats, common, J. A. Common all along our shores generally, from a few fathoms to deep water, G. H.

This and the following species are united by some authors: I think however we have sufficient grounds for separating them, their habitat and the form and character of the spines being quite distinct. The genus is altogether a puzzling one, and one in which it is very difficult to set up distinctive characters by which readily to distinguish one species from another, excepting in those examples which there is no mistaking. *A. rubens* runs off into several variations; but whether they are really distinct species, or mere varieties, it is difficult to decide. I may however state I have three strongly marked varieties, in addition to what I take to be the typical form, viz.:—

1. *Asterias rubens, var. hispida.* A small, squat, neat form, of which I have specimens dredged in deep water off Northumberland and Durham. They appear mature individuals, although they are only about half an inch across.

2. *A. rubens, var. attenuata.* A slender smooth form, sparingly furnished with spines, very distinct in character, obtained by dredging in Berwick Bay thirty to forty-five fathoms.

3. *A. rubens, var. gigantea.* A very large coarse species, occasionally brought in by the fishing lines from deep water. It sometimes attains the enormous size of fourteen inches, Mr. G. S. Brady having a specimen of this size. Those that I have obtained are two to three inches smaller. It is thickly beset with spines; the pedicellariæ are very numerous. In substance it is rather "flabby," and unless care is used when handling it in a living state, its rays are liable to

break off at their junction with the disc: at this part the rays are rather constricted.

2. Asterias violacea (*O. F. Müller*). Violet Cross-fish.

Uraster violacea, Forbes. Brit. Starfishes (1841) p. 91.

Shore, common, J. A. Common, between tide marks, especially on the Durham coast, G. H.

A very common species with us, so far as I know. On the Durham coast it is only found between tide marks, whilst the former species (*A. rubens*) is seldom if ever taken under similar conditions. It is readily distinguished from the preceding by the bluntness of its spines, especially on the dorsal aspect where they are mostly rounded at their summits, or in some cases one would almost say "truncate." In *A. rubens* the spines are (I believe) invariably pointed. Other distinct characters are apparent on examining specimens of each side by side. The general appearance of each is quite distinct, as is their habitat. Here (Seaham) I have never to my knowledge taken this species at sea, neither have I ever obtained *A. rubens* living within tide marks.

3. Asterias Mulleri (*Sars*).

Asteracanthion Mülleri, Sars. Fauna Litt. Norveg., Vol. I., p. 56. Pl. VIII., figs. 38–39.

Asteracanthion Mülleri, Sars. Oversigt af Norges Echinodermer (1861), p. 88.

Rather rare. Northumberland and Durham coasts, G. H.

This is certainly a rare species on our coast, not more than six or eight specimens having been taken. It is quite distinct in character from any other species that we have, but until Mr. Norman pointed out its true features, we had all supposed it to be the young of *A. glacialis*, under which name it was noticed in the first Dogger Bank dredging report.

ORDER IV. ECHINOIDEA.

FAMILY. ECHINIDÆ.

GENUS. ECHINUS, *Linnæus.*

1. ECHINUS ESCULENTUS (*Linnæus*). Sea Egg.

Echinus sphæra, Forbes. Brit. Starfishes (1841), 149.

Common in the north of Northumberland, less so at Cullercoats, J. A. Not very common on the Durham coast, G. H.

In the north this species is frequently found between tide marks, especially at the Farne Islands, a few small individuals are sometimes found during extremely low tides at low water mark on the Durham coast, but this species appears to attain to greater size, as well as greater numbers further north. When dredging at the Farne Islands, the dredges often came up completely filled with this species associated with *E. neglectus.* When taken fresh from the sea, and placed in a dish of clear sea water, they present a very interesting sight, as, waving their suckers about, they slowly crawl over the surface, the numerous *pedicellariæ* meanwhile opening and shutting in their singular manner. A very ingenious plan for obtaining specimens of these curious organisms for "mounting," was adopted by Mr. D. O. Drewett: he simply entangled a tuft of clean sea-weed, of a filamentous character, amongst the spines, when the pedicellariæ seized the weed, and holding it fast, were readily lifted clear of the urchin, and being bottled in spirit, were ready for future examination; great numbers were obtained in this manner.

2. ECHINUS MILIARIS (*Leske*). Purple-tipped Egg-urchin.

Echinus miliaris, Forbes. Brit. Starfishes (1841), p. 161.

"Var. *saxatilis*, not uncommon, between tide marks," J. A. Northumberland and Durham coasts, from deep water, frequent, G. H.

Frequently taken by the dredge, both on the Northumberland

and Durham coast; so far as my experience goes, more frequently on the latter, where it generally occurs in deeper water than the preceding species.

3. Echinus pictus (*Norman*).

Toxopneustes pictus, Norman. The last report on dredging among the Shetland Isles, Brit. Ass. Report for 1868, p. 314.

Not common, but occasionally taken with *E. miliaris*, G. H.

I have met with a few specimens on the Northumberland coast in deep water with a moderately rough bottom: some have also occurred off Seaham under similar conditions. It is rather apt to be mistaken for *E. miliaris*.

4. E. Dröbachiensis, *Müller*. (Silky-spined Egg-urchin.)

E. Dröbachiensis, Müller. Zool. Dan. Prod., No. 235.

Echinus neglectus, Forbes. Brit. Starfishes (1841), p. 172.

Toxopneustes Dröbachiensis (Müller), Norman. The last report on dredging amongst the Shetland Isles, Brit. Ass. Report, 1868, p. 314.

From the boats, Cullercoats, J. A.

Very common inside the Farne Islands, associated with *E. esculentus*. In 1863 we dredged a large number from this ground; but in 1864, although we spent several hours in attempting to dredge over the same spot (which we thought we had marked), we utterly failed to hit it. We got a few specimens amongst our mixed dredgings, but only in the one spot alluded to did we find them in quantity. I have not taken it on the Durham coast.

Family. CLYPEASTERIDÆ.

Genus. ECHINOCYAMUS, (*Leske*).

1. Echinocyamus pusillus (*Müller*). Green Pea-urchin.

Frequent, J. A.

Common, from deep water, all along our coast. Remarkably fine specimens were taken in 1863 and 1864 off the Farne Islands. It appears to be very plentiful off Cullercoats, as I obtained between one hundred and forty and one hundred and fifty specimens from the stomach of a small haddock from that locality; of course the spines were all gone.

FAMILY. SPATANGIDÆ.

GENUS. SPATANGUS, (*Klein*).

1. SPATANGUS PURPUREUS (*Müller*). Purple Heart-urchin.
   Spatangus purpureus, Forbes. Brit. Starfishes (1841), p. 182.

Deep water, J, A.

Decidedly common on our coast. I have remarkably fine specimens, from deep water, on the Northumberland coast. Off Seaham they are not so large.

GENUS. BRISSOPSIS, (*Agassiz*).

1. BRISSOPSIS LYRIFERA (*Forbes*). Fiddle Heart-urchin.
   Brissus lyrifer, Forbes. Brit. Starfishes (1841), p. 187.

Dredged by Mr. McAndrew, off this coast, J. A.

The above would lead one to suppose that Mr. Alder had never himself taken it from the fishing lines or other sources. The dredge shows it to be frequent in deep water, both on the Northumberland and Durham coast. I have taken very fine specimens in Berwick Bay, thirty-five to forty-five fathoms, and off Seaham in about thirty fathoms. I suspect it is never found amongst "inshore" dredgings.

GENUS. ECHINOCARDIUM, (*Gray*).

1. ECHINOCARDIUM CORDATUM (*Pennant*). (Common Heart-urchin—Mermaid's Head).
   Amphidotus cordatus, Forbes. Brit. Starfishes (1841), p. 190.

Common, on sandy beaches, J. A.

I have found this species to be rare amongst dredged material, but very common on some of the sandy portions of our coast. Large numbers of the dead shells (denuded of spines) were seen upon the north-east portion of Holy Island Sands; doubtless in a few fathoms water off this spot the living animals could be taken. Strange to record, this very common Echinoderm is amongst the rarest in my collection, as I have only two specimens, both from the Northumberland coast. My dredgings have been confined to deeper water, and more generally remunerative ground than the usually barren "inshore" sandy ground of our coast.

2. Echinocardium ovatum (*Leske*). Rosy Heart-urchin.

Spatangus ovatus, Leske ap Klein, p. 252. Pl. XLIX., figs. 12–13.

Amphidotus roseus, Forbes. Brit. Starfishes (1841), p. 194.

Rather rare, J. A.

Very common on our coast, it being rare indeed that the dredge comes up from a suitable depth (fifteen to thirty-five fathoms) without one or more specimens. In deep water we frequently bring up large numbers at a single haul: probably it does not take the hook, hence Mr. Alder's different experience.

3. Echinocardium pennatifidum (*Norman*). Pl. V., figs. 1–5.

Amphidotus gibbosus, Barrett. Ann. Nat. Hist., 2nd Series, Vol. XIX. (1857), p. 33. Pl. VII., fig. 2.

Echinocardium pennatifidum, Norman. Last report of dredging among the Shetland Isles, Brit. Ass. Report, p. 315, 1868.

In 1864 I dredged a fine specimen of this species in Berwick Bay, which was recorded in the dredging report of that year. I believe it is the only one that has been taken on the north-east coast. It was whilst examining this specimen that Mr. Norman detected the difference of character between *E. gibbosus*

(Barrett), and *Amphidotus gibbosus* (Agassiz). He accordingly proposed to substitute the specific name of "pennatifidum" for that of "gibbosus." At plate V., fig. 1, this specimen is figured of the natural size, figs. 2–4 representing valves of the two kinds of pedicellariæ present on this species, fig. 2 being the immature stage of fig. 3. The readiest means of identifying this species is by examination of the ambulacral pores, to facilitate which drawings of this species (fig. 5), of *E. cordatum* (fig. 6), and of *E. ovatum* (fig. 7) are given. It will be observed that *E. pennatifidum* has four pairs in the fore and fourteen in the hinder; *E. cordatum* seven and twelve; and *E. ovatum* four and nine. These are all figured from specimens in my collection, and represent the left anterior lateral arrangement of pores drawn of the natural sizes and contour. Forbes in his British Starfishes gives *E. cordatum* six and eleven, and *E. ovatum* five and ten: the numbers are not always exactly the same, being dependent upon age.

Order V. HOLOTHUROIDEA.

Family. HOLOTHURIADÆ.

Genus. CUCUMARIA, *Blainville.*

Cucumaria elongata (*Düben and Koren*). Pl. I., figs. 1–14.

Cucumaria elongata, Düben and Koren. Skan. Echin., p. 301. Pl. XI., fig. 56, and Pl. IV., fig. 14.

Cucumaria elongata, Alder. Trans. Tyneside Nat. Field Club, Vol. IV., p. 43. Pl. II., fig. 3.

From deep water boats, rare, J. A. Northumberland and Durham coasts, rather rare, G. H.

Mr. Alder was the first to record the capture of this species on our coast, Mr. Joseph Wright, with his well-known assiduity, having procured two specimens from the five-men boats in 1857. In 1863 Mr. G. S. Brady and I obtained a few specimens when dredging off Holy Island, and again off Seaham in the following year. It is an inhabitant of deep water, and has never been taken by us in any of our inshore dredgings. The spicules from the body may be described as irregularly formed plates inclining to an elongated oval form, which is the normal type, the largest examined being about $\frac{30}{1000}$ of an inch in length and about half that breadth. They are pierced by a number of circular and oval holes, the largest being about $\frac{2}{1000}$ of an inch across. The early and gradual growth of these spicules is represented by figs. 1–14, the latter numbers being mature plates.

Cucumaria lactea (*Forbes and Goodsir*). Milk-white Sea-girkin. Pl. I., figs. 15–23.

Ocnus lacteus, Forbes. Hist. Brit. Starfishes (1841), p. 231.

Cucumaria lactea, Düben and Koren. Skand. Echin., p. 297. Pl. IV., figs. 3–7; and Pl. XI., fig. 55.

Not uncommon, J. A. Northumberland and Durham coasts, rather rare, G. H.

This species was only taken during the first and last of the dredging expeditions already referred to, and did not then occur on the Durham coast. I have however obtained two or three small specimens during my private dredgings off Seaham. These are very small as compared with some kindly given me by my friend, Mr. G. S. Brady, obtained by him on the west coast of Ireland. Mr. Alder, from his remark "not uncommon," would appear to have more frequently met with it, probably from refuse brought into Cullercoats by the fishing boats. Probably it is an inhabitant of deeper water than we usually have the chance of dredging in. The body spicules are very elegant in form, consisting of a number of spherules arranged in a regular manner at moderate distances from each other and connected by thinner bands of the same material, of such form as to leave circular or slightly oval perforations: the largest of these body spicules are about $\frac{5}{1000}$ of an inch in their greatest length. In addition to these spicules we find in a "boiling" a number of flat plates of irregular form, mostly much longer than broad, and about $\frac{1}{100}$ of an inch long. The perforations in these spicules vary from $\frac{4}{1000}$ to $\frac{1}{1000}$ of an inch in diameter.

GENUS. THYONIDIUM, (*Düben and Koren.*)

THYONIDIUM HYALINUM, *Forbes.* Glassy Sea-cucnmber. Pl. I., figs. 24–33.

Cucumaria hyalina, Forbes. Hist. Brit. Starfishes (1841), p. 221.

Thyonidium pellucidum, Düben and Koren. Skand. Echin., p. 303. Pl. IV., figs. 15–17; and Pl. XI., fig. 57 but not *Holothuria pellucida* of Vahl).

Rare, Northumberland coast, G. H.

A single specimen of this rare species was taken on the Northumberland coast during the dredging expedition of 1864, the only one that has occurred, so far as I am aware. The spicules are of an irregular form, sometimes approaching to an uneven rounded shape, the perforations being either round or four to six sided, the body spicules having a central elevated part, causing it to present the appearance of a sort of three-legged stool. Largest spicules about $\frac{4}{1000}$ of an inch in diameter, the perforations barely exceeding $\frac{8}{10000}$ of an inch across.

THYONIDIUM COMMUNE, *Forbes and Goodsir.* Common Sea-cucumber (of Forbes). Pl. II., figs. 1–18.

Cucumaria communis, Forbes. Hist. Brit. Starfishes (1841), p. 217.

The dental apparatus only from deep water, J. A.

A single specimen is said to have been dredged on the Dogger Bank during the expedition of 1862. Unfortunately the specimen has been mislaid, and, never having seen it, I cannot personally attest to the occurrence of this species on our coast, not having myself taken it. I am indebted to the Rev. A. M. Norman for a mounted slide from which the figures of plate II., numbers 1–18, have been drawn; 1–5 representing the ordinary body spicules, which, when mature, are about $\frac{5}{1000}$ of an inch across, the largest of the perforations being only $\frac{7}{10000}$ of an inch. Figs. 6–17 represent the spicules from the suckers: these are excessively small, the longest being barely $\frac{3}{1000}$ of an inch in length. Fig. 18 represents a portion of a sucker tip, which is a flat plate of a circular form about $\frac{6}{1000}$ of an inch in diameter. It will be seen the edge of the spicule figured is irregular in outline, the deposit having run into a number of pointed projections differing in this respect from the body spicules.

GENUS. THYONE, (*Oken.*)

THYONE FUSUS, *Müller*. Common Thyone. Pl. II., figs. 19–40.

Holothuria fusus, Müller. Zool. Dan. Pl. X., figs. 5, 6.

Thyone papillosa, Forbes. Brit. Starfishes (1841), p. 233.

Cullercoats, from the boats, not uncommon, J. A.

This is by far the commonest species on our coast, several specimens having been taken on the various stations where collecting has been pursued, it may be considered to occur all along our shores in deep water, usually on a rough bottom. It is a well marked form, not readily mistaken for any other species found with us. Its spicules also are usually readily distinguishable; figs. 30–39 representing those found in the skin of the body; 19–29 those from the suckers; 40 the plate from a sucker tip. The length of the body spicules is about $\frac{3}{1000}$ to $\frac{4}{1000}$ of an inch; those from the suckers about $\frac{6}{1000}$ long by $\frac{1}{1000}$ to $\frac{3}{1000}$ broad; the diameter of the sucker disc (fig. 22) $\frac{8}{1000}$.

THYONE RAPHANUS (*Düben and Koren*). Pl. III., figs. 22–30.

Thyone raphanus, Düben and Koren, Echi., p. 311. Pl. V., figs. 49–55; and Pl. XI., fig. 58.

Thyone raphanus, Thompson. Ann. Nat. Hist., 1847. Vol. XX., p. 176.

Rather rare on the Northumberland and Durham coasts, G. H.

Our captures of this species have been limited to three or four specimens, all of moderate dimensions. The spicules are of a very distinct character, consisting of large flat plates of irregular outline, perforated by a varying number of circular or slightly oval holes. Most of the spicules have little "beads" or "knobs" arranged round the perforations with some degree of regularity. These beads do not, however, occur on all the spicules. I am unable to state whether their presence is an indicator of age; possibly it is, as those without them are manifestly of more recent production: figs. 22–25 appear to be the earlier stages, figs. 26–28 those of more mature growth. The largest examined measured $\frac{9}{1000}$ of an inch across, the largest perforations being only $\frac{1}{1000}$ of an inch. Figs. 29 and 30 represent the spicules found at the tips of the suckers: these are very small, being only $\frac{3}{1000}$ of an inch across their widest part; many of the perforations are only $\frac{1}{10000}$ of an inch in diameter.

THYONE FLEXUS, *Hodge.*

> *Thyone flexus*, Hodge. Nat. Hist. Trans. of Northumberland and Durham, Vol. I. Pl. X., figs. 2–13 (which see for drawings).

Rare, a single specimen from Berwick Bay.

The only instance in which this species has occurred was in 1864, when a specimen was taken, as recorded above, in deep water. Having so recently figured the spicules it is unnecessary that they should appear here.

GENUS. PSOLUS, *Oken.*

PSOLUS PHANTAPUS, *Linn.* Snail Sea-cucumber. Pl. III., figs. 1–21.

> *Holothuria phantapus*, Linnæus. Syst., p. 1089.
>
> *Psolus phantapus*, Forbes. Hist. Brit. Starfishes (1841), p. 203.
>
> *Cuvieria phantapus*, Düben and Koren. Skan. Echi., p. 313. Pl. IV., fig. 34.

Occasionally brought in by the five-men boats, rare by the dredge. Young from Berwick Bay, G. H. Cullercoats, J. A.

Only once taken in a mature state during the dredging expeditions, viz., in 1862, on the Northumberland coast. It is sometimes brought in by the fishing boats, probably from the neighbourhood of the Dogger Bank. It is our largest species, and one that cannot well be mistaken in its mature state; but in its young stage it presents a totally different aspect. Several small Holothurians were taken in 1864 which we considered were *P. squamatus* of Von Düben and Koren: a few years before this the late Mr. Alder obtained a similar form at Cullercoats, which he at the time referred to the same species. Recently Mr. Norman, in his "Last Report on Dredging among the Shetland Isles," at page 316 writes:—"The young of this species (*Psolus phantapus*) has been mistaken by British naturalists for *P. squamatus* of Scandinavian authors, a species which, though several times recorded, has not yet been found in the British seas." This remark led me to doubt whether we were justified in referring our species, as recorded in the dredging report for 1864, to *P. squamatus*. Further communication with Mr. Norman rendered it desirable to investigate the matter very carefully, for although the spicules from a mature *P. phantapus* differed very materially from those found in our little forms, Mr. Norman was of opinion that if individuals presenting intermediate stages of growth were examined, a connecting link would be established. Through the kindness of our Newcastle Museum authorities I have been enabled to examine several young *P. phantapus* from Shetland,* younger than my undoubted *P. phantapus*, and older than the doubtful forms. Externally these animals differ in a marked degree from the Holy Island specimens: the spicules, as pointed out by Mr. Norman, agree in their general characters and mode of growth, therefore in recording the occurrence of *P. squamatus* an error was committed, as it was only the young of *P. phantapus*. Nothing could be more dissimilar than the young and mature of this animal externally, and in the spicules from the foot the difference is most conspicuous. A reference to the figures in plate

* I would here record my obligations to the Rev. A. Bethune for his kindness in translating me Von Düben and Koren's descriptions of *P. phantapus* and *P. squamatus*. His translation was most valuable, in enabling me to realise the respective features of the species, as described by these writers, who are undoubtedly *authorities* on the Echinodermata.

III. will confirm this statement; for whereas those from mature animals are flat plates with many perforations, those from the young present a cup-like form having only three to five perforations and a number of rounded projections: intermediate stages show that further growth proceeds in a lateral direction, the "knobs" assuming the character of the little warts depicted in fig. **11**, the concavity (of the cup) being obliterated by the further accretion of calcareous material. Of course it will be understood that all the spicules found in the "foot" of a mature *P. phantapus* have not had this origin: many are there in their earliest stages of growth and never present any approach to a cup shape, but will all along present the character of flat plates. Examples of these are shown by figs. 1–5, the corresponding growth, so to speak, in the young of *P. phantapus* being represented by figs. 13–16.

It would be interesting to trace and figure all the progressive stages, but this is rather beyond the scope of a catalogue; sufficient examples have been given, it is hoped, to enable the spicules to be readily identified. Mature spicules from the foot of this species measure about $\frac{7}{1000}$ of an inch across, the largest perforations being about $\frac{16}{10000}$ in diameter. The spicules from the very young only measure $\frac{3}{1000}$ in diameter. The plate at the tip of a sucker is often $\frac{1}{40}$ of an inch across, or even larger.

EXPLANATION OF PLATES.

PLATE I.

Figs. 1–14. Spicules from body of *Cucumaria elongata*, × 60.
Figs. 15–23. ,, ,, *C. lactea*, × 200.
Figs. 24–33. ,, ,, *Thyonidium hyalinum*, × 200.

PLATE II.

Figs. 1–5. Spicules from body of *Thyonidium commue*, × 200.
Figs. 6–17. ,, ,, tentacles of the same, × 500.
Fig. 18. Part of plate from sucker tip of the same, × 200.

Figs. 19–29.	Spicules from suckers of *Thyone fusus*, × 200.
Figs. 30–39.	,, ,, body of the same, × 200.
Fig. 40.	Plate from sucker tip of the same, × 200.

PLATE III.

Figs. 1–11.	Spicules from foot of mature *Psolus phantapus*, × 200.
Fig. 12.	Part of plate from sucker tip of the same, × 200.
Figs. 13–21.	Spicules from foot of immature, the same, × 200.
Figs. 22–28.	,, ,, body of *Thyone raphanus*, × 200.
Figs. 29-30.	,, (plates) from sucker tips of the same, × 200.

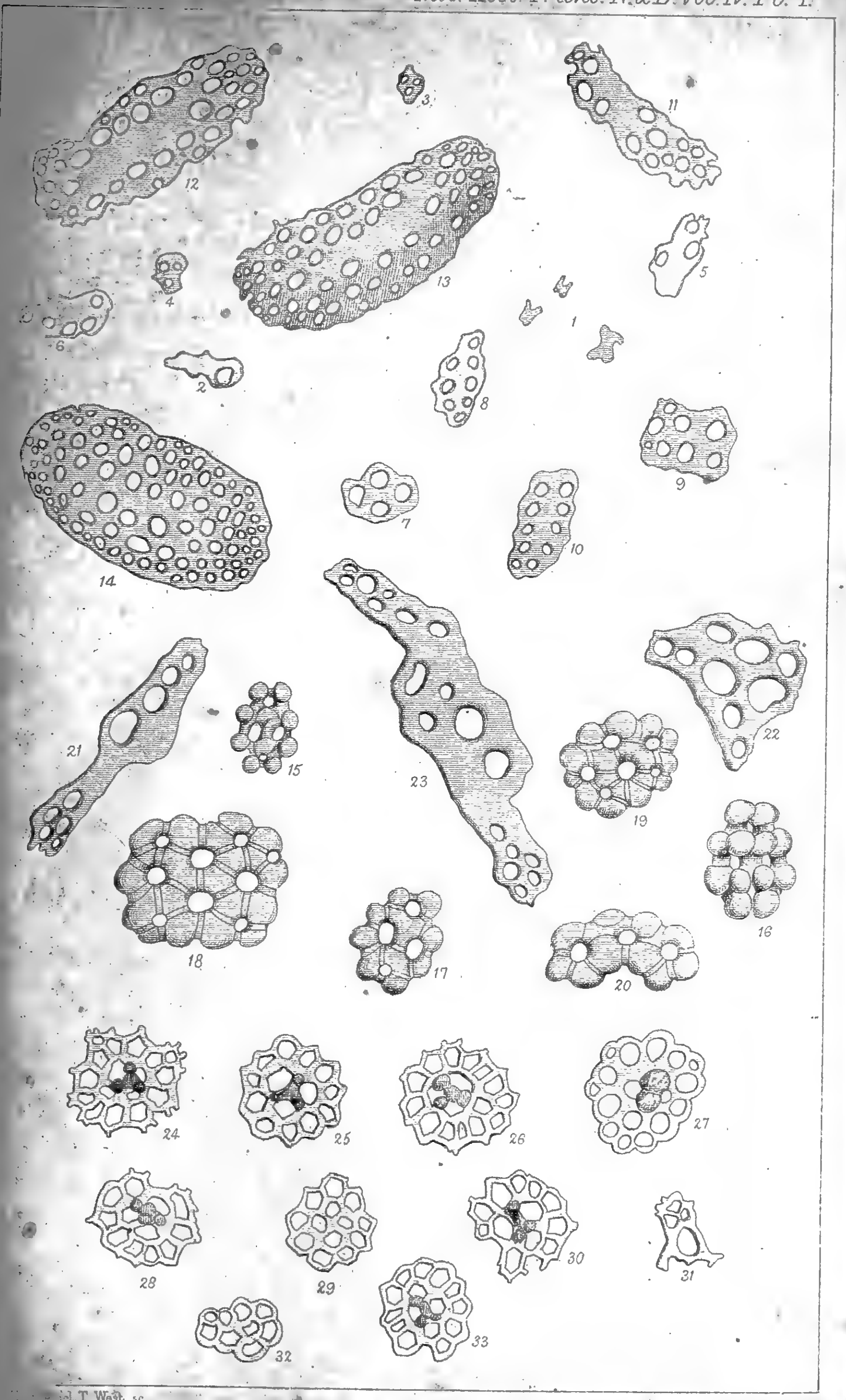
PLATE V.

Fig. 1.	*Echinocardium pennatifidum*, nat. size.
Figs. 2–4.	Valves of pedicellariæ from ditto, × 50.
Fig. 5.	Left anterior lateral pores of *E. pennatifidum*, nat. size.
Fig. 6.	,, ,, *E. cordatum*, nat. size.
Fig. 7.	,, ,, *E. ovatum*, nat. size.

IV.—*Notes on the Geology of Part of South Durham.* By Jas. W. Kirkby and Joseph Duff.

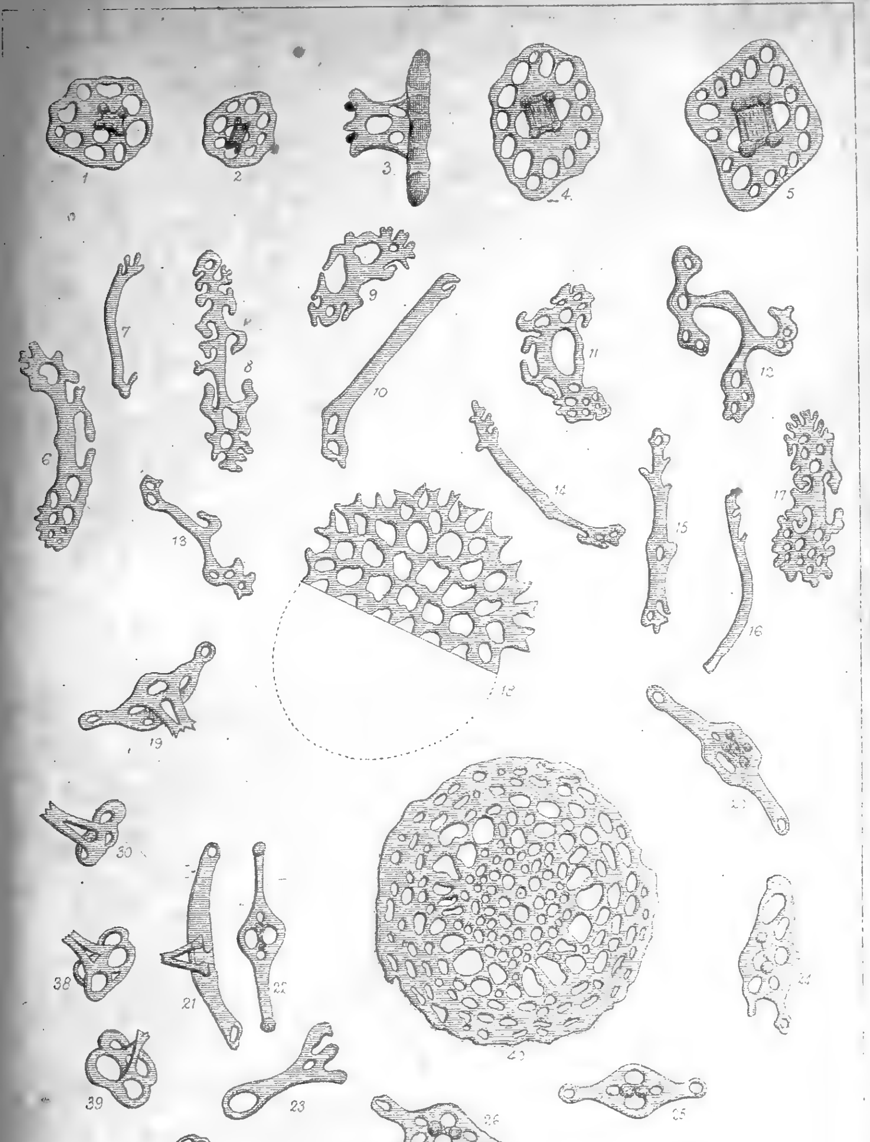
The following observations are properly termed notes on the geology of the district of which they treat, the said district being the country about the village of Etherley. They are notes in the sense of their making no claim to being a full account of the geology of that region, being rather the results of such researches as circumstances or disposition occasionally permitted or suited the authors to make (often in company) during the years 1866, 1867, and 1868.

The prevailing rocks about Etherley are Coal Measures belonging to the lower portion of the series. To the north and north-east these are the only rocks present. A few miles westward they outcrop and give place to the Millstone Grit, which forms much of the fell land in the west of the county. Within as short a distance to the south the coal-field also terminates by the rather abrupt outcrop of its beds, the grit again occupying

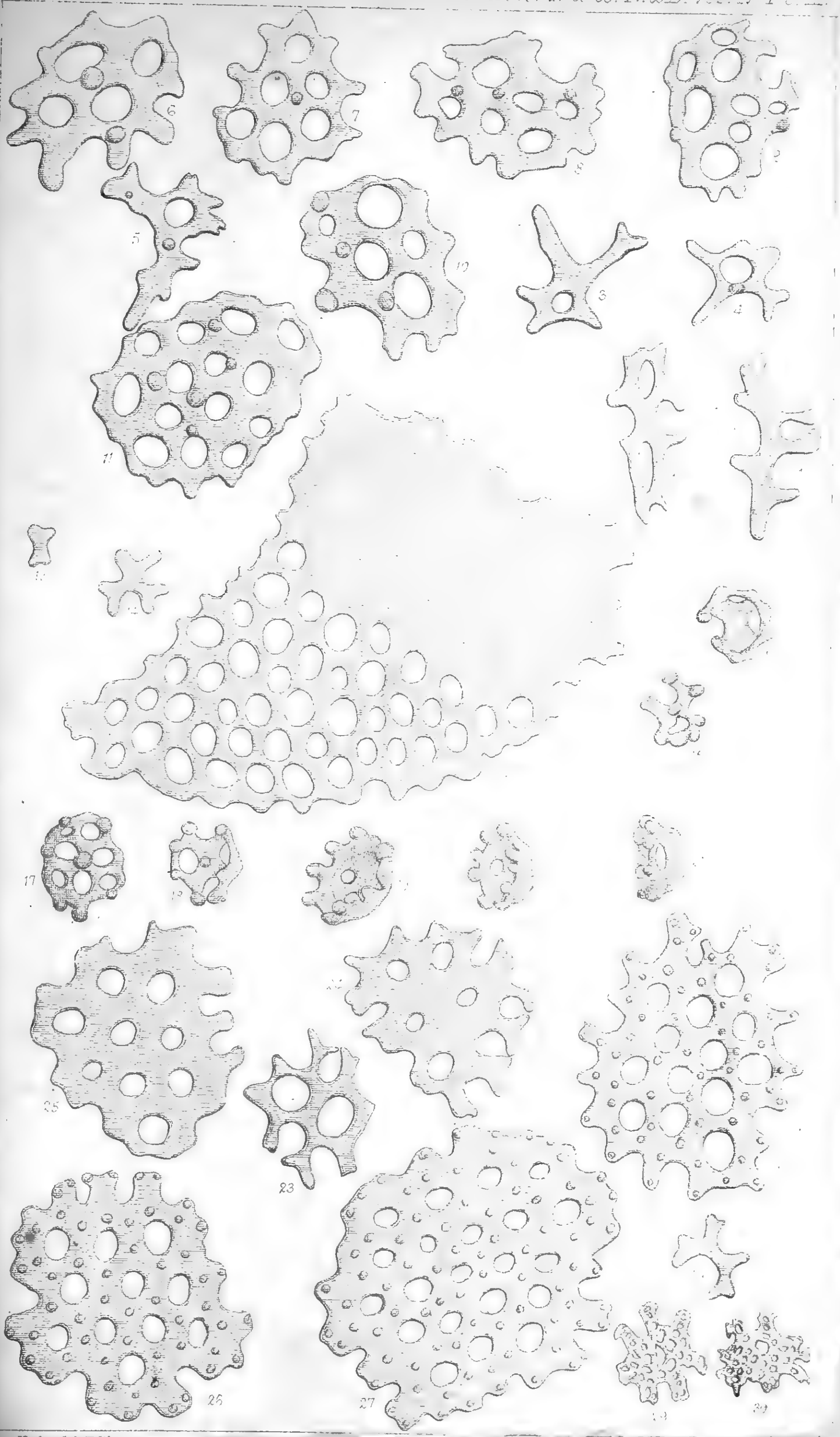


T. West, sc.

West & Co. Lith.



Geo. Hodge del. T. West sc.



Geo Hodge del. T. West sc. West & Co. lith.


1
2
3
4
5

the country beyond. A few miles to the east the Coal Measures are overlaid by the Magnesian Limestone. Our remarks at present chiefly relate to the Coal Measures.

We may remark that this portion of the Durham coal-field has long been noted as a colliery district, as well as for the good quality of its coal. As far back as the twelfth century there is evidence of coal being wrought here. Long after that, though still far back from the present time, the collieries on Cockfield Fell, and those about Etherley and other places near, were in full operation, producing coal not only for South Durham, but for a very large portion of Yorkshire. This was long before the era of railways — even before that of good roads of any kind, for much of the coal was carried away on pack-horses, as well as in carts and waggons, as far as Lofthouse, Guisborough, Ripon, and other places as distant. The method of getting the coal was just as primitive as its mode of transit. There were no deep sinkings. So much, indeed, of the coal lay near the surface, that there was no need to go far for it. A round hole four or five feet wide (sometimes scarcely that), and a few fathoms deep, would "win" the coal: a gin, and perhaps an old blind horse or a donkey, a piece of hempen rope, a few dozen hazel corves, and a barrow or two would be plant enough to work it. When the coal near the shaft was got and the drawing below became troublesome, a new pit would be sunk to win a fresh patch of coal. So often would this be repeated, that we have seen a field of a few acres with almost a score of these old pits in it. At a later period, when the easiest got coal began to be exhausted, deeper pits were sunk, engine power of a simple type was introduced, and a little more systematic mode of working adopted; but by this method probably not more than a third of saleable coal would be got from the seam, the remainder being left below as pillars or as dross, or burnt at bank in great mounds or "pit heaps" of small coal. Later still railways opened out the country; and yet more recently, the iron-ore of Cleveland was discovered—events which effected a wonderful change in the coal-trade of this district, greater perhaps than in any other portion of the coal-field. For, within a short time coke became an article of great demand, and the small coal or dross, which had previously been a source of trouble and expense to the coal-owner, now proved of almost as much value as the large coal, which in such soft seams as the "Brockwell," certainly meant an important change for the better.

COAL MEASURES.

The Coal Measures of this district differ little in general structure from the rest of the coal-field, being composed of alternating strata of sandstone and shale, with seams of coal and their accompanying underclays, and more rarely bands of ironstone.

The principal coal seam is the Brockwell, which ranges from four and a half feet to six and a half feet thick: it is generally of excellent quality, forming a good but rather soft household coal, while for coking it is probably the best in the county. Above it, from twelve to twenty fathoms, is another, called the Five Quarter or Busty, of inferior quality to the first, and varying from three feet to five and a half feet thick. This is chiefly wrought as a steam coal, but is also largely used for coking. Occasionally on the dip side of the Butterknowle and Wigglesworth faults a third and even a fourth workable seam are brought in. The first of these is named the Harvey or Yard Coal; the latter is very little known. The distribution of the last mentioned coals is very limited, and the importance of the district as a coal field has hitherto depended upon the two former, more particularly upon the Brockwell.

Below the Brockwell there is a considerable thickness of Measures containing a few thin coals which will be afterwards noticed separately, as the Brockwell is taken as the base of the group of strata containing all the important coal seams.

The dip of the Coal Measures on the north side of the Butterknowle fault is usually to the east, at no great angle; towards the southern termination of the field, on the south side of the great faults, the general inclination of the strata is northerly, at a comparatively high angle.

Fig. 1 is a generalised vertical section of the coal-field about

Etherley, showing the position and thickness of the various coals.

The Measures above the Brockwell are exposed in various quarries, railway cuttings, and natural sections. They may be seen in quarries at Shildon, Brussleton, Etherley, Evenwood, and other places; in cuttings on the railway crossing Cockfield Fell, and more especially in sections exposed in the Gaunless Valley, where both the Five Quarter and Brockwell coals outcrop. But in this district, as in all other parts of the coal-field, it is from the many pit sinkings, borings, and other works in connection with coal mining, that a knowledge of the Measures is best obtained. It is therefore with pleasure that we are able to give, through the courtesy of W. C. Stobart, Esq., three of the following borings and pit sections that have been put through the Measures on the Etherley and Newton Cap royalties; as well as a boring put down on Cockfield Fell by the owners of the New Copley Colliery. The first given (No. 1) is the most south-westerly, being situate close on the outcrop of the

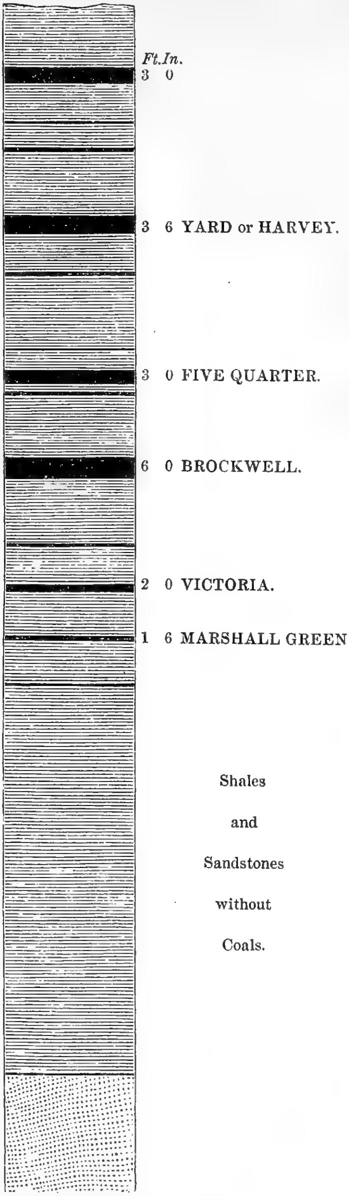


Fig. 1.—Vertical Section of Coal Measures of Etherley District, showing the relative position of the coal seams.

coal-field; the second is rather more than a mile to the north-east of the former; the third is about two and a half miles further away in the same direction; and the fourth is three and a half miles still further on in the same course, giving unitedly a range of more than seven miles on nearly a S.W. and N.E. line.

No. 1.—TABLE OF STRATA BORED THROUGH AT NEW COPLEY COLLIERY, SOUTH OF THE WIGGLESWORTH FAULT, 1866.

		Ft.	In.	Feet.	In.
1.—Soil, clay, and gravel				8	0
2.—Broken brown sandstone				13	0
3.—Sand				1	6
4.—Strong brown sandstone				25	6
5.—FIVE QUARTER COAL	Coal	4	4	7	0
	Clay band	0	6		
	Coal	0	2		
	Clay band	0	5		
	Coal	1	7		
		7	0		
6.—Strong white sandstone, with partings				18	3
7.—Strong blue shale				9	0
8.—White sandstone girdles				0	3
9.—Mild blue shale				1	6
10.—COAL				0	4
11.—Fireclay				1	10
12.—Grey shale				4	4
13.—Ironstone girdle				0	4
14.—Strong grey shale				2	10
15.—Strong sandstone girdle				0	7
16.—Strong grey shale				7	0
17.—Mild blue shale				0	6
18.—Strong grey shale				2	4
19.—Strong white sandstone				4	10
20.—Brass band or ball				0	4
21.—Strong white sandstone				6	5
22.—Mild blue shale				16	0
23.—Sandstone girdles				2	0
24.—Mild blue shale				5	5
25.—Ironstone				0	2
26.—Blue shale				1	3

		Feet.	In.
27.—Ironstone		0	2
28.—Mild blue shale		2	0
29.—Mild coal shale		0	2
30.—BROCKWELL COAL	Ft. In. Cannel 0 7 Coal 4 6 Band 0 $0\frac{1}{2}$ Coal 1 $3\frac{1}{2}$ 6 5	6	5
		149	3

At the place where this bore was made the strata dip about one in three to the north, hence their actual thickness will not be quite so great as is represented in the above section.

No. 2.—TABLE OF STRATA PASSED THROUGH IN SINKING THE No. 2 ENGINE PIT, LANDS COLLIERY, NEAR COCKFIELD.

		Feet.	In.
Gravel		3	0
Strong clay, with gravel and large stones		12	0
Blue shale		1	6
FIVE QUARTER COAL	Ft. In. Coal 4 4 Band 0 6 Coal 1 8	6	6
Grey shale		3	6
White sandstone, mixed with brown "whin"		3	6
Grey arenaceous shale		1	0
White ,, ,,		2	0
Grey ,, ,,		1	6
Soft brown sandstone		1	6
Grey arenaceous shale		1	0
White sandstone, with brown "whin"		2	0
Blue arenaceous shale		12	0
Black shale		1	0
COAL		0	2
"Whin"		1	0
Black shale		1	6
COAL		0	9
Grey shale		3	4
Blue shale		9	6
Brown "whin"		0	10

	Feet.	In.
Grey sandstone	2	6
Grey shale, with sandstone bands	15	0
Blue shale, with ironstone bands	3	0
BROCKWELL COAL { Cannel (Ft. 0, In. 11); Coal (Ft. 5, In. 11) }	6	10
	96	5

No. 3.—TABLE OF STRATA BORED THROUGH NEAR HUNTER HILL HOUSE, ETHERLEY, 1828.

	Feet.	In.
Soil	0	9
Strong brown clay	9	0
Dark grey shale, with hard bands	18	3
Grey shale, with sandstone bands	12	0
Black shale	9	5
Grey shale, with sandstone bands	10	0
Foul COAL	0	5
Grey shale	1	10
COAL	0	10
Grey shale	3	0
Brown and white sandstone	6	0
Grey shale	5	0
Blackstone	3	6
COAL	3	5
Grey shale	4	7
COAL	0	6
Grey shale	4	0
Grey sandstone	2	0
Strong white sandstone, with bands of "whin"	34	6
Grey shale	6	0
Strong white sandstone	8	6
COAL	0	10
Dark grey shale	3	10
COAL	1	4
Strong grey shale, with sandstone girdles	24	6
Black shale	0	10
COAL	1	1
Grey shale	4	0
Strong white sandstone	9	0
Dark grey shale	2	0
COAL	0	8

	Feet.	In.
Grey shale	1	5
COAL	0	4
Grey shale, with girdles of sandstone and "whin"	29	0
Grey shale, with "whin" girdles	22	8
Dark grey shale, with girdles	4	3
SPLINT COAL	0	10
Shale, mixed with foul coal	1	5
FIVE QUARTER COAL, coarse and splinty the last yard	4	0
Grey shale	0	8
Strong shale	20	4
COAL	1	6
Dark grey shale, with sandstone girdles	9	7
Strong white sandstone	2	6
Strong shale, with "whin" girdles	6	9
COAL	0	6
Dark grey shale, mixed with coal	0	4
Grey shale, with sandstone girdles	15	9
FOUL COAL, mixed with shale	1	0
Dark grey shale	6	0
Strong white sandstone, with "whin" girdles	9	2
"Whin"	1	6
Strong white sandstone	1	4
Grey shale, with thin girdles	19	1
BROCKWELL COAL	6	7
Dark grey shale, hard and brassy near top	1	0
	359	1

No. 4.—TABLE OF STRATA SUNK THROUGH AT THE LYON'S PIT, NEWTON CAP COLLIERY, 1857.

		Feet.	In.
Clay		16	0
Strong blue clay		9	6
Brown sandstone		4	0
COAL		1	0
Blue shale		11	0
White sandstone		2	2
	Feet. In.		
COAL	Coal 0 4 Fireclay 0 6 Coal 0 8	1	6
Grey shale		3	6

				Feet.	In.
COAL				0	9
Grey shale				37	7
Black shale				7	0
		Ft.	In.		
FIVE QUARTER COAL	Coal	1	4	5	0
	Band	1	6		
	Coal	2	2		
Fireclay				0	8
White sandstone				33	0
COAL				0	10
Grey sandstone girdles				11	0
Grey "whin"				4	0
Blue shale				6	0
COAL				0	8
Fireclay				4	2
Blue shale				6	4
COAL				1	3
Grey shale, with sandstone girdles				15	0
White sandstone				19	1
Blue shale				3	0
BROCKWELL COAL				4	0
				208	0

It will be observed that both the Five Quarter and Brockwell coals diminish in thickness towards the south-west. The former, from a six feet seam, thins out to about three inches; the latter, from nearly seven feet (inclusive of cannel), to four feet. The decrease is partly due to the coming in and gradual thickening of bands of fireclay or shale in the seam, so as ultimately to separate it into distinct portions, one usually being thin and unworkable. Another mode of sectional decrement is by the upper or lower layer of the seam becoming coarse and banded with earthy matter, and thus of no value as coal. On the following page we give, from actual measurement, the thickness of these seams in six localities, commencing with the most south-westerly we have been able to inspect. Further to the north, in the valley of the Tyne, coals equivalent in position are wrought under, we believe, the same names: in the east of the coal-field their horizon does not appear to have been reached.

SECTIONS OF THE BROCKWELL COAL TO SHOW ITS DECREASE IN THICKNESS FROM THE S.W. TO N.E.

S.W. → N.E.

Locality	Bed	Ft.	In.
LANDS.	Cannel	0	11
	Coal	5	11
		6	10
RAILEY FELL.	Cannel	0	7
	Coal	5	9
		6	4
ETHERLEY.	Coal	6	0
ETHERLEY DEAN.	Coal	5	0
NEWTON CAP.	Coal	4	6
HUNWICK.	Coal	4	0

SECTIONS OF THE FIVE QUARTER OR BUSTY COAL FROM THE S.W. TO N.E.

Locality	Bed	Ft.	In.
LANDS.	Coal	4	4
	Band	0	6
	Coal	1	8
		6	6
NORWOOD.	Bratt	0	3
	Coal	4	0
	Band	0	3
	Coal	0	4
		4	10
RAILEY FELL.	Coarse Bratt	0	3
	Coal	3	2
		3	5
ETHERLEY.	Coarse Coal	0	5
	Fireclay	0	4
	Bratt	0	3
	Coal	3	1
		4	1
NEWTON CAP.	Coal	2	2
HUNWICK.	*Coal	0	3

* On the authority of Mr. Crudace, resident viewer.

In common with many other coals, the Brockwell and Five

Quarter are subject to considerable variation in the nature of their roofs. Most generally the stratum overlying the coal is argillaceous, in the form of shale (or "metal"), which is occasionally of great thickness. At other times it is sandstone, either with a thin layer of shale between it and the coal, or resting directly on the latter itself. In this case it is often curious to observe the evenness and regularity with which the sandstone appears to have been deposited on the coal over very extensive areas, when we consider that the laying down of the materials of such rocks is generally accompanied by powerful and rather erratic current action. But as a rule it is only rarely that traces of such action are evident. One of the most interesting of these occurred to us in the Five Quarter coal at Lands Pit, where a sandstone, lying about five feet above, descends abruptly through the shale roof and for three feet into the coal, as shown in the following sectional view, fig. 2, in which A is a yellow sandstone; B lightish grey shale, with fossil plants, about five feet thick; C coal five feet three inches thick; D fireclay. The

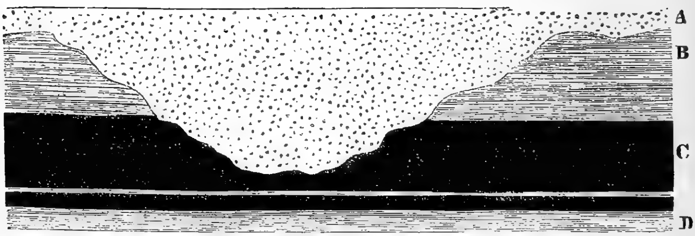


Fig. 2.—"Stone Roll" in Five Quarter Coal, Lands Colliery.

sandstone in other parts of Lands Pit forms the roof of the coal, but it is here superimposed on from three to five feet of shale, its line of junction with the latter being very irregular, as though the shale had been partially denuded before the deposition of the sandstone. Indeed there can be little doubt of this being the case, and of the "stone roll" figured representing a part more deeply denuded than usual. We were unable to trace its course far, though it was observed in other adjacent bords. Its width was about five yards at the top of the coal.

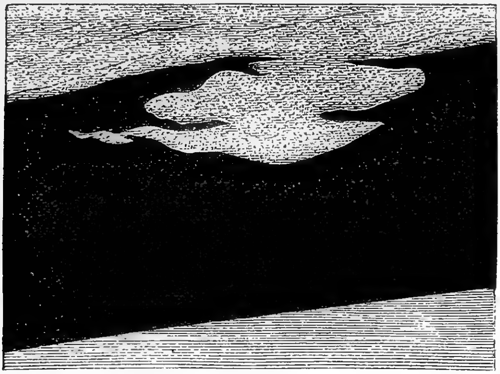


Fig. 3.

In the George Pit, Etherley, irregular beds and patches of sandstone occasionally appear in the Brockwell coal, where the roof is formed of that rock. Sometimes one or more thin beds of sandstone (often mixed with carbonaceous matter) come into the seam for a few yards, accompanied probably with many sandstone roots of *Stigmaria*. At other times thick masses of the same rock descend from the roof for two or three feet, fig. 3 representing one of them as seen in section.

These latter cases appear as if the sandstone was interstratified with the coal and hence contemporaneous; while in the former instance (fig. 2) the sandstone has evidently not been put down until after the deposition of the coal and overlying shale, as well as subsequent to their denudation.

A little to the north of Brussleton Folly there is a sandstone showing some peculiarities, which may be here noticed. The sandstone, which is well exposed in a quarry, is massively bedded, brown or yellowish, and coarse grained. It dips sharply to the N.N.E., and is seen for nearly fifty feet in depth. A few hundred yards to the east of the quarry what is apparently the same sandstone is seen dipping in a similar direction at an angle of 45°, evidently indicating the contiguity of a downthrow fault to the south.

The shaft of an abandoned pit is seen not far off, in which the Brockwell coal is said to have been worked many years ago.

The sandstone contains casts of large *Sigillariæ* and some Calamites, and in some curious masses of shale that are included in the sandstone the remains of ferns and other plants.

These fragments of shale are not regularly intercalated with the sandstone, but strewn broadcast, as it were, like boulders in drift clay. The following woodcuts will give the best idea of their mode of occurrence.

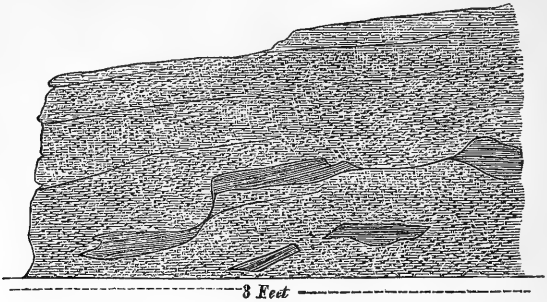


Fig. 4.—Sandstone with enclosed fragments of shale, Brussleton Quarry.

The pieces of shale are of various tints—grey, greenish, dark blue, and purple: some are finely laminated, and, as just stated, fossiliferous. These stratification planes usually approach those of the sandstone, but in some instances they form a considerable angle to the latter. They show no traces of rounding at the edges as though they had been transported any distance in water.

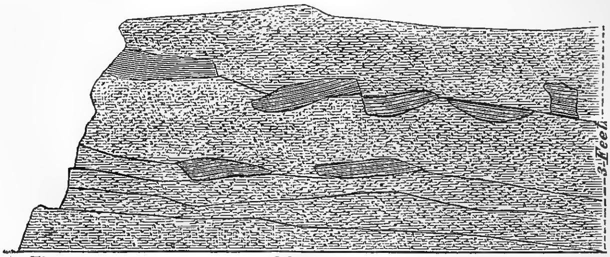


Fig. 5. 8 feet.

Perhaps the most probable explanation of these fragments is to consider them the remains of originally continuous beds of shale deposited with or near the sandstone, and afterwards broken-up and imbedded afresh by a local rearrangement of the materials forming the sandstone.

Faults.—The principal faults that affect this part of the Durham coal-field are noticed afterwards (p. 185). Connected with them are many minor dislocations, a few of which we figure in the following woodcuts.

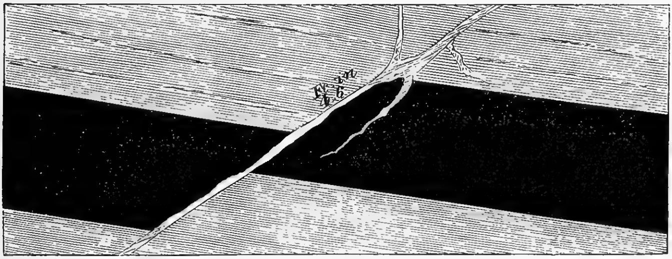


Fig. 6.—Fault in the Brockwell coal, Railey Fell Pit.

Fig. 6 exhibits a fault of the common type, hading nearly at 45° to the plane of the seam, with a throw of four feet nine inches. The coal is six feet thick, and good in quality close up to the fracture on both rise and dip sides. The roof is fine dark grey shale, with the planes of bedding beautifully polished or "slickened" for twelve yards or more on the high side of the fault, but not on the lower side. The strata rise to the fault on its high side, and dip to it on its low side as is usual.

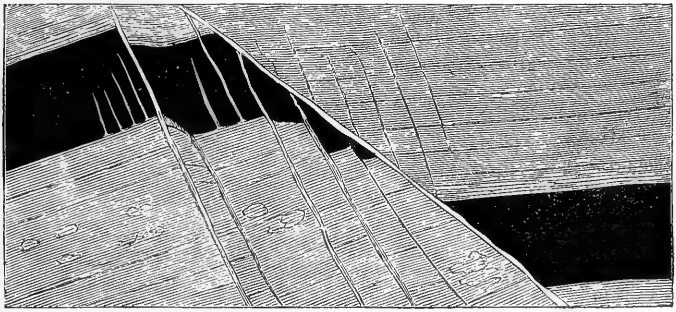


Fig. 7.—Fault in Brockwell coal, Railey Fell Pit.

Fig. 7 represents another fault of larger magnitude than the last, hading at nearly the same angle, but with the coal much broken-up on its high side, while on the other it is unaltered.

The manner in which strata abutting against a fault are affected by the dislocation is a subject worth investigating. It often happens that the coal, roof, and pavement on one side of a fracture are scarcely altered, while on the other they are very much disturbed for several yards from it. We at first thought that it was always the low side that was most disturbed, but additional experience showed us that sometimes one and sometimes the other was affected, and in certain cases both; while again in other instances the strata on neither side were much altered. The amount of throw has little to do with it, nor yet the inclination of the plane of fault. It is perhaps likely that the most broken side represents the side offering the least resistance to the disturbing force, which in most cases would be that in motion. It is also probable that in many cases the movement of a mass of strata in the act of displacement by faulting, would be rather that of a tilting than of a uniform depression or elevation of the whole; that is, while it moved downward along one plane of dislocation it would move upward along the plane of another, hence forming faults of depression and elevation contemporaneously, the position of the centre or axis on which the movement took place determining the relative amount of throw of each. Hence we have a possible explanation, not only of the broken sides of faults, but of the well-known facts that the inclination of strata is generally to a downthrow, and their declination to

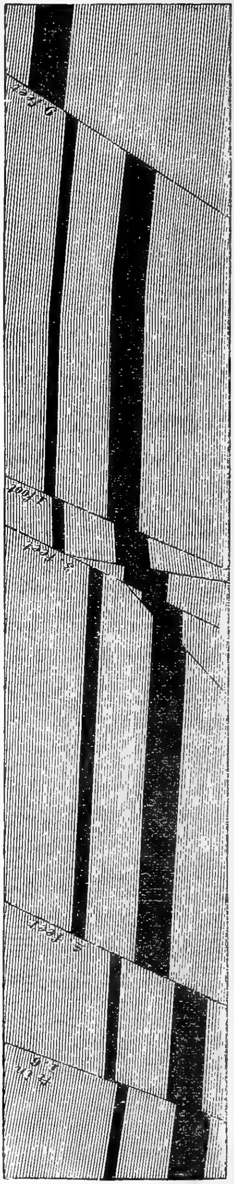


Fig. 8.—Group of Faults in Five Quarter coal, Railey Fell Pit.

an upthrow, notwithstanding that the reverse is sometimes taught.

The group of faults shown in fig. 8 occurs in the Five Quarter coal, at Railey Fell Pit, and within a range of thirty yards.

It is well known that a fault with the hade or plane of dislocation going from you is usually a downthrow, and one hading to you an upthrow. There are, however, exceptions to these rules, and the following figures show two that have come under our observation. The one given in fig. 9 occurs in the Brockwell seam, at Railey Fell Pit. On its low side the coal rises to the fracture at six inches to the yard, the hade being outward at 45°. These facts would lead a miner to expect that he had approached a downthrow, whereas the coal is thrown four feet up.

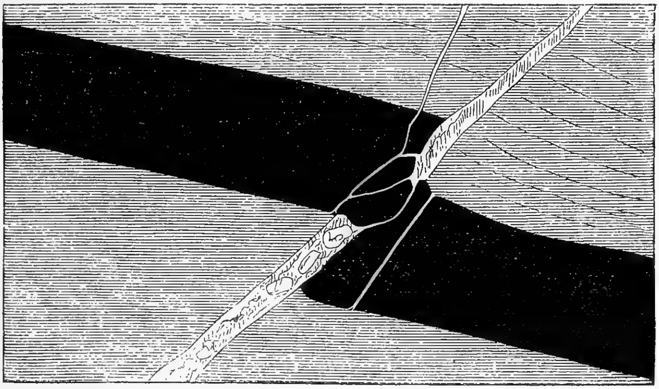


Fig. 9.—Reversed Fault in Brockwell coal, Railey Fell Pit.

We observed this reversed fault in other parts of the pit named, as the workings advanced. When first noticed the displacement was only sixteen inches, and when we saw it last it had apparently split up into two reversed faults and another almost with the hade vertical, giving a united throw of five and a half feet.

The dislocation shown in fig. 10 has been termed an "overlap" fault, on account of it hading reversely at an acute angle, one portion of the seam of coal being pushed on top of the other. In another part of the pit, about one hundred yards away, the throw is only eighteen inches; but the strata on each side of it form a flattish anticline, from which we suppose that in this instance the dislocation was caused by a force acting laterally.

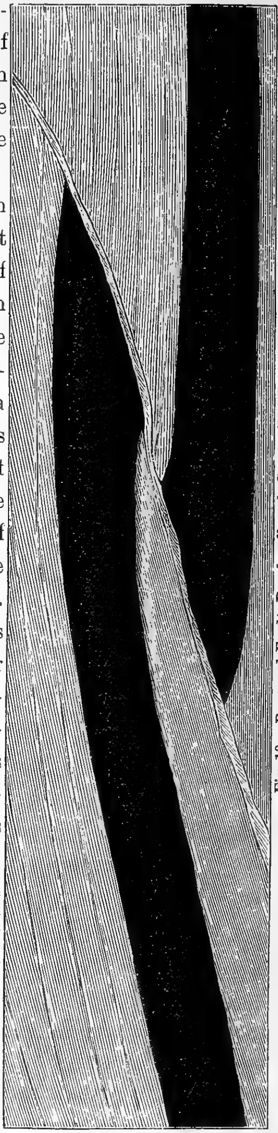


Fig. 10.—Reversed Fault, Brockwell coal, George Pit, Etherley.

In regard to the period of origin of the faults of the Coal Measures, it is certain that some of the greater of them date from after the deposition of the Magnesian Limestone; for the "Ninety Fathom Dyke" of the northern part of the coal-field brings in a patch of the latter formation on its depressed side. It is also evident that the fault at Houghton-le-Side (p. 186), from the tilted position of the strata in Toitup Quarry, likewise disturbs the Magnesian Limestone. But we do not know whether this is the case with the Butterknowle or any other large faults. It is certainly well known that many dislocations found in the Coal Measures do not affect the Magnesian Limestone, where that formation overlies the former in the east of Durham. We have even seen a "hitch" in the George Pit, Etherley, where the roof matter (sandstone) of the Brockwell seam has evidently, at the time when the fault was formed, been soft, to admit of it being run or squeezed into the coal, on the dip side, in thin tongue-like pieces. (Similar instances have occurred to one of us in the Fifeshire coal-field.) From these facts we are inclined to look upon the faulting of the coal-field to have taken place during various periods—probably from the latter part of the Carboniferous to some part of the Mesozoic time, or possibly later.

COAL MEASURES BELOW THE BROCKWELL SEAM.

The Measures between the "Brockwell" and the first of the grit rocks contain only thin seams of coal, which as yet are hardly in themselves to be wrought at a profit. Two of the coals, named the "Victoria" and "Marshall Green" seams, have been tried, and to some extent worked near Witton-le-Wear, in the Beechburn Valley, and on Cockfield Fell, and they are said to be of good quality. Other thin coals occur, some of which are associated with good fireclays; and occasionally beds of hard, fine grained siliceous sandstone form the floor of the coals, which are termed "ganister," from their resemblance, we suppose, to a similar rock forming the floors of the thin coals at the base of the Lancashire and Yorkshire coal-fields. This sandstone forms an admirable firestone, and it is used, mixed with fireclay, in the manufacture of a superior class of fire-bricks, locally known as "ganister" bricks.

Some interesting sections of these Measures are to be seen in the valley of the Gaunless west of Cockfield, where certain of the beds are worked for flags, roofing slates, and fireclay. The outcrop of some of the thin coals are also to be observed there. One of the latter, supposed to be the Victoria seam, is exposed on the S. bank of the Gaunless, above Haggerleases Lane, where it affords the following section:—

	Feet.	In.
White and yellow sandstone	6	0
COAL, with half-inch band near centre	1	6
Coarse black shale	0	1½
Greyish white siliceous sandstone, with many roots and rootlets of *Stigmaria*	1	6

The Oaky Bank Quarry, on the N. bank of the stream, near Gibbsineese, more especially offers a good section of what are probably the middle beds of the series, including one of the thin coals. The following account gives the strata exposed on the face of the quarry in 1867.

SECTION OF STRATA AT OAKY BANKS QUARRY.

	Feet.	In.
1.—Flaggy sandstone, with shaly partings below	7	0
2.—Blue shale—fissle	4	0
3.—Sandy shale	1	0
4.—Blue shale—fissle	3	0
5.—Hard, blackish sandstone	0	6
6.—Soft sandy shale	0	6
7.—Dark grey micaceous sandstone, with annelid markings on surface planes	3	0
8.—COAL	1	2
9.—Hard, fine grained siliceous sandstone } "Ganister"	0	6
10.—Soft sandstone, of irregular texture } "Ganister"	1	2
11.—Sandstone, with soft ferruginous concretions	2	0
12.—Sandy shale	0	6
13.—Yellow sandstone, irregularly bedded, with many large concretions	4	0
14.—Sandy micaceous shale, variegated and foliated, with worm tracks and ripple marked surface planes	3	0
15.—White, grey, and yellowish flags of fine grained sandstone, with ripple marked and worm tracked surfaces	8	0
	39	4

The beds worked are the flags (No. 15) at the base of the section, which have been followed a considerable distance underground. The surfaces of the flags are often beautifully rippled, or covered with current markings and the tracks of annelids or other forms of submarine life. The coal is coarse and of little value.

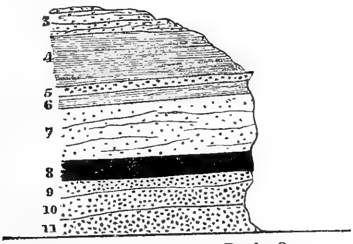


Fig. 11.—Section at Oaky Banks Quarry.

Various borings have been made in these Measures in search of workable seams of coal. One of the most important was made in the year 1834, from the floor of the Brockwell at Witton Park Colliery, of which we are enabled to give a detailed account through the kindness of Geo. Graham, Esq., of Thistleflat Colliery, near Crook.

BORING MADE AT WITTON PARK COLLIERY.

	Feet.	In.
1.—Fireclay, with iron nodules	5	9
2.—Dark grey shale	2	0
3.—White sandstone, with partings	6	3
4.—Brown and grey shale, with partings	15	6
5.—Grey sandstone, with partings	4	0
6.—Grey shale, with sandstone girdles	9	9
7.—Dark shale	1	5
8.—COAL	0	4
9.—Light shale	5	2
10.—Dark shale, with ironstone nodules and water	13	0
11.—Grey shale, with sandstone girdles	5	8
12.—Dark shale	1	9
13.—COAL, mixed with stone	0	6
14.—Dark shale	1	0
15.—COAL	1	0
16.—Grey sandstone	4	11
17.—White sandstone, with shale partings	7	2
18.—Blue shale	1	10
19.—Grey sandstone	1	1
20.—Blue shale	2	8
21.—Black shale, with girdles	3	2
22.—Strong grey shale	9	5
23.—Black slate	0	4
24.—Grey shale, with girdles	3	3
25.—White sandstone, with shale partings	11	6
26.—Dark shale	1	0
27.—COAL	0	4
28.—Dark shale	1	3
29.—COAL	1	8
30.—Fireclay	1	10
31.—Blue shale, with girdles	4	11
32.—White sandstone, with "whin" girdles and blue partings	21	0
33.—Blue shale	14	9
34.—Strong grey sandstone, with shale partings	3	7
35.—Blue shale	2	3
36.—Black shale	0	3
37.—COAL, with three inches of splint in the middle	1	8
38.—Grey shale	2	7
39.—Blue shale, with ironstone nodules	3	5
40.—Blue shale, with sandstone girdles	19	6

	Ft.	In.
41.—Strong sandstone girdles	3	3
42.—Mild white sandstone	3	11
43.—Blue shale, with girdles	13	8
44.—Dark shale	1	6
45.—COAL	0	7
46.—Grey shale, with sandstone girdles	5	7
47.—"Whin"*	1	1
48.—Blue shale	6	9
49.—Dark shale	0	7
50.—"Whin"	1	2
51.—White sandstone	1	6
52.—Strong sandstone	6	1
53.—Blue shale	12	3
54.—Shivery sandstone	12	7
55.—White sandstone	61	3
56.—Grey "whin"	26	0
57.—Blue shale	1	6
58.—Black and grey shale	6	5
59.—Grey "whin" girdles	0	3
60.—Blue shale	1	5
61.—Grey "whin" girdles	0	9
62.—Mild white sandstone	70	9
63.—Hard white sandstone, with shale partings	6	6
64.—Blue and grey shale, with girdles	5	11
65.—Blue shale, with thin bands of ironstone	9	2
66.—"Whin" and grey sandstone girdles, with blue shale partings	20	0
67.—White sandstone, with grey partings	5	9
68.—Blue shale, with thin girdles	12	1
69.—Hard white sandstone girdles	5	9
70.—Strong blue shale	6	8
71.—Shivery grey and white sandstone	5	6
72.—Blue and grey shale, with "whin" girdles	24	1
73.—Hard white sandstone	8	11
74.—Grey "whin" girdles	0	7
75.—Blue shale, with bands of ironstone	7	8
76.—Grey "whin" girdle	0	7
77.—Mild white sandstone	2	7
78.—Strong white sandstone	3	8
79.—Light shale	1	0
80.—Strong shale, mixed with coal	0	6

* A very hard siliceous sandstone—not basalt.

	Ft.	In.
81.—Grey "whin"	2	4
82.—White sandstone, scared with shale	0	8
83.—Hard white sandstone girdles	1	7
84.—White sandstone, scared with shale	0	5
85.—"Whin," with blue shale partings	2	11
86.—White sandstone, mixed with "whin"	23	1
87.—Dark shale	1	3
88.—Blue shale, with bands of ironstone, and scared with coal	7	0
	603	5

Another bore put down a little to the N.W. of the last shows the position of the Victoria and Marshall Green coals with more or less exactness. We are enabled to give it through the kindness of William Lishman, Esq., Etherley.

BORING MADE IN THE BEECHBURN ROYALTY, NEAR THE RIVER WEAR.

	Feet.	In.
1.—Soil	3	0
2.—Gravel	4	0
3.—Sand and clay	5	6
4.—Sandstone	1	0
5.—Shale	14	6
6.—COAL: BROCKWELL SEAM	4	9
7.—Shale	6	0
8.—Sandstone	1	0
9.—Shale	1	9
10.—Sandstone	17	4
11.—Shale	12	0
12.—Sandstone	2	0
13.—Shale	2	0
14.—Sandstone	14	0
15.—Shale	6	6
16.—Black shale	1	2
17.—Grey shale	4	6
18.—COAL: VICTORIA SEAM	2	0
19.—Fireclay	2	6
20.—Sandstone	22	4
21.—Dark shale	3	6
22.—Grey shale	8	0
23.—Sandstone	18	0

24.—Black shale	2	0
25.—COAL: supposed MARSHALL GREEN SEAM ...	1	5
	160	9

The whole of the first of these bores appears to be in lower Coal Measures which are thus shown to exceed six hundred feet in thickness, though the excess is probably not great.

Their position is precisely similar to the "Ganister Beds" or Lower Coal Measures of Lancashire and Yorkshire; but they have not the development of the latter, nor yet are they known to be characterised by those bands of *Goniatites* and *Aviculopectens* that distinguish the latter.*

FOSSILS FOUND IN THE COAL MEASURES.

The following list of fossil plants are those that have occurred to us in the Etherley district. They are chiefly from the Brockwell and Five Quarter or Busty coals; but in some instances they are from near the horizon of the Harvey or Yard coal, some twenty fathoms above the Busty.

They were obtained from the shale or "metal" immediately overlying the coal, usually termed the roof of the seam. It was not often that determinable species were observed in the coal itself, though rude impressions of *Sigillariæ*, with roots and rootlets of *Stigmaria*, sometimes occurred in the body of the seam. Our collecting ground however was the roof, from which most of the species were obtained *in situ* underground.

Therefore, in speaking of the plants characteristic of a coal seam it will, of course, be understood that we refer to those found in the deposit next above the seam, and not in the coal itself. Neither do we wish to imply that the fossils found in the roof were always of the kind whose remains formed the coal beneath. Certainly, where *Sigillariæ* stumps are seen extending up from the coal into the roof, or where the flattened stems of innumerable *Sigillariæ* are strewn over a seam of coal (resting on the coal rather than imbedded in the roof matter), it is not a

* See E. W. Binney, F.R.S., on Fossil Shells in the Lower Coal Measures, Trans. Manchester Geol. Soc. Vol. II., p. 72.

very unsafe conclusion to suppose that the vegetable substance of such plants had much to do in forming the seam. But on the other hand, it is evident that a seam of coal and its roof represents two separate conditions of things—one favourable to the growth and accumulation of the vegetable matter forming the coal, and the other favourable to the accumulation of the earthy matter forming its roof; and as roof-matter is not a growth, but sedimentary materials drifted from a distance, it is possible, to say the least, that many of the remains of plants imbedded in the roof may have been transported along with the sedimentary materials, and be in a measure foreign to their immediate area of occurrence.

The species have mainly been determined from the "Fossil Flora" of Lindley and Hutton, and probably with these authors we have got different portions or growths of the same plants as distinct species. But we do not attempt to treat this branch of the subject, our researches having had relation to the distribution of the fossils rather than to a critical examination of their affinities.

The majority of the species in this list have been previously noticed in the Durham and Northumberland coal-field, in the middle and upper beds of the series. But only twelve species have hitherto been recorded from horizons so low as the Brockwell and Five Quarter seams. Nine of the twelve have occurred to us among the seventy-three of our list. Fifty-six species occur in the Brockwell, and fifty in the Five Quarter and Harvey. Thirty-two species, including all the common and characteristic forms, are found in both Brockwell and Five Quarter.

Species and individuals are both very irregularly distributed. The most common fossils are Sigillariæ and Calamites, both of which occasionally occur alone with great individual profusion, and often intermixed with ferns, Lepidodendra, and other vegetable fossils.

With regard to Sigillaria, we well remember a sight that we saw in the Brockwell seam, at Howdon Colliery, where the roof was one entire mass of specimens of this genus. Among them were several species or varieties which were stretched overhead like so much tapestry. They were of great length: one specimen, the extremities of which were not visible, was forty-five feet long, with a uniform breadth of four feet. With the exception of four Calamites, the Sigillariæ were the only fossils that occurred here; and as the shale forming the roof was light coloured and wet, and the fossils jet black, they were seen to splendid advantage. Although most of the specimens were flattened and in a horizontal position, there were yet a few vertical and round stems intermixed among them. We counted eleven of the latter in an area of less than a quarter of an acre. The coal was only two feet thick; and as the fireclay was lifted along with it, we had a favourable opportunity of tracing these stems from their Stigmaria roots up through the coal into the roof above. We measured one which was thirteen by nine and a half feet in diameter. (J. D.)

Another spectacle of a like nature we saw in the waste of Newton Cap Colliery, where the roof (a lightish grey shale) was thickly strewed with large Calamites, all other fossils being absent. The Calamites were from six to nine feet long, in some cases with the roots attached, and all lying in nearly one direction, as though they had been swept over and buried by a flood of mud-laden water on the spot where they had grown. This was one of our earliest palæontological experiences underground. We had often before seen Calamites in museums, and had collected them at pit heaps, quarries, and other localities on the surface, but we had never yet got, as it were, among an overthrown brake of them, that we might almost have measured by the acre.

Where we have noticed many Calamites in the roof, as we have done repeatedly, it is very rarely that we have found Asterophyllites along with them, although the latter is now supposed by many palæontologists to be part of the same plant as Calamites. But we have observed great masses of Asterophyllites and Sphenophyllum (chiefly the former) only a few bords distant from others with a range of roof full of large Calamites.

Ferns were found most abundant in the roof of the Five Quarter at Lands Pit; and somewhat less abundant, though still numerous, in the Brockwell at the George Pit, Etherley, and Newfield Colliery. At Lands the matted fronds of *Alethopteris lonchitidis* and *Serlii*, and *Pecopteris dentata* filled the shale of the roof in some parts of the pit, while those of *Neuropteris heterophylla* and *Pecopteris laciniata* were as common in others.

We shall allude to the distribution of these fossils further on.

In an important work on the Coal Formation of Saxony, Dr. Hanns Bruno Geinitz, of Dresden, has some interesting observations on the distribution of the vegetable fossils found therein. He states that different groups of coals are characterised by peculiar groups of fossil plants, and of these palæontological features he makes use in his classification of the formation. To quote from a *resume* of the work, in the anniversary address of the President of the Geological Society for 1857, we have these remarks :—

"The great divisions of the Saxon coal-field may be stated as follows.

"1. The coal formation of Hainech-Ebersdorf, which is the earliest band of vegetation in Saxony. 2. The Sigillaria-coal, in which the remains of such plants predominate over all others; this coal is the lowest bed in the Zwickau basin. 3. The Calamite-coal, in which a forest of Calamites, including some of the largest known species, appears to have been buried, mixed, of course, with species of other genera. 4. The next zone is also rich in Calamites, though not in the same proportion as in the one below, the *Calamites approximatus* being however the most abundant. The *Annularia longifolia* finds its peculiar horizon here in which it attains its highest development, though found in beds both above and below. 5. The last girdle or zone of vegetation is characterised by an abundance of ferns, since, of ninety-eight species of plants, fifty belong to this family of plants."

"The fifth zone has eighteen species in common with the fourth, the same number with the third, and even somewhat more with the second; but as Geinitz observes, it is not so much the relative number of species, here so striking, which gives a peculiar character to the flora, as the number of individuals, which must also materially affect the nature of the coal."*

We draw attention to these views of Dr. Geinitz because they relate to a question of considerable importance—not only to the palæontologist, but to those who are practically engaged in coal-mining. For as a question of science, it is certainly not generally known that any regular succession of plant-life obtained during the period of the Coal Measures and other formations of the Carboniferous system; and it is as certainly a thing to be desired by coal-owners, and those in their employ, that such a succession of plant-life should be determined and made known to them. If it could be shown that different seams of coal are characterised by different kinds of fossil plants—that the lower seams, for instance, are marked by *Sigillariæ*, the middle seams by Calamites, and the upper by ferns, mining men would then have something better to guide them in the identification of coals than they are now possessed of, and it would be as easy to determine the relative position of any portion of a coal-field as it generally is now to distinguish one formation from another by its fossil contents.

We were led, from the remarks of Dr. Geinitz on this question, to examine whether the coals of the Etherley district appeared to be marked by any special group or groups of fossil plants. Whether, for example, the "Brockwell" could be distinguished from the "Five Quarter" by its fossils; or whether the prevailing fossils of both pertained to a distinct type; or whether they differed in any way from those already described from higher Measures of the coal-field. The following diagrams and remarks are the results of this examination, which was made from time to time as fossiliferous patches of roof came under our notice, and other circumstances afforded facilities for the investigation.

Fig. 12 shows the relative position of the principal points where fossils were collected from the roof of the Brockwell seam, excepting in one instance where we had not an opportunity of collecting fossils *in situ*, but only from material specially

* Quart. Jour. Geol. Soc., 1857, p. 105.

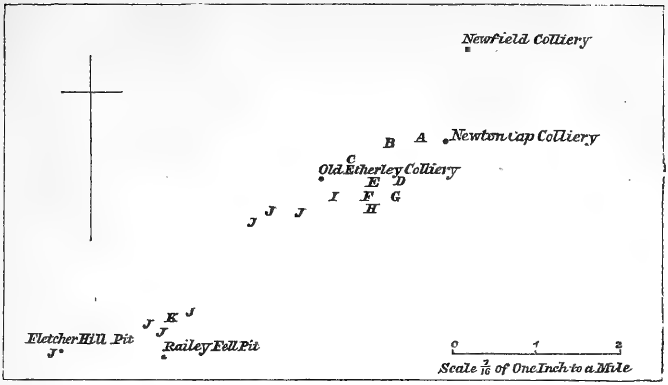


Fig. 12.—Plan showing distribution of fossil plants in Brockwell Seam.

brought to bank for us. By including this locality it gives a distance of about seven miles between the extreme points where fossils were collected. There was, of course, much of the intermediate area that could not be examined, besides a great deal where the roof might be described as unfossiliferous.

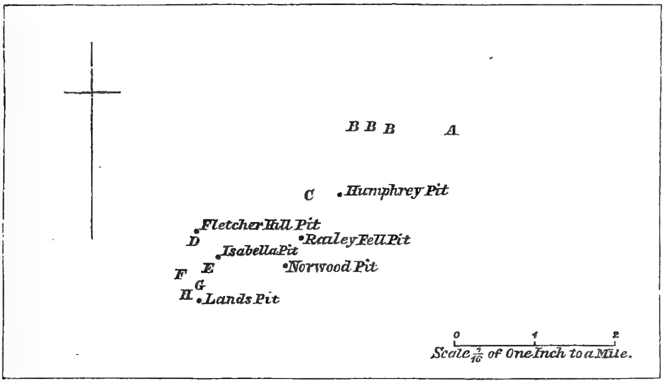


Fig. 13.—Plan to show distribution of fossil plants in Five Quarter seam.

Fig. 13 shows the places where we found fossils in the roof of the Five Quarter seam, the range of our examination being considerably less than in the Brockwell.

We shall briefly notice seriatim the fossiliferous localities indicated in each diagram.

BROCKWELL SEAM :—

At the point marked *A*, and for a considerable district about it, the roof of the seam is a light grey shale, filled with large stems of *Calamites approximatus* and *C. cannæformis.* Nearly all of them lie in one direction: some are eight or nine feet long, and several have the base of the stems perfect with the roots attached.

For several bords near the point *B* the roof is formed of large flattened stems of *Sigillariæ* lying in various directions. Some of them exceed twenty feet in length, and are from twelve to eighteen inches wide. The specimens are not well preserved, and may belong to more than one species: some show character enough to allow their being referred to *S. reniformis.*

At *C* a roof, similar to that at *A*, occurs, and in it are found the remains of *Pecopteris laciniata*, and more rarely one or two other ferns, and *Calamites approximatus.* There is not the profusion of remains here as in the two former cases.

At *D* the roof is a dark grey shale filled with the remains of *Asterophyllites* and *Sphenophyllum*, almost to the exclusion of other fossils, and more remarkably so to that of *Calamites.*

At *E* a change takes place. There is a sandstone roof, with inpressions of worm-tracks, and no indications of plants.

At *F* the roof is formed almost solely of masses of *Calamites approximatus* and a more coarsely ribbed species, probably *C. cannæformis.*

At *G* the roof is a softish grey shale, with an abundance of ferns, belonging to the species *Pecopteris laciniata*, *Sphenopteris Höninghausi*, *Neuropteris gigantea*, *Cyclopteris oblata*, and others, together with large quantities of *Pinnularia capillacea*, *Næggerathia flabellata*, and other species.

At *H* sandstone again forms the roof of the seam, and the only fossils in it are some rude impressions of *Sigillariæ*, and, in the coal itself, sandstone casts of *Stigmaria.*

At *I* vertical stems of large *Sigillariæ* are not uncommon in the roof.

It will be seen from the accompanying diagram that the above localities range from the north-east to the south-west, this being the general direction in which occurred our opportunities of observation. Further away in the same course (*J J J*) the roof is formed of dark grey shale which is almost barren of plant remains, the only exceptions being the very occasional presence of *Calamites approximatus* or of *Lepidodendron selaginoides*, but which contains more frequently specimens of the supposed marine shells *Anthracosia acuta*, and *Anthracoptera* sp. The roof would appear to maintain this character over a wide district; and in one place, almost three miles away from the localities *H* and *I*, there are the remains of fish in the shape of teeth and scales of the well-known *Megalichthys Hibberti.*

Within, however, the limits of this roof with *Anthracosia acuta*, there occurs, at the spot marked *K*, a curious little oasis, as it were, of vegetable fossils, where the remains of *Calamites approximatus*, *Lepidodendron* sp., and *Lepidodostrobus*, are seen in comparative profusion.

At another point nearly two miles north of *A* we obtained from shale from the roof of the Brockwell many species of fossil plants. Among others the following:—*Lepidodendron selaginoides*, *Neuropteris Loshii*, *N. heterophylla*, *N. acuminata*, *Sphenopteris affinis*, *S. bifida*, *S. crenata*, *S. multifida*, *Pecopteris Bucklandi*, *Alethopteris lonchitidis*, *Sphenophyllum erosum*, *Asterophyllites foliosus*, *Antholithes Pitcairnia*, and many other species, more especially of ferns. But the prevailing fossil of this locality is *Lep. selaginoides*.

FIVE QUARTER SEAM:—

At the point marked *A* and *B* (diagram II.) the coarse coal or bratt lying above the seam, with a portion of the roof above, are full of compressed impressions of the fluted stems of *Sigillariæ*, to the exclusion of other species. In some places the upright stools of the same tree appear.

At *C* the roof, for some feet upward, is one mass of the compressed stems of *Sigillaria* and *Stigmaria*, without traces of other fossils.

At *D* the remains of *Sigillaria* are still common, but those of *Calamites approximatus* are almost equally so. Ferns belonging to *Neuropteris heterophylla* and one or two other species likewise occur sparingly.

At *E* patches of flattened *Sigillaria* are still met with, but they are associated with *Favularia tessellata, Lepidodendron selaginoides, Calamites approximatus, Antholites Pitcairnia, Neuropteris heterophylla, N. gigantea, Sphenopteris Höninghausi, Pecopteris laciniata*, and other ferns.

At *F* there are many ferns, such as *Pecopteris laciniata, Alethopteris lonchitidis, Neuropteris heterophylla*, along with *Cal. approximatus, Lep. selaginoides*, and *Lep. elegans*.

While at *G Sigillaria* occurs again in upright stems with a few ferns.

At *H* there is a great profusion of fossils with a predominance of ferns. Among them are—*Alethopteris lonchitidis, A. Serlii, Pecopteris laciniata, P. adiantoides, P. oreopteroides* (?) *Neuropteris attenuata, N. acuminata, N. caudata, N. gigantea, N. heterophylla, Sphenopteris dilatata, S. excelsa*, and *Cyclopteris oblata;* also *Antholithes Pitcairnia, Walchia piniformis, Volkmannia polystachia, Favularia nodosa, Ulodendron major, Megaphyton distans, Lepidodendron elegans, L. selaginoides, Sigillaria reniformis*, &c. The roof, which is grey shale, is often literally covered with the fronds of ferns, sometimes of one species and sometimes of another, and also in such perfection as almost to preclude the idea of their having been subjected to much drifting before deposition.

If the list of species be taken there is little to mark it as distinctive from lists already published from the mid and upper strata of the Durham Coal Measures. A few species have not been recorded from Durham before, but the bulk of them are already well known from the horizons of the Low Main, Bensham, and High Main seams of the Tyne and the Wear.

These are the results of our examination, which would undoubtedly have been more satisfactory had the field of our observation been wider and more exhaustively investigated. Taking them however as they are, they scarcely appear to support the views of Geinitz, for they show anything but uniformity of fossil distribution on the horizons of the Brockwell and Five

COAL MEASURES ABOUT ETHERLEY.

	POSITION.			LOCALITIES.
	Brockwell.	Five Quarter.	Harvey.	
C	*	*	...	Newfield Colliery; Lands Pit.
....	...	*	...	Lands Pit.
....	*	...	...	Newfield Colliery.
....	*	...	...	,,
....	*	*	...	Lands Pit; Gauger's Arms Pit; Isabella Pit; George Pit.
A	*	...	...	Newfield Colliery.
....	*	...	...	,,
....	*	*	*	,, Lands Pit; Etherley New Winning.
....	...	*	*	Lands Pit; Tindal Pit.
....	*	...	*	George Pit; Howden Colliery; Tindal Pit.
... .	*	*	*	Newfield Colliery; Lands Pit; Tindal Pit.
....	*	...	*?	,, Tindal Pit.
S	*	...	*	,, ,,
....	*	...	...	Howden Colliery.
A	*	...	...	,,
....	*	...	...	,,
....	*	*	..	,, Isabella Pit.
....	*	...	...	,,
....	*	*	...	Lands Pit; George Pit.
P ened stems, ars	...	*	*	George Pit; Railey Fell Pit; Lands Pit; Fletcher Hill Pit; Jane Pit; Isabella Pit; Newton Cap Colliery.
....	*	...	...	Lands Pit; Isabella Pit; Howden Colliery.
....	*	...	...	,, Howden Colliery.
....	*	*	*	Everywhere.
S	...	*	...	Lands Pit.
....	*	...	...	Newton Cap Colliery.
....	...	...	*	Tindal Pit.
....	...	*	...	Lands Pit.
....	...	*	...	,,
....	..	...	*	Etherley Quarry.
....	*	*	*	George Pit; Lands Pit; Newfield Colliery.
....	*	*	...	,, Newfield Colliery; Lands Pit.
....	...	*	...	Lands Pit.
....	...	*	...	Gauger's Arms Pit.
N	*	*	...	Lands Pit; Isabella Pit; Newfield Colliery; Howden Colliery.
....	*	*	...	Lands Pit, &c.
....	*	*	...	George Pit; Lands Pit.
....	...	...	*	Tindal Pit.

TABLE, SHOWING THE DISTRIBUTION OF FOSSIL PLANTS OCCURRING IN THE COAL MEASURES ABOUT ETHERLEY.

SPECIES.	POSITION.			LOCALITIES.
	Brockwell.	Five Quarter.	Harvey.	
Calamites approximatus, *Brong.*	*	*	*	Newton Cap Colliery; George, Railey Fell, and Lands Pits, Old Etherley Colliery; Isabella Pit, &c., &c.
,, cannæformis, *Schloth.*	*	...	...	Newton Cap Colliery.
,, inæqualis, *Lindl.*	...	*	...	Lands Pit.
,, nodosus, *Schl.*	*	...	...	George Pit.
,, verticillatus, *Lindl.*	...	*	...	Gauger's Arms Pit.
Asterophyllites equisetiformis, *Schl.*	*	*	...	Newfield Colliery; George Pit.
,, foliosus, *Lindl.*	*	...	...	,, ,,
,, grandis, *Lindl.*	*	...	...	,,
,, tuberculata, *Sternb.*	*	*	...	Lands Pit; Tindal Pit; George Pit.
,, longifolia, *Brong.*	*	*	...	,, George Pit.
,, jubatus, *Lindl.*	*	...	...	Newfield Colliery.
Sphenophyllum Schlotheimi, *Brong.*	*	*	...	Gauger's Arms Pit; George Pit.
,, erosum, *Lindl.*	*	...	...	Newfield Colliery.
Alethopteris lonchitidis, *Sternb.*	*	*	*	Newfield Colliery; George Pit; Lands Pit; Etherley New Winning.
,, heterophylla, *Lindl.*	...	*	*	Lands Pit; Etherley New Winning.
,, Mantelli, *Brong.*	...	*	...	,,
Pecopteris adiantoides, *Lindl.*	...	*	...	Lands Pit.
,, Bucklandi, *Brong.*	*	*	...	,, Newfield Colliery.
,, laciniata, *Lindl.*	*	*	...	George Pit; Lands Pit; Fletcher Hill Pit; Isabella Pit.
,, oreopteroides, (?) *Brong.*	*	*	...	Lands Pit; George Pit; Newfield Colliery.
,, repanda, *Lindl.*	*	*	...	,, Newfield Colliery.
,, Serlii, *Brong.*	...	*	...	,,
Sphenopteris dilata, *Lindl.*	*	*	...	Lands Pit; George Pit.
,, affinis, *Lindl.*	*	...	...	Newfield Colliery.
,, bifida, *Lindl.*	*	...	...	,,
,, caudata, *Lindl.*	*	*	...	,, Lands Pit.
,, crenata, *Lindl.*	*	...	...	,,
,, crithmifolia, *Lindl.*	*	...	...	,,
,, excelsa, *Lindl.*	...	*	...	Lands Pit.
,, Höninghausi, *Brong.*	*	*	...	George Pit; Newfield Colliery.
,, latifolia, *Brong.*	*	...	...	Newfield Colliery.
,, multifida, *Lindl.*	*	...	...	,,
Neuropteris acuminata, *Schl.*	*	...	...	Newfield Colliery.
,, arguata, *Sternb.*	*	...	...	,,
,, attenuata, *Lindl.*	...	*	...	Lands Pit.
,, cordata, *Brong.*	*	*	...	,, Newfield Colliery; Howden Colliery.
,, gigantea, *Sternb.*	*	...	...	Newfield Colliery.
Neuropteris heterophylla, *Brong.*	*	*	...	Newfield Colliery; Lands Pit.
,, (?) ingens, *Lindl.*	...	*	...	Lands Pit.
,, Loshii, *Brong.*	*	...	...	Newfield Colliery.
,, Soretii, *Brong.*	*	...	...	,,
Cylopteris oblata, *Lindl.*	*	*	...	Lands Pit; Gauger's Arms Pit; Isabella Pit; George Pit.
Lepidodendron acerosum, *Lindl.*	*	...	...	Newfield Colliery.
,, dilatum, *Lindl.*	*	...	...	,,
,, gracile, *Lindl.*	*	*	*	,, Lands Pit; Etherley New Winning.
,, elegans, *Brong.*	...	*	*	Lands Pit; Tindal Pit.
,, obovatum, *Sternb.*	*	...	*	George Pit; Howden Colliery; Tindal Pit.
,, selaginoides, *Sternb*	*	*	*	Newfield Colliery; Lands Pit; Tindal Pit.
Lepidophyllum trinerve, *Brong*	*	...	*?	,, Tindal Pit.
Lepidostrobus variabilis, *Lindl.*	*	...	*	,, ,,
Sigillaria alternans, *Sternb.*	*	...	...	Howden Colliery.
,, flexuosa, *Lindl.*	*	...	...	,,
,, monostachya	*	...	...	,,
,, oculata, *Brong.*	*	*	..	,, Isabella Pit.
,, organum, *Sternb.*	*	...	...	,,
,, reniformis, *Brong*	*	*	...	Lands Pit; George Pit.
,, large, strongly ribbed flattened stems, with no marks of leaf scars	...	*	*	George Pit; Railey Fell Pit; Lands Pit; Fletcher Hill Pit; Jane Pit; Isabella Pit; Newton Cap Colliery.
Favularia tessellata, *Brong.*	*	...	...	Lands Pit; Isabella Pit; Howden Colliery.
,, nodosa, *Lindl.*	*	...	...	,, Howden Colliery.
Stigmaria	*	*	*	Everywhere.
Ulodendron majus, *Lindl.*	...	*	...	Lands Pit.
,, minus, *Lindl.*	*	...	...	Newton Cap Colliery.
Botherodendron, punctatum, *Lindl.*	...	...	*	Tindal Pit.
Megaphyton distans, *Lindl.*	...	*	...	Lands Pit.
,, approximatum, *Lindl.*	...	*	...	,,
,, sp. (?)	..	...	*	Etherley Quarry.
Nœggerathia flabellata, *Lindl.*	*	*	*	George Pit; Lands Pit; Newfield Colliery.
Pinnularia capillacea, *Lindl.*	*	*	...	,, Newfield Colliery; Lands Pit.
Volkmannia polystachia	...	*	...	Lands Pit.
Walchia piniformis, *Schloth.*	...	*	...	Gauger's Arms Pit.
Antholithes Pitcairna, *Lindl.*	*	*	...	Lands Pit; Isabella Pit; Newfield Colliery: Howden Colliery.
Cardiocarpum acutum, *Brong.*	*	*	...	Lands Pit, &c.
Trigonocarpon Noeggerathi, *Brong.*	*	*	...	George Pit; Lands Pit.
Lycopodites, sp.	...	...	*	Tindal Pit.

Quarter seams. It has been shown that if we take either seam we find different groupings of genera and species as we vary the district examined. In one part we have nothing but compressed stems of large *Sigillariæ*. In another large *Calamites*, and nothing more. Again, a few bords to the right or left and there is a great abundance of ferns and few Calamites. While some distance away we have a profusion of *Lepidodendra*, a few ferns, and no Calamites. Then we come to acres and acres of roof matter with scarcely a plant to be seen, but in which the shells *Anthracosia* and *Anthracoptera* are not uncommon. Lastly, we come to a region where the only fossils are the upright stumps of large *Sigillariæ*, scattered in (dangerous) profusion overhead.

It would, in fact, be matter of no difficulty to take either the Brockwell or the Five Quarter, as seen by us at the Newton Cap, Old Etherley, Railey Fell, Lands, and Norwood collieries, and term it a Sigillaria coal, a Calamite coal, a fern coal, or a coal characterised by marine or esturine mollusca, just as we varied the district examined.

It is possible that some coal-fields may show a generic progression in their flora, such as that pointed out by Dr. Geinitz for Saxony, though it seems to be expecting too much from palæontology to assume that any such progression should be found generally characteristic of the Coal Measures. The flora of this formation would appear to have been pretty nearly the same throughout. *Sigillaria*, in some localities, may have preceded *Calamites*, while ferns may have succeeded both, either in first appearance or in period of maximum development; but we should rather ascribe such succession of Carboniferous vegetation to peculiarities due to local distribution than to any general sequence of plant-life.

We have met with few animal remains in the Coal Measures. The occurrence of *Megalichthys Hibberti* has been already mentioned. Its remains are rare. We have also alluded to the presence of *Anthracosia acuta*, and *Anthracoptera* sp. in the roof of the Brockwell coal. These, with the entomostracan *Beyrichia arcuata*, found near Woodhouses, near Lands Pit, and in the George Pit, Etherley, together with the common Coal Measure annelid, *Microconchus carbonarius*, constitute about all the species of animal life that have come under our notice.

BOUNDARY OF THE COAL-FIELD TO THE SOUTH.

It is an unsettled point with mining men whether in Durham workable coal is to be found in the region lying to the south of the existing collieries. It is thought by some that good coal exists considerably to the south of the district under notice—where to our eyes there is nothing but unprofitable Millstone Grit. And in the east of the county there are those who hold that the Coal Measures are continued southward beneath the Permian and Triassic rocks, as in some other parts of England. The following remarks bear on the question chiefly as it relates to the former district, where the range and disposition of the Coal Measures are not masked by overlying rocks.

The most southerly colliery now going in Durham is that of New Copley, on Cockfield Fell, where the Brockwell, Five Quarter, Harvey, and another seam have been proved on the south side of a great fault with a downthrow south. In former years the Brockwell seam was wrought in the Three Sisters Pit, a little more to the east. There are also abandoned pits a mile or two further to the east at Paddock Mires, and near the Sun Inn, which are still further to the south, where the Brockwell was worked many years ago. Beyond these points we know of no place where any seam of the Coal Measures has been worked.

At the New Copley Colliery the Measures on the south of the fault rise very rapidly, and soon crop out as shown in figure 15.

At the old pit, near the Sun Inn, where the Brockwell was got at a depth of twelve fathoms, the Measures also rise very sharply to the south, in which direction the workings are said to have ended against a fault with a downthrow south.

About three miles west of Cockfield an outcrop of the Brockwell seam is exposed in Arngill, the coal being over six feet thick, and dipping to the north fully one in two. It is probable that this is a piece of Coal Measures let in by the fault seen at New Copley Colliery.

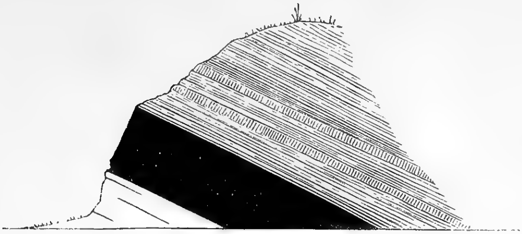


Fig. 14.—Outcrop of Brockwell coal in Arngill.

To the south of Cockfield the outcrop of a thin coal may be seen in a sandstone quarry near to Keverstone. The sandstone is thick bedded, purple and yellowish, and irregularly stratified. The coal beneath is rather over two feet thick, resting upon a dark grey fireclay, and it dips with the sandstone to the north and east. This coal is said to have been bored to further to the west, near the Folly, in Raby Park. We look upon it as the "Victoria" coal, lying from ten to twenty fathoms below the Brockwell.

We have not seen the outcrop of any coal so far south as these just mentioned to the east of Keverstone, although some beds occur on the road side near Hilton that apparently belong to the lower part of the Coal Measures. A thin coal is also said to have been seen in a well-sinking near Wackerfield.

At Bolam the Cockfield Dyke cuts through a series of beds which we take to be the Measures below the Brockwell.

From the latter point the boundary of the Coal Measures appears to lie to the north of the Cockfield Dyke, trending in a north and east line considerably north of Houghton-le-Side and Heighington.

There are old pits near Brussleton Folly which are said to have worked a coal resembling the Brockwell; and in a sandstone quarry a little to the north of the Royal Oak Inn, a two-feet coal crops out to the south at a sharp angle.

Further north-east, at East Thickley Quarry, some thick beds of yellowish sandstone and shale belonging to the Coal Measures are seen rising rapidly to the S.E., their edges abutting against Magnesian Limestone lying unconformably over them. And at a new colliery lately sunk near New Shildon, on the south of the Stockton and Darlington Railway, the Brockwell coal has been reached at forty-six fathoms from the surface, rising quickly to the south.

We have no observation of our own from which to speak of the southern limits of the coal-field still further eastward; but at Thrislington, Cornforth, and South Wingate, which may be said to mark the extreme points at which coal has been wrought to the south in that district, the coal seams are described as terminating "by passing upward at a considerable angle into the unconformable Magnesian Limestone beds."* So far as this evidence goes it is in harmony with the idea of the coal-field ending as a whole, as it is observed to end in part at its south-western extremity.

In the comparatively low country lying to the south of the high ground above Raby, and south of Wackerfield, Hilton, and Bolam, the prevailing Carboniferous rock is a coarse grained sandstone or grit, of purple, grey, or yellow hue, with many white quartz pebbles, and which is sometimes micaceous and often false bedded, but which invariably dips a little to the west or east of north. This rock may be seen at Langton, High Hallam, Morton Tinmouth, Houghton Bank, Dun House, and near Park House, and we have no hesitation in identifying it with the Millstone Grit.

To the south and west of the rock just noticed a series of arenaceous strata, associated with a few calcareous beds full of brachiopod shells and other marine fossils put in, which we take to be the Yoredale rocks of Phillips.†

* Wood, Taylor, and Marley, in Indus. Resour. of Tyne, Wear, and Tees, p. 6.

† We were told more than once of coal having been wrought in former times near to Winston; and we met with one old collier who said that many years ago he helped to bore to a four feet coal on the south bank of the Tees, opposite the church at Winston. The boring took place from the delivery drift of an old pit that had previously been sunk to the seam and abandoned. The depth of the coal from the surface was twenty fathoms.

We were also informed by Mr. George Graham that, near Gainford, he sunk seventeen fathoms through grit to a coal two feet and a half thick; a black band, one and a half feet thick, was worked along with the coal. This Teesside coal does not appear to have been very extensively wrought either at Winston or Gainford; and the seam is probably one of the two thin and inferior coals known to occur in the Yoredale series in the west of Yorkshire and Durham.

Intimately connected with southern termination of the coal-field is a series of great dislocations, which traverse the county in a general east and west direction. The first and most northerly of these is the well known Butterknowle "Dyke," which is a downthrow to the south of from eighty to over one hundred fathoms. Near the outcrop of the Coal Measures the course of the fault is about east, but in traversing the coal-field it soon becomes gradually deflected to the north until its direction is nearly north-east. In the Etherley district the throw appears to be greatest to the east. At Butterknowle it is from eighty to ninety fathoms. At Etherley, where it has been lately proved, it is found to reach one hundred and six fathoms; and a little to the north-east of Coundon it is one hundred and twelve fathoms.

Less known than the Butterknowle fault is the great dislocation already mentioned as having been proved at New Copley Colliery, where it is known as the Wigglesworth fault. The downthrow of this dislocation is again to the

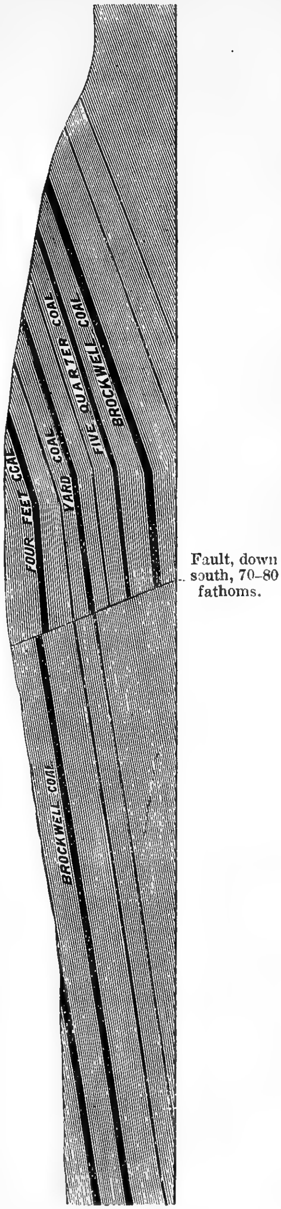


Fig. 15. SKETCH SECTION OF WIGGLESWORTH FAULT.

south, to the extent of eighty fathoms or more, and four workable coals are brought in by it, as shown in figure 15. So far as its course can be determined at the colliery named, it is slightly to the north of east. It is connected with the Butterknowle fault by a cross fault of comparatively small magnitude, called the Doghole "Dyke," which leaves the Wigglesworth fault just to the east of Cockfield. At the latter place the Wigglesworth fault is scarcely more than a mile apart from the Butterknowle fault; between them runs the Cockfield Whin Dyke, at first near the latter and almost parallel to it, but afterwards bending away to the east-south-east.

Another great fault evidently exists near to Brussleton Folly, where the Measures rise sharp to the south, their inclination being especially well seen on the Roman road near the top of the hill, where the strata lie at an angle of 45°, as noticed at p. 161. This dislocation may possibly be the Wigglesworth fault continued to the east, as it is on a line with the assumed course of the latter; and it may be identical with a large fault said to have been met with in West Auckland Colliery to the south-west of the village.

About two miles from Brussleton, in a south-east direction, there is evidence of another dislocation, in an old sandstone quarry close to Houghton-le-Side. The sandstone is yellow, rather fine grained, thick bedded, with a dip to the north-west. On the south side of the quarry, and apparently dipping beneath the former rock, appears a quantity of dark grey limestone* which passes beneath into a limestone shale, both of which contain numerous Mountain Limestone fossils. These fossils have kindly been examined and determined as follows by our friend Mr. John Young, of Glasgow, well known as an authority on Carboniferous species.

Productus semireticulatus, var. Martini, Sow.
Spirifera lineata, Martin.
Athyris ambigua, Sow.

* We were informed by a native that he had formerly quarried the limestone and burnt it for lime, but with poor results, on account of its inferior quality.

Rhynchonella pleurodon (?) Phillips.
Remains of Crinoids.

We were at first inclined to look upon the limestone as the remains of a large erratic boulder belonging to the Drift; but a careful examination satisfied us that both limestone and shale were *in situ*. This opinion was corroborated on our subsequently discovering, further to the east, a similar limestone by the side of the road that descends to Houghton-le-Side from the north. The limestone there is seen about half way down the hill accompanied by the same kind of calcareous shale as seen in the quarry, and containing the same species of fossils as before named. Beneath the limestone and shale follow a grey argillaceous sandstone passing into an arenaceous shale, and a soft grey shale, below which the strata are not shown. These beds are not well exposed; but sufficiently so, on both sides of the road, to show that they are in their natural position.

In connection with the dislocation, we may mention that about a mile to the E.S.E. of Houghton-le Side, and at the foot of the ridge that runs behind that place, the Magnesian Limestone is seen in a quarry near to Broom Dykes (Toitup Quarry), tilted up to the north at an angle of 60°, its usual inclination being to the east at a low angle.

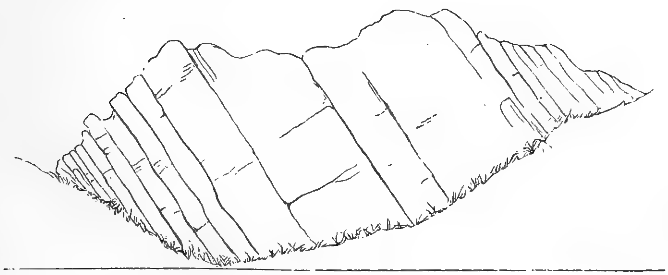


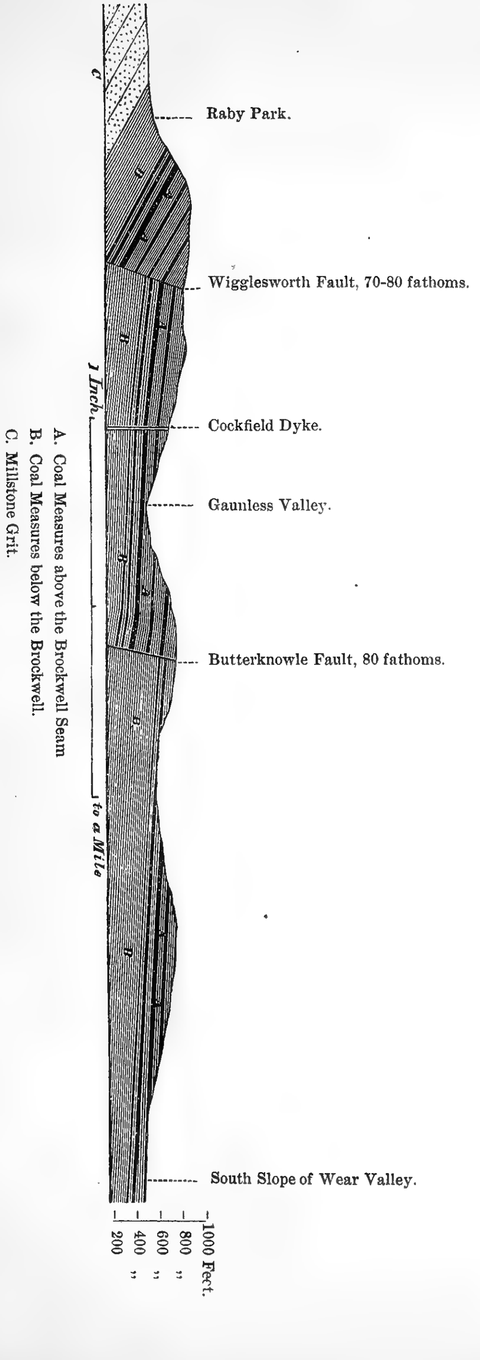
Fig. 16.—Magnesian Limestone, Toitup Quarry.

From these facts it appears clear that a fault with a downthrow south passes along or near to the face of the ridge above Houghton-le-side, which is of such magnitude as to bring in on its rise side one of the calcareous beds of the upper portion of the Yoredale rocks, at a considerable elevation above the Magnesian Limestone. It is not easy to determine the amount of throw that here takes place, which is undoubtedly great; but at the same time it should be remembered that the sharp northerly dip of the strata at Houghton Bank, at the old quarry near to Park House, at Brussleton, and other places in the neighbourhood, must bring the Yoredale rocks rapidly nearer to the surface at this point, and cause the actual displacement to be less than would at first sight appear.

It will be observed, from the preceding remarks, that the general dip of the Carboniferous strata, where affected by these faults, and to the south of them, is northerly, varying from N.W. to N.N.E., whereas the normal dip of the same strata to the north of the faults is easterly. Instead, therefore, of having as usual the outcrop of the Measures to the west, the outcrop is to the south, as shown in fig. 17, which represents the manner in which the coal-field appears to terminate in the south-west, according to our observation. The presence of the last described fault at Houghton-le-Side renders it probable that other dislocations may exist to the south of the Wigglesworth fault which are not included in the accompanying sketch section; but there is nothing in the geology of the country to the south that indicates the existence of any displacements of strata that would again bring in the workable coals, so that for all practical purposes it may be looked upon as correct.

It ought to be pointed out that attention was drawn to the northerly dip of this portion of the coal-field by Professor Sedgwick, in his admirable memoir on the Magnesian Limestone, published in the Geol. Trans., sec. Ser., Vol. III. At p. 59, he remarks, "The south-western extremity of the Durham coal-field is deposited in the form of an irregular trough or basin. The beds on one edge of this trough rise to the lead-measures, and dip to the south-east; but on the south-eastern edge they rise towards the terrace of Magnesian Limestone, and dip on the whole to the N.W. Over this south-eastern edge ranges the limestone; and in its whole course, from Houghton-le-Side to Ferry Hill, dips to the S.E. It is impossible to conceive a more

Fig. 17.—SKETCH SECTION OF THE DURHAM COAL-FIELD SOUTH OF ETHERLEY.



complete instance of want of conformity between two formations.

"The facts on which this conclusion rests are indicated in all the quarries of the district, and in sections formed in various coal-works which have been opened in the line of the limestone. At Brussleton coal-works the average dip is about north by east. In the Shildon works the dip is about N. by W. At the village of Eldon the dip is nearly the same. At Coundon the Coal Measures rise towards the limestone, and probably pass under it. The dip of all the neighbouring coal strata is about N.N.W. Lastly, at Ferry Hill, both the ancient and modern works are sunk through the plateau of Magnesian Limestone, which has a slight inclination to the S.E. After passing through about eight fathoms of limestone they reach the Coal Measures, which dip about N. by E. at a considerable angle. Beyond Ferry Hill the coal strata decline more and more to the east, and gradually acquire a dip which nearly conforms to that of the overlying formation."

Some obscurity exists as to the range of the coal-field beneath the Permian and Triassic rocks in the south-west of the county. Those collieries whose workings have extended the furthest southward in that region, have found the strata rising sharply to the south, and they have followed the coal-seams upward until they ran against the unconformable Permian beds which there overlie them. This has been observed at South Wingate, Cornforth, and Thrislington. Various bores of greater or less depth have been put down in the country beyond without proving the presence of Coal Measures; though these bores cannot in all cases be deemed satisfactory evidence of their absence. When we consider what has already been described as to the manner in which the coal-field ends in its south-west part,—that is, by an outcrop to the south amid a series of large east and west faults—we are disposed to think that all that is known of the extreme south of the field to the eastward indicates a continuation of the same manner of ending.

That the change in the inclination of the Carboniferous strata, noticed in the preceding remarks, is more than local is evident from the persistence of a northerly dip on the Yorkshire side of the Tees, opposite to Winston, Gainford, and Pierce Bridge. In proceeding south from any of these villages, lower and lower beds of the Carboniferous formation are found rising to the surface, until at Forcett, Melsonby, Barton, and as far east as Middleton Tyas and Moulton, thick masses of Mountain Limestone form the surface rock of the country. This latter rock, which we take to be the "Great Limestone" of Weardale, contains the characteristic marine fossils, (shells, corals, and crinoids,) of the Carboniferous system; and at Merrybent, near Melsonby, it is being actively mined for lead and copper. The ground it occupies is where the Magnesian Limestone might naturally have been looked for; but the range of the latter formation in North Yorkshire is broken up into a few isolated patches for a distance of nearly twenty miles, and from a little south of the Tees to Catterick Bridge it would appear to be entirely absent.

The presence of Carboniferous limestone so far to the east, touching in fact on the New Red Sandstone area of Yorkshire, is a point of considerable significance. Viewed in connection with the prevalence of a northerly dip between its outcrop and the great dislocations lately noticed, we are inclined to look upon it as indicating the former existence of a great fold or anticline in the Carboniferous strata of this region; the limestone of Middleton Tyas, Moulton being but the partially denuded and exposed western portion of it, and the outcropping strata of the Yoredale rocks, Millstone Grit, and Coal Measures previously described, but a portion of its northern flank.

We are not in a position to speak as to how far this idea is borne out by the relations of the Carboniferous strata further to the south; but the observations of Professor Sedgwick in the memoir before quoted support it. To the north of Pontefract, he describes the strike of the Coal Measures to be to the north-east, and their dip to the south-east at a considerable angle. Further north, near Church Garforth, and within a mile or two of the northern limits of coal-field, he says that the dip of the Measure is nearly due south.* In Professor John Phillips's Map of the Geology of Yorkshire, the outcrop of the coal

* Trans. Geol. Soc., 2 Ser., Vol. III., pp. 58, 59.

seams is shown to run about east and west in the north part of the coal-field, which of course implies the dip to be to the south. Moreover, it is well known that immediately to the north of the Yorkshire coal-field, the Millstone Grit comes to the surface and ranges over a broad band of country on to Knaresborough and Ripon, just as the same rock comes up beneath and extends beyond the coal-field in South Durham.

It would thus appear that the Yorkshire coal-field ends on the north by its Measures outcropping sharply to the north and north-west; while the Durham coal-field on the south ends, so far as can be seen or known, by the outcrop of its Measures to the south, or by their rising and abutting in that direction against the Magnesian Limestone, as at Thrislington and other places. The following figure will assist in explaining our views on this point:—

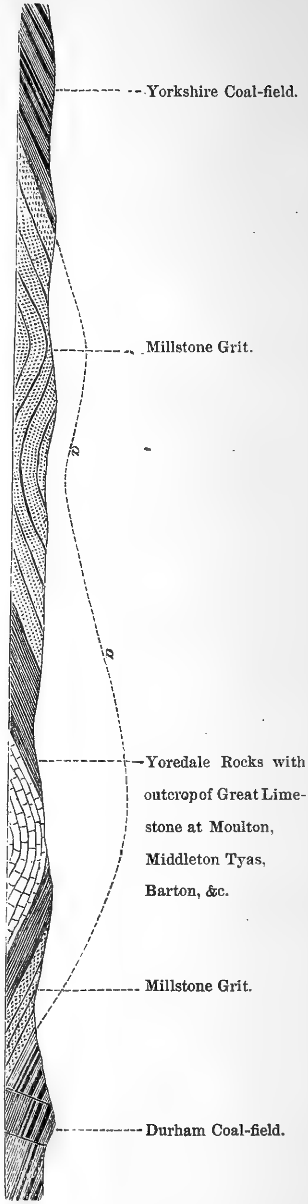


Fig. 18.—Sketch Section across country between the Durham and Yorkshire coal-fields, on a line nearly south from Cockfield.

We of course hold with most geologists that the coal-fields of Durham and Yorkshire were once united, forming, in fact, with those of Cumberland, Lancashire, and possibly others, originally one great area of Coal Measures, which, by various subsequent disturbances and denudations, has been reduced to the existing series of isolated patches called coal-fields. In the case of the two former coal-fields, we consider their isolation has taken place by the elevation of the Coal Measures and other Carboniferous strata, formerly and still partially intervening, into a great anticline, with an axis east and west, which, by the wasting action of denudative forces, has been in a great measure obliterated. The immense amount of strata thus removed in this intervening region will be better realised by reference to fig. 18, where the dotted line *a a* indicates the position of the basal beds of the Coal Measures in the anticline. By estimating the Coal Measures at their maximum thickness in Durham, the thickness of the Carboniferous rocks denuded at Middleton Tyas, Moulton, and Barton would be between three thousand and four thousand feet. That this elevation and succeeding wearing down of North Yorkshire strata was not confined to the west of the district seems more than probable; only to the east the denuded formations have been in part replaced by thick deposits of Trias and other rocks.

From these remarks it will be seen that it is our opinion that the limits of the Durham coal-field have almost been reached,—that there are no good grounds for anticipating its further development to the south. It may be that in the south-east some faulted fragments of coal strata, like the piece brought in by the Wigglesworth fault, at Cockfield, will be found to extend the coal-field beneath the Magnesian Limestone and Trias a little further towards the Tees; but that any workable coal should be found in the grit country south of the high land about Cockfield, Bolam, and Houghton-le-Side, we certainly see no reasons for supposing.

COCKFIELD DYKE.

The most westerly point where we have seen this dyke is about half a mile west of Wooley Hill, where it is quarried for road-metal. It is about twelve yards wide, and worked thirty feet deep. The sides of the excavation are formed of sandstone and shale more or less affected by heat. Old abandoned quarry holes, where the whinstone has been formerly wrought, are seen close to the farm house at Wooley Hill. The course of the dyke is slightly N. of W.

About three miles to the east, at Diamond Pit, the dyke has been driven through twice and found to be not more than six feet in width. In another part of the same colliery it is said to cease as a whinstone dyke, and to exist only as a dislocation.

On the south bank of the Gaunless, near Haggerleases Lane, the dyke is exposed in a township quarry, its width being about ten yards. Near here it divides into two parts, with a mass of shale between.

On Cockfield Fell the dyke has been most extensively wrought for road-metal, the remains of the ancient fosse-like excavation marking its west-north-westerly course for a considerable distance across the fell. It varies in width, but averages about twenty yards, with thirty or forty yards of bad coal and cinder on each side where it cuts one of the seams of coal.

Near the eastern extremity of the fell the dyke is crossed by a fault, called the "Doghole Dyke," running S.S.W. This fault not only severs the dyke, but throws the western portion about its width to the south as depicted below. It may be this perhaps that has led more than one author to describe the strata

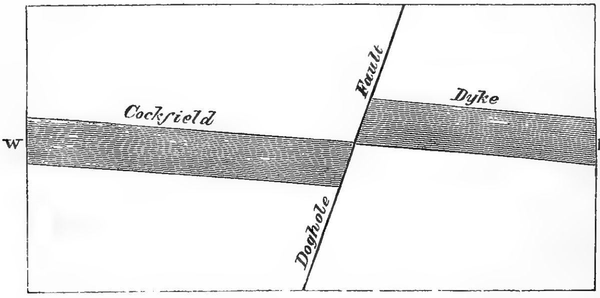


Fig. 19.—Plan showing displacement of Cockfield Dyke by the Doghole Fault on Cockfield Fell.

on the south side of the dyke as upthrown eighteen feet above those on the north, whereas no such faulting of the strata occurs. This has been clearly shown by pit workings which have been put through the dyke, and the coal found no higher on the one side than on the other, than what is to be accounted for by the general rise of the Measures.

At Evenwood Colliery a drift was put through the dyke near to Buckheads Farm, at which point it was not found in one mass, but split up into three or more walls of whinstone with pieces of coal strata between.

Near the village of Bolam it is wrought extensively in an open quarry. To the east it is seen as a dyke about ten yards wide, cutting through beds of sandstone and shale, some of which are considerably altered by heat. To the west the whin spreads out north and south, forming a large tabular mass about one hundred yards across, and fifty or sixty feet deep. Fragments of coal are here sometimes found in the whin very beautifully coked.

The latter locality is the most easterly where we have seen the Cockfield Dyke, but about a mile more to the east, between Legs-a-Cross and Houghton Bank, there is an old quarry hole, half filled with rubbish and water, that is said to have been formerly wrought for whinstone. The rock at present exposed is a very coarse, easily decomposing grit, which looks, from its altered aspect, as if it had been subject to igneous action.

The general course of the dyke, from the last named place to the Gaunless, near Haggerleases Lane, is to the west of W.N.W. From the latter point its bearing becomes still more westerly. From Diamond Pit to Wooley Hill its course is unknown, or it may possibly not reach upwards to the present land surface; but as the latter locality is to the W.S.W. of the former, it is evident that a deflection to the south of west must there take place.

We have observed no traces of the dyke in the Magnesian Limestone. But at Broom Dykes, near to where it would strike the outcrop of that formation, assuming its course to continue as before, a disturbance takes place in the limestone which may possibly be in some way connected with it.

On the right of the road leading from Hilton to the Black Horse, and nearly opposite Wackerfield Lane, there is an old abandoned quarry which Mr. George Bowes, of Wackerfield, informs me was wrought for road-metal by his father and himself more than forty years ago, where I found the whinstone as lying in the form of a small oval basin, with the longer axis east and west, and about three-quarters of an acre in extent, and thirty feet deep. The whole of this basin of whinstone was worked out, but a small dyke of the same rock, from six to nine feet wide, was found beneath it, running east and west. The sides and bottom of the quarry are of sandstone much altered by heat, and the dyke is still to be seen at the bottom and east end of the quarry, in which direction I traced it for half a mile in a direct course for Bolam. To the westward I could find no indication of it: whether it is continued in that direction I cannot say, but I have no doubt of it being an offshoot from the main dyke, which it evidently joins near the last named place. (J. D.)

DRIFT.

A deposit of clay with boulders generally covers the Coal Measures of this district to a greater or less extent. It often partakes more of the character of a local drift than of true boulder clay. At other times the presence of well striated fragments of Lower Carboniferous rocks, that have travelled from the west, give it an aspect identical with the latter deposit.

Apparently of later origin than this boulder clay are some thick accumulations of sand, gravel, and fine brick clays, which are found in and on the flanks of the valleys of the Wear, Gaunless, and Tees. These deposits occur over one hundred feet above the present river levels, and in some cases borings have shown that they extend considerably below them. When they are met with underground, as they sometimes are, much to the chagrin of the coal-owner, they are termed a "wash," we assume from the coal being washed off before they were laid down. Fig. 20 gives an example of a "wash" in the workings of the Brockwell seam, at the Old Etherley Colliery. A similar instance of denudation occurs in the same seam in the Crook valley, and others have of course been noticed in other parts of the coal-field,

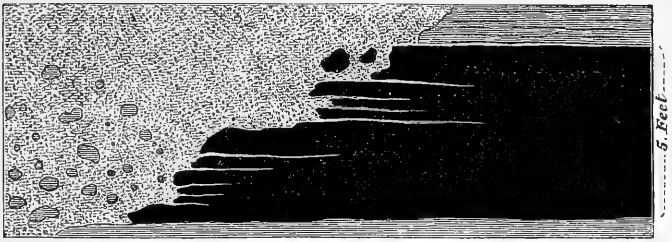


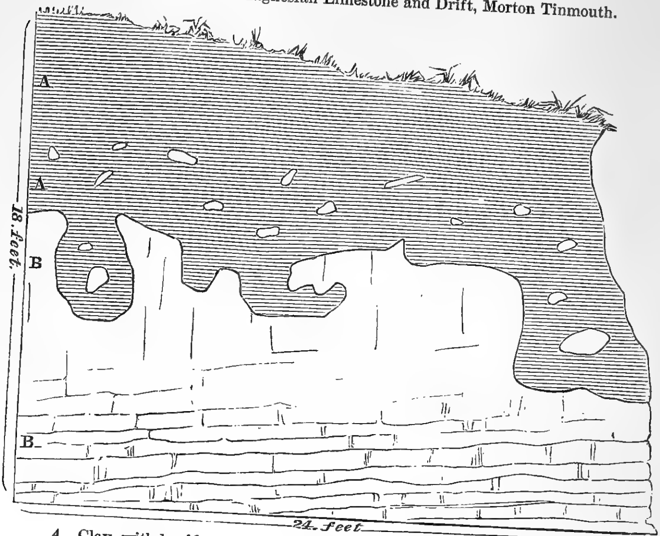
Fig. 20.—Denudation of Brockwell coal, George Pit, Etherley.

the most extensive one being that following the course of the valley of the Team, at a considerable depth below the present surface. In the instance figured the "wash" is formed of silt, sand, and clay, with gravel and boulders: the sand and clay are forced several feet into the planes of bedding of the seam, and the boulders are all more or less worn.

In connection with these comparatively recent deposits may be mentioned a very curious, eroded surface of the Magnesian Limestone, that occurs beneath a drift clay, in a quarry south of Morton Tinmouth. The Magnesian Limestone there, like most of that rock seen in this part of the county, belongs to the lower portion of the series, and is yellow and thin-bedded with marly partings. Covering it for a thickness of eight or ten feet is a deposit of clay with boulders, such as is usually classed as boulder clay. The surface of the limestone, as seen in section, is worn into deep and irregularly shaped cavities, with even more irregularly shaped prominences between. Fig. 21 represents a portion of the surface as seen by one of us in April, 1867. The lower beds of limestone are hard, with well marked planes of stratification: the upper portion is soft and not so well bedded.

It is difficult to explain this eroded rock surface simply by mechanical action. The cavities are not like the "pot-holes" and other hollows formed by running water or by the action of waves on coast-lines, nor yet like any water or weather-wasted surface with which we have acquaintance. Its origin is probably in a great measure chemical—similar to that of "sand-pipes" in the chalk, and in other calcareous rocks.

Fig. 21.—Section of Magnesian Limestone and Drift, Morton Tinmouth.



A Clay, with boulders. *B* Magnesian Limestone, with eroded surface.

In concluding these remarks we may observe that slight as their value undoubtedly is, it would have been less but for information kindly supplied us by several mining friends, among the chief of whom we would name Mr. William Lishman, of Etherley. We would also mention that we are much indebted to the Etherley Coal Company, through Mr. W. C. Stobart, for authority to make use of facts observed by one of us in the underground workings of their collieries.

V.—*Note on an undescribed Fossil Fish from the Newsham Coal-Shale, near Newcastle-on-Tyne.* By Albany Hancock, F.L.S., and Thomas Atthey.

For several years past we have been much puzzled with a large ichthyic tooth that is not by any means uncommon at Newsham. We could not make out to what fish to assign it. Indeed there is but one, of sufficient size, found in the locality, of which the teeth are not known, that was at all likely; and the remains of this were supposed to belong to *Rhizodus;* and as the teeth in question are perfectly devoid of cutting-edges, they could not belong to it. We had doubts, however, as to these remains really being those of that obscure fossil, and thought that probably they would be found some day or other associated with our unknown tooth—that it belonged, in fact, to these supposed *Rhizodus*-bones. And such is apparently the case.

A jaw has just been obtained at Newsham with one of these large enigmatical teeth attached, and the surface-ornament of the bone is of the same character as that of the remains alluded to. This jaw, which is a left ramus, is quite perfect in front; but the proximal extremity is broken away. The part that remains is upwards of seven inches long, and an inch and five-eighths wide; the margins are nearly parallel; the alveolar border is pretty straight, but rises up a little in front, which is rounded. About an inch behind the anterior extremity, a large stout laniary tooth is placed on this elevated part; it is slightly recurved, but the apex is gone. What remains measures an inch in length; the base is broad, being quite five-eighths of an inch wide; and the upper, broken extremity is three-eighths of an inch across. When perfect, this tooth could not be less than an inch and five-eighths in length, as is proved by comparing it with a perfect tooth of the same size at the base. The base is deeply folded, the folds being rounded and covered with minute, sharp, raised striæ, which pass upwards and die gradually out as they approach the broken extremity.

Along the alveolar border there are nine small teeth, three-eighths of an inch long; they have much the character of the large laniary tooth, exhibiting the same minute characteristic striation, but do not seem to be folded at the base. The first of these is about a quarter of an inch behind the large tooth; the next two are about the same distance apart from each other and from the first tooth; the fourth, fifth, and sixth are divided from these and from each other by a space of five-eighths of an inch; the seventh is a little more than one-eighth of an inch from the sixth, and a quarter of an inch from the eighth, which is an eighth of an inch from the ninth, and this the last is an inch and a quarter from the broken extremity of the mandible.

The whole surface of the dentary bone is covered with small rough tubercles, which have a tendency to run in lines, producing vermicular grooves. This peculiar character of bone-surface at once associates our mandibular fragment with the remains already referred to, and supposed to be those of *Rhizodus*, and for a description of which we must content ourselves, on the present occasion, with referring to our paper "On Reptiles and Fishes from the Shales of the Northumberland Coal-Field" (Ann. Nat. Hist., Ser. 4, Vol. I., p. 346). But we may remark that among these remains are many well-marked fragments and several perfect crescentic gill-plates or opercula, the largest being six inches in length; but one recently acquired is seven inches long; and a broken specimen in our possession could not have measured much under eight inches when perfect. There are also described along with these remains two or three jugular plates six inches long; and these are associated with a number of the body-scales, three inches in diameter, usually supposed to be those of *Rhizodus*.

Here, then, we have the crescentic opercula usually attributed to *Rhizodus*, and jugular plates, with many other bones, all of which have the surface-ornament similar to that assigned to that fossil, and associated with the body-scales described as belonging to it—occurring in a locality where the unmistakable tooth of the large *Rhizodus* has never yet been found. But in this locality another large tooth occurs, with peculiar characters, and has now been found attached to a jaw the surface-ornament of which perfectly accords with that of the above-mentioned remains. However it may be with *Rhizodus*, it would therefore seem impossible not to adopt the conclusion that all these specimens belong to one and the same fish; and the tooth proves that they do not belong to *Rhizodus*. For this fish, then, so characterised, and which seems to us to be generically as well as specifically new, we propose the name *Archichthys sulcidens*.

We must add, before concluding this note, that the teeth of our new fish sometimes measure two and a half inches in length, and are upwards of an inch wide at the base, and that upwards of a score of specimens of it have occurred at Newsham. It is therefore pretty certain that they never attain the dimensions of those of *Rhizodus*, from which they can always be distinguished by their rotundity, the total absence of cutting-edges, and the fine striation of the surface; though they are folded at the base in a manner similar to those of that great enigma.

We may also add that thirteen opercular plates have been found, some being quite perfect and in excellent condition. The scales, too, are not by any means rare in the same locality. The remains, then, of this fish being so abundant, the non-occurrence of the large *Rhizodus*-tooth is very significant.

VI.—*On the Occurrence of Loxomma Allmanni in the Northumberland Coal-Field.* By Albany Hancock, F.L.S., and Thos. Atthey.

A few months ago we announced the occurrence in the Coal-shale, near Newcastle, of a considerable portion of the cranium of *Anthracosaurus*. We have now the pleasure of recording the presence of another large Labyrinthodont Amphibian in the same locality, Mr. Atthey having recently obtained, in the black shale at Newsham, a nearly perfect skull of *Loxomma Allmanni*, Huxley, which we believe to be the first authenticated specimen of this fine Labyrinthodont that has been found in this neighbourhood.

The skull is complete, with the exception of the muzzle, which is entirely wanting; but in other respects it is in an excellent state of preservation. The exposed surface, which is that of the crown, is wholly covered with the honeycomb-like sculpture usual in these animals. The pits and ridges are remarkably regular and deep, though they are occasionally elongated; the ridges are smooth, and have a semigloss—which two characters, taken together with the colour, a dark brown, give to the whole surface the appearance of carved box-wood.

As presented to view, the contour of the skull is triangular, with the apex truncated, and the base or occipital region arched considerably inwards. The apex or muzzle not being present, it is impossible to say how much it was produced when perfect; but, judging from the gentle inclination of the side margins, it would seem to have been much prolonged. The whole of the muzzle is broken away as far backward as the anterior border of the enormous orbits. Across the broken extremity the skull measures about five inches; and the width of the occipital region at the widest part is nine inches; the length, from the broken anterior extremity to a line drawn between the points of the lateral expansions, is eight inches and a half. But if we make allowance for what is wanting of the muzzle, the length of the skull may be estimated at upwards of twelve inches.

The longitudinal centre of the cranium is composed of a comparatively narrow strip of bone, which is apparently made up of the frontals, the prefrontals, the parietals, the postfrontals, the epiotics, and the occipitals; but it is quite impossible to determine the boundaries of these component parts, as the sutures are invisible, notwithstanding the fine condition of the specimen. The anterior portion of this compound strip of bone divides the large oblique orbits, the posterior portion the great lateral expansions which forms the sides of the occipital region. In front it is a little expanded laterally, and measures two inches and a quarter across; thence backwards for two inches and three-quarters the sides arch gently inwards, forming the inner anterior boundaries of what may be termed the anterior division of the orbits; and then for an inch and three-quarters further back the sides are more strongly arched in the same direction, forming the inner posterior boundaries of the posterior division of the orbits, there being at the junction of the two divisions of the inner orbital boundary a strong angular projection, emphatically marking off the two parts. At this point the interorbital bone is two inches wide. A little further back, at the narrowest part, it is only an inch and three-eighths wide. The inner boundaries of the orbits appear to be formed by the pre- and postfrontals.

The posterior portion of this central strip reaches from the hinder margin of the orbits to the occiput, the sides being very slightly arched outwards, and continuous with the lateral expansions. This portion of the cranium is two inches and six-eighths wide, and two inches and three-eighths long, measuring from the posterior boundary of the orbit to the point of the epiotic bone, and, rising a little above the general surface, is strongly defined. The occipital margin is slightly arched inwards, and at either side is produced backwards into short horns—the posterior points of the epiotic bones. This division of the central strip of bone is composed of the occipitals, the parietals, a portion of the postfrontals, and the epiotics, though here, as in the anterior division, the boundaries cannot be determined with precision. No parietal foramen can be observed.

The lateral expansions are each three inches wide, and, according to Prof. Huxley, they are composed of the postorbitals, the malars or jugals, the squamosals, and the quadrates. They project backwards quite an inch and a half beyond the central portion of the skull. The hinder margin of each at first bends outwards and backwards from the side of the epiotic bone for about two-thirds of its extent; it then suddenly turns a little forwards and terminates in a short point at the lateral or external angle. From the base of this point the outer or lateral margin advances forwards and outwards, being at first, for about an inch, a little concave; it then bends a little inwards, and runs forwards in a straight line an inch and five-eighths further to the posterior extremity of the maxilla. From this point, which is only slightly indicated, the lateral walls of the skull are continued in a uniformly inclined line to the anterior extremity.

The inner part of the posterior margin is formed by a ridge which thickens and enlarges at the point where it turns suddenly forwards, and this thickened part is turned upwards and overlaps a little the upper surface of the skull; thence to the external point or horn the surface is smooth, and has the appearance of being that of a joint. This is apparently the tympanic bone.

The surface sculpture, however, does not extend so far back as this; it terminates abruptly in a sigmoidal line that reaches from the outer margin of the epiotic bone about midway between its posterior horn and the hinder boundary of the orbit to the base of the outer cornu. At first this line (that is, its inner extremity) arches gracefully forwards, and then sweeps backwards and outwards to its outer termination, as already indicated. Behind this line the bone is depressed and smooth; the space next the epiotic bone is of considerable extent, and has all the appearance of being for muscular attachment: probably the temporal muscles may originate here; for muscles so placed would be conveniently situated to act upon the articular extremity of the mandible.

The posterior outer boundary of the orbit is formed by the postorbital, the limits of which can be partially traced; it is narrow, and extends from the postfrontal to the inner posterior border of the malar; its orbital margin is concave, and is inclined outwards and forwards. The limits of the malar are also pretty well defined; it is wide behind, before quite narrow, not being more than seven-eighths of an inch wide, including the thickness of the posterior extremity of the maxilla, which forms as it were a narrow border to its straight margin. When perfect, this narrow margin of the malar could not be less than two and a half inches long; more than two inches of it still remains, the anterior extremity having been broken away. The orbital boundary of this part is only very slightly concave; it then rather suddenly bends inwards and backwards as it approaches its junction with that of the postorbital, where there is a slight bulging inwards. From this point the posterior margin of the malar is bounded by the postorbital, the squamosal, and the quadrate. At first this boundary passes inwards and backwards, then outwards and backwards, and finally forwards and outwards, reaching the straight external margin of the malar at the posterior point of the maxilla. This enlarged posterior portion is upwards of an inch and a half wide.

The orbits are both imperfect in front, the anterior boundaries having been broken away; but the form, notwithstanding, is determinable throughout. They are very large, measuring upwards of four inches long and one inch and a half wide at the projection of the interorbital bone. Behind this point, which divides it into two parts, an interior and posterior, the orbit extends obliquely outwards and forwards; and in front of it the anterior division, which is the larger, turns a little inwards and forwards.

The maxillæ extend backwards to within three inches of the external cornua; as much as four and a quarter inches of the posterior portion is present: they are narrow and straight, and border the straight outer margin of the malar, forming the lateral boundaries of the cranium. In the right maxilla there are five teeth—four towards the anterior fractured extremity, and the fifth, of which the stump only remains, is seven-eighths of an inch from the hinder extremity. Three of the anterior ones are perfect: the first is placed a quarter of an inch from the broken end of the jaw, and is about half an inch from the next tooth; the second, third, and fourth are a quarter of an inch apart (the crown of the latter is gone); the fifth is placed an inch and three-quarters further back, the intermediate teeth having probably been removed. The remains of three or four teeth are observed in the left maxilla, placed about the same distance apart as those of the right maxilla.

These teeth are of equal size; the perfect ones measure three-tenths of an inch in length; they are grooved from the base halfway up the crown; the upper portion is compressed in the direction of the long axis of the jaw, and the sides are produced into wide, sharp-cutting margins; the extremities are abruptly pointed.

A large palatal tooth or tusk is seen a little within the fractured extremity of the right maxilla, sinking into the matrix;

the exposed portion is three-quarters of an inch in length; it is half an inch wide at the base, and is three-eighths of an inch wide at the upper extremity; it is therefore probable that not half the tooth is seen, and that it cannot have been less than an inch and a half in length.

The under surface of the specimen is partially exposed; but too little is displayed, and that little is too much disturbed to admit of clear elucidation. Part, however, of the basi-sphenoid and its lateral processes can be observed, as well as a portion of the palatal bones; also the palato-temporal foramen seems to be in part recognizable.

We have already stated that this fine cranium is the first authenticated evidence of the occurrence of *Loxomma* in the shale of the Northumberland coal-field. Mr. Atthey, however, has had in his cabinet for several years the crushed cranial bones of this Labyrinthodont; but, owing to the confusion of the parts, we were quite unable to determine to which of the known forms to refer them, until the possession of the specimen under discussion cleared up the matter. We can now trace distinctly the presence of the central portion of the cranium, which agrees with that of the specimen before us in form and surface-sculpture. A portion of a maxilla, with a few teeth attached, as well as considerable remains of the lateral expansions, are likewise determinable.

Having now the advantage afforded by the possession of this almost perfect skull of *Loxomma Allmanni*, we are also enabled confidently to refer to the two magnificent Labyrinthodont skulls exhibited and described, under the name of *Pteroplax brevicornis*, by Mr. James Thomson and Prof. Young, of Glasgow, at the meeting of the British Association held last year at Exeter. On passing through Newcastle on his road homewards, Mr. Thomson kindly gave us an opportunity of inspecting these specimens, and at the time we pronounced them to belong to *Loxomma*—certainly not to *Pteroplax*. We are now in a position to speak on the subject without the least hesitation, in confirmation of our opinion then expressed. That our cranium is that of *Loxomma* there is not the least doubt; that it agrees with Mr. Thomson's specimens generically, and we believe specifically, is equally certain; and that *Pteroplax* is distinct from *Loxomma* we have the high authority of Prof. Huxley, who has examined our type specimens of the former.

This is quite evident even on a cursory examination of the two forms. But we may take this opportunity to state that *Pteroplax* deviates considerably, in the structure of the cranium, from all known Labyrinthodonts. In the conformation of the head it approaches the Siren. This fact was entirely overlooked by us at the time of the publication of our paper on the subject (Ann. Nat. Hist., Ser. 4, Vol. I., p. 266), and was not recognised until Prof. Huxley kindly pointed it out to us some time afterwards.

Pteroplax has no posterior lateral expansions like those in *Anthracosaurus* and *Loxomma*, as we thought it would have (the whole, or nearly the whole, of the cranium is figured in plate xv. fig. 1 of the above paper, and likewise in the Nat. Hist. Trans. of Northumberland and Durham, Vol. III., pl. II.); the maxillæ are also deficient. The long curved horns are undoubtedly the equivalents of the lateral external cornua in *Loxomma;* and the overlying points are the homologues of the inner horns, being in both genera the posterior extremities of epiotic bones.

Shortly before the occurrence of the cranium of *Loxomma* at Newsham, Mr. Atthey obtained from the same locality a series of vertebræ, lying nearly in natural order, with a few ribs scattered among them. We think these also probably belong to *Loxomma*. There are fourteen or fifteen vertebræ; but, unfortunately, little can be made out respecting them except the form and character of the bodies, the processes of which are not determinable, though they seem mixed up with the matrix, which is partly composed of iron-pyrites.

The largest vertebræ are about seven-eighths of an inch wide, and five-eighths of an inch long; they are slightly hollowed at the ends, with the margins a little reflected; there is a minute notochordal foramen in the centre, but this is not always visible; and the sides are hollowed or channelled, but do not exhibit much striation.

The ribs are peculiar in form; they are about five inches long, but we cannot be certain that they are entire; the shaft is three-eighths of an inch wide, and is not much compressed; nor do they exhibit the longitudinal groove so usual in the ribs of these Amphibians. The proximal extremity is exceedingly wide, measuring across seven-eighths of an inch; it is much compressed; but the capitular margin is thick and continues the curve of the shaft; it projects a little beyond the tuberculum, and is divided from it by a very shallow notch; the bifurcation is consequently exceedingly shallow. The tubercular process turns suddenly from the shaft, and, though thin, widens out into a large concave articular surface, much larger than that of the capitulum.

There is, of course, no certainty that these vertebræ and ribs are really those of *Loxomma;* but, from their occurring in the same locality, and about the same time as the cranium, we may infer that it and they came from the same part of the seam; hence the probability that they belonged to the same animal; and, moreover, the ribs differ considerably from those of *Anthracosaurus* and *Pteroplax*, the only other large Labyrithodonts that have yet been found in the Newcastle coal-field.

VII.—*Description of a Labyrinthodont Amphibian, a new Generic Form, obtained in the Coal-Shale at Newsham, near Newcastle-upon-Tyne.* By Albany Hancock, F.L.S., and Thomas Atthey. (Plate IV.)

The fossil vertebrata of the Coal-shale overlying the High-main Seam at Newsham do not yet appear to be exhausted, notwithstanding the great attention that has been bestowed upon the subject, for many years past, by one of the authors of this paper.

In proof of this we have to record the recent occurrence, in the above locality, of two specimens of a small Labyrinthodont skull, differing from anything with which we are acquainted, and of such a peculiar character, that it is necessary to establish a new genus for the reception of this curious species, which we propose to name *Batrachiderpeton lineatum.* One of the specimens is in a good state of preservation, and is almost entire.

The anterior portion of it, however, is crushed and otherwise injured; but the characters of the hinder part are well displayed, and so are those of the median coronal bones, the surface-structure of the whole being beautifully preserved. The other specimen has lost a considerable portion of the right side, and is much crushed and distorted, but nevertheless exhibits, in excellent order, some of the more important characters.

The first-mentioned and the more perfect of the two specimens is flat and shield-like, having the contour in front pointed and broadly wedge-shaped, the sides of this part being broken; the occipital region is exceedingly wide, and considerably arched inwards at the posterior margin. It is evident, however, that when perfect, the front was broad and rounded, the muzzle being quite short, and that the sides were arched outwards. The skull is remarkable for its great width in proportion to its length, and for the wing-like character of the lateral expansions of the occipital region, which are very largely developed, and project considerably backwards, the lateral posterior angles being produced into long processes or cornua: consequently, from this peculiar formation, the inward arching of the occipital margin arises. From the outer angles of the occipital bones there are two other or inner horns, which are much less than the outer pair. When entire, the skull must have had the form of a broad inverted shield, with the apex in front rounded, and the basal or posterior margin concave. It measures two inches and three-tenths in length from the muzzle (the extremity of which is present) to a line extending from tip to tip of the external horns, but only an inch and seven-eighths to the extremity of the inner or occipital cornua. One side of the skull, behind, is quite perfect; so, by doubling the width of this from the median line, the breadth of the entire skull can be correctly determined: measured thus, it is two inches and five-eighths across the widest part; it is two inches and a quarter in width without making such allowance.

The central coronal bones are narrow in proportion to the great breadth of the entire skull, and their boundaries are marked by strongly raised lines or ridges. The occipitals in combination are quadrilateral, and are half an inch wide and six-tenths of an inch long; behind, the margin is slightly concave, and from the sides, as if in continuation of the raised lateral lines, the two inner cornua project; they are a quarter of an inch long, are conical and irregularly three- or four-sided, with the surface roughened with ornamentation like that of the skull.

In front the occipitals are divided from the parietals by a double, raised, transverse line. The latter are as wide as the occipitals, and have their lateral boundaries marked in the same manner by raised lines, which are in continuation of those of the occipitals, but are not so much elevated. These parietal lines slightly incline towards each other as they advance forward, which they do for about half an inch; they then diverge a little, and are lost in front in a circular groove which reaches four-tenths of an inch further forward. The anterior boundary of the parietals appears to be at the point where the lateral lines are most approximate; and in front of this the circular groove may perhaps circumscribe the frontals and nasals.

On the longitudinal middle line, a little in advance of the posterior margin of the parietals, there is a circular foramen a tenth of an inch wide, thus proving that we are correct in denominating this elongated area the parietals: consequently the area behind must be that of the occipitals. But we must remark that the forward position of the parietals, and the great extent of the occipitals, are uncommon features in the Labyrinthodonts, and seem to indicate an approximation to the Batrachian form of structure—though, as we shall afterwards endeavour to show, our new genus is more closely related to the recent genera *Siren*, *Proteus*, and *Axolotl*.

It is difficult to say of what bones the lateral expansions are composed; they remind us much of similar expansions seen in other Labyrinthodonts, only they are proportionally much larger than usual. Judging from this similarity, it may be assumed that they are composed of the quadrates and squamosals, postorbitals and malars, so far as the posterior portions of them are concerned—though probably they also comprise the epiotics; for it can scarcely be supposed that these latter bones lie within the raised boundary lines which we assume to be those of the occipitals. And yet, from analogy, it might be thought that the inner cornua formed the posterior extremities of the epiotics. In front of the lateral expansions, and external to the frontals and parietals, the ridges on the surface probably indicate the presence of the several component bones of these parts; but it is imposible to determine with precision their limits and exact configuration.

The posterior margin of each lateral expansion extends in a straight line outwards and backwards from the base of the occipital horn for seven-tenths of an inch to the external horn, which projects backwards with a slight inclination outwards, and is four-tenths of an inch long and one-fourth of an inch wide at the base; the surface is rough, like that of the inner horns, and is carinated longitudinally above and below, so that it presents four irregular facets. Of the lateral margins only the posterior portion of the left side is perfect, and this turns suddenly forward from the base of the horn in a slightly convex line for nine-tenths of an inch; it then bends rather abruptly forwards and inwards, and extends in an outward curved line for six-tenths of an inch further, at which point the margin of this side is broken away in an inward sloping direction to the anterior extremity of the skull. At the right side in front the lateral margin is folded inwards, and is otherwise injured for nearly two-thirds of its length; the posterior third is almost perfect, but the lateral horn is broken off.

The surface of the skull is in a very good state of preservation, and is sculptured in a very peculiar manner, long linear ridges being the most conspicuous feature. As already stated, such ridges define the boundaries of the coronal bones; those of the occiput are very strong, and, together with the lateral ridges of the parietals, form along the sides of the central portion of the skull two nearly parallel lines enclosing the occipitals and parietals, each of which is rectangular in form. Other lines pass diagonally backwards in a radiating manner from the junction of the parietals and occipitals (that is, from the point where the transverse double line divides these two sets of bones), and are continued to the base of the outer horns; there are three or four of such lines on each side. Also from the base of the outer horns other three or four somewhat interrupted lines stretch diagonally forwards and inwards, extending nearly as far as the front of the parietals. At the posterior margin of the lateral expansions, and parallel to it, there are likewise two or three obscure lines.

Besides these lines, the occipital area and lateral expansions are irregularly tuberculated; in front the skull is comparatively smooth; but the whole surface, including the ridges and tubercles, as well as the smooth portions, is covered with a minute reticulation of raised ridges; the meshes, being deeply sunk, give, when seen under a lens, a punctured appearance, and when so magnified, this minute reticulation much resembles the usual Labyrinthodont honeycomb-like surface-structure.

The under surface of the specimen displays the roof of the mouth, which, though imperfect, exhibits some very interesting characters. In front the remains of the præmaxillæ are seen at either side doubled inwards and pressed down; they seem to have been short, probably not much over six-tenths of an inch in length. That of the right side is nearly entire, and lies with its outer surface exposed, which is covered with a minute reticulation of raised lines. The posterior extremity is considerably produced beyond the teeth, and is pointed and conical. This process is apparently for cartilaginous attachment. The alveolar border is straight and thick, and contains seven teeth, three or four of which are perfect; they are close-set, stout, and slightly incurved, with the tips rather abruptly pointed, a little compressed in the direction of the length of the jaw, and finely and sharply striated, the striæ being raised; the base and middle portion are smooth and cylindrical. A mere trace of the left præmaxilla is visible; but four or five of its teeth are pressed down upon the vomer. These teeth are well preserved, and have all the characters of those of the right side.

The vomer is largely developed, and extends backward quite half the length of the skull; it is divided by a suture on the longitudinal middle line, and the two lateral portions diverge a little behind. To these diverging points the pterygoids are attached; they are wide, stout bones, which, passing outward and backward, abut at the posterior portion of the malars or the bones forming the hinder lateral margins of the skull. In front of the pterygoids there is a large depression on each side, which may be the palato-temporal foramen: these depressions are circular in front; but their inner posterior boundaries are formed by the almost straight line of the pterygoids.

On the middle longitudinal line behind the pterygoids there is an elevated process, which probably indicates the presence of the sphenoid; and behind this, on either hand, at the posterior margin of the skull, which is bounded by a strong ridge, there is a rounded elevation. These two elevations are probably the occipital condyles pressed inwards; or it may be that they are the lateral margins of the sphenoid turned upwards and distorted.

The large plates in front, which we have assumed to be the vomers, may possibly hold in combination the palatal bones. Be this, however, as it may, they are thickly covered with minute teeth from end to end, and to within a short distance of the lateral margins. These teeth do not appear to be arranged in any particular order, but are much obscured by the matrix. A few, however, are quite free, and show that they are short, stout, pointed, conical, and have the apices striated. This great patch of minute teeth is bounded on either side by a row of eight or ten stout close-set teeth, similar in all respects to the præmaxillary teeth, even to the apical compression and striation; and they are nearly as large, if not quite as large, as the latter. The posterior one, which is placed close in front of the palato-temporal foramen, is larger than the rest, and is certainly equal in size to the præmaxillary teeth.

The other or less perfect specimen of the skull has lost the whole of the right side; and the margin of the left side is much injured, and is doubled inwards. It is quite evident, however, that this specimen, when perfect, was quite as large as the one first described; and the surface-ornamentation is of the same character. The two principal coronal bones, the occipitals, and parietals, are almost entire, and are of the same rectangular form. The parietal foramen is distinctly displayed, and in every respect agrees with that of the other example. The left outer horn is present, and shows no variation in character; the two inner horns and the right outer horn are broken away.

The left præmaxillary bone is pressed inwards, and agrees in size and position with that previously described. It has seven teeth, beautifully preserved, the exact number in the other specimen, and, in fact, the præmaxillaries of the two individuals are in every respect similar, only in that now before us the posterior pointed extremity is apparently hidden in the matrix. The greater portion of the vomer is preserved, and is studded, in the same manner as in the first specimen, with numerous, short, stout, conical teeth. The left outer or lateral row of vomerine teeth are well exhibited, and are pressed down inwards; they are ten or twelve in number, and are quite as large as those of the præmaxillæ, and are in like manner striated at the apices. They seem better developed and are rather more numerous than in the other specimen; but in it these teeth are broken down and are much encumbered with the matrix, and there can be little doubt some of them have entirely disappeared: eight nevertheless can be counted. Had we not had the first-described specimen for comparison, we might have taken this lateral row of vomerine teeth to have belonged to either a maxilla or a mandible pressed inwards; but after carefully considering the evidence for and against, we think it favours the opinion we have adopted, though it is quite possible that we may be mistaken. At the same time it must be remarked that this row of teeth occupies exactly the same position that the lateral vomerine row does in the other specimen, that it is of the same length, and that the number of teeth is apparently the same, two or three having been removed in the first specimen.

The folded margin of the cranium exhibits in front a longitudinal depression, which there can be little doubt indicates the position of the orbit; indeed, at one point the inner orbital margin can be traced. A similar depression is observable in the other specimen, at the right side. The only other feature worthy of notice in our second specimen is the pterygoid; that on the left side is pretty well preserved, and shows no variation of character, except that the surface is minutely striated in a longitudinal direction.

For three or four years past, Mr. Atthey has had in his possession a mandible belonging to this new Labyrinthodont; and, though always believing it to be distinct from that of any known species, we have kept it back till now, not feeling ourselves justified in encumbering the nomenclature with terms signifying so little, and, in a scientific point of view, almost valueless. We are now, however, in a position to associate it with a cranium possessing important and interesting features. There can be no doubt that this mandible is really that of *Batrachiderpeton*. The surface-character of the bone, its size, and the character, form, and size of the teeth all go to prove this.

This mandible is perfect in front, where it is obtusely pointed; behind it is imperfect, a considerable portion evidently having been removed. The outer surface is exposed, and is seen to be covered with a few coarse, irregular, longitudinal ridges, having much the character of those on the cranium; and in front there are a few reticulated ridges, quite similar to those on the præmaxillæ. It is an inch long and a quarter of an inch broad at the widest part; the margins are nearly parallel, the jaw narrowing only very slightly forwards; the alveolar border is thick and almost straight, there being a slight depression near the centre, dividing the teeth into two groups. In all, there are fifteen teeth; they are closely arranged, stout, a little incurved, rather obtusely pointed, and have the tips finely striated and slightly compressed in the direction of the length of the jaw—agreeing in these peculiarities, as in all the other characters, with the præmaxillary teeth. They are confined to the anterior portion of the mandible, there apparently having been none in the posterior part. The range of the teeth will therefore correspond very well to those of the præmaxilla. They are the sixteenth of an inch in length, being of the same size as those of the præmaxilla.

It is impossible to contemplate the structure of the roof of the mouth of this curious Labyrinthodont without being reminded of the arrangement of the parts in that of *Siren*, *Proteus*, and *Axolotl*. The well-armed vomer in particular is very striking. The extensive development of this vomerine armature, and the deficiency of bony maxillæ, would seem to ally *Batrachiderpeton* to *Siren* and *Proteus;* while the relationship of the vomers to the pterygoids, and the form of the latter, are very similar to what obtains in *Axolotl*. And the alliance with this interesting form would be rendered still stronger if it should turn out that our new genus has really bony maxillæ, particularly as the præmaxillæ are armed with teeth. In *Siren* and *Proteus* the præmaxillaries are quite minute, and are devoid of teeth.

The characters of the præmaxillæ in *Batrachiderpeton* are, as we have seen, only imperfectly displayed, and some doubt as to their form and extent might be entertained. But it would seem likely that in them we see the whole of the bones of the upper jaw, and that they must have stretched outwards and backwards, and have each been united to a membrane or cartilage (the representative of the maxilla), and in this way have become attached to the under surface of the malar or the lateral cranial bone where it is smooth and seems well fitted for such attachment; they could not have been attached to the outer edge of it, for it is covered with surface-ornamentation. By this arrangement spaces for the orbits are provided; and thus, again, our new Labyrinthodont would seem to resemble *Siren* and *Proteus*.

That this is the fact is apparently corroborated by what can be traced of the bones themselves. The præmaxilla of the right side in the more perfect specimen is, as before pointed out, pressed inwards upon the vomer, or rather in front of it. Before, it is wide, and is continuous with the bone of the muzzle, as is proved by the continuation of the surface-ornament. Behind, however, it appears to have been free, and to have terminated in a pointed extremity. On this side, too, the malar is turned inwards; but its anterior extremity, which is pointed, does not seem to be united to the præmaxilla; it has likewise all the appearance of having been free.

In the less perfect specimen, as before mentioned, the præmaxilla of the left side is pressed inwards in the same manner as that of the right side in the other specimen; and both agree in having seven teeth, and in having had apparently the posterior extremity free. From these coincidences it would seem fair to assume that the præmaxillæ comprise the whole of the bony structure of the upper jaw. At the same time it must be allowed that, as previously pointed out, the row of teeth on the left side of the vomer in one of the specimens has much the appearance of having belonged to a maxilla; and if this should prove to be the case, then *Batrachiderpeton* would be more closely allied to *Axolotl* than to *Siren*.

In the large size of the coronal bones, *Batrachiderpeton* also shows an alliance with *Siren* and *Axolotl*, while, in the squareness of the occipitals and parietals, it agrees with the Salamander and the Batrachians. But, notwithstanding these deviations from the usual characters, there can be little doubt that our new form is a true Labyrinthodont; for the lateral cranial expansions, though more developed than commonly, are very similar to those characteristic features of these amphibians. And the parietal foramen is most significant, as well as the stoutness of the teeth; and the row of strong vomerine teeth on each side is also characteristic.

But this is not the only instance in which a Labyrinthodont has been found to exhibit an approximation to the *Siren*-type of structure. *Pteroplax* is so related, as we have pointed out in the May number of the "Annals." At present, however, it is not necessary to dilate further on this matter than to state that *Pteroplax* seems to approach *Siren* in a different line from that by which it is approximated by *Batrachiderpeton*. In the former the lateral cranial expansions of the Labyrinthodont are entirely reduced, while in the latter they are even exaggerated in extent; and in *Pteroplax*, again, the coronal bones are not much altered in form, and the frontals are very long, showing that the muzzle was much produced. In *Batrachiderpeton*, on the contrary, the muzzle is extremely short, and the posterior region of the skull is much developed. *Pteroplax* shows its relationship to *Siren* by the reduction of the lateral cranial expansions, *Batrachiderpeton* by the large development of the occipital and parietal bones, both also by the peculiar character of the præmaxillæ and the deficiency of bony maxillæ, though, as we have already seen, there may be some doubt as to this last feature in *Batrachiderpeton*.

EXPLANATION OF PLATE IV.

Fig. 1. Dorsal view of the cranium of *Batrachiderpeton lineatum*, a little enlarged; the dotted lines indicate the restored parts: *a*, occipital bones, bounded by raised lines; *b*, inner cornua; *c*, parietals exhibiting foramen near the posterior part; *d*, area circumscribed by a circular groove, probably the frontals and nasals; *e*, lateral expansion; *f*, one of the outer cornua; *g*, supposed malar; *h*, præmaxillæ, indicated in outline, in their supposed natural position; *i*, orbits, indicated by dotted lines.

Fig. 2. View of roof of mouth of the same: *a*, inner cornua; *b*, one of the outer cornua; *c*, left malar; *d*, right malar, bent inwards; *e*, right præmaxilla, doubled inwards; *f*, free posterior extremity of ditto; *g*, teeth of the left præmaxilla, bent inwards; *h*, vomer studded with minute teeth; *i i*, two lateral rows of large vomerine teeth; *j*, pterygoid; *k*, an eminence, probably the sphenoid; *l*, two elevations, perhaps portions of the sphenoid, or possibly the occipital condyles; *m*, occipital ridge; *n*, palato-temporal foramen; *o*, a depression, probably marking the position of the right orbit.

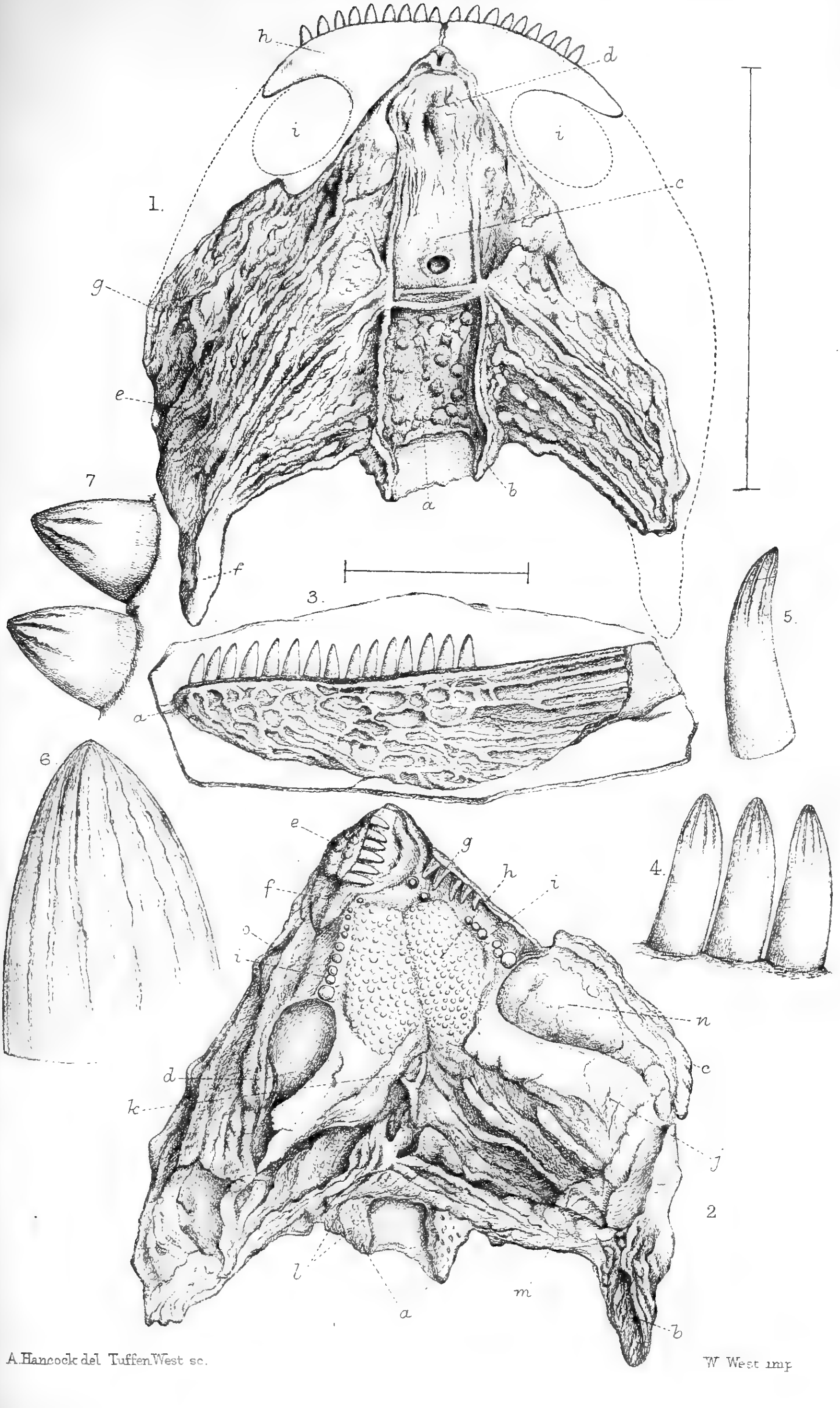
Fig. 3. View of the anterior portion of the left mandible, exhibiting the teeth and surface-ornamentation: *a*, anterior extremity.

Fig. 4. Three præmaxillary teeth, seen in front, much enlarged.

Fig. 5. Side view of one præmaxillary tooth, much enlarged.

Fig. 6. Much enlarged view of the apical extremity of the same, exhibiting the striation.

Fig. 7. Two of the small vomerine teeth, considerably enlarged.



A. Hancock del. Tuffen West sc.

W. West imp.

VIII.—*On a new Labyrinthodont Amphibian from the Magnesian Limestone of Midderidge, Durham.* By Albany Hancock, F.L.S., and Richard Howse.* (Plate VI.)

Among the important additions to the fauna of the Permian rocks of Durham made by Joseph Duff, Esq., last autumn, not the least interesting, perhaps, may be reckoned the remains of a Labyrinthodont having numerous finely striated, rhombiform scutes or scales, resembling in shape those of some Ganoid fishes, though very superior in size. These remains were found at the Midderidge quarry (a portion of which has recently been removed for the purpose of widening the Darlington and Wear Valley Railway), in a bed of yellow marly limestone seven or eight feet above the Marl-slate properly so called. The section at this quarry is thus described by Prof. Sedgwick, Geol. Trans., Ser. II., Vol. III., p. 76:—

"1. Bed of light-coloured siliceous sandstone, worked as a coarse flagstone and also as a building-stone. The upper beds alternate with blue-coloured calcareous shale. At East Thickley they are about thirty feet thick.

"2. Yellow-coloured calcareous shale and shale-slate, in thickness about nine feet. Some of these beds are incoherent and sandy; the Marl-slate forms a series of indurated bands, which divide the more incoherent shale.

"3. A series of thin beds with marly partings; the whole about twenty feet thick. The average thickness of the several beds is not more than a few inches; their surfaces are often covered with yellow marl; at their natural partings they are generally covered with dendritical impressions," etc.

In the above section, No. 1 represents the uppermost member of the Coal Measures, which in this part of Durham have been much disturbed and denuded prior to the deposition of the Marl-slate. It must be mentioned that in this quarry and in the south of Durham there is no bed of "yellow incoherent sand," a bed

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which forms an important item in the section a few miles further north and in the north of Durham generally.

The Marl-slate proper equals the lower portion of No. 2 of Prof. Sedgwick's section. When closely examined, it can be distinctly separated from the marly limestone, into which it gradually passes upwards. And it is more emphatically distinguished by the fossils it contains; for, though a few stray fishes are now and then found in the calcareous beds above, yet this lowest part is the depository for the numerous fish- and plant-remains which characterise the Permian rocks. It is then in the middle, or nearly so, of this yard of Marl-slate that Mr. Duff has found the remains of the *Dorypterus Hoffmanni*, Germar, and also the remains of two species of reptiles, viz., *Proterosaurus Speneri*, H. v. Meyer, and *Proterosaurus Huxleyi*, nov. spec., descriptions of which have been communicated to the Geological Society. Associated with these occurred numerous remains of the fishes which have been so long well known, and fragments of plants, a few of which are new to England, though most of them have been described from the Kupferschiefer of Germany. The Mollusca observed by Mr. Duff consist of fragments of *Nautilus Freieslebeni*, Schloth., specimens of *Discina nitida*, Phil., *Lingula mytiloides*, Sow., and *Myalina Hausmanni*, Goldf. Of these shells, only a few imperfect specimens occurred. The appearances presented by the whole of the fossils entombed in this Marl-slate seem to lead to the conclusion that this deposit was formed in a very quiet estuary, into which the land reptiles, the freshwater Ganoids, and the remains of coniferous plants were brought, to be intermixed with other exuviæ, such as the shells of *Nautili*, *Discinæ*, and *Lingulæ*, which are undoubtedly of marine origin.

The Marl-slate at this spot appears to be perfectly unconformable to the Coal Measures No. 1 of the above section. But between it and this sandstone there is an accumulation of yellow unctuous clay, about two feet thick, which has not the appearance of an original deposit, but appears to have been formed partly by the destruction of the lower part of the Marl-slate, and partly by the infiltration of water carrying in clayey particles through the extensive fissures which abound in the superincumbent limestone. Upwards the Marl-slate gradually passes, becoming more calcareous according to its height, into the thin-bedded compact limestone No. 3 of Prof. Sedgwick's section. It is in these transition beds, at about seven feet above the Marl-slate proper, that our new Labyrinthodont was found. The beds of this portion are much thicker than in the compact limestone above, and more marly, and contain here and there small accumulations of gritty materials surrounded by hard compact limestone. The amphibian itself seems to have been imbedded in a very compact nodulous mass of one of these beds, and was fortunately brought to light by the splitting of the stone right through the central portion of the bed. In this part of the series at this quarry the only other fossil remains found were a few *Lingulæ* and fragments of a Polyzoon; but in a neighbouring quarry the beds on this horizon contain numerous remains of the well-known Permian mollusca. Although found in this higher portion of the series, we imagine there will be no difficulty in inferring that the remains of this creature were carried from its freshwater haunts to be imbedded in a deposit which was fast putting on a marine aspect.

The specimen of this new and interesting form (Pl. VI., fig. 1), for which we propose the name of *Lepidotosaurus Duffii*, is unfortunately in a bad state of preservation, owing partly to the crystalline condition of the matrix, and partly to the peculiar state of the bones, some of which look as if they were composed of dark grey carbonate of lime, while certain parts of them have a burnt appearance, and are reduced to a brittle white, flaky, chalk-like substance, conspicuously displaying the concentric layers of growth. The fossil lies on its side, and is seen in vertical section, part of the bones being on one slab and part on the counter slab. The backbone (*a*, *a*, *à*) is split open longitudinally, there having been a natural division through this part. The ribs (*e*, *e*, *e*) are divided in the same direction; but they for the most part are torn asunder, as the division has not extended much beyond the backbone. The same may be said of the head (*b*, *c*, *d*), which lies split open horizontally below the ventral margin of the animal. The neck (*à*,) is curled round in front of the anterior end of the body in the direction of the head, which lies in a reversed position, as we have just seen, below the trunk, which to some little extent overlaps it. The tail or posterior end of the spine seems to have been turned round the hinder extremity towards the same region, but none of its bones are present—only an indistinct depression indicates the fact.

As the body lies thus curled up it measures fifteen inches in length; and in width, from the backbone to the distal extremity of the ribs, eight inches. The length of the specimen, including the head if stretched out, would be about thirty-five inches.

The course of the backbone is obvious enough, running along the dorsal margin, turning round in front of the body, and curving backwards in the direction of the occipital region of the skull; but, unfortunately, at this point the slab is broken away for upwards of two inches, separating by that space the head from the spine. The vertebral column (*a*), as seen in longitudinal section, is about an inch and one-eighth wide; but it is quite impossible to make out any of the characters of the vertebræ, or even to determine their dimensions with the necessary precision. All that can be said on this point is that, from the assumed extent of four consecutive vertebræ, the length of a single vertebra may be estimated at about seven-eighths of an inch. This difficulty arises partly from the crystalline condition of the whole line of the vertebræ, and partly from the fact that the whole of the bone is broken up and partially removed, little else than cellular or flaky matter remaining, all boundaries determining the forms of the parts having disappeared.

There is, however, one feature of the vertebral column which cannot pass unnoticed. The neck (*à*) seems to have been remarkably long for a Labyrinthodont. From the length of the ribs, the body must undoubtedly have been of considerable depth; and unless the neck had been long, it is evident that the head, if attached to the trunk, as it appears to have been when deposited, could not have assumed the position in which it is placed immediately below and parallel to the belly. But it is impossible to determine the exact length of this portion of the column, as we cannot be sure how many of the anterior ribs are wanting.

The ribs (*e*, *e*, *e*) are arranged in regular order, inclining from before backwards, but have been apparently torn bodily from their spinal attachment by pressure after deposition, and now their proximal extremities are removed about an inch and a quarter from the column, the whole having been afterwards pushed downwards. Twenty-one are distinctly displayed in parallel order, about a quarter of an inch apart from each other in front; but the space dividing the posterior ones is somewhat greater. They are inclined diagonally from the front in slightly arched curves, the concavity being forward; and traces of eight or ten more can be determined, so that in all there have been about thirty ribs. In front, too, there are indistinct impressions of one or two more; but whether or not these terminate the series in this direction it is impossible to say.

The largest ribs, which are near the centre, are six inches and a quarter in length, following the curve, and the shaft is one quarter of an inch thick; they taper slightly towards the distal extremity, and do not exhibit the longitudinal groove or depression usually observed in the ribs of Labyrinthodonts, neither are they apparently depressed in the usual manner. The proximal extremities are crushed and broken, but are widened a little, indicating a double articular surface; these extremities are, however, too imperfect to warrant any confident assertion of the fact.

The greater number of the ribs have a crystalline appearance, as if composed of a dark grey carbonate of lime; but the concentric bone-layers are for the most part conspicuously displayed. Eleven or twelve of the anterior ribs have more than an inch of their distal extremity broken away, and the ruptured ends are united to an irregular, narrow, thin, longitudinal belt of bone (*f*), which is in the same crystalline condition as the ribs, and which has a fanciful resemblance to a fragmentary breast-bone; but this appearance is altogether illusory, for, though this long belt is completely incorporated with the extremities of the ribs, the result merely of pressure, it is undoubtedly composed of the remains of a few of the dermal scales to be afterwards described.

The limbs are not present, nor can any trace of them be observed. There is, however, a thickish mass of bony matter in the dorsal region in front (*g*, *g*), lying incorporated with the proximal extremities of eight or nine of the anterior ribs, and extending in advance of them nearly as far as the curved line of the cervical vertebræ. This may, perhaps, be the remains of the scapulæ and other members of the shoulder-girdle, but the forms of the parts are entirely obliterated; indeed, there is no indication of the mass having been composed of distinct parts. The thickness of the bone, which, however, cannot be easily accounted for in any other way, justifies the above supposition; and in fact, from its extent, measuring as it does five inches long and nearly two inches wide, the fair inference would seem to be that the fore limbs must have been largely developed.

There, is, however, another explanation which has been suggested, which, though possible, can scarcely be considered probable: it is, that this bony mass may be the remains of the large pectoral plates found in all Labyrinthodonts, which in some way or other have been removed thus far from their natural position. But this bony mass lies united to the ribs, and is covered by the dermal scales already alluded to, which appear to be undisturbed. This could scarcely be the case did this bony mass originate in the transported pectoral plates.

Further back, incorporated with the dorsal extremities of the ribs there situated, is another considerable accumulation of bony matter (*h*) in the form of a very irregular elongated belt. The greater portion of this is undoubtedly derived from the surface-scales and the crushed ribs. At the anterior part of the belt, however, the bony substance is too thick to be thus accounted for, and, had it been placed sufficiently far backwards, it might have been supposed to be the remains of the pelvic girdle; but we fear its nature must be left undetermined.

The head, we have already observed, is seen in section, lying in a reversed position below the ventral margin, which to a limited extent overlies it, the muzzle being directed backwards (*c*, *b*, *d*). The coronal portion is on the slab on which the right side of the trunk rests; the lower or basal portion and muzzle are on the other, which may be denominated the left slab, as it contains the left side of the trunk.

The cavity of the cranium was filled with crystallized carbonate of lime, and the bone is in a very flaky tender condition, having a chalky or burnt appearance, and in some places it is so much reduced as to be difficult to trace; neither the sutures of the component bones nor much of the surface character can be determined.

The entire length of the skull is nine inches and three-quarters; but the extremity of the muzzle is wanting. The occipital region is much injured; it is wide, truncated, and angulated at the sides; it measures across five inches and a quarter: for about an inch forward the skull widens a little, and then suddenly tapers for nearly an inch and three-quarters, at which point it is three inches wide; here the muzzle seems to commence, and from hence it tapers gradually to the broken anterior extremity, where it is a little more than an inch and a half wide.

The portion that remains of the narrow elongated muzzle is in a better state of preservation than the rest of the skull, and is seven inches long, and measures across the centre two inches and a half. Only a part of the upper surface was exposed; but, aided by the skilful manipulation of our friend Mr. Atthey, to whom our best thanks are due, we have been enabled to work out the features of this characteristic portion of the cranium. The matrix has been carefully removed by that gentleman from the sides, and has been dug away from beneath, so as to exhibit to some extent the palate. Thus revealed, the muzzle is seen to be much depressed, slightly convex above, with the roof of the mouth apparently flat, or only a little concave. The maxillæ, which seem to form the sides of the muzzle, are thick at the outer margins, but are quite thin above. Unfortunately, however, the roof of this portion is much injured; there is, nevertheless, a strip about half an inch wide, extending the whole length of the maxilla along the right side, and a small portion near the centre of the left maxilla, in a tolerable state of preservation. The central portion of the roof is, for the most part, deficient—little more than the cast of it showing the form.

The upper surface of the roof, or as much of it as remains, and the margins of the maxillæ are studded with small conical, bluntly pointed tooth-like processes, irregularly disposed, but nowhere crowded. They are largest at the outer margins of the maxillæ, where they incline outwards, and appear to diminish in length, and to become erect as they pass inwards towards the middle longitudinal line. They are for the most part broken down, merely tubercular scars marking their position; but near to the centre of the left maxilla they are quite perfect, and are seen projecting into the adherent matrix, having much the appearance of minute teeth. The largest are one-sixteenth of an inch in length, and are rather obtusely pointed; several of them are coated with a thin layer of transparent glass-like enamel. Their resemblance to teeth is still further shown by a large pulp-cavity and thick dentine-like walls, which have a white milky hue, and are very tender, being evidently much changed by fossilization. They are, however, apparently processes of the bone from which they project; no distinct anchylosis can be seen, and when broken away there is no depressed scar, but their bases are persistent, like rugged tubercles.

Traces of similar tooth-like processes are found much further back on the sides of the skull. The palatal surface of the muzzle, so far as it could be explored, displays no teeth, neither does the outer or alveolar margin of the maxillæ; but not much importance can be placed on these negative facts when the peculiar state of the specimen is considered. Very little can be added to what has already been said respecting the other portions of the cranium. After carefully removing the crystalline carbonate of lime from the interior of both portions of the skull, its walls are found distinctly lining the concavities in the matrix, though in places the bone is reduced to mere traces. And in one part the coronal wall has been thrust inwards, apparently by some disturbance in the matrix; and the general distortion is so extensive that little can be determined except the contour, which has been already described, and this is not by any means perfect (see Pl. VI., fig. 2). The crown seems to have been considerably elevated and arched.

Perhaps the most interesting, and certainly the best-preserved feature of our strange amphibian has yet to be noticed. As it lies, it seems to have been covered with large, minutely striated, bony, imbricated scutes or scales, which extend from end to end and from the dorsal to the ventral margin of the specimen. These scales are arranged in diagonal lines, sloping from behind forwards, and give to the surface of the animal a strongly ribbed appearance in the same direction. The inside view of the scales presents the same sort of ribbing as the exterior: indeed, both sides of this bony armature remind the observer of the ridges and furrows of a tiled roof, only the individual scales are not distinguishable as the tiles of a roof are; the ridges and furrows alone are visible, and the junction of the rows is not perceptible. This may be partly owing to the pressure to which the fossil has been subjected, incorporating the bony scales with each other; but it undoubtedly results in a great measure from the character of the scales themselves, which permit the most close and accurate fitting. However this may be, the specimen at present has the appearance of having been incased in a continuous bony shield coextensive with the trunk. No portion of the tail existing, it is impossible to say whether or not the scales extended to it.

Such is the general character of this peculiar scaly armature. Not much, however, of the external surface is seen; but a portion of two or three rows of the scales is well displayed at the anterior extremity of the ribs on the right slab, or that on which the coronal portion of the cranium is preserved. This patch of the scaly covering of course belongs really to the left side of the animal; it overlies the ribs, and in part covers the bony mass, which we suppose may be the remains of the shoulder-girdle. Other two considerable patches are observed overlying the ribs near the centre of the body, and several smaller patches are scattered over the specimen. All these patches exhibit the minute striation of the surface, and that in front displays also the ribbed structure; and the casts of all of them can be traced on the left slab. That of the anterior patch is well marked, and is of considerable extent, showing both the ridges and the minute striation of the surface.

Upon the left slab, too, the under surface of the scales is well seen, particularly a belt of a portion of four or five rows about an inch wide, that stretches along by the side of the vertebral column. And towards the posterior extremity of the specimen, the rows of scales are seen in their whole length (*i*, *i*) extending in parallel order from the ventral to the dorsal margin, sloping forwards, and crossed by the ribs which incline in the opposite direction. The inside of the rows of the scales is equally well displayed on the right slab.

The scales themselves (fig. 3) are rhombiform, with the angles slightly rounded, and having projecting from the lower anterior angle a strong, pointed conical process, which is overlapped by the dorsal margin of the scale next below. They are transversely elongated, and measure in this direction an inch and three-quarters lengthwise, or from the anterior to the posterior margin five-eighths of an inch. We shall, however, merely for the sake of convenience, consider the long measurement as that of the length, the short as that of the width.

The ends, then, of the scales are truncated diagonally from above downwards and backwards; they (the scutes) are rather stout, but gradually thin out to the margins, which are very fine, and have a widish, thick ridge extending the whole length, much nearer to the front than the posterior margin, and parallel to it. This ridge is smooth and rounded below, where it is seen to be continued into the projecting process; above, on the outer surface, it forms an obtuse ridge the entire length of the scale. The anterior part of the outer surface is smooth as far back as this ridge, and is bevelled or sloped to the margin; the posterior portion is twice as wide as the smooth anterior border, and slopes or inclines in the opposite direction or backwards, so that the longitudinal carina is like the ridge of a very low-pitched roof with one of the slopes much shorter than the other. The wide posterior slope is minutely and closely striated, the striæ being raised, sharply defined, and slightly diagonal from above downwards and backwards, and are somewhat broken and tortuous.

The scales imbricate backwards, the anterior overlapping the posterior as far as the longitudinal ridge, so that the whole of the smooth anterior border is covered, as well as the conical process projecting from the lower extremity, and the striæ of the surface become continuous from scale to scale, and in this way the whole of the scaly surface is covered with uninterrupted striæ. This is all the more perfect as the boundaries of the scales are not distinguishable, as already stated, the thin margins overlapping with great accuracy, and the pressure during fossilization undoubtedly aiding in obliterating the visibility of the junctions. The ridges and furrows formed by the rows of scales, and the striation of the surface, alone give evidence of the presence of this scaly armature; and had it not been for the aid of some isolated scales on the margin of the specimen, their form and character could not have been determined.

From the above description, the close resemblance of the scales to those of some ganoid fishes is sufficiently obvious; indeed, they might very readily be mistaken for the scales of a gigantic *Platysomus*, the chief distinguishing feature being that there is no notch to receive the peg of the adjoining scale, the connexion being merely that of superposition.

Such are the characters of this curious Labyrinthodont, as they are determinable in our specimen, and they are certainly very anomalous. The most remarkable feature is the covering of uniform fish-like scales, which undoubtedly seem to clothe the entire body from back to belly; and were this really the natural condition of the creature it would indeed be extremely abnormal, and we should be at a loss to ascertain its affinities, particularly as very little aid is supplied by the few other characters that we have been able to make out. Is it possible, then, in any way to account for this extraordinary appearance, so as to bring *Lepidotosaurus* into the category of the Labyrinthodonts? for it seems to have some relationship to that group, as is shown by certain cranial characters to be shortly referred to.

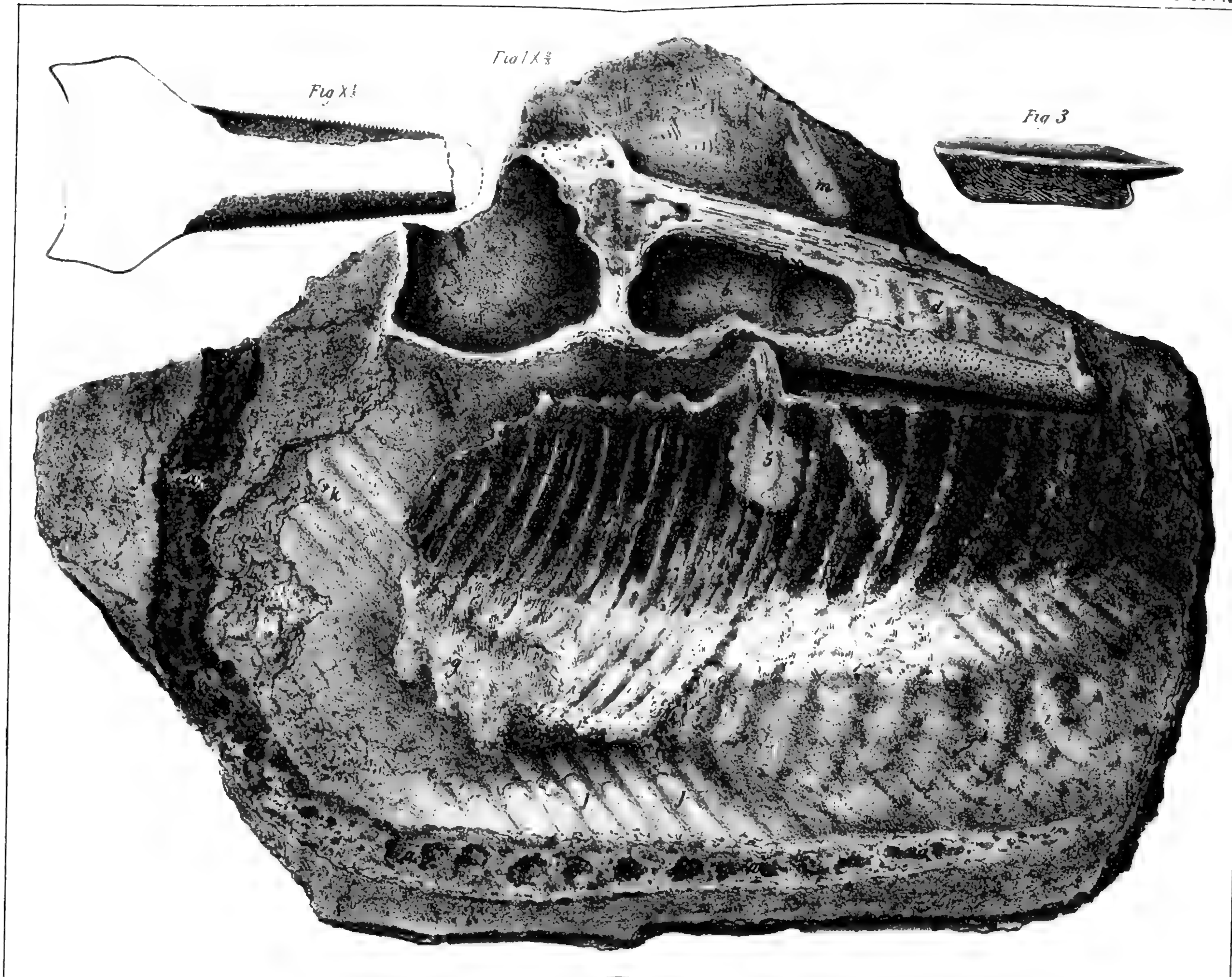
We are indebted to the kindness of Prof. Huxley for an answer to this question. After carefully examining this specimen, and considering it in every possible way, that gentleman suggested to us that, after all, the scales that now seem to be coextensive with the whole body may be nothing more than the ventral scutes common to all Labyrinthodonts, though somewhat modified in character and more extensively developed than usual.

The specimen, as we have already pointed out, lies on its side. Now these Amphibians have had depressed bodies; and as it may be supposed that the ventral scales would be developed in proportion to the degree of depression (or, in other words, those individuals with broad bellies would have more scutes than those with narrow bellies), it is easy to see that in *Lepidotosaurus* the scutes or scales, assuming the depression to have been extreme in this form, might have been more than usually developed. It is quite possible, then, nay, even likely, that on the collapse of the ventral scales, under the influence of lateral pressure, the animal lying on its side, their outer or upper margins of both flanks might reach to the dorsal region covering up and enclosing the ribs, exactly as is the case with the specimen before us. The perfect imbrication and close interlocking of the scales would undoubtedly conduce to this end by maintaining their compact order.

This seems to us so natural an explanation of the phenomenon, that we gladly adopt it; and thus we find the greatest difficulty of the problem turned and conquered. We are also indebted to the liberality of Prof. Huxley for pointing out to us the affinity of our new form to *Dasyceps*, also a Permian Labyrinthodont.

The relationship to the latter is seen in the form and ornamentation of the head. In *Dasyceps* the muzzle is not by any means so much produced as it is in *Lepidotosaurus:* the form, however, of the occipital region presents considerable resemblance. But what is most remarkable is that the surface of the skull is covered with minute, sharp, tooth-like processes, quite similar to those before described on the muzzle and sides of the skull of our new form.

The Bradford fossil recently described by Prof. Huxley in the Quart. Journ. Geol. Soc., Vol. XXV., p. 309, under the name of



De Wilde del et lith

LEPIDOTOSAURUS DUFFII.

M & N Hanhart imp

Pholiderpeton scutigerum, shows some relationship to *Lepidotosaurus* in the large development of the ventral scutes; but they differ greatly in character from those of the latter.

The extraordinary characters of the scales, their vast development, peculiar ornamentation, and perfect mode of imbrication, as well as the greatly elongated, narrow muzzle, and other characters of the head, make it necessary to establish a new genus for the reception of the Midderidge Labyrinthodont, to which, as previously stated, we have given the name of *Lepidotosaurus Duffii*, the specific name being in honour of the gentleman who has added so much to our knowledge of the vertebrata of the British Permian rocks.

We are much indebted to W. C. Stobart, Esq., and J. Duff, Esq., for the pleasure of examining and describing this fossil. The specimens have been obligingly deposited in the Natural History Society's Museum.

EXPLANATION OF PLATE VI.

Fig. 1. Slab exhibiting the left side of *Lepidotosaurus Duffii*, two-thirds natural size:—*a*, *a*, *à*, line of the vertebral column; *à*, the cervical portion of ditto; *b*, the inferior portion of the skull; *c*, small piece of the upper wall of ditto bulged inwards; *d*, muzzle exhibiting at the sides minute conical tooth-like processes; *e*, *e*, *e*, ribs; *f*, belt of bony matter, resembling a fragmentary breastbone; *g*, *g*, anterior mass of bony matter, supposed to be the remains of the shoulder-girdle; *h*, posterior ditto, nature undetermined; *i*, *i*, inside view of the rows of dermal scales; *j*, the dorsal extremities of four or five of ditto; *k*, impressions of the anterior or lower extremities of four or five rows of scutes of the right side, showing the ridges and furrows and the minute striation of the surface; *l*, *l*, patches showing the striated impressions of scales.

Fig. 2. Outline of cranium, dorsal view; one-third natural size.

Fig. 3. A scute, about the natural size.

IX.—*On Proterosaurus Speneri, von Meyer, and a new species, Proterosaurus Huxleyi, from the Marl-Slate of Midderidge, Durham.* By Albany Hancock, F.L.S., and Richard Howse. (Plates VII., VIII.)

In the preceding paper it has been stated that the requirements of a railway company for increased accommodation of their traffic, and the continuous indefatigable exertions of our friend Jos. Duff, Esq., to enlarge the knowledge of the Marl-slate fauna of Durham, have led to the discovery of some fossil remains which are certainly the most interesting palæontologically of recent acquisitions. These consist of a considerable portion of the skeleton of that earliest-recorded and still oldest-known reptile, *Proterosaurus Speneri*, v. Meyer, and also in close association with it of the greater portion of the skeleton of a smaller species, for which we propose the name *Proterosaurus Huxleyi.* Through the obliging kindness of Mr. Duff these specimens have not only been placed in our hands for description, but have also been added to the collection of the Natural History Society of Newcastle, Durham, and Northumberland.

Perhaps we may be allowed to reflect that in England we have now arrived, after the lapse of more than a century and a half, at the same point of palæontological discovery, bathymetrically considered, which was attained in Germany in the year 1706 through the intelligent observations of a learned physician of Berlin, whose name has been properly attached to this earliest discovered reptile; and also to consider this fact, that after the expiration of one hundred and sixty-four years, and notwithstanding the exertions and multiplication of observers and enlarged fields of inquiry, these reptilian remains, described by Spener, and compared by him to the Crocodile and Lizard, still continue to be the highest organisms up to this time recorded from the palæozoic rocks. And thus this discovery, though it increases our knowledge of the geographical distribution of ancient reptiles, adds nothing to our knowledge of their bathymetrical range if we admit, as is generally done, that the English Marl-slate was contemporaneous with, or deposited about the same geological period as, the German Kupferschiefer.

For the history and description of more complete specimens we must refer to the classical monograph of Hermann von Meyer, "Fauna der Vorwelt—Saurier aus dem Kupferschiefer der Zechstein-formation."

The geological position in which these reptiles were found has already been described in a former communication, so that it is unnecessary to repeat it here, further than to state that they were associated in the Marl-slate proper on the same stratigraphical horizon with such fishes as *Platysomus*, *Palæoniscus*, etc.

The two specimens which we are about to describe were much obscured in the matrix; but by the skilful aid of Mr. Thomas Atthey the whole of the bones have been perfectly developed at the expense of much labour and judgment. One is the remains of a well-developed individual; but little more than vertebræ and a few of the ribs in a more or less dilapidated state are preserved; but on another slab three or four perfect ribs have occurred. The other specimen is in a much more perfect condition, the principal bones of three of the limbs being well displayed, as well as one of the fore feet and most of the ribs, which lie in regular order on either side of the vertebral column. The former, as already mentioned, is undoubtedly the remains of *Proterosaurus Speneri*, and the latter a new species of the same genus, *Proterosaurus Huxleyi*.

PROTEROSAURUS SPENERI, *v. Meyer*. (Pl. VII.)

The bones of the specimen of this species are in a very perfect condition, the surface of them being quite intact, and in places having even a semigloss. The vertebræ are lying articulated in a much curved line, the animal having apparently died with the spine arched violently backwards, as seems to have been the case with all the examples hitherto obtained. In our specimen the curve is even more sharp than usual, the remains of the column forming almost half a circle. The anterior portion of it is thrown suddenly back, and at the pelvic region it is as suddenly bent upwards.

In all there are thirty-five or thirty-six vertebræ and casts of vertebræ in continuous order, measuring, if placed in a right line, twenty-two inches in length. Of these vertebræ twenty-one appear to belong to the trunk, and fifteen or sixteen are caudal. Now, if we deduct two or three for the lumbar vertebræ, there will remain seventeen or eighteen dorsal vertebræ. Meyer concluded, after carefully enumerating the joints in all the known individuals, that the number is "not under sixteen, and not over nineteen;" so that it would appear that the whole of the dorsal vertebræ are present, in front only the cervical being deficient. As Meyer estimates the tail-joints at more than thirty-six or thirty-eight, it would then appear that more than half of them are wanting in the specimen before us.

The centrum of the dorsal vertebræ is upwards of three-quarters of an inch long, and about half an inch in height. In one of the largest specimens figured by von Meyer (tab. IX.) it is seven-eighths of an inch long and half an inch high. It would therefore seem that the Midderidge example is full-grown and a large individual. It is impossible to observe the ends of the vertebræ, as they are all articulated; but from the appearance of the joints where they gape a little, it would seem that both the anterior and posterior articular surfaces are slightly concave, and their margins appear as if reflected; the sides of the centrum are smooth, and are a little concave.

The spinous process is one inch and a quarter high, being more than twice the height of the centrum, and it is half an inch from back to front; consequently it is considerably shorter than the body. It is much compressed, and is expanded a little above in the direction of the long axis of the vertebræ; and the dorsal margin or crest is slightly arched in the same direction, and exhibits on the sides delicate longitudinal radiating striæ. The upper extremity of some of the anterior spinous processes are strongly roughened at the sides, as if for muscular attachment.

The anterior zygapophyses are stout and well produced; they incline outwards and upwards. The posterior pair are considerably shorter than the anterior, and stretch backwards or outwards to overlap them.

The transverse processes are not well preserved; but distinct traces of them are observed in most of the vertebræ, and on one or two the form is pretty well seen. They are simple, short, and obtuse, and are lengthened a little in the direction of the long axis of the centrum.

The caudal vertebræ are longer in proportion to their height than those of the trunk; and the neural arch, as in them, is completely united to the body, no suture or other trace of the junction of the parts being perceptible. The spinous process is as long proportionately, and those near the root of the tail are of the same shape as those of the trunk. But further down they become considerably contracted at the base in the direction of the long axis, and gradually widen in the same place upwards. The spine of the last joint on the slab, being the fifteenth or sixteenth of the tail, exhibits at the upper margin an indication of the peculiar bifurcation of the lower distal caudal spines of this saurian.

The anterior zygapophyses are considerably longer than those of the trunk-vertebræ, and are more inclined upwards. Immediately beneath the neural arch on either side of the centrum there is a longitudinal ridge, which, near the centre of the body, is produced a little into a short projecting tubercle, the transverse process. The chevron bones forming the hæmal arch are about as long as the dorsal spine, but are much narrower, and are of a spatulate form, being narrow at the proximal and flat and small towards the outer extremity. They are not fixed, like the processes, in connexion with the neural arch, but are articulated below to the broad reflected margin of the posterior extremity of the body, articulated, as it were, between the joints, and are inclined backwards. Only a few of them remain, but two or three are well displayed on a fragment of the counter-slab, which has fortunately been preserved.

The lumbar vertebræ are not well marked, and in this region the specimen is unluckily fractured. Certainly two, perhaps three, of the last vertebræ of the trunk are, however, apparently anchylosed. Von Meyer seems to have been uncertain whether there were two or three pelvic joints; but from what he states it would seem likely that three is the number.

A fragment of a flattened rounded bone, measuring one inch and an eighth across, lies directly below the lumbar vertebræ. This is probably a portion of the pelvic girdle, and is the only indication of its presence. This resembles in form the rounded extremity of a bone (tab. IV., f. 1, 2, of von Meyer's work) lying in contact with the femur, and is probably a portion of either the pubis or ischium.

Immediately in front of the fragment lie the short ribs, which are not more than an inch long; they are only slightly arched, with the head a little enlarged, and the distal extremity obtusely pointed. Further in advance there are the remains of three or four other ribs, with more or less of the enlarged proximal extremity preserved and lying on the vertebræ apparently near to the point of articulation. One such extremity, the most anterior, is pressed down upon the sixth or seventh vertebra in advance of the sacrum. It lies immediately behind and below the distorted and broken transverse process, to which it is probably attached. Portions of the other heads occupy relatively exactly the same position on the two posterior vertebræ.

The head of each rib is of a triangular form, and is compressed, with the articulating surface simple and almost straight. The shaft at the proximal extremity is rather strongly bent; it is afterwards slightly and regularly arched, and at first it is narrow and almost cylindrical, afterwards it widens and flattens, and is grooved longitudinally; the distal end is truncated for the attachment of the ventral ribs, of which, according to Meyer, there are three to each vertebral rib. The ventral ribs are not preserved in our specimen, with the exception of one or two. Two or three ribs on a portion of the counter-slab measure four inches and three-eighths along the chord. The widened extremity is one quarter of an inch broad; the constricted portion above is not more than half that width.

Proterosaurus Huxleyi, n. sp. (Pl. VIII.)

The small specimen of *Proterosaurus*, though far from being perfect, is not by any means so much mutilated as the large example of the genus above described. It lies apparently on its belly, with the two anterior limbs spread out, and the principal bones of the left posterior limb lying nearly in their natural order, though dislocated. In front of the trunk the neck-joints are scattered about in contact with the right coracoid; and a little further in advance towards the left is apparently a fragment of the skull, an arched bone five-eighths of an inch in length. The lumbar vertebræ are not present, and the proximal caudal vertebræ are likewise deficient, the slab being broken away at this point; but a few of the distal ones can be traced. The ribs are spread out on either side of the spinal column, which strongly marks the central line. The trunk of the body from the pelvic region, or from the point where the slab is broken away, to a point level with the supposed cranial fragment, is about five inches in length.

The bones are in a peculiar state. The surface of most of the limb-bones and ribs is well preserved. These bones seem to have been hollow, and are filled up with galena; but the vertebræ and some of the smaller bones, such as the carpals, are almost entirely composed of that mineral; and when this is the case, the form of the bones is often much distorted, apparently by the influence of the lead-ore in assuming its usual cubic form.

The vertebræ are not in a good state of preservation; they are much injured by the deposition of the galena, as above referred to, which has so distorted the form of the bones that it is quite impossible to make out the parts, or to say whether or not they are provided with the long characteristic spinous processes of *P. Speneri*. Indeed, it is difficult to determine the number of joints, though twelve can be counted. As, however, there are fourteen or fifteen pairs of ribs, there must be at least as many dorsal vertebræ. It would still seem, nevertheless, that they are not so numerous in this species as they are in *P. Speneri*, in which we have seen there are seventeen or eighteen dorsal vertebræ. But it is quite possible, indeed it is likely, that they are more ribs than we have been able to enumerate, in which case we have underestimated the number of the vertebræ, and the two species may be found to agree in this particular more closely than is apparent. It is equally impossible to ascertain the character and exact number of the cervical vertebræ; but as six or seven lie scattered about in front of the trunk, it would seem that this species may have seven, the number of the neck-vertebræ of *P. Speneri*, according to Meyer. All that can be said about the caudal vertebræ is, that the traces of their remains seem to indicate that the tail, when perfect, must have been of considerable length. About two inches of the distal extremity is determinable; and as about the same length of the proximal portion seems to be broken away, the tail, when complete, must have been longer than the trunk, which is nearly three inches and a half in length.

The ribs lie, as we have already said, spread out in their natural order on each side of the vertebral column, and fourteen or fifteen pairs can be enumerated; but there is some difficulty in determining the precise number. They are well and regularly arched from end to end, and are moderately and nearly equally thick throughout. Towards the proximal end they are a little flattened, and terminate in a slightly enlarged simple head of a triangular form. The distal extremity is abruptly truncated, but is not flattened and widened to the same degree as the ribs of *P. Speneri;* neither are the ribs so decidedly grooved as they are in that species, but are on the whole more cylindrical. The ventral ribs appear to have been numerous and comparatively stout; they lie pressed in between the vertebral ribs near to the spinal column, but their relative number cannot be ascertained. The longest vertebral ribs are near the centre of the trunk; here they are seven-eighths of an inch long measured along the chord; they shorten a little before and behind to about seven-tenths of an inch in front and four-tenths behind.

Both the coracoids are well preserved, particularly the left, which lies nearly in its natural position at the left side on the fore part of the trunk. The right coracoid is removed a short distance in front. They are stout discoidal bones five-eighths of an inch in diameter, with a deep wide notch apparently on the posterior margin, forming the glenoid cavity for the articulation of the humerus. At the inner margin of the notch there is an elevated boss; and from thence to the front margin there is a widish ridge indicating perhaps the compound nature of this bone, which is most likely composed of both the coracoid and scapula, the glenoid cavity being as usual at the junction of the two elements; but there is no distinct trace of a suture. There is a straight narrow bone lying with one end in contact with the right coracoid, which may perhaps be a clavicle. A somewhat similar bone is also in contact with the left coracoid, but in this instance it has in some respects the character of a rib.

The humerus is one inch long, and is a slightly arched stout bone, with the extremities a little expanded; the distal end, which is the wider of the two, is fully one quarter of an inch across, while the most constricted part of the shaft is a little more than half that width. The proportional measurements of the humerus in *P. Speneri* differ considerably from the above. In that species this bone has the extremities extremely wide. One figured by von Meyer (tab. IX.), which is two inches and a half long, has the shaft three-eighths of an inch thick, while the proximal extremity is a little less than nine-eighths of an inch wide, and the distal nine-eighths. In *P. Huxleyi* the proximal extremity is very little wider than the shaft, and the distal extremity is about twice as thick as the shaft. In *P. Speneri* the proximal and the distal extremities are three times the width of the shaft.

The radius and ulna are not by any means slender; they are about seven-tenths of an inch long, being considerably shorter than the humerus. The radius is not quite so stout as the ulna, and both exhibit a slight sigmoidal curve. The latter is one-tenth of an inch thick at the centre of the shaft, but is a little enlarged at the extremity.

The hand, including the wrist, is a little longer than the lower arm. There are two rows of carpals, of which, though disposed in nearly regular order, it is not easy to determine the precise number. There seem, however, to be three in the proximal row, and four or five in the distal, in all seven or eight. The metacarpals are long, being not much short of the length of the toes, of which there are five. The number of joints in each will have to be estimated rather than precisely determined, for the extremities are considerably injured. The first is the shortest, and has apparently two phalanges; the second has three; the third has four, all of which are quite distinct; the fourth, which, judging from the size of the phalanges, is the longest, has four, but as no trace of the claw is present, there has no doubt been an additional joint, bringing the number up to five, and if so, agreeing in this respect with *P. Speneri.*

The left fore limb is almost as perfect as the right, and lies stretched out nearly at right angles with the trunk, with the front aspect exposed; the back of the right limb is uppermost. The proximal end lies upon the coracoid; the distal extremity is separated by a short space from the radius and ulna, both of which are extended in parallel order to unite with the projecting wrist and hand. The two latter, however, are so much injured by the accumulation of galena that the parts are much obscured.

The chief bones of the left hinder limb, though dislocated, are lying close to the pelvic margin in nearly their natural sequence. The femur is as stoutly developed as the humerus; it is one inch and a quarter long, consequently a little more than one-eighth of an inch larger than the upper bone of the anterior limb; it is slightly bent, and has the extremities gradually but not excessively enlarged. The shaft is one-eighth of an inch thick, and the proximal extremity is nearly double that thickness, the increase being due in part to a ridge, apparently at the outer or upper surface.

The tibia and fibula are one inch and one-tenth long, so that they are a little more than one-eighth of an inch shorter than the femur. They are nearly straight; the fibula is slender, and does not seem to have been much enlarged at the extremities, which are, however, not perfect. The tibia is considerably stouter, but not by any means so thick as the femur. The distal end is gradually thickened a little, but the proximal extremity is considerably and rather suddenly enlarged. In this as in all the other bones, the articular extremities, having been formed of cartilage, are wanting, the ends being truncated. It is therefore quite impossible to describe in detail the characters of the joints.

Fragments, apparently of the right tibia and fibula, and three or four of the phalanges, are scattered about in the vicinity of the bones of the left leg; but no other traces of the right limb are to be found.

The only portion of the pelvic girdle present is the extremity of a flat bone. This fragment is three-tenths of an inch long, and two-tenths of an inch wide; it slightly widens towards the anterior extremity, which is truncated. This is probably a portion of the ilium.

From the above description it seems evident enough that this small reptile is a true *Proterosaurus*, and that it is specifically distinct from *P. Speneri*. The long articulating limbs and extensively produced tail are common to both species. In both, too, the neck has been of considerable length, and the number of cervical vertebræ (seven) is apparently the same in both. And the number of the dorsal vertebræ would likewise appear to agree in both species, and in each there are numerous ventral ribs. The same harmony is found in the number and character of the hand-bones. Unfortunately no comparison can be instituted respecting the skulls and the individual features of the vertebræ, as the parts in the new species are too imperfectly preserved; enough, however, seems to be known to warrant the assertion that the two are generically coordinate.

It appears equally clear that the small individual is specifically distinct. The diminutive size alone suggests this, especially as there are no appearances of immaturity; and the form of the ribs would seem to prove its specific distinctness. In *P. Huxleyi* we have seen that they are flattened towards the proximal extremity, while in *P. Speneri* they are rounded at this part; and in the former they are not widened and grooved to anything like the same degree at the distal extremity.

The limbs, too, are proportionately different. In *P. Speneri* the fore limb is four inches and seven-eighths long, as figured in von Meyer's work, tab. IX. The hind limb is seven inches and five-eighths in length; consequently the former is one-third shorter than the latter. In *P. Huxleyi* the fore limb is one inch and seven-tenths in length, the hind limb two inches and three-eighths long; the former in this species is therefore considerably more than two-thirds the length of the latter.

In the new species, then, the limbs vary more in length than they do in the old ones, the hind limb being considerably longer in the former, in proportion to the fore limb, than is the case in *P. Speneri*.

The difference likewise is strongly marked in the proportions of the humerus. On referring to von Meyer's tab. IX., above quoted, the constricted part of the shaft of the humerus therein figured measures three-eighths of an inch wide, while the distal extremity is nine-eighths of an inch across: thus it appears that the latter part is three times wider than the former. In *P. Huxleyi* the narrow part of the humerus is one-eighth of an inch thick, and the distal extremity is two-eighths of an inch wide: so here the disparity is only as two to one, but in *P. Speneri* it is as three to one. It must be stated, too, that in the old species the proximal end of the humerus is nearly as wide as the distal, while in the new species it is only slightly enlarged.

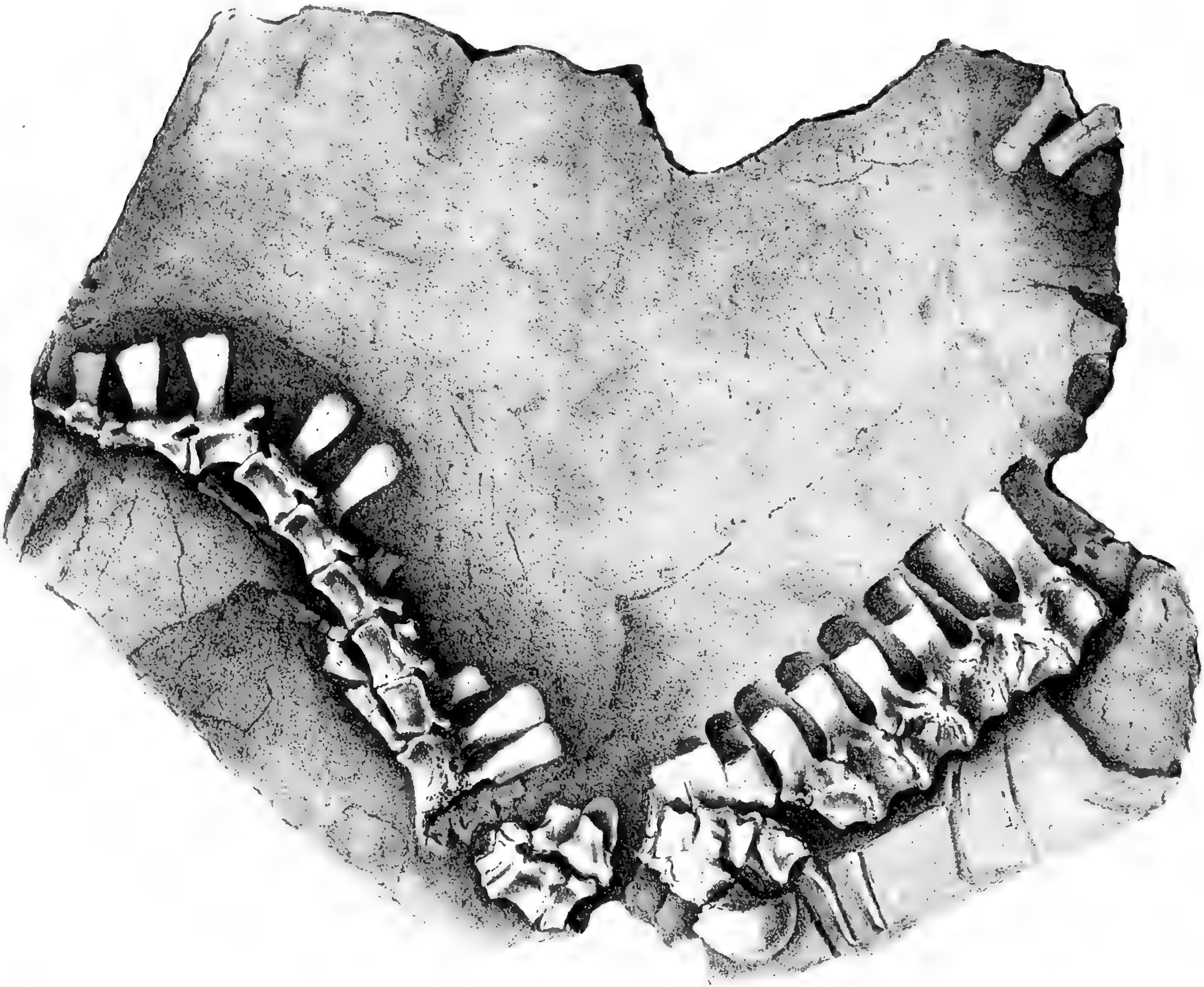
EXPLANATION OF PLATES VII., VIII.

PLATE VII.

Slab of Marl-slate from Midderidge, containing the vertebral column, etc., of *Proterosaurus Speneri*, von Meyer.

PLATE VIII.

Slab of Marl-slate from Midderidge, containing the skeleton of *Proterosaurus Huxleyi*, sp. nov., Hancock and Howse.



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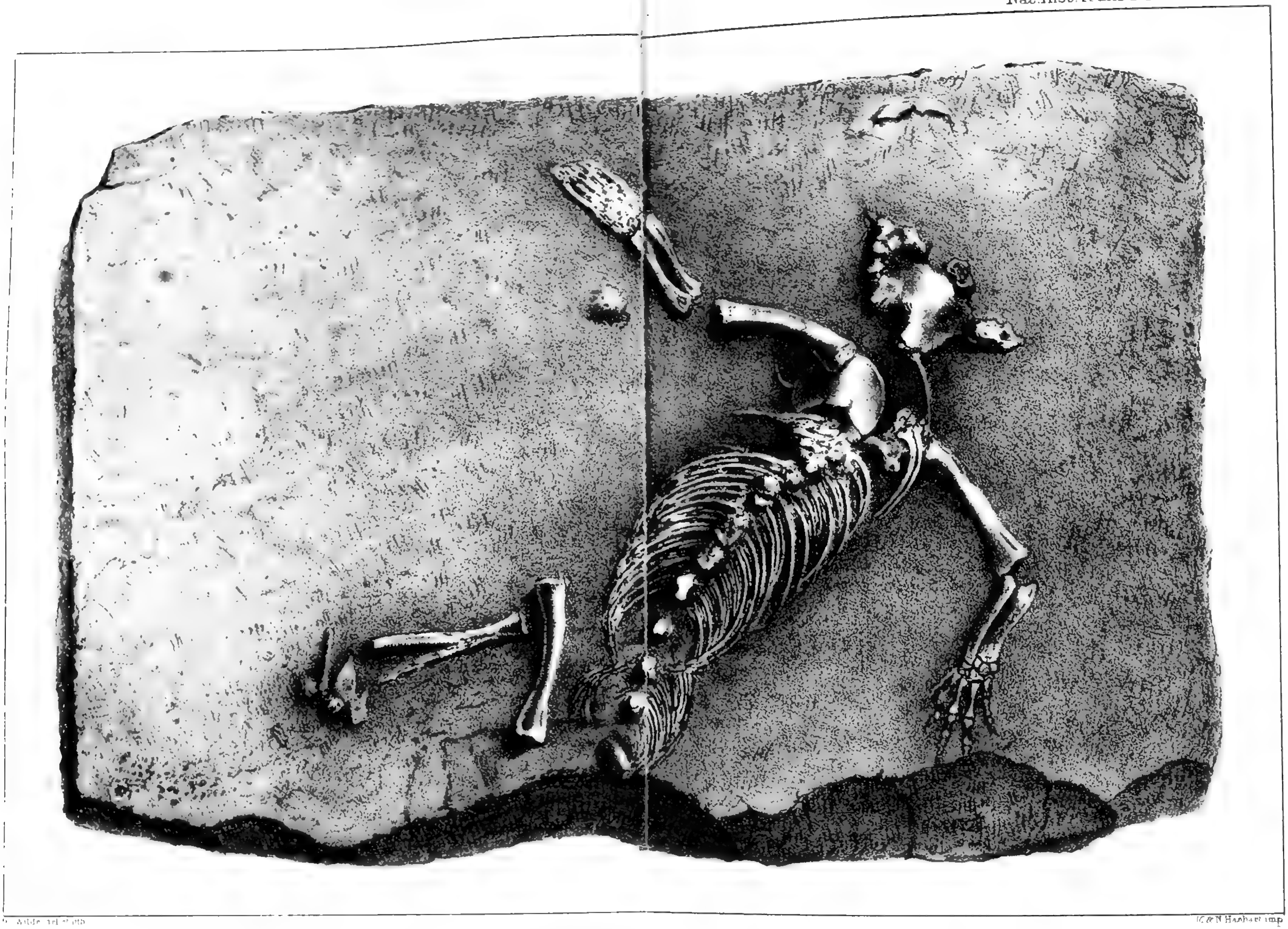
PROTEROSAURUS SPENERI.



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PROTEROSAURUS HUXLEYI

X.—*On Dorypterus Hoffmanni, Germar, from the Marl-Slate of Midderidge, Durham.* By ALBANY HANCOCK, F.L.S., AND RICHARD HOWSE. (Plates IX., X.)

WITHIN the last few years four specimens of *Dorypterus Hoffmanni* have been discovered in the Marl-slate of Midderidge, in the county of Durham, by Joseph Duff, Esq., two of them in the year 1865, and the other two in the autumn of last year, 1869. A few traces of other individuals were also observed at the same time and in the same locality. These are, we believe, the first specimens of this very singular fish that have been obtained from the Marl-slate of this country.

The Midderidge quarry, in which these examples were found, is situated on the Darlington and Wear-Valley Railway, not far from Bishop's Auckland, and is well known as being the locality where the Marl-slate fishes were first discovered. Prof. Sedgwick a long time ago (Trans. Geol. Soc., 2nd series, Vol. III., pp. 76, 77) accurately described the position of this quarry and the stratum in which these specimens were found.

Through the kindness of Mr. Duff, we have had the opportunity and pleasure of examining and studying all the specimens of this interesting fish: and this has happened fortunately; for each specimen, being in a different state of preservation, has assisted much towards the working out and comprehension of the structure of this extraordinary ichthyolite.

When Mr. Duff's original specimens were first seen, they were supposed to be merely the skeletons of a species of *Platysomus;* but a short examination soon showed that this opinion was entirely erroneous; and happily the discovery of two more specimens, and especially of one in which the characteristic dorsal fin was better preserved than in the former specimens, led us at once to identify Mr. Duff's discovery with the *Dorypterus Hoffmanni* described originally by Prof. Germar in Count Münster's Beiträge zur Petrefactenkunde (Heft v., pp. 35–37, tab. xiv., f. 4), from a specimen obtained from the Kupferschiefer of the Eisleben district.

Also there appears to us not the least doubt that the two fishes described by Count Münster in the same work (Heft v., p. 44, tab. v., f. 2), under the name of *Platysomus Althausii*, belong also to the genus *Dorypterus*, and to the same species as the one described by Prof. Germar. But in order to establish more satisfactorily the strict identity of these with the English specimens, it seems necessary to reproduce the original descriptions given by Prof. Germar and Count Münster.

Dorypterus Hoffmanni, Germar (Beiträge, Heft v., pp. 35–37). "This specimen was found only last autumn (1840) in the Kupferschiefer of the Eisleben district; and, although it is not perfect enough to ascertain all its essential parts, yet it presents so many peculiar characters that the establishment of a distinct genus becomes necessary. As generic characters one can point out:—an oval profile and a body flattened on the sides, with a distinct bony skeleton; a very high and spit-shaped dorsal fin; pectoral fin placed in the mid-height of the body, behind the gill-cover; the small, narrow ventral fins in the middle of the ventral margin; and a fork-shaped, equal-lobed tail.

"The whole length of the fish, from the tail-fin to the front of the jaws, is three inches seven lines; its height, without the fins, one inch eleven lines; the height of the dorsal two inches, its breadth in the middle one line. The head, broadly ovate, has a nearly semicircular outline; the under jaws are much bent upwards; and also the front and the nose seem much bent downwards. It occupies nearly one-third of the body; and the jaws do not appear to have borne teeth. The backbone has a few more than thirty joints, of which about seventeen belonged to the ventral vertebræ; but the number of the vertebræ cannot be distinctly reckoned.

"Satisfactory information cannot be given respecting the pectoral fins. Behind the gill-covers a somewhat waved ribbon-shaped organ runs in a sloping direction backwards to the ventral margin, which perhaps might be the humerus; and at its root one sees some bones which one is inclined to take for the roots of the pectoral rays. But this ribbon-shaped organ is provided with distinct parallel longitudinal striæ, and itself resembles a pectoral fin; and those bones we took for roots of the pectoral rays might be apophyses of the vertebral column displaced by pressure.

"The little elliptical ventral fins are nearly behind the middle of the belly, and not in immediate connexion with other bones, and may perhaps, through pressure or dislocation, have been pushed backwards; but at any rate they are placed behind the pectorals. The anal fin itself is not to be seen; but the root-bones (fin-supports), which are present, show that it commenced close to or not far from the ventrals, and extended for a considerable distance towards the tail.

"The dorsal commences a little before the middle of the back, quickly gets narrower towards the apex, and continues in a vertical direction, with pretty equal breadth, to the tip. It has in this example, on the hinder side at the base, a bow-shaped emargination, which, however, may not have been caused by tearing or injury, because the rays do not break off, but run in parallel curves to the root. The support-bones also show that the dorsal did not extend more behind than before, and that we have the dorsal fin perfect and complete before us. The existence of a second dorsal cannot be directly denied, because in the place where it should appear the fish becomes obscured by the stone, and there are no sharp lines; but occasionally one can see the outline of the back so clearly that one would certainly see bones if there had been a second dorsal; and we may therefore conclude that, in all probability, it was absent.

"The caudal is forked; both lobes are equal, and are separated by the backbone.

"It is all the more difficult to determine the family to which this fish belongs, as neither scales nor teeth are to be seen. The rhombical markings which the figure shows near the tail, and which one might take for scales, have no glistening surface, and appear more as fragments of ribs and spinous processes crossing each other. If they were really scales, the genus *Dorypterus* would then belong to the Ganoids, and stand near *Dapedius*. But the form, the situation of the fins, and the whole skeleton remind one very much of the recent genus *Vomer*."

Although Prof. Germar's specimen was not perfect enough to enable him to describe it fully, yet in the foregoing description we find a sufficient number of characters to justify us in referring our specimens to this peculiar fish. Among these the position of the lower jaw, the rather large orbit, and the unusually long dorsal fin would alone be sufficient to establish this identity; but to these points may be added the situation of the pectoral in the mid-height of the body, the curious "ribbon-shaped" process descending from behind the pectoral to the ventral margin, the abdominal rod which bounds the ventral cavity behind (not mentioned by Germar or Münster, but characteristically shown in their figures) the hourglass-shaped processes beneath the dorsal, and the peculiar sigmoidal plates seen near the ventral margins of the posterior half of the body: these establish beyond any doubt, not only the generic, but also the specific identity of the Marl-slate with the Kupferschiefer specimens. But there are a few points in Prof. Germar's description which the more perfect state of the specimens we have had the use of enable us to correct. It will appear in the sequel that what seemed to Germar to be an internal bony skeleton is, according to our observations and opinions, also in part an exo-skeleton. The situation of the ventral fin also, which is placed in this fish under the throat and rather in advance of the pectoral fin and ventral cavity, has been overlooked by this author (for, judging from his figure, the ventral appears to be present); and in consequence of this oversight he has been led to describe the anal as the ventral, and the anal (which is well shown in his specimen) as not present. Another point deserving of remark is the statement that the tail is homocercal. This mistake arose, no doubt, from the imperfect state of the tail in the specimen examined; but in those which we have investigated this fin is very well preserved in three individuals, and shows itself to be decidedly heterocercal. The size of Germar's specimen is rather less than that of three of ours; but the dorsal fin is more perfect and more characteristically shown in the German than in those which we have before us from Midderidge.

Count Münster says of his *Platysomus Althausii* (Münster, Beiträge, Heft v., p. 44, tab. v., f. 2) that "the only two small individuals of this species which I saw at Mr. Althaus's are of equal size, but both without scales, so that only the skeleton of the fish is seen, an appearance very common in the lithographic slates of Bavaria, but very rare in the Kupferschiefer. One recognizes pretty clearly the very strange composition of the skeleton of this fish, which Agassiz has fully described in 'Recherches sur les Poissons Fossiles.' Only faint impressions exist of each individual.

"The individual figured (tab. v., f. 2), which Mr. Althaus was so kind as to let me have, has at the first superficial glance some resemblance in its external form to *Platysomus gibbosus*, Agassiz, so that at first I thought this might be only the skeleton of a young individual of that species; but a stricter investigation and comparison soon convinced me that it is an entirely new species.

"The body has a rounded rhomboidal, nearly ovate form. The head is disproportionately large, and occupies nearly one half of the body; its profile from the dorsal fin to the snout is somewhat straight; the snout much bent. The large orbit is placed high and far backwards. The faint impressions of the head-bones are smooth, without striæ or granulations; but their appearance is not very distinct. The hind border of the operculum or gill-plate is narrow; near to it is placed the left pectoral fin, which has probably been pushed so high up by pressure from without. One recognizes only the impressions of a few rays: below, on the margin near the anal, the rays of a small fin are shown, which appear to have belonged to the ventral; for although, until now, on the specimens of the genus *Platysomus*, which have been examined by Agassiz, Germar, and others, ventral fins have not been seen, yet I have found them on two examples of *P. Fuldai* (=*Platysomus macrurus*, Ag.).

"The dorsal fin is somewhat large; the commencement of it is near the head, in the central part of the back. The anal stands opposite to it, and is nearly of the same form and size, but is situated nearer to the mouth than to the tail, for it reaches nearly to the head. The rays of both fins run to the tail, and are very fine. On the example before us, fragments only of the rays of the continuation of the dorsal could be seen.

"The pedicle of the tail is remarkably narrow, only about a line broad; the deep-forked fin is proportionally very large. Of both lobes the extremity is wanting; but it seems that the upper lobe was not much longer than the lower, which is a little broader.

"There is, as mentioned before, no trace of the scales."

In Münster's figure of *P. Althausii*, the posterior part of the body, allowing for the slightly different state of preservation, much resembles ours. The form of the abdominal cavity, bounded in front by the "ribbon-shaped process," and posteriorly by the abdominal rod, is identical. The position of the pectoral fin is also the same, though thought by Münster to have been disturbed and pushed upwards out of its true position. The prolongation of the dorsal fin is destroyed, as in most of our specimens; and the bones of the head are much displaced, and moved downwards and backwards towards the ventral cavity; but these bones are said to be smooth and without striæ or granulations—a character which at once distinguishes this fish from *Platysomus*, in which the bones of the head are always more or less ornamented with granulations or striæ.

In Münster's example the anal fin is finely preserved, and shows very distinctly its continuation to the tail; but by displacement and pressure of the bones of the head downwards, the ventral fins, which Münster saw, but could not describe rightly on account of the disturbed state of his specimen, have been pushed backwards, and brought nearly into contact with the anal fin; and thus one of the striking peculiarities of *Dorypterus* (the thoracic or jugular position of the ventrals) remained till now unobserved. It will, we think, be admitted by every one who carefully collates Münster's figure and description of *P. Althausii* with those of Germar's *Dorypterus Hoffmanni*, that they are perfectly identical; and we adopt the latter name for the species, as it has a slight precedence in order of description, and was, besides, more strongly characterized than the former.

The German specimens of *Dorypterus* were obtained from the Kupferschiefer of Richelsdorf and the Eisleben district, where it appears to be very rare.

Dorypterus is pretty regularly oval in contour, inclining to ovate, the posterior slopes being more rapid than the anterior, and the head rather obtuse. It was probably much compressed, and is very deep in proportion to its length; the length of the body, including the central rays of the tail, is about twice its depth at the deepest part. Our largest specimen is five inches long, including the tail, and two inches and a quarter deep; and the head, from the anterior extremity of the mandible to the posterior angle of the gill-plate, is about one-third the length of the entire animal, including the centre rays of the tail. The muzzle is obtuse, the mouth shutting upwards; the mandibles are long, flat, and rather wide; the præmaxillæ are about half the length of the mandibles, and, like them, are flattened and wide; the maxillæ are about as long as the præmaxillæ, and bend downwards, and overlap the posterior portions of the mandibles. The gape was large; and the jaws probably shot out a little when in action; no teeth have been observed.

The orbits (Pl. IX., fig. 1, *u*) are large, and are situated immediately behind the præmaxillæ and a little below the brow or dorsal ridge: the gill-plate or operculum (*s*) seems to be composed of two pieces, and is of a narrow crescent-form, the posterior margin being a little angulated, the angle projecting above the middle longitudinal line of the body. The præoperculum (*t*) partakes of the same form, but is considerably less than the operculum, and is placed midway between the eye and the posterior margin of the gill-plate.

The clavicle (*r*), which is well preserved in one of the specimens, is a long, stout, fusiform bone, extending from above the longitudinal middle line of the body to the insertion of the ventral fin, and is well inclined thence upwards and backwards.

The pectoral fins (*c*), which are eight-tenths of an inch long, are wide and somewhat rounded, the extremity being obtuse; they are rather large in proportion to the size of the body, and are situated just behind and below the angle of the operculum, consequently on the central longitudinal line. They are connected with the upper portion of the clavicle. The remains of apparently the scapula and coracoid were observed in one of the specimens; they are, however, in a crushed state, but seem to have been broad, flat, and short, and are arched towards each other. From these extend fourteen or fifteen flat and rather delicate brachial rays (*c'*), the longest of which are near the middle, and measure rather more than one-eighth of an inch in length; they are articulated with double their number of simple fin-rays, which are composed of numerous joints.

The ventral fins (*d*) originate in front of the ventral or thoracic plates, to be shortly described, and immediately behind the lower extremity of the clavicle, and incline backwards; they are upwards of half an inch in length, are proportionally narrow, and are sharp pointed; they have each about fourteen or fifteen rays, which are made up of numerous joints, and are attached to elongated narrow pelvic bones; but these are too much obscured to admit of complete description. The posterior extremity, however, is a little enlarged, and appears to have been the articular surface.

The enlarged part of the anal fin (*b*) is placed near to the transverse centre of the body. It is about half an inch long, and is triangular, with the extremity pointed, the posterior margin being slightly convex, the anterior straight, or a little concave. The base extends nearly as far forwards as the posterior ventral plates, being prolonged in this direction by seven or eight pointed scale-like rays or plates, which diminish in length forwards; and it is continued backward to the root of the tail as a low fringe (*b'*), about three-sixteenths of an inch wide, supported by rather distant delicate rays, but whether jointed or not could not be determined. The anterior elongated portion is composed of between twenty and thirty simple jointed rays, the joints being rather long, with the articular extremities slightly enlarged.

The dorsal fin (*a*) has a very extraordinary development; its anterior elongated portion is estimated to be as long as the whole fish *minus* the tail, and rises up from the dorsal ridge a little in advance of the centre, consequently just in front of the position of the anal fin, in the form of a scimitar slightly bent forwards. It seems to have been in the larger specimens upwards of four inches and a quarter in length, and is extremely narrow, being only two-tenths of an inch wide an inch from the base, gradually tapers to a fine point above, and as gradually widens downwards to within three-eighths of an inch of the base, which suddenly expands, stretching forwards almost as far as the occiput, and backwards to the root of the tail, as a narrow fringe, similar in height and appearance to that on the opposite or ventral margin. The anterior prolongation (*a''*) is composed of a double lateral series of about twelve low, stout, pointed, scale-like rays or processes, the fin-fulcra, inclining and increasing in length backwards. The first of the series is extremely short, just appearing above the dorsal ridge; the last is about four-tenths of an inch in length; and the whole, leaning in the direction of the fin, one supporting the other, form, as it were, a sort of buttress to the base of the enormously elongated fin. Only a few of the central rays reach to the top of this elongated portion of the fin; both in front and behind they die out gradually. At the base, just above the fin-fulcra, there are twelve or thirteen rays; halfway up they are reduced in number to seven or eight; and within half an inch of the top, judging by the upper portion of a fin in our possession, there are only four or five. All the rays are divided into numerous and unusually elongated joints (fig. 4), which at the points of articulation are slightly enlarged. The joints are longest in the centre or anterior rays, some of them measuring one-tenth of an inch in length.

The tail is distinctly heterocercal, and is deeply and regularly forked, the upper lobe being only a little longer than the under. The former is one and a quarter inch in length; and from tip to tip of the lobes the tail is one and a half inch in width. The anterior margin of the upper lobe is defended by a closely arranged series of stout, sharply pointed, enamelled, scale-like processes or fin-fulcra (fig. 1, *f*), which imbricate and diminish in size backwards. Behind or below these there is a double row of rhombiform scales (*e*), likewise covered with enamel, and articulating lengthwise by notches and points. The fin-rays, which occupy more than half the width of the entire lobe, are rather delicate, jointed, and bifurcated once or twice at the extremities. The rays are longest and are much inclined on the lobes, and become shorter and less inclined in the axis of the fork.

Perhaps the most curious feature in this interesting fish is found in the character and mode of arrangement of the more or less bony plates and rods, regarded by Germar as composing an internal "bony skeleton;" and indeed in the general disposition of the component parts there is a strong resemblance to such. On examining them in detail, however, there are one or two anomalous features which render it difficult to work out the homologies of the bones; and the discrepancies are of a nature to raise the questions, Do, indeed, all these bones really belong to an endo-skeleton? and may they not in part belong to an exoskeleton? Before, however, entering on these points it will be better to describe the form and arrangement of these peculiar plates and rods. And for the sake of avoiding circumlocution, and to simplify the description, we shall give to the various parts distinct names, referring only occasionally to those in general use, for the purpose of pointing out resemblances.

The plates and rods are arranged in transverse series, of which there are twenty-seven or twenty-eight, extending from the occiput to the root of the tail, reminding one much of the disposition of the transverse flakes of muscle observed on the sides of the body of a fish when the skin has been removed. These transverse series of plates and rods are, for the most part, placed a little asunder, but are at some points in contact, and occasionally seem as if imbricated. They are in contact along the longitudinal middle line, which corresponds to the usual lateral line or the line of the vertebral column. Here there is a chain of lozenge-shaped plates or areas (*h*), with their angles placed lengthwise and transversely. In the centre of each there is an elongated rounded edge (fig. 2, *h*') placed longitudinally; these ridges resemble the mucus-tubes of the lateral line of certain fishes.

These lozenge-shaped areas or plates measure about one-tenth of an inch across. From either side of each of them there extends a longitudinal transversely elongated plate (figs. 1, 2, *g*) inclined backwards, the largest of which measures about a quarter of an inch in length; these, which we shall call the lateral plates, are expanded and bifurcated (*g'*) in the direction of the length of the fish at their inner extremities, and thus embrace, as it were, the lozenge-formed areas or plates bearing the ridges already described; or perhaps this arrangement would be better described by stating that the forks of the opposed plates, meeting on the median line, form the lozenge-shaped areas or plates, to which they give an elevated border. The lateral plates have a boss-like enlargement at the point of bifurcation; here the plates are narrowest; hence they widen gradually for some distance, and then, turning backwards, taper to the termination. The margins are abruptly defined, and are slightly elevated into narrow ridges, which die out towards the outer margin. The bifurcations of the adjacent plates are in contact; and so are the outer terminations. But for the rest, the plates are divided by a lanceolate space. The tapering distal or outer extremities of the lateral plates are united each to a stoutish rod (*i*), which at the point of union is cylindrical and somewhat enlarged. These are slightly arched backwards and inclined considerably in the same direction; their outer extremities are a little widened, flattened, and grooved longitudinally; and, suddenly contracting, they turn forwards, and each becomes joined to the inner pointed extremity of a sigmoidal ridge-like plate (*j*), which rises boldly up, and which, inclining much forward, terminates in a recurved sharp point a little within the general margin of the fish. The sigmoidal ridges gradually widen in the centre, where there is a longitudinal groove; and they, as well as the rods, are divided from each other by a considerable space. Such is the general appearance of these sigmoidal ridges or plates; but on closer examination the ridges are found to be formed of the turned-up edges of wide flat sigmoidal plates (*j'*), which extend from ridge to ridge.

Such is the description of the transverse series of plates and rods of the posterior half of the body, numbering sixteen or seventeen, corresponding to the caudal vertebræ, to which the lozenge-shaped areas and lateral plates have a strong resemblance. On the anterior half the dorsal members of the transverse plates and rods are somewhat modified. The central lozenge-shaped plates bearing the ridges and the elongated lateral plates are continued to the occiput unaltered in character, or only slightly changed in form. Below, or towards the ventral margin, the sigmoidal ridges or plates seem to be replaced by a series of seven large thoracic or ventral plates (*m*), which are arranged along the margin of the body, those of the two sides meeting on the median line, where doubtless they formed a sharp edge. They are three-eighths of an inch long, and about one-eighth of an inch wide.

They *appear* to imbricate forwards, and are of an irregular ovate form, with the posterior margin thin and somewhat flattened, and the anterior or overlapping margin thickened, grooved, and a little shouldered above. We say *appear* to imbricate forwards; but in the most perfect specimens there are indications that they are really imbricated backwards, the groove of the anterior margin receiving the thin posterior border of the preceding plate; and the appearance to the contrary seems to be owing to dislocation. Both extremities of the plates are drawn out, the lower one being considerably prolonged, pointed, and directed backwards. The upper extremities are directed upwards and forwards, and are produced into widish columns (*n*) (the ribbon-shaped organ of Germar), the two or three anterior of which, increasing in length backwards, terminate immediately behind the clavicle. The posterior ones pass upwards, and are united to the outer extremities of the lower lateral plates near the occiput. These columns, which are divided by narrow spaces, present a very peculiar appearance. Each of them is composed of numerous narrow, much elongated plates or rods, with pointed extremities, which, overlapping each other considerably, give to the whole a sort of twisted look. They are probably, however, in a disturbed state. About seven of the lower lateral plates next the occiput are in connexion with these columns, which seem to divide into their component parts as they approach them, two or three being thus joined to each column; but in all our specimens this part of the fish is injured. The lateral plates are narrower than those lower down the body, and apparently gradually subside into the columns, without any distinguishing point.

These lateral plates at this point incline forwards; the few next lower down are much inclined backwards; so that there is here a large space over the abdominal region devoid of all such appendages. In all the four specimens this is the case, as well as in the German specimens above referred to; and it is therefore probably the natural condition, and is not owing to accidental circumstances, though it is possible enough that pressure may have had something to do in forcing the plates asunder.

The ventral plates (*m*) extend from the root of the ventral fins to almost the commencement of the anal; and from the lower part of the posterior plate there is a stout rod or process (*o*) extending upwards and backwards as far as the outer extremities of the lateral plates. Below, this process is wide and flattened; above, it is cylindrical; and at the point where this change takes place it is obtusely angulated backwards, the whole being a little arched in the same direction. There are apparently two of these great abdominal rods or processes, one belonging to each side, giving support probably to the lower posterior boundary of the abdominal walls, and limiting in this direction the naked space above alluded to as extending over the lateral walls of the abdominal chamber. These two stout rods are closely pressed together, and in all the specimens are much confounded with each other.

Above the median line, in front, the outer members of the series of transverse plates and rods are likewise considerably modified. The change takes place gradually, just behind the elevated portion of the dorsal fin. The lateral plates (fig. 3, *g*), however, are only slightly modified; but instead of being united to rods are continued as broad flat plates (*i*), which, inclining forwards, become angulated in front, and then for a short distance (*j*) incline backwards, and are united to a series of hourglass-shaped plates (*k*) that lean in the opposite direction, are extended to the dorsal margin, immediately below the anterior portion of the dorsal fin, and form part of an extended series that reaches to the root of the tail. The broad plate inclining forwards, and in continuation of the lateral plates, is undoubtedly a modification of the rod of the posterior part of the body; its margins are abrupt and produced into slightly elevated ridges; and it contracts a little towards its outer extremity, and is slightly thickened at this point. The next portion, which inclines backwards, appears to represent the sigmoidal ridge or plate. The margins of this portion of the series are in contact, and seem to be slightly imbricated; and the outer extremities are turned a little forwards to become united to the external hour-glass-shaped plates.

In the transverse centre of these modified sigmoidal plates there is a ridge (*j''*), similar in appearance to that on the median lozenge-shaped areas. This upper series of ridges forms a line which extends from the nape, a little above the commencement of the lozenge-shaped areas, and, passing backward parallel to them and about midway between them and the dorsal margin, terminates immediately behind the anterior elongated portion of the dorsal fin. This line of ridges resembles the upper line of mucus-tubes in *Polypterus* ('Poissons Fossiles,' t. ii. pt. 2. p. 50) and in *Dapedius punctatus* (*ibid.* t. ii. p. 192, pl. 25 *a*); and, indeed in the latter, which in form closely resembles *Dorypterus*, this upper or second lateral line, according to Agassiz, holds relatively exactly the same position.

The marginal hour-glass-shaped plates have their sides abrupt and slightly elevated into ridges. A similar ridge passes along the centre; and the most contracted part of the plate is thickened or elevated, the ends becoming depressed and thin. These peculiar plates, we have said, form a portion of a marginal series (fig. 1, *k*) that reaches to the root of the tail. Behind the anterior or elevated division of the dorsal fin they are much reduced in size, diminishing backward in length in proportion to the reduced height of the fin, and are not connected with the sigmoidal extremities of the transverse series of plates and rods; neither do their outer extremities appear to articulate with the fin-rays, though there are pretty regularly two rays to each plate. The largest of the hour-glass-shaped plates are three-sixteenths of an inch in length. These, in their arrangement and situation, resemble fin-supports.

A similar series of hour-glass-shaped plates extends along the ventral margin immediately within the base of the anal fin, and are large in front for some short distance backwards, corresponding to the space occupied by the enlarged anterior portion of the fin. These large plates and the large ones at the root of the dorsal seem to be articulated with the fin-rays.

The whole of the transverse plates, areas, and rods, as well as the ventral plates and columns and great posterior abdominal rods, seem as if covered with black enamel-like matter, having a semigloss similar in appearance to that which covers the head-bones and fin-rays. Indeed some of them seem as if composed of nothing else; and such is the appearance of a few of the cranial bones themselves. The bony support, however, can be traced in some of them; and a few of the lateral rods are hollow, the bony or cartilaginous support having apparently disappeared. But this enamel-like matter does not seem to have been confined to these parts; it appears to have been continued as a thin film composed of granules between the series of plates, and was extended over the entire surface of the fish as a dermal envelope, the plates and rods being, as it were, immersed in it. Such is the appearance particularly in the region of the sigmoidal ridges, where there is a continuous darkish film of considerable thickness, having a granulated surface, and giving the appearance to them of a series of broad continuous plates, which in all probability they are, the grooves in the ridges limiting the anterior and posterior margins of each plate. And there is usually, extending from the margin of the lateral plates, a broken fringe (figs. 2, 3, *v*) of black matter continuous with that which covers the plates, and which seems to be the remains of the ruptured film or dermal envelope. In fact, in one or two places where the plates are more approximated than usual, the continuity of the connecting film is quite obvious.

Now comes the question, Are the whole of these plates and rods the component parts of an endo-skeleton, or do they partially belong to an exo-skeleton ?

At first sight one is disposed to look upon these plates and rods as the remains of an endo-skeleton in a more or less disturbed condition; but on a closer examination a certain difficulty presents itself. There is an element or two too much, that are not found in the usual ichthyic skeleton. The sigmoidal plates and their rods (fig. 1, *j*, *j'*, *i*) are additional parts that are very perplexing; had they not existed, there would have been no difficulty in the matter. The lozenge-shaped areas and the lateral plates in that case might have been assumed at once to be a partially ossified vertebral column with the neural and hæmal spines attached, and the hour-glass-shaped plates the fin-supports. But these redundant sigmoidal plates and rods must likewise be taken into account. What are they ?

We have to express our indebtedness to Prof. Huxley for an answer to this question.

All the Pycnodonts have supplementary spinous processes, which extend from the vertebral spines to the interspinous processes or fin-supports. The lateral rods, then, in *Dorypterus* would appear to be the homologues of these supplementary spinous processes. Such being the case, the only remaining anomalous feature to be explained is the sigmoidal plates. These, there can be little doubt, are dermal, and consequently do not belong to the endo-skeleton; they are parts of an exo-skeleton, and therefore belong to the same category as the ventral plates, which are assuredly dermal. But this is not so clear with regard to the peculiar compound columns with which the latter are connected, though it would seem evident that the lower portion, which is continuous with the plates, should be so considered. The upper and larger portion, however, of the column, which is composed of numerous elongated rods articulated lengthwise with each other and with the upper prolongation of the plates, probably belong to the endo-skeleton. These peculiar columns, in their compound structure and twisted appearance, closely resemble similar columns, which are considered to be ribs, in *Pycnodus rhombus*, Ag., and in which they are apparently joined to the vertebræ. In *Dorypterus*, too, the compound columns seem to have their upper extremities united to the lateral plates or neural spines. It would therefore seem probable that in this genus the upper portions at least of the columns are likewise ribs.

The great abdominal rods have a strong resemblance to the bone similarly situated in such fishes as *Vomer*, *Zeus*, and, according to Agassiz's restoration, also *Platysomus*; but in these it seems to be an enlarged development of an interhæmal spinous process; while in *Dorypterus*, in which there appear to be two such rods, they seem to be developed in connexion with the posterior pair of ventral plates; nevertheless they are probably internal bones.

On the whole, then, it seems pretty clear that these peculiar plates and rods in *Dorypterus* are the component parts of both an endo- and an exo-skeleton. The lozenge-shaped plates or areas are the vertebral centres, or rather the remains of them; the lateral plates are the neural and hæmal spines, and the rods in connexion with them are the supplementary spinous processes; while the hour-glass-shaped plates are the interspinal processes or fin-supports, and the greater portion of the compound thoracic columns are apparently ribs. All these, as well as the great abdominal rods, are component parts of the internal bony skeleton.

The sigmoidal and ventral or thoracic plates, together with the upper prolongation of the latter, forming the basal portion of the compound thoracic columns, seem to be developments of the skin, and consequently belong to an exo-skeleton. The plates, too, on the shoulder, that apparently correspond to the sigmoidal plates of the posterior portion of the body, are most likely also dermal; and if so, the ridges in their transverse centre which form a line extending from the nape to some distance down the body are probably true mucus-tubes, which they so much resemble.

There is not much more to say with respect to this matter; we may observe, however, that in *Dorypterus* the ganoid type is modified; and in this interesting form we see, for the first time in the geological series, a true thoracic, or rather a true jugular fish of the Linnean classification; for the ventral fins are considerably in advance of the pectorals, and, indeed, they are placed as far forward as it is possible for them to be. Some change in the body-scales might therefore be expected, though the fins have the usual structure of those of the group to which this fish belongs; and the tail is decidedly heterocercal, with the lobes, which are deeply forked, of nearly equal length. And in the upper lobe there is a double row of the usual rhomboidal scales, resembling in their form and mode of articulation those on the tail of *Acipenser Sturio*, Linn. No other scales are observed on any part of the body of either of the four specimens, unless, indeed, the ventral and sigmoidal plates be so considered. We have, then, in *Dorypterus* a ganoid fish not only deprived of body-scales, but without plates of any kind except those just alluded to.

Having now given the result of a very careful examination of all the four specimens at our disposal, collating and rigorously estimating the facts exhibited by each, we shall now give separate descriptions of the specimens themselves, marking emphatically the points for which each is distinguished.

The first specimen (Pl. X., fig. 1) that we shall notice is from the cabinet of our friend Edward Wood, Esq., Richmond, Yorkshire. It is four inches long, including the tail, and is about one inch and three-quarters deep at the deepest part. The anterior portion is well preserved. The head is one-third of the entire length of the fish, exclusive of the tail-lobes, and is one-third higher than long; it is arched in front, being most protuberant at the muzzle; behind, it is angulated near the centre, the posterior margin of the operculum (*s*) determining the form; the jaws (*p*, *q*) are nearly perfect, and are closed, showing that the mouth shuts upwards; the maxilla is wanting, only the impression of it remaining, indicating its form and position. The brow, orbit (*u*,) gill-cover, and clavicle (*r*), are all in their natural positions, no considerable disturbance of these parts having taken place.

The pectoral fin (*c*), though in disorder, occupies its proper situation immediately below the angle of the operculum, near the longitudinal centre; and one of the ventral fins (*d*) is well displayed at the ventral margin in connexion with the lower extremity of the clavicle. It is narrow, and its pointed extremity inclines backwards as far as the posterior extremity of the second ventral or thoracic plate; it is upwards of half an inch in length. Little more than half an inch remains of the elongated portion of the dorsal fin (*a*); and mere traces are perceptible of the narrow posterior division. The narrow backward portion of the anal fin is scarcely distinguishable; but the large anterior member (*b*), though not entire, is distinct about the middle of the ventral margin and a little behind the ventral plates. The tail-fin is almost perfect, exhibiting both the general outline with the lobes spread and the surface-characters. The upper lobe, which is a little longer than the under, is about an inch long.

The transverse series of plates and rods are much disturbed over the whole surface, though in places they are partially in order, and show the same surface-characters as are displayed in specimens in which these parts are more perfect; and, as in them, they are covered with black enamel-like matter. The ventral plates (*m*), however, are arranged in complete order along the ventral margin, from the base of the ventral fin to a little in front of the anal, overlying each other apparently forwards; but on closer examination they are seen to imbricate backwards, and to give off from their upper extremities the peculiar compound columns (*n*) already described, which, extending upwards in parallel order, incline towards the head. The anterior ones are the shortest, and appear to terminate near to the margin of the clavicle. A few of the posterior pass above the angle of the operculum, and can be seen to join with the lateral plates of this region, notwithstanding that they are much disturbed. The large posterior abdominal rods (*o*) occupy their usual position, sloping backwards from the last ventral plate.

The specimen (Pl. X., fig. 2) next to be described is highly instructive, though it is in many parts much disarranged. The head, in particular, has greatly suffered, the upper margin being entirely obscured by the opercula (*s*), which have been torn from their natural positions and turned upwards and forwards; their lower extremities are placed close together, and project in front of the brow. They lie with the external surface uppermost, their anterior margins approximating. That belonging to the right side has carried along with it the pectoral fin (*c*), which is beautifully displayed, in an expanded state, almost complete. The left pectoral is distinctly seen in its natural position, though much injured, and overlain by a thin film of apparently the skin. The mandibles are not disturbed, and by their position indicate that the mouth was closed; but the bones of the upper jaws are not determinable, except the left maxilla, which is in a pretty perfect state; the præmaxilla, however has been torn away. The orbit (*u*) is pretty well preserved, but is removed a little below the natural position.

The contour of the dorsal margin, in front of the dorsal fin, is entirely lost, this region having been forced downwards nearly as far as the centre of the body. Posteriorly, however, the whole form is well preserved, and exhibits the transverse plates and rods in a good state of preservation, the series of lateral (*g*) and sigmoidal plates (*j*) being almost complete; the line of the central lozenge-shaped plates (*h*) is also quite distinct, with a plate here and there bearing a central ridge. In front this line is thrown suddenly upwards, in consequence of the ruptured condition of the anterior parts. Twenty-eight lateral plates can be counted, and fifteen or sixteen sigmoidal ones along the lower margin; only ten or eleven can be made out of the dorsal row.

One of the most interesting features in this specimen is the ventral plates (*m*), which are displayed in a remarkable manner. Without the aid of this specimen it might have been difficult to determine the existence of a double series of these plates, one belonging to each side of the abdomen. Here, however, both sets are most satisfactorily seen, those belonging to the exposed, or left side, being arranged in their natural order, while those of the right side are turned downwards below the ventral margin, so that their outer surface is placed upwards, and in the same plane with the similar aspect of the other plates. The lower margins of the two sets are in close contact, the line of junction coinciding with the ventral margin. The plates in both series incline forwards, their pointed extremities being turned backwards; and the compound columns (*n*) in connexion with the upper extremities are distinctly displayed, those belonging to the left side taking their usual course upwards in the direction of the head and lozenge-shaped area, those on the right side, or those of the displaced series, passing outwards from the specimen, the columns, like the plates themselves, having being displaced and thrown downwards. And thus we have a satisfactory proof that both the ventral plates and columns are developed in two lateral and distinct series. And furthermore, these columns are seen, in the specimen before us, to pass upwards and become united to the lower anterior lateral plates, notwithstanding that they are much disturbed at this point.

The dorsal fin (*a*) has been broken away, only three-quarters of an inch remaining. The anterior basal extension, however, is well shown, as this portion is turned a little towards the observer, and has been forced downwards. Consequently the short anterior basal plates, or fin-fulcra (*a''*), are seen to be arranged in a bilateral series of about twelve. This bilateral arrangement of the fin-fulcra is not, we believe, usual among the ganoids, in which the two lateral halves are commonly united into one piece. Mere traces are observable of the narrow posterior extension of the fin, though the marginal hour-glass-shaped plates are regularly disposed immediately within the posterior slope. Nothing is to be seen of the anal fin, except the base of the anterior portion, at which point the hour-glass-shaped plates are distinctly displayed; and traces of them are visible almost to the tail. The remains of both ventral fins (*d*) are traceable immediately in front of the ventral plates, over the anterior of which one of them is spread, the rays being directed backwards.

The tail is admirably shown, and is exceedingly perfect. The lobes are expanded, exhibiting the depth of the bifurcation. The marginal fulcra, plates or scales (f), and the double row of rhombiform scales (e) behind, as well as the fin-rays of both divisions, are very perfect, the latter displaying their bifurcated extremities stretched out. The lobes are about equal in length, if measured from the root, along the axis. In this way they are one inch and a quarter in length; but if measured along the posterior margin, the upper lobe is nearly one inch and a quarter long, and the under lobe only seven-eighths of an inch in length. The width of the tail from tip to tip is upwards of one inch and three-quarters. The specimen measures four inches and three quarters in length, and one inch and seven-eighths in depth. This specimen remains in the possession of Mr. Duff, to whom we are indebted for the discovery of these and many other interesting fossil remains.

Our third specimen (Pl. X., fig. 3) is the only one which lies with its right side exposed; all the other three have the left side uppermost. This measures in length, including the tail, and making allowance for what is wanting in front, four inches and three-quarters, and in depth at the widest part two inches and one-eighth; and it is chiefly distinguished by the large portion that remains of the dorsal fin.

The head does not appear to have been much injured when the specimen was deposited; but unfortunately the upper and frontal portions are broken away. The orbit (u), however, is well marked; and so are the boundaries of the opercula (s), the posterior contours of which are quite distinct. Three or four of the ventral plates (m) are seen in their proper places in front of the anal fin, sending upwards their columns, which exhibit well their compound and twisted appearance. Some of them reach the lateral plates near the occiput. The great abdominal rods (o) are seen in connexion with the posterior plate inclining upwards and backwards.

The plates and rods are much displaced; but, notwithstanding, their connexions and characters are in some places well seen, particularly the relationship of the lateral plates to the lozenge-shaped central plates, or areas, on a few of which the median ridge is quite distinct, and the continuity of the dark enamel-like surface-matter with that covering the lateral plates is very obvious.

Considerably more of the dorsal fin (*a*) is present than in any of the other specimens. One inch and three-quarters of it, in a good state of preservation, inclines backwards; and in front, arranged in exact order, are twelve or thirteen short plates, the fin-fulcra (*a''*); but these so imperceptibly graduate into the regular rays that it is difficult to determine the exact number; they are strong, pointed, and have the root distinctly rounded. The broken extremity of the fin is a little less than two-tenths of an inch wide; and from this we infer that more than one-half of this fin is wanting. In this specimen it would probably be a little short of four inches long. There are twenty-four or twenty-five rays at the base of this elongated portion, including the short anterior plates or fulcra; and one inch and a half up only seven or eight can be counted. Very little is to be seen of the narrow posterior portion of the fin, there being only a slight trace of a few rays.

The pectoral fins (*c*) are in a pretty perfect condition, occupying their natural position immediately behind the posterior angle of the gill-covers, one partially overlying the other. At the root of one of them there are two flat curved bones, which may perhaps be respectively the scapula and coracoid. Arising from these are the brachials (*c'*), to the number of fourteen or fifteen; they are about one-eighth of an inch long, and are delicate and flat, thicker than the fin-rays, with the extremities obtuse; and there are two simple rays, composed of many joints, to each brachial.

The remains of both the ventral fins (*d*) are seen in front of the ventral plates, the edge of the belly being turned a little upwards. Two elongated bones, nearly a quarter of an inch long, lie in contact with them, and have their anterior ends a little enlarged and nodulous. These are probably the pelvic bones, to which the fins are attached, the thickened extremities having all the appearance of articular surfaces. The mere casts of these bones are observed in connexion with the specimen; but the bones themselves are present on a fragment of the slab that was split off from the specimen.

The enlarged portion of the anal fin (*b*) is pretty well displayed, immediately behind the ventral plates; but the narrow posterior part is scarcely traceable.

The tail is well developed; but half of the upper lobe is wanting. The under lobe shows distinctly the numerous short joints of which the rays are composed, as well as their terminal bifurcations. This lobe is one inch and a half long. The scales (*e*) and marginal plates, or fulcra (*f*), are well preserved on the upper lobe.

The last specimen (Pl. X., fig. 4) we have to describe is the largest of the four; it is five inches in length and two inches and a quarter deep. The head is much crushed; but the orbit (*u*), the narrow elongated gill-plates (*s*), and jaws (*p*, *q*), are all determinable, though much injured. The ventral plates are confused and broken; they occupy, however, their natural position; and a few of the compound columns are present, and can be traced to the anterior lateral plates. The great abdominal rods (*o*) are also conspicuous, inclining backwards, the lower wide extremities in contact with the last ventral plate, and the upper extremities leaning against and as it were, pushing backwards the lateral plates in the immediate vicinity of the abdomen.

The lateral plates (*g*) and rods (*i*) are well preserved; and the series of lozenge-shaped areas (*h*) form a distinct line from end to end, displaying better than any of the other examples the elevated central ridges. The plates on the shoulder (*j'*) are also beautifully preserved in regular order, and exhibit, in great perfection, the ridges resembling mucus-tubes; and the whole series of the sigmoidal plates (*j*), with their rods (*i*), along the ventral margin, can be determined; and some of them are in good condition. The hour-glass-shaped plates (*k*) are quite distinct, and are regularly arranged along the same margin; and those below the elevated portion of the dorsal fin are likewise in excellent order.

No distinct traces of either the pectoral or ventral fins are left. The dorsal fin (*a*), too, is very imperfect, three-quarters of an inch only remaining. The short anterior plates, or fulcra (*a''*), are pretty distinct; but the merest traces are found of the narrow posterior part. The greater portion of the anterior division of the anal fin (*b*) is well preserved, and the narrow posterior part (*b'*) is determinable throughout its length. The tail is much injured, but lies, as in all the other examples, spread out, the two lobes being strongly defined.

We have now only a few concluding words to say as to the place this curious fish should occupy in the classification. We know of no family with which it can be associated, though it is undoubtedly closely allied to the Pycnodonts; and of these perhaps it approaches most closely to *Gyrodus* and *Microdon;* but while in *Dorypterus* the head-bones are smooth, they are in most of the Pycnodonts granulated or otherwise ornamented; and our fish likewise differs from them in the absence of the usual body-scales.

The large and upward-shutting mouth, too, is not found in the Pycnodonts; and the apparent absence of the strong characteristic teeth of that group is noteworthy. Had such teeth existed in the fish under discussion, some trace of them would assuredly have been observed, since we have seen that the jaws are pretty well preserved in two or three of our specimens. It is probable, therefore, that the dental organs were small and inconspicuous, if they existed at all. The enormous development of the dorsal fin and the forward position of the ventrals are significant facts. The latter is particularly worthy of notice, especially when we consider that we have in this palæozoic species the earliest thoracic fish known in the geological series. And further, Sir Philip Egerton states, in a letter with which he has lately favoured us, that he "is not cognizant of any fish in strata older than the chalk having the fins thoracic or jugular." On the whole, then, we confess ourselves at a loss to determine where to locate *Dorypterus* in the system. Is it not the representative of a distinct family having a certain relationship to the Pycnodonts? This we must leave for the determination of those more conversant with ichthyology than we ourselves are.

EXPLANATION OF PLATES IX., X.

The following letters apply to all the figures of *Dorypterus Hoffmanni.*

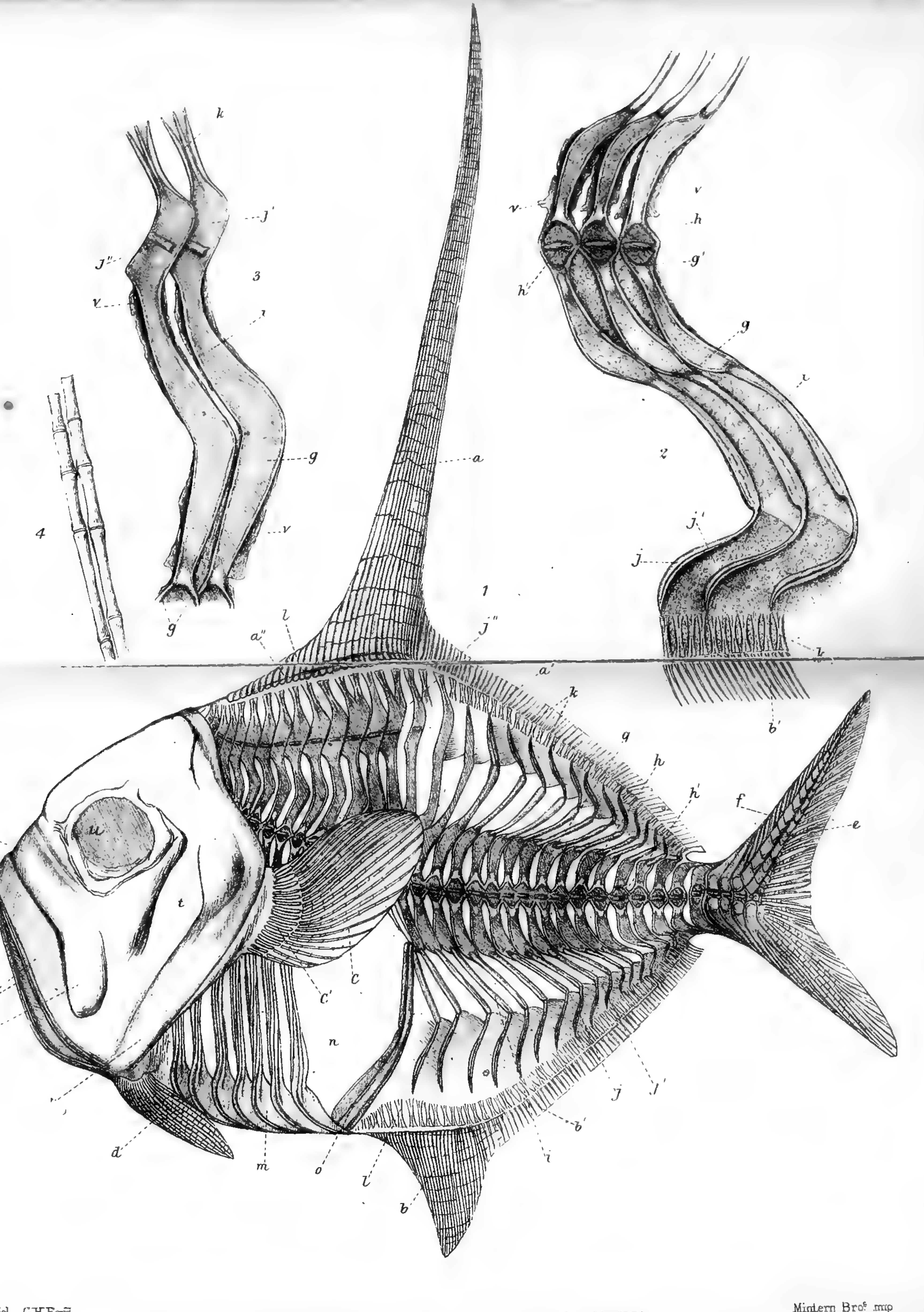
a, dorsal fin; *a*', narrow posterior prolongation of ditto; *a*'', anterior prolongation, or fin-fulcra of ditto; *b*, anal fin; *b*', posterior, narrow prolongation of ditto; *c*, pectoral fins; *c*', brachial rays; *d*, ventral fins; *e*, rhombiform scales of the tail; *f*, fin-fulcra of ditto; *g*, lateral plates or vertebral spines; *g*', bifurcation of the inner extremity of ditto; *h*, lozenge-shaped plates, or areas,—the vertebral centres; *h*', ridge in the centre of ditto; *i*, rods, or supplementary vertebral spines, in connexion with the lateral plates; *j*, sigmoidal ridges; *j*', sigmoidal plates; *j*'', ridge or mucus-tube in the centre of ditto; *k*, hour-glass-shaped plates or fin-supports; *l*, large ditto at the base of the dorsal and anal fins; *m*, ventral or thoracic plates; *n*, compound columns in connexion with ditto; *o*, great abdominal rods; *p*, mandibles; *q*, præmaxilla; *q*', maxilla; *r*, clavicle; *s*, operculum; *t*, præoperculum; *u*, orbit; *v*, fragments of dark granular matter, apparently dermal.

PLATE IX.

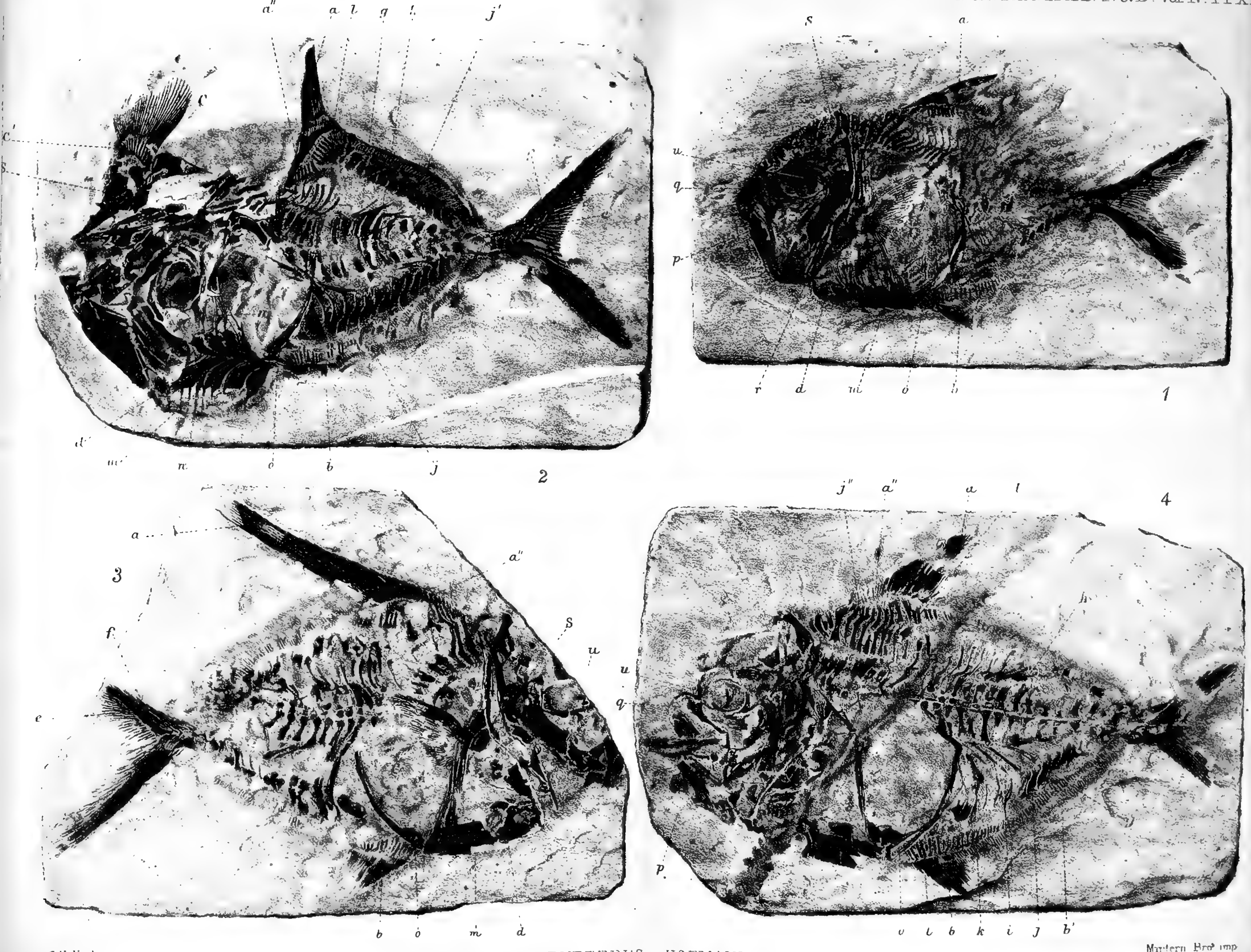
Fig. 1. General view of the restored skeleton of *Dorypterus Hoffmanni.*
Fig. 2. Much enlarged view of three of the transverse rods and plates.
Fig. 3. Much enlarged view of two of the plates and rods on the shoulder.
Fig. 4. Portion of two rays of the dorsal fin, showing the joints.

PLATE X.

Fig. 1. Specimen of *Dorypterus Hoffmanni*, exhibiting the head, ventral plates, and ventral fin in good order.
Fig. 2. Another specimen, exhibiting the tail, pectoral fins, base of dorsal fin, gill-covers, ventral plates, the skin, and the various plates and rods.
Fig. 3. Specimen of *Dorypterus Hoffmanni*, exhibiting the dorsal fin, pectoral fins, and lateral plates with the lozenge-shaped areas and central ridges.
Fig. 4. Specimen of *Dorypterus Hoffmanni*, exhibiting the dermal plates with the lozenge-shaped areas and ridges, particularly the plates on the shoulder with the upper line of ridges or mucus-tubes.



A Hancock del. G.H.Ford. RESTORATION OF DORYPTERUS HOFMANNI. Mintern Bros imp



G. H. Ford

DORYPTERUS HOFMANNI.

Mintern Bros imp.

XI.—*On Saccammina Carteri, a new Foraminifer from the Carboniferous Limestone of Northumberland.* By Henry B. Brady, F.L.S., F.G.S. (Plate XI.)

Introductory.—Notwithstanding the prominent place occupied by the Mountain Limestone amongst the geological formations of Great Britain, its geographical extent and its enormous thickness, but little is known of the Foraminifera of the earlier Carboniferous age. The organic remains of which the calcareous beds are at times almost entirely composed afford abundant evidence of their marine origin, and analogy with other limestone strata would lead to the expectation that Foraminifera would constitute an important part of their fossil fauna; yet were a catalogue drawn up representing the present state of our knowledge of Carboniferous Invertebrata, the whole of the subkingdom Protozoa would be told off in a few lines. Nor have we far to seek for the reason of our comparative ignorance of the minuter fossils, indeed we need hardly look further than the physical characters of the material forming the beds to see where the difficulty lies. Our Mountain Limestone is almost always exceedingly hard and compact, sometimes even subcrystalline, and scarcely ever admits of examination in respect to its Microzoa otherwise than by means of transparent sections, which yield but little reliable information. It is only here and there that pieces can be met with soft enough to allow the separation of their constituent fossils by washing or other mechanical means; and the cases are still rarer in which any chemical process can be resorted to with advantage to the same end. But possibly an even greater difficulty exists in the Microzoa themselves. The Rhizopoda, at least, either from natural deficiency of marked characters, the obliterating effects of time, or the alteration produced by the process of mineralization, present serious obstacles to accurate study.

Under these circumstances, the discovery of Foraminifera of a well-defined and easily understood type in the Carboniferous Limestone is a matter of some importance, and an additional interest pertains to those about to be described, on the ground of their zoological relationship.

Amongst the fossils met with by Mr. Charles Moore in his examination of mineral veins and the adjacent rocks, were two or three almost spherical bodies, one-twentieth of an inch in diameter, somewhat produced at two opposite portions of their periphery, and having a nearly smooth arenaceous exterior. In the absence of material for a definite conclusion as to their nature, I suggested that they were properly segments of a gigantic *Lituola;* and as such they were mentioned in the list of fossils appended to Mr. Moore's report presented to the British Association at the Exeter meeting in 1869. As the geological source of these specimens could not be determined with accuracy, much significance was not attached to them; but shortly after the presentation of the paper referred to, my attention was directed by Mr. G. A. Lebour, of the Geological Survey, and Mr. Howse to a limestone of somewhat unusual character occurring in the heart of Northumberland. The specimen placed in my hands by Mr. Lebour appeared to be made up almost entirely of spheres, which were at once recognized as identical with those in Mr. Moore's collection. Through the kindness of Sir Walter C. Trevelyan, on whose estate the limestone occurs, and to whom its discovery is due, every facility has been afforded for studying the structure of the rock, and the following notes embody the results arrived at.

Geological.—The bed from which the specimens were taken is the so-called "four-fathom limestone," one of the thickest and best-defined members of the Carboniferous Limestone series throughout the north of England. At Elfhills, a point situated a mile or two west of Cambo, near the Wansbeck Valley Railway, it is quarried to a considerable extent, the stone being burnt for agricultural purposes, and a section of from twenty to thirty feet in height is there exposed. This exhibits beds of limestone varying somewhat in physical characters, with one or two thin beds of shale, and an intruded mass of whin (apparently the overflow of a larger whin-sill) interbedded with it. In some places the limestone is a good deal altered by its proximity to the volcanic rock.

The uppermost bed exposed in the quarry appears to be entirely composed of spheroidal or fusiform bodies, but so aggregated and infiltrated that they form an intensely hard dark-coloured limestone, the freshly fractured surface of which appears almost homogeneous and sometimes subcrystaline. It is, however, readily acted upon by the atmosphere, and the weathered portions reveal a spheroidal structure that might at the first glance be assigned to purely physical causes depending on some peculiarity in the mode of deposit. A fair idea of the characters of the rock forming this bed may be gained from Plate XI., fig. 1, which represents an average specimen, with the upper surface considerably weathered. Very frequently the disintegration, instead of being merely superficial as in the figured specimen, extends to a considerable depth, leaving the stone in the condition of a crumbling mass of spheres. A layer in this state exists between the surface-soil and the hard rock, and by a little treatment the fossil portions may be obtained from it quite clear of the matrix.

A few feet below this bed (in the same section), and separated from it by a thin layer of shale and a stratum of limestone containing Bryozoa, is a second and more considerable bed, with the same sort of fusiform bodies distributed through its entire length and thickness. The individual specimens are larger than those occurring in the later deposit, but they do not constitute nearly so considerable a proportion of the entire rock. The segments do not appear to differ in structural characters from those found in the upper bed.

Mr. Topley, of the Geological Survey, has furnished me with a rock specimen from another section in the neighbourhood of Elfhills, but at some distance from the main quarry. The point from which it was taken is apparently about sixteen feet higher in the series than the top of the quarry. This may perhaps only be the upper bed, faulted. It immediately overlies one of the branches of the whin-sill, and seems to have been a good deal altered by heat, but portions at least of it are entirely composed of the same fossil remains.

The Elfhills bed appears again on the banks of the Wansbeck above Wallington Hall, where it has more or less of the same spheroidal structure, determined by the presence of its characteristic fossil.

As the "four-fathom limestone" traverses the Alston Moor district, it can scarcely be doubted that the specimens originally found by Mr. Charles Moore amongst other Foraminifera, associated with the mineral veins of the higher part of Weardale, have been derived from it; but hitherto no fossil similar in character to those of the Northumberland bed has been discovered, though carefully sought for by my friend Dr. Savage, of Nenthead, who is thoroughly conversant with the geology of that region.

It seemed desirable to compare the Elfhills rock with other spheroidal and concretionary limestones of palæozoic age; and for the means of doing so I am indebted to the kindness of Mr. Etheridge, the palæontologist to the Geological Survey, who has furnished me with a number of specimens of such limestones, some of them Carboniferous, others from the Wenlock and Bala beds. In each of the specimens there is some *primâ-facie* resemblance to the Elfhills rock, and in one or two the similarity is so striking that the naked eye is hardly sufficient to discern the differences that in point of fact exist between them and it. By means of transparent sections and a good microscope, the true structure is readily made out; and in all the specimens sent by Mr. Etheridge it is essentially the same. They are composed of laminated spheres of carbonate of lime, formed by the common process of spherical coalescence, and that their physical peculiarities are in no way due to organic remains may be asserted with certainty in every instance.

Chemical.—Although the Elfhills limestone is as compact as many varieties of marble, considerable difficulty is experienced in obtaining a polished surface by grinding, owing to the different degrees of hardness of its constituents. The matrix is usually softer than the fossils imbedded in it, and frequently the infiltrated matter which occupies the interior of the spheres is harder than the investing shell. This was found to be due to the presence of silica unequally distributed. The matrix appears to be free from silica; but a number of unbroken spheres washed quite clean were submitted to analysis by my friend Mr. A. Freire-Marreco, and found to contain as follows :—

Silica	44·66
Iron and alumina	4·86
Carbonate of lime	48·33
Loss	2·15
	100 parts.

The casts and crystalline tufts which occupy the interior of the spheres were subsequently examined, and found to yield ninety-two per cent of silica. The analysis was made from forty or fifty of the "cores" taken at random; but the percentage named can scarcely be said to represent accurately the proportion of siliceous and calcareous infiltration. The siliceous casts are usually amorphous (colloid), and completely fill the cavities; and if the interior be smooth, they enucleate themselves as solid spherical masses on the fracture of the arenaceous investment. The crystalline cores, on the other hand, usually adhere by points to the interior of the shell; so that the siliceous casts are not only far more commonly met with clear of the test than the calcareous, but they are also individually heavier.

There is considerable difference in the appearance under the microscope of the chambers under different conditions of infiltration. Sometimes a sphere may be found partially filled with silica and partially with carbonate of lime. A section of such a one is shown at Pl. XI., fig. 5. The lobe of silica which occupies part of the right side of the chamber (*a*) is amorphous, and has a yellowish tint by transmitted light, whilst the remainder is calcareous and crystalline. Under these conditions it is useless to attempt a comparison between the chemical composition of the test of the fossil under consideration and that of recent species of the same genus or other allied arenaceous Foraminifera—a circumstance the more to be regretted as the process of mineralization has also obscured the minuter structure of the former so far as to prevent accurate observations on the nature of the sand-grains and cement used in building its investment.

Zoological.—To revert to the Elfhills specimens. The subspherical bodies which constitute the mass of the rock may be examined to some extent by means of sections, but far more completely and accurately by washing the marly or crumbling mass resulting from partial disintegration by the long-continued action of air and moisture. The residue after washing this material consists chiefly of the arenaceous spheres, fragments of Encrinites, and a few kindred fossils. The spherical or, rather, fusiform bodies average about one-eight of an inch in length, and one-twelfth of an inch in transverse diameter: large specimens may be found measuring one-sixth or even one-fifth of an inch by one-ninth or one-eight of an inch, but such are of rare occurrence. Sometimes they are more elongate, and extreme examples have been noted in which the conjugate and transverse diameters were in the proportion of three to one. The two ends are usually produced and tubular, apparently for the passage of sarcode stolons or pseudopodia: they are sometimes symmetrical, but more frequently one end tapers more gradually than the other: occasionally the base is rounded, and the shape is completely pyriform. The question arises whether these bodies represent individual animals, or to what extent they may have been connected with each other when living. It is not at all unusual to find on any weathered piece of the rock two segments connected by a stoloniferous tube—rarely, three are found in this condition—and in one or two instances four or five have been noticed still retaining connexion with each other. The bulk and weight of the segments and the comparative tenuity of the intermediate processes would be sufficient to account for the separation into single chambers, were this less constant than it is; but there is no need to suppose that the single segment may not represent a perfect animal equally with the many-chambered shell. Occasionally, though very rarely, a chamber is found with a round imperforate base and a single orifice at its apex, and if this is taken to correspond to the ordinary form of *Lagena*, the fusiform chambers may be regarded as analogous to the distomous varieties of that genus. The moniliform fossils might be compared to the *Nodosariæ*, but that all that have as yet been met with have an aperture at each end of the series of segments, and, for any thing known to the contrary, the test might extend itself indefinitely in either direction.

The test is composite and arenaceous, the constituent particles being fitted and cemented together so as to give a nearly smooth exterior. The size of the sand-grains and their mode of aggregation is a character of some importance amongst the recent *Lituolida*, but as has been before stated, the process of mineralization has obscured the minute structure of the fossil in these particulars.

The interior of the test is commonly smooth, resembling the recent *Saccammina*; but it sometimes presents a surface of very short, delicate, labyrinthic, shelly ingrowths, as shown in Plate XI., figs. 3 and 4. This cancellated or labyrinthic structure is often met with amongst the arenaceous Foraminifera, and in some genera it is developed to an enormous extent.

Here and there a specimen may be found with a sort of circular patch on the surface, which has the appearance of a cicatrix resulting either from the gradual closing-in of an orifice or possibly the reparation of some injury to the shell-wall. These slightly raised concentric markings, apparently deposited regularly from without inwards, occurring frequently and with considerable uniformity, can scarcely be accidental. The positions in which they are generally noticed, viz., the sides rather than the ends of the segments, is an objection, though possibly not a fatal one, to the supposition that they mark the closure of normal apertures.

When first investigated, the characters of the fossil seemed sufficiently distinct from those of any known type of Foraminifera to necessitate the establishment of a new genus for its reception, and the generic term *Carteria** was provisionally assigned to it; but I have since had the opportunity of seeing a number of type slides of deep Atlantic Foraminifera sent by Prof. Sars of Christiania to Dr. Carpenter, and amongst them specimens of his *Saccammina sphærica*, a species named in his paper on the deep-sea fauna,† but, so far as I know, not yet described. I am further indebted to Dr. Carpenter for a supply of specimens of this form, which appears to be common at great depths, and careful examination has convinced me of its very close relationship to the Carboniferous fossil, although sufficient difference appears to exist in minor particulars to justify specific separation. The following morphological characters will serve for diagnosis:—

GENUS. SACCAMMINA, *Sars.*

SACCAMMINA CARTERI, n. sp.

Test free, consisting either of a single chamber or of several joined end to end in a single series; chambers subspherical, fusiform or pyriform; texture arenaceous, compact; exterior surface nearly smooth, interior smooth or slightly labyrinthic. Long diameter of the chambers (average) about one-eighth of an inch.

Hab. Carboniferous Limestone, north of England.

The distinction between the fossil species and Prof. Sars's type is based, firstly, on the form of the chambers, which in the latter are always subspherical and have but one aperture, whilst in the former they are, as a rule, fusiform and have two apertures; secondly, on the fact that the recent species always occurs in single segments, and there is no reason to believe that it is ever polythalamous; the test of *S. Carteri*, on the other hand, is frequently many-chambered; thirdly, the test of *S. sphærica* is somewhat thinner, and nearly smooth both inside and out,

* See Brit. Assoc. Reports, 1860 (Exeter Meeting), p. 381. I thereby wished to associate the *type* with the name of my friend H. J. Carter, F.R.S., who has laboured so assiduously and successfully amongst the Protozoa. As the matter stands, the *specific* term only is left at my disposal.

† See "Vidensk.-Selsk. Forhandlinger" for 1868, p. 248.

whilst that of *S. Carteri* often shows a tendency to produce loose cancellated growths on its inner surface. It is an interesting fact, however, that the palæozoic fossil should have its nearest known ally in a species living abundantly on the coast of Norway at a depth of four hundred and fifty fathoms.

The *Saccammina*-beds have not yielded any great variety of Foraminifera, though subjected to very careful search. Small specimens of *Trochammina gordialis*, P. and J., are not uncommon, and a few examples of a somewhat peculiar modification of *Textularia*, which has attracted the attention of observers elsewhere, have been found. There still remain, however, some doubtful organisms to be worked out. The *Textularia* alluded to is a stout arenaceous variety, frequently Bigenerine in its mode of growth, and with an anomalous aperture, sometimes labyrinthic, but more frequently consisting of two or three distinct circular pores. Mr. John Young, of Glasgow, has a number of beautiful specimens of this form, and I find, in my notes on his collection of Carboniferous Foraminifera, that I have the MS. name *Textularia antiqua* appended to it.

Postscript.—During the month which has elapsed since the above was written Dr. Savage has continued his search for this fossil in the Alston district, and I hear of his success just in time to append some particulars which he has been good enough to forward me relative to its occurrence.

He says, "I first found the fossil in a quarry between here (Nenthead) and Alston. It occurs plentifully in the lowest post but one of the four-fathom limestone. The *lowest* post, resting on the Natterass Gill hazel, is two feet to two feet six inches thick, and the miners tell me that it is usually the hardest part of the formation. The *Saccammina* bed which immediately overlies it is four to six inches thick, and distinct. I have traced the bed, still full of the fossil, wherever it is exposed along the sides of the Nent towards Nenthead. I have also examined the four-fathom limestone nearer Alston, but have been unable to discover any corresponding post and no *Saccammina*, but this is only negative evidence.

"Just below Garrigill Gate I examined the same limestone again, and again noticed the fossil, but in a position from which I could not obtain specimens. It is beautifully seen in this last place, but is not so thickly set as in the others. The specimens on the weathered surface in many cases have lost their arenaceous tests and appear as quartz beads.

"I have as yet found no evidence of *Saccammina* in the upper posts, though I have carefully examined three complete sections of the four-fathom limestone; indeed, except a few somewhat doubtful specimens from the upper part of the lowest post, its occurrence here seems to be limited to the thin bed I have described."

This information is most interesting, and tends to define *Saccammina Carteri* as peculiar to the lower portion of the four-fathom limestone.

EXPLANATION OF PLATE XI.

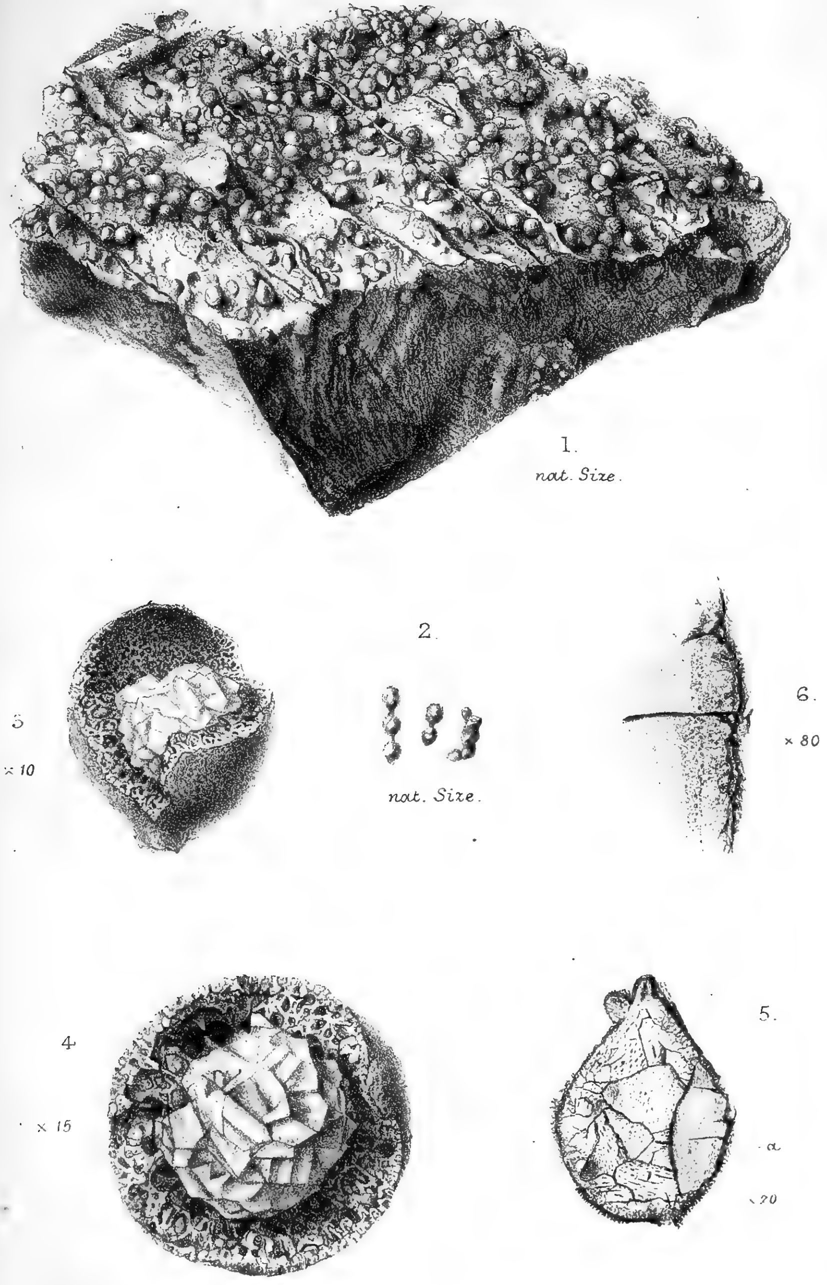
Fig. 1. A piece of *Saccammina*-limestone from Elfhills, natural size. The upper portion of the figure shows a weathered surface, the lower a fresh fracture. The white spots on the latter indicate the tufts of crystals which often occupy the interior of the chambers.

Fig. 2. Polythalamous specimens of *Saccammina Carteri*, natural size.

Figs. 3 & 4. Broken specimens showing the occasional labyrinthic structure of the inner surface of the test and the crystalline calcareous masses occupying the interior. Fig. 3 magnified 10 diams., fig. 4 magnified 15 diams.

Fig. 5. Transparent section of a segment, infiltrated partially with carbonate of lime, partially with silica: *a* is a lobe of colloid silica. Magnified 29 diams.

Fig. 6. A portion of the last specimen, at *a*, more highly magnified, showing the structure of the infiltrated test in transverse section. Magnified 80 diams.



.B. Brady del. A.T. Hollick lith. W. West & C° imp.

Saccammina Carteri.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, GEORGE STEWARDSON BRADY, ESQ., C.M.Z.S., AT THE TWENTY-FIFTH ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-UPON-TYNE, ON THURSDAY, MARCH 16TH, 1871.

GENTLEMEN,—At the close of my year of office as your President, I appear before you painfully conscious of the many imperfections on my head. It is indeed no small honour, considering the position which the Tyneside Naturalists' Field Club now holds in the estimation both of English and foreign naturalists, to be elected to its presidential chair. For this honour my most hearty thanks are due to you, and also much apology for the imperfect manner in which I have fulfilled the duties of the office. Knowing that my own professional avocations might very probably interfere (as unfortunately they have much interfered) with my regular attendance at the Field Meetings, it was with considerable misgiving that I accepted the nomination of the Committee: I can now only express the trust that not much inconvenience or detriment to the Club has arisen from these, on my part most unwilling, lapses. Thus much of egotism and apology was due to you and to myself. We will now go on to our usual review of the year's proceedings.

The FIRST FIELD MEETING of the Season was held at Hartford Bridge, on the 26th of May. The party numbered about one hundred, amongst whom were several ladies. A long winter, followed by a cold and unsettled spring, had only just previously given way to more genial weather, and the warm and brilliant afternoon tempted together a more than usually numerous company, who most thoroughly enjoyed their excursion. A short walk from the Plessey Station, partly along the high road and partly through the fields, brought the party to the beautifully wooded banks of the river Blyth, and after arranging on the bridge the order of the afternoon's proceedings, they proceeded at once to the beautiful grounds surrounding Hartford Hall, through which, by the courtesy of Mr. Young, who also provided a guide, they were allowed to wander "at their own sweet will." The woodland paths leading along the banks of the river, and disclosing at each turn new and ever-changing combinations of rock, river, and foliage, allured many as far as the "Crag" which terminates the grounds of Hartford Hall. Here a streamlet courses through a tiny ravine down to the river, and on its banks were gathered by some of the party the oak fern and hart's tongue (*Polypodium dryopteris* and *Scolopendrium vulgare*). Amongst the more noticeable plants found during the ramble were the globe-flower (*Trollius europæus*) and the celandine (*Chelidonium majus*), and the banks were everywhere gay with forget-me-not, woodruff, wild hyacinth, broom, and gorse, and if not gay or fragrant, were at any rate odorous with whole acres of garlic. A few members, instead of following the downward course of the river, turned upwards along its northern bank, a walk which, if not so tempting for its beauty, is perhaps more productive to the naturalist, its open, sunny banks and masses of dwarf brushwood affording ample scope for the exertions of the entomologist and bird-nester. The beautiful collection of dogs and poultry belonging to Mr. J. Shorthose, of Hartford Bridge Cottage, attracted the attention and admiration of many members. These are, I believe, unequalled in our district and probably unsurpassed by any private collection in the kingdom: they have gained for their possessor many valuable prizes. At five o'clock a sumptuous tea was provided for the party by Mr. Shorthose, this being the more acceptable as, owing to the recent closing of the two inns, it was found impossible to arrange for refreshments in the usual manner. The repast was served in a pretty tent close to the river, and by the bountiful provision and assiduous attentions of host and hostess, formed a most agreeable termination to the day's proceedings. At its conclusion votes of thanks were passed to Mr. and Mrs. Shorthose and to Mr. Young for their kindness throughout the day. Eighteen new members were elected, and two papers were read—1. "*On the Occurrence of the Trunk of an Oak in the Boulder Clay*," by Sir W. C. Trevelyan, Bart. 2. "*Entomological Notes*," by Thomas John Bold.

Altogether the excursion was a most enjoyable one. The brilliant weather showed a lovely neighbourhood to the greatest advantage, while the vivid green of the foliage not yet made sombre by continued sun, and the great profusion of spring flowers, point to May as perhaps the best month of the year for the enjoyment of localities such as Hartford Bridge. From the number of members present on this and other similar occasions I infer that the facility of getting to an afternoon's excursion must tend to popularise the Club: and it would I think be well if every year we were to arrange that two or three of the meetings should cover an afternoon only. This has in fact been our practice during the last few years.

The SECOND FIELD MEETING was held at Castle Eden Dene on the 15th of June. The well-known beauty of the place, the fine weather, and unwonted facilities afforded by the kindness of the proprietor, Rowland Burdon, Esq., combined to attract a party of about one hundred members on the occasion of this, the fifth visit of the Club to Castle Eden. Absence from home prevented my own presence with the party, but those who were in this respect more fortunate than myself concur in saying that the day was spent in a most enjoyable manner. Mr. Burdon considerately provided a mid-day meal, and at the conclusion of the day's ramble dinner was served at the Castle Eden Inn, Dr. Embleton occupying the chair. Nineteen new members were added to the Club on this occasion.

On the 21st of July a party of about seventy members met on the banks of the Wear above Finchale Abbey. Two sections were formed, one walking down from Brasside Bridge to the Abbey, and thence by the direct road to Durham, the other keeping the right bank of the river to Durham by way of Kepier Woods and Hospital. The weather was all that could be wished though the morning had been somewhat gloomy and threatening. The flush of spring flowers had to a large extent vanished from the woods, their places being taken by others which, if larger and more pretentious individually, were not so numerous or so brilliant in general effect as the masses of hyacinth, primroses, and forget-me-nots which greeted us a couple of months earlier at Hartford Bridge. The most abundant and conspicuous flower on this occasion was *Campanula latifolia,* which in the shelter of Kepier Wood grows luxuriantly, its spikes of white or pale blue often "making a sunshine of the shady place." The only other plant requiring notice was *Hypericum humifusum,* an inconspicuous species not very abundant in our district.

After tea, which awaited us at the County Hotel, Durham, seven new members were elected, and a short paper by myself entitled, "*Note on some instances of protective adaptation in marine animals,*" was read. This has since been printed in "Nature."

The FOURTH MEETING was held at Hareshaw Linn on the 18th of August. Leaving Newcastle by the early morning train the party arrived at Bellingham in time for breakfast, which was provided at the Railway Hotel. This important part of the proceedings having been satisfactorily despatched they walked to Hareshaw Linn, following the course of the burn along a path newly made by Mr. Charlton of Hesleyside. A long continuance of dry weather had left the Linn without much water, but despite this drawback, the surroundings of the fall are beautiful enough to be well worthy of a visit. Apart from the High Force of the Tees, we have indeed no waterfall in our district at all comparable for picturesqueness to Hareshaw Linn. Through a rift in an almost perpendicular wall of rock, about one hundred feet in height, the water of the little burn comes in a single broken leap off the moors. The banks of the ravine into which it tumbles are very precipitous and richly wooded, boughs and leafage almost meeting over the waterfall. But Mr. Baker's description of this spot, in his introduction to the "New Flora of Northumberland and Durham" is so picturesque, and according to my recollection so characteristic, that I cannot forbear reproducing it here. "The waterfall is about a mile distant from the town (of Bellingham). Just above the railway we have to climb over the shale heaps of the ironworks. Then the sides of the glen become steeper and we lose sight of the town and the surrounding moors, and enter a winding ravine where uncertain wandering paths lead up and down amongst the trees and underwood. First the lower fall is reached, a perpendicular ledge of rock some twenty feet in height, over which the stream breaks in two places, the rocks continued on both sides a little distance down the glen. The principal fall is about half a mile further up, and is of a much more important character. On the left a precipice rises up without break to a height of nearly one hundred feet one sheer wall of massive rock, brown and cool toward the base, with green mosses in the crevices; higher up, where the sun sometimes catches it, bare brown and white, or yellow-stained with lichen, the summit clothed with ivy and bird-cherry, and waving branches of elm and rowan. The stream flows from an opening half-way down between this cliff and its counterpart on the opposite side, forming, not a large waterfall, but one where nature has made the most of the volume of water she has had to work with, for the cliff, contrary to the ordinary plan in the north of England cascades of small side-streams, projects at the base considerably more than at the ledge, so that the water falls down an irregular slope of hard gritstone rock, the jagged projections of which break it into foam and spray, and innumerable sparkling eddies. The tall slightly-overhanging side-cliffs of the glen converge crescent-wise toward the fall and shut in a cool ravine where such plants as woodruff, golden saxifrage, *Cardamine sylvatica*, and *Campanula latifolia* luxuriate, and where we may gather oak fern, beech fern, and *Trollius*, *Rubus saxatilis*, *Epilobium angustifolium*, and *Crepis succisæfolia*." From this spot the party ascended the hills to the Caller Heughs, the Rev. Mr. Newton of Cambo acting as guide. Thence a detachment was conducted across the moor to Tarset Castle and to Hesleyside, the beautiful grounds of which were viewed under the kind guidance of Mr. Charlton himself. Returning to Bellingham the ancient church of that town, remarkable for its stone roof, was examined with much interest. Dinner was served at the Railway Hotel at five o'clock, after which two new members were elected, and a specimen of the crested cuckoo (the first of its kind taken in England) was exhibited. This example had been shot by Mr. Charlton's gamekeeper on the moor about seven miles west of Bellingham a few days previously. The bird, according to Mr. Tristram, is a well-known inhabitant of Africa, the Holy Land, and parts of Southern Europe. Probably in a case of this kind, any protection which could have been extended to the bird would have had no effect in encouraging its breeding or permanent occupation of the locality, and the acquisition of the specimen is valuable as a tangible record of its occurrence here; but one must deeply regret the indiscriminate slaughter of all rare animals by gamekeepers and others, a slaughter which is fast making many species rare which ought not to be so, and which will probably before long quite exterminate some of the most interesting and useful inhabitants of our woods and moors. May I while on this subject entreat our own members in all ways to set their faces resolutely against the *wanton* destruction of plants or animals, whether rare or common. If a botanist takes twenty specimens of a rare plant when he needs only half a dozen, or the owner of an aquarium decamps with two three specimens of an *Actinia* which perhaps exists on our coasts only by scores, and which he will probably not be able to keep in health for any great length of time, he is acting to the detriment of Science, and trespassing on the enjoyment of his fellow-naturalists, not only now, but possibly to future generations. There is really more pleasure to be gained from the quiet contemplation of natural objects in their own proper haunts than from the obtaining forcible possession of them. Who but must at some time or other have experienced, after letting loose his marauding propensities, something of that feeling so vividly described by Wordsworth, after seeing the ravages he himself had made in nutting—

Then up I rose,
And dragged to earth both branch and bough, with crash
And merciless ravage: and the shady nook
Of hazels, and the green and mossy bower,
Deformed and sullied, patiently gave up
Their quiet being: and unless I now
Confound my present feelings with the past,
Ere from the mutilated bower I turned

Exulting, rich beyond the wealth of kings,
I felt a sense of pain when I beheld
The silent trees, and saw the intruding sky.
Then, dearest maiden, move along these shades
In gentleness of heart; with gentle hand
Touch—for there is a spirit in the woods.

The fern loses much of its charm when parted from its rift of rock, the bird dead and bleeding on heather or wave, its wild cry and circling flight for ever stilled, must surely bring a shock of remorse to any but a callous mind. Better, as I think, that that remorse should remain and bring forth fruit in future abstinence from unnecessary destruction of life. For my own part I do not doubt, that in the course of perhaps not very many years we shall come to view even those "field sports," now commonly considered manly and admirable, as being essentially barbarous, that even the fisher's pastime (for some mysterious reason known as the "*gentle* craft) will as such be laid aside, and that we shall learn to practice as well as to preach the much needed lesson,

Never to blend our pleasure or our pride
With sorrow of the meanest thing that feels.

I do not overlook the fact, that in the prosecution of scientific enquiry, the pain and death of animals are often necessary; but it is certainly incumbent on all thus engaged to inflict death, where unavoidable, as speedily and painlessly as possible, and to mitigate or altogether annul pain by one or other of the many agents now so easily attainable.

The September Meeting was held on the 15th and 16th of the month at Rothbury. It was hoped that the Northumberland Central Railway would have been opened in time to allow of our reaching Rothbury by that route, but though the meeting was postponed for a month on that account, the inertia of engineers, contractors, or directors prevailed, and the older but not less pleasant methods of transit between Morpeth and Coquetdale were brought into requisition. About twenty members met at Rothbury on the 15th, some having walked over from Morpeth the previous evening, but the greater portion having left Newcastle by the early morning train, breakfasted at Morpeth, and thence came forward by conveyances. The afternoon of this day was occupied with the ascent of Simonside, whence the air being clear, very extensive views of the surrounding country were obtained. Selby's Cove and the Roman Camp at Great Tosson were visited on the way back. Dinner was provided at the Queen's Head, Rothbury, at six o'clock, after which two new members were elected. The morning of the following day was devoted to an inspection of Sir W. G. Armstrong's beautiful grounds at Cragside. In the hot-houses the superb exotic shrubs and ferns were greatly admired, and the arrangements of hydraulic machinery for airing and sunning the fruit trees excited much interest. After dinner the beautifully situated Priory of Brinkburn was visited, on the return route to Morpeth. The only Natural History observation recorded is that of *Celæna Haworthii* on the wing, by our Secretary, Mr. D. P. Morison.

The Sixth and concluding Field Meeting of the Season was held at Marsden on the 30th of September. Three years having elapsed since the last meeting at this favourite place, the repast in the cave, which is after all *the* feature of the meeting, had regained something of the charm of novelty which by repeated yearly gatherings had threatened to wear off. The attendance was good (about ninety, including a large number of ladies, sitting down to tea), the weather exquisitely fine and sunny, and though the results, as regards Natural History investigation were probably *nil*, one cannot but feel that a gathering of this kind, more social than scientific, does much to promote the success of the Club, by bringing together many who perhaps seldom see each other, for friendly chat; and by enabling those who, from pressure of other engagements, are mostly prevented joining the more distant excursions, to keep up their connection with, and let us hope their interest in, the Society. The route taken on this occasion was from the Cleadon Lane Station, visiting by the way Mr. Abbes's wildly picturesque grounds at Cleadon, and the more prim and decorous, but pretty and well-kept station of the Sunderland and South Shields Water Company on Lizard Hill. The coast at Marsden is undergoing a somewhat rapid disintegration, several detached pinnacles having succumbed to the action of the waves during the last few years: the "Velvet Beds," however, and the "Rock" itself remain without any appreciable change. Before five o'clock, the hour appointed for tea, a porcine savour was distinctly perceptible even at the further end of the beach, and as where the carcase is, there surely will the eagles be gathered together, it needed not ring of bell or beat of gong to collect our scattered forces for the wonted attack upon Miss Allen's ham and eggs—an attack not relinquished until, sated with slaughter,

"From the charge we drew
As mountain waves from wasted lands
Sweep back to ocean blue."

The only formal business transacted at this meeting was the election of three new members. Mr. E. C. Robson followed with some interesting and humourous remarks on the unusual abundance of the "turnip-fly" during the past season, wishing that some means could be devised of destroying these noxious insects. Mr. Abbes drew attention to the good already effected in our district by the act for the preservation of sea birds, and expressed a hope that some similar measures would soon be taken in the interest of smaller birds. Possibly the newly imposed tax on fire-arms may have a beneficial effect in this direction; and the ladies might certainly give a little help if they could be induced to forego such additions to their dress as birds' wings, humming-birds, and other ornaments involving wholesale slaughter. Meantime Mr. Courthorpe, in his recently published work, the "Paradise of Birds," has put with admirable humour the case of the birds *versus* man, and except that his book cannot possibly reach the class who chiefly need its influence, one might expect great good from it. What can be better than this?

Hopeful and bold, progressive from his birth,
Man through all quarters of productive earth
Advanced his posts: he sowed the shore with crops,
Turned mountain-summits into turnip-tops,

Cut down the virginal forests, drove a share
O'er barren waves, and tracked the pathless air.
Where'er he made his dwelling, far and wide
The ancient speechless tenants pined and died;
First the wild beasts, and then the gentler herds
Of antlered game, and last of all the birds.
These, by the new-built town from woodlands chased,
Soon proved attractive to the city taste.
The truant schoolboy sought their mossy nests;
The milliner their plumes and curving breasts.
Others, preferred from their Seven-Dials Court,
Made for the gentler gun club generous sport;
While cooks and beauties claimed an even share—
Cooks for their pies, and beauties for their hair.
In short, by such proscription, one by one,
Cut off to improve man's cookery, clothes, or gun,
The holiday of birds is most distinctly done.
No swallows skim our pools; no wagtail's seen,
The dainty stepping duchess of the green;
Walk a long day in June through cherries ripe,
But never hope to hear a blackbird pipe.
Who loves at eve the home-returning rooks,
Who monkish daws, remote in cloistered nooks,
Who the light owl, with great white wings outspread,
He loves in vain—for all the birds are dead!
If it were well that lives so bright and gay
Should thus be quenched, is not for me to say:
Men are progressive animals,—but hear
From this extinction what results appear.
The birds being gone, the caterpillars freed
From all restraints, began to enlarge their breed.
The chaffer in the wheat his larvæ laid;
Dark weevils, mustering like the Cossack, preyed
Upon each leaf, and blackened every blade.
Scorched up, as though by arson, sword, or plague,
Our land lies sickening through every league;
Our children pine beneath the winged curse,
Our cattle starve upon the hills—nay worse,
The foe, swoll'n up to monstrous size, now seems
Hideous and huge as nightmares in our dreams.
Food they no longer find in fruit or flower,
But, pressed for sustenance, must now devour
Man, man himself! The caterpillar soon
Will be the last live thing beneath the moon!*

The Marsden gathering brought to a close, for the season, our

* The Paradise of Birds, pp. 15–17.

out-of-door meetings—meetings which I think may be said to have been uniformly pleasant and successful, and which owed not a little to the good will and exertions of members resident near the several localities. To those who thus have helped our proceedings I would here express the cordial thanks of the Club, and the wish that they may have many more opportunities of exhibiting a similar kindliness. While our meetings are thus pleasant and profitable to ourselves, it is encouraging to find that our work is approved by brother-naturalists in distant parts of the country, and that our published "Transactions" still command a high place in the estimation of scientific men. In his Presidential Address to the Biological Section of the British Association at Liverpool, Professor Rolleston said, "Let me say that a person who wishes to know what a Field Club can do for its members, and not for them only, but for the world at large, will do well to purchase one, or any number more than one, of the 'Transactions of the Tyneside Naturalists' Field Club.'" And a writer in "Nature" of October 13th, 1870, after commending Mr. Baker's Flora of our two counties, goes on to say—"The Tyneside naturalists certainly stand first in the value and importance of their published proceedings, which, especially since their union with the Natural History Society of Northumberland, Durham, and Newcastle, have attained a scientific position which renders them indispensable to those who would obtain a complete knowledge of the Natural History of the country at large. As a proof that local matters are not neglecled in these volumes, catalogues of the Lepidoptera, Mollusca, Zoophytes, recent Foraminifera, and Fossils,* have been published in them, and also issued separately at a moderate cost; and the last volume contains a

* This, however, does not exhaust the list of our published catalogues. Up to the present time, in addition to the new Flora of Messrs. Baker and Tate, the following lists have appeared in the pages of our Transactions—

Insects (Coleoptera), by James Hardy and Thomas John Bold.
Mollusca, by Joshua Alder. Permian Fossils, by Richard Howse.
Zoophytes, by Joshua Alder. Lepidoptera (part I.), by George Wailes.
Marine Algæ, by G. S. Brady. Mammalia, by H. T. Mennell and V. R. Perkins
Recent Foraminifera, by H. B. Brady. Aculeate Hymenoptera, by T. J. Bold.
Echinodermata, by George Hodge; and several other less comprehensive lists families or small sections.

paper on the 'Crustacean Fauna of the Salt Marshes,' and a 'Catalogue of the Aculeate Hymenoptera' of the two counties. We have been thus particular in commenting on these Transactions, as they appear to us to afford a very good example of what the publications of the higher class of Field Clubs ought to be: essentially local, yet at the same time of sufficient general interest to be really valuable contributions to the Natural History of England." Dr. Rolleston in the course of the address just referred to also remarked, that "if some such person as Gilbert White could be found in each county to write the Natural History of its Selborne, I know not at what cost it would not be well to retain his services." Now our Transactions already bear witness to our members having done something in this way, but there is one piece of work which I especially wish that we could have added to our stores. If we could prevail upon Mr. John Hancock to let us have a list of our birds with notes from his large experience on their ways of life, I think it would be worth almost all that we have ever published—worth at least a double subscription from every one of us.

Our First Winter Evening Meeting, in conjunction with the Natural History Society, was held on the 10th of November. The attendance was very small, and the only business was the reading of the following papers—

1. "*Catalogue of the Insects of Northumberland and Durham*" (*Revision of Coleoptera*), by T. J. Bold.

2. "*Catalogue of the Echinodermata of Northumberland and Durham,*" by George Hodge.

3. "*Report on a Collection of Annelids dredged off the Coasts of Northumberland and Durham,*" by W. C. M'Intosh, M.D., F.L.S.

4. "*Notes on the Geology of Part of South Durham,*" by J. W. Kirkby and Joseph Duff.

5. "*Note on the Occurrence of Ray's Bream* (*Brama Raii*) *on the Durham Coast,*" by Geo. S. Brady, C.M.Z.S.

These will be found *in extenso* in the forthcoming part of our Transactions.

At the SECOND EVENING MEETING, held on the 30th January, 1871, was read an important series of palæontological papers, which also will appear in the next part of the Transactions. The titles of the papers are as follows—

1. *On Saccammina Carteri, a new Foraminifer from the Carboniferous Limestone of Northumberland,*" by Henry B. Brady, F.L.S.

2. "*On a new Labyrinthodont Amphibian, Batrachiderpeton lineatum, from the Coal-Shale at Newsham,*" by Albany Hancock, F.L.S., and Thomas Atthey.

3. "*On Proterosaurus Speneri* (von Meyer), *and a new Species, Proterosaurus Huxleyi, from the Marl-Slate of Midderidge, Durham,*" by Albany Hancock, F.L.S., and Richard Howse.

4. "*On a new Labyrinthodont Amphibian, Lepidotosaurus Duffii, from the Magnesian Limestone of Midderidge, Durham,*" by Albany Hancock, F.L.S., and Richard Howse.

5. "*On Dorypterus Hoffmanni* (Germar), *from the Marl-Slate of Midderidge,*" by Albany Hancock, F.L.S., and Richard Howse.

6. "*Remarks on a considerable Portion of a Mandibular Ramus of Anthracosaurus Russelli, with Notes on Loxomma and Archichthys,*" by Albany Hancock, F.L.S., and Thomas Atthey.

A Note by Mr. Edward Mounsey of Denham, near Uxbridge, was also read, recording the occurrence of a bat (*Vespertilio aurita*, Linn.) on the wing on the 13th January, 1871.

As to the practical working of our Society, though we have much reason for satisfaction and encouragement, we may freely admit that improvements are possible, and perhaps requisite if we would attain our full measure of usefulness. Aiming, as we do, to interest a large body of persons actively engaged in business or other absorbing pursuits, it would be a mistake to endeavour after too great profundity or scientific severity in the conduct of our meetings. Those indeed whose object is serious work in the field will prefer to choose occasions when they can be out of the crowd, either alone or at most with one or two others similarly employed; so that we need not expect any very glowing reports of discoveries made or work done actually at our Field Meetings. Our endeavours should be directed to make these gatherings as interesting as possible, by each imparting as freely as he may such information as he possesses respecting surrounding objects either of nature or art, and two things especially we should resolutely and distinctly discountenance, first, the wanton destruction or injury of any interesting thing, secondly, any efforts at display by mere tyros or sciolists. Not that we have had much to complain of on either of these heads, but the last-named might, in a large and socially constituted organization, become an intolerable nuisance, while the first has in some cases gained a bad reputation (probably through the default of only a few individuals) for Clubs otherwise useful and flourishing. We cannot expect that all our members should be thoughtful and cultured, and one great object of our existence should be to promote thought and culture in those who lack. To assist in carrying out these objects I have said that I think some improvements are possible, and these I will as briefly as possible indicate.

We have no law excluding ladies from our Club, but yet we have no lady-members. Ladies, however, sometimes attend our meetings, and it would I think be an advantage to the Club (may I hint also that it might be an advantage to the ladies) if more of them came and oftener. It is of infinite importance that mothers should be able to impart to their children an intelligent interest in Nature. They cannot do this unless they first possess that interest themselves, and in what way can it be more pleasantly developed and refreshed than by meetings such as ours? It may perhaps be objected that the length and occasionally the rugged character of our walks prove an obstacle to the presence of the weaker sex, but my impression is that this is not the case to any very serious extent, and in many of our excursions the ladies have proved themselves quite equal to walks as long and as arduous as are at all desirable for our purposes. I would therefore recommend (not any new rule, which is needless, but) simply that we should persuade our lady-friends to join the Club as members and not as only casual visitors. A wish has sometimes been expressed, and I think was noticed by Mr. Wheeler in his Address last year, to form sections of the Club for the study of separate branches of natural science. It seems to me that this might possibly be attended with good results, and that at any rate no harm could arise from allowing those interested in any special subject to associate themselves together as a section under suitable regulations. The formal consent of the Committee should in all cases be required (some minimum number of members being fixed for each section), and in the event of a separate route or order of proceeding being adopted by a section for any particular Field Meeting, a specified term of notice should be required to be given to the general Secretaries, if it is wished that such arrangement should appear in the circulars of the Club. I am not myself very sanguine that much good would arise from this course, but I cannot see the possibility of any evil result; while if any group of students think it to their advantage so to associate themselves we ought not, I think, to oppose any unnecessary obstacles.

With a constituency of six hundred members scattered over the entire surface of two counties, we may reasonably ask whether more use might not be made of the observing and recording faculties of the great bulk of these who are not definitely given to science but who yet possess, doubtless, a large share of interest in what they see round about them. Except in the matter of meteorological observation, I am not aware that our Club has yet availed itself systematically of this latent power. Our meteorological reports have indeed gradually grown in interest and comprehensiveness (thanks to the energy and diligence of successive editors and their staff of contributors) for many years past, until there is now I believe no similar series of local observations at all comparable to them for fulness. But why should we not go further, and endeavour to enlist as observers those who do not trouble themselves about meteorology. As a specimen of what might be done in this way I may refer to a circular issued some years ago to its members by the Woolhope Naturalists' Club, inviting information as to the remarkable trees of its district. The result has been the publication in the Transactions of that Club of some excellent photographs of trees, together with such particulars of history, measurement, &c., as could be gleaned respecting them. Some of these illustrations I have now the pleasure of exhibiting to you, and I think you will agree with me that we might judiciously follow the example of the Woolhope Naturalists in this matter, nor is there any reason why our enterprise should not extend to other natural objects. I am indebted to Dr. Bull of Hereford for a copy of the circular issued by the Club, which is as follows:—

WOOLHOPE NATURALISTS' FIELD CLUB.

HEREFORDSHIRE TREES.

"It is very desirable (for obvious reasons) that a record should be obtained of the exact size and condition of the MORE REMARKABLE TREES OF HEREFORDSHIRE at the present time. The subject is within the proper field of the Woolhope Club, and it is necessarily so extensive that it can only be done satisfactorily, within a reasonable time, by the mutual cooperation of its members.

"The enquiry is intended to embrace, not only the indigenous trees, oak, elm, yew, beech, ash, &c., but also the introduced trees, chestnut, walnut, cedar, and the coniferæ in general, &c., in short, whatever forest trees are growing in the county that are now remarkable for their size and luxuriance, or that promise hereafter to become so, especially if their exact age is known, and they are in situations where there is every probability of their being allowed to remain.

"All members of the Club (and all gentlemen who may be interested in the subject) are hereby requested, each of them individually, to consider it a duty to report on the trees in their several districts, in order that when a sufficient number of facts and observations are obtained, a trust-worthy paper may be prepared from them for the Transactions of the Club.

"The report should contain, *first*, general observations on the trees which are most common and flourish best in the district, the localities in which they grow to the greatest size, and the average size of the several kinds; and *secondly*, exact measurements and descriptions of all trees remarkable for their size, or from the fact of their exact or approximate age being known. Lest any should be deterred from making a general report, it is hoped that at least all will send a list of the large trees they are acquainted with, with exact measurements of those in their immediate neighbourhood.

"The following examples will show the form in which it is suggested that the reports should be made—

OAK (OR OTHER TREE, AS THE CASE MAY BE).

1	2	3		4	5
LOCALITY.	Circumference of bole 5 ft. from the ground in feet and inches, and its relative proportion to the height of the tree.	Spread of Branches in Yards. N.S.	E.W.	Date of Observations.	Remarks on the Age, Condition of the Tree, Cubic Feet of Timber, &c.
Moccas Oak. — Sir George H. Cornewall, Bart. Moccas Park.	35 feet 6 inches. Remains of the tree, only about 30 feet high altogether.	49	47	1866	This well-known tree is now reduced to a mere shell, hollow from top to bottom. The large limb represented in drawings as broken off and lying beside it has now disappeared, leaving a large irregular opening 6 feet by 9 feet on the east side. The bark on the main trunk is gone, but several branches on the north-west have the bark entire, and still produce leaves and acorns. Loudon makes the girth, at three feet from the ground 36 feet.
Col. Matthews' Oak. — F. R. Wegg-Prooser, Esq., Belmont. Near the Kitchen Garden.	10 feet 2 inches. Main trunk 22 feet, one-third the height of the tree.	28	24	June, 1864	A well balanced tree, ninety-one years old. A cast-iron tablet near the tree says, "The acorn was sown at Foxley in 1773, and the sapling planted by John Matthews, Esq., in 1788. The tree measured 5 feet 6 inches in circumference in 1813." It now contains 139 feet of timber.

It is satisfactory to be able to point to the continued prosperity of our Club as regards members and financial condition. Our roll of members now contains more names than at any former period, and though the bulk, and consequently the expense of our printed Transactions has of late years greatly increased, this has been accomplished without overstepping the limits of our income. Looking, indeed, to the number and character of the papers and illustrations contained in these volumes, we may fairly consider that we receive the full value of our subscriptions in this way alone. Nevertheless the Treasurer's statements show that every year there must be a considerable number of defaulters in the matter of subscriptions, and it cannot be too strongly urged upon all members that the punctual payment of these is essential to the efficient working of the Club, and that the greater the pecuniary means at the disposal of the Committee, the more fully will they be able to sustain or even to increase the well-earned reputation of the district as to its Natural History literature. The following statement is in continuation of one given by Mr. Norman in his address five years ago, and shows the progress of the Club in numbers, financial condition, and publications:—

President.	Members elected.	Total Members.	Receipts.	Expenditure	Transactions published.	
					Pages.	Plates.
1865 Rev. A. Norman, M.A. ...	81	573	£210 6 0	£195 10 0	138	3
1866 Rev. J. C. Bruce, LL.D. ...	43	......	152 14 2	106 7 0	182	8
1867 Rev. Angus Bethune, M.A.	52	......	181 14 4	189 10 6	316	2
1868 E. J. J. Browell, Esq.	43	......	158 4 8	137 16 9	301	6
1869 Rev. R. F. Wheeler, M.A.	40	......	165 17 3	200 13 8	250	9
1870 Geo. S. Brady, C.M.Z.S ...	51	590	190 18 9*	225 12 8	307	11

The part of Transactions shortly to be issued to our members has involved a greater outlay than any preceding one both for plates and printing; and in order to lighten this drain upon our funds, the Committee of the Natural History Society has generously voted a grant of £20 to the Field Club in aid of the work:

* This sum includes a donation of £20 from the Natural History Society.

a tangible evidence of benefit to the Club resulting from the arrangements for joint publication between the two Societies.

In general Natural History literature the past twelve months have produced no single work of very supreme importance.* We in England have been kept alive by a running fire of controversial writing, chiefly in the pages of "*Nature*," on the subjects of Spontaneous Generation, Mimicry, and other topics connected with the Origin of Species; and at least two works of considerable interest have appeared independently—Wallace's "Contributions to the Theory of Natural Selection," and St. George Mivart's "Genesis of Species." Respecting these we shall presently have a few remarks to offer. On the Continent scientific research has been for the time paralyzed by the hideous war which has laid waste one of earth's fairest and most productive regions: instead of the peaceful triumphs of mind over matter we have seen a reign of terror, a rule of blood and iron, a "furnace of affliction" from which indeed we may hope that France will emerge purified and strengthened, but which in the meantime has both for conquerors and conquered, dried up the fountain heads of philosophy and science. Yet with the din of rival armies sounding in our ears, and notwithstanding the absorbing interest of that terrific struggle, those countries which, like our own, have happily held aloof from the strife, were still able to extend government aid to works of science, notably to the eclipse expeditions of December last, and to the Mediterranean dredging expedition. The latter possesses a particular interest for our Club, the excellent commander and staff of the "Porcupine" being either fellow-members or otherwise well known to many amongst us. The cruise of 1870 cannot, however, be pronounced so interesting in its zoological results as that of the previous year. The time allowed was shorter, the weather less favourable, and the areas examined as a whole much less productive. Nevertheless many organisms of great interest and beauty were obtained, more particularly off the Atlantic coasts of Spain and Portugal; and we believe that a part of the spoils taken during

* Mr. Darwin's long-expected volumes on the "Descent of Man and Sexual Selection" have appeared only three weeks ago, and since the foregoing sentence was written.

this and the previous Atlantic dredging expedition have been allotted to certain of our members for description and publication.

The two great questions which have been referred to above, "Spontaneous Generation" and the "Origin of Species," possess unabated interest for the student of Natural History. But it is on the latter only, and that with reference chiefly to the works of Messrs. Wallace and Mivart, that I propose briefly to dwell this evening. It need scarcely be said that Mr. Darwin's great work on this subject has encountered much hostile criticism. The opposition which greeted it on its first appearance was not so much directed against the theory of *natural selection* as against the doctrine of *evolution* generally, which, though by no means a new doctrine, had never previously been placed on a natural or comprehensible basis. At the present time it may be said that evolution in some form or other is held by almost all naturalists, who likewise agree that the process of Natural Selection, or the "Survival of the Fittest," though it may or may not have been the most powerful factor in the production of new species, must at least have exerted an influence by no means insignificant. And, in justice to Darwin and Wallace, it must be remembered that neither of them has claimed for the principle the sole agency in the process: both have indeed distinctly recognized the probable existence of other, at present unrecognized, but doubtless highly important directing and controlling influences. Mr. Wallace, in his essay on the "Limits of Natural Selection as applied to Man," attempts partially to deal with the subject, and to show that certain characteristics, more especially the highly developed brain and naked back of man, are inexplicable by reference simply to Natural Selection. Here we may admit that if Mr. Wallace's premises are accepted, his conclusion acquires a high degree of probability: but for myself, I am not disposed, without further proof, to accept these premises. It has never been shown that brain power is in direct and invariable proportion to bulk; indeed the brain of an idiot is mostly undistinguishable from that of an intelligent man, and it appears certain, that had the brains of savages been so much in excess of their needs as Mr. Wallace thinks, they would have diminished in size, in accordance with the well-known law of atrophy following upon disuse of any organ. And considerations equally cogent, but upon which time will not now allow us to enter, might, I think be urged against other of Mr. Wallace's propositions.

But it does not appear that there is anything altogether exceptional about the phenomena which he thus withdraws from the sphere of Natural Selection, and it at once occurs to us to ask, why, if some unexplained matters in the genetic history of man are to be ascribed to the action of unknown influences—why may not like difficulties, of which there are not a few in the history of the lower animals, be similarly dealt with? It does not indeed seem clear how far Mr. Wallace is inclined to believe the development of man to be under the control of natural law at all, for he goes on to say: "At the same time I must confess that my theory has the disadvantage of requiring the intervention of some distinct individual intelligence to aid in the production of what we can hardly avoid considering as the ultimate aim and outcome of all organized existence—intellectual, ever-advancing, spiritual man. It therefore implies that the great laws which govern the material universe were insufficient for his production, unless we consider (as we may fairly do) that the controlling action of such higher intelligences is a necessary part of those laws, just as the action of all surrounding organisms is one of the agencies in organic development." It seems to me, if I rightly understand this passage, that Mr. Wallace has here got into difficulties by withdrawing from the rest of the universe that "supreme intelligence" which he holds to have been necessary for the production of man, and that he has thus introduced a sense of discordance which was not inherent in the subject. He seems, too, to be inconsistent in this respect, for his whole argument on a later page is directed to prove the existence of one supreme will manifesting itself in perfect law, and certainly, though in many instances we cannot yet trace the workings of that law, we need not on that account seek a refuge in supernaturalism, as we must do if we believe with Mr. Wallace, that "the great laws which govern the material universe are insufficient" to account for the whole cycle of natural phenomena.

One of the most interesting subjects treated by Mr. Wallace in these Essays is that of Mimicry, or Protective Resemblance, a phenomenon first distinctly noticed, I believe, by Mr. Bates in his valuable work, "The Naturalist on the Amazons," and by him referred to the action of Natural Selection. The most prominent instance given by this author is that of certain butterflies (*Leptalides*) of South America, which closely imitate in flight and general appearance an essentially different family, the *Heliconidæ;* these latter being apparently protected from the attacks of insectivorous birds by their overpowering odour, which is, however, not shared by the *Leptalides*. The facts here are not disputed, and Mr. Wallace adds, from his own experience, many striking examples, some of them even more wonderful, from the closeness and grotesqueness of mimetic resemblance, as for instance in the cases of the so-called stick and leaf insects. The disputed point, however, is the *origin* of these extraordinary resemblances. Mr. Bates and Mr. Wallace hold that they have arisen by the long-continued action of Natural Selection on successive small variations, each bringing the animal more near to the stage of perfect mimicry, and thus affording a continually increasing protection. The difficulty here seems to lie in the first stages, where the protection afforded must in all probability be small; how small it is impossible to say: Mr. Wallace, however, believes that quite a profitable degree of modification may occur as a first step, a belief in which he is opposed by various other writers. In considering this subject, it must be remembered that we have to account not only for cases of extreme and grotesque Mimicry which appear to be more prevalent in tropical climates than in our own, but for a very wide spread mimetic tendency, which seems indeed to exist more or less throughout the whole animal creation; and it seems to me that Natural Selection, though not offering in every point an entirely satisfactory solution, is at least the only principle at present known to us which renders the matter at all intelligible.

Mr. Mivart tells us that he was at one time disposed to accept the Darwinian theory, but that further thought and investigation have brought him to believe it incapable of accounting, except as a subordinate agency, for the Origin of Species. The object of his work is to set forth the difficulties which in the author's belief are insuperable obstacles to the thorough acceptance of Darwin's theory, and to propose a new solution of the problem. The solution is certainly, to me at least, a disappointment; and Mr. Mivart himself seems to feel some misgiving as to how far it really is a solution at all, for he specially deprecates the application to his work of the old French witticism concerning opium, "Opium produces sleep by virtue of a certain soporific quality which it possesses." Mr. Mivart's solution, however, amounts simply to this: that new species arise by virtue of a certain unexplained tendency to vary, which is possessed more or less by all creatures, which may, and probably does, show itself in sudden leaps rather than in slow impalpable modifications, and which is governed and modified by external conditions and by forces inherent in the organisms themselves. It will be seen that this does not put matters in a very clear light, and though the solution may be true, it is not proved: indeed Mr. Mivart does not attempt more than to show that it is not contradicted by what we know of nature. Some of the more important propositions which Mr. Mivart endeavours to establish in support of his idea are as follows:—Variation occurs suddenly, not by infinitesimal degrees; And has definite limits; Mimicry is inexplicable on the theory of small initial variations; Closely similar structures in distantly related or non-related animals are not intelligible on Darwin's theory; Man's moral development is similarly inexplicable. I shall not attempt to adjudicate as to Mr. Mivart's success or failure; that he has shown good reasons for believing Natural Selection incompetent by itself to the production of species as we now see them, must I think be admitted: the probability of other forces sharing in the work had, however, been already pointed out by the authors of that theory. For myself, I laid down Mr. Mivart's book feeling that it dealt with the case temperately and thoughtfully, and was likely to be useful in bringing out certain difficulties clearly and philosophically. Its point of view is indeed identical with that propounded two years previously by Mr. Murphy, and summarised as follows in the preface to his work on "Habit and Intelligence:"—"I agree with Darwin in the belief that all species have been derived by descent with modification, probably from one, certainly from a few, original germs: and I further agree with him in attaching great importance to 'Natural Selection among spontaneous variations,' as part of the agency by which the modifications have been effected. But I altogether differ from him, in that I believe the wondrous facts of organic adaptation cannot have been produced by Natural Selection, or by any unintelligent agency whatever. * * * As on the subject of organizing intelligence I have come to a conclusion which is fundamentally opposed to that of Darwin, so on that of mental growth and intelligence I have come to a conclusion which is fundamentally opposed to that of the dominant psychological school in this country: I mean that school which was founded, as I believe, by Hartley, and to which Mill, Bain, and Herbert Spencer belong. The characteristic point of their theory is that they endeavour to account for the whole mental nature by the simple principle of the association of ideas, or, as I call it, of mental habit. I maintain, on the contrary, that in all mental intelligence, as in organizing intelligence, there is an element not derived from habit, and not resolvable into any unintelligent force whatever."*

Works like those of Messrs. Murphy and Mivart are likely to be very beneficial in a direction quite apart from that we have hitherto considered. They show that it is possible to hold the idea of Creation by Law without being either atheist or infidel; that in fact belief as to the limits of natural law need have nothing whatever to do with personal religion; and we cannot but hail with pleasure any work which assists in banishing the suspicion and anxiety with which many devout and well meaning persons view the discussion of these topics.

We sometimes hear it ascribed to those who hold the views expressed by the terms Continuity and Evolution, that they

* Preface "Habit and Intelligence," p. vii.

suppose the Creator to have wound up the universe like a watch, and now to be standing at one side until it runs down without exercising any control whatever over its movements. This imputation would, however, apply equally well to provinces of nature where the reign of Law is on all hands admitted. The exercise of a personal Will is not incompatible with the reign of universal Law; Law is in fact only the expression of that Will, Nature only the garment of the ever-living God, or as Goethe expresses it,—

> What were the God who sat outside to scan
> The spheres that 'neath his finger circling ran?
> God dwells within, and moves the world and moulds,
> Himself and Nature in one form enfolds.*

And again, Tennyson,—

> God is law, say the wise; O Soul, and let us rejoice,
> For if he thunder by law the thunder is yet His voice.
>
> Law is God say some: no God at all, says the fool;
> For all we have power to see is a straight staff bent in a pool;
>
> And the ear of man cannot hear, and the eye of man cannot see;
> But if we could see and hear, this vision—were it not He?†

And it is impossible to deny the influence of Law in the development and government either of the organic or inorganic creation. Without it there would henceforth be no ground whatever for scientific research: were we unable to predict unerringly the occurrence of certain consequences from certain causes, there would be no basis or use for experiment.

The relation of the Creator to his works may, indeed, as to mode of operation, be a subject too recondite and obscure for our powers; probably, in the present state of our knowledge, it is one for the exercise of faith rather than of sight. But as regards the ultimate result of scientific investigation, let us not give way to an unworthy fear: we have in very truth much reason for patient and even exultant hope, and we can but echo the words of the Laureate:—

> Let knowledge grow from more to more,
> But more of reverence in us dwell,

* Goethe: Proem, "Gott und Welt." † Tennyson, "The Higher Pantheism."

That mind and soul according well
May make one music as before,
But vaster. We are fools and slight;
We mock thee when we do not fear:
But help thy foolish ones to bear;
Help thy vain worlds to bear thy light.*

The Field Meetings for 1871 were arranged to be held as follows:—

May	Lintz Green.
June	Bywell.
July	Woodburn.
August	Cotherston.
September	Wooler and Yetholm.
October	St. Mary's Island.

The Treasurer's report (see p. 307) was read and adopted.

The following gentlemen were elected officers of the Club for the year 1871–72:—

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* Tennyson: Proem, "In Memoriam."

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XII.—*Meteorological Report for* 1870. Edited by the Rev. R. F. Wheeler, M.A.

The editor of the Meteorological Report has again the privilege of thankfully acknowledging the support he has received in his labours, from the numerous staff of observers who so kindly year by year contribute the result of their observations to the Tyneside Club. It is a subject of regret that the funds of the Club will not allow of a more extended report this year on this increasingly important branch of Natural Science. That fact must be an apology for many short comings which otherwise would be unpardonable.

NOTES ON THE MONTH.

January.—

> January commits the fault, and May bears the blame.
>
> —*Old Proverb.*

Greenwich.—The weather at the beginning of the year was very mild, with frequent rain; the wind for the first few days was moderate from the west; it blew very strongly on the 7th and 8th of January from S.W. This mild weather continued until the 17th; the average excess of temperature for this period being $6\frac{1}{4}°$ daily. On the 18th there was a change, and from this date the predominating winds were easterly and northerly, but generally light, and very little rain fell. From the 18th to the 30th the air was mostly dry and frequently very cold, the average deficiency of daily temperature being 5°.

The mean temperature of January was 38·3°, being 2° higher than the average of 99 years, lower than the corresponding temperature in 1869 by 2·8°, but higher than in 1868 by 1°.

The daily range of temperature was 1° less than the average. The fall of rain was 0·4 inch in defect.

During the first fifteen days of January the mean daily readings of the barometer, at the height of 160 feet above the level of the sea, were but with one exception below the average. 30·45 inches, being the absolute maximum for the month, was reached on the 18th. From this period until the 30th the mean daily reading continued above the average, on the 31st, however, passing below. The absolute daily range during the month was 1·55 inches.

Wallington.—Wet weather prevailed from the 1st to the 9th. The temperature was mild during that time, except a slight frost on the 6th. From the 10th to the 13th there were snow showers at intervals with much cold and piercing winds. From the 16th to the 18th it was calm, but very foggy and showery. Sharp frosts from the 25th to the 30th. Frost was registered on nineteen nights. The greatest cold was on the 30th, when the thermometer fell to 11°. Snow fell to the depth of 8 inches from the 10th to the 13th. There was rain, sleet, or snow on twenty-one days.

Wylam.—A dull gloomy month, scarcely any sunshine till the 22nd, and then not much. Six days of successive white frost after the 25th.

Barometer—Mean height (corrected to sea level), 29·942; highest, 30·685 on the 19th; lowest, 28·806 on the 8th.

Thermometer—Mean of daily minimum, 31·03°; lowest, 19° on the 27th and 28th. Mean of daily maximum, 42·03°; highest, 49° on the 5th. Mean of minimum and maximum, 36·53°. Mean of wet bulb, 33·07° at 8 A.M.; of dry bulb, 34·63° at 8 A.M.

Rainfall—1·55 inches on fifteen days; greatest fall 0·28 inch on the 8th.

Mean height of river at Wylam Bridge, 3·92 feet; highest, 11 feet on the 8th. Wind—W., 10° S.

Acklam, near Middlesbro'.—The last week in January was marked by the prevalence of dry frosts, from which vegetation suffered greatly.

LUNAR HALOS were seen at Wallington on the 9th and 14th; at Sunderland on the 7th, 14th, and 15th. SOLAR HALOS were seen at Wallington on the 13th; at Sunderland on the 6th and 14th. AURORÆ BOREALES were seen at Wallington on the 3rd, 8th, and 28th; at Dyke Head, near Elsdon, on the 28th, 29th, and 30th; at Cresswell on the 27th; at Sunderland on the 3rd, 4th, 7th, and 30th; at Darlington on the 8th; at Durham on the 3rd and 8th. THUNDER was heard, but LIGHTNING was not seen, at Cresswell on the 4th. HAIL fell at Byrness on the 31st; at Wallington on the 19th; at Acklam, near Middlesbro', on the 20th and 21st. SNOW or SLEET fell at Byrness on the 11th, 12th, and 31st; at Otterburn on the 13th; at Wallington on the 4th, 11th, 12th, 13th, and 25th; at Dyke Head, near Elsdon, on the 11th and 12th; at Rothbury on the 12th; at Cresswell on the 20th; at Seaham on the 17th and 19th; at Greta Bridge on the 11th, 15th, 20th, and 23rd; at Acklam, near Middlesbro', on the 11th; at Gainford on the 12th.

February.—

All the months in the year
Curse a fair Februeer.

—*Old Proverb.*

Greenwich.—The beginning of February was mild. The average excess of temperature from the 1st to the 8th was 4° daily. On the 9th a complete change took place, and for five or six days the cold was excessively severe. This period of low temperature prevailed until the 25th, during which period the average deficiency of daily temperature was as much as $7\frac{1}{4}$°. Six warm days followed with an average excess of daily temperature to the amount of $8\frac{1}{4}$°.

During February scarcely any movements in the barometer worthy of note occurred. The mean daily readings were slightly below the average from the 2nd to the 9th, above from the 10th to the 17th, and again below from the 18th to the 28th, with the exception of the 20th. The absolute range of reading during the month was 1·00 inch.

The mean temperature of the month was 36·2°, being 2·3° lower than the average of 99 years, and lower than the corresponding temperatures in any year since 1864, when 36·0° was recorded. The fall of rain was 1·1 inches below the average.

Wallington.—The weather was very changeable, and more severe and dull than in January. Snow or rain fell on twenty-four days. Frost was registered on twenty-two nights. The lowest temperature recorded was 17° on the 10th.

Heavy fall of snow on the 14th in the northern part of Northumberland. The trains were delayed at Belford for two hours and a half by snow drift.

North Sunderland.—A remarkably dull cold month. Heavy snow storms, and constant wet or mist. The sun was scarcely seen. Snow or rain on twenty-five days.

Wylam.—A changeable severe month. A curious atmospheric wave commenced to rise from 29·573 on the 7th, to 30·511 on the 12th, and then to fall, with slight fluctuations, to 29·108 on the 24th.

Barometer—Mean height, 29·873; highest, 30·607 on the 12th; lowest, 29·140 on the 26th.

Thermometer—Mean of daily minimum, 30·65°; lowest, 22° on the 10th. Mean of daily maximum, 41·36°; highest, 48° on the 6th. Mean of minimum and maximum, 36·02°. Mean of wet bulb, 33·25°; of dry bulb, 34·75°.

Fall on seventeen days, viz., rain, 0·80 inch; melted snow, 1·14 inches, = 1·94 inches; greatest fall 0·30 inch on the 9th.

Mean height of river, 2·83 feet; highest, 10 feet on the 28th. Wind—W., 14° N.

Lunar Halos were seen at Sunderland on the 11th; at Darlington on the 10th. Solar Halos were seen at Wallington on the 1st, 4th, and 25th; at Sunderland on the 4th, 11th, 15th, 19th, 20th, 21st, 26th, and 28th. Auroræ Boreales were seen at Dyke Head, near Elsdon, on the 12th; at Sunderland on the 7th and 22nd. Thunder was heard, but Lightning was not seen, at Rothbury, on the 1st. Hail fell at Byrness on the 14th; at Acklam, near Middlesbro', on the 23rd and 24th. Snow or Sleet fell at Byrness on the 11th, 12th, 13th, 16th, 18th, 21st, 23rd, 24th, 25th, 26th, and 27th; at Otterburn on the 10th, 15th, 17th, and 28th; at Wallington on the 7th, 8th, 10th, 11th, 12th, 13th, 16th, 17th, 18th, 21st, 23rd, 25th, and 27th; at Alnwick on the 8th, 13th, 18th, 21st, 23rd, 24th, 26th, and 27th; at Dyke Head, near Elsdon, on the 9th and 24th; at Rothbury on the 8th, 17th, and 24th; at Cresswell on the 8th, 11th, 23rd, and 24th; at Shotley Bridge on the 21st; at Whitley on the

10th–13th, 17th, 24th, and 26th; at Seaham on the 10th–14th, 16th, 20th, and 22nd; at Greta Bridge on the 8th–12th, 21st, 23rd, 26th, and 27th; at Darlington on the 12th, 21st, and 24th; at Acklam, near Middlesbro', on the 16th, 17th, 18th, and 21st; at Gainford on the 8th, 12th, and 21st.

March.—

Worse than the sun in March
This praise doth nourish agues.
—*Shakspeare.*

Greenwich.—From the 4th of March, with the exception of the three days, the 16th, 17th, and 18th, the temperature was low, and the weather very cold for the season. The deficiency of temperature daily from March the 4th to the 15th was 3½°, the excess for the three days, the 16th, 17th, and 18th, was 6¼°, and the deficiency to the end of the quarter, from the 19th, was 5½° daily. Upon the whole quarter of ninety days the deficiency of temperature averaged 1° daily.

During the first three days in March the readings of the barometer remained steadily at 29·4 inches. On the 4th, however, a rise set in and reached its maximum, 30·22 inches on the 6th. This was followed by a steady fall to 29·51 inches on the 12th. Increasing readings were then recorded, and 30·29 inches was reached on the 19th. From the 20th to the end of the month the readings were generally high, the absolute maximum for the month, 30·30 inches, occurring on the 28th. The absolute range of reading during March was 0·93 inch.

The mean temperature of March was 39·6°, being 1·3° lower than the average of 99 years, higher than in 1869 by 2·1°, lower than in 1868 by 4·4°, and higher than in 1867, when 37·7° was registered. The fall of rain was 0·5 inch in excess.

Wallington.—Like the two former months of the year this was marked by a continuance of severe cold. Frost was registered on fourteen days. The two lowest readings were on the 27th and 28th, when the thermometer fell to 20°. The low temperature retarded vegetation considerably, and the grass made no growth. The wind was comparatively light for March.

North Sunderland.—Another dull cold month. Continued absence of sun. Very heavy gales from north on the 11th and 12th, and 22nd and 23rd. Rain on seventeen days.

Wylam.—A cold disagreeable month, with much east wind.

Barometer—Mean height, 30·033; highest, 30·578 on the 6th; lowest, 29·180 on the 1st.

Thermometer—Mean of daily minimum, 30·65°; lowest, 24° on the 27th. Mean of daily maximum, 41·36°; highest, 58° on the 20th and 31st. Mean of minimum and maximum, 36·01°. Mean of wet bulb, 36·03°; of dry bulb, 37·85°.

Fall on seventeen days, viz., rain, 0·80 inch; melted snow, 1·14 inches, = 1·94 inches; greatest fall, 0·35 inch on the 22nd.

Mean height of river, 2·7 feet; highest, 3·5 feet on the 2nd, 3rd, 4th, and 5th. Wind—N., 3° E.

Whitley.—Cold bleak month. Vegetation made no progress.

LUNAR HALOS were seen at Wallington on the 7th, 8th, and 14th; at Sunderland on the 9th. SOLAR HALOS were seen at Sunderland on the 1st, 5th, 14th, and 30th. AURORÆ BOREALES were seen at Wallington on the 1st, 20th, and 30th; at Rothbury on the 13th and 22nd; at Sunderland on the 4th, 22nd, and 26th; at Newcastle-on-Tyne on the 22nd; at Durham on the 20th and 22nd. HAIL fell at Wallington on the 11th and 21st; at Shotley Bridge on the 25th and 26th. SNOW OR SLEET fell at Byrness on the 14th; at Wallington on the 2nd, 3rd, 12th, 14th, 21st, 22nd, 23rd–27th; at Alnwick on the 15th, 22nd, 25th, and 26th; at Cresswell on the 22nd; at Shotley Bridge on the 21st; at Whitley on the 3rd, 11th, 22nd, and 25th; at Seaham on the 11th, 22nd, and 25th; at Greta Bridge on the 3rd, 21st, and 26th; at Darlington on the 22nd, 24th–27th; at Acklam, near Middlesbro', on the 3rd, 14th, 15th, and 26th.

The estimated population of the largest towns in Northumberland and Durham, and the respective death-rates for the first quarter of 1870 were as follows:—

	Estimated Population.	Persons to an acre.	Deaths.	Annual rate to 1000 living.
Newcastle	133,367	25·0	894	30·4
Sunderland	100,979	30·5	551	21·9

	Estimated Population.	Persons to an acre.	Deaths.	Annual rate to 1000 living.
South Shields (Municipal Boundaries)	68,514	......	376	22·0
Gateshead (ditto)...............	44,405	......	302	27·2
Tynemouth (ditto)	40,599	......	229	22·6

April.—

April rain is worth David's chariot.

—*French Proverb.*

Greenwich.—The bleak cold weather at the end of March continued to the 5th of April. On the 6th the weather underwent a favourable change, and the temperature of the air until the 26th was high. The average excess was $5\frac{3}{4}°$ daily. On two of these days, the 20th and 21st, the excess was as large as 16° and 13° respectively. On the 27th the weather became changeable; the wind was mostly N.W. The average of temperature was 5° daily from April 27th to May 11th.

The mean daily readings of the barometer during the month of April were with few exceptions above the average, the exceptions occurring on the 8th, 9th, 10th, and 30th. From the 17th to the 29th the readings were generally close to 30 inches. The absolute range was 1·04 inches.

The mean temperature of April was 48·9°, being 2·9° higher than the average of 99 years, lower than in 1869 by 1·4°, but higher than in 1868 by 0·8°.

The fall of rain in April was 0·27 of an inch; back to the year 1815 there were three instances only in which the fall was less in April, viz., 1817, 1840, and 1855, in each of which month the fall was 0·1 inch only.

Wallington.—The first week was dry, clear, and fine, with slight frost during the nights. A remarkable thunderstorm occurred on the 9th, about 11 A.M.; wind N.W. It was so dark for about half an hour that all in-door work was stopped. At Capheaton there was a heavy fall of hail; at Cambo hail and rain. Milder weather commenced on the 10th, and continued to the end of the month. Rain fell on eleven days. Frost was registered on twelve mornings. The lowest reading of the thermometer was 25° on the 3rd; the highest 70° on the 17th and

20th. Average of the month 45°. There was a very favourable contrast between April 1870, and April 1869, in reference to the effects of frost on vegetation. Nothing was injured in 1870.

North Sunderland.—A dry seasonable month, though cold at nights, with sudden variations in temperature, especially about the 25th and 28th. Rain on nine days.

Wylam.—A fine month with a good deal of wind, especially towards the end.

Barometer—Mean height, 30·035; highest, 30·477 on the 3rd; lowest, 29·347 on the 9th.

Thermometer—Mean of daily minimum, 38·57°; lowest, 29° on the 3rd, 5th, and 6th. Mean of daily maximum, 58·63°; highest, 74° on the 21st. Mean of minimum and maximum, 48·60°. Mean of wet bulb, 41·37°; of dry bulb, 44·82°.

Rainfall on five days, viz., 1·01 inches.

Mean height of river, 1·7 feet; highest, 2·2 feet on the 11th, 12th, and 13th. Wind—W., 3° S.

Whitley.—Unusually dry month. Much wind during the last fortnight. Vegetation very backward.

Lunar Halos were seen at Wallington on the 11th, 12th, and 13th; at Sedgefield on the 11th; at Sunderland on the 11th and 13th; at Darlington on the 12th. Solar Halos were seen at Byrness on the 10th; at Wallington on the 13th, 14th, and 21st; at Sunderland on the 2nd, 8th, 10th, 12th, 13th, 15th, 17th, 20th, 21st, and 23rd. Auroræ Boreales were seen at Byrness on the 5th; at Wallington on the 28th; at Cresswell on the 22nd; at Sunderland on the 5th, 21st, 22nd, 25th, and 28th; at Greta Bridge on the 19th; at Newcastle-on-Tyne on the 26th; at Durham on the 21st and 22nd. Hail fell at Byrness on the 10th and 30th; at Wallington on the 27th; at Rothbury on the 3rd; at Cresswell on the 11th and 27th; at Acklam, near Middlesbro', on the 28th. Snow or Sleet fell at Wallington on the 26th; at Rothbury on the 27th–29th; at Cresswell on the 27th; at Sunderland on the 28th; at Gainford on the 28th.

May.—

> A dry May and a dripping June
> Bring all things into tune.
>
> —*Bedfordshire Proverb.*

Greenwich.—The cloudy cold harsh weather which characterised the end of April changed on the 12th of May to very fine and warm with an abundance of sunshine, and the weather continued very summer like until the end of the month.

The fall of the barometer, which commenced at the end of April, reached its minimum, 29·37 inches, at noon on the 1st of May, and increasing values were recorded until the 8th. These movements were succeeded by a decrease to 29·20 inches on the 11th, and another increase to 30·12 inches on the 18th. From the 19th the mean daily values were generally high, and with the exception of the 30th and 31st, continually above the average. The absolute range of readings during May was 1·09 inches.

The mean temperature of May was 53·4°, being 0·8° higher than the average of 99 years, higher than in 1869 by 2·0°, lower than in 1868 by 3·9°, and the same as the corresponding value in 1867.

The fall of rain was 0·47 inch: in 1833 it was 0·2 inch: in 1844 and 1848 it was 0·4 inch; and there are no other instances of less falls back to 1815.

Wallington.—The first week was cold, with slight frosts at night. After that the weather was warm and very favourable to vegetation. The warmest days were the 26th and 27th, when 73° and 70° were marked. The lowest reading was on the 4th, 28°. Slight frost on six nights.

Wylam.—A very fine month, with a good deal of wind.

Barometer—Mean height, 29·904; highest, 30·332 on the 25th; lowest, 20·070 on the 12th.

Thermometer—Mean of daily minimum, 43·35°; lowest, 34° on the 10th. Mean of daily maximum, 61·84; highest, 74° on the 30th. Mean of minimum and maximum, 52·59°. Mean of wet bulb, 46·48°; of dry bulb, 50·02°.

Rainfall on seven days, viz., 0·72 inch; greatest fall 0·30 inch on the 12th.

Mean height of river, 2 feet; highest, 2·8 feet on the 12th, 13th, 14th, and 15th. Wind—S.W., 10° N.

Acklam, near Middlesbro'.—A very trying month for vegetation. The wheat was looking well at the close of the month, though rather thin. Turnips and potatoes had made little progress owing to the want of rain. There was much wind during the month. Hot sunshine during the day, and often cold frosts at night.

Solar Halos were seen at Wallington on the 19th; at Sunderland on the 4th, 12th, 14th, 18th, 24th, 28th, and 29th. Aurora Borealis was seen at Greta Bridge on the 19th. Thunderstorm occurred at Newcastle-on-Tyne on the 1st. Thunder was heard, but Lightning was not seen, at Wallington on the 20th and 22nd; at Cresswell on the 29th; at Sedgefield on the 1st; at Seaham on the 30th. Hail fell at Byrness on the 1st; at Wallington on the 2nd; at Cresswell on the 1st; at Shotley Bridge on the 1st. Snow or Sleet fell at Byrness on the 2nd; at Wallington on the 3rd; at Dyke Head, near Elsdon, on the 2nd.

June.—

If St. Vitus' day be rainy weather,
It will rain for thirty days together.

—*Old Proverb.*

Greenwich.—The weather up to June 22nd was summer like with very little rain. On the 23rd the weather became cold and changeable. The average daily deficiency of temperature from June the 23rd to the 30th was $3\frac{1}{2}$°.

Upon the whole quarter the periods of warm weather being of longer duration than those of cold, there was an excess of temperature amounting to 1·4° daily. The temperature rose to 90·2° on the 22nd. In June, 1846, the highest temperature observed was 91·1°, in 1857 92·7°, and in 1858 94·5°.

The mean daily readings of the barometer during June were generally high, there being only six days on which the mean was in defect of the average. The absolute maximum for the month was 30·37 inches; the absolute minimum 29·55 inches; and the range of reading 0·82 inches.

The mean temperature of June was 60·9°, being 2·7° higher than the average of 99 years, higher by 5·6° than in 1869, lower than in 1868 by 11°, higher than in 1867 by 2·8, and the same as in 1866. The fall of rain was 0·39 inch, and there is only one instance of a smaller fall, viz., in 1849, when it was 0·3 inch.

Wallington.—The month was marked by fine growing weather, with frequent showers of rain. Vegetation generally advanced rapidly. Rain fell on fourteen days. The 6th was the warmest day, 80°. The lowest night temperature recorded was on the 28th, 34°. Mean of month, 54·4°.

Whitley.—A very good mirage was seen on the 23rd about 7 P.M.

Wylam.—A very fine month.

Barometer—Mean height, 29·979; highest, 30·605 on the 6th; lowest, 29·473 on the 11th.

Thermometer—Mean of daily minimum, 48·20°; lowest, 38° on the 28th. Mean of daily maximum, 67·23°; highest, 79° on the 22nd. Mean of minimum and maximum, 57·72°. Mean of wet bulb, 53·83°; of dry bulb, 57·67°.

Rainfall on twelve days, viz., 1·40 inches; greatest fall, 0·53 inch on the 25th.

Mean height of river, 1·57 feet; highest, 2·5 feet on the 2nd. Wind—W.

Acklam, near Middlesbro'.—The commencement of the month was marked by hot days and cold nights—very trying to vegetation.

A LUNAR HALO was seen at Sunderland on the 11th. SOLAR HALOS were seen at Sunderland on the 2nd, 6th, 10th, 11th, 13th, 15th, 18th, and 30th. THUNDER was heard, but LIGHTNING was not seen, at Wallington on the 17th, 24th, 29th, and 30th; at Rothbury on the 23rd; at Gainford on the 9th. THUNDERSTORMS occurred at Byrness on the 23rd; at Wallington on the 23rd; at Dyke Head, near Elsdon, on the 23rd; at Rothbury on the 8th and 29th; at Cresswell on the 17th and 24th; at Whitley on the 16th; at Gainford on the 16th; at Sedgefield on the 16th; at Seaham on the 24th; at Sunderland on the 17th and 24th; at Greta Bridge on the 16th; at Darlington on the 16th and 24th. HAIL fell at Byrness on the 10th, 11th, and 23rd; at Wallington on the 23rd; at Whitley on the 10th; at Seaham on the 24th.

The mortality was below the average during the second quarter of 1870 in the Northern Counties. It was at the annual rate of 20·84. The total deaths from scarlet fever were 248, from fever 256. Stockton and Auckland suffered severely.

The estimated population of the largest towns in Northumberland and Durham, and the respective death-rates for the second quarter of 1870, was as follows:—

	Estimated Population.	Persons to an acre.	Deaths.	Annual rate to 1000 living.
Newcastle	133,367	25·0	720	21·6
Sunderland	100,979	30·5	427	16·9
South Shields (Municipal Boundaries)	68,514	......	332	19·4
Gateshead (ditto)..............	44,405	......	257	23·2
Tynemouth (ditto)	40,599	......	229	22·6

July.—

No tempest good July,
Lest corn come off blue by (mildew).
—*Old Proverb.*

Greenwich.—The weather was cold until July the 3rd. On the 4th it changed to warm and fine with light westerly winds. This change of weather exercised a great influence on the growing crops, which up to this time were in a doubtful condition. Harvest operations began in the Southern Counties in the third week in July, and extended into the Midland Counties by the end of the month.

The readings of the barometer during July were very steady throughout the month; the highest readings being 30·13 inch, and the lowest 29·50 inch. From the 1st to the 16th the mean daily readings were generally below, and from the 17th to the 30th above the average.

The mean temperature of July was 65·4°, being 3·9 higher than the average of 99 years, higher than the corresponding temperature in 1869 by 0·9°, lower than 1868 by 2·1, but higher than in any of the preceding years back to 1859. The fall of rain was 0·6 inch in defect.

Wallington.—Showery from the 1st to the 9th, but hot and dry from that time until the end of the month. The hay was all secured in fine condition, although the crops in most cases were below the average. The warmest days were the 10th and 23rd, when 81° and 88° were recorded. The coldest day was the 2nd, when 40° was registered.

Whitley.—A warm month up to St. Anne's day, the 26th. On that day the wind changed to N., and dull and cold weather prevailed to the close.

Wylam.—A very fine warm month, the temperature reaching its climax on the 24th, when it was 88°. Soon after that day some heavy thunderstorms occurred in the south and other parts of England, and the temperature fell till the end of the month, the wind changing from W. to N.E. on and after the 24th. There was scarcely any rain after the 4th, and it was much wanted.

Barometer—Mean height, 29·914; highest, 30·257 on the 28th; lowest, 29·587 on the 12th.

Thermometer—Mean of daily minimum, 52·58°; lowest, 45° on the 2nd. Mean of daily maximum, 71·90°; highest, 88° on the 24th. Mean of minimum and maximum, 62·24°. Mean of wet bulb, 57·07°; of dry bulb, 61·76°.

Rainfall on five days, viz., 0·63 inch; greatest fall 0·26 inch on the 1st.

Mean height of river, 1·48 feet; highest, 2·4 feet on the 4th. Wind—W., 22° N.

Acklam, near Middlesbro'.—The hay harvest was general by the end of the first week. Hot days and cold nights characterised the weather until the end of July.

Solar Halos were seen at Byrness on the 3rd; at Wallington on the 15th and 25th; at Sunderland on the 4th, 5th, 7th, 8th, 22nd, and 25th. Lightning was seen, but Thunder was not heard, at Sunderland on the 16th; at Allenheads on the 15th and 21st; at Bywell on the 15th; at North Shields on the 15th. Thunder was heard, but Lightning was not seen, at Byrness on the 9th and 10th; at Wallington on the 1st; at Bywell on the 1st; at Allenheads on the 1st and 10th; at Cresswell on the 10th and 14th; at Sedgefield on the 10th; at Sunderland on the 10th. Thunderstorms occurred at Wallington on the 9th and 15th; at Alnwick on the 10th; at Rothbury on the 16th; at Whitley on the 15th; at Darlington on the 9th.

August.—

Dry August and warm
Doth harvest no harm.

— *Old Proverb.*

Greenwich.—The weather was fine and warm up to the 18th. On the 19th the temperature passed below the average, and it continued generally low until the end of the month.

The mean temperature of August was 61·1°, being 0·4° higher than the average of 99 years, higher than in 1869 by 0·3°, but lower than in 1868 by 2·5°.

The change in the readings of the barometer was very small, the absolute range being only 0·86 inch. The minimum reading for the month was 29·26 inches on the 28th. The mean daily values were in excess of the average from the 8th to the 17th, but generally in defect on the remaining days of the month.

The fall of rain was 0·4 inch in defect.

Wallington.—The month was marked by continued high temperature. The 11th and 12th were the warmest days, 80·5° and 80°. On twelve days between the 1st and 18th a temperature of between 70° and 80° was registered. The lowest minimum reading was on the 16th, 37°. Rain fell on fourteen days.

Wylam.—Fine fresh breezy month.

Barometer—Not observed during the remainder of the year, an imperfect instrument being used.

Thermometer—Mean of daily minimum, 48·63°; lowest, 41° on the 27th and 30th. Mean of daily maximum, 69·03°; highest, 79° on the 7th. Mean of minimum and maximum, 58·83°. Mean of wet bulb, 54·05°; of dry bulb, 57·45°.

Rainfall on eight days, viz., 2·39 inches; greatest fall, 1·30 inches on the 18th.

Mean height of river, 1·10 feet; highest, 1·2 feet on the 1st. Wind—N.E., 3° N.

Acklam, near Middlesbro'.—The beginning of the month was marked by hot days and cold nights. The appearance of rain at times was very promising, but the performance fell short. Harvest was general about the 12th of the month. Dull foggy weather was prevalent about that time, which proved refreshing to vegetation. Many garden crops such as beet, carrots, &c., had previously had the leaves flat on the ground and withered for want of moisture. Showers towards the close of the month.

Seaham.—On the 10th the sun was so hot that it scorched many flowers in the borders, such as asters and hollyhocks. The flowers shaded by leaves escaped. It was an occurrence without precedent in this locality.

A Solar Halo was seen at Wallington on August the 1st. Auroræ Boreales were seen at Otterburn on the 25th; at Durham on the 20th. Lightning was seen, but Thunder was not heard, at Wallington on the 4th and 26th, at Allenheads on the 4th; at North Shields on the 18th. Thunder was heard, but Lightning was not seen, at Otterburn on the 4th and 17th; at Wallington on the 17th; at Allenheads on the 1st and 17th; at North Shields on the 17th. Thunderstorms occurred at Wallington on the 5th and 6th; at Alnwick on the 17th; at Cresswell on the 5th and 17th; at Darlington on the 5th; at Acklam, near Middlesbro', on the 29th; at Allenheads and Bywell on the 5th; at North Shields on the 29th. Hail fell at Cresswell and at Whitley on the 29th.

September.—

September dries up wells or breaks down bridges.

—*Old Proverb.*

Greenwich.—The temperature was low but the weather was fine and frequently nearly cloudless. This was particularly the case during the last ten days of the quarter. The deficiency of temperature below the average in the forty-three days ending September 30th was rather more than 1½ daily.

Upon the whole quarter, the period of warm weather having been more above the average than the period of cold was below, there was an excess of temperature of little less on the average of 1° daily.

The readings of the barometer at the beginning of September were about 29·7 inches, and a depression, followed by a rise of the same value, occurred during the 2nd, 3rd, and 4th. A more decided fall commenced on the 4th and lasted till the 7th, when 29·16 inches was recorded. An increase then occurred, and on the 15th the readings passed above 30 inches, and remained in excess of that value during the remainder of the month.

The mean daily reading was 29·91 inches, and the absolute range was 1·21 inches.

The mean temperature was 55·7°, being 0·8° lower than the average of 99 years, and lower than in any year back to 1863 when 53·7 was recorded. The rainfall was 0·8 inch in defect.

A very fine display of the Aurora Borealis was seen at almost all stations on September the 24th. It was reported from all parts of the country from Guernsey to the Scotch border.

Wallington.—A remarkably fine autumn month with a plentiful supply of rain. Vegetation of all kinds advanced well. The highest maximum temperature was on the 26th, 28th, and 29th, when 70° was registered on each day. The lowest minimum reading was 30° on the 9th.

Whitley.—Fine month on the whole. Very windy from the 4th to the 11th. On the 24th and 25th two very fine displays of the Aurora Borealis.

Wylam.—A very fine month.

Thermometer—Mean of daily minimum, 44·49°; lowest, 33° on the 15th. Mean of daily maximum, 65·73°; highest, 73° on the 27th. Mean of minimum and maximum, 55·11°. The wet and dry bulb thermometers were accidentally broken.

Rainfall on eleven days, viz., 1·07 inches; greatest fall, 0·30 inch on the 3rd.

Mean height of river, 1·3 feet. Wind—W., 11° S.

Acklam, near Middlesbro'.—During the first few days of September the weather was variable. From the middle of the month sharp frosty mornings and bright sunny days prevailed. There were two unusually fine displays of the Aurora Borealis at the end of the month.

Seaham.—This month was remarkable on account of the peculiar changes of the wind. Almost daily the wind has changed about noon to the east, which made the after part of the day cold.

LUNAR HALOS were seen at Wallington on the 10th and 11th; at Sunderland on the 12th. SOLAR HALOS were seen at Wallington on the 10th and 14th; at Sunderland on the 2nd, 3rd, 4th, 6th, 13th, and 20th. AURORÆ BOREALES were seen at Wallington on the 4th, 24th, and 25th; at Alnwick on the 24th and 25th; at Cresswell on the 24th; at Whitley on the 3rd, 23rd, and 24th; at North Shields on the 3rd, 24th, and 25th; at Gainford on the 24th and 25th; at Sedgefield on the 24th and 25th; at Sunderland on the 13th, 24th, and 25th; at Greta Bridge on the 23rd; at Darlington on the 24th; at Newcastle-on-Tyne on the 3rd, 7th, and 11th; at Durham on the 3rd, 15th, 24th, and 25th. THUNDER was heard, but LIGHTNING was not seen, at Sunderland and Allenheads on the 6th. THUNDERSTORMS occurred at Wallington, Alnwick, and Cresswell on the 6th; at Whitley on the 6th and 13th.

The usual table showing the death-rate for the largest towns in Northumberland and Durham is subjoined:—

	Estimated Population.	Persons to an acre.	Deaths.	Annual rate to 1000 living.
Newcastle-on-Tyne	133,367	25·0	853	25·6
Sunderland	100,979	30·5	505	20·0

	Estimated Population.	Persons to an acre.	Deaths.	Annual rate to 1000 living.
South Shields	68,514	.. ...	446	26·0
Gateshead	44,405	......	294	26·5
Tynemouth	40,599	......	256	25·2

October.—

A good nut year, a good corn year.

—*Old Proverb.*

Greenwich.—During the month of October there were constant alternations of temperature; for two or three days together it was in excess of the average, and for two or three days in defect. On the whole month there was a deficiency averaging $\frac{1}{2}°$ daily.

The mean temperature was 49·8°, being 0·1° higher than the average of 99 years, higher than the corresponding values in 1869, 1868, and 1867, but lower than in any previous year back to 1854, when 49·4° was recorded.

During the first few days of the month of October the readings of the barometer were generally high, and the mean daily values above the average, but after the 7th low readings were recorded, and the mean daily values were in defect of the average. The range of pressure was 1·65 inches. The fall of rain was 0·5 inch in excess.

Wallington.—Dry weather up to the 5th. Fine mild month throughout, with only a few stormy days. Rain fell on twenty-three days. The highest maximum temperature was on the 4th, 64°. The lowest minimum on the 5th, 28°.

North Sunderland.—The barometrical variations were very great. There were several displays of the Aurora Borealis, especially magnificent on the 25th. Rain on seventeen days.

Wylam.—A very changeable month, but fine on the whole. On the 24th a very fine display of Aurora Borealis, seen all over England, and in North America, and again on the 25th, the streams of light springing very much from the S.E. and S., and concentrating in streaks of white, sometimes tinged with rose colour, a little to the S. of the zenith; the last display lasted from 6 P.M. till 10 P.M.

Thermometer—Mean of daily minimum, 38·87°; lowest, 31° on the 15th. Mean of daily maximum, 55·71°; highest, 68° on 1st and 2nd. Mean of minimum and maximum, 47·29°. The wet and dry bulb instruments not replaced till the 11th.

Rainfall on twenty-two days, viz., 4·81 inches; greatest fall, 1·52 inches on the 9th.

Mean height of river, 2·5 feet; highest, 5·5 feet on the 10th. Wind—W., 10° N.

Acklam, near Middlesbro'.—October began with foggy nights and hot bright days. Magnificent display of Aurora Borealis on the 24th and 25th. Daisies and dandelions were well out in bloom. The farmers were very busy at the end of the month with potato harvest and wheat sowing.

LUNAR HALOS were seen at Wallington on the 13th; at Whitley on the 13th; at Sedgefield on the 9th and 13th; at Sunderland on the 13th; at Darlington on the 13th. SOLAR HALOS were seen at Sunderland on the 13th, 15th, 16th, 18th, 21st, 27th, and 31st. AURORÆ BOREALES were seen at Otterburn on the 22nd, 24th, and 25th; at Wallington on the 14th, 20th, 24th, 25th, and 28th; at Alnwick on the 24th and 25th; at Rothbury on the 6th, 24th, and 25th; at Cresswell on the 24th and 25th; at North Shields on the 24th and 25th; at Sedgefield on the 24th and 25th; at Sunderland on the 19th, 24th, and 25th; at Greta Bridge on the 24th and 25th; at Darlington on the 24th and 25th; at Newcastle-on-Tyne on the 10th, 14th, 20th, 24th, and 25th; at Durham on the 1st, 14th, 24th, and 25th; at Gainford on the 24th and 25th. LIGHTNING was seen, but THUNDER was not heard, at Wallington on the 26th and 27th; at Allenheads on the 1st and 26th. THUNDERSTORMS occurred at Seaham on the 26th; at Sunderland on the 26th. HAIL fell at Wallington on the 9th; at Alnwick on the 9th; at Whitley on the 26th; at Seaham on the 9th. SNOW or SLEET fell at Wallington on the 9th; at Gainford on the 9th.

November.—

Expect St. Martin's summer.

—*Shakspeare.*

Greenwich.—On November the 1st a cold period set in and continued till the 19th. The average daily deficiency of temperature for this period amounted to $4\frac{3}{4}$°. This was followed by another period of ten warm days, the daily excess of temperature being $4\frac{1}{2}$° nearly.

The temperature of November was 41·5°, being 0·9° lower than the average of 99 years, lower in 1869 by 1·5°, but the same as in 1868.

From the 1st of November to the 15th a steady fall of the barometer was recorded; and from the 15th to the end of the month an equally gradual rise occurred, though broken at times by slight oscillations. The minimum reading for the month was 28·27 inches, and the range 1·39 inches. The fall of rain was 1·2 inches in defect.

Wallington.—Fine during the first week. From the 9th to the 12th stormy, with strong winds from N.E., and snow, sleet, and hail, to the depth of 12 inches. The latter half of the month the weather was comparatively mild. Frost was registered on twenty-two nights. The lowest minimum temperature was 22° on the 9th; the highest maximum, 54°, on the 3rd.

North Sunderland.—A cold wet and unsettled month. Several displays of the Aurora Borealis; notably on the 18th. Rain on twelve days.

Whitley.—A cold ungenial month on the whole. The first frost of the season occurred on the 7th.

Wylam.—A cold damp month.

Thermometer—Mean of daily minimum, 32·17°; lowest, 24° on the 15th. Mean of daily maximum, 46·83°; highest, 59° on the 5th. Mean of minimum and maximum, 39·50°. Mean of wet bulb, 35·54°; of dry bulb, 36·81°.

Fall on fifteen days, viz., rain, 0·76 inch; melted snow, 1·97 inches, = 2·73 inches; greatest fall, 0·35 on the 11th.

Mean height of river, 1·7 feet. Wind—N.W., 20° N.

Acklam, near Middlesbro'.—Very mild at commencement. A sudden change took place on the 9th, when the weather became very cold, with showers of sleet and rain. A very heavy thunderstorm passed over on the 10th. Its passage was from N.E. to S.W. On the 17th there was a very fine Aurora. The unsettled weather was a great hindrance to out-door work. At the close of the month some potatoes were still ungathered, and some wheat fields were not sown in this locality. The supply of water was fair, and the springs began to rise. In many places they had become quite dry from the long absence of rain.

LUNAR HALOS were seen at Wallington on the 5th, 6th, 16th, and 17th; at Sunderland on the 2nd, 5th, 6th, and 14th. SOLAR HALOS were seen at Sunderland on the 2nd, 7th, 13th, 15th, 20th, 21st, and 28th. AURORÆ BOREALES were seen at Alnwick on the 18th; at Cresswell on the 6th; at Sunderland on the 18th; at Greta Bridge on the 18th; at Durham on the 9th, 18th, and 23rd. LIGHTNING was seen, but THUNDER was not heard, at Byrness on the 16th; at Wallington on the 10th, 18th, 21st, and 24th; at North Shields on the 10th. THUNDERSTORMS occurred at Cresswell on the 11th; at Seaham on the 11th; at Sunderland on the 10th. HAIL fell at Wallington on the 10th; at Whitley on the 11th; at Seaham on the 11th. SNOW OR SLEET fell at Wallington on the 9th, 10th, and 12th; at Alnwick on the 8th, 11th, 12th, and 15th; at Cresswell on the 12th; at Shotley Bridge on the 10th and 11th; at Whitley on the 9th, 10th, and 11th; at North Shields on the 6th; at Sedgefield on the 9th, 11th, and 15th; at Seaham on the 10th and 11th; at Sunderland on the 9th; at Greta Bridge on the 10th and 12th; at Darlington on the 10th and 15th; at Acklam Hall, near Middlesbro', on the 9th, 10th, 11th, and 15th; at Newcastle-on-Tyne on the 6th.

December.—

> When Cheviot ye see put on his cap,
> Of rain ye'll have a wee bit drap.
>
> —*Local Proverb.*

Greenwich.—The beginning of the month was cold, and the deficiency of temperature from the 1st to the 12th on the average of days was $7\frac{1}{2}°$. From the 12th to the 20th the weather was warm. The mean daily excess for the nine days was 4¼°. A very great change took place on the 21st, when the mean value was 27·7°. On Christmas Day it was lower still, the mean value being 20·6°. The day was painfully cold.

The days of lowest temperature since 1814 were on January the 20th, 1838, 10·7°; the next, February the 9th, 1816, 12·6°; and January the 8th, 1841, 12·8°.

Of forty-one days of lowest temperature since 1814, eleven only have taken place in the last thirty years, six in January, two in February, and three in December, the last two both occurring on Christmas Day, the one in 1860, when the temperature fell to 20·2°, the other in 1870.

The temperature on December the 25th, 1870, descended to a very low point: it was the minimum for the month at many stations in England, but not at all. The lowest reading occurred on the 23rd and 24th at a few places, and on the 25th or 31st at a greater and nearly an equal number of places.

The lowest temperatures recorded during the month throughout England were, at Taunton, 1°; Strathfield Turges, 4°; Gloucester, 6°; Leicester, Hull, and Allenheads, 7°; Leamington, 8°; Nottingham, 8·7°; Bywell, 10°; North Shields, 13·3°, the two latter on the 23rd.

The mean temperature of December was 33·6°, being 5·6° lower than the average of 99 years. Since 1771 the following have been the only instances in which the corresponding temperatures have been lower, viz.:—

1784... 31°.	1796... 30·4°.	1840... 33·3°.
1788... 29°.	1799... 32·8°.	1844... 33·0°.
		1846... 32·9°.

The maximum barometric readings occurred at the beginning and end of the month, and the minimum about the middle. A wave of high readings occurred on the 17th and 18th.

The minimum reading for the month was 28·94 inches. The range of pressure amounted to 1·51 inches. The fall of rain was 0·5 inch in excess.

Wallington.—Wet, snowy, cold month. Between the 6th and 7th snow fell to the depth of 10 inches. On the 7th the wind veered to southward and a rapid thaw set in, accompanied by a heavy fall of rain and a high gale of wind. The brooks and streams were flooded. The 20th was a remarkably fine day, maximum temperature 48°, but towards night a great change set in and there was a heavy snow storm. Boisterous and cold weather continued till the 30th. Frost was recorded on twenty-three nights. The lowest minimum temperature was 3° on the 30th. The greatest maximum temperature 48° on the 20th. The year closed with an intense frost, the thermometer standing at 5° at 12 P.M. on the 31st.

North Sunderland.—Remarkably wet, cold, and stormy month. The frost on the night of the 31st was more severe than had been experienced in any year since 1860. Rain on twenty-five days.

Wylam.—A dull wet month. The barometer fell (with the exception of a rally on the 8th and 9th) from 30·636 on the 1st, to 28·839 on the 14th; and from the 3rd to the 10th, 3·20 inches of rain and (melted) snow fell.

Thermometer—Mean of daily minimum, 27·63°; lowest, 8° on the 23rd. Mean of daily maximum, 40·30°; highest, 52° on the 20th. Mean of minimum and maximum, 38·97°. Mean of wet bulb, 31·36°; of dry bulb, 32·85°.

Fall on twenty days, viz., rain, 3·04 inches; melted snow, 1·79 inches, = 4·83 inches; greatest fall, 0·52 inch on the 10th.

Mean height of river, 3·27 feet; highest, 11 feet on the 15th. Wind—N.W., 30° N.

Acklam, near Middlesbro'.—A very stormy month. Very unfavourable for out-door work. Wheat sowing was brought to a close about the middle of the month. The earlier sown wheat was well up and looked promising. The year closed with frost and snow.

A LUNAR HALO was seen at Sunderland on the 12th. A SOLAR HALO was seen at Sunderland on the 16th. AURORÆ BOREALES were seen at Wallington on the 14th, 15th, and 17th; at Cresswell on the 16th; at Seaham on the 17th; at Sunderland on the 14th, 18th, 22nd, and 26th; at Darlington on the 17th; at Durham on the 14th, 15th, and 17th. LIGHTNING was seen, but

Thunder was not heard, at North Shields on the 19th. Thunder was heard, but Lightning was not seen, at Wallington on the 8th. Thunderstorms occurred at Cresswell on the 25th; at Newcastle-on-Tyne on the 25th; at North Shields on the 25th. Hail fell at Wallington on the 11th, 25th, 28th, and 30th. Snow or Sleet fell at Byrness on the 20th; at Otterburn on the 7th and 20th; at Wallington on the 6th, 7th, 12th, 19th–23rd, 25th, 26th, and 30th; at Alnwick on the 7th, 21st, 22nd, and 29th; at Dyke Head, near Elsdon, on the 22nd, 29th, and 30th; at Rothbury, on the 6th, 7th, 12th, and 22nd–31st; at Cresswell on the 7th, 22nd, 26th, and 31st; at Whitley on the 7th, 20th–23rd, 27th, and 30th; at Seaham on the 7th, 12th, 21st, 22nd, 27th, 29th, and 30th; at Greta Bridge on the 6th, 7th, 8th, 12th, 21st, and 23rd–31st; at Darlington on 12th, 21st, and 25th–27th; at Acklam, near Middlesbro', on the 6th–8th, 12th, 21st, 26th, and 31st; at Gainford on the 6th, 21st, and 27th.

The Registrar General reports that—"During the last quarter of the year scarlet fever, often capricious in attacking single families, yet constant in sweeping away children living in unnatural conditions, was excessively fatal. In the Stockton-on-Tees sub-district alone one hundred and fifteen lives were sacrificed. The authorities of the town will do well to ask 'the reason why.' In Newcastle and Tynemouth the epidemic was comparatively mild, and it was still milder in the rest of Northumberland."

	Estimated Population.	Persons to an acre.	Deaths.	Annual rate to 1000 living.
Newcastle-on-Tyne	133,367	25	743	22·3
Sunderland	100,979	31	543	21·5
South Shields	68,514	...	407	23·8
Gateshead	44,405	...	259	23·3
Tynemouth	40,599	...	223	22·0

RAINFALL RETURNS.

The editor has again to express his gratification at the number of returns of the rainfall in the two Northern Counties, which have been sent in to the Club for the year 1870. He regrets, however, very much, that the additional returns which he hoped to secure, as mentioned in last year's report, have not been forthcoming.

It may be as well to mention that several of the Station Masters on the North British Railway, in the North Tyne District, and others in that locality, have been furnished with guages, and it is hoped that the next Report may tell of some interesting results. It is very desirable that some additional observers should be obtained in the neighbourhood of Middleton-in-Teesdale, Bishop Auckland, Medomsley, Morpeth, Belford, the Cheviots, and Berwick-on-Tweed. It is hoped that some persons may be found in each of these districts, before 1871 is out, who will undertake the slight labour required to register the rainfall.

As regards the rainfall throughout the British Isles, in 1870, Mr. Symons remarks in his Annual Report, a work which increases much in value every year that passes, that "the geographical distribution of rain during 1870 was very simple, but very remarkable; simple, because there were only five stations which were above the average—all others were below it. In England and Wales the deficiency has no exceptions but York and Settle: the amount of deficiency varies considerably, ranging from a trifling excess of about an inch, or four per cent. at the two stations named to more than 30 per cent. in the Southern Counties, Devon and Cornwall. At some of the Devonshire stations, 1870 was drier than any year for more than a quarter of a century; in other parts, the years 1854 and 1864 had less rain.

"The resemblance between the years 1864 and 1870 is, in many respects, striking. July 1864 was much drier than July 1870, otherwise the description of the monthly falls in one year would almost answer for the other. This is notably the case with respect to October; but in 1864 the drought ended a week later than in 1870, and the excessive rains (and they were even more striking than those of 1870) occurred further North in the vicinity of the Cheviots, instead of in Wales and along the Pennine chain.

"The actual deficiency in England and Wales for 1870 was 17 per cent.

"The Scotch returns seem more consistent this year than for some years past, and show that the drought was felt there also, and that the rainfall scarcely exceeded three-quarters of the average.

"In Ireland the deficiency, though sensible, was not quite so great."

The rainfall of 1870 was—

In England..................	17 per cent. below the average.
In Scotland	22 per cent. below the average.
Ireland	14 per cent. below the average.
For the British Isles......	18 per cent. below the average.

EXTREMES OF RAINFALL FOR 1870.

ENGLAND.

GREATEST.	INCHES.	LEAST.	INCHES.
Seathwaite, Cumberland ...	119·60	Merton Villa, Cambridge......	14·17
Wet Sleddale, ditto ...	101·00	Observatory, ditto	14·25
Wythburn, ditto ...	88·75	Wytham-on-the-Hill	14·40
Easdale, ditto ...	88·15	Bedford	14·52
Berkside	87·25	White Waltham.................	15·35
Patterdale	85·87	Waresley, Huntingdon.........	15·47

WALES.

GREATEST.	INCHES.	LEAST.	INCHES.
Bryn-gwynant, Beddgelert,	101·58	Llwyn Onn, Wrexham.........	22·56
Treherbert, Aberdare	72·61	Hawarden	23·29
Festiniog	70·19	Llanerch...........................	24·53

SCOTLAND.

GREATEST.	INCHES.	LEAST.	INCHES.
Lochgoilhead, Upper Glencoe	109·20	Milne Graden	16·10
Cairndow	77·33	Fenton Barns, Drem	17·00
Glengyle	71·30	Fearn, Tain	18·48

IRELAND.

GREATEST.	INCHES.	LEAST.	INCHES
Kenman House, Killarney	69·01	Collaltine Park	18·88
Galway	44·84	Dublin	20·86
Curraghmore	40·94	Wexford	25·22

At Greenwich the rainfall from January to June was 5·21 inches, the average fall in the first half of the year is 10·88; therefore the fall in 1870 was less than one half the average. The previous instances of small falls in the first six months of the year are 1855, when it was 6·5 inches; 1842 and 1847, when it was 7·5 inches; 1840, when it was 7·6 inches; so that the fall at Greenwich for the six months ending June, 1870, was smaller than in the first half of any year between 1815 and 1869.

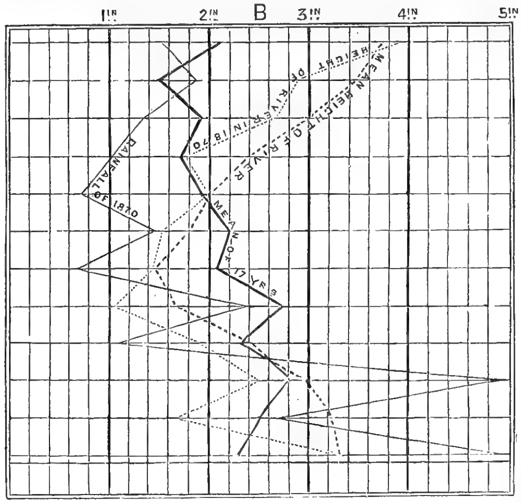
The following diagram and tables have again been most kindly prepared by Mr. George Clayton Atkinson, of Wylam. Every year adds both to the interest and usefulness of these tables, and increases the indebtedness of the Club to Mr. Atkinson for his very valuable assistance in this matter.

It will be seen that the rainfall from March to September (inclusive), 1870, compared with the mean rainfall of seventeen years at Wylam was below the average, while in October and December it rose above it, the whole year's fall being however two inches deficient on the average of those years.* The greatest fall of the year was 1·52 inches on October the 9th.

In the diagram the dotted lines represent the monthly mean height of the Tyne at Wylam Bridge in 1870, compared with the monthly mean height for ten years (1870 inclusive). These lines *ought* to bear some relation to the rainfall, but it is difficult to perceive it. They are introduced however as facts worthy of consideration, and as affording data for investigation hereafter. The river was highest on January the 8th and December 15th, when the water rose to the 15 feet mark.

* The amount of deficiency, 1·63 inches, given in the table, is for fifteen years.

DIAGRAM OF RAINFALL at Wylam in 1870, compared with Monthly Mean Rainfall (at Wylam) for last 17 years, 1870 included; and of HEIGHT OF RIVER in 1870, compared with mean heights for 10 years.



Sea level. Inches drawn in plain lines.

	Rainfall of 1870.	Mean of 17 Years.	Height in 1870.	Mn. hght. for 10 Yrs.
January	1·55 Inches	2·086 Inches	3·92 feet	3·75 feet
February	1·94 ,,	1·521 ,,	2·83 ,,	3·44 ,,
March.........	1 35 ,,	1·915 ,,	2·70 ,,	3·05 ,,
April..........	1·01 ,,	1·754 ,,	1·70 ,,	2·44 ,,
May...........	·72 ,,	1·888 ,,	2·00 ,,	1·97 ,,
June..........	1·40 ,,	2·199 ,,	1·57 ,,	1·80 ,,
July...........	·63 ,,	2·151 ,,	1 48 ,,	1·53 ,,
August........	2·39 ,,	2·773 ,,	1·10 ,,	1·74 ,,
September....	1·07 ,,	2·338 ,,	2 00 ,,	2·36 ,,
October	4·81 ,,	2·952 ,,	2·50 ,,	2·92 ,,
November ...	2·73 ,,	2·567 ,,	1·67 ,,	3·21 ,,
December.....	4·83 ,,	2·303 ,,	3·27 ,,	3·32 ,,
Totals ...	24·43 ,,	26·445 ,,	Mean 2·23 ,,	2·67 ,,

The subjoined interesting table of the comparative rainfall in 1868, 1869, and 1870, has been compiled by Mr. Atkinson, of Gainford. The height of the rain guage is 251·8 feet above the sea:—

	1868.		1869.		1870.	
	Inches.	Tons per Acre.	Inches.	Tons per Acre.	Inches.	Tons per Acre.
January	2·33	235	3·31	334	1·56	157
February	0·66	66	1·40	141	2·14	216
March	0·61	61	2·07	209	1·35	136
April	2·60	262	1·54	155	0·45	45
May	1·02	103	3·49	352	0.52	52
June	0·22	22	1·01	102	1·61	162
July	0·79	79	0·45	45	0·57	57
August	3·07	310	1·45	146	2·36	238
September	5·12	517	3·89	390	0·81	81
October	1·71	172	1·92	193	5·10	515
November	2·53	255	2·70	272	1·45	146
December	5·47	552	3·52	355	3·70	373
Total	26·13	2634	26·75	2694	21·62	2178

Mr. Procter, of North Shields, has again kindly furnished a return of the depth of water at his works at the Low Lights, North Shields. It is interesting for comparison with former returns.

1870.	A. Well 11ft. deep.		B. Well 23ft. deep.		C. Well 15ft. deep.		REMARKS.
	Ft.	In.	Ft.	In.	Ft.	In.	
January	8	2	20	2	12	8	
February	8	2	20	0	11	11	
March	8	2	19	7	11	2	
April	8	2	19	10	9	5	
May	7	10	19	2	9	2	Only taken three times this Month.
June	7	7	18	11	8	7	
July	6	10	18	8	8	0	
August	5	6	17	5	5	10	
September	5	1	16	11	5	7	
October	6	7	17	11	8	4	
November	7	10	19	8	11	2	
December	8	2	19	11	12	1	

FAL

EAR DIS

COQUET, WANSBECK, AND ALN DISTRICTS.

ham.	Ushaw Du	Wallington.		Rothbury, Cragside.		Brink-burn Priory.	Lilburn Tower.	Glanton Pyke.	Millfield, near Wooler.	Middleton Hall, nr. Belford.
et.	600	398 ft. 6 in.		400 feet.		300 feet.	300 feet.	534 feet.	200 feet.	240 feet.
t.	10 i	1 foot.				1 foot.	6 „	4 ft. 4 in.	4 inches.	2 „
Days on wh Rain fell.	Quanti	antity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Quantity.	Quantity.	Quantity.	Quantity.
	Inche	nches.		Inches.		Inches.	Inches.	Inches.	Inches.	Inches.
17	2.0	2·66	20	2·37	9	Monthly returns not furnished.	Monthly returns not furnished.	1·96	1·31	1·300
23	1·6	2 83	23	3·20	7			3·06	3·30	0·680
14	1·4	1·17	17	0·35	2			1·13	0·93	1·020
7	0·6	1·13	12	0·98	2			0·72	0·95	0·720
12	1·3	1·69	14	1·42	2			1·62	1·10	0·970
12	1·5	1·97	14	1·31	4			1·53	2·22	1·085
3	0·7	0·63	9	1·46	3			0·83	0·80	1·855
7	1·2	2·23	14	1·87	2			1·63	1·43	0·930
12	0·8	1·56	15	0·91	6			1·26	0·94	0·980
22	5.0	4·88	23	4·35	12			4·00	3·62	2·685
11	2·4	2·57	16	3·62	7			3·10	2·65	2·865
26	4·7	5·49	26	5·40	11			4·54	4·59	4·115
166	24·8	8·81	203	27·24	67	29·36	23·27	25·38	23·84	19·205
177	26·8	9·25	193	26·94	86	25·24	23·97	25·14	23·34	25·205
...	25·7	1·47	209	25·54	79	26·69	27·42	30·15	27·51	29·200
...	25·8	8·99	198	16·25*	...	33·68	26·61	27·82	24·45	24·100
...	31·2	.....	...	......	...	33·87	30·02	35·06	32·18	26·890
...	29·7	.....	...	......	...	32·45	30·39	34·26	28·65	28·920
...	24·5	.....	...	......	...	29·54	31·97	28·69	......	30·100
..	28·9	.....	...	......	...	......	25·86	30·09	......	......
...	22·9	.....	...	......	...	......	30·04	27·12	......	......
...	26·0	.....	...	......	...	......	26·17	27·10	......	......
...	.....	.....	...	......	...	......	......	......	......	......
...	.....	.....	...	......	...	......	25·98	......	......	......
...	.....	.....	...	......	...	......	24·27	......	... ..	......
...	.....	.....	...	......	...	......	27·11	......	......	... ..
...	.....	.....	...	......	...	......	32·90	......	......	......
176 2 yrs.	26·6 10 yea	9·62 years.	201 4 yrs.	26·57 3 years.	77 3 yrs.	30·12 7 years.	27·78 14 years.	29·08 10 years.	26·66 6 years.	25·945 7 years.
—10 Days	—1· Inche	-0·81 nches.	+2 Days	+0·67 Inches.	—10 Days	—0·76 Inches.	—4·51 Inches.	—3·70 Inches.	—2·82 Inches.	—6·740 Inches.

* For 8 months.

RAINFALL FOR 1870.

TEES DISTRICT.

Place.	Dinsdale Rectory, near Darlington. Quantity.	Days on wh Rain fell.	Darlington (Southend). Quantity.	Days on wh Rain fell.	Brinkburn (Darlington). Quantity.	Days on wh Rain fell.	Hartlepool. Quantity.	Days on wh Rain fell.	Greta Bridge. Quantity.	Days on wh Rain fell.	Egglescliffe, near Yarm. Quantity.	Days on wh Rain fell.	Sedgefield, Durham County Asylum. Quantity.	Days on wh Rain fell.	Gainford. Quantity.	Days on wh Rain fell.
Height of Guage... Above Sea Level	54 feet.		130 feet.		50 feet.		30 feet 1 inch.		431 feet.		80 feet.		360 feet.		251·8 feet.	
Height of Guage... Above Ground ...	2 "		10 inches.		1 foot.		1 inch.		5 inches.		1 foot.		5 inches.		1 foot.	
Month.	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.	
January	1·45	17	Monthly returns not furnished.	Monthly returns not furnished.	1·35	5	1·22	20	2·72	6	Monthly returns not furnished.	Monthly returns not furnished.	1·23	17	1·56	15
February	1·89	20			2·00	13	1·22	22	3·11	10			1·22	18	2·14	18
March	1·82	12			1·25	6	1·44	14	1·64	5			1·42	11	1·35	7
April	0·39	4			0·75	2	0·33	5	0·42	3			0·40	6	0·45	3
May	2·87	7			0·65	7	1·42	10	1·12	7			1·29	9	0·52	8
June	2·30	7			1·60	8	2·50	14	2·26	9			1·73	12	1·61	14
July	0·68	5			0·45	2	0·60	7	0·52	3			0·66	6	0·57	4
August	2·20	8			2·10	5	2·17	11	2·12	6			2·62	9	2·36	9
September	0·69	8			0·55	4	0·82	12	0·77	10			0·85	10	0·81	11
October	5·19	19			4·70	13	3·51	20	6·17	17			4·62	17	5·10	22
November	2·52	15			1·90	7	3·94	13	1·90	6			2·43	14	1·45	14
December	3·39	24			2·35	11	4·61	26	2·86	8			4·92	22	3·70	17
Total for 1870	23.39	146	21·15	...	19·65	83	23·78	174	25·61	90	20·89	153	23·39	151	21·62	142
" 1869	26·32	155	24·03	125	25·75	102	24·50	...	30·98	129	23·74	186	28·88	194	26·75	..
" 1868	24·96	187	37·25	...	21·75	97	......	...	28·89	...	20·38	167	26·93	206	......	...
" 1867	26·66	175	40·79	...	......	...	......	...	22·24	...	23 23	175	25·56	238	......	...
" 1866	29·25	...	38·71	...	......	...	......	...	29·42	...	26·27	...	30·27	...	......	...
" 1865	22·50	...	27·05	...	......	...	......	...	26·73	...	......	...	25·57	...	......	...
" 1864	......	...	22·11	..	......	...	......	...	24·26	...	......	...	......	...	......	...
" 1863	......	...	19·26	...	......	...	......	...	26·25	...	......	...	......	...	......	...
" 1862	......	...	21·24	...	......	...	......	...	25·84	...	......	...	......	...	......	...
" 1861	......	...	32·83	...	......	...	......	...	24·54	...	......	...	......	...	......	...
" 1860	......	...	31·86	...	......	...	......	...	30·28	...	......	...	......	...	......	...
" 1859	......	...	27·65	...	......	...	......	...	26·74	...	......	...	......	...	......	...
" 1858	......	...	......	...	......	...	......	...	21·56	...	......	...	......	...	......	...
" 1857	......	...	......	...	......	...	......	...	23·93	...	......	...	......	...	......	...
" 1856	......	...	......	...	......	...	......	...	27·30	...	......	...	......	...	......	...
Average of Years	25·51 6 Years.	165 4 yrs.	28·66 12 years.	...	22·38 3 years.	94 Days	24·14 2 years.	...	26·30 15 years.	109 2 yrs.	22·90 5 years.	170 4 yrs.	26·76 6 years.	197 4 yrs	24·18 2 years.	142 1 yr.
Difference in 1870 from Mean...	—2·12 Inches	—19 Days	—7·51 Inches.	...	—2·73 Inches.	—11 Days	—·36 Inches.	...	—·69 Inches.	—19 Days	—2·01 Inches.	—17 Days	—3·37 Inches.	—46 Days	—2·56 Inches.	...

WEAR DISTRICT.

Place.	Stanhope Castle. Quantity.	St. John's, Wolsingham. Quantity.	Days on wh Rain fell.	Wolsingham. Quantity	Days on wh Rain fell.	Ushaw College, Durham. Quantity.	Days on wh Rain fell.	Durham Observatory. Quantity.	Days on wh Rain fell.	Sunderland, West Hendon House. Quantity.	Days on wh Rain fell.
Height of Guage... Above Sea Level	670 feet.	927 feet.		464 feet.		600 Feet.		352 ft. 5 in.		132 feet.	
Height of Guage... Above Ground ...	3 "	1 foot 1 inch.		1 foot.		10 inches.		4 ft. 6 in.		1 foot.	
Month.	Inches.	Inches.		Inches.		Inches.		Inches.		Inches.	
January	4·59	3·40	14	2·86	17	2.05	15	2·299	18	1·36	14
February	1·41	2·57	20	3·26	23	1·69	21	1·988	21	1·27	18
March	2·50	1·57	9	1·95	14	1·40	13	1·486	13	0·78	15
April	1·50	0·76	7	0·81	7	0·62	6	0·629	7	0·67	7
May	0·10	1·75	13	1·79	12	1·35	10	1·780	11	1.21	11
June	1·17	1·54	14	1·77	12	1·54	12	2·018	11	1·75	15
July	0·60	0·72	6	0·60	3	0·79	8	0·574	8	0·39	9
August	3·01	2·17	6	2·35	7	1·29	11	2·135	10	2·50	9
September	1·09	1·19	8	1·21	12	0·80	11	0·340	9	0·62	11
October	8·08	6·82	20	6·31	22	5.08	17	3·764	18	3·67	18
November	2·70	3·60	6	2·58	11	2·46	11	2·115	14	3·67	14
December	4·77	4·80	23	5·69	26	4·79	24	5·535	25	5·02	26
Total for 1870	31·52	29·27	146	31·18	166	24·86	159	24·663	165	22·91	158
" 1869	44·16	30·87	167	36·70	177	26·82	163	29·564	169	24·25	160
" 1868	39·68	38·33	199	......	...	25·75	174	30·770	191	21·29	...
" 1867	32·33	32·53	192	......	...	25·85	159	19·450	...	......	...
" 1866	41·24	36 90	218	......	...	31·26	190	25·100	...	......	...
" 1865	......	28·91	199	......	...	29·73	168	24·510	...	......	...
" 1864	......	......	...	......	...	24·59	...	23·240	...	......	...
" 1863	......	......	...	......	..	28·90	...	24·090	...	......	...
" 1862	......	......	...	......	...	22·95	...	21·820	...	......	...
" 1861	......	......	...	......	...	26·03	...	24·280	...	......	...
" 1860	......	......	...	......	...	......	...	30·330	...	......	...
" 1859	......	......	...	......	...	......	...	21·570	...	......	...
" 1858	......	......	...	......	...	......	...	18·730	...	......	...
" 1857	......	......	...	......	...	......	...	26·550	...	......	...
" 1856	......	......	...	......	...	......	...	29·650	...	......	...
Average of Years	37·78 5 years.	32·80 6 years.	187 6 yrs.	33·94 2 years.	176 2 yrs.	26·67 10 years.	169 6 yrs.	24·954 15 years.	175 3 yrs.	22·82 3 years.	159 2 yrs.
Difference in 1870 from Mean...	—6·27 Inches.	—3 53 Inches.	—41 Days	—2·76 Inches.	—10 Days	—1·81 Inches.	—10 Days	—0·291 Inches.	—10 Days	+·09 Inches.	—1 Day

COAST DISTRICT.

Place.	North Sunderland. Quantity.	Days on wh Rain fell.	Cresswell. Quantity.	Howick. Quantity.	Days on wh Rain fell.	Whitley, The Vicarage. Quantity.	Days on wh Rain fell.	Convalescent Home, Whitley. Quantity.	Earsdon. Quantity.	Days on wh Rain fell.	Tynemouth Pier Works. Quantity.	Days on wh Rain fell.	Seaham Hall. Quantity.	Days on wh Rain fell.
Height of Guage... Above Sea Level	69 feet.		96 feet.	121 feet.		82 feet.		18 feet.	185 feet.		61 ft. 10½ in.		80 feet.	
Height of Guage... Above Ground ...	1 foot 2 inches.			10 inches.		9 inches.		9 inches.	2 feet 10 inches.		1 foot.		1 foot.	
Month.	Inches.		Inches.	Inches.		Inches.		Inches.	Inches.		Inches.		Inches.	
January	1·53	16	1·98	The monthly returns not furnished.	The monthly returns not furnished.	1·47	14	......	1·45	11	1·29	13	1·13	12
February	2·78	25	2·10			2·07	17	......	1·67	12	1·89	22	1·22	11
March	1·17	17	0·99			1·16	8	......	0·86	7	1·08	18	1·14	9
April	0·40	9	0·50			0·74	4	......	0·60	5	0·75	8	0·55	4
May	1·19	14	1·48			1·18	5	1·02	1·31	7	1·14	10	1·23	4
June	1·25	12	0·74			2·66	7	2·05	2·25	11	2·59	14	1·28	7
July	1·07	9	0·77			0·32	8	0·18	0·31	6	0·43	7	0·42	5
August	1·03	11	1·65			1·94	11	1·57	1·74	7	1·82	12	2·25	5
September	0·84	12	1·44			0·81	7	0·61	0·64	10	0·75	9	0·61	8
October	2·35	17	2·92			3·21	14	3·88	3·18	17	3·28	20	4·18	16
November	4·00	12	2·69			1·28	6	2·51	3·01	11	3·35	15	3·53	10
December	4·96	25	3·29			4·95	14	3·30	4·05	15	5·01	25	4·09	11
Total for 1870	22·57	179	20·55	22·99	120	21·79	115	15·12	21·04	119	23·38	173	21·63	102
" 1869	20·09	173	19·61	22·66	130	23·03	...	8 months	21·85	129	22·68	174	24·22	132
" 1868	23·23	162	19·82	25·22	124	25·37	...	......	......	...	21·05	170	22·56	145
" 1867	24·40	170	19·95	24·98	159	23·45	...	......	......	...	24·22	...	23·61	151
" 1866	25·75	189	26·37	28·88	168	28·35	...	......	......	...	23·68	...	28·32	154
" 1865	32·47	...	25·78	28·64	...	26·99	...	......	......	...	23·47	...	26·07	...
" 1864	......	...	22·42	22·01	...	26·64	...	......	......	...	......	...	22·74	...
" 1863	......	...	21·38	18·34	...	......	...	......	......	...	......	...	26·15	...
" 1862	......	...	24·77	19·30	...	......	...	......	......	...	......	...	......	...
" 1861	......	...	20·46	18·30	...	......	...	......	......	..	......	...	......	...
" 1860	......	...	26·78	27·48	...	......	...	......	......	...	......	...	......	...
" 1859	......	...	20·55	18·84	...	......	...	......	......	...	......	...	......	...
" 1858	......	...	19·43	22·51	...	......	...	......	......	...	......	...	......	...
" 1857	......	...	20·76	20·77	...	......	...	......	......	...	......	...	......	...
" 1856	......	...	24·88	22·58	...	......	...	......	......	...	......	...	......	...
Average of Years	24·75 6 years.	174 5 yrs.	22·23 15 years.	22·90 15 years.	140 5 yrs.	25·08 7 years.	115 1 yr.	......	21·44 2 years.	124 2 yrs.	23·08 6 years.	172 3 yrs.	24·41 8 years.	137 5 yrs.
Difference in 1870 from Mean...	—2·18 Inches.	+5 Days	—1·68 Inches.	+0·9 Inches.	—20 Days	—3·29 Inches.	...	......	—0·40 Inches.	—5 Days	+0·30 Inches.	+1 Day	—2·78 Inches.	+35 Days

COQUET, WANSBECK, AND ALN DISTRICTS.

Place.	Wallington. Quantity.	Days on wh Rain fell.	Rothbury, Cragside. Quantity.	Days on wh Rain fell.	Brinkburn Priory. Quantity.	Lilburn Tower. Quantity.	Glanton Pyke. Quantity.	Millfield, near Wooler. Quantity.	Middleton Hall, nr. Belford. Quantity.
Height of Guage... Above Sea Level	398 ft. 6 in.		400 feet.		300 feet.	300 feet.	534 feet.	200 feet.	240 feet.
Height of Guage... Above Ground ...	1 foot.				1 foot.	6 "	4 ft. 4 in.	4 inches.	2 "
Month.	Inches.		Inches.		Inches.	Inches.	Inches.	Inches.	Inches.
January	2·66	20	2·37	9	Monthly returns not furnished.	Monthly returns not furnished.	1·96	1·31	1·300
February	2 83	23	3·20	7			3·06	3·30	0·680
March	1·17	17	0·35	2			1·13	0·93	1·020
April	1·13	12	0·98	2			0·72	0·95	0·720
May	1·69	14	1·42	2			1·63	1·10	0·970
June	1·97	14	1·31	4			1·58	2·22	1·085
July	0·63	9	1·46	3			0·83	0·80	1·855
August	2·23	14	1·87	2			1·68	1·48	0·930
September	1·56	15	0·91	6			1·26	0·94	0·980
October	4·88	23	4·35	12			4·00	3·62	2·685
November	2·57	16	3·62	7			3·10	2·65	2·805
December	5·49	26	5·40	11			4·54	4·59	4·115
Total for 1870	28·81	203	27·24	67	29·36	23·27	25·88	23·84	19·205
" 1869	29·25	193	26·94	86	25·24	23·97	25·14	23·34	25·205
" 1868	31·47	209	25·54	79	26·69	27·42	30·15	27·51	29·200
" 1867	28·99	198	16·25*	...	33·68	26·61	27·82	24·45	24·100
" 1866	......	...	......	...	33·87	30·02	35·06	32·18	26·890
" 1865	......	...	......	...	32·45	30·39	34·26	28·65	28·920
" 1864	......	...	......	...	29·54	31·97	28·69	......	30·100
" 1863	......	...	......	...	......	25·86	30·09	......	......
" 1862	......	...	......	...	......	30·04	27·12	......	......
" 1861	......	...	......	...	......	26·17	27·10	......	......
" 1860	......	...	......	...	......	......	......	......	......
" 1859	......	...	......	...	......	25·98	......	......	......
" 1858	......	...	......	...	......	24·27	......	......	......
" 1857	......	...	......	...	......	27·11	......	......	......
" 1856	......	...	......	...	......	32·90	......	......	......
Average of Years	29·62 4 years.	201 4 yrs.	26·57 3 years.	77 3 yrs.	30·12 7 years.	27·78 14 years.	29·08 10 years.	26·66 6 years.	25·945 7 years.
Difference in 1870 from Mean...	—0·81 Inches.	+2 Days	+0·67 Inches.	—10 Days	—0·76 Inches.	—4·51 Inches.	—3·70 Inches.	—2·82 Inches.	—6·740 Inches.

* For 8 months.

L

…hill, …rton.	Gree… Cra…	North Shields, Rosella Place.		North Shields, Clementhorpe.		North Shields, Low Lights.		Tynemouth Pier Works.	
…et.	800 f…	125 feet.		150 feet.		12 feet.		61 ft. 10 in.	
…es.	6 inc…	1 foot.		1 foot.		3 ft. in.		1 ft. 2 in.	
…ity.	Quant…	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.
…es.	Inch…	Inches.		Inches.		Inches.		Inches.	
8	2·8	1·599	18	1·30	16	1·47	14	1·29	13
4	1·3	1·947	23	1·52	18	1·69	20	1·89	22
9	2·2	1·210	14	0·96	12	1·01	9	1·08	18
6	1·3	0·776	8	0·77	7	0·72	7	0·75	8
4	1·2	1·402	10	1·21	10	1·20	9	1·14	10
9	2·1	2·444	12	2·38	13	2·51	12	2·59	14
6	1·1	0·549	8	0·41	8	0·50	8	0·43	7
0	2·1	2·116	10	1·79	8	1·97	9	1·82	12
6	1·3	0·994	12	0·75	9	0·70	9	0·75	9
5	4·7	3·473	18	3·16	17	3·42	18	3·28	20
6	1·6	3·500	14	3·19	14	3·55	13	3·35	15
1	3·3	5·212	25	4·30	20	4·91	21	5·01	25
4	25.5	25·222	172†	21·74	152	23·65	149	23·38	173
0	30·5	23·938	166	20·70	163	22·42	160	22·68	174
0	29·8	23·35	173	20·92	174	22·46	171	21·05	170
5	28·4	23·61	163	......	...	22·49	175	24·22	...
8	34·2	25·39	188	......	...	26·62	192	23·68	...
.	....	26·89	130	......	...	25·56	142	23·47	...
9	27·6	26·00	...	......	...	27·60	...	......	...
1	30·4	24·70	...	......	...	24·74	224	......	...
6	22·1	28·01	...	......	...	28·01	260	......	...
..	....	24·76	...	......	...	24·76	264	......	...
..	....	32·19	...	......	...	32·18	290	......	...
..	....	......	...	......	...	......	...	......	...
..	....	......	...	......	...	......	...	......	...
..	....	......	...	......	...	......	...	......	...
..	....	......	...	......	...	......	...	......	...
9 …rs.	28·… 8 yea…	25·914 11 years.	165 6 yrs.	21·12 3 years.	163 3 yrs.	25·45 11 years.	212 10 yrs.	23·08 6 years.	172 3 yrs.
45 …es.	—3… Inch…	—0·692 Inches.	+7 Days	+0·62 Inches.	—11 Days	—1·80 Inches.	—63 Days	+0·30 Inches.	+1 Day

† 55 additional days not appearing in quantity.

RAINFALL FOR 1870 (CONTINUED).

TYNE DISTRICT.

Place.	Byrness.		Otterburn.		Haltwhistle, Unthank Hall.		Bellingham, Hesleyside.		Allenheads.		Park End, Hexham.	
Height of Guage... Above Sea Level	700 feet.		500 feet.		380 feet.		420(?) feet.		1360 feet.		276 feet.	
Height of Guage... Above Ground ...	2 ,,		1 foot.		6 inches.		3 ft. 10 in.		9 inches.		4 inches.	
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.	
January	3·96	14	2·90	...	3·22	16	Monthly returns not furnished.	Monthly returns not furnished.	4·46	23	2·98	13
February	2·39	22	3·07	...	2·38	22			4·76	26	2·67	7
March	0·06	2	1·09	...	1·29	9			2·08	21	0·82	12
April	0·79	8	1·12	...	0·83	5			1·79	12	1·49	10
May	2·71	14	1·82	...	1·50	13			3·14	20	1·37	16
June	2·64	14	1·80	...	2·49	13			2·03	19	2·10	15
July	0·69	8	0·78	...	1·46	10			0·82	17	0·87	10
August	1·74	7	2·20	...	1·35	5			2·39	13	2·04	8
September	2·17	10	1·25	...	2·32	11			3·08	22	1·52	14
October	4·89	...	4·55	...	5·14	22			9·98	25	4·40	20
November	1·76	...	1·67	...	1·80	15			2·42	22	1·80	13
December	4·32	...	4·20	...	3·12	21			7·34	28	3·10	16
Total for 1870	28·12	...	26·45	..	26·90	162	31·99	74	44·29	248	25·16	162
,, 1869	34·35	170	29·88	...	33·07	159	49·52	108	54·40	267	33·43	201
,, 1868	37·26	187	34·06	145	......	...	......	...	56·40	266	34·33	203
,, 1867	......	...	31·59	154	......	...	......	...	49·45	268	28·53	216
,, 1866	......	...	36·02	...	......	...	......	...	56·84	287	41·83	228
,, 1865	......	...	......	...	......	...	......	...	44·42	248	29·80	...
,, 1864	......	...	......	...	......	...	......	...	43·24	258	29·02	...
,, 1863	......	...	......	...	......	...	......	...	54·01	...	41·77	...
,, 1862	......	...	......	...	......	...	......	...	44·20	291	34·76	...
,, 1861	......	...	......	...	......	...	......	...	49·35	282	31·07	...
,, 1860	......	...	......	...	......	...	......	...	59·15	297	31·04	...
,, 1859	......	...	......	...	......	...	......	...	47·70	259	......	...
,, 1858	......	...	......	...	......	...	......	...	37·21	229	26·00	...
,, 1857	......	...	......	...	......	...	......	...	41·79	...	25·68	...
,, 1856	......	...	......	...	......	...	......	...	45·48	...	45·87	...
Average of Years	33·24 3 years.	...	31·60 5 years.	149 2 yrs.	29·98 2 years.	160 2 yrs.	40·70 2 years.	91 2 yrs.	48·54 15 years.	266 12 yrs	32·73 14 years.	202 5 yrs.
Difference in 1870 from Mean	—5·12 Inches.	...	—5·15 Inches.	...	—3·08 Inches.	+3 Days	—8 71 Inches.	—17 Days	—4·25 Inches.	—16 Days	—7·57 Inches.	—40 Days

Place.	Whittle Dean Reservoir.	Hallington Village.	Fawcett.	Woodford.	Camphill, Gunnerton.	Green Crag.	Valley of No. Tyne.	Bywell.		Wylam.		Stamfordham Ground.	Stamfordham Church Tower.
Height of Guage... Above Sea Level		469 feet.	563 feet.	500 feet.	676 feet.	800 feet.		86 ft. 6 in.		60 Feet.		460 feet.	452 feet.
Height of Guage... Above Ground ...			6 inches.	6 inches.	6 inches.	6 inches.		6 inches.		5 ,,		1 foot.	42 ,,
Month.	Quantity.	Quantity.	Quantity.	Quantity.	Quantity.	Quantity.	Quantity.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Quantity.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.		Inches.		Inches.	Inches
January	1·55	2·47	2·28	2·36	2 58	2·89	2·53	1·53	20	1·55	15	0·81	Monthly returns not furnished.
February	0·91	1·64	1·62	1·47	1·64	1·34	1·06	1·89	25	1·94	17	0·77	
March	1·32	2·13	1·74	2·84	2·59	2·27	1·94	1·16	17	1·35	17	5·34	
April	0·74	1·24	1·16	1·23	1·16	1·38	1·07	0·64	9	1·01	5	0·80	
May	0·74	1·09	0·98	1·13	1·14	1·23	1·05	0·80	11	0·72	7	0·92	
June	1·36	2·02	1·68	1·80	2·09	2·11	1·84	1·61	17	1·40	12	1·71	
July	0·68	1·12	1·09	1·11	1·16	1·17	1·25	0·71	8	0·63	5	0·54	
August	1·69	2·20	2·22	2·32	1·90	2·13	2·11	2·17	12	2·39	8	2·34	
September	1·24	1·49	1·43	1·35	1·16	1·30	1·38	1·52	14	1·07	11	1·00	
October	3·62	4·56	4·33	4·36	4·05	4·73	4·36	5·18	21	4·81	22	3·90	
November	1·60	2·04	1·40	1·72	1·46	1·65	1·19	2·44	16	2·73	15	2·60	
December	3·93	4·19	3·33	3·87	3·91	3·38	3·11	6·19	25	4·83	20	5·42	
Total for 1870	19·38	26·19	23·26	25·56	24·84	25.58	22·89	25·84	195	24·43	154	26·15	20·07
,, 1869	23·06	28·54	26 95	29·36	29·90	30·59	29·20	24·97	204	25·15	157	24·93	18·36
,, 1868	23·77	28·69	27·08	29·17	30·60	29·89	30·11	27·70	199	26·43	131	25·41	......
,, 1867	23·39	25·07	25·66	29·65	29·95	28·49	26·97	27·55	227	22·38	144	25·53	......
,, 1866	33·45	33·42	31·35	33·84	34·18	34·28	33·45	29·19	230	29·81	173	30·09	......
,, 1865	......	......	......	......	......	......	......	29·82	186	29·67	156	27·41	......
,, 1864	25·92	27·70	26·25	26·08	23·09	27·69	24·96	28·81	188	27·57	206	26·93	......
,, 1863	27·09	32·66	31·56	30·25	32·31	30·40	34·31	28·49	198	28·39	185	28·60	......
,, 1862	24·32	27·62	25·95	24·93	29·46	22·19	26·68	26·49	199	24·68	211	26·00	......
,, 1861	......	......	......	......	......	......	......	23·80	213	23 54	...	26·22	......
,, 1860	......	......	......	......	......	......	......	38 00	259	31·38	...	35·26	......
,, 1859	......	......	......	......	......	......	......	27·34	182	25·15	...	27·85	......
,, 1858	......	......	......	......	......	......	......	21·88	165	18·20	...	29·19	......
,, 1857	......	......	......	......	......	......	......	27·55	...	24·47	...	28·86	......
,, 1856	......	......	......	......	......	......	......	29·82	...	29·25	...	35·06	......
Average of Years	25·04 8 years.	28·73 8 years.	27·26 8 years.	28·60 8 years.	29·29 8 years.	28·64 8 years.	28·57 8 years.	27·82 15 years.	203 13 yrs	26·03 15 years.	168 9 yrs.	28·23 15 years.	19·21 2 years.
Difference in 1870 from Mean	—5·66 Inches.	—2·54 Inches.	—4·00 Inches.	—3·04 Inches.	—4·45 Inches.	—3·06 Inches.	—5·68 Inches.	—1·98 Inches.	—08 Days	—1·60 Inches.	—14 Days	—2·08 Inches.	+0.86 Inches.

Place.	Shotley Hall.		Newcastle, West Parade.		Newcastle, 30, Rye Hill.		Newcastle, Deaf and Dumb Institution.		Newcastle, Lit and Phil. Institution.*	
Height of Guage... Above Sea Level	312 feet.		270 feet.		200 feet.		200 ft. 9 in.		105 feet.	
Height of Guage... Above Ground ...	3 inches.		4 inches.		1 ft. 6 in.		6 inches.		7 inches.	
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.
	Inches.		Inches.		Inches		Inches.		Inches.	
January	1·75	11	1·28	8	1·52	16	1·55	16	1·43	10
February	2·06	13	2·00	18	1·91	22	2·33	21	2·35	10
March	1·66	10	1·51	16	1·36	11	1·42	14	1·49	11
April	0·70	4	1·13	9	0·64	2	1·13	8	0·83	5
May	1·03	7	1·20	10	1·09	7	1·17	8	1·08	6
June	1·58	12	2·00	15	1·59	7	2·26	18	1·79	9
July	0·75	5	0·49	8	0 47	9	0·45	9	0·67	5
August	2·06	7	2·42	8	1·69	10	2·32	10	1·88	6
September	0·88	9	0·97	11	1·05	11	0·99	14	1·40	12
October	4·60	17	4·15	19	3·94	17	3·92	23	4·00	11
November	2·33	7	2·46	7	2·36	10	2·88	14	2·64	10
December	6·07	16	4·34	15	4·99	22	4·68	26	4·02	14
Total for 1870	25·47	118	22·95	144	22·61	144	25·10	181	23·58	109
,, 1869	26·22	148	......	...	25·48	179	24·78	155	30·01	160
,, 1868	28·01	149	......	...	......	...	24·51	154	26·25	175
,, 1867	......	...	......	...	......	...	......	...	22·29	134
,, 1866	......	...	......	...	......	...	......	...	22·19	169
,, 1865	......	...	......	...	......	...	......	...	21·24	124
,, 1864	......	...	......	...	......	...	......	...	......	...
,, 1863	......	...	......	...	......	...	......	...	......	...
,, 1862	......	...	......	...	......	...	......	...	......	...
,, 1861	......	...	......	...	......	...	......	...	19·56	...
,, 1860	......	...	......	...	......	...	......	...	27·40	...
,, 1859	......	...	......	...	......	...	......	...	18·41	...
,, 1858	......	...	......	...	......	...	......	...	13·29	...
,, 1857	......	...	......	...	......	...	......	...	16·43	...
,, 1856	......	...	......	...	......	...	......	...	21·22	...
Average of Years	26·57 3 years.	138 3 yrs.	22·95 1 year.	144 1 yr.	24·05 2 years.	161 2 yrs.	24·79 3 years.	163 3 yrs.	21·82 12 years.	145 6 yrs.
Difference in 1870 from Mean	—1·10 Inches.	—20 Days	......	...	—1·44 Inches.	17 Days	+0·31 Inches.	+18 Days	+1·76 Inches.	36 Days

Place.	Wallsend.		North Shields, Rosella Place.		North Shields, Clementhorpe.		North Shields, Low Lights.		Tynemouth Pier Works.	
Height of Guage... Above Sea Level	100 feet.		125 feet.		150 feet.		12 feet.		61 ft. 10 in.	
Height of Guage... Above Ground ...	6 inches.		1 foot.		1 foot.		3 ft. in.		1 ft. 2 in.	
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.
	Inches.		Inches.		Inches.		Inches.		Inches.	
January	1·498	...	1·599	18	1·30	16	1·47	14	1·29	18
February	1·807	...	1·947	23	1·52	18	1·69	20	1·89	22
March	1·228	...	1·210	14	0·96	12	1·01	9	1·08	18
April	0·865	...	0·776	8	0·77	7	0·72	7	0·75	8
May	1·470	...	1·402	10	1·21	10	1·20	9	1·14	10
June	1·996	...	2·444	12	2·38	13	2·51	12	2·59	14
July	0·790	...	0·549	8	0·41	8	0·50	8	0·43	7
August	2·101	...	2·116	10	1·79	8	1·97	9	1·82	12
September	0·495	...	0·994	12	0·75	9	0·70	9	0·75	9
October	3·634	...	3·473	18	3·16	17	3·42	18	3·28	20
November	2·783	...	3·500	14	3·19	14	3·55	13	3·35	15
December	5·236	...	5·212	25	4·30	20	4·91	21	5·01	25
Total for 1870	23·903	...	25·222	172†	21·74	152	23·65	149	23·38	173
,, 1869	24·354	91	23·938	166	20·70	163	22·42	160	22·68	174
,, 1868	24·490	113	23·35	173	20·92	174	22·46	171	21·05	170
,, 1867	25·240	...	23·61	163	......	...	22·49	175	24·22	...
,, 1866	26·650	...	25·39	188	......	...	26·62	192	28·68	...
,, 1865	27·290	...	26·89	130	......	...	25·56	142	23·47	...
,, 1864	27·820	...	26·00	...	......	...	27·60	...	......	...
,, 1863	26·240	...	24·70	...	......	...	24·74	224	......	...
,, 1862	25·680	...	28·01	...	......	...	28·01	260	......	...
,, 1861	24·620	...	24·76	...	......	...	24·76	264	......	...
,, 1860	34·120	...	32·19	...	......	...	32·18	290	......	...
,, 1859	23·510	...	......	...	......	...	......	...	......	...
,, 1858	......	...	......	...	......	...	......	...	......	...
,, 1857	......	...	......	...	......	...	......	...	......	...
,, 1856	......	...	......	...	......	...	......	...	......	...
Average of Years	26·160 12 years.	102 2 yrs.	25·914 11 years.	165 6 yrs.	21·12 3 years.	163 3 yrs.	25·45 11 years.	212 10 yrs	23·08 6 years.	172 3 yrs.
Difference in 1870 from Mean	—2·257 Inches.	...	—0·692 Inches.	+7 Days	+0·62 Inches.	—11 Days	—1·80 Inches.	—63 Days	+0·30 Inches.	+1 Day

* Owing to the peculiarity of the Guage then in use, 10 per cent. should be added to the quantities stated previously to 1868.

† 55 additional days not appearing in quantity.

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	NORTH SUND						
Height above Sea......	69 feet						
MONTHS.	Min.	Max.	Mean.	Dry Bulb.	Wet Bulb.		Highest Maximum Temperature recorded.
	Degrees	Degrees	Degrees	Degrees	Degress		
January	33·93	40·77	37·35	36·70	35·72	22°	41° on 4th, 7th, & 14th.
February	33·28	40·00	36·66	36·32	35·46	25°	48° on 28th.
March	34·77	45·40	40·00	38·80	37·80	25°	53° on 31st.
April	40·60	56·30	48·50	44·70	43·50	35°	70° on 17th.
May	43·90	60·00	51·90	48·30	47·30	41°	73° on 26th.
June	47·90	67·40	57·68	54·00	53·00	43°	80° on 6th.
July	52·40	68·80	60·60	56·60	55·60	47°	88° on 23rd.
August	53·40	67·90	60·70	56·10	55·10	48°	80° on 11th.
September	45·90	62·80	54·35	52·00	50·95	36°	70° on 29th.
October	40·87	54·00	47 40	46·70	45·60	32°	64° on 4th.
November	34·60	46·00	40·30	39·80	38·95	30°	54° on 3rd.
December	31·40	40·60	36·00	37·10	36·00	15°	48° on 19th.
Average—1870	41.92	54·16	48·04	......	......	....	....
Ditto 1869	42·60	54·20	48·40	......	......	.. .	....
Ditto 1868	44·00	54·20	49·10	......	......	....	....
Ditto 1867	......	......	......	......	......	....	....

TABLES OF TEMPERATURE FOR 1870.

Months.	North Sunderland. Min.	Max.	Mean.	Dry Bulb.	Wet Bulb.	Lowest Minimum Temperature recorded.	Highest Maximum Temperature recorded.	Alnwick Castle. Min.	Max.	Mean.	Lowest Minimum Temperature recorded.	Highest Maximum Temperature recorded.
Height above Sea......	69 feet.							178 feet.				
	Degrees	Degrees	Degrees	Degrees	Degrees			Degrees	Degrees	Degrees		
January	33·93	40·77	37·35	36·70	35·72	22° on 29th & 30th.	46° on 3rd & 15th.	32·2	36·3	34·2	21° on 29th & 30th.	44° on 1st, 4th, 5th, 7th, 8th, & 9th.
February	33·28	40·00	36·66	36·32	35·46	25° on 27th.	56° on 28th.	31·8	38·8	35·3	27° on 27th.	45° on 4th & 28th.
March	34·77	45·40	40·00	38·80	37·80	25° on 12th.	57° on 20th.	34·9	42·9	38·9	25° on 12th.	55° on 21st.
April	40·60	56·30	48·50	44·70	43·50	35° on 3rd.	68° on 25th.	40·3	53·7	47·0	33° on 3rd.	63° on 26th.
May	43·90	60·00	51·90	48·30	47·30	41° on 3rd.	71° on 20th.	44·8	56·7	50·7	35° on 2nd & 3rd.	66° on 20th.
June	47·90	67·40	57·68	54·00	53·00	43° on 2nd, 11th, and 24th.	81° on 21st.	50·0	63·0	56·1	44° on 2nd.	72° on 22nd.
July	52·40	68·80	60·60	56·60	55·60	47° on 1st, 3rd, & 6th.	75° on 19th & 23rd.	53·8	65·9	59·8	48° on 1st.	74° on 24th.
August	53·40	67·90	60·70	56·10	55·10	48° on 11th.	75° on 18th.	50·9	61·7	56·3	45° on 29th.	69° on 6th & 7th.
September	45·90	62·80	54·35	52·00	50·95	36° on 15th.	70° on 5th.	46·3	59·9	53·1	34° on 15th	65° on 6th.
October	40·87	54·00	47 40	46·70	45·60	32° on 15th.	60° on 2nd.	42·6	51·4	47·0	33° on 15th.	56° on 2nd & 3rd.
November	34·60	46·00	40·30	39·80	38·95	30° on 9th.	56° on 3rd.	35·5	43·9	39·6	31° on 9th & 19th.	54° on 4th.
December	31·40	40·60	36·00	37·10	36·00	15° on 31st.	51° on 14th.	31·5	39·6	35·5	14° on 31st.	52° on 19th.
Average—1870	41.92	54·16	48·04	......	......	......	......	41·2	51·1	46·2	......	......
Ditto 1869	42·60	54·20	48·40	......	......	......	......	......	......	......	......	......
Ditto 1868	44·00	54·20	49·10	......	......	......	......	......	......	......	......	......
Ditto 1867	......	......	......	......	......	......	......	......	......	......	......	......

Months.	Wallington. Min.	Max.	Mean.	Lowest Minimum Temperature recorded.	Highest Maximum Temperature recorded.	Cragside, Rothbury. Dry Bulb.	Wet Bulb.	Min.	Max.	Mean.	Lowest Minimum Temperature recorded.	Highest Maximum Temperature recorded.
Height above Sea......	398 feet.					400 feet.						
	Degrees	Degrees	Degrees			Degrees	Degrees	Degrees	Degrees	Degrees		
January	27·9	36·4	32·1	11° on 29th.	41° on 4th, 7th, & 14th.	33·1	32·7	28·7	40·2	34·5	16° on 29th.	45° on 4th.
February	28·4	38·0	33·2	17° on 10th.	48° on 28th.	33·0	32·7	27·7	39·6	33·6	14° on 25th.	51° on 28th.
March	31·5	44·4	37·9	20° on 27th & 28th.	53° on 31st.	38·2	36·8	31·4	46·7	39·0	22° on 12th.	60° on 20th.
April	34·9	55·2	45·0	24° on 6th.	70° on 17th.	48·5	46·1	37·1	43·6	40·3	28° on 5th.	70° on 20th.
May	38·7	58·1	48·4	28° on 4th.	73° on 26th.	52·5	50·2	40·9	61·9	51·4	32° on 2nd & 3rd.	75° on 26th.
June	44·7	64·2	54·4	33° on 28th.	80° on 6th.	56·1	54·9	46·1	68·5	57·3	40° on 3rd & 28th.	77° on 27th.
July	47·7	69·2	58·4	40° on 2nd.	88° on 23rd.	60·5	58·8	49·9	72·7	61·3	40° on 1st.	89° on 23rd.
August	48·0	68·9	58·4	37° on 16th.	80° on 11th.	60·2	56·0	46·8	67·6	57·2	40° on 16th, 27th, and 30th.	79° on 5th.
September	39·5	62·5	50·6	30° on 9th.	70° on 29th.	53·5	51·2	42·3	63·2	54·2	36° on 19th, 29th, and 30th.	68° on 29th.
October	37·1	50·2	43·6	28° on 5th.	64° on 4th.	45·0	44·0	37·1	53·8	45·5	30° on 15th.	64° on 2nd.
November	30 2	42·2	36·2	22° on 9th.	54° on 3rd.	37·7	36·1	31·9	44·6	38·2	26° on 8th.	57° on 3rd.
December	26·5	36·1	31·3	3° on 31st.	48° on 19th.	32·7	32·1	26·4	38·7	32·5	4° on 31st.	45° on 6th.
Average—1870	36·2	52·1	44·1	......	......	45·9	44·6	37·2	53·4	45·3	......	......
Ditto 1869	33·3	48·1	40·7	......	......	46·9	46·0	38·9	55·2	47·0	......	......
Ditto 1868	36·4	51·2	43·8	......	......	......	......	......	......	......	......	......
Ditto 1867	37·5	51·4	44·5	......	......	......	......	......	......	......	......	......

Months.	Allenheads. Mean of all the highest.	Mean of all the lowest.	Bywell. Mean of all the highest.	Mean of all the lowest.	Newcastle-on-Tyne (West Parade). Date.	Highest	Date.	Lowest.	Mean of Month.	North Shields (Rosella Place). Highest	Lowest.	Mean.	Ground.	Range of Thermometer.
Height above Sea......	1360 feet.		86·5 feet.		270 feet.					125 feet.				
	Degrees	Degrees	Degrees	Degrees		Degrees		Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees
January	37·5	29·3	42·9	31·1	4th.	45	27th.	20	35·25	48·8	22·7	37·4	20·5	26·1
February	36·9	27·3	42·5	31·4	28th.	51	10th to 14th	26	36·38	54·0	24·0	37·1	22·5	30·0
March	42·7	31·0	48·5	33·9	17th.	53	13th.	25	40·3	57·0	25·0	40·1	25·0	32·0
April	53·8	37·4	59·2	40·7	20th.	74	5th.	34	49·16	64·2	32·5	48·8	30·0	31·7
May	57·1	40·9	60·9	45·9	29th.	74	2nd.	31	53·0	70·4	33·5	52·6	31·7	36·9
June	62·6	47·2	67·2	54·4	21st.	82	28th.	42	60·15	75·8	43·0	56·8	41·0	32·8
July	67·5	51·5	72·9	56·4	23rd.	89	2nd.	46	63·0	76·2	47·2	60·7	42·0	29·0
August	65·1	47·3	69·3	53·0	11th.	81	29th.	43	60·23	70·7	43·0	57·5	42·0	27·7
September	60·3	44·5	65·7	47·0	28th.	72	15th.	38	57·38	67·2	38·0	53·9	37·4	29·2
October	50·9	38·1	56·1	42·4	1st.	65	26th.	34	48·85	61·0	34·7	48·3	32·8	26·3
November	41·7	31·6	46·6	34·1	1st.	54	10th to 12th	30	40·6	56·0	30·0	40·8	27·0	26·0
December	35·6	25·4	39·1	29·2	......	......	31st.	13	......	54·0	13·3	36·1	11·0	40·7
Average—1870	50·9	37·7	55·9	41·6	Means	61·8	......	30·1	45·29	62·9	32·2	47·5	30·2	30·7
Ditto 1869	52·0	39·6	58·6	42·8	......	......	......	......	......	......	......	......	......	......
Ditto 1868	49·6	36·6	......	......	......	......	......	......	......	......	......	......	......	......
Ditto 1867	50·7	37·7	......	......	......	......	......	......	......	......	......	......	......	......

	NORTH SHIELDS POST OFFICE.						
Height above Sea......	80 feet (?)						
MONTHS.	Dry Bulb.	Wet Bulb.	Min.	Max.	Mean.	Lowest Minimum Temperature recorded.	Wet Bulb. 9 A.M.
	Degrees	Degrees	Degrees	Degrees	Degrees		Degrees
January	...	......	......	......	......	....	33·4
February...............	...	......	......	......	......	....	33·7
March	...	......	......	......	.....	....	36·5
			No	record	made.		
April	...	......	......	......	......	....	45·1
May...............	...	......	......	......	......	....	48·4
June	...	......	......	......	......	....	54·1
July...............	62·5	60·7	56·5	65·8	61·1	51° on 1st & 2nd.	57·9
August	58.6	56·3	53·5	62·3	57·9	46° on 29th & 30th	54·7
September	55·7	52·7	49·7	59·3	54·5	46° on 30th.	46·8
October	48·3	46·7	43·9	51·1	47 5	37° on 11th.	45·7
November	40·4	39·3	36·8	42·8	39·8	32° on 12th & 13th	36·3
December	36·2	35·2	32·8	38·1	35·5	19° on 31st.	32·0
Average—1870	......	......	......	......	......	....	43·7
Ditto 1869	......	......	......	......	......	....	45·4
Ditto 1868	......	......	......	......	......	....	......
Ditto 1867	......	......	......	......	......	....	43·8

TEMPERATURE.

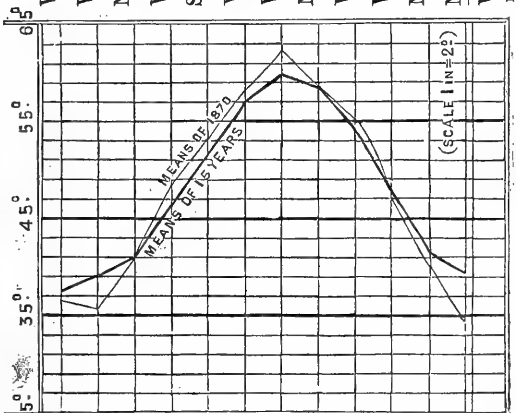
Various facts concerning the temperature of the different months have already been recorded. Mr. George Clayton Atkinson has forwarded the subjoined table and diagram of the variations of the thermometer at Wylam. It will be seen that the winter months, January, February, October, November, and December were exceptionally cold; while the spring and summer months, April, May, June, and July were considerably warmer than usual, one consequence of which was a great abundance of well ripened fruit and a good harvest.

The lowest temperature of the year at Wylam was 8° on December the 23rd; the highest 88° on July the 24th.

DIAGRAM OF MEAN MONTHLY TEMPERATURES IN 1870, AT WYLAM, COMPARED WITH THE MEAN MONTHLY TEMPERATURES FOR THE LAST 15 YEARS, 1870 INCLUDED.

A

	Means of 1870.	Means of 15 years.	1870. WIND.
January ...	36·53°	37·24°	W. 10° S.
February...	36·02°	39·13°	W. 14° N.
March	40·47°	40·50°	N. 3° E.
April	48·60°	46·19°	W. 3° S.
May.........	52·59°	51·04°	S.W. 10° N.
June.........	57·72°	56·90°	W.
July.........	62·24°	59·28°	W. 22° N.
August	58·83°	58·87°	N.E. 3° N.
September	55·11°	54·85°	W. 11° S.
October ...	47·29°	48·03°	W. 10° N.
November	39·50°	41·01°	N.W. 20° N.
December ..	33·97°	39·52°	N.W. 30° N.
Annual Mean	47·406°	47·713°	W. 20° N. Annual Mean Wind



TABLES OF TEMPERATURE FOR 1870 (CONTINUED.

Months.	North Shields Post Office. Dry Bulb.	Wet Bulb.	Min.	Max.	Mean.	Lowest Minimum Temperature recorded.	Highest Maximum Temperature recorded.	Shotley Hall. Min.	Max.	Mean.
Height above Sea......	80 feet (?)							312 feet.		
	Degrees	Degrees	Degrees	Degrees	Degrees			Degrees	Degrees	Degrees
January	...	......	......	......	......	......	......	31·7	40·5	36·1
February	...	......	......	......	......	......	......	31·7	40·5	36·1
March	...	......	......	......	......	......	......	33·9	45·6	39·8
			No	record	made.					
April	...	......	......	......	......	......	......	46·2	57·3	47·1
May	...	......	......	......	......	......	......	45·8	60·7	53·3
June	...	......	......	......	......	......	......	54·3	66·0	60·2
July	62·5	60·7	56·5	65·8	61·1	51° on 1st & 2nd.	77° on 23rd.	55·4	70·0	62·7
August	58.6	56·3	53·5	62·3	57·9	46° on 29th & 30th.	67° on 8th.	50·1	65·9	58·0
September	55·7	52·7	49·7	59·3	54·5	46° on 30th.	65° on 6th.	46·9	61·2	54·1
October	48·3	46·7	43·9	51·1	47 5	37° on 11th.	56° on 1st & 2nd.	41·9	51·5	46·7
November	40·4	39·3	36·8	42·8	39·8	32° on 12th & 13th.	50° on 1st.	34·2	43·6	38·9
December	36·2	35·2	32·8	38·1	35·5	19° on 31st.	50° on 19th.	27·7	38·6	33·2
Average—1870	......	......	......	......	......	......	......	41·6	53·4	47·1
Ditto 1869	......	......	......	......	......	......	......	......	......	......
Ditto 1868	......	......	......	......	......	......	......	......	......	......
Ditto 1867	......	......	......	......	......	......	......	......	......	......

Months.	Durham Observatory. Highest Reading	Lowest Reading	Mean of all Max. Readings.	Mean of all Min. Readings.	Mean Temp. of the Month.	Mean Temp. of the Air.	Mean Temp. of Evaporation.	Mean Temp. of the Dew Point.	Relative Humidity Sat. —100.	Weight of Vapour in a cubic foot of Air.	Weight required for Saturation.	Weight of a cubic foot of Air.	Mean Elastic Force of Vapour.	Mean Pres. of Dry Air reduced to Sea level.
Height above Sea......	352·4 feet.													
	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Grains	Grains	Grains.	Inches	Inches
January	45·9	20·1	38·60	31·57	35·08	35·27	33·84	31·60	86·6	2·09	0·32	552·7	0·178	29 712
February	51·2	23·4	39·34	30·88	35·11	35·25	33·51	30·77	83·3	2·01	0·40	551·9	0·172	29·677
March	58·6	23·4	45.76	33·50	39·63	38·51	36·26	33·25	82·0	2·22	0·49	551·7	0·190	29·847
April	74·7	29·9	58·03	38·98	48·51	47·38	43·39	38·96	73·4	2·75	0·99	541·8	0·238	29·810
May	72·7	32·7	60·93	43·16	52·05	50·30	46·42	42·35	75·0	3·11	1·03	536·9	0·271	29·688
June	80·6	38·4	67·62	48·21	57·92	56·21	52·38	48·78	76·2	3·87	1·21	532·1	0·345	29·713
July	86·2	45·0	71·87	52·53	62·20	60·00	56·51	53·44	79·1	4·56	1·21	526·1	0·409	29·555
August	80·1	39·9	68·87	48·85	58·86	57·56	53·40	49·62	74·6	3·96	1·35	529·3	0·356	29·628
September	70·0	31·9	64·24	45·37	54·81	53·14	50 46	47·78	81·9	3·74	0·83	534·1	0·333	29·655
October	66·0	30·1	53·66	40·99	47·33	46·77	44·32	41·58	82·8	3·03	0·63	534·6	0·263	29 359
November	53·9	27 6	43·68	33·77	38 73	38·92	37·36	35·30	87·5	2·41	0 34	546·4	0·206	29·522
December	51·0	5·6	37·56	29·23	33·40	33·87	32·44	29·87	84·7	1·94	0·35	554 4	0·166	29·793
Average—1870	......	......	......	......	46·97	46·10	43·36	40·28	80·6	2·97	0·76	541·0	0·261	29·663
Ditto 1869	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Ditto 1868	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Ditto 1867	......	......	......	......	......									

*** These results are reduced from the readings of the Dry and Wet Bulb Thermometers, corrected for diurnal range by Glaisher's Tables—the observations being taken twice daily, viz., at 10 A.M. and 10 P.M.

Months.	Sedgefield. Dry Bulb. 9 A.M.	Wet Bulb. 9 A.M.	Dry Bulb. 9 P.M.	Wet Bulb. 9 P.M.	Min. Ther. 9 A.M.	Max. Ther. 9 A.M.	Mean of two preceding.	Lowest Minimum Temperature recorded.	Highest Maximum Temperature recorded.
Height above Sea......	360 feet.								
	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees		
January	34·1	33·4	34·6	33·7	31·9	38·6	35·3	20° on 27th.	46° on 4th & 8th.
February	34·9	33·7	34·4	33·5	31·7	39·7	35·9	21° on 25th.	52° on 28th.
March	38·7	36·5	37·3	35·8	33·5	45·5	39·5	23° on 13th.	54° on 21st.
April	50·1	45·1	45·3	41·9	39·6	58·5	48·8	31° on 5th.	76° on 20th.
May	52·7	48·4	48·1	45·6	43·7	58·5	51·0	32° on 4th.	70° on 29th.
June	58·4	54·1	53·1	51·2	48·7	64·9	56·8	41° on 28th.	79° on 21st.
July	62·5	57·9	57·7	55·1	52·8	69·0	60·5	45° on 2nd.	77° on 24th.
August	59·3	54·7	53·7	51·5	49·4	65·5	57·6	42° on 27th & 28th.	75° on 6th.
September	47·8	46·8	50·9	49·5	46·5	62·7	54·6	35° on 15th.	59° on 5th.
October	47·7	45·7	45·1	43·7	41·2	53·1	47·2	32° on 15th.	64° on 2nd & 4th.
November	37·4	36·3	37·1	36·2	34·3	44·1	39·2	26° on 15th.	54° on 1st.
December	33·0	32·0	33·0	32·2	30 1	37·6	33·6	9° on 31st.	50° on 12th.
Average—1870	46·3	43·7	44·2	42·5	40·3	53·1	46·6	......	......
Ditto 1869	48·6	45·4	44·2	42·8	40·9	53·3	47·0	......	......
Ditto 1868	......	......	......	......	41·5	55·5	48·0	......	......
Ditto 1867	45·8	43·8	......	......	40·5	57·0	45·7	......	......

Months.	Seaham Hall. Min.	Max.	Mean.	Gainford. Dry Bulb.	Wet Bulb.	Min.	Max.	Mean.	Hartlepool. Dry Bulb.	Wet Bulb.	Min.	Max.	Mean.	Brinkburn, Darlington. Min.	Max.	Mea
Height above Sea......	100 feet.			251·8 feet.					30 feet.					80 feet (?)		
	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degrees	Degr
January	29·8	38·6	34·2	44·0	38·5	28·8	39·9	34·3	36·6	35·6	34·4	39·7	37·0	29·0	38·0	33·
February	30·4	39·7	35·3	43·8	34·4	26·9	39·8	33·4	36·5	35·2	33·1	39·2	36·1	27·3	37·9	32·
March	30·8	45·2	38·0	36·0	28·0	28·0	47·0	37·5	38·7	36·4	35·2	43·1	39·1	29·1	44·7	37·8
April	37·7	59·3	48·5	48·2	45·0	62·0	36·6	49·3	47·6	44·2	41·8	54·5	48·1	35·3	60·1	47·9
May	40·3	64·1	52·2	53·2	49·6	42·2	64·6	53·4	51·9	47·8	46·5	57·3	51·4	40·7	62·6	51·9
June	46·5	68·9	58·2	59·3	55·5	46·5	68·3	57 4	56·3	52·6	51·6	62·9	57·2	44·2	69·0	57·5
July	51·4	70·7	61·0	59·5	58·1	52·2	74·3	63·2	60·2	56·8	56·5	66·1	61·3	50·1	77·3	63·7
August	48·1	65·9	56·9	56·9	52·9	46·1	71·4	58·7	57·2	54·5	53·8	61·0	57·4	45·5	69·9	57·7
September	41·6	63·3	52·4	52·2	50·5	41·1	64·8	52·9	54·3	51·7	50·2	60·7	55·4	41·1	66·0	53·8
October	39·2	53·1	46·2	45·8	45·7	36·9	54·1	45·0	48·4	46·5	45·6	52·2	48·9	37·3	53·1	45·1
November	31·1	43·4	33·9	37·3	36·9	28·6	44·6	36·6	39·8	38·3	37·2	43·6	40·4	29·7	43·8	36·5
December	28·9	39·5	34·3	32·3	38·9	24·7	37·7	31·2	36·0	34·8	33·0	39·7	36·4	......	......	......
Average—1870	37·9	54·1	46·0	47·4	44·5	38·6	53·6	46·1	46·9	44·5	43·2	51·7	47·1	34·1	51·8	43·1
Ditto 1869	39·5	54·8	47·1	......	......	......	......	......	......	......	43·5	51·8	47·6	......	......	
Ditto 1868	41·1	57·3	48 8	......	......	......	......	......	......	......	......	......	......	......	......	
Ditto 1867	39·9	54·3	54·3	......	......	......	......	......	......	......	......	......	......	......	......	

The following list shows the lowest temperature for each day in December, 1870 (according to a self-registering thermometer, four feet from the ground), at Gainford:—

December 1	30°	December 17	20·5°	December 29	18·5°
,, 2	26°	,, 18	27°	,, 30	20·0°
,, 3	29°	,, 21	26·5°	,, 31	0·3°
,, 7	28°	,, 22	16°	*i.e.* 3 degrees below zero.	
,, 8	23°	,, 23	7·5°		
,, 9	24°	,, 24	0·5°		
,, 10	31°	,, 25	14·5°		
,, 12	29°	,, 26	21°		
,, 14	25°	,, 27	14°		
,, 16	24°	,, 28	11°		

The readings are taken at 9 A.M. daily, and, therefore, give the extreme degree of cold during the previous 24 hours.

WIND.

The following tables shows the number of days on which the wind blew from each quarter at the different stations from which observations have been received.

Mr. T. W. Backhouse, of Sunderland, has been good enough to prepare the following statement which shows—A, the number of hours that each wind blew in 1870, according to observations made several times a day; B, the amount of rain with each wind, as nearly as could be ascertained; and C, the amount that would have fallen with each wind in a year if it had fallen in the same proportion: showing that 1870 the N.E. wind was the wettest, and the S.W. the dryest.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	UNCERTAIN.
A—	477,	377,	517,	909,	806,	1281,	1966,	1097,	1330
B—	2·02,	1·70,	1·67,	3·01,	1·32,	1·71,	2·92,	4·24,	4·32
C—	37·1,	39·5,	28·3,	29·0,	14·3,	11·7,	13·0,	33·9.	

NOTES ON FLOWERING PLANTS.

January.—

Acklam, near Middlesbro.'—Field daisy on the 4th.

February.—

Wallington.—The Christmas rose, winter aconite, and the snowdrop were the only flowers observed to be in bloom.

Acklam, near Middlesbro'.—On the 6th the catkins on the

RELATIVE PREVALENCE OF WIND FROM DIFFERENT QUARTERS IN 1870.

ALNWICK.		NORTH SHIELDS.—Rosella Place.			WYLAM.	DURHAM OBSERVATORY.			
Days and Direction.	Calculated Average Velocity in Miles.*	1870.	Prevailing Wind and Force.	Av. Amt. of Cloud.	Direction.	Estimated force, 0·10.	Mean Velocity.	Times observed in each quarter.	Relative frequency.
							miles.		
N. 31	January ... 24·6	January......	N.W. ... 1·5	5·8	W. 10° S.	1·19	10·06	N....... 75	10·29
N.E. ... 34	February 30·1	February ...	S.W. ... 1·6	7·9	W. 14° N.	2·13	14·15	N.E.... 65	8·92
N.W. ... 23	March...... 27·0	March	N.E. ... 1·9	6·4	N. 3° E.	1·67	11·37	E....... 54	7·41
S. 36	April ...... 30·4	April	N.W. ... 1·8	4·8	W. 3° S.	1·83	12·30	S.E. ... 29	3·98
S.E. ... 42	May......... 31·9	May	S.W. ... 1·7	6·8	S.W. 10° N.	1·90	12·91	S. 159	21·80
S.W. ... 61	June ...... 30·7	June	N.W. ... 1·6	6·9	W.	1·18	7·68	S.W.... 87	11·93
E. 7	July......... 22·3	July	N.W. ... 1·7	6·4	W. 22° N.	1·09	7·61	W. ... 136	18·66
W. 65	August ... 17·3	August	N.E. ... 1·8	6·1	N.E. 3° N.	1·07	7·03	N.W... 95	13·03
Variable 66	September 24·6	September ...	S.W. ... 1.7	5·4	W. 11° S.	1·27	9·09	Calm... 29	3·98
	October ... 30·7	October	S.W. ... 2·0	6·6	W. 10° N.	1·58	10·92		
365	November 22·6	November ...	N.W. ... 1·5	6·8	N.W. 20° N.	1.30	8·71	2)729*	100·00
	December 29·7	December ...	N.W. ... 1·7	6·5	N.W. 30° N.	1·39	10·35		
			N.W. ... 1·7	6·3	W. 20° N.	1·48	10·18	364½ dys. *Defective 1 Reading in July	

* Registered by self-acting Anemometer at Alnwick Castle.

Direction.	North Sunderland.	Rothbury.	Wallington	Whitley.	Newcastle.	Cresswell.	North Shields. Post Office.*	Shotley Hall.	Sunderland West Hendon House.†	Sedgefield.	Seaham Hall.‡	Seaham. London-derry Office.	Darlington §	Gainford. ‖	Acklam, Middlesbro	Hartlepool.
	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.
N.	75	44	12	33	28	30	29	26	18	10	98	37	50	60	53	82
N.E. ...	14	22	72	40	26	32	17	37	11	7	34	37	64	6	37	36
N.W....	25	104	87	57	38	73	20	49	62	18	22	34	33	78	40	40
S.	86	15	14	23	33	13	20	23	35	76	46	37	35	11	35	29
S.E. ...	19	48	36	44	11	74	5	23	24	12	14	36	27	2	14	46
S.W. ...	37	46	48	73	63	49	28	59	57	38	29	24	77	10	90	93
E.	21	16	12	18	24	22	11	39	16	32	31	44	5	10	25	8
W.	88	70	74	77	94	66	54	73	91	133	61	91	65	58	71	29
Variable	...	...	...	...	...	...	...	...	...	39	...	25	...	...	...	...
Total	365	365	365	365	317	359	184	329	314	365	335	365	356	235	365	365

* July—December. † No observation made in August. Deficencies in April, July, September, October, and November. ‡ No observations in June.
§ Nine Days no observations. ‖ May, December.

ES

ON.	
lossom	ssom
one.	..
ril 26	8
y 21	..
a Tree Blossom	..
.....	..
y 6	29
ly 20	..
y 28	..
ne 25	..
ril 8	22
ril 16	20
y 30	25
r. 31	..
y 28	..
y 29	..
y 27	26
ril 20	..
y 19	27
ly 1	..
y 25	..
ne 1	..
.....	..
ne 22	..
ne 8	20
ril 6	..
ay 18	..
ril 25	20

FOREST TREES, SHRUBS, &c.

FOREST TREES AND SHRUBS.	NORTH SUNDERLAND.		CRAGSIDE, ROTHBURY.			WALLINGTON.				CRESSWELL.				NORTH SHIELDS.		SEAHAM HALL.				ACKLAM, NEAR MIDDLESBRO'.				GRETA BRIDGE.		
	In Leaf.	In Blossom	In Bud.	In Leaf.	In Blossom	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Leaf.	In Blossom	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Bud.	In Leaf.	In Blossom
Alder	......	......	April 4	......	......	April 4	April 25	None.	Oct. 31	......	May 12	June 30	Nov. 15	......	......	April 20	May 12	April 4	Most of the Forest Trees began to change the colour of their leaves after the 28th day of September.	April 15	April 30	April 15	Oct. 31	......	......	......
Ash	......	......	May 4	May 24	......	April 14	May 28	April 26	Oct. 12	......	June 1	May —	Oct. 12	......	......	......	May 30	......		April 25	May 23	April 20	Oct. 20	......	May 22	May 8
Barberry	May 22	......	......	......	......	April 1	April 18	May 21	Oct. 26	......	May 18	April 15	Nov. 8	......	......	......	......	June 19		April 12	April 23	May 18	Nov. 4	......	......	......
Beech	May 26	......	May 14	......	......	April 14	April 23	Not a Tree in Blossom	Oct. 28	......	May 18	May 25	Dec. 1	May 7	......	April 20	May 20	......		April 22	May 9	May 30	Oct. 25	April 2	Mar. 1	......
Birch	......	......	April 10	May 30	......	April 6	May 7	......	Nov. 4	......	April 26	April 26	Nov. 1	......	......	......	May 20	......		April 15	April 25	April 21	Nov. 5	......	......	... ..
Black Thorn	......	May 2	......	......	April 28	Mar. 22	April 20	May 6	Oct. 27	......	May 18	April 24	Nov. 1	......	April 23	April 3	May 4	May 12		Mar. 26	April 25	April 18	Oct. 29	......	Mar. 29	May 29
Bramble	......	......	......	......	......	Mar. 12	April 12	July 20	Dec. 20	......	May 6	June 18	Nov. 10	......	......	April 4	April 30	June 12		Mar. 16	April 23	June 13	Dec. 7	......	......	......
Broom	......	......	......	......	May 14	Mar. 25	April 27	May 28	Nov. 16	......	May 10	April 8	Oct. 30	......	May 19	......	......	May 30		April 1	April 26	May 16	......	April 5	Mar. 30	......
Elder	......	......	......	......	......	Mar. 2	April 6	June 25	Nov. 13	......	April 24	June 15	Oct. 25	......	......	April 2	May 4	June 20		Mar. 25	April 18	June 21	Oct. 17	......	......	......
Elm	......	......	......	......	......	April 1	April 23	April 8	Nov. 18	......	May 20	Mar. 30	Oct. 12	......	April 16	April 17	May 2	April 17		April 12	April 26	Mar. 23	Oct. 17	......	......	April 22
Flowering Currant	April 18	......	......	......	April 8	Mar. 6	April 5	April 16	Nov. 12	Mar. 20	April 20	April 3	Nov. 8	......	April 5	April 1	May 2	April 3		Mar. 18	Mar. 31	Mar. 24	Oct. 24	Mar. 2	......	May 20
Hawthorn	April 28	May 28	......	......	May 2	Mar. 12	April 18	May 30	Oct. 26	......	April 24	May 25	Nov. 1	April 26	May 20	April 2	May 4	May 20		Mar. 31	April 21	May 10	Nov. 10	......	April 20	May 25
Hazel	......	......	......	......	......	Mar. 15	April 20	Mar. 31	Nov. 14	Feb. —	April 24	Mar. 12	Nov. 8	......	......	April 16	May 5	April 1		Mar. 25	April 28	Feb. 5	Oct. 28	......	......	......
Holly	......	......	......	......	......	April 6	May 18	May 28	June 28	......	April 26	May 23	......	......	......	......	......	May 29		April 16	May 12	May 10	July 9	......	......	......
Honeysuckle	May 2	......	......	......	......	Jan. 10	Mar. 12	May 29	Nov. 6	......	April 26	July 1	Oct. 25	......	......	April 1	April 28	May 24		Mar. 4	April 7	May 14	Nov. 8	......	May 4	......
Laburnum	......	......	......	......	June 4	April 2	April 22	May 27	Nov. 12	......	May 6	May 22	Nov. 8	......	May 19	April 16	May 12	May 24		April 4	April 28	May 16	Oct. 8	......	May 1	May 26
Larch	April 28	......	......	... ..	......	Mar. 28	April 16	April 20	Nov. 15	......	April 25	April 25	Nov. 1	......	......	April 12	April 22	......		Mar. 18	April 15	April 6	Oct. 12	April 7	April 17	......
Lilac	......	......	......	......	......	Mar. 15	April 18	May 19	Nov. 4	......	April 26	May 22	Oct. 25	......	May 14	April 3	May 12	May 18		Mar. 24	April 22	May 14	Nov. 1	......	May 3	May 27
Lime	May 6	......	......	......	June 1	Mar. 28	April 26	July 1	Oct. 28	......	May 10	July 1	Oct. 25	......	......	April 20	May 20	July 21		April 12	May 7	June 14	Nov. 1	......	......	......
Mountain Ash	......	......	April 6	......	......	April 8	April 14	May 25	Nov. 8	......	May 6	May 25	Oct. 15	......	May 20	April —	April 28	May 20		April 5	April 25	May 25	Oct. 15	......	......	......
Oak	......	......	......	......	......	May 1	May 21	June 1	Nov. 20	......	{May 24 May 12}	May 25	Dec. 1	......	......	April 20	May 24	May 29		April 22	May 13	May 16	Oct. 31	May 2	May 15	.. ...
Poplar	April 28	......	......	......	......	Mar. 8	April 16	......	Oct. 20	... ..	......	April 2	{Oct. 25 Oct 15}	April 16	......	April 2	April 23	April 20		April 8	April 27	Mar. 16	Oct. 22	......	......	......
Privet	......	......	......	......	Aug. 1	April 1	April 21	June 22	Dec. 4	......	{Apr. 24 Apr. 26}	July 12	......	......	......	April 1	May 4	June 20		April 4	April 23	May 29	Nov. 23	......	......	......
Rose	......	......	......	......	......	Mar. 10	April 21	June 8	Nov. 24	......	May 6	June 18	Nov. 10	......	......	April 16	April 28	June 10		Mar. 31	April 21	June 8	Nov. 12	April 10	.....	June 20
Sallow	......	......	......	......	......	April 1	April 18	April 6	Nov. 13	......	April 25	April 2	Nov. 10	......	......	April 1	May 1	April 4		Mar. 22	April 26	April 6	Oct. 27	......	......	......
Sycamore	May 6	......	April 10	......	......	April 6	April 20	May 18	Oct. 30	......	May 8	May 13	Oct. 25	May 7	......	April 2	May 1	May 20		April 13	April 30	May 9	Oct. 29	......	April 12	......
Whin	......	April 2	......	.....	March 1	April 10	May 26	April 25	Nov. 2	......	June 5	April 15	......	......	Mar. 18	......	......	April —		Mar. 16	April 20	Jan. 4	......	......	......	Mar. 20

RUIT T

NORTH SHIEL	
In Blossom	Yie
May 9	Very abun
April 24	....
April 17	Very abun
......	....
April 15	Very abun
April 14	Ditto
......	Ditto
April 25	....

, &c., CROPS

NGTON.

thered.	Yield.
18	Good ....
...	....
1	Below an average...
...	....
24	Good ....
...	....
12	Good ....
Nov.	Large, and of first quality...
...	....

filberts were out and very fine and full. Ranunculus ficaria in flower on the 24th.

March.—

Wallington.—Spring flowers scarce and late. The only ones in addition to those recorded last month are primroses, coltsfoot, and violets. The hazel was not in blossom until the 31st.

Wylam.—On the 20th wild primrose in flower on warm sun-exposed banks. On the 22nd apricot in blossom on cold wall: the 18th being the average of thirteen years, 1870 therefore four days behind. On the 27th lesser celandine in flower.

Acklam, near Middlesbro'.—Apricot trees beautifully in bloom on the 28th.

April.—

Wylam.—On the 12th Ribes sanguinea in flower: March the 26th being the average of ten years, 1870 therefore seventeen days behind. On the 3rd wood anemone in flower. On the 8th pear on cold wall in flower: April the 1st being the average of eleven years, 1870 therefore seven days behind. On the 15th black thorn in flower. On the 19th gooseberries in flower. On the 19th dwarf standard plums in flower. On the 20th dwarf standard pear in flower.

Gainford, Darlington.—Golden drop plum in blossom on the 8th. Apricot trees on wall in blossom on the 3rd. Strawberries in blossom on the 21st. Peas in blossom on the 23rd.

May.—

Wallington.—Very favourable month for vegetation. The slight frosts did no harm to the fruit blossoms whether protected or not, a rare occurrence in the month of May.

Wylam.—On the 4th strawberries in garden in flower. On the 4th dwarf standard apples in flower. On the 9th oak leaf as big as a shilling. On the 14th horse chestnut in blossom. On the 17th white thorn in blossom. On the 19th ash in leaf. On the 20th Gloire de Dijon rose on wall in flower.

STANDARD FRUIT TREES, &c.

STANDARD FRUIT TREES, &c.	NORTH SUNDERLAND.	WALLINGTON.		CRESSWELL.		NORTH SHIELDS.		SEAHAM.	ACKLAM, NEAR MIDDLESBRO'.		GRETA BRIDGE.	
	In Blossom.	In Blossom	Yield.	In Blossom	Yield.	In Blossom	Yield.	In Blossom.	In Blossom	Yield.	In Blossom	Fruit Gathered.
Apple	......	May 15	Abundant	May 20	Plentiful	May 9	Very abundant	May 20	May 4	Moderate	April 22	September 8.
Cherry	......	April 30	Ditto	April 26	Good	April 24	....	May 10	April 23	Very good	May 2	....
Pear	May 2	May 7	Ditto	April 26	Partial	April 17	Very abundant	May 10	April 25	Good crop	April 26	September 8.
Plum	......	April 24	Ditto	April 26	Plentiful	......	....	May 10	April 20	Good crop	May 4	September 8.
Currant	April 10	April 20	Ditto	April 25	Plentiful	April 15	Very abundant	April 2	April 22	Very fine	April 5	....
Gooseberry	April 5	April 16	Ditto	April 15	Partial	April 14	Ditto	April 20	April 16	Abundant	April 5	June 16.
Raspberry	......	June 2	Ditto	June 5	Good	......	Ditto	June 4	May 20	Good crop	May 2	....
Strawberry	......	April 29	Ditto	May 20	Good	April 25	....	May 24	April 12	Very abundant	May 10	June 18.

GRAIN, &c., CROPS.

GRAIN, &c., CROPS.	NORTH SUNDERLAND.			WALLINGTON.			NORTH SHIELDS.	ACKLAM, NEAR MIDDLESBRO'.			GRETA BRIDGE.
	Sown.	Cut, or Gathered.	Yield.	Sown.	Cut, or Gathered.	Yield.	Cut, or Gathered.	Sown.	Cut, or Gathered.	Yield.	Cut, or Gathered.
Barley	....	....	....	April 4	Aug. 18	Good	August 10	April 9	August 13	Fair crop	August 13
Beans	....	....	....	....	....	....	....	March 15	Septem. 10	Good crops	....
Hay	Cloverseeds... Old land	End of June ... 3rd wk. in July	Much below average..	Old Land...	July 1	Below an average...	....	....	July 4	Moderate	....
Mangold	....	....	....	....	....	....	....	April 16	October 25	Fair crop	....
Oats	....	....	....	April 6	Aug. 24	Good	August 11	March 30	August 10	Good crop	....
Peas	....	....	....	....	....	....	....	April 4	August 2	Good crop	....
Potatoes	....	....	....	April 28	Oct. 12	Good	....	April 12	Gathered Sept. 30	Good crop; fine quality	....
Turnips	....	....	....	May 10	Oct.—Nov.	Large, and of first quality...	....	May 5 Spring sown	October 27	Very moderate	....
Wheat	Shot on July 1	June 23 (in flower)...	....	....	....	....	August 13	March 8	August 26	Very good	August 20

WILD FLOWERS.

WILD FLOWERS	NORTH SUNDERLAND.	WALLINGTON.	CRESSWELL.	WINLATON	NORTH SHIELDS.	SEAHAM HALL.	ACKLAM, NEAR MIDDLESBRO'.	GRETA BRIDGE.
	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.
Anemone	......	April 15	April 17	April 4	......	April 10	April 30	April 12
Bulbous Crow-foot	......	May 12	April 15	......	May 14	May 12	May 18	......
Coltsfoot	April 4	Mar. 19	April 1	......	Mar. 1	Mar. 20	Mar. 8	April 13
Cowslip	May 20	April 12	April 20	......	April 16	April 23	April 25	April 18
Dandelion	......	April 22	April 4	......	Mar. 24	April 1	April 2	April 30
Forget-me-not.	......	June 6	May 27	......	......	May 20	May 7	April 20
Garlic	......	May 28	July 8	......	......	April 28	May 20	......
Hyacinth	......	May 24	May 18	......	......	May 10	May 26	May 18
Lily of the Valley	May 24	May 10	May 15	......	May 7	May 12	May 10	May 25
Marsh Marigold	......	April 18	April 20	......	......	April 20	April 18	......
Pilewort	......	April 3	April 2	......	Mar. 16	April 2	Feb. 25	......
Primrose	April 12	Mar. 4	April 5	Mar. 12	April 10	April 3	April 4	April 11
Red Poppy	......	......	July 12	......	......	June 12	May 31	......
Stitchwort	......	May 18	May 18	......	Mar. 10	April 20	April 26	......
Snowdrop	......	Feb. 15	Feb. 28	......	Feb. 20	Feb. 20	Jan. 28	Mar. 1[illegible]
Strawberry	......	April 19	May 20	......	April 20	May 13	April 27	May 1[illegible]
Viola Chamædrys	......	May 17	May 25	......	May 9	May 1	May 9	......
Violet	......	Mar. 29	Mar. 30	Mar. 2	April 2	April 1	Mar. 30	April 7

June.—

Wylam.—On the 5th wild rose in flower. On the 13th first dish of peas. On the 13th first ripe strawberry in garden. On the 19th Portugal laurel in flower, and very profusely.

Whitley.—First new potatoes gathered on the 21st. First dish of peas on the 21st. Strawberries gathered ripe on the 25th.

Acklam, near Middlesbro'.—Mildew appeared on the apple trees early in the month and many apples are falling off. Pears, plums, and cherries promise well. The crops generally look well, but rain is much wanted.

July.—

On the 28th corn cut in the valley of the Tyne.

August.—

Bywell.—At the end of August the cutting of grain was about finished, and most of it secured in good condition. The crop was about an average and of good quality. The late rains had improved the turnips. Apples and pears were abundant.

September.—

The warm dry weather which marked the close of the month was especially favourable to the swelling and ripening of all fruit, more especially apples, pears, and plums.

Wylam.—Fruit of all kinds very fine and abundant; also mushrooms.

Bywell.—The showers up to the middle of the month very much improved the grass and turnips. Potatoes good both in quantity and quality.

October.—

Wylam.—From the time of flowering this year of apricot, ribes, and pear, as compared with the average period, say—average time of blossoming of apricot the 18th of March, of ribes the 26th March, of pear the 1st of April. Day of blossoming, in 1870, of apricots the 22nd of March, of ribes the 2nd of April, of pear the 8th of April; we observe that this spring is late by apricot four days, by ribes seven days, by pear seven days, or six days on the three events.

Seaham.—Mr. Draper found two plants not described in the "Flora" published by the Club. One is the *Valeriana Pyrenaica*, or heart leaved valerian. It grows freely in the woods about Seaham, flowering in June, and having an unpleasant smell. It is a native of the Pyrennees, but naturalised in Britain. The other is a ballast plant, *Henchera cylindrica*, a native of North America, belonging to the natural order *Saxifrageæ*.

The following table, giving a list of wild and garden plants growing and flowering within three miles of Tynemouth, has been kindly supplied by John Coppin, Esq., and is printed in continuation of the lists given in former reports:—

WILD PLANTS GROWING WITHIN THREE MILES OF TYNEMOUTH, 1870.

	Date of Flowering.
Tussilago farfara (coltsfoot)	March 1.
Lamium purpureum (red dead nettle)	,, 14.
Veronica hederifolia (ivy-leaved speedwell)	,, 15.
Ranunculus ficaria (pilewort)	,, 16.
Taraxacum officinale (dandelion)	,, 24.
Viola canina (dog violet)	April 2.
Primula vulgaris (primrose)	,, 10.
Lamium album (white dead nettle)	,, 11.
Ribes grossularia (gooseberry)	,, 14.
Primula veris (cowslip)	,, 16.
Prunus spinosus (blackthorn)	,, 23.
Veronica chamædrys (germander speedwell)	May 9.
Ranunculus bulbosus	,, 14.
Potentilla anserina (silver weed)	,, 14.
Trifolium pratense (purple clover)	,, 13.
Broom	,, 19.
Cratægus oxyacantha (hawthorn)	,, 20.
Mountain ash	,, 20.
Horse chestnut	,, 20.

PLANTS GROWING IN GARDEN NEAR NORTH SHIELDS, 1870.

	Date of Flowering.
Snowdrop	Feb. 20.
Crocus—yellow	March 1.
Crocus—purple and white	,, 10.
Red flowering currant (against a wall)	,, 15.
Red flowering currant (standard)	April 5.
Daffodil	,, 5.
Gooseberry	,, 15.
Red currant	,, 15.
Cherry tree	,, 24.
Jargonelle pear tree	,, 16.
Blue hyacinth	May 11.
Keswick codling	April 27.
Black currant	,, 28.
London pride	May 13.
Lilly of the valley	,, 7.
Purple lilac	,, 14.
Strawberry	April 25.
Laburnum	May 19.

NOTES ON BIRDS AND INSECTS.

January.—

Wallington.—During the last week of the month the sun shone brightly, and a few birds began to sing. The thrush, water ousel, red breast, chaffinch, blue titmouse, and hedge sparrow were particularly remarked. The wood pigeons were heard cooing in all parts of the woods, and many were observed to have paired. Great numbers of wood pigeons have died during the winter. They appear to have suffered from some peculiar disease, as the dead birds were covered with swellings or boils upon the head, feet, and other parts of the body.

Acklam, near Middlesbro'.—Thrushes in full song on the 17th.

February.—

Darlington.—Wasps seen on the 27th.

March.—

Wylam.—Rooks began to build on the 6th. Many flocks of the long tailed titmouse were observed this month. They appeared to be more numerous than usual.

)S.

...TLEY.	NORTH SHIELDS.		
...rival.	Arrival.	Departure.	A...
......	....	....	Ju...
......	....	....	A...
23	May 21	....	M...
l 21	April 17	....	M...
.....	....	....	.
22	May 15	....	M...
......	....	....	.
......	Sept. 10	....	.
......	....	....	.
......	May 16	....	M...
...il 16	May 4	....	A...
......	April 20	....	A...
......	....	....	A...
......	Sept. 2	April 20	O...
...rch 25	....	....	

	NORTH SHIELDS.	
	Appearance.	Appearance.
....	April 25	April 18
....	....	May.
...	....	....
....	....	....
....	....	....
.	....	April 16
...	April 6	....
..	....	....
..	....	....
..	....	....
..	....	....
..	....	April 16
..	. ...	....
....	April 4	April 2
....	April 15	April 19

MIGRATORY BIRDS.

MIGRATORY BIRDS.	BYRNESS.	NORTH SUNDERLAND.		ROT[illegible]		WALLINGTON.			CRESSWELL.			WHITLEY.	NORTH SHIELDS.		SEAHAM.			ACKLAM, NEAR MIDDLESBRO'.			BRINKBURN, DARLINGTON.
	Arrival.	Arrival.	Departure.	Arrival.	Prevalence.	Arrival.	Departure.	Prevalence.	Arrival.	Departure.	Prevalence.	Arrival.	Arrival.	Departure.	Arrival.	Departure.	Prevalence.	Arrival.	Departure.	Prevalence.	Arrival.
Black-cap		April 15				April 18	Aug. 10	Scarce	May 1						June 4	August.	Rare	April 26			
Chiff-chaff									April 17						April 16	September.	Common				
Corncrake				May 24	Very few	May 20	Sept. 18	Scarce	May 25			May 23	May 21		May 10		{Rare this Season}			Not heard here	
Cuckoo	May 7	May 21		April 23		April 26	June 18	Plentiful	May 4	June.	Scarce	April 21	April 17		May 3	June.		April 25	July 14	In full song	April 6
Fieldfare		Oct. 3	{Saw some last wk. on Apr.26,'70}			Oct. 26	Mar. 30	Ditto	Oct. 20	March.	Plentiful					March.	April 20				
Martin		April 28				May 1	Sept. 20	Ditto				May 22	May 15		May 15	Aug. 24		May 24	Sept. 7	Not many	
Redstart						April 18	Aug. 29	Ditto	May 20		Plentiful						{Not seen this year}				
Redwing						Nov. 29	April 8	Ditto	Oct. 20	March.	Scarce		Sept. 10			February.					
Snow-bunting																					
Swift				April 30		June 7	Aug. 30	Scarce	May 7				May 16		May 20	July.		May 30	Sept. 15	Not many	
Swallow		May 4		April 28	Few	April 19	Sept. 19	Plentiful	April 26	Sept. 15	Plentiful	April 16	May 4		April 16			May 6	Sept. 20	Very numerous	April 14
Wheat-ear	April 15					May 22	Sept. 27	Scarce					April 20		April —						
Willow Wren		April 26				April 19	Sept. 12	Plentiful	April 26		Plentiful				April 17	August.					
Woodcock		Oct. 9				Nov. 25	April 6	Scarce	Oct. 8	March 25	Scarce		Sept. 2	April 20	Oct. 11	March.					
Yellow Wagtail						April 3	Sept. 25	Ditto				March 25									2nd week Feb.

INSECTS.

INSECTS.	NORTH SUNDERLAND.		WALLINGTON.		CRESSWELL.		NORTH SHIELDS.	SEAHAM.		ACKLAM, NEAR MIDDLESBRO'.		BRINKBURN, DARLINGTON.
	Appearance.	Prevalence.	Appearance.	Prevalence.	Appearance.	Prevalence.	Appearance.	Appearance.	Prevalence.	Appearance.	Prevalence.	Appearance.
Small White Butterfly	April 16	Numerous	April 1	Plentiful	April 16	Numerous	April 25	April 18	Not common	April 16	Not many seen	
Holly Blue ditto	July 6		July 20	Scarce	July 20	Scarce		May.	Common	June 30	Rather numerous	
Lesser Heath ditto			June 8	Plentiful								
Orange Tip ditto			May 22	Scarce	May 25	Scarce				May 28	Very few	
Painted Lady ditto					April 16	Scarce						
Red Admiral ditto			June 9	Scarce				April 16	Common			
Tortoise Shell ditto	April 2		April 1	Plentiful			April 6			April 5	Very numerous	April 5
Brimstone Moth			May 26	Scarce						June 8	Scarce	
Currant ditto												
Ghost ditto			June 13	Scarce								
Small Dagger ditto				None seen								
Cockchafer				None in this Neighbourhood.				April 16				
Hive Bee			March 2	First swarm June 5	April 2				Swarm on June 13	March 15	Numerous	March 19
Humble Bee	April 5		April 2	Abundant	April 2	Plentiful	April 4	April 2		April 1	Numerous	
Wasp	April 8	Numerous	April 12	Scarce	April 6	Scarce	April 15	April 19		Feb. 28	{Numerous in Spring—not many during Summer..}	

April.—

Darlington.—White butterflies, wasps, humble bees, honey bees, thrushes, blackbirds, and starlings were more than commonly numerous towards the end of the month.

Wylam.—Willow wren first heard on the 15th. Many female wasps were observed.

May.—

Wallington.—Queen wasps were very plentiful in April and May, feeding on a favourite food supplied by the blossoms of the gooseberry bushes. They were well looked after, and nearly three hundred were destroyed.

Acklam, near Middlesbro'.—Caterpillars of various kinds were very numerous at the end of the month, and gave much trouble on the fruit trees. Roses suffered much.

June.—

Wallington.—The humming-bird hawk moth was seen on the 15th. The first swarm of bees on the same day.

Acklam, near Middlesbro'.—Butterflies and moths were very abundant at the beginning of the month.

July.—

North Sunderland.—A white sparrow was seen on the 15th by the Rev. F. R. Simpson in the fields between Falloden and Newton Barns. The colour was not pure but a dirty white. The swallows, blue tits, willow wrens, and flycatchers all had young out of the nest in the second week of July. Flocks of starlings were seen the first week in July.

August.—

Wallington.—The turnip fly was very destructive during this month and the latter part of July. Whole fields of young turnips were almost destroyed by them. The northern part of Northumberland seems to have been nearly free from this pest.

Three Galium sphinx moths were taken on the 1st of this month, and several humming-bird hawk moths were seen in the course of it.

Acklam, near Middlesbro'.—Towards the close of the month great numbers of white butterflies were seen, and hosts of caterpillars on the gooseberry bushes.

September.—

North Sunderland.—A quail was shot at Pasture Hill farm on the 27th.

Wallington.—No wasps were to be seen nor a nest to be found, and so no fruit was destroyed by them. Male wasps were not observed last season, which is probably in some measure the cause of the absence of nests and queen wasps this fine and favourable season.

Wylam.—The humming-bird hawk moth was seen on the 19th.

Acklam, near Middlesbro'.—Insect life abounded. Butterflies and moths numerous. Swarms of gnats filled the air at times.

Seaham.—The swallow, martin, sedge-warbler, chiff-chaff, willow wren, black-cap, and white-throat disappeared soon after September the 20th.

October.—

North Sunderland.—First woodcocks seen on the 7th–9th.

Wallington.—Large swarms of the black aphis abounded during several days, and settled down on every plant and tree. The peach, nectarine, cherry, and plum trees seemed to be especial favourites with them. They deposited their eggs on the under side of the leaves, and in a few days the young green larvæ appeared in millions and made the leaves to fall off prematurely before the fruit buds were matured. This may cause the loss of the fruit crop next year.

Acklam, near Middlesbro'.—Thrushes were singing at the end of the month, and starlings were numerous.

Seaham.—Great numbers of mountain finches arrived in October, and remained for about a month.

December.—

Acklam, near Middlesbro'.—Large flocks of red-wings, fieldfares, blackbirds, sparrows, and wood pigeons were seen, drawn hither in search of food. The severe weather made great havoc amongst them.

Wolsingham.—It may be worthy of remark to notice the appearance of so rare and fine an insect as *Deilephila galii*, the bedstraw hawk moth. It occurred at Wolsingham during the first week in August. I captured four specimens, and saw others. It appears from the records in the "Entomologist" to have occurred simultaneously in most of the English counties. The caterpillars of the death's-head hawk moth were found in this neighbourhood this autumn. I had seven larvæ from which I reared five imagos in the first week in October.—*A. Mitchell.*

Brinkburn, Darlington.—The golden-crested wren was scarce throughout the winter, and was not seen in summer.

On the 22nd of November a flock of the long-tailed titmouse passed over Darlington.

Seaham.—Wasps were rarely seen in 1870—not one nest was found. Hive bees have been productive; but dry warm seasons suit them well in this neighbourhood.

Two new species of ants were discovered by Mr. Draper, who sent them to the Club's old friend Mr. Bold. They were also submitted by him to the authorities at the British Museum, who could not identify them with any known species. One is common in the hot houses at Seaham, and is of a red or sandy colour, thick in proportion to its length, and slow in its motions. The other species is from "The Barns," near Sunderland, and is a very destructive and lively little fellow, making a meal out of anything which comes in its way. It is supposed that they have been imported with some foreign plants.

The cabbage fly, a species of aphis, has been very destructive to all the brassica tribe of plants. Whole fields of turnips were destroyed. The farmers agree in thinking that in their experience they never knew such swarms.

Great numbers of mountain finches arrived at Seaham in October and remained for about a month.

The swallow, martin, sedge-warbler, chiff-chaff, willow wren, black-cap, and white-throat took their departure on or about the 20th of September.

Mr. Thomas Thompson, of Winlaton, has kindly forwarded the subjoined notes on the arrival, nesting, &c., of various birds in 1870:—

DATES OF ARRIVAL.

April 18	Grasshopper warbler.
April 10	Chiff-chaff.
Sept. 20*	Jack snipe.
April 20	Cuckoo.
April 14	Sand martin.
April 29	Redstart.
May 1	Whitethroat.
April 16	House martin (departed Oct. 9).
April 9	Chimney swallow.
April 17	Willow wren.
Oct. 10	Woodcock.
Oct. 24	Redwing.
April 26	Winchat.

DATES OF NESTING OF BIRDS.

March 28	Rook.
March 30	Hedge sparrow.
March 31	Wood owl and dipper.
	Long-eared owl.
April 2	Missel thrush.
April 5	Long-tailed titmouse.
April 5	Thrush.
April 12	Black ouzel and cushat.
April 14	Peewit and redbreast.
April 17	Snipe and pheasant.
April 22	Jackdaw.
April 28	Cole titmouse.
	Golden-crested wren.
May 1	Kestrel and partridge.
	Marsh titmouse.
	Carrion crow (young birds).

* The jack snipe was never recorded as having arrived at so early a date before.

May 8	Ring ouzel and ox eye.
May 12	Blue titmouse.
May 15	Jay and water hen.
May 17	Redstart and whitethroat.
May 22	Golden plover and common sandpiper

The observations recorded in the Meteorological Report and Climatological Tables have this year been supplied by the following contributors:—

Alnwick	His Grace the Duke of Northumberland, by Major Holland, Alnwick Castle.
Allenheads and Bywell	T. Sopwith. Esq., F.R.S. Mr. John Dawson.
Belford	T. J. Leather, Esq., Middleton Hall.
Byrness	Rev. J. Nicholson.
Brinkburn, Morpeth	C. H. Cadogan, Esq.
Cresswell	Mr. Forsyth. Rev. J. E. Leefe, M.A.
Darlington	Mr. Henry Ward, Brinkburn Gardens
Dinsdale Rectory, near Darlington,	Rev. J. W. Smith, M.A.
Durham	Rev. Dr. Gillow, Ushaw College.
Durham Observatory	John J. Plummer, Esq.
Eaglescliffe, near Yarm	Rev. Canon Hull, M.A.
Earsdon	John Taylor, Esq.
Gainford	A. Atkinson, Esq.
Glanton Pike	F. W. Collingwood, Esq.
Greenwich	James Glaisher, Esq.
Hartlepool	Mr. J. Howkins Grey, jun., C.E.
Haltwhistle	Rev. Dixon Brown, M.A., Unthank Hall.
Hexham (Park End)	M. A. Ridley, Esq.
Howick	Earl Grey, K.G., per Mr. F. Moor.
Lilburn Tower	Mr. John Deas.
London	J. G. Symons, Esq.
Middlesbro' (Acklam Hall)	Mr. Hebblethwaite.
Millfield, near Wooler	G. A. Grey, Esq.
Newcastle-on-Tyne	Rev. G. R. Bousfield, West Parade. G. Lyall, Esq., Lit. & Phil. Society. Mr. W. Neill, Deaf & Dumb Institution. Robert Foster, Esq., 30, Rye Hill.

North Shields	John Coppin, Esq. J. R. Procter, Esq. R. Spence, Esq. Mr. Humble, } Post Office. Mr. Irwin, } Post Office.
North Sunderland	Rev. F. R. Simpson, M.A.
Otterburn	Rev. T. Wearing.
Dean Head	Burdon Sanderson, Esq.
Rothbury	Sir W. G. Armstrong, D.C.L.
Seaham	Mr. R. Draper, Seaham Hall Gardens. Mr. G. W. Lax, Londonderry Office.
Sedgefield, Durham	Robert Smith, Esq., M.D.
Shotley	Mr. Coulson, Shotley Hall.
Stamfordham	Rev. J. F. Bigge, M.A.
Sunderland	T. W. Backhouse, Esq., West Hendon House.
Thorpe Grange, Greta Bridge	T. Dodgson, Esq.
Tynemouth	P. J. Messent, Esq. C. B. Goldston, Esq.
Wallington	Mr. Hedley, Wallington Hall Gardens. Mr. Arthur Dixon.
Wallsend	J. W. Dees, Esq.
Whitley	Rev. R. F. Wheeler, M.A.
Whittle Dene Company's Reservoirs,	D. D. Main, Esq.
Winlaton	Thomas Thompson, Esq.
Wolsingham (St. John's)	C. J. Backhouse, Esq.
Wolsingham	Amos Mitchell, Esq.
Wylam	G. C. Atkinson, Esq., Wylam Hall.

XIII.—*A Catalogue of the Insects of Northumberland and Durham (Hemiptera–Heteroptera).* By Thomas John Bold.

Up to the present time one hundred and fifty-one species of *Hemiptera–Heteroptera*, or *Bugs*, have been found to inhabit the counties of Northumberland and Durham. These I have thought desirable to bring into shape so as to be easily added to by future workers. The catalogue will be found sadly deficient in the larger *Geodromica*, or land species, nor does either our soil or climate hold out hopes of many of them being hereafter found. We are much stronger proportionately in the *Hydrodromica,* or species which live in water. This might be expected, as such are much less subject to climatic influences. On the whole, not much over one-third of the recorded British species have been captured in our district.

Many Hemiptera lead innocent enough lives, feeding upon the plants they frequent, whose sap they extract by means of their proboscis; but a majority of them are highly carniverous, and feed upon the juices of insects, or their larva. Many of the small species, notably the *Anthocoridæ,* devour great numbers of "plant lice," or aphides; and not a few of the larger ones appear to have the same liking, as I have often seen a green *Lygus,* with an *aphis* kicking at the end of its proboscis.

Notwithstanding the elegance of form, and beauty of colouring, in many of the species, the study of these creatures has been much neglected in this country. All the species of this order have the power of emitting at will a most penetrating odour which is often exceedingly offensive: this, and the evil doings of our domestic pest, have caused people generally to look upon the whole tribe with disgust.

As will be seen by the catalogue, great use has been made of the admirable work of Messrs. Douglas and Scott on the "British Hemiptera," and to their papers published in the "Entomologist's Monthly Magazine." Abbreviated references to them, and to three other authors casually mentioned, are below.

Doug. and Scott, Brit. Hem.—Douglas and Scott, British Hemiptera–Heteroptera.

Doug. and Scott, Ent. Mon. Mag.—Douglas and Scott, in Entomologist's Monthly Magazine.

Fieb.—Fieber, Die Europaischen Hemiptera.

Flor, Rhyn. Liv.—Flor, Die Rhynchoten Livlands.

Zett. Ins. Lap.—Zetterstedt, Insecta Lapponica.

HEMIPTERA.

HETEROPTERA, *Lat.*

Div. I. GYMNOCERATA.

Sub-Div. I. GEODROMICA.

Section I. SCUTATINA.

Fam. CYDNIDÆ.

SEHIRUS, *Am. et Serv.*

1. *S. bicolor*, Linn.; Doug. and Scott, Brit. Hem. 52.

Local specimens are in the collections of Mr. John Hancock, and Mr. V. R. Perkins.

2. *S. albomarginatus*, Fab.; Doug. and Scott, l. c. 56.

Gibside, very rare. Mr. V. R. Perkins.

Fam. PODOPIDÆ.

PODOPS, *Lap.*

3. *P. inunctus*, Fab.; Doug. and Scott, l. c. 73. Pl. II., fig. 8.

Mr. Perkins has a local specimen taken by the Rev. R. Kirwood. Found throughout Europe, in Siberia, and in North Africa.

Fam. PENTATOMIDÆ.

PENTATOMA, *Latr.*

4. *P. baccarum*, Linn.; Doug. and Scott, l. c. 80.

Of occasional occurrence. Near Wooler, Mr. J. Hardy. Found throughout Europe, and in Siberia.

5. *P. juniperinum*, Linn.; Doug. and Scott, l. c. 81.

In Mr. V. R. Perkins' collection.

6. *P. viridissima; Poda dissimile*, Doug. and Scott, l. c. 83. Pl. III., fig. 1.

Rare. Jesmond.

Fam. ASOPIDÆ.

ZICRONA, *Am. et Serv.*

7. *Z. cœrulea*, Linn.; Doug. and Scott, l. c. 88. Pl. III., fig. 3.

Not uncommon. Gilsland, Prestwick Carr, Wooler, &c. Flors says that it occurs over the whole of Europe, and in Siberia.

PICROMERUS, *Am. et Serv.*

8. *P. bidens*, Linn.; Doug. and Scott, l. c. 96. Pl. III., fig. 7.

In Mr. John Hancock's collection.

Fam. RAPHIGASTRIDÆ.

TROPICORIS, *Hahn.*

9. *T. rufipes*, Linn.; Doug. and Scott, l. c. 98. Pl. III., fig. 8.

On trees, &c. Common. Lives on caterpillars, &c. It is found throughout Europe.

PIEZODORUS, *Fieb.*

10. *P. lituratus*, Fieb.; *P. purpuripennis*, Doug. and Scott, l. c. 100. Pl. III., fig. 9.

Of occasional occurrence.

ACANTHOSOMA, *Curt.*

11. *A. dentatum*, De G.; Doug. and Scott, l. c. 104.

Frequents the birch. Not common. Old Berwick and near Wooler, Mr. J. Hardy.

Section II. COREINA.

Fam. COREIDÆ.

ENOPLOPS, *Am. et Serv.*

12. *E. scapha*, Fab.; Doug. and Scott, l. c. 112. Plate IV., fig. 4.

Ryhope Dene, Mr. John Hancock. Flors informs us that it is found all over Europe.

Section III. BERYTINA.

Not found in our district.

Section IV. CŒCIGENINA.

Not found in our district.

Section V. LYGÆINA.

Fam. RHYPAROCHROMIDÆ.

SCOLOPOSTETHUS, *Fieb.*

13. *S. adjunctus*, Doug. and Scott, l. c. 183. Pl. VI., fig. 9.
Found principally on the sea coast, and frequents nettles.

14. *S. affinis*, Schill.; Doug. and Scott, l. c. 185.
In sandy places. Common. Wooler, Mr. J. Hardy.

15. *S. contractus*, H. Schf.; Doug. and Scott, l. c. 186.
Abundant beneath stones on the sea coast.

PERITRECHUS, *Fieb.*

16. *P. luniger*, Schill.; Doug. and Scott, l. c. 188. Pl. VII., fig. 1.
Not uncommon. Wooler, Mr. J. Hardy.

TRAPEZONOTUS, *Fieb.*

17. *T. agrestis*, Panz.; Doug. and Scott, l. c. 192. Pl. VII., fig. 2.
Rare. Wooler, Mr. J. Hardy. Wallington, Dr. Power.

DRYMUS, *Fieb.*

18. *D. sylvaticus*, Fab.; Doug. and Scott, l. c. 197.
In moss, &c., throughout the district.

19. *D. brunneus*, Sahlb.; Doug. and Scott, l. c. 198. Pl. VII., fig. 4.
In dead leaves, moss, &c. Common.

20. *Lamproplax Sharpi*, Doug. and Scott, Ent. Mon. Mag., IV., 244. Pl. II., fig. 1.
Two examples of this very rare insect were taken near Wooler, in October, by Mr. J. Hardy.

STYGNOCORIS, *Doug. and Scott.*

21. *S. rusticus*, Fall.; Doug. and Scott, Brit. Hem., l. c. 214. Pl. VII., fig. 9.

Sea banks north of Whitley. Found principally in the north of Europe.

22. *S. sabulosus*, Schill., Doug. and Scott, l. c. 215.

In sandy places. Common.

23. *S. arenarius*, Hahn.; Doug. and Scott, l. c. 216.

At the roots of plants in dry places. Abundant.

Fam. PHYGADICIDÆ.

NYSIUS, *Dall.*

24. *N. thymi*, Wolff; Doug. and Scott, l. c. Pl. VIII., fig. 4.

Whitley, Wooler, &c. Not rare. July and August. I also took it at Tain, Ross-shire, in September.

Fam. CYMIDÆ.

ISCHNORHYNCHUS, *Fieb.*

25. *I. resedæ*, Panz.; Doug. and Scott, Ent. Mon. Mag. II., 217.

Berwickshire, a little out of our district, Mr. J. Hardy. October.

26. *I. geminatus*, (*Mus. Vien.*,) Doug. and Scott, l. c. 218, and Brit. Hem., 233.

At the roots of heather, &c. Cold Martin Moss, near Wooler, Mr. J. Hardy. August and October.

Section VI. TINGIDINA.

Fam. TINGIDIDÆ.

TINGIS, *Fab.*; MONANTHIA, *Doug. and Scott.*

27. *T. cardui*, Linn.; Doug. and Scott, l. c. 251.

On thistles. Common. Gibside, Hartley, Wooler, &c.

DEREPHYSIA, *Spin.*

28. *D. foliacea*, Fall.; Doug. and Scott, l. c. 254. Pl. IX., fig. 4.

In cut grass near Long Benton, and near Hartley. August and September.

ORTHOSTIRA, *Fieb.*

29. *O. cervina*, Germ.; Doug. and Scott, l. c. 262. Pl. IX., fig. 7.

On Cheviot. Rare. August. Mr. J. Hardy.

30. *O. obscura*, H. Schf.; Doug. and Scott, l. c. 263.

Whitley, Long Benton, &c. Common.

CAMPLOSTIRA, *Fieb.*

30*a*. *C. brachycera*, Fieb.; Doug. and Scott, l. c. 259. Pl. IX., fig. 6.

Sea banks near Hartley. Rare.

Section VII. HEBRINA.

Not found in our district.

Section VIII. CORTICICOLINA.

Not found in our district.

Section IX. CAPSINA.

Div. I. UNICELLULI.

Fam. BRYOCORIDÆ.

BRYOCORIS, *Fall.*

31. *B. pteridis*, Fall.; Doug. and Scott, l. c. 277. Pl. X., fig. 1.

Bothal, Seghill Dene, Wooler, &c. The undeveloped form only has been taken.

MONALOCORIS, *Dahlb.*

32. *M. filicis*, Linn.; Doug. and Scott, l. c. 279. Pl. X., fig. 2.

Common throughout the two counties.

Div. 2. BICELLULI.

Fam. PITHANIDÆ.

PITHANUS, *Fieb.*

33. *P. Märkeli*, H. Schf.; Doug. and Scott, l. c. 281. Pl. X., fig. 3.

The undeveloped form is very abundant among grass in woods, &c., and I took a winged female, in cut grass, near Heaton, in July.

Fam. MIRIDÆ.

MIRIS, *Fab.*

34. *M. holsatus*, Fab.; Doug. and Scott, l. c. 283.

Gosforth Woods, Hartley, Long Benton, Gilsland, &c. Not rare.

35. *M. calcaratus*, Fall.; Doug. and Scott, l. c. 286.

Very abundant throughout the district.

36. *M. ruficornis*, Fall.; Doug. and Scott, l. c. 290.

On bushes, &c. Axwell, Benton, Heaton, Hartley, Wooler, &c. July and August.

LOPOMORPHUS, *Doug. and Scott.*

37. *L. ferrugatus*, Fall.; Doug. and Scott, l. c. 295. Pl. X., fig. 6; *L. carinatus*, l. c. 294, *var.*

Not common. Long Benton, near Gilsland, &c.

38. *L. dolobratus*, Linn.; Doug. and Scott, l. c. 297.

Among herbage. Common throughout the district.

Fam. PHYTOCORIDÆ.

PHYTOCORIS, *Fall.*

39. *P. distinctus*, Doug. and Scott, l. c. 302.

Rare. Little Benton, Gosforth, and Hartley Dene. August and September.

40. *P. crassipes*, Flor; Doug. and Scott, l. c. 309.

Rare. Gosforth Woods. August.

41. *P. floralis*, Fab.; *P. divergens*, Doug. and Scott, l. c. 311.
Also rare. Long Benton and Gosforth Woods. August.

Fam. DERÆOCORIDÆ.

DERÆOCORIS, *Kirschb.*

42. *D. striatellus*, Fab.; Doug. and Scott, l. c. 318.
Not uncommon in flowers of broom, &c. June.

43. *D. bipunctatus*, Fab.; Doug. and Scott, l. c. 319.
Common. In gardens it oft renders the foliage of dahlias unsightly by puncturing the young leaves with its proboscis.

44. *D. sexguttatus*, Fab.; Doug. and Scott, l. c. 322.
A handsome insect, which frequents the flowers of the cow-parsnip, and is not rare.

45. *D. alpestris*, Meyer; Doug. and Scott, Ent. Mon. Mag., IV., 47. Pl. I., fig. 3.
Rare. Near Dilston in May, and at Gibside in July.

46. *D. chenopodii*, Panz.; Doug. and Scott, Brit. Hem., 325.
In plenty on the sea banks north of Whitley.

47. *D. ferrugatus*, Fab.; Doug. and Scott, l. c. 327.
Not uncommon on dyers weed at Briar Dene. Also from Marsden, Wooler, &c. A fine handsome insect.

48. *D. fornicatus*, Doug. and Scott, l. c. 329.
A single specimen taken near Wooler, in August, by Mr. J. Hardy.

PANTILIUS, *Curt.*

49. *P. tunicatus*, Fab.; Doug. and Scott, l. c. 333. Pl. XI., fig. 2.
Rare. Near Wooler. Mr. J. Hardy. Occurs in temperate and northern Europe, according to Flor.

Fam. LITOSOMIDÆ.

LITOSOMA, *Doug. and Scott.*

50. *L. nassatus*, Fab,; Doug. and Scott, l. c. 337. Pl. XI., fig. 3.
On bushes, &c. Common.

51. *L. concolor*, Kirschb.; Doug. and Scott, l. c. 340.
Very rare. Gibside. August.

52. *L. ericetorum*, Fall.; Doug. and Scott, l. c. 343.
On heath. Gosforth, Scaffold Hill, Wooler, &c. Abundant.

53. *L. chloropterus*, Kirschb.; Doug. and Scott, l. c. 345.
On heath near Wooler, in August, Mr. J. Hardy.

Fam. PHYLIDÆ.

ÆTORHINUS, *Fieb.*

54. *Æ. angulatus*, Fall.; Doug. and Scott, l. c. 347. Pl. XI., fig. 4.
On bushes, &c. Common.

SPHYRACEPHALUS, *Doug. and Scott.*

55. *S. ambulans*, Fall.; Doug. and Scott, l. c. 349. Pl. XI., fig. 5.
Among herbage. Abundant all over the district.

56. *S. elegantulus*, Meyer, Caps. 69, t. V., fig. 2; Doug. and Scott, l. c. 351.
Boldon Flats, and Gosforth Lake. September.

PHYLUS (*Hahn*), *Fieb.*

57. *P. palliceps*, Fieb.; Doug. and Scott, l. c. 355.
On trees, &c. Gosforth, Wooler, &c. Rare.

58. *P. melanocephalus*, Linn.; Doug. and Scott, l. c. 355. Pl. XI., fig. 7.
Rare. Gosforth Woods. August.

59. *P. avellanæ*, H. Schf.; Doug. and Scott, l. c. 357.
Rare. Near Wooler in August, Mr. J. Hardy.

Fam. GLOBICEPIDÆ.

GLOBICEPS (*Lat.*), *Fieb.*

60. *G. flavomaculatus*, Scop.; Doug. and Scott, l. c. 357.
Gibside. Rare. Mr. V. R. Perkins.

61. *G. dispar*, Boh., Fieb., Hem. Eur., 283; Doug. and Scott, Ent. Mon. Mag., IV., 48. Pl. I., fig. 4.

Heaton, Hartley, Wooler, &c. Lives at the roots of grass, &c.

Fam. IDOLOCORIDÆ.

CYLLOCORIS, *Hahn.*

62. *C. histrionicus*, Linn.; Doug. and Scott, l. c. 368. Pl. XII., fig. 3.

In woods. Gosforth, Wooler, &c. Not common. June to August.

IDOLOCORIS, *Doug. and Scott.*

63. *I. pallicornis* (Pict. and Meyer), Fieb.; Doug. and Scott, l. c. 375.

Near Wooler, and plentifully in Berwickshire, Mr. J. Hardy.

64. *I. annulatus*, Wolff; Doug. and Scott, l. c. 376.

Frequents the rest harrow (*Ononis arvensis*), and is not rare.

65. *I. globulifer*, Fall.; Doug. and Scott, l. c. 377.

Hartley, Wooler, &c. Rare.

66. *I. errans*, Wolff; Doug. and Scott, l. c. 378.

Occurs throughout the district.

67. *I. pallidus*, Fall.; Doug. and Scott, l. c. 380.

Borders of Gosforth Lake, Wooler, Gibside, Axwell, &c. Common.

MALACOCORIS, *Fieb.*

68. *M. chlorizans*, Panz.; Doug. and Scott, l. c. 383. Pl. XII., fig. 7.

Near Wooler, Mr. J. Hardy. Rare.

Fam. ONCOTYLIDÆ.

MACROCOLEUS, *Fieb.*

69. *M. Hardyi*, n. sp.

Yellowish green slightly clouded with fuscous on the clavus and corium, and thickly clothed with long black hairs.

Antennæ yellowish, brown at the apex, sparingly covered with very short brown hairs; eyes brown; rostrum yellowish green, the tip black and shining; thorax slightly convex; scutellum flattish in front, rather more convex behind the transverse impression; clavus, corium, and cuneus yellowish green, disk of the two first slightly clouded with fuscous; membrane whitish, iridescent, margin entirely brown; between the inner cell nerve and the apex of the cuneus a white line, immediately below which is a small round black spot, followed by two larger but less clearly defined spots one on each side of the apex; cell nerves yellow, cells white, the inner one sometimes fuscous; legs yellowish-green, with the third joint of the tarsi and claws black; fenora clothed with black hairs; tibia furnished with long black spinous hairs; abdomen beneath greenish, clothed with pale and black hairs intermixed. Length, 2·2½ lines.

Most nearly allied to *M. molliculus*, but in the opinion of Mr. Douglas distinct, and apparently undescribed, I have therefore ventured to name it in honour of my old friend Mr. J. Hardy, by whom nine specimens were taken near Wooler, in August, on the tansy (*Tanacetum vulgare*).

70. *M. Paykullii*, Fall.; Doug. and Scott, l. c. 388.

A coast species which frequents the rest-harrow (*Ononis arvensis*), and is not rare.

TINICEPHALUS, *Fieb.*

71. *T. obsoletus*, Doug. and. Scott, l. c. 301. Pl. XIII., fig. 1.

Near Heaton, Wooler, &c. Not common. July and August.

Fam. PSALLIDÆ.

PLAGIOGNATHUS, *Fieb.*

72. *P. viridulus*, Fall.; Doug. and Scott, l. c. 401.

Common among herbage on the coast, and at Wooler.

73. *P. arbustorum*, Fab.; Doug. and Scott, l. c. 402. Pl. XIII., fig. 5.

On bushes, &c. Abundant.

APOCREMNUS, *Fieb.*

74. *A. ambiguus*, Fall.; Doug. and Scott, l. c. 404.

Very common.

75. *A. obscurus*, Kirschb.; Doug. and Scott, l. c. 406.
Not common. Bothal. August.

76. *A. variabilis*, Fall.; Doug. and Scott, l. c. 408.
Common throughout the district.

77. *A. simillimus*, Kirschb.; Doug. and Scott, l. c. 410.
Rare. Long Benton. August.

PSALLUS, *Fieb.*

78. *P. alni*, Fab.; *P. querceti*, Doug. and Scott, l. c. 412.
Occasionally. Gosforth and Wooler. August and September.

79. *P. sanguineus*, Fab.; Doug. and Scott, l. c. 413.
Rare. Wooler.

80. *P. salicis*, Kirschb.; Doug. and Scott, l. c. 415.
Long Benton and Gosforth. August and September.

81. *P. lepidus*, Fieb.; Doug. and Scott, l. c. 416.
Rare. Little Benton and Wooler.

82. *P. varians*, H. Schf.; Doug. and Scott, l. c. 418. Pl. XIII., fig. 7.
Bothal, Axwell, Gosforth, and Wooler. Wallington, Dr. Power. August and September.

83. *P. distinctus*, Fieb.; Doug. and Scott, l. c. 419.
Rare. Long Benton. August.

Fam. CAPSIDÆ.

AGALLIASTES, *Fieb.*

84. *A. saltitans*, Fall.; Doug. and Scott, l. c. 428.
One example taken on the sea banks near Hartley, in July.

HETEROCORDYLUS, *Fieb.*

85. *H. unicolor*, Hahn.; Doug. and Scott, l. c. 432.
Briar Dene on dyers weed (*Genista tinctoria*), plentifully, in June and July.

86. *H. tibialis*, Hahn.; Doug. and Scott, l. c. 434.
In flowers of broom. Gilsland, Gibside, Axwell, &c. June.

RHOPALOTOMUS, *Fieb.*

87. *R. ater*, Linn.; Doug. and Scott, l. c. 440. Pl. XIV., fig. 7.

On grass, &c. Common throughout the district.

Fam. LYGIDÆ.

LIOCORIS, *Fieb.*

88. *L. tripustulatus*, Fab.; Doug. and Scott, l. c. 450. Pl. XV., fig. 4.

Not abundant. Gilsland, Durham, &c.

ORTHOPS, *Fieb.*

89. *O. Kalmii*, Linn.; Doug. and Scott, l. c. 452.

Among herbage. Common, especially on the sea coast.

90. *O. cervinus*, H. Schf.; Doug. and Scott, l. c. 454.

Rare. Gilsland and Gibside.

91. *O. pastinacæ*, Fall.; Doug. and Scott, l. c. 455. Pl. XV., fig. 5.

Middleton Old Wood, near Wooler, and at Long Benton. June and August.

LYGUS, *Hahn.*

92. *L. pabulinus*, Linn.; Doug. and Scott, l. c. 457.

Long Benton. Wallington, Dr. Power. August and September.

93. *L. lucorum*, Meyer; Doug. and Scott, l. c. 458.

Long Benton, Whitley, Wooler, &c. September and October.

94. *L. contaminatus*, Fall.; Doug. and Scott, l. c. 461.

Frequents the flowers of *Umbelliferæ* in woods, and is abundant throughout the district.

95. *L. campestris*, Linn.; Doug. and Scott, l. c. 463.

Abundant. Very variable in colour. Specimens found on Cheviot are much more sombre in colour than those found in woods, &c.

POECILOSCYTUS, *Fieb.*

96. *P. unifasciatus*, Fab.; Doug. and Scott, l. c. 467. Pl. XV., fig. 6.
Very rare. Gosforth Woods.

Fam. HARPOCERIDÆ.

HARPOCERA, *Curt.*

97. *H. thoracica*, Fall.; Doug. and Scott, l. c. 469. Pl. XV., fig. 8.
Long Benton, Jesmond, Gilsland, Wooler, &c.

Fam. STIPHROSOMIDÆ.

STIPHROSOMA, *Fieb.*

98. *S. leucocephala*, Linn.; Doug. and Scott, l. c. 482. Pl. XXI., fig. 2.
Very rare. Heaton. June.

Section X. ANTHOCORINA.

Fam. MICROPHYSIDÆ.

ZYGONOTUS, *Fieb.*

99. *Z. pselaphiformis*, Curt.; Doug. and Scott, l. c. 487. Pl. XVI., fig. 3.
Near Gilsland. Rare.

Fam. ANTHOCORIDÆ.

TETRAPHLEPS, *Fieb.*

100. *T. vittatus*, Fieb.; Doug. and Scott, l. c. 491. Pl. XVI., fig. 4.
Near Axwell Park. September.

TEMNOSTETHUS, *Fieb.*

101. *T. nemoralis*, Fab.; *T. lucorum*, Doug. and Scott, l. c. 492. Pl. XVI., fig. 5.
Not common. Gosforth, &c. August and September.

ANTHOCORIS, *Fall.*

102. *A. nemorum*, Linn.; Doug. and Scott, l. c. 495. Pl. XVI., fig. 6.

Abundant. This and the next species are great destroyers of aphides.

103. *A. austriacus*, Fab.; *A. nemoralis*, Doug. and Scott, l. c. 496.

Also very abundant.

104. *A. sarothamni*, Doug. and Scott, l. c. 497.

Gosforth Woods. Rare.

LYCTOCORIS, *Hahn.*

105. *L. campestris*, Fab.; *L. domesticus*, Doug. and Scott, l. c. 499. Pl. XVII., fig. 1.

In herbage. Abundant throughout our district.

PIEZOSTETHUS, *Fieb.*

106. *P. galactinus*, Fieb.; Doug. and Scott, l. c. 500. Pl. XVII., fig. 2.

In cut grass, &c. Common.

Fam. ACANTHIIDÆ.

ACANTHIA, *Fab.*

107. *A. lectularia*, Linn.; Doug. and Scott, l. c. 510.

The *bed bug*, and far too common. Bugs are often found in situations where it seems impossible for them to indulge in the blood of humanity. Such a place is found in the depths of a coal mine, where they abound in the cracks, &c., of the timber which is used to support the roof in the workings. They may there revel in the darkness and heat, but it is difficult to imagine what they can feed on.

Fam. CERATOCOMBIDÆ.

DIPSOCORIS, *Haliday.*

108. *D. alienum*, H. Schf.; Doug. and Scott, l. c. 515. Pl. XVII., fig. 8.

Banks of the river Till, Mr. J. Hardy.

Section XI. OCULATINA.

Fam. SALDIDÆ.

SALDA, *Fab.*

109. *S. orthochila*, Fieb.; Doug. and Scott, l. c. 521.
Gosforth Lake. Very rare.

110. *S. saltatoria*, Linn.; Doug. and Scott, l. c. 522.
Abounds all over our district.

111. *S. stellata*, Curt.; Doug. and Scott, l. c. 525.
Banks of the Irthing, Derwent, Wansbeck, Till, &c.

112. *S. pallipes*, Fab.; Doug. and Scott, l. c. 527.
Wooler district, several specimens, Mr. J. Hardy.

113. *S. scotica*, Curt.; *S. riparia*, Doug. and Scott, l. c. 530.
Banks of Irthing, Derwent, and Till. Not common.

114. *S. cincta*, H. Schf.; Doug. and Scott, l. c. 531.
Bed of Gosforth Lake. April and October. Gibside, Mr. V. R. Perkins.

Section XII. REDUVINA.

Fam. NABIDÆ.

NABIS, *Lat.*

115. *N. apterus*, Fab.; Doug. and Scott, l. c. 550.
Very abundant, and always with undeveloped wings, &c.

116. *N. limbatus*, Dahlb.; Doug. and Scott, l. c. 551.
Also common.

117. *N. dorsalis*, L. Duf.; Doug. and Scott, l. c. 552.
On heath. Not uncommon, and generally of the fully developed form.

118. *N. ferus*, Linn.; Doug. and Scott, l. c. 555.
Gibside, near Axwell Park, Warkworth, Wooler, &c.

SUB-DIV. II. HYDRODROMICA.

SECTION I. HYDROMETRINA.

FAM. HYDROMETRIDÆ.

HYDROMETRA, *Fab.*

119. *H. najas*, De G.; Doug. and Scott, l. c. 560.

Abundant on the surface of running water. Of many hundreds taken and examined not one was found with wings.

120. *H. thoracica*, Schum.; Doug. and Scott, l. c. 562.

Frequents pools of water on the moors.

121. *H. lacustris*, Linn.; Doug. and Scott, l. c. 566.

In ponds and ditches. Very common.

122. *H. odontogaster*, Zett. Ins. Lap. 282, 3; Doug. and Scott, Ent. Mon. Mag., III., 25.

Rare. Long Benton. March.

FAM. VELIIDÆ.

VELIA, *Lat.*

123. V. *currens*; Fab.; Doug. and Scott, Brit. Hem. 571.

Very abundant, but always without wings. Mr. Douglas—Entomologist's Monthly Magazine, VI., 10—records the appearance of great numbers of winged individuals of this species (after seeking for them in that state for several years in vain) in 1868, a year not at all remarkable for its warmth; thus proving that it is not heat which causes the organs of flight to become fully developed. May it not be a provision of nature whereby the distribution of the species is facilitated and insured by the occasional appearance of those winged broods? or, like many other curious facts in insect life, it no doubt tends to the safety and continuation of the species.

MICROVELIA, *Westw.*

124. *M. pygmæa*, L. Duf.; Doug. and Scott, l. c. 574. Pl. XIX., fig. 3.

The undeveloped form in plenty on the border of ponds at Heaton and Gosforth.

Section II. LIMNOBATINA.

Fam. LIMNOBATIDÆ.

LIMNOBATES, *Burm.*

125. *L. stagnorum*, Linn.; Doug. and Scott, l. c. 576. Pl. XIX., fig. 7.

Among herbage on the borders of ponds, &c. Not uncommon.

Div. II. CRYPTOCERATA.

Sub-Div. AQUATILIA.

Section I. APHELOCHIRINA.

Not found in our district.

Section II. NAUCORINA.

Not found in our district.

Section III. NEPINA.

Fam. NEPIDÆ.

NEPA, *Linn.*

126. *N. cinerea*, Linn.; Doug. and Scott, l. c. 584. Pl. XX., fig. 1.

This creature (*the water scorpion*) abounds in ponds and ditches. It is highly carnivorous.

Section IV. NOTONECTINA.

Fam. NOTONECTIDÆ.

NOTONECTA, *Linn.*

127. *N. glauca*, Linn.; Doug. and Scott, l. c. 587. Pl. XX., fig. IV.

This insect, commonly known as *the water boatman*, is very abundant in ponds, and is voracious, preying on other insects.

Fam. PLEIDÆ.

PLEA, *Leach.*

128. *P. minutissima*, Fab.; Doug. aud Scott, l. c. 591. Pl. XX., fig. 3.

Ouseburn, Gosforth, Blyth, &c. Common.

Section V. CORIXINA.

Fam. CORIXIDÆ.

CORIXA, *Geoffr.*

129. *C. Geoffroyi*, Leach; Doug. and Scott, l. c. 593. Pl. XX., fig. 5.

In ponds, &c. Abundant.

130. *C. Panzeri*, Fieb.; Doug. and Scott, l. c. 594.

Gosforth Lake. Very rare.

131. *C. hieroglyphica*, L. Duf.; Doug. and Scott, l. c. 598.

Heaton, Long Benton, Gosforth, and Wooler. Rather rare.

132. *C. Sahlbergi*, Fieb.; Doug. and Scott, l. c. 600.

In ponds and ditches throughout the two counties.

133. *C. Linnéi*, Fieb.; Doug. and Scott, l. c. 601.

Very rare. Long Benton. September.

134. *C. semistriata*, Fieb.; Doug. and Scott, l. c. 602.

Rare. Gosforth. September. Near Wooler in May and August, Mr. J. Hardy.

135. *C. Wollastoni*, Doug. and Scott, l. c. 603.

In pools on the Cheviot range. Plentiful in May and August, Mr. J. Hardy.

136. *C. præusta*, Fieb.; Doug. and Scott, Ent. Mon. Mag., III., 26.

Long Benton, Gosforth, Wooler, &c. By no means rare.

A female of this species flew into my room one hot evening in summer, attracted by the light of my candle, and was so active that I had great difficulty in securing her.

137. *C. socia*, Doug. and Scott, l. c. VI., 243.

Gosforth Lake and Wooler. May and August.

138. *C. Boldi*, Doug. and Scott, l. c. 245.

A single specimen taken in Gosforth Lake. August.

139. *C. sodalis*, Doug. and Scott, l. c.

Rare. Gosforth Lake. September.

140. *C. nigrolineata*, Fieb.; Doug. and Scott, Brit. Hem. 605.

In ponds and ditches. Very common.

141. *C. striata*, Fieb.; Doug. and Scott, l. c. 606.

In running water. Abundant.

142. *C. Falléni*, Fieb.; Doug. and Scott, l. c. 607.

In running water, but much less common than the preceding.

143. *C. distincta*, Fieb.; Doug. and Scott, l. c. 608.

Rare. Long Benton and Gosforth Lake. September and October.

144. *C. mœsta*, Fieb.; Doug. and Scott, l. c. 610.

Cheviot district. Not uncommon, Mr. James Hardy. May and August.

145. *C. Fabricii*, Fieb.; Doug. and Scott, Ent. Mon. Mag., V., 267.

Rare. Cheviot district, Mr. J. Hardy. May.

146. *C. fossarum*, Leach; Doug. and Scott, Brit. Hem., 611.

In ponds, &c. Long Benton, Gosforth, and Wooler. Common. May to October.

147. *C. dubia* (Fieb.), Doug. and Scott, Ent. Mon. Mag., V., 266.

Very rare. Gosforth Lake.

148. *C. venusta*, Doug. and Scott, l. c. 266.

Rare. Ouseburn. September.

149. *C. Douglasi* (Fieb.), Doug. and Scott, Brit. Hem., 612.

Long Benton, Gosforth Lake, Wooler, &c. Not uncommon. May to September.

CYMATIA, *Flor.*

150. *C. Bonsdorffii*, Sahlb.; Doug. and Scott, l. c. 613. Pl. XXI., fig. 6.

Rare. Gosforth Lake. August.

Fam. SIGARIDÆ.

SIGARA, *Fab.*

151. *S. minutissima*, Linn.; Doug. and Scott, l. c. 616. Pl. XX., fig. 6.

Wallington, Dr. Power.

I have frequently found various species of *Corixa* to be infested with minute red mites, generally on the upper side of the abdomen, and adhering to the membrane between the segments. In a specimen in my possession a hole is drilled in each corium, immediately over the mites, and evidently intended to give them free egress and ingress to their dwelling place.

HEMIPTERA-HOMOPTERA.

(*Species new to our Local Fauna: continued from Nat. Hist. Trans. of Northumberland and Durham*, I., 313.)

65. *Cixius intermedius*, Fieb. (M.S.); Scott, Ent. Mon. Mag., VII., 147.

New to the British fauna. A few specimens in my collection were taken in Gosforth Woods.

66. *C. brachycranus*, Fieb. (M.S.); Scott, l. c. 148.

The only known British example is a male, which I took in Gosforth Woods, in September.

LIBURNIA, *Staål.* (DELPHAX, *Auct.*)

67. *L. Boldi*, Scott, l. c. 68.

A female, taken by myself in Seghill Dene, in May, is the only known representative of the species.

68. *L. melanopachys*, Fieb. (M.S.); Scott, l. c. 70.

A male, from Gosforth Woods, in September, is the only known specimen of this species.

69. *L. leptosoma*, Flor (?) Scott, l. c. 27.

An undeveloped female, from Cheviot, was rather doubtingly referred to this species by Mr. Douglas.

70. *L. Fieberi*, Scott, l. c. 71.

New to Britain. A male, taken at Abbey Wood, by Mr. Scott, in July; and a female, taken by myself in Gosforth Woods, in October, are the only specimens known.

EUPTERYX, *Curtis.*

71. *E. nitidulus*, Fab.; Marshall, Ent. Mon. Mag., III., 247.

Three specimens from Middleton Old Wood, near Wooler, were taken by Mr. James Hardy. This, according to Flor, is nearly confined to Northern Europe.

72. *E. decempunctatà*, Fall.; Marshall, l. c. 248.

Taken rather plentifully in the Wooler district, by Mr. James Hardy. Also a northern species.

COCCIDÆ.

Coccus vitis, Linn., Syst. Nat., II., 741, 16.

Last summer I had brought to my notice a curious departure from the usual habit of this creature. In many hot-houses it infests the vines, often to an injurious extent, and is known to gardeners as the "scale." In this case a colony had taken possession of a gooseberry bush growing in the open air, but in a snug corner near the vinery. A branch of this bush was brought to me and had egg-bundles at short intervals throughout its whole length; these bundles being silky-white, with the dead female on the top of each, curiously simulated the droppings of birds. Besides these the branch was quite alive with young from the just hatched pink hexapod to the half-grown scale. Is it not very curious that instinct should have led the insect to the plant which is said to produce the greater portion of that delicious exhilarating tipple champagne?

Dorthesia characias, Latr., Westw. Intro., Vol. I., frontispiece, fig. 8, ♂; Vol. II., 445, fig. 118, 20, ♀ (*D. cataphracta*).

The female of this curious creature was taken in Cold Martin Moss, Wooler, by Mr. Hardy. I once had a bunch of the culms of grass brought to me which had attached to them what might be the egg-bundles of this insect: they were silky white, about the size and shape of a stout grain of rye, and full of pink coloured eggs.

XIV.—*Insects of Northumberland and Durham* (*Notes on Coleoptera*). By Thomas John Bold.

During the past year (1871) several interesting additions have been made to our local fauna, principally resulting from the labours of my old friend and fellow-worker, Mr. James Hardy, of Old Cambas, who, for two seasons past, has been investigating with considerable success the insect fauna of the neighbourhood of Wooler. For us his captures have an especial interest, occurring as they do on our extreme northern limits: moreover, several of them are species which have hitherto been found on the Scottish mountains only, and which appear to find their southern limit on the Cheviots.

For full particulars of Mr. Hardy's examination of the district mentioned, reference must be made to the Proceedings of the Berwickshire Naturalists' Club, Vol. VI.

COLEOPTERA.

(species new to our local fauna.)

1. *Bembidium Clarki*, Dawson, Geodephaga Britannica, 199. Pl. III., fig. E.

Not uncommon on the Durham coast, where it lives amongst the shingle on the beach. Mr. Hardy also finds it on the coast of Berwickshire.

2. *Haliplus varius*, Nic.; T. J. Bold, Ent. Mon. Mag., IV., 284; D. Sharp, Cat. Brit. Col., 4.

E. C. Rye, Ent. Annual, 1872, 137, refers this species to *confinis, var.*; nevertheless, I am of opinion that it is the insect described by Dr. Schaum as *varius*. Many of our small Halipli are most closely related, and may ultimately have to be united, but this must not be done until the intermediate steps are found. Dr. Sharp retains *varius* as a species in his recently published catalogue of British Coleoptera.

This species has occurred to me sparingly in Gosforth Lake.

3. *Agabus Solieri*, Aubé; E. C. Rye, Entom. Annual, 1868, p. 18.

Apparently very rare. A female, taken on the east end of Cheviot, is the only local example known to me.

4. *Helophorus arvernicus*, Muls., = *H. pumilio*, Wat. Cat.

In ponds. Wooler district. Rare.

5. *Ocalea latipennis*, Sharp, Ent. Mon. Mag., VI., 280.

A single specimen from near Wooler. It has hitherto only occurred in Scotland.

6. *Homalota silvicola*, Fuss.; D. Sharp, Trans. Ent. Soc. London, April, 1869, p. 132.

Two females of this fine species were taken near Wooler in August.

7. *H. crassicornis*, Gyll.; D. Sharp, l. c. 135.

A fine male, taken in October, is from the same locality as the last. Dr. Sharp records three specimens, taken by himself in Inverness-shire, as the only British examples known to him.

8. *H. pilicornis*, Thoms.; D. Sharp, l. c. 155.

Two specimens from Wooler Haugh.

9. *H. debilis*, Erich.; D. Sharp, l. c, 157.

A specimen from Cheviot, and another from Berwickshire, are referred by Dr. Sharp, rather doubtfully, to this species.

10. *H. Aubei*, Bris.; D. Sharp, l. c. 171.

11. *H. gemina*, Erich.; D. Sharp, l. c. 172.

Both species taken in the Cheviot district in July, but they are apparently very rare.

12. *Myllæna minuta*, Grav.; Kraatz., Ins. Deutsch, II., 369.

Sparingly from Cold Martin Moss, near Wooler.

13. *Gymnusa brevicollis*, Payk.; Kraatz, l. c. 373.

Very rare near some swampy pools at Wooler.

14. *Megacronus inclinans*, Grav.; Kraatz, l. c. 444 (*Bolitobius*).

My collection has been enriched, by the kindness of Mr. Wilson, junr., with a specimen of this rare species, which he took in the Ravensworth Woods.

15. *Heterothops dissimilis*, Grav.; Kraatz, l. c. 485.

Very rare. Wood at Old Earl, near Wooler, in October.

16. *Stenus incanus*, Erich.; Kraatz, l. c. 758.

A single specimen from Wooler Haugh. Apparently a very rare and local insect, and previously only taken in Dumfriesshire, by Dr. Sharp.

17. *S. Guynemeri*, Duval, Faune Française, 581.

In moss near a waterfall, in company with *Dianous cærulescens*.

18. *Geodromicus globulicollis*, Mann; Kraatz, l. c. 927 (*Anthophagus*).

Rare. Cheviot, Mr. R. Hislop.

19. *Lesteva Sharpi*, Rye, Ent. Annual, 1867, 51.

Cheviot, but very rarely, in August. Not taken hitherto in England to my knowledge.

20. *L. muscorum*, Duval; D. Sharp, Ent. Mon. Mag., VIII., 83.

Three specimens from Wooler Haugh.

21. *Phlœobium clypeatum*, Müll.; Kraatz, l. c. 1033.

Omitted in my revision. Not of frequent occurrence: most commonly found in cut grass. Several specimens were taken at Wooler, in October.

22. *Tychus niger*, Payk., Faune Française, 356.

In moss, &c. Common.

23. *Bythinus Burrelli*, Denny, Faune Française, 358.

Very rare. Wooler district. July and August.

24. *Trichopteryx rivularis*, All.; Matthews, Ent. Mon. Mag., Dec., 1871, p. 152.

Two examples, named by the Rev. A. Matthews, are from Gosforth, and are the only local specimens I have seen.

25. *Hydnobius Perrisi*, Fairm., Ent. Annual, 1865, 62.

Very rare. I have only seen one local specimen, which was taken in the vicinity of Gateshead.

26. *Anisotoma scita*, Erich.; E. C. Rye, Ent. Mon. Mag., VIII., 158.

I have a female of this recently introduced species, which I beat out of herbage at Hartford in May.

27. *Cryptophagus punctipennis*, Briss.; D. Sharp, Ent. Mon. Mag., VIII., 158.

Several local specimens, mostly from tufts of withered grass, near South Shields.

28. *Cyphon nigriceps*, Kies.; G. R. Crotch, Entomologist, September, 1866.

Six specimens from the Wooler district, and taken in October. This species appears to vary a good deal in colour, as in these examples I find the type form (testaceous with a black head), one nearly black, and an intermediate form in which the head and thorax are black with the elytra fusco-testaceous.

I believe that it has hitherto only occurred in Scotland.

29. *Pissodes piniphilus*, Herbst.; Thomson, Skand. Col., VII., 222; T. J. Bold, Ent. Mon. Mag., VII., 275.

Two specimens from Sunderland, but probably introduced. It is however not unlikely to be found in this country, for it occurs over nearly the whole of northern Europe.

30. *Erirhinus salicinis*, Gyll.; Walton, Ann. and Mag. Nat. Hist., 1844 (*Dorytomus*).

A small series of this pretty insect was beaten out of willows, in the Cheviot district in May. It appears to be both rare and local.

31. *Rhynchites æneovirens*, Marsh.; Walton, l. c.

Rare. Middleton Old Wood, near Wooler.

32. *Caligrapha signatipennis*, Ställ.

A living specimen of this handsome insect was taken in the greenhouse of R. S. Newall, Esq., at Fern Dene. It is said to be a native of Mexico, and had no doubt come to this country with some plant.

33. *Thyamis atriceps*, Kuts., Ent. Ann., 1867, 96.

Occurs, but appears to be rare, in the Wooler district.

(NOTES ON RARE OR LOCAL SPECIES).

Dromius nigriventris, *Metabletus foveola*,* Rev. 4.

Both species are found in plenty on Wooler Haugh (the site of the battle of Flodden), but with us they occur only on the sea coast. Two other coast loving species, *Aleochara obscurella* and *Rhizobius litura*, are found in the same locality.

Calosoma sycophanta, Rev. 6.

This specimen, which was caught crawling on a load of sand brought from higher up the river, was purchased at the late Mr. Wingate's sale, by Mr. John Hancock, and is now in his collection.

Bembidium Mannerheimii, Rev. 13.

Rather a good series of this rare insect has been taken in the Wooler district, in May, July, and October. In July it was found to frequent cut grass at a considerable elevation on the hills.

Hydroporus 9-*lineatus*, Rev. 17.

Not uncommon in the Wooler district, in May.

Hy. Gyllenhalli, Schiod., = *Hy. piceus*, Rev. 17.

In Cold Martin Moss, and upon the hills of the Wooler district, in May and July, plentifully.

Hy. monticola, Rev. 17.

About a dozen specimens have occurred with the preceding.

Hy. nigrita, Rev. 18.

Since the publication of my Revision several specimens of this species have been taken near Wooler, and again both forms are present, still further confirming my opinion that *discretus* is only the male of *nigrita*. Other grounds may be pointed out why this should be the case: in nearly every other species of the

* Revision of Coleoptera, Nat. Hist. Trans. N. & D., Vol. IV.

genus the sexes differ in a like manner, the male always being more glossy than his partner, even in the most obscurely coloured species. This opacity of the female, which runs also through the genus *Agabus*, and indeed extends over nearly the whole family *Hydradephaga*, is caused by the surface being finely sculptured (strigose, coriaceous, alutaceous, &c.) in that sex, and which is either absent in the males or not so much developed. This difference of the sexes is but little noticed by even our best authorities. I may add, that a pair of foreign types of *discretus*, kindly lent me by Mr. Crotch, differed precisely as do our local examples of *nigrita*, the male being glossy black with long hair, and the female opaque, nearly hairless, and much less strongly punctured than the other sex.

Hy. elongatulus, Rev. 18.

Mr. Rye, Ent. Annual, 1872, 138, informs us that this species is "erroneously identified," but on what grounds he has formed his opinion I am at a loss to know, as he has not seen the specimen on which it is founded, nor had any description of it.

Hy. umbrosus; Hy. incognitus, Rev. 18.

Both species from Wooler; a series of the former, and two examples of the latter.

Agabus nitidus, Fab., = *A. fontinalis*, Rev. 20.

A fine male of this rare species was taken near Wooler in May.

Ocalea castanea, Erich., = *O. rufilabris*, Rev. 22.

Has occurred in some plenty in the Wooler district.

O. badia, Rev. 22.

Several specimens from the same locality.

Microglossa pulla; M. nidicola, Rev. 22 (*Haploglossa*).

Both species taken sparingly by beating willows on Wooler Haugh, in May.

Aleochara villosa, Rev. 114, E. C. Rye, Ent. Annual, 1872, 49.

A second example of this new British species has occurred at Long Benton.

Callicerus rigidicornis, Rev. 23.

One specimen, from the Wooler district.

Homalota cærulea, Sahl., = *H. carbonaria*, Rev. 25.

Taken on the banks of the Wansbeck, sparingly, by Dr. Power, and very rarely, near Wooler, by Mr. Hardy. *H. labilis* is very abundant in the latter district.

Ho. londinensis, Rev. 26.

Two examples, from Wooler.

Ho. clavipes, Rev. 26.

Several more specimens have been taken, and prove that, with us, this is exclusively a hill species.

Ho. pagana, Rev. 27.

Three or four from the Wooler district.

Ho. occulta, Rev. 27; *Ho. fungivora*, id. (*var.*)

In fungi, at Wooler, sparingly.

Ho. picipes, Rev. 27.

With the foregoing, but more abundant.

Ho. fallaciosa, Rev. 28.

Wooler. Rare.

Ho. curtipennis, Rev. 28.

Several other examples have been found on the Cheviot range.

Ho. valida, Rev. 28.

A few examples, found in fungi, are from the Wooler district.

Ho. sodalis (several); *Ho. angusticollis* (one), Rev. 29; *Ho marcida* (one); *Ho. intermedia* (three); *Ho. macrocera* (a few); *Ho. lævana* (two or three); *Ho. cinnamoptera* (two or three), Rev. 30; *Ho. orbata*, Rev. 31.

All are from the Wooler district.

Encephalus complicans, Rev. 32.

A single example, from the same locality, in October.

Tachinus proximus, Rev. 33.

In fungi, &c., in the Cheviot district, rather plentifully.

T. pallipes, Rev. 33.

A female, with the preceding.

Quedius ruficollis; Qu. suturalis; Qu. auricomus, Rev. 36.

All from Cheviot, but very rare.

Philonthus umbratilus, Rev. 30.

Wooler. Rare.

Dianöus cærulescens, Rev. 41.

Hitherto very rare and local, but in May, 1871, it was taken in plenty on the margin of a stream in the Cheviot district.

Stenus tarsalis, Rev. 43.

Six specimens from Cold Martin Moss, near Wooler, in October.

Acidota crenata, Rev. 45.

At the roots of heather on Cheviot, in August and October. Five specimens taken.

Homalium exiguum, Rev. 47.

Several examples, from the Wooler district.

Ho. brevicorne, Rev. 114; *Ho. gracilicorne*, l. c. 47.

Mr. Rye has pointed out that these are identical. Ent. Annual, 1871, 36.

Choleva longula, Rev. 50.

Half a dozen specimens, from the Wooler district, and all found in fungi. All the examples that I have seen have the apices of their elytra rounded.

Epuræa florea, Rev. 56.

Three or four from the flowers of sallows, in May, near Wooler.

Cryptophagus pubescens, Rev. 62.

Cheviot. One specimen only.

Morychus æneus, Rev. 65.

In plenty, near Wooler, in May.

Malthodes mysticus, Rev. 76.

Several specimens, from Cheviot, in August.

Anobium striatum, Rev. 79. [The Death-watch.]

One of our county gentlemen had nearly a score of bedsteads completely destroyed by this pest.

Tetratoma fungorum, Rev. 81.
A fine series, from fungi, near Wooler.

Te. ancora, l. c.
A specimen, taken in fungi, at Earl, near Wooler, in October.

Phytonomus polygoni, Rev. 89.
Several taken in the Wooler district.

Trachyphlœus scaber, Rev. 90.
Very rare. Near Wooler, in October.

Erirhinus majalis, Rev. 92.
A fine series beaten out of sallows, near Wooler, in May.

Er. agnathus, l. c.
Two specimens with the foregoing.

Elleschus bipunctatus, Rev. 92.
Local, but in abundance, near Wooler, in May.

Rhinonchus castor, Rev. 94.
Wooler. Rare.

Ceuthorhynchus rugulosus, l. c. 95.
Wooler. Rare.

Ce. cyanipennis, l. c.
Wooler. Rare.

Graptodera longicollis, Rev. 103.
Of several batches, taken promiscously, at various times, on heather, nearly all are females; one male to eight or ten females being the usual proportion. This is very curious, and it would be interesting to know if the same disparity obtains in other species of the family *Halticidæ*.

Note.—Dr. Sharp, in his recently published (July, 1871), and valuable "Catalogue of British Coleoptera," has made considerable alterations in nomenclature, most of which will have to be adopted. They are however too numerous to be enumerated here.

XV.—*Notes on the Occurrence of Lepidoptera in* 1871. By THOMAS JOHN BOLD.

THINKING that an authentic record of the abundance, or otherwise, of local *Lepidoptera* would be of considerable interest to most of our members, I applied to my friend Mr. W. Maling, and he has supplied me with the following most interesting notes for the past season (1871).

DIURNI (BUTTERFLIES).

The Whites (*Pieris brassicæ, napi and rapæ*).—The spring brood not so common as usual. The second broods, in July and August, were in average numbers.

The Orange Tip (*Anthocharis cardamines*).—Not so numerous as in 1870 on the banks of the Derwent, at Chopwell, and Gibside.

The Fritillaries (*Argynnis Euphrosyne, and Selene*).—Rather plentiful in May and June, at the same localities as the above.

The Small Tortoise Shell (*Vanessa urticæ*).—A second brood of this common insect occurred in this neighbourhood in 1870. I found the small larvæ during the last week in May, and again (in the same bed of nettles) on the 9th of August following. They were then nearly full fed, and the butterfly was on the wing in the last week of September.

The Peacock (*Vanessa Io*).—I saw one specimen on the 4th of September, near South Shields. For several years previous I had not seen the species alive in our district.

The Red Admiral (*Vanessa Atalanta*).—Rather scarce.

The Painted Lady (*Vanessa cardui.*)—I have not met with either larva or imago this season. The former is generally abundant on the coast.

The Wall (*Tithonus Megæra*).—Saw one on the wing, at Rothbury, in the first week of September.

Satyrus Tithonus.—Plentiful on the banks of the Wansbeck, near North Seaton, in the end of July.

The Small Heath (*Cœnonympha Pamphillus*).—In average numbers.

The Common Blue (*Lycæna Alexis*).—Also in average numbers.

The Lilac Blue (*Lycæna Argiolus*).—Two females (worn) were taken at Chopwell, in the first week of June.

A Skipper (*Thanaos Tages*).—Two or three at Chopwell. June.

NOCTURNI (MOTHS).

The Poplar Hawk-Moth (*Smerinthus populi*).—The larva plentiful on poplars, near Newcastle, in July and August.

The Convolvulus Hawk-Moth (*Sphinx convolvuli*).—A specimen, in the possession of Mr. Eales, South Shields, was found in the river near the Mill Dam, and is in tolerable condition.

Deilephila galii.—I had the pleasure of seeing this beautiful insect on the wing at Newbiggen-by-the-Sea, on the evening of the 15th of August, 1870. An imago of the same species (a male) was bred by Mr. Hamilton (Secretary of our Entomological Club) from a larva found in the engine-shed of the Newcastle and Carlisle Railway, on the 7th of September, which fed upon *Galium verum*, and came out of the pupa on the 30th of April following. Mr. H. thinks the larva had come in the sand which is brought for the use of the engines. Mr. Henderson, Jesmond, also found a larva on the sea coast, near South Shields, but unfortunately it had been stung.

The Small Elephant Hawk-Moth (*Chærocampa Porcellus*).—I have not met with either larva or imago this season, and have only heard of one being found.

The Humming Bird Hawk-Moth (*Macroglossum stellatarum*).—Like *Porcellus*, this usually abundant insect has not appeared on our coast this season.

Sisia bembeciformis.—Larva on the trunks of old poplars, at Jesmond. The perfect insect is taken in the finest condition about five o'clock in the morning soon after leaving the pupa.

Hepialus Hectus.—One specimen at Chopwell. July 4th.

H. sylvinus.—Newbiggin-by-the-Sea. End of July.

H. velleda.—Jesmond Dene. End of June.

Zygæna filipendulæ.—Swarming at Newbiggen-by-the-Sea. Middle of July.

Nudaria mundana.—Newbiggen-by-the-Sea, July. Larva on lichen covered walls. Beginning of June.

Euchelia jacobeæ.—The larvæ of this pretty species swarms at Newbiggen-by-the-Sea, feeding on ragwort. I have met with it along the coast from Marsden to Bamboro'.

Arctia mendica.—Thornley Wood. May 10th.

Orgyia fascelina.—Bred from pupæ found on the moors at Redesdale. May 24th.

O. antiqua.—Larvæ feeding on white thorn, near Pelaw Station. End of August.

Bombyx rubi.—Larvæ very plentiful on the moors at Rothbury. September and October.

GEOMETRÆ.

Odontopera bidentata.—Larva numerous on ivy and lilacs in Jesmond Road. Not generally a common species.

Phigalia pilosaria.—On trunks of oaks, near Corbridge. February 20th and 21st.

Cleora lichenaria.—Tuggal Hall. July.

Gnophos obscurata.—Two specimens at Newbiggen-by-the-Sea. July 25th.

Geometra papilonaria.—One taken by Mr. Hedworth (Dunston), at Thornley. July 23rd, 1870.

Ephyra trilinearia.—One near Winlaton Mill. June.

Asthena luteata.—Chopwell. June 4th.

Eupisteria heparata.—One specimen (worn). Chopwell. July 4th.

Acidalia imitaria.—Five or six at Newbiggen-by-the-Sea. July 18th to 30th.

Macaria liturata.—Three, near Hexham. June 30th, and July 1st.

Emmelsia alchemillata.—Hexham. June.

E. decolorata. Jesmond Dene. June.

Eupithecia centaureata.—Two at South Shields, on palings. June. One at Beadnell. July.

Melanippe rivata and tristata. Near Hexham. June.

Coremia minutaria.—Eight specimens, at Newbiggen-by-the-Sea, in July.

C. propugnata.—One at Warden, near Hexham, in June.

Phibalapteryx lignata.—Newbiggen-by-the-Sea. July.

Cidaria prunata.—Newbiggen - by - the - Sea. Beginning of August. In a garden only.

C. testata.—Plentiful at Rothbury. September.

Chesias spartiata.—Amongst broom, near Hexham. End of September.

DEPRANULÆ.

Platypteryx falcula.—Two specimens at Chopwell. July 4th.

Cilix spinula.—Two broods of this insect. May and July.

PSEUDO BOMBYCES.

Dicranura vinula.—Larvæ plentiful, near the town, on poplars and willows.

Notodonta dictæa and ziczac.—Larvæ on poplars and willows, near the town.

Diloba cæruleocephala.—Found larva at Hexham, on white thorn. June 30th.

NOCTUÆ.

Thyatira batis, and derasa.—The latter at sugar, in Jesmond Dene: beginning of July. The former at Hexham on the wing. End of June.

Cymatophora diluta.—Plentiful at sugar. Thornley. September.

Bryophila perla.—Imago on lichen covered walls, at Newbiggen-by-the-Sea. July and August.

Nonagria elymi.—About fifty specimens of this formerly rare insect were captured on the coast at South Shields, in July, by different members of the "Entomological Club," flying at dusk, or at rest on the sand reed, in the stems of which plant the larva feeds.

Gortyna flavago.—Pupa in the stems of thistles. August and September. South Shields, &c.

Axylia putris.—Newbiggen-by-the-Sea. July. Flying at dusk over nettles.

Charæas graminis.—On the flowers of ragwort by day. Newbiggen-by-the-Sea. August.

Mamestra albicolon.—On the coast at South Shields. May and June. Very scarce this year.

Apamea unanimis.—Larvæ (hybernated). Jesmond Dene. April.

Miana arcuosa.—Rather plentiful at Newbiggen-by-the-Sea, in July.

Agrotis valligera, cursoria, and tritici.—Not so numerous as usual on the coast, near South Shields. Larvæ probably destroyed by the frosts in May and June.

Noctua glareosa. At sugar. Thornley Wood. August.

Tæniocampa gothica, rubricosa, instabilis, gracilis, munda, and cruda.—Very scarce, at sallow blossoms in April, on account of the frost.

Orthosia upsilon.—Bred from larva found in Jesmond Dene, on willow, in June.

O. lota, and macilenta.—Also bred, and at sugar. Thornley. September.

Anchocelis rufina, pistacina, and litura.—Rather plentiful at sugar. Thornley. September and October.

Scopelosoma satellitia.—Swarming at sugar. Hexham. September, and beginning of October.

Xanthia cerago, silago, and ferruginea.—Rather plentiful.

Polia chi.—Plentiful, as usual, on walls near the town. A dark variety (*olivacea*) seems peculiar to this part of the country.

Agriopis aprilina.—At sugar. Thornley. September.

Phytometra ænea.—Plentiful at Chopwell, flying in the sun. End of June.

XVI.—*Description of a considerable portion of a Mandibular Ramus of Anthracosaurus Russelli; with Notes on Loxomma and Archichthys.* By Albany Hancock, F.L.S., and Thomas Atthey. (Plate XII.)

In 1862 Professor Huxley made known the presence in the Lanarkshire Coal-field of a large and powerful Labyrinthodont, to which he gave the name of *Anthracosaurus Russelli.** This species was founded on a nearly perfect cranium; and at the same time a vertebra and a rib supposed to belong to this Amphibian were also described. No further evidence of the existence of this formidable creature of the Carboniferous era was procured till Mr. Atthey obtained a large portion of another cranium belonging to it at Newsham. This interesting fragment was described, in the September number of the "Annals," in 1869; and we gave in the same paper an account of the anterior extremity of a mandibular ramus and of a large sternal plate, which we believed likewise to belong to *Anthracosaurus.*

We are not aware that any further account has appeared of the occurrence of the remains of this rare Amphibian. It is therefore with much pleasure that we are enabled, through the kindness of Mr. Ward, of Longton, to describe a large fragment of a mandible belonging to this species. This specimen forms

* Quarterly Journal of the Geological Society, Vol. XIX., p. 56.

part of that gentleman's well-known collection, and is from the new ironstone shale of Fenton. It is a portion of the posterior extremity; but the articular process is wanting. The fragment is seven inches long, and measures nearly four inches from the alveolar border (Pl. XII. *a*) to the inferior margin (*b*). There is just two inches of this margin perfect; and this is at the point where undoubtedly the ramus is deepest. The inner surface is exposed to view, and is concave longitudinally, the outer surface being a little convex, as is evident in the transverse section of the specimen in front. The bone, which is in a very perfect state of preservation, is composed of two parallel layers—an inner, the splenial plate (*c*), and an outer, the dentary piece (*d*)—and is stout, particularly at the alveolar border, where it is an inch thick; thence it becomes gradually thinner to the longitudinal middle line; here it is scarcely more than one-fourth of an inch thick, and so continues to the inferior margin.

The upper surface of the alveolar border is slightly channelled, and is almost straight; but within three inches and a quarter of the posterior extremity it is bent a little downwards (*e*), and then, rising up considerably above the level of the border, is continued backwards in a straight line (*f*) to the posterior extremity; this straight part is one inch and a half long, and is bevelled off to a sharp edge. In front of the elevation the alveolar border has been torn, apparently by pressure, from the inner layer of bone, which at this part is pushed a little downwards.

The teeth are well preserved; in all there have been twelve, nine of which are almost perfect, and with the exception of the three posterior ones, are all of the same size. They are nearly an inch long, and at the base are upwards of a quarter of an inch wide; they taper gradually to the apex, which is a little compressed in the direction of the long axis of the jaw, and in the same plane has the sides slightly carinated, and is also rather suddenly bent inwards and backwards; but the recurving is probably, in part at least, owing to pressure. The crown is not perfectly cylindrical, or rather conical; it is a little flattened at the sides, and is therefore in cross section somewhat angulated; and at the base it is wider in the transverse than in the longitudinal direction of the jaw. The whole surface is covered with brilliant enamel, and is longitudinally grooved to within less than a third of the apex. The grooves are fine, rather distant, and the spaces between them are flattened, so that there is a tendency to a ridged appearance.

The teeth are clustered, and in this respect agree with those of the maxillæ. In the clusters the bases are in contact; and short spaces divide the clusters. The first tooth (*g*) is split longitudinally by the anterior fracture of the specimen, and very little of it remains: only a small piece of the base is perceptible; but a partial impression of the crown shows that it was as large as the others. The base of the second tooth is not far from that of the first, and is the first perfect one of the series. The third tooth has been removed for structural examination; it stood apart, about a quarter of an inch from the second, and as far from the fourth tooth. The fourth and fifth are in contact, and are separated from the sixth by about a quarter of an inch; the sixth, seventh, and eighth are close together, and form the largest cluster of the series. Then follows a space of upwards of a quarter of an inch, and the series is terminated by three teeth much smaller than the rest; these are clustered, the first two being almost perfect, and the third (*h*) having almost entirely disappeared. These three posterior teeth are placed just at the point where the alveolar border begins to rise, and are two inches and a half from the hinder extremity of the specimen.

The mandible of *Anthracosaurus* is distinguished from that of *Loxomma*, the only known jaw with which it is likely to be confounded, not only by its greater size, but also by the massiveness of the bone. It is an inch deeper or wider than the largest mandible we have seen of the latter, and the bone is very much thicker. The form of the teeth likewise distinguishes this species from *Loxomma*: they have the crown much less compressed, and the trenchant margins are not nearly so much developed; towards the base, too, they are more cylindrical, or rather conical, though they are somewhat irregularly flattened and angulated at the sides. They are also much more uniformly of a size; in this respect they vary greatly in *Loxomma*, while we have seen that in the fragment before us the teeth are about the same length, with the exception of the three terminal ones of the series. The internal structure of the tooth is also characteristic, and at once distinguishes this species from *Loxomma*.

Indeed, the characters of the teeth of *Anthracosaurus* are very peculiar; their thickness and angularity at the base, the delicate conical taper outwards, the incurving of the apex, its slight compression and the small development of the trenchant margins are the distinguishing features of this form, and at once enable us to determine the generic and specific identity of Mr. Ward's interesting fragment. But had any doubt existed, the internal structure of the tooth would have removed it. In all these characters this specimen exactly agrees with *Anthracosaurus Russelli;* the Labyrinthodont structure in particular accords in every respect with the very clear description given of it by Professor Huxley in the original memoir.

It is true that the teeth are stated to be ridged, while we have described them as grooved. This character, however, we pointed out, in our former paper on *Anthracosaurus* already quoted, varies according to the state of preservation of the specimen. We have in our possession teeth of this species both ridged and grooved. They seem to vary in this respect even when perfectly fresh; but if a little eroded, the ridges are much exaggerated and become quite sharp, giving a very striking appearance to the tooth. In *Loxomma* the same variability obtains: the teeth of that form are usually grooved; some, however, are ridged, while in others the ridges are greatly increased by erosion.

There is in Mr. Atthey's collection a peculiar bone from the shale at Newsham, that has been a great puzzle to us for a long time. It was not till a nearly perfect mandibular ramus of *Loxomma* was obtained that its true nature was solved. It was then at once seen to be the articular piece, with a portion of the dentary bone attached, of some large Labyrinthodont. In form it closely resembles the same part in the ramus just alluded to; only it is very much larger, and must have belonged to a jaw equal in size to that from Fenton. In fact, from its dimensions and massive character, it would seem more than probable that this Newsham articular piece really belongs to *Anthracosaurus*.

The posterior margin of the fragment of the ramus in connexion with the articular piece is perfect, and sweeps downwards in an even curve, which, if continued a little further, as it appears to have been, would give to the posterior part of the jaw a depth of quite four inches—the measurement near the same point of Mr. Ward's specimen. The articular piece stands well up; the neck is short and stout; the process bearing the glenoid surface is massive, and is transversely elongated, measuring two inches and a quarter long, and an inch wide; the glenoid cavity is deep, and takes a slight sigmoid curve; behind at the outer margin there has been a stout projecting process; and in front towards the inner margin there has been a similar projection of the lip of the articular cavity. It would therefore seem evident that the attachment of the mandible to the tympanic trochlea must have been very firm, rendering the movements of the jaw secure and precise. Indeed, the massive character of the whole articular piece indicates great power, and is well correlated with the huge vomerine tusks and formidable dentition of this species.

The presence of *Anthracosaurus* in the Newcastle Coal-field does not rest merely on the occurrence of this articular piece. We have already alluded to a large portion of the cranium that was found at Newsham. This interesting specimen exhibits numerous maxillary teeth and the two great vomerine tusks so characteristic of this powerful Labyrinthodont. The anterior extremity of a mandibular ramus, with five teeth attached, was also described in the same paper with the last-named specimen. And now we have to record from the same locality a fragmentary specimen of the middle portions of a pair of mandibular rami displaying several teeth. These fragments lie one over the other, and are much confused and mixed up with some other bones that are adherent by pressure to the general mass. The surfaces of the teeth, however, are in a very good state: some exhibit grooves, others ridges. In one of the teeth the grooves are very delicate, and are precisely like those in Mr. Ward's specimen.

Besides the above evidence of the occurrence of *Anthracosaurus* in the Newcastle Coal-field, detached teeth are likewise found at Newsham, agreeing in every particular, externally and internally, with the type specimens. They are rare, however, in comparison with those of *Loxomma*, which is undoubtedly the much commoner fossil of the two.

Loxomma Allmanni, *Huxley*.

Since our paper appeared in the "Annals" (May, 1870) on the occurrence at Newsham of an imperfect cranium of *Loxomma Allmanni*, Mr. Atthey has obtained from the same locality another and complete cranium of this fine Labyrinthodont. This second example was procured about the middle of last June, and is one of the finest and most perfect specimens that have yet been found. Indeed, so far as we know, there are but two others that can at all be compared with it; and these are the beautiful skulls alluded to in the above paper as being in the possession of Mr. James Thomson, of Glasgow.

Our second specimen is fourteen inches long and nearly seven inches and three-quarters wide across the occipital region, where the skull is widest. We estimated the length of the first obtained specimen, which wants the muzzle, at twelve inches; but, as it is nine inches wide, this estimate is probably considerably less than it ought to be. Since we have seen that the one which is only seven inches and three-quarters wide is fourteen inches long, we should certainly expect that the specimen measuring nine inches across would be proportionately longer. The latter could scarcely have been less, when perfect, than fifteen or sixteen inches in length.

The specimen recently obtained has been entirely removed from the matrix, so that both the upper and under surfaces of the skull are completely exposed to view. The bone is in a very good state of preservation, and exhibits in great perfection, covering the whole of the upper aspect, the peculiar honeycombed or reticulated structure common to these Labyrinthodonts. The roof of the mouth is also well displayed, particularly the sphenoid and the vomerine and palatal bones, likewise the posterior nares and the palato-temporal foramen. The basal portions of the teeth, too, are nearly all present; but the crowns, unfortunately, have disappeared.

In every respect the characters agree with those of the previously described specimen; and in addition, the parietal foramen is distinctly marked in the new example. This characteristic feature is not seen in either of Mr. Thomson's specimens; but in the original cranial fragment described by Professor Huxley it is well indicated on the inner surface.* In our specimen it is small and circular, measuring not much over an eighth of an inch in diameter. It is placed near the centre of the wide occipital portion of the median coronal bones. The mucus grooves on the muzzle, too, are well developed: one passes straight across the premaxillaries in front; from either end of this, and forming with it an acute angle, another groove passes backwards for a considerable distance along the side of the muzzle.

The teeth are nearly all present in a more or less imperfect condition; mostly, however, the stumps only remain. There are three pairs of large tusks—one vomerine, two palatal. The vomerine tusks are situated about one inch and a quarter behind the anterior margin of the præmaxillæ; the basal portions of these project considerably, and measure in diameter three quarters of an inch. The first pair of palatal tusks are placed two inches further back, and are scarcely so large as the vomerines; the second pair, which seem equally large, are one inch and a quarter further in the rear, being somewhat in front of the transverse centre of the skull. Each præmaxilla bears four teeth, which are upwards of a quarter of an inch wide at the base. There are five or six rather smaller teeth behind the vomerine and the first palatal tusk, and the like number between the latter and the second palatal tusk; and behind this, again, there

* Quarterly Journal of the Geological Society, 1862. Vol. XVIII., p. 291.

are four or five more, making in all in each side of the jaw about twenty teeth. All these teeth are placed a little apart, and have depressions behind them in the alveolar border; the tusks also are accompanied by similar depressions.

Not far from the spot where this fine skull was obtained, two mandibular rami (a right and a left) occurred two or three feet apart. They are of the same size, and most probably belonged to the skull in question. This would seem to be likely, not only on account of their close proximity, but also on account of their size, which agrees well with that of the cranium. The left ramus is imperfect, the posterior portion having been fractured and lost. A piece nine inches long, however, of the anterior portion remains in a very good state, with the stumps of the teeth attached. The right ramus is almost perfect; the alveolar border is quite so, and exhibits the teeth in a beautiful state of preservation; a great portion of the dentary bone is present, and is covered with the usual reticulated sculpture; the anterior extremity is quite perfect, as well as the articular bone—at the posterior end with the glenoid surface, which is transversely elongated, deep, and considerably elevated.

This large and perfect ramus is nearly fourteen inches and a half in length, and at the widest part, which is about four inches from the posterior extremity, is two inches and three-quarters broad. From this point it tapers gradually to the anterior end, where it is little more than an inch wide. The inferior margin is slightly convex; and the alveolar border is somewhat concave, with a slight eminence in front giving support to the first large tusk-like tooth.

There are upwards of twenty teeth, seventeen or eighteen of which are well preserved: a dozen are entire. They vary much in size, and in some places are arranged almost in contact; in other places they are considerably apart. Three are much larger than the rest, and seem to correspond to the vomerine and palatal tusks of the skull. These large teeth are one inch and a half long, and are upwards of half an inch wide at the base. The first of these is placed an inch from the anterior extremity, upon the eminence of the alveolar border already noticed; a single small tooth is situated in front of this. The second large tooth is two inches further back, and the third is one inch and one-eighth behind the second; the last is therefore three inches and three-eighths behind the first; but the space between the apices of the first and last large teeth is four inches and a quarter—a distance corresponding very nearly to that between the depressions behind the vomerine and last palatal teeth. The smaller teeth vary from three-eighths to about three-quarters of an inch in length; they are all considerably compressed towards the apex, and have wide cutting-margins; the lower portion is rounded and grooved, the grooves extending for a considerable way up the crown.

ARCHICHTHYS SULCIDENS, *Hancock and Atthey.*

Some additional remains of this large and powerful fish have recently occurred at Newsham, where the original specimens were obtained that were described some time ago in the "Annals" (April, 1870). The most important of these recent acquisitions is a considerable portion of a crushed head, which, though in a bad and much disturbed condition, shows in a very satisfactory manner the thick, massive character of the bones; moreover, many of the parts are very well displayed. A large portion of a mandible, measuring upwards of ten inches long, lies in the middle of the mass, with the inner surface exposed, and with the alveolar border turned over; so that several of the teeth are seen, measuring from three-eighths to four-eighths of an inch in length. This fragment (for, large as it is, it is but a fragment) has lost both extremities.

The anterior extremity of each mandibular ramus is likewise present on the slab, and has a large laniary tooth in front, and several of the small teeth behind. One of the large teeth is nearly perfect, and measures two inches in length, though the extreme apex is deficient, and is nearly an inch wide at the base. The other laniary tooth has been apparently equally large, but merely its stump remains. The largest of the small teeth are about half an inch long; they appear, however, to have been pretty regular in size, and are placed a little apart from each other. These two mandibular fragments are each upwards of two inches long; so that if one of them be joined to the large portion of the mandible already described, we have the dimensions raised to twelve inches; but as we have no means of determining how much of the proximal extremity is wanting, it is difficult to say what was the real length of this formidable jaw when perfect. Its massiveness, however, is sufficiently evident, as the bone of the anterior fragment is nearly an inch thick.

The left præmaxilla is also very well displayed, lying across the large mandibular fragment. It is three inches and a half long and one inch and three-quarters wide. The anterior extremity is rounded; and close to the front margin there is, as in the mandible, a laniary tooth, which is small, however, in comparison with that of the latter; it is seven-eighths of an inch in length, and is proportionately narrow. This tooth is succeeded by about twenty minute teeth, one eighth of an inch long, or thereabouts, which are very regularly arranged at a little distance from each other.

Mixed up with the above are many other bones, belonging apparently to the skull; but they are too much broken up to admit of exact determination; the right præmaxilla, however, with its anterior laniary tooth, can be discovered amidst the commingled mass.

The surface of the more perfect bones exhibits the peculiar tubercular sculpture originally described; and the characters of the teeth show no variation from (indeed they are precisely similar to) those at first pointed out as distinguishing the species.

Two gigantic jugular plates were obtained at the same time, associated with the above remains, though not on the identical slab. We do not hesitate to assign them to *Archichthys*, not more on account of their association than from the character of the surface-structure, which agrees with that of the other bones of this fish, and that we know of no other species found in our coal-shales to which they can belong. The size alone would seem sufficient to determine the question. *Megalichthys* is certainly a large species; but the largest jugular plate we have seen of that fish is scarcely more than seven inches long, not half the length of those in question. And, moreover, its form and enamelled surface are sufficient to distinguish it, though in general character it has considerable resemblance to the specimens under discussion. Except those that are altogether out of the question, the only other fishes of any considerable size that occur in our coal-shales are the three large species of *Ctenodus:* in this genus, however, the mandible is too short, and the space in front between the rami too contracted to admit of there being any large jugular plates. Unfortunately, these two enormous plates are imperfect; but what remains of each is in an excellent state of preservation, and lies flattened out, the form being completely retained: and there is no difficulty in determining the entire contour; for whilst one has only the posterior extremity imperfect, this extremity in the other is entire.

The right plate has the under surface exposed; the anterior portion of this is quite perfect, a small part only of the posterior extremity, as just noticed, being wanting. In front it tapers gradually to a point, and there is a notch on the inner margin, about one inch and a quarter from the apex; at this part the surface is depressed diagonally, the depression being bounded in front by a stoutish ridge. This plate, or, rather, as much of it as remains, is twelve inches long and four inches and a half wide. Only the posterior extremity of the left plate is present; and this fragment is three inches and a half in length, and lies with the upper surface exposed, with the inner margin in contact with the outer margin of the other plate. The posterior border is obtusely pointed; but as the slope is shorter on the outer than on the inner margin, the acumination is towards the outer edge.

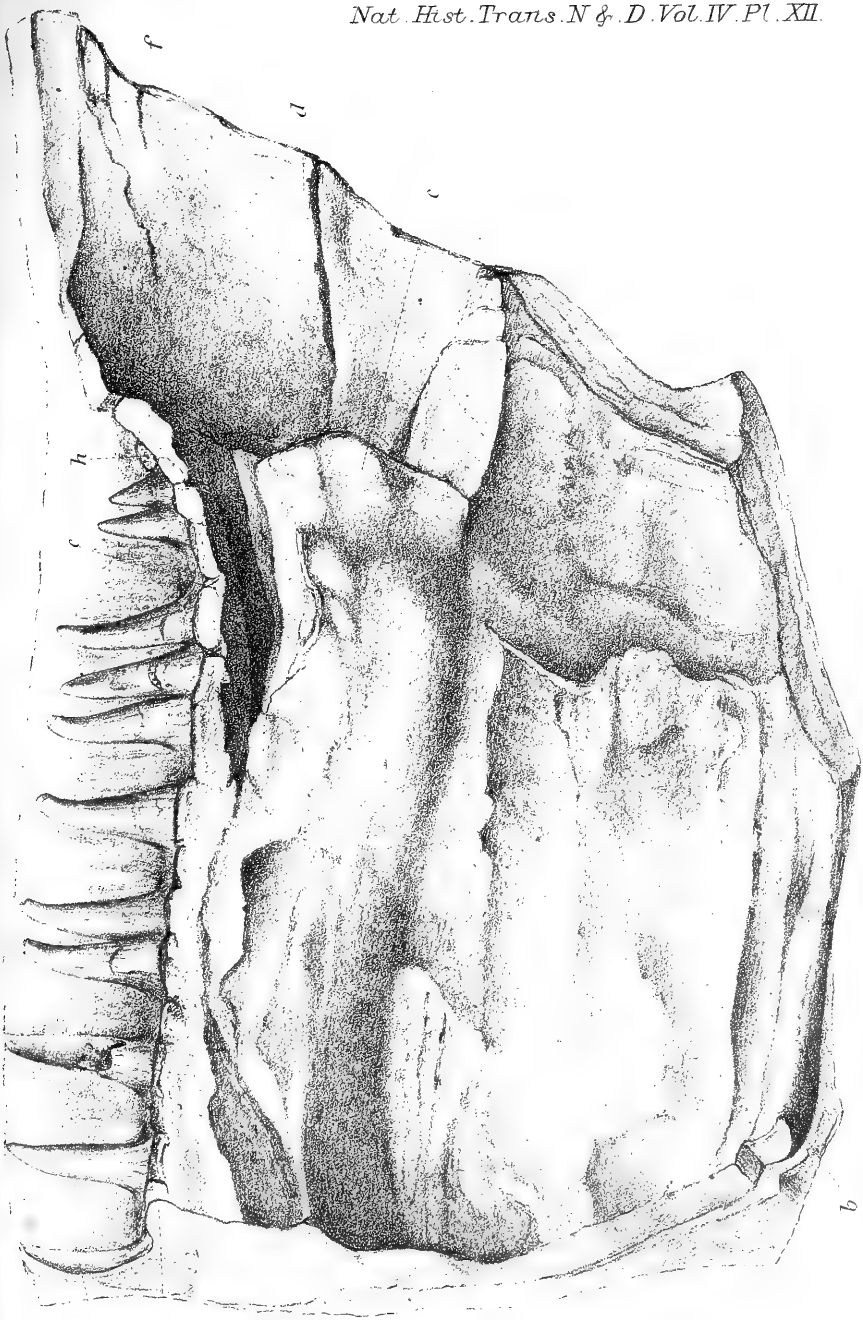
By the aid of the two fragments, the form of the entire plate is easily determined. It is elliptical or widely fusiform, with the anterior extremity pretty regularly and gradually pointed, the posterior end being more abruptly and excentrically acuminated. When perfect, these huge jugular plates cannot have been less than fourteen or fifteen inches in length, as, judging from the specimens, it would seem evident that the fragment (which is twelve inches long) of the right plate has lost two or three inches of its posterior extremity.

A fragment of a bone lies on the outer margin of the right plate, which in all probability is the anterior central plate; but it is too imperfect to admit of any decided opinion.

The bones originally supposed to be jugular plates were folded and much crumpled and distorted, so that their form and dimensions could not be determined with certainty. We are now disposed to consider these to be certain cranial bones, of the exact nature of which we have not yet satisfied ourselves.

From the size of the jugular plates a very fair estimate may be made of the magnitude of the head. In *Megalichthys* the large jugular plates (and in that genus these plates closely resemble those of *Archichthys*) are about the length of the mandible, or rather a little shorter, allowing for the projection of the rami in front. If therefore we take this as a guide, and are correct in estimating the jugulars in *Archichthys* at fourteen or fifteen inches, the mandible cannot have been less than fifteen or sixteen inches long. Now, as the head extends considerably backwards beyond the articulation of the mandible, in some species far more than a third of the length of the mandible, it would appear that the head of *Archichthys* may be estimated as about twenty inches long, including, of course, in this calculation the gill-plates. That this is not an over-estimate is evident from the fact that the operculum and præoperculum together are between four and five inches wide. The width of the head can also be very correctly estimated: it could not be less than ten or twelve inches. This is evident when we recollect that the joint width of the jugulars is nine inches, that the mandibular rami are each an inch thick, and that it is not improbable that there were small external jugular plates lying between the rami and the outer margins of the large jugulars.

These are formidable proportions, indicating a very powerful creature; and when we take into account the magnitude of the oral weapons and the animal's superior activity, *Archichthys* must have been no mean rival to the large Amphibians of the



A Hancock del. G.H. Ford

Mintern Bros. imp.

Carboniferous waters: it must have been quite able to hold its own against *Loxomma*, or even against the more powerful *Anthracosaurus*.

Nothwithstanding the recent discovery of this large and formidable fish, we are in possession of more information respecting it than has been attained in regard to many species that have been acknowledged for years. The characters of the dentition are perfectly determined: the mandible and præmaxilla have been obtained in a good state of preservation, with the teeth attached. The gill and jugular plates, too, have occurred in most excellent condition, as well as several other bones, including some that apparently belong to the thoracic girdle. The body-scales have likewise been found associated with the bones.

We have also good reason to conclude that the genus *Archichthys* occurs not only in other coal-fields, but likewise considerably lower in the Carboniferous series.

EXPLANATION OF PLATE XII.

View of the inner surface of a portion of a mandibular ramus of *Anthracosaurus Russelli*, a little reduced in size: *a*, alveolar border; *b*, inferior margin; *c*, inner or splenial plate; *d*, outer plate or dentary bone; *e*, depression in alveolar border; *f*, elevated straight portion of ditto; *g*, impression of first tooth of the series; *h*, remains of the last ditto.

XVII.—*A few Remarks on Dipterus and Ctenodus, and on their Relationship to Ceratodus Forsteri, Krefft.* By Albany Hancock, F.L.S., and Thomas Atthey. (Plates XIII., XIV.)

In our paper on *Ctenodus*, published in a previous volume of these Transactions,* while recognizing the close connexion between this genus and *Dipterus*, we deemed it prudent to keep the two forms asunder, for certain reasons therein expressed; and the time that has elapsed since then has only tended to confirm us in this opinion. Among other characters that influenced us, stress was laid on the differences in the scales in the

* See Natural History Transactions of Northumberland and Durham, Vol. III., p. 54.

two genera; and allusion was made to the fact that the *Dipteri* are all small fishes, and that the *Ctenodi*, on the contrary are, with one exception, all of considerable size.

In the paper alluded to, seven species were described, six of which were new. Three of the seven (namely, *C. cristatus*, *C. tuberculatus*, and *C. corrugatus*) cannot have been less than five or six feet in length. We originally estimated the length at four or five feet; but as larger specimens have since come to hand, we now think that that estimate was too low. Three others (namely, *C. obliquus*, *C. imbricatus*, and *C. ellipticus*) were probably upwards of three feet long. *C. elegans* is quite small. The latter is the only species of which an entire specimen has occurred; and though much crushed and disturbed, its dimensions can be determined with sufficient accuracy; it measures only three inches in length, but, judging from the size of detached dental plates, it probably reaches sometimes nearly twice that length. The *Dipteri* are usually about five or six inches long, and apparently never much exceed that length.

The scales are very different in the two forms. While in *Dipterus* they are circular and truly cycloidal, in *Ctenodus* they (Pl. XIII., fig. 3) are elongated and parallelogrammatic, with the posterior end well rounded, and the sides nearly parallel or a little hollowed or concave; they are in length nearly twice their width, and, though imbricated, can scarcely be called truly cycloidal: they are delicate and large for the size of the fish, and are longitudinally ridged or grooved; the ridges, becoming curved and nodose, form a sort of rosette in the centre of the exposed imbricated portion. This is very different from the ornamentation of the scales of *Dipterus*, which are either irregularly tuberculated, the tubercles being elongated and scattered, or striated and punctate. The scales alone would therefore seem sufficient for generic distinction.

There are other characters, however, which distinguish the two forms. When our paper on the subject was written, we had not access to Pander's valuable "Monograph on the *Ctenodipterini*."* Since then we have enjoyed this advantage, and

* "Ueber die Ctenodipterinen des Devonischen Systems," Dr. C. H. Pander, 1858.

are now in a position to point out other features that separate *Dipterus* from *Ctenodus*. In the former the upper dental plates are each adherent to the anterior extremities of the two bones named by Pander respectively the palatal and inner pterygoid. These are elongated flattened bones, and lie parallel to and in close contact with each other, being apparently united by a suture. These conjoined bones form on either side of the oral roof a flattened widish plate, with the posterior extremity somewhat expanded. The two plates are united in front along the longitudinal middle line, and diverge widely backwards.

Now the upper dental plates of *Ctenodus* are usually found attached to similar plate-like bones, which incline or diverge to the right or left accordingly as they are united to the right or left dental plate. These bony supports (Pl. XIV., *c*, *d*) are expanded at the posterior extremity, and are in general configuration exactly like the plate composed of the palatal and pterygoid bones in *Dipterus*. Indeed there can be no doubt that they are homologous; but the fact to which we wish to draw attention is, that while in *Ctenodus* the component bones are united so as to form but one bone, the suture being entirely obliterated, they are distinctly separated in *Dipterus* by a well-marked sutural line. This difference would seem to be of some importance; for it appears to be constant, as it occurs in all our species, of the whole of which, excepting *C. corrugatus*, these bones have been found.

The sphenoid bones in the two genera are likewise very different in character. In *Dipterus*, according to the same high authority already quoted, as well as according to Hugh Miller*, this bone is widely lozenge-formed, and does not extend backwards very much beyond the extremities of the palato-pterygoid bones to which the dental plates are attached, and fills up the entire space between them: this bone Pander considers the basi-sphenoid.

In *Ctenodus* the sphenoid is a much elongated depressed bone, with a wide lozenge-formed expansion near the anterior extremity. In other words, the posterior angle of the lozenge

* See "Footprints of the Creator," p. 58.

formed expansion is much produced, while the anterior angle is only slightly produced. The frontal portion (the pre-sphenoid) is rounded, inclining to conical at the extremity, and fits in between the divergent bones that support the dental plates. The lozenge-formed expansion lies partly behind these bones; and the elongated posterior extension (the basi-sphenoid) is continued for a considerable distance further back, in the large species for nearly five inches. It is therefore pretty clear that in *Dipterus*, in which the sphenoid reaches only a short way behind the extremities of the palato-pterygoids, the head is proportionately short in comparison with that of *Ctenodus*, in which it must be much elongated.

We have in our possession numerous sphenoids, belonging to five or six species, three of which demonstrably are those of *C. tuberculatus*, *C. obliquus*, and *C. elegans*, respectively. They are all very similar in character, varying only a little in the proportions of the parts. The largest are seven or eight inches long; the smallest, that of *C. elegans*, is only half an inch in length; the usual size is five or six inches. The basi-sphenoid at its junction with the lozenge-formed expansion is usually thick and nearly circular; elsewhere it is flattened.

In *Dipterus*, too, the vertebræ are ossified; but there is nothing to show that this is the case in *Ctenodus*. Indeed the total absence of any appearance of vertebræ in the specimen of *C. elegans* before referred to is a pretty good proof that in this genus the central axis of the skeleton was cartilaginous.

The above distinctive features will perhaps be considered sufficient to warrant the generic separation of these two forms, notwithstanding their evidently close relationship—and this without referring to the minute structure of the dental plates, which exhibits nevertheless some diversity in character.

In proof of the relationship of the two genera we have only to look to the general form of the oral armature, and to the manner in which the dental plates are placed in the mouth. We have already noticed the similarity of the palato-pterygoid bones to which the upper dental plates are attached, and have pointed out that, while in the one genus the bones are distinct, they are in the other united so that no suture is perceptible. The mandibles (Pl. XIII., fig. 1) are also very much alike in both genera, and so is their relationship to the dental plates.

The cranial bones of *Ctenodus*, so far as we are able to compare them, also closely resemble those of *Dipterus*, in which the whole of them appear to have been determined. Unfortunately, only those of the posterior part of the skull are known in *Ctenodus*. A fragmentary specimen of the occipital region of *C. tuberculatus* in our possession exhibits the occipitals, with a portion of the parietals and the lateral bones, all lying in their natural positions and united into one mass, the component parts being distinguished by well-marked sutures; and the whole so closely resemble the same bones in *Dipterus* that they might be taken to belong to a gigantic specimen of that genus. This fragmentary skull is eight inches and a half across the occiput.

The posterior portions of three other skulls have likewise been found: these belong to *C. obliquus*; they are nearly perfect, and one of them displays the bones up to and including the parietals. The surface is in excellent order, and is more coarsely pitted or punctate than in the former species, and exhibits throughout a semigloss; the sutures are quite distinct. The bones vary in form only specifically from those of *C. tuberculatus*: the occipital is the most characteristic, the frontal margin of which is deeply concave, while in the latter it projects and has a wedge-shaped process in the centre. This beautiful specimen measures seven inches across. The two other examples agree in all their characters with the above; but some of the lateral bones of one side are wanting. As in *Dipterus*, the component bones in *Ctenodus* are comparatively small, vary little in size, are many-sided, and fit together like a mosaic pavement or like the pieces of a Chinese puzzle. And that the anterior bones of the skull are of the same character, we have ample evidence in numerous separate bones that have occurred at Newsham, which though differing in form from those composing the fragmentary skulls, undoubtedly belong to *Ctenodus*.

Another specimen, showing half of the bones of the occipital region, including the parietals, has occurred. This may perhaps belong to *C. cristatus*; at all events it is a portion of the skull of one of the larger species, for it is of considerable size. And that it cannot belong to either of the above two species is proved by the form of the median occipital, which differs greatly from that of both. It is strongly pointed in front, and the lateral posterior margins are remarkably sinuous; the surface-structure, too, is different.

The bones that are determinable in the above fragmentary skulls are the median and external occipitals, the anterior occipitals, the parietals, and the lateral or "skin bones" according to Pander, of which only the three posterior are present. The arrangement of these bones is precisely similar to that given in Pander's restored figure of the cranial shield of *Dipterus* (tab. 3, fig. 1), the principal difference being that they vary even less in size than those in the figure; the median occipital in *C. tuberculatus* is scarcely, if at all, larger than the other bones. And the surface of the whole, which is in a good state, is devoid of ornamentation, save that it is minutely and irregularly granular and punctate; but the species vary a little in these respects.

In Mr. Atthey's collection of separate cranial bones there are, besides specimens of the above, the median occipital of three or four other species, all varying a little in contour and in surface-character; so that we have here additional corroborative evidence that our shales contain six or seven species of *Ctenodus*.

The opercula likewise resemble those of *Dipterus*; they are large, stout, slightly convex, irregularly circular plates, with one side of the margin a little flattened, and slightly produced at each end of the flattened space; the surface is punctate and granular like the cranial bones. We possess six or seven different forms of these gill-covers, two of which have been identified as belonging to *C. elegans* and *C. obliquus* respectively. But, for a particular description of the various opercula, we must refer to our paper previously quoted, merely observing here that the largest are upwards of six inches in diameter; the smallest, that of *C. elegans*, about five-sixteenths of an inch, though detached specimens of this species measure as much as nine-sixteenths of an inch; all the others are very much larger than this.

The ribs are well ossified both in *Dipterus* and *Ctenodus*. Those of the latter are frequently found associated with other remains of this fish, many of them having been identified with the various species; they are well arched towards the proximal extremity, which is considerably enlarged; and the central channel is quite small, the cylindrical wall of bone being very thick; the ossification of the ribs is, in fact, almost complete. The largest ribs are from six to eight inches long.

The fins, so far as they can be made out in *C. elegans*, are arranged in the same manner as in *Dipterus*, The tail-fin is heterocercal and rhomboidal; and the anal and ventral can be traced, immediately before the caudal.

On the whole, then, it appears quite certain that these two genera are very closely related, as generally considered; but at the same time the several differences already pointed out would seem quite sufficient to justifiy their generic separation, at least for the present.

We may remark here that a peculiar hatchet-shaped or wedge-formed bone belonging to *Ctenodus* has occurred, which, though we are not able to determine the fact, we believe to belong to the shoulder-girdle.* Several specimens have been found, which are divisible into five or six species by the modification in the form; they are paired bones. Their general character is that of a flattened elongated bone, with one end a little expanded, arched slightly, and gradually thinned out to a fine edge; it narrows a little towards the other end: one of the lateral margins is slightly thickened, and is somewhat convex; the opposite margin is a little concave. From the narrow extremity a strong wide process is given off at right angles, and extends considerably beyond the concave margin.

* In *Lepidosiren* the shoulder-girdle seems to be reduced to a single large bone having considerable resemblance to the above.

These bones vary a good deal in size and form: some are comparatively narrow and much elongated; others are short and broad; but all have the right-angular process at the narrow extremity. The largest are four inches and three-eighths, and the smallest five-eighths of an inch in length.

These hatchet-shaped bones undoubtedly belong to *Ctenodus*, as they frequently occur with the remains of that fish; and a right and left specimen have been found in connexion with a crushed head of *C. obliquus*, which fine cranial example exhibits three of the dental plates, both opercula, the sphenoid, the occipitals, and several other bones of the head. No jugular plates have been found; but as they are present in *Dipterus*, they may be expected to occur in *Ctenodus*.

The Hon. William Forster's most interesting discovery of the extraordinary fish which Mr. Gerard Krefft has described under the name of *Ceratodus Forsteri*, will, no doubt, in due course throw a flood of light on these curious Devonian and Carboniferous genera, with which it evidently has much in common. Its relationship to *Ceratodus*, however, is perhaps doubtful. From Mr. Krefft's description,* it appears that in *Ceratodus Forsteri* the skeleton is only partially ossified, in this respect agreeing with *Dipterus* and *Ctenodus*; but from what is known of *Ceratodus*, the latter is probably a true cartilaginous fish, and consequently a Selachian or Placoid. If this were not the case, surely something more would be known of it than the mere dental plates, which do not seem to be uncommon, but which are never found, so far as we know, in connexion with bony supports, with palatal or mandibular bones. In *Ctenodus*, on the contrary, which has the palatal bones and mandible ossified, the dental plates usually occur attached to them. Mr. Atthey has in his collection numerous specimens of the dental plates adhering to entire rami and perfect palato-pterygoid bones. Specimens of all the species, excepting *C. corrugatus*, occur in this state; and, in fact, some portion of the bony support is almost always present. The entire absence, then, in *Ceratodus* of any such bony support would seem to indicate that none had ever existed.

* Proc. Zool. Soc. 1870, part 2, p. 221.

So long as *Ctenodus* and *Dipterus* were represented merely by the dental plates, they were placed with the Placoids; and no one would have been justified in placing them elsewhere. Therefore, until some further information is obtained respecting *Ceratodus,* it would seem best to allow it to remain as at present located, along with the Selachians. The form of its dental plates, too, is sufficiently characteristic to justify its separation generically from this interesting Australian animal, as well as from *Dipterus* and *Ctenodus.* Certainly in the dental organs all three approximate to the Selachians; but the Ganoid characters so predominate that we apprehend no naturalist would hesitate to place them in that order, though they may be considared to a certain extent "synthetic" forms, as suggested by M. Agassiz.*

In the present state of knowledge respecting *Ceratodus*, it is, then, evidently hazardous to place Mr. Krefft's fish in that genus; but its affinity with *Dipterus* and *Ctenodus*, more especially with the latter, is clear enough. All three are covered with large cycloidal scales; the fins are arranged much in the same manner; the skeletons are nearly in the like state of partial ossification; the dental plates are much alike, there being four ridged plates—two palatal, two mandibular. And when the so-called *Ceratodus Forsteri* has been fully examined, there can be little doubt that this affinity will become only the more evident.

Nevertheless the relationship is perhaps closest with *Ctenodus.* Like most of the members of that genus, the Australian fish is large, measuring from three to six feet in length. And it is only necessary to look to the mandibles (Pl. XIII., figs. 1, 2,) of the two forms to be convinced how close this relationship is. In *Ctenodus* the ramus (fig. 2) is a stoutish bone, flattened vertically, with the upper margin turned over towards the external surface, to give support to the large dental plate; it is therefore channelled on the outer surface, and somewhat convex on the inner. The posterior extremity projects backwards beyond the dental plate a little more than half the length of the latter, and is for the greater part occupied by the glenoid surface, which extends from the upper margin, and is a deep, wide, circular notch,

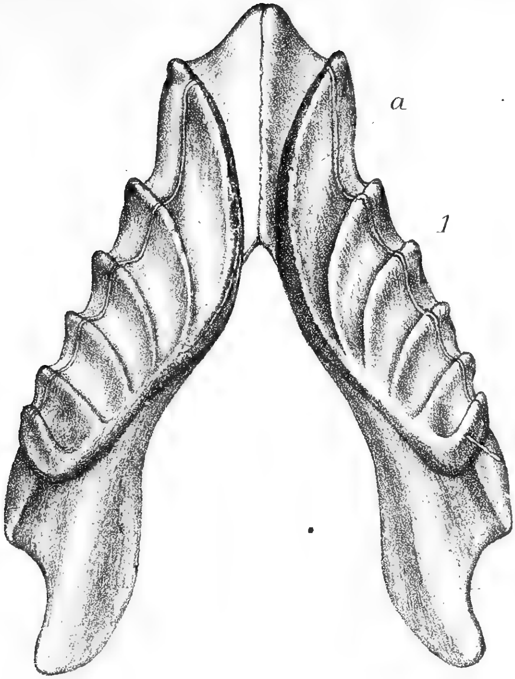
* "Nature," No. 61, Vol. III., p. 166 (1870).

inclining backwards and downwards. In front the symphysial surface is straight, extending the whole depth of the ramus, and is grooved transversely. The dental plate is about two-thirds the entire length of the ramus, and is placed nearer the symphysis than the posterior extremity. The ramus is upwards of three inches in length, and, including the thickness of the dental plate, is an inch deep.

Such is the description of the ramus of *C. obliquus*, which, with very little modification, would do equally well for all the other species, as they vary only in size and slightly in the proportions of the parts. On comparing this description and the figure of the ramus (Pl. XIII., fig. 2), as well as that of the entire mandible of *C. imbricatus* (fig. 1), with the representation of the mandible of the so-called *Ceratodus Forsteri* that accompanies the paper on the subject in the "Proceedings of the Zoological Society," previously quoted, it will at once be seen that these parts in this curious fish and those in *Ctenodus* closely resemble each other. So similar, indeed, are they, particularly in the dentition, that, were nothing more known of the two forms, they would both assuredly be considered to belong to one and the same genus.

And this likeness would be still greater if the cartilage were present that undoubtedly originally supplemented the ramus of *Ctenodus*. At present the outer border of the dental plate is unsupported, overhanging as it does the side of the ramus. This channel or cavity (Pl. XIII., fig. 2, *d*) beneath the dental plate must have been occupied by cartilage, which, passing backward to the glenoid notch, might, it can easily be seen, form here a semicircular cavity similar to that shown in the figure of the mandible of *Ceratodus Forsteri*. The ramus would thus assume a somewhat rotund form, instead of being a flattened, or rather, a semicylindrical plate, as it has all the appearance of having been, encasing incompletely a cartilaginous core.

But, notwithstanding the similarity of the so-called *Ceratodus Forsteri* to the *Ctenodipterini*, we are quite inclined to believe that it will be found to be generically distinct from all known forms.



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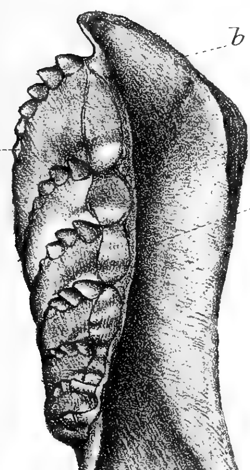

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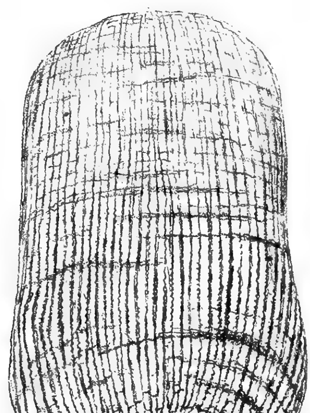
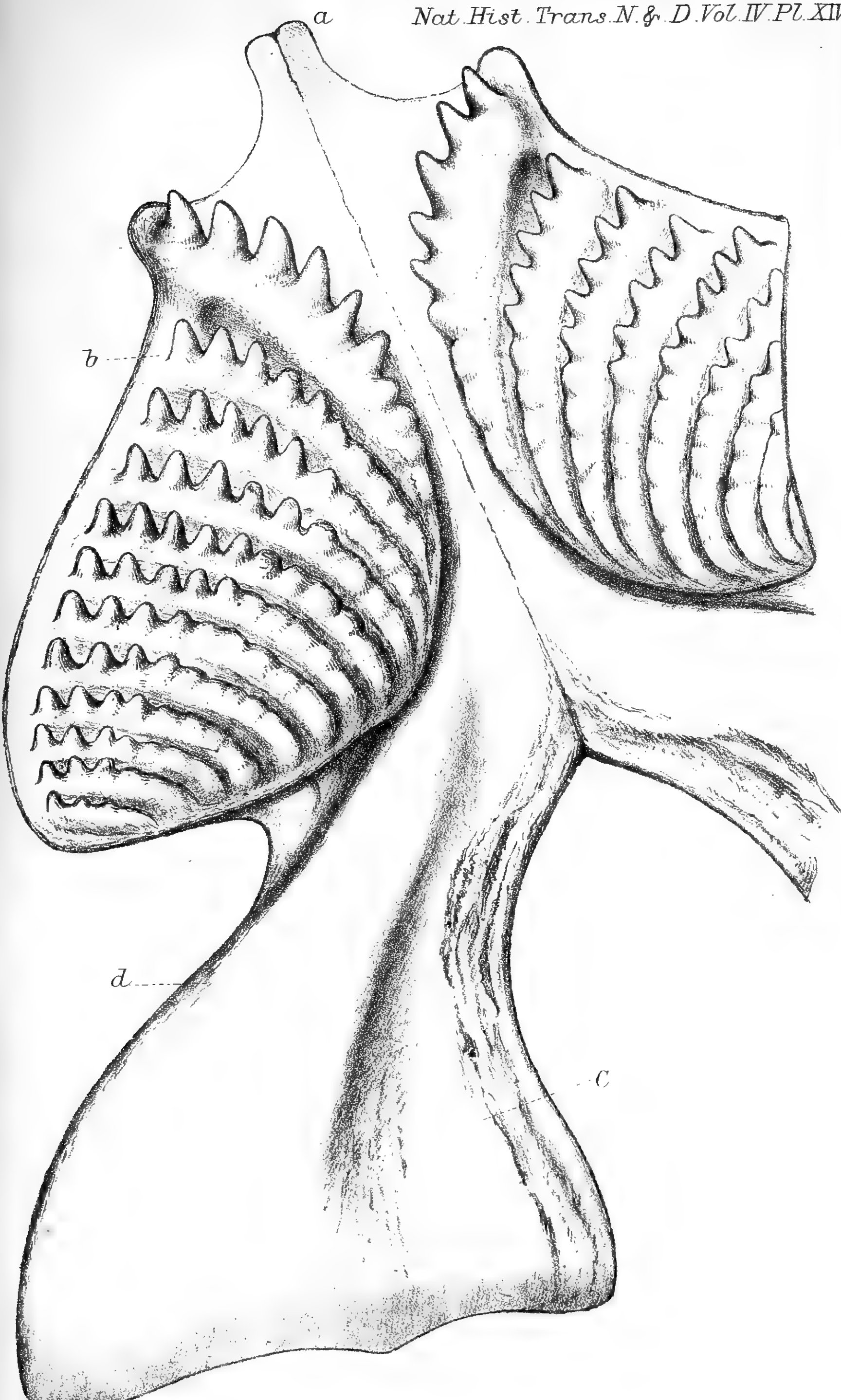


3

A. Hancock del. R. Mintern lith.

Mintern Bros imp.



A Hancock del. R. Mintern lith.

Mintern Bros imp.

The new Australian fish is described to have two "incisor" teeth in the upper jaw, placed a little in advance of the dental plates. There is no reason for believing that such additional teeth are present in either *Dipterus* or *Ctenodus*. Several entire heads of the former have been obtained; and we possess in the specimen before alluded to of *C. elegans* a crushed head of that species, and have also two crushed heads of *C. obliquus;* and in neither genus has there been found the least trace of any such "incisor" teeth. The four dental plates only are present—two palatal, two mandibular. And, again, these plates are not by any means uncommon at Newsham, where upwards of four hundred specimens have been obtained by Mr. Atthey. Had such "incisors" existed, about two hundred of them might therefore have been expected to occur; not one has been found.

This peculiar character alone would seem sufficient to separate generically the so-called *Ceratodus Forsteri* from *Dipterus* and *Ctenodus*, and shows very clearly the relationship of the former to *Lepidosiren*, which is provided with two small pointed teeth in front of the upper dental plates,* which latter do not differ much from those of this interesting Australian fish.

EXPLANATION OF THE PLATES.

PLATE XIII.

Fig. 1. Mandible, natural size, with the dental plate attached, of *Ctenodus imbricatus: a*, dental plate; *b*, glenoid notch.

Fig. 2. Outside view, natural size, of the right ramus, with the dental plate attached, of *Ctenodus obliquus: a*, dental plate; *b*, symphysial margin; *c*, glenoid notch; *d*, channel or cavity overhung by the dental plate.

Fig. 3. Scale, much enlarged, of *Ctenodus elegans: a*, posterior or imbricated extremity.

PLATE XIV.

The palato-pterygoid bones, natural size, with dental plate attached, of *Ctenodus tuberculatus: a*, anterior extremity of the bone; *b*, dental plate; *c*, palatal side of the bone; *d*, pterygoid side of ditto.

* "Description of the *Lepidosiren annectens*," by Richard Owen, Esq. Trans. Linn. Soc., Vol. XVIII., p. 341, tab. 27, fig. 2.

XVIII.—*Descriptive Notes on a nearly entire specimen of Pleurodus Rankinii, on two new species of Platysomus and a new Amphicentrum, with Remarks on a few other Fish-remains found in the Coal-Measures at Newsham.* By ALBANY HANCOCK, F.L.S., AND THOMAS ATTHEY. (Plates XV., XVI.)

PLEURODUS RANKINII, sp. ined., *Agassiz.*

SEVERAL years have elapsed since we first obtained specimens of the peculiar little tooth named by Agassiz *Pleurodus Rankinii*: a few only occurred; they were found at Cramlington. Since then several specimens of it have been procured at Newsham and Kenton, but never in any great abundance.

The tooth is, we believe, all that has been known, up to the present time, of this reputed Selachian. In the spring of the year 1870, however, we had the good fortune to meet with the remains of an almost entire specimen of this fish at Newsham, exhibiting a crushed head containing the teeth, most of the body, with thoracic expansions, a dorsal spine, and the shagreen covering or skin (Pl. XV., fig. 1). In addition to this interesting specimen, a detached head with the teeth, and a separate spine, have also occurred in the same locality.

These discoveries are highly important, inasmuch as they seem to demonstrate not only that this species is a Selachian, but that it is a Cestraciont, not far removed from the curious Permian form *Wodnika*, Münster. This relationship is not only seen in the general characters of the teeth, but also in the similarity of the shagreen and in the form and grooving of the dorsal spine.

The specimen lies apparently on its belly, and measures a little more than three inches from the front of the head to the posterior tapering extremity of the body, which has lost the tail, and is a little less than two inches wide across the thoracic expansions, which are just behind the head. The contour is much obscured by the scattering of the tubercles composing the shagreen; and the slab has been broken away so as to remove a part of the left side of the specimen. A portion of the counter slab, however, has been saved; and on this the left thoracic expansion is sufficiently revealed. The head (Pl. XV., fig. 1, *a*) lies immediately in front of and in connexion with the body, but it is so much distorted that the form cannot be determined: it is about five-eighths of an inch long. No bones are distinguishable; but the substance is here a little thickened, indicative of the cartilaginous remains of the cranium; nor is there anywhere in the body the least appearance of bones, the skeleton undoubtedly having been cartilaginous throughout. The teeth (*b*) lie within the area of the head, in a disturbed condition, some with the crown uppermost, others with it downwards. They do not seem to have been numerous, but are so obscured that the exact number cannot be ascertained. In the detached head, however, ten or a dozen can be counted; but there is no certainty that the number may not have been greater; indeed, it is probable that some have been removed with the counter slab.

The body suddenly widens immediately behind the head, the width being considerably increased by the thoracic expansions (*c*, *c*), which extend about half-way down and appear to have had their margins pointed; thence it tapers backwards, and soon dies out, there being no definite indication of the form of this portion; and, as has been already stated, there is no trace of the tail. The spine (*d*) is situated a little behind the thoracic expansions; consequently it is nearer the posterior than the anterior extremity. It projects from the dorsal margin, and is inclined backwards, apparently in its natural position, marking the situation of the dorsal fin; but no traces of this remain. About two-thirds of the spine is in a good state of preservation, the other third being well and sharply defined in cast; it is straight and stout in proportion to its length, and tapers somewhat abruptly to a sharp point; it is compressed laterally, with the anterior margin thicker than the posterior; the surface is coarsely and irregularly grooved and ridged longitudinally; it measures five-eighths of an inch in length, and is at the thickest part one-eighth of an inch wide.

Shagreen covers the whole of the specimen, defining its extent and form, though, as already noticed, with no great precision, as the margins are much blurred by the displacement of the shagreen-tubercles; but, notwithstanding this disturbance, towards the margins in many places considerable patches of them lie in their natural order, particularly on the right thoracic expansion, on a large portion of which the shagreen is entire. The tubercles are very minute, requiring a powerful lens to exhibit them, and the lower powers of the microscope to display their characters. They are many sided, irregularly formed bodies, closely fitting together like mosaic work; the surface is a little raised and beset with irregular rugæ. This is the appearance presented where the shagreen is undisturbed; but it is doubtful whether it may not be the under surface that is presented to view. In places where the tubercles are scattered numerous shining bodies are observed; these are about the same size as the tubercles, and, like them, are irregular in form, but are more gibbose, and have a ridge or two on the surface, which are produced into points at one of the sides. From analogy we might suppose that these bodies exhibit the upper surface of the shagreen-tubercles; but further observations are required to determine this point.

The teeth are boss-like in form, somewhat elongated and ridged or carinated along the longer axis; the sides are considerably expanded in the centre, the expansions dying out towards the ends of the tooth: usually the expansion is more produced on one side than on the other, and the ridge inclined to the opposite side. The expansions are frequently transversely ridged or plaited, and sometimes tuberculated. The central ridge or carina of the crown is arched in the long axis of the tooth, following the curvature of the surface, and is frequently reduced, as if by wear. The whole surface of the tooth, as well as the lateral expansions, is covered with a thick brownish-white enamel, and is coarsely punctate, the punctations being most conspicuous when the enamel is worn off. The tooth measures two-tenths of an inch in length: a variety, however, four or five of which have occurred at Kenton, is twice that size; but it is more oblique than the small form, has no coronal carina, and is broad and rounded on the upper surface; in all other respects it agrees with the small and usual form. It is quite possible that these large teeth may belong to another species.

From the above description it will be perceived that *Pleurodus* is a not very distant ally, as we have already stated, of *Wodnika*, of the Kupferschiefer of Germany, the relationship being seen in the characters of the spine and shagreen, and particularly in the form of the teeth: in both genera they have the same boss-like, carinated crown, with expanded lateral margins, more or less ridged or crenate; in both, too, they are coarsely punctate, and covered with a stout, highly polished enamel.

We are thus assured that *Pleurodus* is a Cestraciont; and such being the case, its small size is very remarkable. But it must be mentioned that if the large teeth are mere varieties of the small and usual form, then our specimen may not by any means be fully grown; however, after making every allowance for increase in size on this account, still the species would be a very small Cestraciont, most of which are of considerable dimensions. *Wodnika*, which is a small species, judging from Münster's figure,* cannot have been less than a foot long. It is nevertheless quite possible that our specimen is, notwithstanding, a fully developed individual. This is rendered probable by the fact that the teeth in connexion with it are of the usual size of those found detached at Newsham; and of such we possess thirty or forty: some of these are smaller than those connected with the specimen; scarcely any are larger; or, if so, there is a mere shade of difference in this respect. In the separate head before alluded to, the teeth are likewise of the usual size; and the second or detached spine already mentioned is not quite so large as that in connexion with the fish.

PLATYSOMUS ROTUNDUS, n. sp.

A very distinct and beautiful species of *Platysomus* has occurred at Newsham; three almost perfect specimens of it have been met with, and four or five considerable portions, all of which exactly agree in character, though they vary a little in size. The largest and most perfect specimen is three inches long, measured from the clavicle to the end of the tail-fin, and is two inches and three-quarters deep at the widest part. It is

* Beiträge, Heft vi., p. 48, Taf. 1, fig. 1 *a* to *d*.

in a fine state of preservation; the contour is perfect, with the exception of that of the head, which is moderately developed in proportion to the body; the cranial bones, however, are dislocated and thrust a little forward; but apparently the head would not project much were they restored to their natural positions. The dorsal margin, from the occipital crest to the root of the tail, is regularly and deeply convex; so is the ventral margin in its whole extent from the clavicle downwards; the body of the fish, including the head, is therefore almost circular. The pectoral fins appear to have been well developed, but they are badly displayed; the ventrals are also very indistinct, though sufficient of one of them is seen for verification:* the dorsal and anal are well preserved; they are placed opposite to each other, terminating in front of the caudal peduncle, and anteriorly near the centre of the body; the anterior portion of each is considerably prolonged, and the articulations of the rays are much longer than wide. The caudal fin is well developed, with the lobes, which are nearly of equal length, only slightly recurved at the extremities.

The scales (Pl. XV., fig. 2) are rhomboidal, long, narrow, and exceedingly delicate, the thickening of the anterior margin being very inconspicuous at the surface, so that the usual ribbed appearance is scarcely observed: the upper surface is finely and regularly striated longitudinally, the striæ being raised a little, undulated, and almost parallel to the margins of the scale; they occasionally bifurcate, and, though minute, are relatively strong and few in number, there being not more than eight or ten on each scale. The length of the scale, including the peg, is five-sixteenths of an inch; the peg is long and pointed. The occipital crest, all the bones of the head, gill-covers, clavicle, and mandibles are striated in the same manner as the scales. The mandibular teeth are minute, conical, and pointed; those of the maxillaries are of the same character, but more minute; on the premaxillaries they seem a little larger.

* As the existence of ventrals in *Platysomus* has been doubted, we take this opportunity of stating that a specimen of *P. parvulus* in our possession displays distinctly the pectoral, ventral, and anal fins, the form of one of the ventrals being well defined: it is small and narrow.

This is a very distinct species, and is at once distinguished from *P. striatus* by its small size and the much greater delicacy of its parts: the scales of *striatus* are wide, thick, and coarse in comparison with those of *P. rotundus*, in which they are thinner and much narrower than in any other species with which we are acquainted; and, moreover, the striæ in *P. striatus* are much more numerous and more oblique. The same features equally distinguish our new species from *P. gibbosus*, which is apparently a close ally of *P. striatus*. On account of its small size, it might possibly be confounded with *P. parvulus*: but the scales of the latter are twice the width of those of the former, and the striæ are much more numerous; the head-bones, too, are tuberculated, while in *P. rotundus* they are, as we have already pointed out, striated; the teeth of *P. parvulus* are likewise considerably larger.

Of the inedited species *P. declivis*, Agassiz, we know very little, but understand that the scale is similar to that of *P. striatus*: the name, too, so far as it is descriptive, is certainly not specially applicable to *P. rotundus*.

Platysomus Forsteri, n. sp.

We have in our possession considerable portions of three specimens of another species of *Platysomus* that appears to be undescribed; they were all obtained at Newsham. Unfortunately, the general contour cannot be traced in any of them; the fins are not present; and though many of the cranial bones are well preserved, they are all scattered. We shall therefore have to rely mainly on the scales for specific characters. The scales (Pl. XV., fig. 3) however, are sufficiently marked to distinguish the species from all its congeners, and are in good condition. They are large, measuring nine-tenths of an inch in length, including the peg, and two-tenths of an inch wide; they are consequently long and comparatively narrow; the form is rhomboidal; the peg is long, and tapers gradually to a fine point; the smooth anterior margin of the scale is rather wide, the rest of the surface being covered with close-set, raised, longitudinal striæ, which are somewhat undulated and slightly diagonal, passing upwards a little inclined towards the front or smooth border, and becoming finer as they approach it; they very rarely bifurcate; and new striæ are abruptly introduced, and do not originate in other striæ.

The head bones, occipital crest, gill-covers, clavicle, and mandibles, are all striated like the scales. The mandibular teeth are large, conical, stout, and obtusely pointed; those of the maxillæ are small, conical, and tubercle-like, with wide bases and recurved pointed apices, and are disposed without order along the alveolar border.

This fine species cannot measure less than *P. striatus*, and at first sight, so far as the scales are concerned, might be confounded with it; but on attentive examination, they are seen to be very different. They are much longer and narrower; and while these are rhomboidal, those of *P. striatus* can scarcely be so designated, being more nearly oblong. The striæ are coarser and less oblique in *P. Forsteri;* the peg is longer, more slender, and with a sharper point. Indeed, from the form and character of the scales, it would seem that this species is more nearly allied to *P. rotundus* than to *P. striatus*. *P. gibbosus* is distinguished by having some of the cranial bones granulated, which is not the case with our new species; and, besides, the scales of the former resemble those of *P. striatus*, according to the figures in Agassiz's "Poissons Fossiles," Vol. II., Tab. 15. *P. declivis* would appear also to have the scales of similar proportions.

This species is named after G. B. Forster, Esq., of Backworth, who has kindly granted every facility for the examination of the shale at Newsham, without which valuable privilege much of our knowledge of the palæontology of the Low Main could not have been attained.

Amphicentrum striatum, n. sp.

A new species of this rare and interesting genus has been found at Newsham; seven or eight specimens have been obtained. It differs by well marked characters from the *A. granulatum*, Huxley, the only other known member of the genus, and it is much smaller. The contour of the new species is rhombic, the trunk being a little wider than long, measured from angle to angle; the dorsal and ventral angles are not much produced. The head is small and conical, with the muzzle forming the anterior angle; the upper and lower margins are continuous with the dorsal and ventral lines of the trunk. The cranial bones are too much disturbed to admit of particular description; they are, however, covered with a lustrous enamel, and are ornamented with strong striæ and tubercles, which irregularly run into each other. The fins are almost entirely wanting in our specimens; only one of them shows a little of the dorsal, which appears to be very delicate; and another a portion of the caudal.

The scales are well preserved in three or four specimens. They are oblong, perhaps somewhat rhomboidal, and are much longer than wide; the peg is long; they become smaller towards the dorsal and ventral margins of the trunk, where they are strongly tuberculated: the large central scales, of which there are three series in depth, have their extremities also a little tuberculated; but their middle and greater portions are covered with strong, somewhat irregular, raised, longitudinal striæ; so that the trunk of the fish has tuberculated dorsal and ventral belts, with the central portion striated.

The V-like arrangement of the dental tubercles, so far as we have been able to examine it, is the same as in *A. granulatum;* and the mandibular dental plates, which are frequently found detached, do not seen to differ in any important respect from those of that species, size being the chief distinguishing feature. The length of the body, including the head, is two inches, and its depth from the dorsal to the ventral angle an inch and three-quarters.

This is a very beautiful species, and is at once distinguished from its congener by its small size, and particularly by the striæ on the middle portion of the body, which ornamentation contrasts well with the strong marginal tubercles, the whole being coated with brilliant enamel.

Cœlacanthus lepturus, *Agassiz.*

We have long had in our possession certain mandibuliform bones from the Newsham shale, evidently piscine, though we could not make out to what species or even to what genus they belonged; and it was not till some short time ago, when we fortunately obtained a crushed head of *Cœlacanthus*, that the enigma was solved. This specimen exhibits our supposed mandible in connexion with the rather strangely formed bone figured and described in the "Memoirs of the Geological Survey," Decade 12, by Professor Huxley, as the mandible, and so placed in relationship to it that it became at once evident that the mandible of Huxley is merely the articular piece, and our supposed mandible the dentary bone.

The articular piece is well represented in the memoir referred to. We have three or four isolated specimens of it in a good state of preservation; also one or two others in connexion with the bones of the head and united to the dentary bone. The articular piece (Pl. XV., fig. 4, *a*) is long and narrow, with a large arched lobe rising from the upper margin and situated a little nearer to the proximal than the distal extremity; the proximal extremity is obtusely pointed, and the upper border is occupied by a narrow longitudinal channel (the glenoid surface, *b*), which widens a little backwards and is twisted or inclined to the external surface; the borders of the distal extremity are nearly parallel, and in front it thins out and is diagonally truncated forwards and upwards. Our largest specimen is about two inches and a half long, and at the widest part measures five-eighths of an inch across.

The dentary bone (fig. 4, *c*) is as peculiar in form as the articular piece: it is narrow and semicylindrical in front, the outer surface being convex, the inner channeled or concave; the posterior portion, more than half the entire length, widens backwards, and has the upper and lower borders somewhat thickened; the proximal extremity thins out, is truncated diagonally downwards and backwards, and has the lower border, which is the longer, produced into a point. The whole bone is strongly arched, the lower margin being regularly convex; the symphysial surface is not distinguishable, and was probably formed chiefly by the cartilage that undoubtedly occupied the groove or channel of the inner surface.

The teeth (*d*) are placed on the upper border of the expanded portion, and extend in a close series of from six to eight from the posterior extremity almost to the junction of the border with the anterior semicylindrical portion of the bone: the dentary area is thus very limited. The teeth are small, short, stout, conical, and obtusely pointed, and seem to be firmly anchylosed to the bone.

The dentary bone has apparently been united to the articular piece by a squamose suture; but however this may have been, it is evident that the attachment was only slight, as the two bones are frequently found detached.

The maxillary teeth are well developed; they are larger than those of the mandible, are stoutish at the base, decidedly recurved and sharply pointed; but we are unable to determine their number and arrangement, on account of the disturbed condition of our specimens. There are teeth on both the maxillæ and premaxillæ. In addition to these dental organs, the vomer is armed with close-set, minute, rounded tubercles or teeth. This is undoubtedly the same spatulate dentigerous bone figured and described in the 12th Decade of the Geological Survey by Professor Huxley as the parasphenoid or vomer in *Macropoma:* in form and position it is very similar.

CTENODUS, *Agassiz*.

The body-scales of *Ctenodus* are entirely unknown, with the exception of those of *C. elegans* and *C. obliquus*, which we described some time ago*—the former in a good state of preservation, the latter in a less perfect condition. We have, however, obtained from time to time numerous fragments of large scales, so frequently associated with the remains of the larger *Ctenodi*,

* Ann. Nat. Hist., Ser. 4, Vol. I., p. 77.

that we can have little doubt they belong to them.* Among these fragments are four or five which exhibit the greater portion of the contour of the scale, and one which has it almost entire. These are all parallelogramic in form, are thin and delicate, and apparently represent three species, though the distinguishing characters are slight.

The first (Pl. XVI., fig. 1), the largest and most perfect specimen, measures two inches and a half long, and upwards of two inches wide. The sides are parallel; the anterior extremity (*a*) is a little arched outwards, and the posterior or exposed extremity (*b*) is rounded; the angles are rounded off; the central area (*e*), under an ordinary hand-lens, appears quite smooth, and is bordered by a rather narrow margin (*c*) having several concentric undulations or lines of growth, and marked with minute radiating striæ; no growth-lines are visible within the marginal border. On examination with the inch object-glass, the central area is found to be finely reticulated with slightly elevated bony fibres, the meshes being sunk, so that the surface is minutely and regularly punctate. This is undoubtedly the underside of the scale; the upper surface is revealed on fragments, and, at a rupture (*d*) near the centre of the rounded exposed extremity, is minutely granular. Of course, in the latter case, it is only the cast of the upper surface that is seen; and at this point it is evident that the granules are enlarged and become arranged so as to form imperfect and very irregular vermicular grooves.

* As this paper was passing through the press, we obtained complete proof of the truth of this opinion in a fine specimen of the greater portion of a cranium and part of the trunk of a large *Ctenodus* with the opercular plates attached: a considerable number of the ribs are exhibited in connexion with the head, disposed in natural order; and numerous neurapophyses and apparently interneural spines are scattered along the dorsal ridge. Everywhere mixed up with this interesting specimen these peculiar scales are found, much broken, indeed, but occupying both sides of the body portion of the fish, in such a manner as to leave no doubt on the subject. The scales are very similar to those described in the text, differing only specifically, the margin being wider; the smooth central area has the same peculiar minute surface-structure, and the upper surface is minutely granulated in the same manner. Moreover this specimen shows the hatchet-shaped bones, or clavicles, described by us on a former occasion, in connexion with the cranium, almost in their natural positions; so that here we have not only proof respecting these scales, but the true nature of the hatchet-shaped bones is also established.

The second species (fig. 2) is less perfect than that just described; the greater portion, however, of the scale is preserved; but the border of one side is gone, as well as the posterior margin and part of the anterior. The sides are slightly convex, and so is the anterior extremity, the angles being rounded; the border (*c*) is wide, and distinguished by several concentric lines of growth and fine minute radiating striæ, as in the first species. The central area (*d*) is likewise similar; but the minute surface-structure is finer, and the bony net-work has the meshes drawn out in the long axis of the scale; the punctures, too, are not so large and distinct. This fragment (for fragment it is) measures two inches long, and one inch and one-eighth wide.

The third species, which has lost the greater portion of the rounded posterior extremity, and is in other respects imperfect, is upwards of an inch and three-fourths long; it seems to have been more nearly square than either of the other two forms, and is characterized by a very narrow border, which shows only one or two concentric lines of growth and minute radiating striæ. The bony network of the central area is fine and indistinct, with a longitudinal arrangement of the meshes, as in the second species; the punctures are numerous, rather large, and longitudinally oval.

The last description is apparently of a mere cast of the under surface; but a small portion of the scale, exhibiting the upper surface, is adherent, and proves that it is minutely striated in an irregular broken manner, the striæ for the most part having a longitudinal disposition.

The peculiar rectangular form distinguishes these from all the cycloid scales with which we are acquainted; and they are much thinner than any other of the *large* scales of the Coal-Measure fishes. The only scale that can be compared to them in this respect is that usually attributed to *Rhizodus*—the scale which we described some time ago as belonging to *Archichthys*.* But this scale is pretty regularly rounded, is more coarsely granulated on the surface, and usually exhibits concentric lines of growth over the whole surface; it is also generally found split

* Ann. Naf. Hist., Ser. 4, Vol. V., p. 266.

open, exposing to view the internal structure, when the concentric lines of growth and minute radiating striæ are sharply defined over the entire surface. The scale of *Ctenodus* is never seen with the internal structure thus exposed; at least we have never seen the concentric lines of growth and radiating striæ pass beyond the border, the under surface being usually exposed to view. This is well shown in our second species, the specimen being preserved on one slab in relief, the cast of the underside in intaglio on the other. This specimen, too, enables us to judge of the thickness of the scale, as it is evident the entire substance of it is present, and that it is not torn open by the splitting of the shale.

The rectangular outline of these scales we have just pointed out as peculiar; and in this respect these large scales agree with those we previously described of *C. elegans* and *C. obliquus*, the former being the smallest known species of the genus. And here we must not overlook the similarity both in form and size of these large *Ctenodus*-scales to those of the so-called *Ceratodus Forsteri*, as figured and described by Dr. A. Günther in his valuable memoir on this remarkable Australian fish, recently published in the "Philosophical Transactions." This resemblance is very striking in our second species, in which the sides are nearly parallel, being a little arched outwards, much in the same way as they are in the recent species. In both forms the scales are of an extraordinary size: those of *Ceratodus Forsteri* are two inches and three-eighths long, and one inch and six-eighths broad; the largest *Ctenodus*-scale measures two inches and a half in length, and an inch and a half in breadth; and that of *C. elegans*, which is quite a small species, is remarkably large for the size of the fish.

We have shown on a previous occasion that the dental plates of *Ctenodus imbricatus* are so similar to those of the Australian fish that without other aid they could not be generically separated; and we now see that in the peculiar form and great size of the scales the similarity is equally striking.

GYRACANTHUS TUBERCULATUS, *Agassiz;* AND CLADODUS MIRABILIS, *Agassiz.*

We believe we were the first to point out that certain minute bodies found associated with the remains of these two species are dermal tubercles.* When we wrote our remarks on the subject we described two forms of these peculiar bodies—one considerably larger than the other, and having from four to seven cusps with carinæ on their convex surfaces, the smaller form having only two or three smooth points. And we thought both varieties belonged to *Gyracanthus*, having found the large scattered amidst the small form (which latter was by far the more numerous), and both associated with the spines of that fish and with the teeth of *Cladodus*. We have long been satisfied, however, that this was a mistake, and that, while the small form is the dermal tubercle of *Gyracanthus*, the large variety is that of *Cladodus*. This is satisfactorily proved by numerous specimens in our possession, in which the small variety unmixed with the other is associated in large patches with the spines and other remains of *Gyracanthus;* while the large form has occurred on several occasions, unaccompanied by the small variety, on the same slab with the teeth of *Cladodus* and the spines of *Ctenacanthus hybodoides*. This has so frequently happened now, that it is impossible any longer to question the fact that the two forms belong respectively to these two large Selachians. And we are also satisfied that the so-called tooth *Mitrodus quadricornis* of Owen is the larger form of these dermal tubercles, as we originally asserted, and consequently belongs to *Cladodus* or *Ctenacanthus*, and not to *Gyracanthus*, as we at first thought.

We have much pleasure in observing that the dermal nature of these minute spinous bodies has recently been confirmed by the researches of Mr. James Thomson, of Glasgow, who has found the large form associated with the teeth of *Cladodus mirabilis* and the spines of *Ctenacanthus hybodoides*.† This gentleman

* See paper entitled "Notes on the Remains of some Reptiles and Fishes from the Shales of the Northumberland Coal-Field," Ann. Nat. Hist., Ser. 4, Vol. I., p. 370.

† See paper entitled "On a Specimen of *Acanthodes Wardii* from the Lanarkshire Coal-Field, and on *Ctenacanthus hybodoides*," Trans. Geol. Soc. Glasgow, Vol. IV., pp. 57–59.

however, seems to confound *Diplodus* with these dermal tubercles, and to consider the remains of the semicartilaginous skeleton to be shagreen. It is to Professor Williamson that we owe the discovery of the true nature of this peculiar substance, who clearly proves it to be the remains of what he terms the chondriform bone or semicartilaginous skeleton.*

In a former communication† we described a large triangular bone associated with the spines of *Gyracanthus* as one of the carpals. We have now to notice a second carpal, several of which have occurred on the same slabs with the spines and triangular bones. In one instance the two spines are associated with one triangular bone and two of our second carpal. This second form is probably the inner carpal: it is a broad, flat bone, irregularly bilobed, or somewhat reniform, with one of the lobes produced and the external margin straightened; the convex border is a little flattened, angulated, and thickened; thence the bony fibres radiate to the opposite or lobed margin, which gradually thins out. It measures in the transverse or longest diameter eight inches and a quarter, and in length, from the thickened to the thin margin, two inches and a half. The former we take to be the proximal margin; consequently the thin opposite edge will give support to the fin. The texture of this bone is quite similar to that of the large triangular carpal; namely, it is of a semicartilaginous appearance, with coarse radiating fibres extending from margin to margin.

Helodus simplex, *Agassiz*.

We take this opportunity to announce the occurrence of this strange form of tooth at Prestwick, Northumberland. Only a single specimen has been found; and we believe this to be the first that has been obtained in the district.

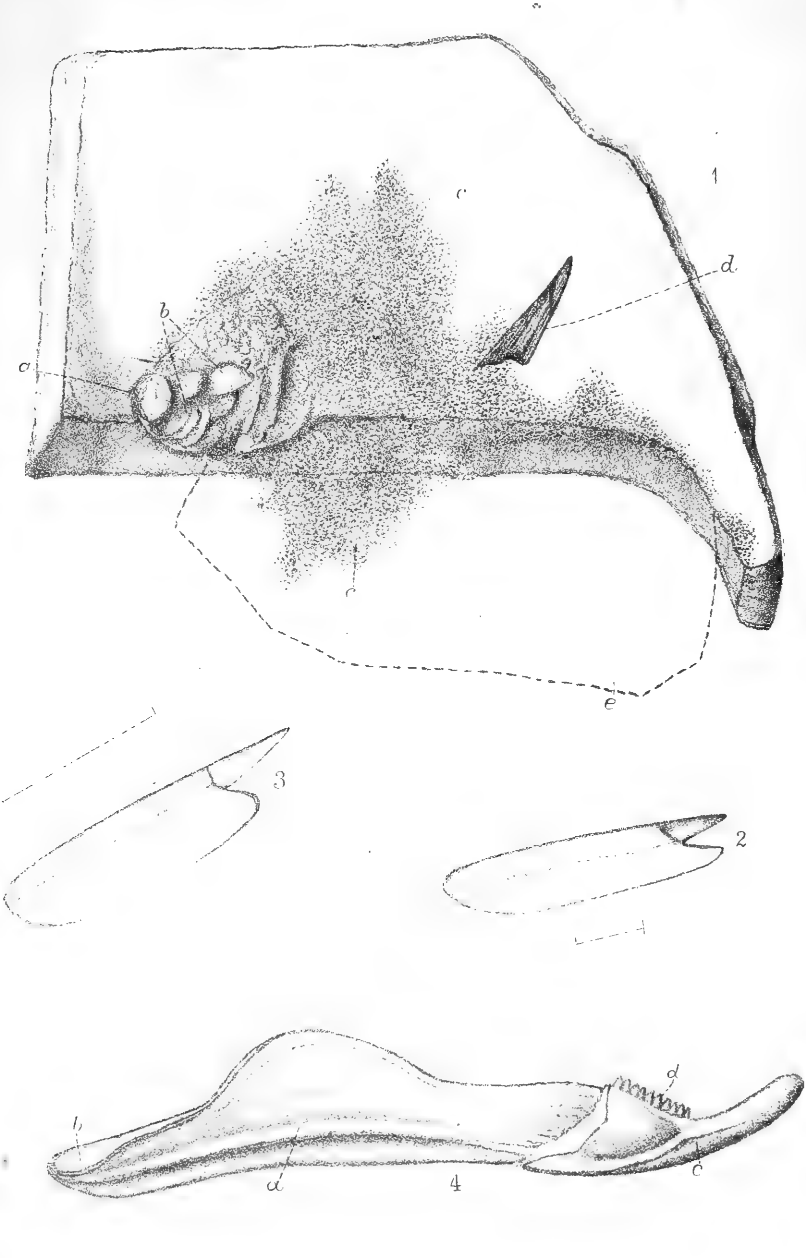
EXPLANATION OF THE PLATES.

PLATE XV.

Fig. 1. View of *Pleurodus Rankinii*, natural size; *a*, head; *b*, teeth; *c c*, thoracic expansions; *d*, dorsal spine; *e*, counter slab, on which

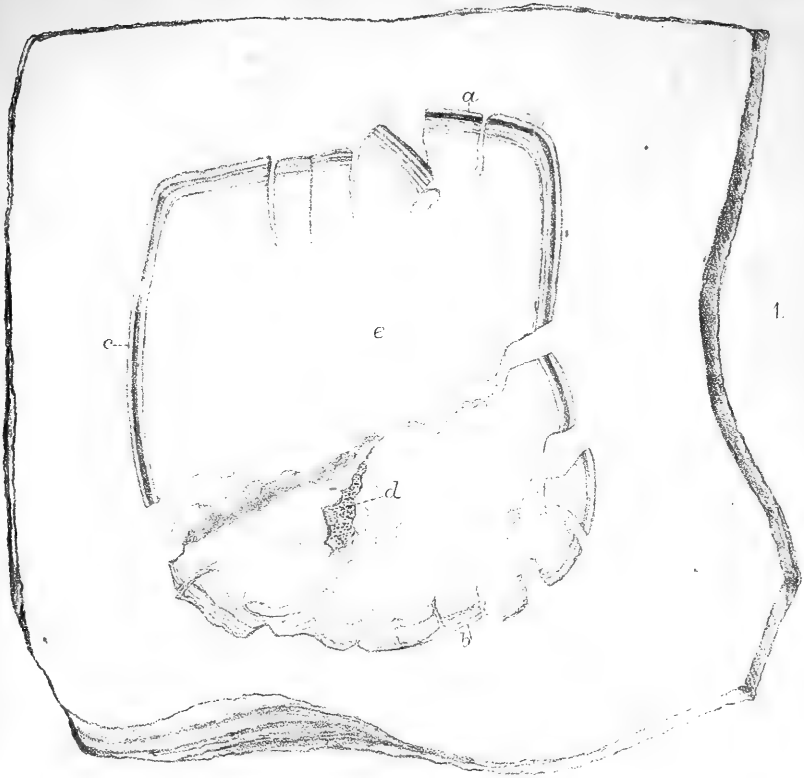
* "Investigations into the Structure and Development of the Scales and Bones of Fishes," by W. C. Williamson, Philosophical Transactions, 1851, Pt. 1, pp. 669-679.

† Ann. Nat. Hist., Ser. 4, Vol. I., p. 369.



A. Hancock del.

Mintern Bros. lith.



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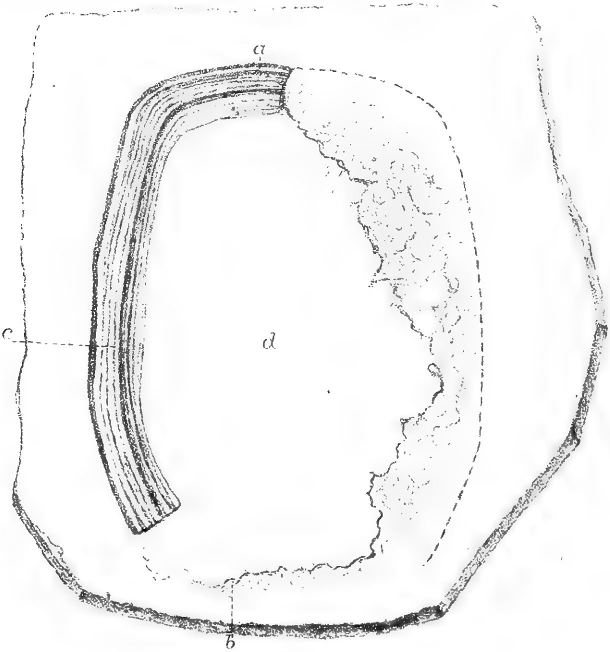

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A. Hancock del.

Mintern Bros. lith.

the left thoracic expansion is preserved, and which is represented as if seen through.

Fig. 2. Outline of a scale of *Platysomus rotundus*, considerably enlarged.

Fig. 3. Outline of a scale of *Platysomus Forsteri*, enlarged.

Fig. 4. Outline of a mandibular ramus of *Cœlacanthus lepturus*, slightly enlarged: *a*, articular piece; *b*, glenoid surface; *c*, dentary bone; *d*. teeth. The articular piece and dentary bone are laid together in their natural positions, but not united; so that the form and extent of each can be distinctly traced.

PLATE XVI.

Fig. 1. Scale, natural size, of *Ctenodus* (first species): *a*, anterior margin; *b*, posterior or exposed ditto; *c*, marginal border; *d*, rupture exposing cast of upper surface; *e*, central area.

Fig. 2. Scale, natural size, of *Ctenodus* (second species): *a*, anterior margin; *b*, posterior extremity; *c*, marginal border; *d*, central area: the dotted line indicates the form and extent of the scale.

XIX.—*A List of the non-parasitic marine Copepoda of the North-east coast of England.* By Geo. Stewardson Brady, C.M.Z.S. (Plates XVII.–XXI.)

The following list, though embracing all the species at present known to me as inhabiting our district, must be taken only as an instalment of what an exhaustive survey would no doubt reveal. The examination of these little creatures is exceedingly tedious and laborious, the points of difference being often indistinguishable except with tolerably high microscopic powers. Thus a very small gathering, if it contain any great variety of species, will often occupy many hours in its examination.

By far the greater number of species here noted, or described by foreign authors, are free-swimming animals; some have a special predilection for the fronds of fuci, and others for muddy localities or the bed of the sea, but little is yet known of the ground-inhabiting forms, and among them there remains doubtless a rich harvest for future collectors.

Two of the species described in Baird's "British Entomostraca," it seems impossible to identify—*Canthocamptus Stromii* and *C. minuticornis*. The former name probably applies to some member of the genus *Thalestris*, the latter perhaps to a *Laophonte*. Neither species is included in the following list.

Fam. CALANIDÆ, *Dana.*

Sub-Fam. CALANINÆ, *Dana.*

Genus CALANUS, *Leach.*

(CETOCHILUS, *R. de Vauzéme, fide Boeck*).

1. Calanus finmarchicus, (*Gunner.*)

Monoculus finmarchicus, Gunner, Act. Hafn. (1765), X., 175, f. 20–23.

Cetochilus septentrionalis, Goodsir, Edin. New Phil. Journ., XXXV., 339, Pl. VI., figs. 1–11. Baird, Nat. Hist. Brit. Entom. (1850), p. 335, T. XXX., figs. 1*a–g*.

Cetochilus helgolandicus, Claus, Die frei leb. Copep. (1863), p. 171, T. XXVI., figs. 2–9.

According to M. Boeck the species described first by Gunner as *Monoculus finmarchicus* is identical with the *Cetochilus helgolandicus* of Claus, and not at all with the species called by Baird *Temora finmarchica*. Leach's genus *Calanus* was, however, constituted to receive Gunner's species, and is synomymous with the more recent name *Cetochilus*, applied by Roussel de Vauzéme to the same animal. Not having the opportunity of reference to the original memoirs of Gunner and Leach, I must accept as substantially correct M. Boeck's careful account of this synonymy. The generic name *Cetochilus* will therefore give way to *Calanus*.

The present species, *C. finmarchicus*, is generally distributed all around our coast, being met with in equal abundance both between tide marks and in the open sea. It is said to constitute an important part of the food of the whale.

Genus CLAUSIA, *Boeck.*

1. Clausia elongata, *Boeck.*

Clausia elongata, Boeck, Oversigt Norges Copep. (1864), p. 10.

Calanus Clausii, Brady, Nat. Hist. Trans. N. & D. (1865), Vol. I., p. 33, Pl. I., figs. 1–11, 13.

Often taken in abundance, by the surface net, in the open sea, and in tide-pools, all along our coast.

Boeck's *C. elongata* is undoubtedly the same species as that described by myself (possibly a little later, though I am not perfectly sure as to the actual date of publication of Boeck's monograph) under the name *Calanus Clausii.* The differences between this and the genus *Paracalanus,* Boeck (*Calanus,* Claus) lie chiefly in the one-jointed inner branch of the first foot, and in the very small or entirely wanting fifth foot of the female. It is, I think, open to doubt whether these ought to be considered of generic importance, but the separation having been made, it seems best to adhere to it.

Genus DIAS, *Lilljeborg.*

1. Dias longiremis, *Lilljeborg.*

Abundant all round the British Islands, both in the open sea and between tide marks: frequent also in brackish water.

Genus TEMORA, *Baird.*

1. Temora longicornis, (*Müller.*)

Cyclops longicornis, Müller, Entomostraca (1785), p. 115, T. XIX., figs. 7–9.

Temora finmarchica, Baird, Brit. Entom. (1850), p. 228, T. XXVIII., figs. 1*a–g*. Claus, Die frei leb. Copep., p. 195, T. XXXIV., figs. 1–11. Brady, Nat. Hist. Trans. N. & D., Vol. I., p. 36, Pl. I., fig. 15; and Pl. II., figs. 1–10.

Temora longicornis, Boeck, loc. cit., p. 15.

Diaptomus longicaudatus, Lubbock.
(Not *Monoculus finmarchicus*, Gunner).

Common in the open sea; and between tide marks perhaps the most abundant of all British species.

2. Temora velox, *Lilljeborg*.

In autumn when the brackish pools of salt-marshes have become thoroughly warmed by the sun, this species occurs in such situations in immense profusion. I have only on one or two occasions met with a stray specimen amongst the weeds on the sea-shore.

Genus ISIAS, *Boeck*.

1. Isias clavipes, *Boeck*.

Isias clavipes, Boeck, loc. cit., p. 18.

Superior antennæ twenty-five-jointed, about equal in length to the cephalothorax, joints short and broad at the base, and gradually increasing in length to the nineteenth, which is about four times as long as broad; first fifteen joints of the male antennæ bearing each a single club-shaped, ciliated, auditory seta: hinge joint of the twenty-one-jointed right male antenna situated between the eighteenth and nineteenth joints; eighteenth joint formed by the coalescence of the normal eighteenth and nineteenth, nineteenth by the twentieth and twenty-first, twentieth by the twenty-second, twenty-third, and twenty-fourth. Mouth organs and swimming feet as in *Centropages typicus*. Fifth pair of feet two-branched, in the *female* having the inner branch of one joint with two terminal setæ, the outer branch of three broad laminar joints, the second of which is produced on the inner margin into a broad spinous process: in the *male* the feet are somewhat similar, but the central joint is destitute of the spinous process, and the terminal joint of the outer branch of one side is expanded into a very broad lamina, which is terminated by a broad ciliated seta. Abdomen of the female, four—of the male, five-jointed. Length, exclusive of tail setæ, $\frac{1}{17}$th of an inch.

Hab.—Bridlington Bay, several specimens taken in the towing net by Mr. E. C. Davison. On weeds in Roundstone and Clifden Bays, Ireland (*G. S. B.*).

The most distinguishing characters of this fine species are the auditory setæ, with which the upper antennæ are on their basal portions thickly clothed, and the broadly laminar construction of the fifth pair of feet, more especially in the male sex.

Genus CENTROPAGES, *Kroyer.*

(ICHTHYOPHORBA, *Lilljeborg;* CALANOPIA, *Dana;* CATOPIA (?), *Dana*).

1. Centropages typicus, *Kroyer.*

C. typicus, Kroyer (1849), Nat. Tidskr. Anden. Række andet Bind. Side 288. Boeck (1864), Oversigt over de ved Norges Kyster iagttagne Copepoder, p. 19.

Ichthyophorba denticornis, Claus (1863), Die frei lebenden Copepoden, p. 199, Pl. XXXV., figs. 1, 3–9. Brady, Nat. Hist. Trans. N. & D., Vol. I., p. 40, Pl. IV., figs. 1–6.

This species occurs not uncommonly in surface net gatherings from the open sea, but never in very great numbers so far as my observation extends. I accept Boeck's identification of the species with *C. typicus* of Kroyer, but without the opportunity of myself referring for verification to the original description.

2. Centropages hamatus, (*Lilljeborg.*)

Ichthyophorba hamata, Lilljeborg (1853), De crustaceis, &c., p. 185, T. XXI., figs. 1–5, 7–9, and T. XXII., figs. 9–12; Brady, Nat Hist. Trans. N. & D. (1865), Vol. I., p. 39, Pl. IV., figs. 7–10.

I. angustata, Claus (1863), Die frei lebenden Copepoden, p. 199, T. XXXV., figs. 2, 10–12.

Diaptomus Bateanus, Lubbock (1857), Ann. and Mag. Nat. Hist. (2nd ser.), Vol. XX., p. 404, Pl. XI., figs. 1–3.

Centropages hamatus, Boeck (1864), Oversigt, &c., p. 20.

Of very frequent occurrence in surface net gatherings from the North Sea. I have also once taken it sparingly amongst fuci near low water-mark, between Sunderland and Ryhope.

Sub-Fam. PONTELLINÆ.

Genus ANOMALOCERA, *Templeton.*

1. Anomalocera Patersonii, *Temp.*

Anomalocera Patersonii, Temp., Trans. Ent. Soc. (1837). Baird, Brit. Entom. (1850); Boeck, loc. cit. (1864).

Irenæus Patersonii, Claus, Die frei leb. Copep. (1863).

Of common occurrence in the open sea all round the British Islands.

Genus PONTELLA, *Dana.*

1. Pontella brevicornis, *Lubbock.*

Pontella brevicornis, Lubbock, Ann. and Mag. Nat. Hist., 2nd Ser., Vol. XX. (1857), Pl. XI., figs. 4–8.

In surface-net off Grimsby, and in Bridlington Bay. Amongst weeds in tide pools near Ryhope, August, 1871. Shetland (*Mr. Norman*).

In a gathering made by Mr. E. C. Davison in Bridlington Bay, this species occurred in great abundance, the contents of the net, which quite filled a six-ounce bottle, consisting of about equal numbers of *P. brevicornis*, *Anomalocera Patersonii*, and larval forms of the higher decapods.

Fam. CYCLOPIDÆ.

Genus CYCLOPS, *O. F. Müller.*

1. Cyclops Lubbockii, *Brady.*

C. Lubbockii, Brady, Nat. Hist. Trans. N. and D., Vol. IV., p. 127, Pl. IV., figs. 1–8.

In pools of brackish water, Hartlepool, June, 1866.

2. CYCLOPS ÆQUOREUS, *Fischer.*

C. æquoreus, Fischer, Abhandl. der Akad. der Wissenschaft, München (1860), Band VIII., p. 654. Brady, Nat. Hist. Trans. N. and D., Vol. IV., p. 128, Pl. IV., figs. 9–16.

In brackish pools at Seaton Sluice, Northumberland.

3. CYCLOPS LITTORALIS, *nov. sp.* Plate XVII., figs. 9–14.

Superior antennæ twenty-two-jointed, clothed with long setæ, more particularly towards the base, joints all very short, the two terminal ones, which are the longest, not being much longer than broad, the twelfth and sixteenth much produced, and bearing a long seta at the external margin. Inferior antennæ without a secondary branch, four-jointed. Fifth pair of feet composed of a single three-jointed branch. Caudal segments about four times as long as broad; setæ four, the two central ones being alike in length and equal to the three preceding segments.

Hab.—Amongst weeds in tidal pools, near Whitley and Ryhope: scarce.

4. CYCLOPS OVALIS, *nov. sp.* Plate XVIII., figs. 1, 2.

Superior antennæ twenty-four jointed, as long as cephalothorax, slender and nearly equal in width throughout, joints about equal in length and breadth at the base, gradually increasing in length towards the apex, the terminal joint being about thrice as long as broad; each joint bearing a single short, delicate hair on the external margin, the twenty-second and twenty-third one on each margin, the last having four or five apical setæ. Caudal segments about four times as long as broad, setæ not much longer than the caudal segments.

Hab.—One specimen only taken off Sunderland in the surface net.

GENUS OITHONA, *Baird.*

1. OITHONA HELGOLANDICA, *Claus.*

Oithona helgolandica, Claus (1863), Die frei lebenden Copepoden, p. 105, Taf. XI., figs. 10–12.

O. spinifrons? Boeck (1864), Oversigt Norges Copep., p. 25.

Taken occasionally in the surface-net. Plentifully off Sunderland, August, 1871. Frith of Forth, Whitby, and Bridlington, in gatherings made by Mr. E. C. Davison.

Boeck's description of *O. spinifrons* seems to me not to indicate any essential difference between it and *O. helgolandica*, Claus, the chief point being the presence of a minute rostrum in the Norwegian specimens, which is not noted in Claus's definition. This, however, might be easily overlooked. I have seen it in some of my examples, but have not succeeded in bringing it into view in others, and should, in fact, have probably missed it altogether, had it not been for M. Boeck's description.

Genus BOECKIA, *nov. gen.*

Like *Cyclopina* in general appearance. Superior antennæ very short, six-jointed, much shorter than cephalothorax. (Mouth organs totally different from those of any of the allied genera). Swimming feet like those of *Cyclops*, but very short and broad. Fifth pair of feet one-jointed, laminar, spinous. Abdomen much elongated; tail setæ short, ovisacs two.

1. Boeckia arenicola, *nov. sp.*

Second joint of superior antennæ the longest, three times as long as broad; fourth and fifth joints of equal length, two-thirds as long as the second; sixth joint scarcely as long as the preceding, third the shortest of all, about one-fourth as long as the second. Inferior antennæ short and thick, three-jointed, without any secondary branch, densely beset with rather short and stout setæ. Swimming feet having the marginal angles of the inner branch much produced; margins densely and finely ciliated; lateral spines of the outer branch lanceolate, laminar; the basal joint fringed with a row of somewhat similar, but much smaller spines in pectinate series. Feet of fifth pair consisting of a single slightly curved, club-shaped joint, having on its outer margin one long spiniform seta with two minute ones near its base; at the truncate extremity two similar large setæ with an intermediate smaller one; on the middle of the inner margin six sub-equal curved setæ of moderate size, and at the extreme angle three of a similar kind but smaller. Abdomen elongated, swollen at the base; caudal segments rather more than twice as long as broad; tail setæ shorter than the abdomen. Length, $\frac{1}{12}$th of an inch.

One specimen dredged on a sandy bottom, at a depth of four fathoms, off Seaton Carew, September, 1871.

The mouth organs of this animal are of very remarkable structure, but I defer attempting any description or giving any drawings in the hope of being able to illustrate it completely from a better series of specimens.

Genus PSEUDOCYCLOPS, *nov. gen.*

In general conformation resembling *Cyclops*. Right superior antennæ of male without a hinge joint, but much swollen in the middle. Inferior antennæ two-branched, secondary branch nearly equal in size to the primary. Lower footjaw like that of *Cyclops*. Swimming feet having both branches three-jointed. Fifth pair of feet in the male very complex in structure,—the external branch of one side produced into a powerful sickle-shaped clasping joint, the whole resembling very closely the male copulative organs of some ostracoda.

1. Pseudocyclops crassiremis, *nov. sp.* Plate XVII., figs. 1–8.

Left superior antenna of male seventeen-jointed, basal joint large and stout, those next following very short and broad, gradually decreasing in breadth to the fifteenth, which is about as long as broad; last two joints more slender, about twice as long as broad, the whole limb densely beset on the outer margin, especially towards the base, with long setæ; antenna of right side ten-jointed, the central joints much enlarged, last two suddenly contracted and similar to those of the left side, antepenultimate joint armed with a strong lateral subfalciform process. Both branches of inferior antennæ bearing numerous long, curved terminal setæ, first joint of the lower branch enlarged and truncate at the distal end. Maxillæ composed of four digitate lobes, each bearing four long terminal setæ. Lower footjaw stout, with almost entire margins. Joints of swimming feet very broad, subtriangular, much produced at the external distal angle. Abdomen slender, four jointed, tail setæ slender, finely plumose, the longest equal to about twice the length of the abdomen. Length of animal, $\frac{1}{38}$th of an inch.

Hab.—Off Seaham Harbour, dredged in a depth of twenty to thirty fathoms. One specimen only taken.

The characters of this genus are very remarkable and strongly pronounced, especially as regards the fifth pair of feet of the male, which are more complex than anything of the kind hitherto known amongst the Copepoda. Another species referable to the same genus (*P. obtusatus*, Brady M.S.) was taken abundantly in the surface-net by Mr. D. Robertson and myself in Roundstone Bay, Ireland, on a calm moonlight night in June of last year.

Genus THORELLIA, *Boeck.*

1. Thorellia brunnea, *Boeck.*

T. brunnea, Boeck (1864), Oversigt over de ved Norges Kyster iagt. Copep., p. 26.

Cyclops nigricauda, Norman (1868), Last Shetland Dredging Report, p. 295.

One specimen of this species occurred to me amongst fuci, in pools near low-water mark between Ryhope and Sunderland, in the autumn of 1871. Mr. Norman takes it abundantly amongst Laminariæ in Shetland, and at Tobermory in Mull.

The genus differs from *Cyclops* chiefly in the conformation of the lower footjaw, which is transformed into a four-jointed clawed foot. M. Boeck describes also in the same place another closely allied genus, *Misophria*, in which the maxillæ are formed as in the Harpactidæ, but with a strongly developed palp; the lower footjaws as in *Calanus*.

Genus CYCLOPICERA, *nov. gen.*

Superior antennæ about as long as the cephalothorax, many jointed, bearing (as in the Harpactidæ) a sword-shaped appendage near the distal extremity. Inferior antennæ three-jointed, having a minute secondary branch. Upper footjaw chelate, three-jointed, the last joint forming a doubly-curved very long claw; lower footjaw four-jointed, last two joints forming a long claw, each joint of which bears a spine on its inner margin. Swimming feet as in *Cyclops*. Fifth pair of feet small, one-jointed.

1. Cyclopicera lata, *nov. sp.* Plate XVIII., figs. 3–8.

Superior antennæ twenty-jointed, basal joint large, next eight very short and broad, the following six about as long as broad, sixteenth and seventeenth about twice as long as broad, last three shorter and more slender: seventeenth joint bearing a long laminated ensiform seta. Inferior antennæ tri-articulate, the first joint bearing a minute bi-ciliated, one-jointed branch, second joint of about equal length with the first, third very short, and terminating in a slender claw. Maxillæ two-branched (?), each branch terminating in three long, slender setæ. Fifth pair of feet very small, laminar, with one basal and two apical setæ. First joint of abdomen very short and broad, finely ciliated in the middle of each lateral margin. Caudal joints about twice as long as broad; setæ equal in length to the abdomen.

One specimen only taken amongst weeds in rock-pools at Roker.

Fam. CORYCÆIDÆ.

Genus MACROCHEIRON, *nov. gen.*

Superior antennæ (6–7 ?) jointed, inferior four-jointed, uncinate. Lower footjaw very large and powerfully chelate. First three pairs of swimming feet alike, each branch being three-jointed, fourth pair with the inner branch small and two-jointed, rudimentary. Fifth joint of cephalothorax long and greatly swollen below. Abdomen five-jointed, all the joints short.

1. Macrocheiron fucicolum, *nov. sp.* Pl. XVIII., figs. 9–18.

Rostrum short but distinctly angulated. First cephalothoracic segment very large, following three small, fifth constricted at the base, but much swollen and elongated below, equal in length to the preceding three segments: abdominal joints short, none of them longer than broad, the first the shortest. Superior antennæ in the male seven (?), in the female six-jointed. Last joint of lower antenna very short, bearing several long setæ and a long curved claw which is serrated on its inner margin. Terminal claw of the lower footjaw very long and strong, suddenly curved at the extremity. First three pairs of swimming feet short, springing from a large base, the joints short and broad: fourth pair having the outer branch elongated, the inner short, bi-articulate, its second joint bearing two apical setæ. Fifth pair of feet rudimentary, slightly different in the two sexes. Caudal segments about thrice as long as broad, setæ short, ciliated, jointed in the middle. Length, $\frac{1}{35}$th of an inch. Colour dark brown.

Hab.—Amongst fuci near low water mark, between Ryhope and Sunderland: two or three specimens.

This approaches very closely the genera *Oncaea*, Philippi, and *Antaria*, Dana, but does not seem strictly referable to either of them. Probably, indeed, the two are synonymous. One of my specimens differed in some minor points from the others, whence I supposed it to be of different sex, and have so described it here. The species, however, requires further examination.

Fam. HARPACTIDÆ.

Genus LONGIPEDIA, *Claus.*

1. Longipedia coronata, *Claus.*

This beautiful species occurred abundantly on a sandy bottom off Seaton Carew, in a depth of four fathoms, also off Seaham Harbour (twenty to thirty fathoms), and among weeds near the Bell Rock Lighthouse. Mr. Norman finds it in Shetland, and I have myself taken it on the West Coast of Ireland.

Genus ECTINOSOMA, *Boeck.*

1. Ectinosoma melaniceps, *Boeck.* Pl. XX., figs. 1–12.

Off Seaton Carew and Seaham Harbour in company with the foregoing species, but less abundantly.

The characters of this remarkable species are so distinct that I cannot doubt its identity with that described by Boeck, though I have not noticed anything in my specimens which warrants the term *melaniceps*. Moreover the fifth foot consists of two branches, and not of one only as stated by that author, unless indeed, the Norwegian animal be a different but closely allied member of the same genus.

Genus TACHIDIUS, *Lilljeborg.*

1. Tachidius brevicornis (*Müller*).

Cyclops brevicornis, Müller, Entomostraca, p. 118.

Tachidius brevicornis, Lillj., De crustaceis. Brady, Nat. Hist. Trans. N. and D., Vol. IV., p. 130, Pl. V., figs. 1–9.

In pools of brackish water at Hartlepool, Hylton Dene, and Seaton Sluice.

Genus IDYA, *Philippi.*

1. Idya furcata (*Baird*).

Canthocamptus furcatus, Baird, Brit. Entom. (1850).

Tisbe furcata, Lilljeborg, De crustaceis (1853).

Tisbe ensifer, Fischer, Beitr. zur Kennt. der. Entom. (1860).

Iyda barbigera (?) Phil., Weigmann's Archiv. (1843).

Very common amongst weeds in tide pools.

Genus WESTWOODIA, *Dana.*

1. Westwoodia nobilis (*Baird*).

Harpacticus nobilis, Baird, Brit. Entom.

One specimen on *Laminaria saccharina* at Roker (1871). Berwick Bay (*Dr. Baird*).

Genus DELAVALIA, *Brady.*

1. Delavalia palustris, *Brady.*

D. palustris, Brady, Nat. Hist. Trans. N. and D., Vol. IV., p. 134, Pl. V., figs. 10–15.

In pools of brackish water at the side of the Seaton Burn, above Seaton Sluice.

Genus CANTHOCAMPTUS, *Westwood.*

1. Canthocamptus imus, *nov. sp.* Pl. XIX., figs. 1–5.

Animal slender, sublinear. Superior antennæ of the *female* eight-jointed, the fourth, seventh, and eighth joints bearing several long setæ, the second and third each three of moderate length, the last joint having also five or six smaller marginal setæ arranged in a pectinate series; rostrum long and slender, curvate. Lower foot-jaw simple, chelate, inner margin of hand bearing in the middle one seta of moderate length. First joint of inner branch of first swimming foot equal in length to the entire outer branch, second joint very short, third about half as long as first, bearing three terminal setæ, the middle one being very long and minutely pectinate at the extremity. Outer branch of fifth pair oblong, having two long apical setæ, three shorter ones on outer and one on inner margin; inner branch ciliate on outer, and armed with five long setæ, the last of which is excessively slender, on inner margin. Ovisac single, curvate, containing but few (six to nine) ova, ranged in a single plane, and very large in proportion to the size of the animal. Length, $\frac{1}{30}$th of an inch.

Hab.—About ten miles off Seaham Harbour, in a depth of thirty fathoms on a muddy bottom: a few specimens only taken.

Genus LAOPHONTE, *Philippi.*

1. Laophonte similis? (*Claus*).

Cleta similis, Cls., Die Copepoden Fauna von Nizza, p. 23, Pl. V., figs. 13–16.

Amongst weeds in tide pools at Whitley, Cullercoats, and Sunderland, and in brackish water at Seaton Sluice.

My specimens do not entirely agree with the figures and descriptions given by Claus, but I am unwilling, without a more extended examination, to describe them as belonging to a distinct species.

2. Laophonte lamellifera (*Claus*).

Cleta lamellifera, Cls., Die frei lebend. Copep., p. 123, Pl. XV., figs. 21–24.

One specimen on frond of *Laminaria saccharina* at Roker.

3. Laophonte Hodgii, *nov. sp.* Pl. XXI., figs. 1–9.

Upper antennæ six or seven-jointed, those of the male (?) shorter and thicker than of the female, rather densely setose. Lower footjaw of moderate size, with a very long and slender, slightly curved claw. Outer branch of first foot three-jointed, short. Fifth pair of feet foliaceous, larger in the male, the outer branch elongated, having four or six long setæ on the apex and outer margin, the inner wider, and bearing internally four or five marginal setæ, those situated near the apex being very long. Caudal segments in the female at least four times as long as broad.

Hab.—Off Seaham, dredged in twenty to thirty fathoms. Several specimens were taken. I have a mournful pleasure in naming this species after my late friend, Mr. George Hodge, it having been taken during one of the last dredging excursions in which I had the pleasure of his company.

Genus CLETODES, *nov. gen.*

Animal resembling *Laophonte* in general appearance. Upper antennæ six-jointed. All the four pairs of swimming feet alike, and having the outer branch three, the inner two-jointed. Lower footjaw chelate. Lower antennæ without a secondary branch.

1. Cletodes limicola, *nov. sp.* Pl. XXI.. figs. 10–17.

Animal, when seen from above, elongated, distinctly indented at each ring of the body. First segment of cephalothorax short, about equal in length to the two following; second and third abdominal segments produced into spinous processes at the lower lateral angles. Upper antennæ in the *female* much shorter than the first cephalothoracic segment; first three joints short, and nearly equal, fourth about half as long as the third, fifth as long as the third, but much more slender; in the *male* forming at the third joint a large vesiculiform swelling, last joint elongated and uncinate. Swimming feet elongated, slender; the outer branch ciliated on the margins, bearing at the apex of each joint, on the external margin, a long slender spine, terminal spines long and slender; the middle joint has also a long apical seta at the inner margin: inner branch two-jointed, the first joint very small, the second long, almost filiform, and dividing at the extremity into one short and two very long lash-like branches. Fifth foot in the female foliaceous, the outer branch rather the longer, bearing one long seta at the apex and three shorter ones on the outer margin, inner branch with two long apical setæ; in the *male* the two branches are of nearly equal length, very narrow, simple, one branch bearing one, the other two long setæ at the apex. The caudal segments short, but longer in the male than in the female, setæ one on each segment, scarcely longer than the segment itself. Length, $\frac{1}{33}$rd of an inch.

Hab.—Off Seaham Harbour in a depth of twenty to thirty fathoms, on a soft muddy bottom. Two specimens only taken. On account of the peculiar structure of the swimming feet, which were identical in both examples, I think I am justified in referring these to the male and female of the same species. The genus approaches *Lilljeborgia* of Claus, but the characters given by that author, "*Pedum sequentium* (2, 3, 4), *rami interni rudimentarii, rami externi triarticulati, uncinati,*" do not apply here.

Genus HARPACTICUS, *M. Edwards.*

1. Harpacticus chelifer (*O. F. Müller*).

Cyclops chelifer, Müller, Entomostraca (1798).

Harpacticus chelifer, Claus, Die frei lebend. Copep. (1863).

Harpacticus chelifer, Boeck, Oversigt Norges. Copep. (1864).
(Not *H. chelifer* of Lilljeborg).

Not uncommon amongst weeds between tide marks. Roker, Whitley, &c. In the open sea off Seaton Carew.

2. Harpacticus gracilis, *Claus.*

H. gracilis, Cls., Die frei lebend. Copep. (1863)

H. elongatus, Boeck, Oversigt Norges. Copep. (1864).

This occurs in the same situations, though not so frequently as the foregoing species. M. Boeck doubts the identity of his *H. elongatus* with Claus's *gracilis* on account of a difference in the lengths of the antennal joints. This character, however, seems to me to be often subject to considerable variation, and I should not, without some divergence in other respects, be disposed to separate the two forms. Indeed, both approach so closely to *H. chelifer* that it seems questionable whether they might not be more fitly regarded as varieties of that species.

3. Harpacticus fulvus, *Fischer.*

H. fulvus, Fisch., Beitrag. zur Kenntniss der Entom. (1860); G. O. Sars, Som. 1862, Zool. Reise.

H. curticornis, Boeck, loc. cit., p. 38 (1864).

H. chelifer, Lilljeborg, De crustaceis ex. ord. trib.

Tigriopus Lilljeborgii, Norman, Last Shetland Dredging Report, p. 296.

In pools at or above high water mark; Bambro', Cullercoats, Marsden. Boeck and Sars both describe this species as inhabiting chiefly pools at or above high water mark, which are liable to get warmed by the sun. In such situations it is often extremely abundant in our district.

4. Harpacticus nicæensis? *Claus.*

Harpacticus nicæensis, Claus, Die Copep.-fauna von Nizza, p. 31, Pl. II., figs. 12–14.

A few specimens which I doubtfully refer to this species have occurred to me on the fronds of *Laminaria saccharina* and other fuci at Sunderland and Ryhope.

GENUS ZAUS, *Goodsir.*

1. ZAUS SPINOSUS, *Goodsir.*

Z. spinosus, Goodsir, Edinbro' New Phil. Journ. (1842); Claus, die frei lebend. Copep. (1863). Boeck, Oversigt Norges Copep. (1864).

Common on fuci, and especially on the fronds of *Laminariæ*, in tidal pools and beyond low water mark. Roker, Ryhope, Sunderland, Cullercoats, &c. Shetland (*Rev. A. M. Norman*).

GENUS THALESTRIS, *Claus.*

1. THALESTRIS LONGIMANA, *Claus.*

Frequent on the smaller weeds and on *Laminariæ* in tidal pools; Roker, Sunderland, Ryhope, &c. Also in the open sea, but more rarely.

2. THALESTRIS HELGOLANDICA? *Claus.*

On *Laminariæ* in tide pools at Roker. Not common.

3. THALESTRIS HARPACTOIDES, *Claus.*

In the surface-net off Grimsby and Teesmouth.

4. THALESTRIS CLAUSII, *Norman.*

T. Clausii, Norman, Last Shetland Dredging Report.

Frequent on *Laminaria saccharina* and other weeds in tide pools. Ryhope, Sunderland, Roker, Whitley, &c.

GENUS DACTYLOPUS, *Claus.*

1. DACTYLOPUS TISBOIDES, *Claus.*

On *Laminaria saccharina* at Roker and Ryhope; scarce. Abundant in brackish pools at Seaton Sluice.

2. Dactylopus similis, *Claus.*

One specimen dredged in a depth of four fathoms off Seaton Carew.

3. Dactylopus brevicornis, *Claus.*

On *Laminaria saccharina*, at Roker; not common.

4. Dactylopus Normani, *nov. sp.* Pl. XX., figs. 13–17.

Closely approaching *D. tisboides*, from which it differs, however, in the following particulars:—The superior antennæ are eight-jointed, and not so densely setose, the proportionate lengths of the various joints being as follows:—$\frac{1}{6}$, $\frac{2}{5}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{2}$, $\frac{6}{2}$, $\frac{7}{2}$, $\frac{8}{4}$. The secondary branch of the lower antennæ bi-articulate, each joint bearing two moderately long setæ. Lower footjaw (gnathopod) simply chelate, the inner margin of the hand fringed with short setæ. Longer branch of the first foot slender, bearing almost at the extremity of the outer margin a short ciliated seta. Fifth pair of feet large, outer branch subovate, bearing three long setæ, one at the apex, one on each lateral margin, and three shorter ones on the outer margin between the apical and lateral setæ; inner branch very much smaller, subquadrate, extending only half the length of the outer, bearing four primary setæ, two of them long and two of moderate length, the interspaces being densely ciliated.

Hab.—Roker, on *Laminaria saccharina;* rare.

Genus SCUTELLIDIUM, *Claus.*

1. Scutellidium tisboides, *Claus.* Pl. XIX., figs. 6–10.

One specimen on the frond of *Laminaria saccharina* at Roker.

Genus ALTEUTHA, *Baird.*

1. Alteutha bopyroides, *Claus.*

Often taken abundantly in the surface-net, all round the British Islands.

2. Alteutha purpurocincta, *Norman.*

A. purpurocincta, Norman, Last Shetland Dredging Report.

Peltidium purpureum, White, Pop. Hist. Brit. Crust.

On *Laminaria saccharina* at Roker and Cullercoats; frequent. Shetland (*Rev. A. M. Norman*).

3. ALTEUTHA DEPRESSA, *Baird.*

This species, described by Dr. Baird in his "Natural History of the British Entomostraca," is unknown to me, and appears not to have been recognized by any other author. It was taken by Dr. Baird in Berwick Bay.

GENUS ASPIDISCUS, *Norman.*

1. ASPIDISCUS FASCIATUS, *Norman*, Last Shetland Dredging Report, p. 298.

Abundant on the fronds of *Laminaria saccharina* at Roker, Sunderland, and Cullercoats. Shetland (*Rev. A. M. Norman*).

EXPLANATION OF PLATES.

PLATE XVII.

PSEUDOCYCLOPS CRASSIREMIS (male).

Fig. 1. Animal, seen from right side, × 84.
Fig. 2. Superior antenna of right side, × 210.
Fig. 3. ,, ,, of left side, × 210.
Fig. 4. Inferior antenna, × 210.
Fig. 5. Maxilla, × 210.
Fig. 6. Lower footjaw, × 210.
Fig. 7. Fifth pair of feet, × 120.
Fig. 8. Last abdominal segments and tail, × 84.

CYCLOPS LITTORALIS.

Fig. 9. Superior antenna, × 210.
Fig. 10. Inferior antenna, × 210.
Fig. 11. Mandible, × 210.
Fig. 12. Upper footjaw (?), × 210.
Fig. 13. Lower footjaw, × 210.
Fig. 14. Abdomen and tail: (*a*) foot of fifth pair, × 210.

PLATE XVIII.

CYCLOPS OVALIS

Fig. 1. Superior antenna, × 120.
Fig. 2. Abdomen and tail, × 120.

CYCLOPICERA LATA.

Fig. 3. Superior antenna, × 210.
Fig. 4. Inferior antenna, × 210.
Fig. 5. Maxilla, × 210.
Fig. 6. Upper footjaw, × 210.
Fig. 7. Lower footjaw, × 210.
Fig. 8. Abdomen and tail: (*a*) foot of fifth pair, × 120.

MACROCHEIRON FUCICOLUM.

Fig. 9. Male (?), seen from right side, × 100.
Fig. 10. Upper antenna of male, × 220.
Fig. 11. ,, ,, of female, × 220.
Fig. 12. Lower antenna, × 220.
Fig. 13. Mandible, × 220.
Fig. 14. Lower footjaw, × 220.
Fig. 15. Foot of fourth pair, × 220.
Fig. 16. ,, fifth pair (male), × 220.
Fig. 17. ,, ,, (female), × 220.
Fig. 18. Caudal segment and setæ, × 220.

PLATE XIX.

CANTHOCAMPTUS IMUS (female).

Fig. 1. Animal, seen from left side, × 100.
Fig. 2. Superior antenna, × 250.
Fig. 3. Lower footjaw, × 250.
Fig. 4. Foot of first pair, × 250.
Fig. 5. Foot of fifth pair, × 250.

SCUTELLIDIUM TISBOIDES (female).

Fig. 6. Upper antenna, × 210.
Fig. 7. Mandible and maxilla, × 210.
Fig. 8. Foot of first pair, × 210.
Fig. 9. Lower footjaw, × 210.
Fig. 10. Foot of fifth pair, × 210.

PLATE XX.

ECTINOSOMA MELANICEPS.

Fig. 1. Female (?), seen from right side, × 84.
Fig. 2. Superior antenna, × 210.
Fig. 3. Lower antenna, × 210.
Fig. 4. Mandible: (*a*) origin of palp, × 300.
Fig. 5. Mandible-palp, × 300.
Fig. 6. Maxilla, × 300.
Fig. 7. Upper footjaw, × 300.
Fig. 8. Lower footjaw, × 300.
Fig. 9. Foot of first pair, × 210.
Fig. 10. Posterior abdominal segments and setæ, × 120.
Fig. 12. Maxillary appendage (?).

DACTYLOPUS NORMANI.

Fig. 13. Superior antenna, × 210.
Fig. 14. Lower footjaw, × 210.
Fig. 15. Foot of first pair, × 210.
Fig. 16. Secondary branch of lower antenna, × 210.
Fig. 17. Fifth pair of feet, × 210.

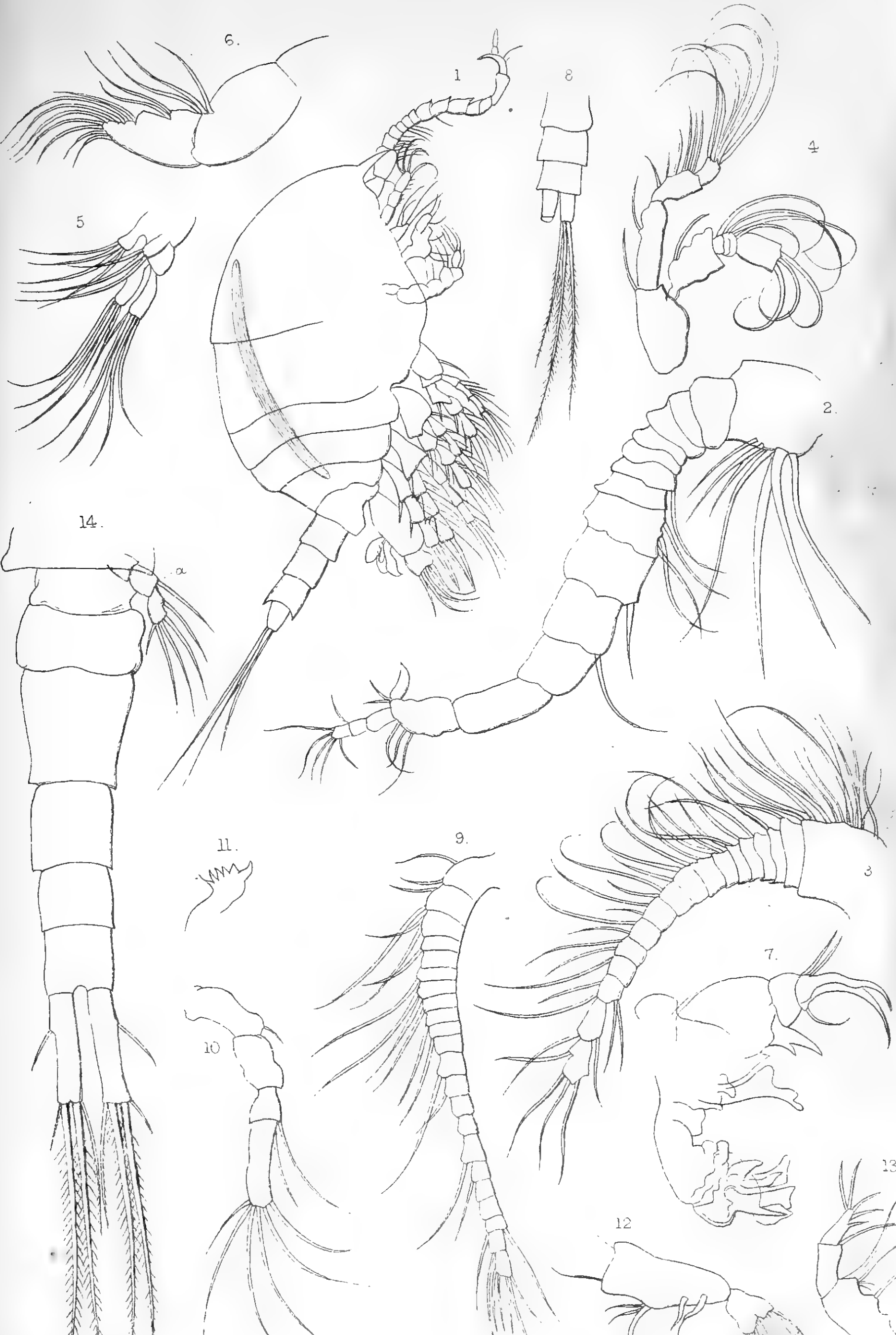
PLATE XXI.

LAOPHONTE HODGII.

Fig. 1. Upper antenna of female, × 210.
Fig. 2. ,, ,, male, × 210.
Fig. 3. Lower footjaw, × 210.
Fig. 4. Foot of first pair, × 210.
Fig. 5. ,, fourth pair, × 210.
Fig. 6. Fifth foot of female, × 250.
Fig. 7. ,, male, × 250.
Fig. 8. Caudal segment of female, × 250.
Fig. 9. ,, ,, male, × 210.

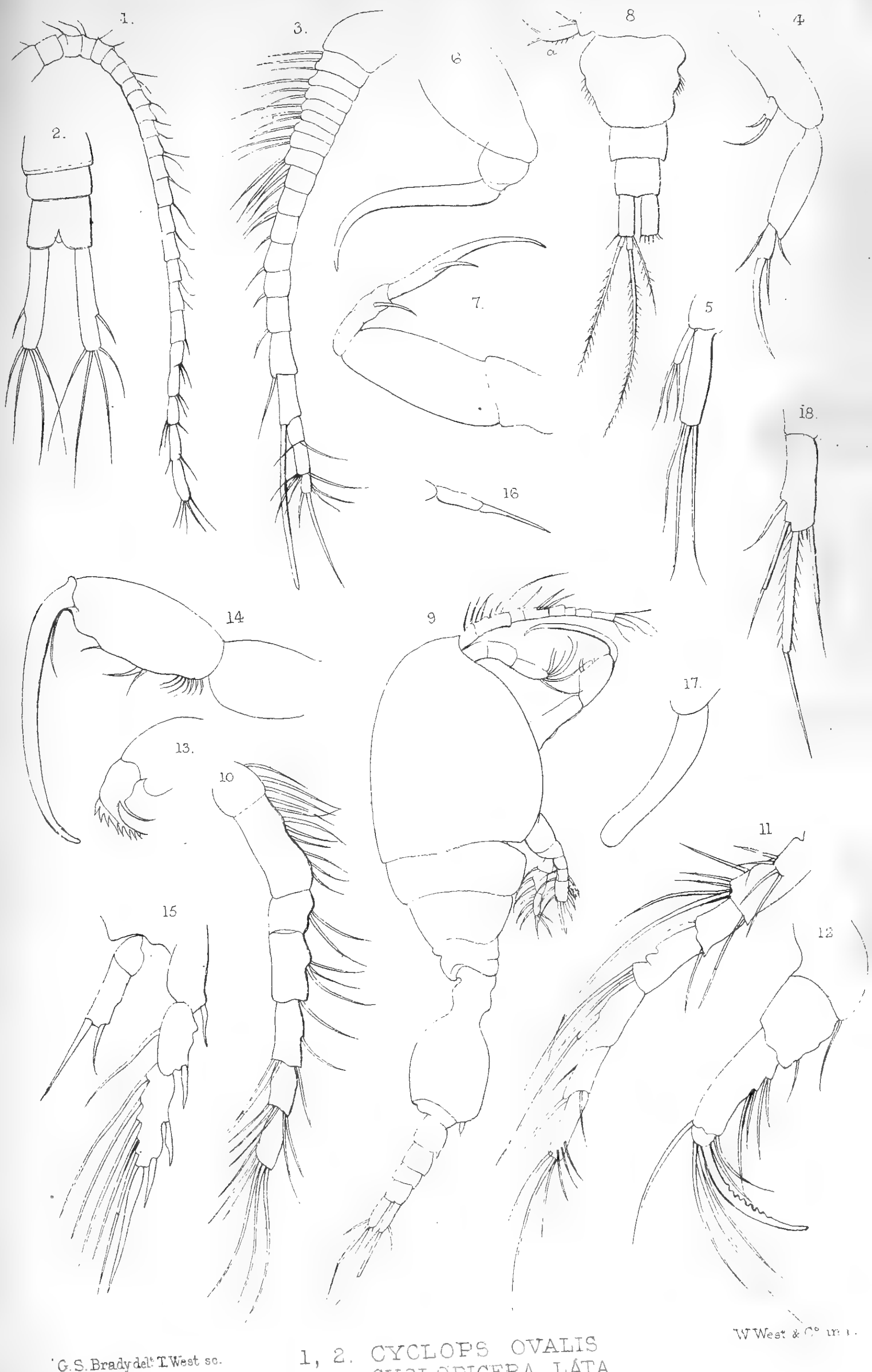
CLETODES LIMICOLA.

Fig. 10. Female, seen from above, × 100.
Fig. 11. Upper antenna of female, × 250.
Fig. 12. ,, ,, male, × 250.
Fig. 13. Lower footjaw, × 250.



G. S. Brady del.

1–8 PSEUD[illegible]
9–14 CYCL[illegible]



G. S. Brady del. T. West sc.

W. West & Co. imp.

1, 2. CYCLOPS OVALIS
3–8. CYCLOPICERA LATA
9–18. MACROCHEIRON FUCICOLUM.

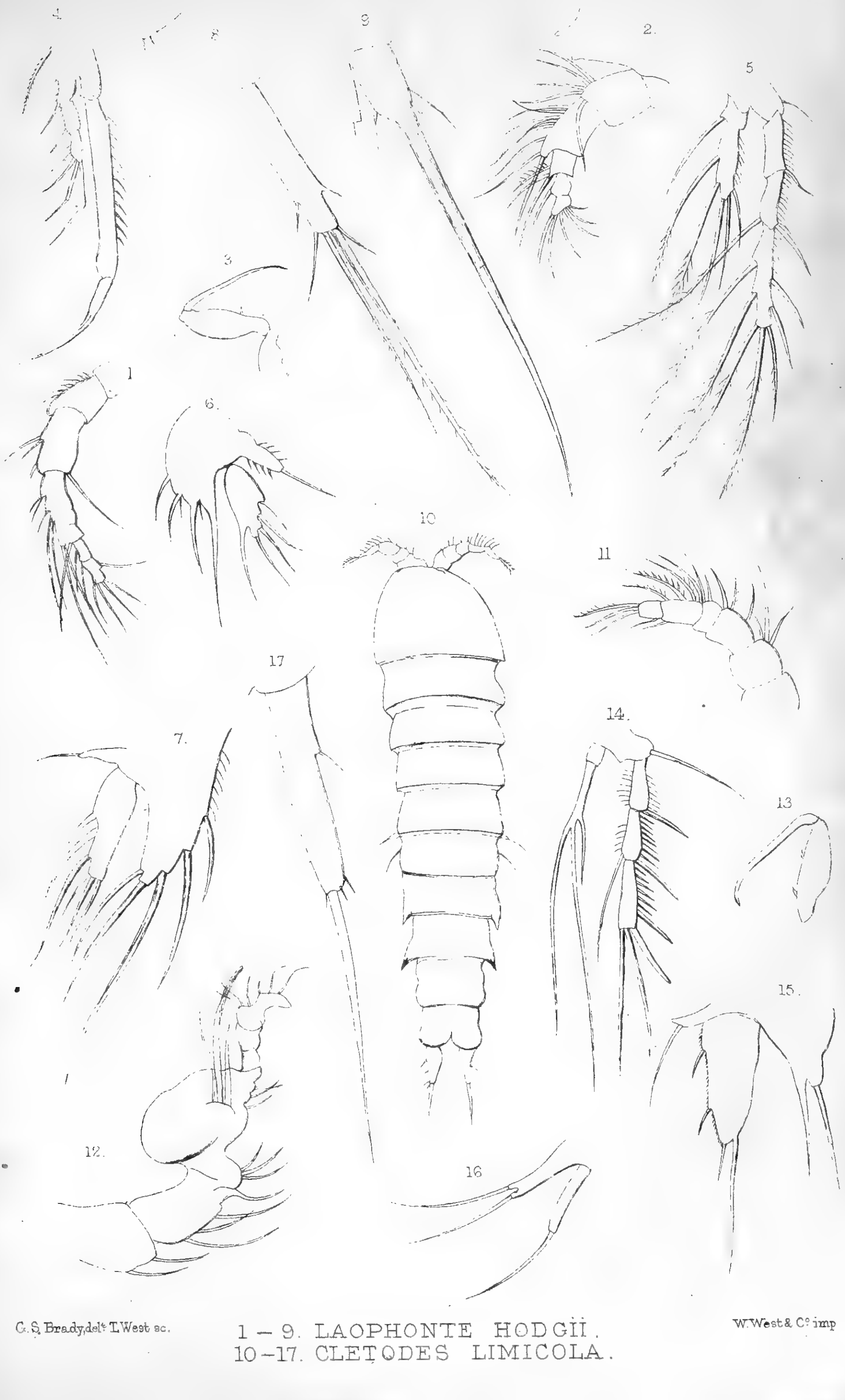
G. S. Brady del.t T West sc

W. West & Co. imp

1–5. CANTHOCAMPTUS IMUS.
6–10. SCUTELLIDIUM TISBOIDES.

G. S. Brady del. E. West sc.

1–12. ECTINOSOMA MELANICEPS
13–17. DACTYLOPUS NORMANI.



G. S. Brady, del[t]. T. West sc.   W. West & C[o] imp.

1 – 9. LAOPHONTE HODGII.
10 – 17. CLETODES LIMICOLA.

Fig. 14. Foot of first pair, × 250.
Fig. 15. ,, fifth pair, female, × 250.
Fig. 16. ,, ,, male, × 250.
Fig. 17. Caudal segment of female, × 250.

XX.—*Meteorological Report for* 1871. Edited by the Rev. R. F. Wheeler, M.A., and Rev. R. E. Hooppell, LL.D.

NOTES ON THE MONTHS.

January.—

> " When Candlemas day is come and gone
> The snow lies on a hot stone."
>
> —*Old Proverb.*

Greenwich.—The very cold weather which occurred at the close of 1870 continued until January the 5th, then somewhat moderated, but continued cold until the 13th. A few days of temperature above the average followed. On the 19th the cold weather returned and continued until February the 2nd.

The mean temperature of January was 33·2°, being 3·1° lower than the average of 100 years, and lower than any year back to 1842, when 32.9° was recorded. The mean high day temperatures of January were 5·8° lower than the average. The mean low night temperatures of January were 4·2° lower than the average.

The fall of rain was 0·2 inch in excess.

The mean readings of the barometer oscillated above and below the average several times during the first few days of January, but on the 13th a rapid fall commenced, and reached its minimum, 28·73°, on the 16th; a steady increase was recorded after this, and, with few exceptions, continued until the end of the month. The range of reading for January was 1·36 inches.

North Sunderland.—The storm which began on December the 20th continued all through January, except on the 14th and

15th, when the frost gave way for a time. The snow never disappeared, and at the end of the month there were no signs of the frost leaving.

Wallington.—The year began with a sharp frost, being a continuance of the previous severe weather of December. On the 1st, 2nd, 4th, and 27th, the thermometer fell to 5°, 10°, 8°, and 7°. On twenty-eight mornings frost was registered during the month.

The lowest minimum temperature was on the 1st, 5°, and the highest maximum on the 14th, 44·6°. The minimum mean for the month was 23·8°, and the maximum mean 35·8°. Snow and hail fell on fourteen days; rain and sleet on four days. Frost remained in the ground, with a covering of snow, during the whole month, with the exception of a temporary thaw on the 6th, 7th, 14th, and 15th. The 19th and 20th were two remarkable days, very bright and clear during the day-time, with severe frost each night. Owing to the long continuance of frost and snow upon the ground in this locality, birds of all kinds suffered severely for want of food. Rooks were seen in numbers striving one against another round a dead wood-pigeon, picking its bones in great fury, or any such like thing that came in their way. They were quite tamed for the time, as well as other birds about homesteads.

Pheasants were also seen upon the thorn trees feeding on the haws.

Meldon, near Morpeth.—A very severe month; the minimum temperature was only three nights above the freezing point. On the 1st and 2nd the reading of the minimum thermometer was 3° each night, or 29° of frost.

The brocoli were all destroyed by the severe frost, also about half of the Brussels sprouts and Savoys.

Wylam.—A cold, fine, dull month, with more skating than there has been for many years.

Barometer—Mean height at 8 A.M., 29·780; highest, 30·360 on the 27th; lowest, 28·470 on the 16th.

Thermometer—Mean of maximum	....	38·42°
Mean of minimum	....	25·78°
Difference	....	12·64°
Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right)$	=	32·10°
Mean for sixteen years, including 1871	....	36·92°
Deficiency of 1871	....	4·82°

Highest reading, 50° on the 15th; lowest, 7° on the 1st.

Mean of wet bulb at 8 A.M., 29·66°; of dry bulb, 31,41°; difference, 1·75°.

Fall—Rain, 0·63 inch, snow (melted), 0·63, = 1·26 inches; greatest fall, 0·39 inch on the 16th; days of fall, eleven.

River Tyne at Wylam Bridge—Mean height, 3·46 feet; highest, 14 feet on the 7th.

Wind—W., 5° S.

Whitley.—A fine meteor was seen on the 1st.

SOLAR HALOS were seen at Wallington on the 21st; at Sunderland on the 6th; at Gainford on the 20th. LUNAR HALOS were seen at Wallington on the 9th, 10th, and 11th; at Sunderland on the 1st and 8th; at Darlington on the 6th. LIGHTNING was seen, but THUNDER was not heard, at Wallington on the 15th. HAIL fell at North Sunderland on the 29th and 30th; at Wallington on the 22nd–24th, 28th–31st; at Acklam, near Middlesbro', on the 23rd–25th, and 28th. SNOW OR SLEET fell at Saughtree on the 9th; at North Sunderland on the 2nd, 9th, 11th, 25th, and 28th; at Rothbury on the 14th, 15th, 24th, 26th, and 28th; at Wallington on the 2nd, 9th–12th, 16th, 17th, and 23rd; at Meldon on the 25th, 28th, 29th, and 31st; at Whitley on the 8th, 9th, 25th, 27th, and 28th; at Darlington on the 9th and 25th; at Gainford on the 1st–10th, 22nd, 23rd, and 25th; at Greta Bridge on the 1st, 8th, and 11th; at Acklam, near Middlesbro', on the 9th, 11th, 14th, 22nd, 25th, 26th, and 29th. AURORÆ BOREALES were seen at Sunderland on the 13th; at Cresswell on the 15th; at Sunderland on the 9th and 11th.

February.—

"February makes a bridge and March breaks it."

—*Old Proverb.*

Greenwich.—From February the 3rd to March the 14th the weather was mostly mild and spring-like ; the average excess of those forty days was $4\frac{3}{4}$° daily. The mean temperature of February was 42·4°, being 3·9° higher than the average of 100 years, and higher than in 1870 by 6·2°, but lower than in 1869 by 2·9°. The mean high day temperatures of February were 2·9° higher than the average. The mean low night temperatures were 3·5° higher than the average.

The fall of rain was 0·5 inch in defect.

The mean daily readings of the barometer were generally above the average. The minimum for the month (29·06°) occurred on the 10th. The range amounted to 1·20 inches.

North Sunderland.—The first part of the month was wet and cold, the latter half dry and seasonable. The barometrical disturbance was great throughout.

Wallington.—Severe weather prevailed up to the 13th. On the 14th the wind veered to the west, and a thaw set in. The frost and snow soon disappeared. The lowest reading of the thermometer was 25° on the 12th. The highest reading 50°, on the 14th, 18th, and 19th. The mean minimum reading for the month was 33·5°, and the maximum 42·5°. Frost was registered on eleven mornings. Snow, rain, or sleet fell on nineteen days, accompanied by gales of severe cold wind.

Wylam.—Cold, wet, and windy till the 13th ; then fine, with a good deal of wind, till the end of the month.

Barometer—Mean height at 8 A.M., 29·889 ; highest, 30·173 on the 22nd ; lowest, 29·308 on the 20th.

Thermometer—	Mean of maximum	46·89°
	Mean of minimum	35·60°
	Difference	11·29°

Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right)$ =	41·24°
Mean for sixteen years	39·27°
Excess of 1871	8·97°

Highest reading, 56° on the 19th; lowest, 26° on the 12th.

Mean of wet bulb at 8 A.M., 38·82°; of dry bulb, 40·70°; difference, 1·88°.

Fall—Rain, 1·22 inches; snow (melted), 0·32 inch = 1·54 inches; greatest fall, 0·39 inch on the 8th; days of fall, eight.

River Tyne at Wylam Bridge—Mean height, 3·24 feet; highest, 10 feet on the 6th.

Wind—W., 15° S.

SOLAR HALOS were seen at Sunderland on the 15th, 17th, and 23rd. LUNAR HALOS were seen at Sunderland on the 7th. HAIL fell at Wallington on the 1st and 11th; at Whitley on the 1st. SNOW OR SLEET fell at Saughtree on the 3rd and 11th; at North Sunderland on the 12th; at Rothbury on the 10th; at Wallington on the 10th; at Cresswell on the 14th, 15th, and 16th; at Meldon on the 1st, 10th, and 11th; at Gainford on the 10th and 12th; at Greta Bridge on the 10th and 12th; at Acklam, near Middlesbro' on the 10th and 12th. AURORA BOREALIS was seen at Durham on the 22nd.

March.—

"March wind and May sun make clothes white and maids dun."

—*Old Proverb.*

Greenwich.—From the 14th to the end of the month the weather was very changeable, the temperature being for two or three days considerably in excess, and then for two or three days much below the average. Taking the whole seventeen days together the excess averaged 1·5° daily.

The mean temperature of March was 44·9°, being 4° higher than the average of 100 years, and higher than in the corresponding month in any year back to 1859, when 46·4° was recorded. The mean high day temperature was 5·4° above the average.

The mean low night temperature was 1·6° higher than the average.

The mean temperature of the air for the three winter months of December, 1870, and February and March, 1871, was 36·4°, being 1·6° lower than the average of 100 years.

The principal movements of the barometer were as follows:— A decrease from 30·35 inches on the 1st to 29·42 inches on the 6th, an increase to 30·00 inches on the 10th, a decrease to 29·12 inches on the 16th, an increase to 30·15 inches on the 18th; a decrease to 29·59 inches on the 24th, and an increase to 30·28 inches on the 28th. The range of reading amounted to 1·24 inches.

North Sunderland.—A very cold month, with some very hot days. Great variation of temperature in shade. Barometer very unsteady. Lowest temperature in shade, 24° on the 15th; highest temperature, 64° in shade on the 25th.

Wark.—On the 14th and 15th the mercury in a thermometer, facing N. about four feet from ground, and eighteen inches from a wall covered with ivy, fell to 5°.

Wallington.—March came in like a lamb—the first four days were remarkably fine and warm with bright sunshine. The weather was more like June than March. The maximum temperature on the 3rd was 64°. On the 5th a change took place, and extremely cold and stormy weather set in, with frequent gales of wind and showers of snow. This continued till the 18th. Mock sun seen on the 5th and 7th.

Minimum temperature on the 15th 12°, and the lowest for the month. From the 19th again another extreme of fine and clear weather, which continued to the 25th. On that day the maximum temperature was 67°, accompanied with thunder and lightning. Afterwards followed cold and stormy weather to end of the month. The minimum mean temperature for the month 33°, and the maximum mean 48·6°. Rain and snow fell on fourteen days to the amount of 1·07 of an inch. Mock suns were observed on the 5th and 7th.

Meldon, near Morpeth.—From the 5th the weather was favourable to vegetation, until the 26th, except one severe frost on the

15th, which destroyed all the apricot blossoms which were out. There were 17° of frost on the 26th. The 25th was a very hot day for the time of year—the thermometer rose to 70° in the shade. There was a change in the weather from the 26th; it was much colder, and vegetation made little progress.

Wylam.—Very warm and fine from the 2nd to the 8th, with wind from W. and S.W.; and again from the 18th to the 22nd, when exceedingly chill winds set in from E. till the end of the month. On the whole, a changeable fine month; coming in like a lamb, and going out like a lion.

On the 17th the shock of an earthquake was felt a little after 11 P.M., in the N. and W. of England, but was unobserved by any one in my house; indeed, its power seemed to vary much within short distances; the household of a friend of mine (G. C. A.), seven miles W. of this, were all roused out of their sleep, and rushed from their beds in great consternation. Near Whitehaven it was also plainly felt; a favourite parrot in a house there screamed out in a great fright, and tumbled off its perch, clinging to the side of its cage and flapping its wings with fear.

Barometer—Mean height at 8 A.M., 29·980; highest, 30·543 on the 28th; lowest, 29·371 on the 13th.

Thermometer—Mean of maximum	52·32°
Mean of mininum	35·29°
Difference	17·03°
Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right)$ =	43·81°
Mean of sixteen years	40·70°
Excess in 1871	3·11°

Highest reading, 69° on the 26th; lowest, 19° on the 15th.

Mean of wet bulb at 8 A.M., 37·64°; of dry bulb, 40·29°; difference, 2·65°.

Fall—Rain, 0·56 inch; snow (melted), 0·32 inch, = 0·88 inch; greatest fall, 0·30 inch on the 10th; days of fall, twelve.

River Tyne at Wylam Bridge—Mean height, 2·25 feet; highest, 4 feet on the 10th.

Wind—W., 23° S.

North Shields.—A shock, which is said to have been an earthquake, was noticed about 11·10 P.M. on the 17th. We were moving about at the time, and thus did not notice the oscillation, but the windows rattled very clearly. My sister, living in Newcastle, was roused from sleep by the shaking of the bed. A friend, living in Gateshead, was awakened by all his bells ringing; a small glass ornament was thrown down and broken in one of his rooms.—*R. Spence.*

Gainford.—An earthquake occurred on the 17th a little after 11 o'clock P.M. "I was awakened by my daughter coming to enquire the cause of the shaking of the house and the noise on the roof. The shock was felt in different parts of the village by seven persons, all of whom agreed as to the time and the fact."—*A. Atkinson.*

The estimated population of the largest towns in Durham and Northumberland, and the death-rate in the first quarter of 1871 were as follows:—

	Estimated Population.	Persons to an Acre.	Deaths.	Annual Rate to 1000 living.
Newcastle	136,293	25·5	899	26·5
Sunderland	103,037	31·2	685	26·7
So. Shields (Municipal boundary)	71,178	...	671	37·4
Gateshead ditto	45,933	...	284	24·7
Tynemouth ditto	41,205	...	246	23·9

The Registrar General reports that four hundred and sixty-three deaths from smallpox took place in the Northern Counties, two hundred and thirty-eight in South Shields, seventy-eight in Stockton, thirty-seven in Hartlepool, seventeen in Durham, fifteen in Auckland, thirteen in Gateshead, twenty-five in Newcastle-on-Tyne, and twenty-three in the Borough of Tynemouth. He states that the epidemic was almost confined to four great centres of infection—London, Liverpool, and the mining districts of Durham and South Wales. All the smaller outbreaks may be more or less directly traced to one of these centres. There is distinct evidence in many cases of the introduction of the disease into sea-side towns by sailors; and, considering its fatal prevalance in Holland, Belgium, and many parts of France, it is not a matter of great surprise that the ports should have suffered from the epidemic. That the epidemic may, to a great extent, be traced to foreign communication is beyond doubt.

In the first quarter of 1870 the mean temperature of January was considerably above the average, while February and March were, comparatively speaking, cold; the mean temperature of the quarter being 38°.

In the first quarter of 1871 the weather of January was remarkably severe, February and March were warmer than the average, and the mean of the quarter was 40·2°. This difference between the two winters did not materially affect the proportions of deaths among infants and elderly persons.

Solar Halos were seen at Wallington on the 14th and 15th; at Sunderland on the 1st, 5th, 7th, 9th, 10th–12th, 14th, 15th, 19th, 20th, and 25th. Lunar Halos were seen at Allenheads on the 24th; at North Shields on the 1st and 4th; at Sunderland on the 1st, 6th, 7th, and 31st; at Durham on the 7th. Lightning was seen, but Thunder was not heard, at Allenheads on the 25th. Thunderstorm occurred at Wallington on the 25th; at Acklam, near Middlesbro', on the 25th. Hail fell at North Sunderland on the 16th and 28th; at Cresswell on the 13th, 16th, 26th, 27th, 28th, and 29th; at Whitley on the 16th; at Acklam, near Middlesbro', on the 15th, 16th, and 28th. Snow fell at Saughtree on the 14th and 15th; at Wallington on the 8th, 12th, 13th, and 14th; at Cresswell on the 8th and 15th; at Meldon on the 8th, 9th, 13th, 14th, 15th, 16th, and 27th; at Whitley on the 14th; at Sunderland on the 28th; at Darlington on the 28th; at Greta Bridge on the 16th and 27th; at Gainford on the 9th, 16th, and 27th; at Acklam, near Middlesbro', on the 15th, 16th, 28th, and 31st. Auroræ Boreales were seen at Rothbury on the 8th and 22nd; at Cresswell on the 31st; at Sunderland on the 1st, 12th, 17th, and 27th; at Greta Bridge on the 17th and 27th; at Durham on the 23rd.

April.—

"April and May are the keys of the year."

Greenwich.—The mean temperature of April was 47·7°, being 1·7° higher than the average of 100 years, but lower than the corresponding value in any year back to 1861, when 44·3° was recorded. The result would have been different but for a warm period between April the 12th and 29th, when the daily excess was 4°.

The mean high day temperature of April was its average. The mean low night temperature of April was higher than its average.

The daily range of temperature was less than the average by 2°.

The fall of rain was 1·3 inches in excess.

The atmospheric pressure increased from 29·59 inches on April the 3rd to its maximum reading for the month, 30·050 inches, on the 6th, and continued generally about 29·8 inches till the 13th; on the 14th it decreased, and continued, with slight exceptions, to the 19th, when the minimum for the month, 29·08, occurs. From the 20th there were increasing readings till the 25th, to a maximum of 29·90 inches, and this was followed by readings decreasing to 29·34 inches on the 29th. The range for the month was 1·042 inches.

North Sunderland.—A wet, dull, cold month throughout.

Wallington.—Like the previous months of the year this was marked by a continuance of severe cold. Rain fell on twenty-four days to the amount of 4·78 inches. The highest reading of the thermometer was on the 7th, 58°, and the lowest on the 11th, when the thermometer fell to 18°. The low temperature destroyed nearly all the plums and pears upon the wall-trees; also retarded vegetation considerably several days. The minimum mean temperature for the month was 33·3°, and the maximum mean 49·4°, and the minimum and maximum mean 41·3°.

Meldon, near Morpeth.—The first eleven days of April were very ungenial. Vegetation was nearly at a standstill until the rain of the 11th, which did much good. There were only two days on which rain did not fall, namely the 21st and 29th. On the night of the 17th 1·07 inches of rain fell.

Wylam.—A cold, raw, changeable month, with a good deal of E. wind and a good deal of rain.

Barometer—Mean height at 8 A.M., 29·819; highest, 30·261 on the 6th; lowest, 29·073 on the 19th.

Thermometer—	Mean of maximum	52·30°
	Mean of minimum	35·77°
	Difference	16·53°
	Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right)$ =	44.03°
	Mean for sixteen years	46·06°
	Deficiency of 1871	2·03°

Highest reading, 63° on the 29th; lowest, 26° on the 7th.

Mean of wet bulb at 8 A.M., 39·30°; of dry bulb, 41·14°; difference, 1·84°.

Fall—Rain, 3·61 inches; greatest fall, 1·00 inch on the 19th; days of fall, sixteen.

River Tyne at Wylam Bridge—Mean height, 2·4 feet; highest, 8 feet on the 14th.

Wind—E., 12° N.

SOLAR HALOS were seen at Wallington on the 10th; at Sunderland on the 1st, 29th, and 30th. LUNAR HALOS were seen at Wallington on the 26th; at Sunderland on the 1st and 7th. THUNDERSTORMS occurred at Sunderland on the 27th; at Acklam, near Middlesbro', on the 19th. LIGHTNING was seen, but THUNDER was not heard, at Wallington on the 21st, 22nd, and 28th; at Greta Bridge on the 21st. THUNDER was heard, but LIGHTNING was not seen, at Saughtree on the 29th; at Wallington on the 13th, 14th, 15th, 16th, and 29th; at Allenheads on the 29th; at Meldon on the 29th; at North Shields on the 27th and 28th. HAIL fell at Meldon on the 28th; at Acklam, near Middlesbro', on the 3rd. SNOW fell at Saughtree on the 4th and 18th; at North Sunderland on the 3rd; at Meldon on the 1st, 2nd, 3rd, and 4th. AURORÆ BOREALES were seen at Rothbury on the 10th and 27th; at Wallington on the 9th; at Cresswell on the 9th; at Whitley on the 1st; at North Shields on the 1st and 9th; at Sunderland on the 1st, 9th, and 15th.

May.—

"When rain comes before wind
Halyard sheets and braces mend;
But—
When wind comes before rain
Soon you may set sail again."—*Fitzroy.*

Greenwich.—The mean temperature of May was 51·9°, being 0·7° below the average of 100 years, lower than in 1870 by 1·5°, but higher than in 1869 by 1·4°.

The mean high day temperature of May was lower than the average. The mean low night temperature of May was also lower than the average.

The daily range of temperature was 1·8° greater than the average.

The fall of rain was 1·3 inches in defect.

During the month of May the readings of the barometer, with six exceptions, were above the average. The range of readings was from 30·214 inches on the 7th, to 29·636 inches on the 25th, or 0·578 inch only.

Saughtree, North Tyne.—Severe frost on the 16th.

Wark.—On the 16th the mercury in a thermometer, on a stand facing east, about four feet from the ground, and eighteen inches from a wall, fell to 20°. In one facing north, eighteen inches from a wall covered with ivy, it fell to 18°.

All the potatoes were cut down to the ground. The gooseberries, except those sheltered by leaves, were killed. Many of the bushes lost their leaves. Apple blossom and cherry wholly destroyed. The young leaves of "horse knots" (*Plantago lanceolata*), and coltsfoot (*Tussilgo farfara*), turned black.

The trees in a beech wood by river side, at Chipchase, a quarter of a mile in length, turned as red as in autumn and lost their leaves. Yeast in a pantry within the rectory was frozen; as was milk in an underground pantry.

North Sunderland.—First part of month dry and cold, last ten days hot.

Wallington.—A continuance of low night temperatures, with north-east and northerly winds, characterised the month. Frost was registered on seven nights. The lowest reading of the thermometer recorded was 23° on the 17th, which nearly destroyed the fruit crops.

The highest maximum temperature was 73·5° on the 22nd. The mean maximum temperature for the month was 58·7°, the mean minimum 36°. Rain fell on ten days.

Meldon, near Morpeth.—Vegetation progressed favourably up to the 9th; from that date to the 25th the weather was very ungenial. On the night of the 17th there were 8° of frost, which was very destructive to the fruit crops. The peaches which were set upon the wall trees nearly all fell off, and about three-fourths of the apricots, which were as large as marbles, dropped; gooseberries also suffered greatly. The earlier blossoms of the pear and apple trees and strawberries were entirely destroyed. All potatoes above the ground were cut down. The peas also were much damaged with the severe frost of the 17th. The 17th was a remarkable cold windy day from the N.W. After the rain of the 25th vegetation advanced rapidly to the end of the month.

Cresswell.—The hills in the distance were covered with snow, and there was ice here a quarter of an inch thick on the 18th.

Wylam.—Very cold and raw, with N.E. wind till the 16th, when the wind changed to N.W., and the thermometer, which on the 17th was down to 27°, began to rise; and on the 19th the weather was much milder, and continued so till nearly the end of the month. Much damage was done to the gardens by the severe frost of the 17th. The blossoms of most of the wall fruit trees, and that of many of the standards, being killed by this unusually late and severe frost.

Barometer—Mean height at 8 A.M., 30·047; highest, 30·357 on the 7th; lowest, 29·573 on the 4th.

Thermometer—Mean of maximum	....	59·49°
Mean of minimum	....	39·61°
Difference	....	19·88°
Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right) =$		49·55°
Mean of sixteen years	....	50·95°
Deficiency of 1871	....	1·40°

Highest reading, 77° on the 25th; lowest, 27° on the 17th.

Mean of wet bulb at 8 A.M., 44·4°; of dry bulb, 47·8°; difference, 3·4°.

Fall—Rain, 0·88 inch; greatest fall, 0·38 inch on the 26th; days of fall, seven.

River Tyne at Wylam Bridge—Mean height, 1·7 feet; highest, 2·2 feet on the 1st.

Wind—N., 12° E.

Acklam, near Middlesbro'.—On the 23rd the currant and gooseberry leaves were falling, having been damaged by the frost. The plum trees were also much hurt.

Solar Halos were seen at Sunderland on the 2nd, 5th, 6th, 14th, 15th, 18th, 20th, and 24th. Thunderstorms occurred at Sunderland on the 26th; at Acklam on the 26th; at Darlington on the 26th; at Gainford on the 26th. Thunder was heard, but Lightning was not seen, at Wallington on the 26th; at Allenheads on the 29th; at Meldon on the 25th; at Cresswell on the 2nd; at North Shields on the 26th; at Greta Bridge on the 8th. Snow or Sleet fell at Sunderland on the 16th; at Seaham on the 16th. Hail fell at Gainford on the 26th.

June.—

"A bright yellow sky at sunset
Presages wind. A pale yellow, wet."

—*Fitzroy.*

Greenwich.—The low temperature was most severe at the beginning and end of June, and the deficiency of temperature from the average of the preceding thirty years exceeded 4° daily. The month of June, 1860, was of the same low temperature, but previous to that we must go as far back as the year 1821 for one of lower temperature.

The unseasonable, cold weather which, for the most part, prevailed during April, May, and June, together with the north winds, cloudy sky, and scanty sunshine, caused vegetation to be very backward.

The mean temperature of June was 54·8°, being 3·4° lower than the average of 100 years. The only instances in that period in which the temperatures were the same, or of lower value, were as follows:—

1771	54·0°	1812	54·0°
1789	54·8°	1814	53·4°
1792	54·4°	1816	53·1°
1795	53·7°	1821	54·1°
1797	54·8°	1860	54·8°
1805	54·5°		

The mean high day temperature was lower than the average, as was also the mean low night temperature.

The daily range of temperature was less than the average by 2·8°.

The fall of rain was 1·1 inches in excess.

The barometrical oscillations were small, and there were no large departures from the average. The readings varied from 30·097 in the maximum on the 26th to 29·337, the minimum, on the 17th. The range was 0·760 inch.

Wark.—On the night of the 25th water in a pail at a door in the village of Wark was frozen over.

The following temperatures were registered:—June the 2nd, 28°; 4th, 26°; 21st and 23rd, 29°; 24th, 32°; 25th, 28°; 26th, 30°.

North Sunderland.—Weather much overcast and misty; cold winds generally from north.

Wallington.—A cold month throughout, wind chiefly from the north-east; and frost was registered on four mornings of the month, which retarded the growth of fruit trees and the smaller fruit bushes very much, and which appeared to be favourable to the growth and production of aphides. They covered the underside of the leaves of fruit trees and bushes in myriads. The colours varied with the trees on which the insects fed. The aphis on the peach was a pale colour: the cherry black. The plum a large dark green: the pear and beech yellow.

Farm and garden crops otherwise promised well and were very luxuriant.

The minimum temperature recorded was 29° on the 25th; the maximum 72° on the 2nd. The mean minimum for the month was 41°; the mean maximum 62·2°. Rain fell on fourteen days.

Meldon, near Morpeth.—This month commenced with a fine day, but the wind changed to the north on the 2nd, and it continued cold from that date to the 10th, except the 6th, which was a fine day. On the 7th there was a strong gale of wind from the N.E., which strewed the ground with green leaves. After the rain on the 14th, which was much wanted, vegetation advanced rapidly to the end of the month.

There were thunderstorms at intervals on the 18th, from 11·50 A.M. to 7.0 P.M., in which time 0·45 inch of rain fell.

Wylam.—A cold ungenial month, with chill E. winds. A few warm days occurred from the 14th to the 18th, when there was a thunderstorm, and cold weather ensued till very nearly the end of the month.

Barometer—Mean height at 8 A.M., 29·625; highest, 30·290 on the 26th; lowest, 29·343 on the 18th.

Thermometer—	Mean of maximum	61·10°
	Mean of minimum	44·10°
	Difference	17·00°
	Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right) =$	52·60°
	Mean of sixteen years...........	56·63°
	Deficiency in 1871	4·03°

Highest reading, 76° on the 17th; lowest, 35° on the 5th.

Mean of wet bulb at 8 A.M., 48·83°; of dry bulb, 50·97°; difference, 2·14°.

Fall—Rain, 3-13 inches; greatest fall, 1·40 inches on the 16th; days of fall, eleven.

River Tyne at Wylam Bridge—Mean height, 1·6 feet; highest, 2·2 feet on the 19th and 29th.

Wind—E., 24° N.

The population of the largest towns in Northumberland and Durham, with their respective death rates, for the second quarter of 1871, was as follows:—

	Estimated Population middle of 1871*.	Persons to an acre.	Deaths.	Annual Death Rate per 1000 from all classes.	Annual Death per 1000 from seven principal zymotic diseases.
Newcastle-on-Tyne	128·677	24·1	1,040	32·4	9·3
Sunderland	98·797	29·9	774	31·4	12·7
Gateshead	48·226	...	347	28·8	...
Tynemouth	40·800	...	244	23·9	...
South Shields	75·390	...	586	31·1	...
Total of 17 large Towns	...	...	...	24·4	5·9

Smallpox was very prevalent during this quarter, not only in Northumberland and Durham, but elsewhere. In London the death rate from this cause was 4·0 persons per 1000, 1·5 in Lancashire, 4·3 in Durham, 2·9 in Northumberland; Liverpool 6, Newcastle-on-Tyne 7, and Sunderland 9 per 1000. In South Shields the number who died from this disease was 148, and in Gateshead 67.

SOLAR HALOS were seen at Wallington on the 11th and 29th; at Sunderland on the 3rd, 4th, 6th, 14th, 19th, 29th, and 30th. LUNAR HALOS were seen at Sunderland on the 1st. THUNDER-STORMS occurred at Wallington on the 18th; at Allenheads on the 17th; at Meldon on the 18th; at Cresswell on the 18th; at Whitley on the 30th; at North Shields on the 18th and 30th;

* The figures in this column are the unrevised mumbers enumerated at the census in April, 1871, raised to the middle of the year by adding one-fortieth of the rate of increase which prevailed between 1861 and 1871.

at Darlington on the 18th and 30th; at Acklam, near Middlesbro', on the 18th and 20th. LIGHTNING was seen, but THUNDER was not heard, at Acklam on the 15th and 19th. THUNDER was heard, but LIGHTNING was not seen, at Allenheads on the 18th and 25th; at Meldon on the 19th; at Cresswell on the 12th and 19th; at North Shields on the 17th, 19th, and 28th; at Bywell on the 19th. HAIL fell at Saughtree on the 25th; at Darlington on the 16th. AURORA BOREALIS was seen at North Sunderland on the 4th.

July.—

"Rainbow to windward, foul fall the day;
Rainbow to leeward, damp runs away."
—*Old Nautical Saw.*

Greenwich.—The cold weather which had been generally prevalent throughout the preceding quarter continued, with the slight exception of the few days, July 14th to 21st, till August the 5th.

The mean temperature of July was 61·7°, being 0·1° higher than the average of 100 years, but lower than the corresponding values in 1870, 1869, and 1868.

The mean high day temperatures of July were lower than the average. The mean low night temperatures were above the average. The daily range of temperature was less than the average by 2·5°.

The changes of atmospheric pressure were small but frequent, the tendency being higher in the middle than at the beginning and end of the month. The maximum, 30·06 inches occurred on the 16th, and the minimum, 29·24 inches on the 24th. The range was 0·82 inch.

The fall of rain was 0·7 inch in defect.

North Sunderland.—Damp, wet month. Prevailing winds W. and S.W.

Wallington.—The weather was fine and warm. Brilliant sunshine and frequent showers of rain made the crops both in field and garden advance very rapidly.

The lowest temperature was 38·5°, the only day during the month when it fell below 41°. The highest temperature was 75° on the 14th. The maximum temperature was never below 60°. The mean minimum for the month was 46·5°, the mean maximum 65·5°.

Rain fell on twenty-five days.

Meldon, near Morpeth.—A remarkable month from the absence of sunshine, and rain on almost every day. Rain fell on twenty-four days, either more or less, to the amount of 2·90 inches. The 14th was the warmest day of this month—minimum temperature 59°, maximum 79°.

As the weather was dull and moist the turnips grew rapidly, and pastures were exceedingly good. From the crops of hay being large and the weather unsuitable, hay-making was a tedious operation, but on the whole the hay was got in good condition.

Wylam.—Fine, with occasional rain and thunder.

Barometer—Mean height at 8 A.M., 29·701; highest, 30·019 on the 16th; lowest, 29·148 on the 25th.

Thermometer—	Mean of maximum	68·51°
	Mean of minimum	50·07°
	Difference	18·44°
	Mean for month $\left(\frac{\text{max.}+\text{min.}}{2}\right)$ =	59·29°
	Mean of sixteen years	59·28°
	Excess of 1871	00·01°

Highest reading, 75° on the 15th and 17th; lowest, 43° on the 30th.

Mean of wet bulb at 8 A.M., 55·43°; of dry bulb, 59·94°; difference, 4·51°.

Fall—Rain, 2·85 inches; greatest fall, 0·50 inch on the 5th; days of fall, twenty-one.

River Tyne at Wylam Bridge.—Mean height, 1·9 feet; highest, 3·5 feet on the 5th.

Wind—W., 4° S.

Solar Halos were seen at Wallington on the 4th and 30th; at Sunderland on the 2nd, 5th, 14th, 18th, and 23rd. Lunar Halo was seen at Sunderland on the 27th. Thunderstorms occurred at Saughtree on the 1st, 2nd, 5th, 23rd, and 30th; at North Sunderland on the 1st, 4th, 23rd, and 24th; at Rothbury on the 4th, 9th, 16th, and 29th; at Wallington on the 1st, 8th, 16th, 23rd, 24th, 25th, 26th, and 30th; at Allenheads on the 4th, 10th, and 30th; at Cresswell on the 1st, 4th, 5th, 7th, 8th, 9th, 10th, 14th, 17th, 26th, and 29th; at Bywell on the 1st, 4th, 10th, and 30th; at Whitley on the 1st, 5th, 8th, 14th, and 23rd; at North Shields on the 1st, 10th, 14th, 23rd, 26th, and 29th; at Sunderland on the 1st, 5th, 8th, 10th, 14th, 23rd, 28th, and 30th; at Darlington on the 1st, 6th, 8th, 14th, 23rd, 28th, 29th, and 30th; at Gainford on the 1st, 3rd, 5th, 8th, 10th, 14th, 23rd, 29th, and 30th; at Seaham on the 5th; at Greta Bridge on the 1st and 14th; at Acklam, near Middlesbro', on the 1st, 4th, 8th, 14th, 16th, 23rd, 26th, and 27th. Hail fell at Meldon on the 5th, 10th, 23rd, 26th, and 30th; at Cresswell on the 5th; at North Shields on the 23rd; at Sunderland on the 5th and 23rd; at Seaham on the 5th; at Acklam on the 5th.

August.—

"At St. Bartholomew
There comes cold dew."—*Old Proverb.*

Greenwich.—The mean temperature of August was 64·8°, being 4° higher than the average of 100 years; and in the period, 1771–1870, the only instances in which the corresponding values have been the same as, or in excess of, this value, are 1780, 65·7°; 1802, 64·8°; 1842, 65·4°; and 1857, 65·8°

The mean high day and low night temperatures of August were higher than the average. The daily range of temperature was greater than the average by 4·7°.

The oscillations of the barometer in August were larger than in July, the principal movements being an increase to 30·02 inches on the 10th, a decrease to 29·26 inches on the 18th, an increase to 29·80 inches on the 21st, a decrease to 29·56 inches on the 24th, an increase to 30·31 inches on the 28th, and a decrease to 29·82 inches on the 30th. The range was 1·05 inches.

The fall of rain was 1·5 inches in defect.

North Sunderland.—A fine, hot month. Harvest began about the 20th, and corn was generally cut by the end of the month.

Wallington.—August was a continuance of hot and fine weather similar to last month, but the temperature was hotter and the air dryer. No rain fell from July the 30th to August the 16th; after that light showers fell on ten days, except on the 20th, when there was a heavy fall of nearly one inch, accompanied with a thunderstorm, which was favourable to the growth of all kinds of crops. Corn progressed wonderfully, and at the end of the month harvest was progressing well in nearly every county, and was earlier than could have been expected considering the lateness of the spring, but July and August fully made up for the lateness.

The highest maximum temperatures and hottest days of the year were 85·5° on the 9th, and 81° on the 10th. The lowest minimum 35·3° on the 22nd. The maximum mean for the month 69·5°, the minimum mean 46°. The temperature on twelve days was between 70° and 80°, and on fifteen days between 60° and 70°.

Meldon, near Morpeth.—From the close of July to August the 16th the weather was very favourable for the making of hay, as there was not any rainfall during that time. From the 1st of the month to the 6th the maximum temperature varied from 68° to 75°, but on the 7th there was a great change, the maximum temperature reaching to 84°, and the range was from 79° to 86° up to the 13th. The 10th was the warmest day of the year, when the thermometer reached 86°. On the 24th, 25th, and 26th, the weather was dull and the temperature low, and very violent gales of wind prevailed during that period, more especially on the 24th and 26th, when a great quantity of corn in this neighbourhood was shaken out. The minimum temperature on the 22nd was 37°.

Wylam.—A very fine month; very warm from 8th to 12th. A good deal of thunder and lightning all over England, and several deaths from lightning.

Barometer—Mean height at 8 A.M., 29·923; highest, 30·431 on the 28th; lowest, 29·168 on the 25th.

Thermometer—Mean of maximum	....	71·90°
Mean of minimum	....	49·81°
Difference	....	22·09°
Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right)$	=	60·85°
Mean for sixteen years	....	57·74°
Excess of 1871	....	3·11°

Highest reading, 84° on the 11th; lowest, 38° on the 22nd.

Mean of wet bulb at 8 A.M., 54·22°; of dry bulb, 57·81°; difference, 3·59°.

Fall—Rain, 0·87 inch; greatest fall, 0·44 inch on the 21st; days of fall, eight.

River Tyne at Wylam Bridge—Mean height, 1·64 feet; highest, 3·7 feet on the 21st.

Wind—W., 23° S.

SOLAR HALOS were seen at Sunderland on the 23rd, 27th, and 31st. LUNAR HALOS were seen at North Sunderland on the 27th; at Sunderland on the 27th. THUNDER was heard, but LIGHTNING was not seen, at Rothbury on the 16th; at Allenheads on the 1st and 9th; at Wallington on the 20th; at Bywell on the 16th, 23rd, and 29th; at North Shields on the 2nd, 8th, and 24th. LIGHTNING was seen, but THUNDER was not heard, at Acklam, near Middlesbro', on the 18th. THUNDERSTORMS occurred at Allenheads on the 18th; at Darlington on the 18th; at Gainford on the 18th; at Acklam on the 18th. AURORÆ BOREALES were seen at Wallington on the 21st; at North Shields on the 24th; at Whitley on the 23rd, 24th, and 25th; at Sunderland on the 21st, 23rd, 24th, and 25th; at Durham on the 21st and 24th.

September.—

"St. Michael's rain does not stay long in the sky."

—*French Proverb.*

Greenwich.—The mean temperature of September was 57·4°, being 0·9° higher than the average of 100 years, and higher than in 1870 by 1·7°.

The mean high day temperatures of September were lower, and the mean low night temperatures were higher than the average.

The daily ranges of temperature were less than the average by 1·2°.

The mean daily readings of the barometer were generally below the average from the 1st to the 11th and from the 20th to the end of the month, the means for the remaining days being in excess. The minimum reading for the month was 28·85 inches on the 27th, the highest reading was 30·12 on the 14th, and the range 1·27 inches.

The fall of rain was 1·7 inches in excess.

The mean temperature of the air in the three months ending August was 60·4°, being 0·2° higher than the average of 100 years.

The population of the largest towns in Northumberland and Durham, with their respective death rates, for the third quarter of 1871, were as follows:—

	Estimated Population	Persons to an Acre.	Deaths.	Annual Death Rate to 1000 living from 7 principal zymotic diseases.	Annual Death Rate to 1000 living.
Newcastle-on-Tyne......	128·677	24·1	1,208	15·3	37·7
Sunderland	98·797	29·9	1,132	26·4	46·0
South Shields	75·390	..	610	...	32·4
Gateshead..................	48·226	...	455	...	47·7
Tynemouth	40·800	...	305	...	29·9

The highest death rates in the seventeen largest English towns during the quarter ending September 30th were as follows:—

Manchester, 34; Salford, 35; Newcastle-upon-Tyne, 38;

Sunderland, 46. Diarrhæa was more or less fatal in each of the towns, and smallpox showed especial fatality in Newcastle and Sunderland, while it was also prevalent in London, Liverpool, Manchester, and Salford.

North Sunderland.—In the early part of the month the weather was good for harvest work, but the latter part was wet and cold.

Wallington.—The rainfall this month was excessive ; upwards of 5 inches fell. This was very unfavourable for harvest work. Indeed only some ten days (11th to 21st) could be said to be suitable for getting the corn in.

From September the 22nd to October the 6th heavy showers of rain fell every day. The highest temperature recorded was 70° on the 11th, the lowest 31° on the 29th.

The mean maximum for the month was 59·1°, the mean minimum 41·1°.

Lunar rainbow seen on the 28th.

Meldon, near Morpeth.—This has been a very wet month. From the 19th to the end of it rain fell on every day except the 21st. The 24th and 27th were excessively wet days ; 1·21 and 1·01 inches of rain fell respectively.

With the long continuance of wet weather the harvest work has been very much retarded, and a great quantity of corn remained in the fields and was much damaged.

Wylam.—A fine month, the temperature falling with singular regularity from a mean of 63° at the beginning to about 45° at the end of the month.

Barometer—Mean height at 8 A.M., 29·892 ; highest, 30·392 on the 14th ; lowest. 29·244 on the 28th.

Thermometer—Mean of maximum	62·03°
Mean of minimum	44·33°
Difference	17·70°

Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right) =$	53·18°
Mean for sixteen years	54·75°
Deficiency of 1871	1·57°

Highest reading, 75° on the 2nd and 3rd; lowest, 35° on the 29th.

Mean of wet bulb at 8 A.M., 48·23°; of dry bulb, 50·43°; difference, 2·20°.

Fall—Rain, 5·28 inches; greatest fall, 1·56 inches on the 25th; days of fall, thirteen.

River Tyne at Wylam Bridge—Mean height, 2·06 feet; highest, 7 feet on the 28th.

Wind—N., 24° E.

Whitley.—On September the 4th, 1871, about 11 P.M., a fine Lunar Rainbow of considerable permanence was seen. The arc was complete and very clearly defined.

On September the 5th a very vivid meteor was seen about 9.45 P.M., which emerged near Polaris and passed close by Dubhe. It was visible about two and a half seconds, and left a trail of brilliant violet which faded into faint bluish white.

SOLAR HALOS were seen at Wallington on the 26th; at Sunderland on the 2nd, 6th, 8th, 9th, 10th, 23rd, and 29th. LUNAR HALOS were seen at Wallington on the 26th and 30th; at Sunderland on the 2nd, 25th, 26th, and 30th. LIGHTNING was seen, but THUNDER was not heard, at Wallington on the 3rd, 7th, 21st, and 30th; at Rothbury on the 18th; at Whitley on the 9th; at Sunderland on the 21st and 22nd; at Acklam on the 9th. THUNDER was heard, but LIGHTNING was not seen, at Wallington on the 20th and 21st; at Acklam on the 6th. THUNDERSTORMS occurred at Sunderland on the 7th; at North Shields on the 6th. HAIL fell at Sunderland on the 30th; at Darlington on the 8th; at Acklam on the 30th.

October.—

"When Cheviot ye see put on his cap,
Of rain ye'll have a wee bit drap."
—*Old Proverb.*

Greenwich.—Till the 16th of October the temperature was constantly below the average. This was followed by five warm days, then by six cold, and the month closed with a second period of five days of warm weather. Upon the whole month the temperature was nearly a degree below the average as found from the previous thirty Ootobers.

The mean temperature of October was 49·4°, being 0·2° lower than the average of 100 years, 0·4° lower than the corresponding value of 1870, but higher than in 1869, 1868, and 1867, when 48·9°, 47·9°, and 48·7° were recorded.

The mean high day temperatures of October were higher, and the mean low night temperatures were lower than the average.

On the 1st of October the reading of the barometer, at a height of 159 feet above the sea level, was 28·9 inches. An increase then set in and lasted till the 13th, when the maximum, 30·3 inches, for the month was reached. A decrease in the reading till the 19th was then registered, the value at 9 P.M. of that day being 25·5 inches. Another high wave then ensued reaching its maximum, 30·18 inches, on the 25th, followed by decreasing readings till the 29th.

The range was 1·4 inches.

The rainfall was 1·4 inches in defect.

North Sunderland.—Dull, damp month. Great want of sun. Much mist and fog, and very light winds.

Wallington.—The long continued wet weather of this and last month has caused great delay in the harvest work. Corn was much injured by the wet. The only favourable days for harvest work were the 7th–13th. It was close on the end of the month before all was stacked.

Rain fell on eighteen days.

Highest temperature recorded, 60° on the 18th; lowest, 23° on the 10th.

Mean minimum for month, 37·6°, mean maximum, 52·7°.

Meldon, near Morpeth.—Rain fell every day from the 1st to the 6th; the weather from the 6th to the 14th was fine. By the middle of the month the corn was all carried and stacked. On the 10th and 11th there were 8° and 7° of frost respectively.

Wylam.—Fine calm month; temperature pretty even.

Barometer—Mean height at 8 A.M., 29·819; highest, 30·406 on the 10th; lowest, 29·129 on the 2nd.

Thermometer—Mean of maximum	....	56·45°
Mean of minimum	....	39·19°
Difference	....	17·26°
Mean for month $\left(\frac{\text{max.} \times \text{min.}}{2}\right)$	=	47·82°
Mean of sixteen years	....	48·02°
Deficiency of 1871	....	0·20°

Highest reading, 66° on the 19th; lowest, 26° on the 10th.

Mean of wet bulb, 43·10°; of dry bulb, 44·90°; difference, 1·80°.

Fall—Rain, 2·78 inches; greatest fall, 0·84 inch on the 20th; days of fall, fifteen.

River Tyne at Wylam Bridge—Mean height, 3·08 feet; highest, 7·5 feet on the 19th.

Wind—W., 10° S.

Solar Halos were seen at Sunderland on the 9th, 10th, 25th, and 27th. Lunar Halos were seen at Wallington on the 25th, 26th, and 29th; at Sunderland on the 1st, 26th, and 28th; at Durham on the 26th. Lightning was seen, but Thunder was not heard, at Saughtree on the 4th; at Allenheads on the 4th; at Wallington on the 4th; at North Shields on the 2nd; at Acklam on the 4th. Thunder was heard, but Lightning was not seen, at Wallington on the 8th; at Allenheads on the 8th; at Cresswell on the 19th; at North Shields on the 8th. Thunderstorms occurred at Whitley on the 8th; at Sunderland on the 8th; at Acklam on the 8th. Auroræ Boreales were seen at Cresswell on the 3rd; at Durham on the 4th; at Rothbury on the 13th; at Sunderland on the 17th. HAIL fell at Sunderland on the 8th; at Acklam on the 8th.

November.—

"If the wind be in the south-west at Martinmas, it will keep there till after Candlemas."—*Midland Counties Proverb.*

Greenwich.—On the 2nd of November a period of cold weather set in of unprecedented length, continuing throughout the whole month. The mean temperature of the month was 37·6°, being 4½° below the average of 100 years, 5½° below the mean temperature of the fifty years ending 1863, and 6¼° below the average of the last thirty Novembers.

Since the year 1771 the following are the instances of Novembers with mean temperatures below 40°:—

1773	39·2°	1809	39·5°
1774	39·2°	1815	38·9°
1780	39·5°	1816	39·3°
1782	34·7°	1826	39·9°
1786	36·7°	1829	39·3°
1787	39·6°	1851	37·9°
1789	38·7°	1858	39·6°
1805	39·9°	1862	39·8°
1807	38·7°		

So that in two instances only, viz., in the years 1782 and 1786 has the mean temperature been lower than 37·6° since the year 1771, and since the year 1786 (85 years), there has not been any instance of such a cold November.

The mean temperature of October and November, taken together, was 43·5°, and we must travel back to 1829 for a mean temperature for these two months of so low a value, when it was 43·4°. In the year 1813 it was 43·7°, and in 1808, 43·6°, and there were no other instances in the century of similar temperature.

The mean high day temperatures and the mean low night temperatures of November were lower than the average.

The range of temperature was less than the average. The rainfall was 1·8 inches in defect.

During November, few movements of the barometric column of any magnitude were experienced, the principal being a steady fall from 29·97 inches on the 5th to 29·30 inches on the 8th, followed by a rise of 36·2 inches on the 13th. During the remainder of the month the variations were of small amount. The range of reading was 0·99 inch.

North Sunderland.—An exceedingly cold, raw, ungenial month.

Wallington.—A cold, dull, and frosty month. The minimum temperature was 19° and 17° on the 13th and 19th; the maximum, 47·8° on the 2nd. The maximum mean for the month was 40·3°; the minimum mean, 30·4°; the mean of the two preceding, 35·3°. The first fall of snow and sleet was on the 10th, to nearly the amount of one-fourth of an inch.

During the month rain, sleet, snow, and hail fell on twenty days, but only to $2\frac{1}{4}$ inches. On the morning of the 13th, between 8 and 9 A.M., a Solar Halo was observed at a considerable distance from the sun, and three mock suns in the centre of the ring—one on each side and one above the sun.

Meldon, near Morpeth.—This has been a very changeable month, with frost almost every night, or the thermometer near the freezing point. On the 13th and 19th there were 13° and 14° of frost respectively.

Owing to the weather being so showery it has been difficult for the farmers to get their turnips off the strong lands.

Wylam.—A very cold, raw month; not much wind, and that chiefly from N.W. and N.E.

Barometer—Mean height at 8 A.M., 29·938; highest, 30·323 on the 19th; lowest, 29·871 on the 14th.

Thermometer—	Mean of maximum	45·40°
	Mean of minimum	31·90°
	Difference	13·50°
	Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right) =$	38·65°
	Mean of sixteen years	40.86°
	Deficiency of 1871	2·21°

Highest reading, 61° on the 1st; lowest, 19° on the 19th.

Mean of wet bulb, 34·15°; of dry bulb, 35·83°; difference, 1·68°.

Fall—Rain, 2·11 inches; greatest fall, 0·42 inch on the 26th; days of fall, sixteen.

River Tyne at Wylam Bridge—Mean height, 2·4 feet; highest, 4·5 feet on the 15th.

Wind—N., 18° W.

Seaham Harbour.—The lowest barometrical pressure recorded was 29·32 on the 8th, and the highest 30·24 on the 19th; on the 20th, 21st, and 22nd it fell 0·50, and rose again to the same level between 9 A.M. and 6 P.M. each day. The lowest temperature recorded was 23° on the 18th, and the highest 52° on the 6th—generally a very cold month.

On the evening of the 2nd, at 7.30 P.M., a brilliant Aurora was seen; on the 4th, at 8.20 A.M., a Solar Rainbow was seen; on the 9th, after a very fine, clear day, a splendid double Auroral arch was seen, one stretcting from N.E. to N.W. and the other from N.E. to S.W. After this four days of sharp frost. On the 16th a light covering of snow at night; the 30th very stormy and a very high sea.

SOLAR HALOS were seen at Wallington on the 13th; at Sunderland on the 10th and 13th. LUNAR HALOS were seen at Wallington on the 1st, 4th, 19th, 23rd, 27th, 28th, and 29th; at Allenheads on the 23rd; at Sunderland on the 23rd. LIGHTNING was seen, but THUNDER was not heard, at Saughtree on the 8th; at Wallington on the 10th. HAIL fell at North Sunderland on the 30th; at Wallington on the 29th; at Cresswell on the 27th; at Meldon on the 27th and 29th; at Acklam on the 8th. SNOW fell at Saughtree on the 8th, 16th, 21st, 29th, and 30th; at North Sunderland on the 29th and 30th; at Wallington on the 10th, 21st, 22nd, and 30th; at Cresswell on the 10th, 17th, 20th, 21st, 22nd, and 23rd; at Meldon on the 10th, 16th, 21st, 22nd, and 29th; at Whitley on the 18th, 28th, and 30th; at Sunderland on the 16th; at Greta Bridge on the 17th; at Acklam on the 8th. AURORÆ BOREALES were seen at North Sunderland on the 9th; at Wallington on the 9th; at Cresswell on the 9th and 13th; at Whitley on the 6th and 9th; at Sunderland on the 2nd and 9th: at Gainford on the 9th and 10th; at Greta Bridge on the 9th and 10th; at Acklam on the 16th.

December.—

"Thunder in December presages fine weather."
—*Old Saying.*

Greenwich.—The mean temperature of December was 38·3°, being 0·8° below the average of 100 years, and 4·7° higher than in 1870. The cold which marked the end of November continued till December the 12th. From the 1st to the 12th the average deficiency of mean daily temperature was 9¼°. The difference from the average on the 7th, 8th, and 9th of December was more than 14°; on the 8th it was as large as 19·3°, the mean temperature of the day being 18·6°. The following table gives the lowest readings at various places on those days:—

	MINIMUM TEMPERATURE ON THE		
	7th.	8th.	9th.
Guernsey	34·0°	30·5°	25·5°
Helston	27·0°	28·0°	29·0°
Brighton	28·4°	22·0°	21·0°
Tilbury (Essex)	16·0°	19·5°	29·2°
Bath	22·2°	20·8°	23·8°
Greenwich	26·0°	18·6°	21·3°
Leamington	28·5°	23·0°	22·3°
Norwich	24·0°	9·0°	13·0°
Holkham	27·2°	7·6°	16·4°
Liverpool	31·6°	22·9°	25·0°
Halifax	26·0°	16·0°	25·0°
Allenheads	22·2°	21·7°	28·8°
Carlisle	26·8°	28·7°	33·5°
Bywell	31·0°	30·0°	33·0°
North Shields	30·0°	25·0°	27·0°

It will be remarked that the cold was most severe in Norfolk (Holkham and Norwich). The temperatures were not particularly low at Guernsey, in Cornwall, and Northumberland. The cold was generally severely felt at a little distance from the South Coast and throughout the Midland Counties, but not extending to the far north.

The quarter has been remarkable for the longest continuance of low temperatures in November and the first half of December in this century.

The rainfall was 0·8 inch in defect.

From the 1st to the 18th high readings of the barometer were recorded; the daily means, without exception, being in excess of the average; but on the 18th a fall set in which reached its minimnm, 29·2 inches on the 20th. Increasing readings were then registered till 9 P.M. on the 23rd, the value then being 30 inches. Another decrease was then experienced, arriving at its minimum, 29·2 inches on the 28th. This was again followed by an increase till the end of the month, when the reading was 30·0 inches.

The range of readings was 1·1 inch.

North Sunderland.—A cold, dull, variable month.

Wallington.—The weather this month was very cold and stormy from the 1st to the 24th. Snow, rain, or sleet fell on twenty-three days. Frost was registered on twenty days.

Lowest temperature recorded, 19° on the 23rd; highest temperature, 46° on the 18th; mean temperature for month, 34·7°.

There was a very violent gale of wind on the 18th.

Meldon, near Morpeth.—From the 1st to the 12th frost was registered on every night, and snow was on the ground to the depth of 3 inches. The severest frost was on the 5th, when the minimum thermometer fell to 15°.

On the 18th a strong gale of wind prevailed, which uprooted large trees and divested others of their large branches. On seventeen days either rain, sleet, or snow fell.

Wylam.—A fine month, with a good deal of wind; the barometer very steady till the 16th, at about 30·200; then falling, and more unsteady, till the end of the month. The thermometer rather rising from the beginning to the end of the month.

Barometer—Mean height at 3 A.M., 29·883; highest, 30·405 on the 8th; lowest, 29·117 on the 28th.

Thermometer—	Mean of maximum	44·81°
	Mean of minimum	32·58°
	Difference	12·23°
	Mean for month $\left(\frac{\text{max.} + \text{min.}}{2}\right) =$	38·69°
	Mean of sixteen years	39·47°
	Deficiency of 1871	0·78°

Highest reading, 58° on the 19th; lowest, 22° on the 5th.

Mean of wet bulb at 8 A.M., 35·84°; of dry bulb, 37·82°; difference, 1·98°.

Fall—Rain, 1·14 inches, snow (melted), 0·36 inch, = 1·50 inch; greatest fall, 0·34 inch on the 23rd; days of fall, thirteen.

River Tyne at Wylam Bridge—Mean height, 3·75 feet; highest, 8·5 feet on the 11th.

Wind—W., 22·5° N.

Seaham Harbour.—The lowest reading of the barometer was 29·12 inches on the 28th; the highest 30·35 inches on the 13th. Heavy showers of snow fell on the 3rd. December on the whole was a milder month than November. There was a violent gale of wind on the 18th. The prevailing winds were S. and S.W.

Sunderland.—On the 3rd, about 9.40 P.M., while it was snowing, a brilliant flash of lighting was seen, followed quickly by a very loud peal of thunder. Many persons who witnessed it described it as the brightest flash and loudest thunder they had ever witnessed. There is no reason to suppose that it was a meteor.

Dinsdale, near Darlington.—The closing year has been on the whole a most ungenial one. Both vegetables and fruit suffered from want of sunshine. The fruit crop was both scarce and lacking in flavour.

Salmon were more plentiful than usual in the Tees, owing to frequent freshes in the river. The fish were thus tempted to leave the sea, and the fishermen had more than an average season.

It was a grand season for young plantations, and seldom have the young trees made such rapid and healthy growth.

Solar Halos were seen at Wallington on the 12th, 25th, and 30th; at Sunderland on the 25th. Lunar Halos were seen at Wallington on the 6th, 22nd, 24th, and 29th; at North Shields on the 23rd; at Sunderland on the 24th and 27th. Thunderstorms occurred at Saughtree on the 20th; at North Sunderland on the 1st and 3rd; at Rothbury on the 4th; at North Shields on the 3rd; at Greta Bridge on the 4th and 20th. Snow fell at Wallington on the 1st, 3rd, 4th, 6th, 7th, 8th, 20th, and 22nd; at Cresswell on the 1st–7th; at Meldon on the 2nd–4th, 6th–8th, 20th, and 22nd; at Darlington on the 3rd, 4th, 20th, and 27th; at Acklam on the 1st and 4th. Auroræ Boreales were seen at Wallington on the 9th; at Allenheads on the 9th; at Sunderland on the 9th and 30th. Hail fell at Whitley on the 1st and 18th; at Acklam on the 1st.

Smallpox continued very prevalent during the last quarter of 1871. The Registrar General remarks that "The mining districts of the Northern Counties have been one of the most fatal smallpox fields since the outbreak of the epidemic; during the four quarters of 1871 the deaths from this cause were respectively 463, 1069, 1566, 1546, or 4644 for the whole year. The number showed a slight decline during the last quarter of the year in Durham, but the considerable decrease both in Sunderland and Newcastle was more than balanced by a large increase in Auckland, Easington, and Tynemouth.

It is well known that among the lower classes in Holland a very strong prejudice exists against vaccination. It may be useful to enquire what might be the result in London if prejudice against vaccination should ever become as widely spread as in Holland. If the same death-rate from small pox had

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prevailed in London during the last quarter of 1871 as existed in the Hague during January and February, the deaths would have been 38·828 instead of 2·400.

Greenwich.—The population of the largest towns in Northumberland and Durham, and their respective death rates, for the last quarter of 1871, were as follows:—

	Estimated Population.	Persons to an Acre.	Deaths.	Annual Death Rate per 1000 from 7 principal zymotic diseases.	Death Rate per 1000 from all causes.
Newcastle-on-Tyne......	128·677	24·1	993	9.4	31·0
Sunderland	98·757	29·9	1,017	18·9	41·3
South Shields	75·390	...	646	...	34·3
Gateshead..................	48·226	...	453	...	37·6
Tynemouth	40·800	...	254	7·5	24·9

WIND.

The editors have to acknowledge the receipt of many valuable records of observations of the wind for the year 1871. As many as admitted of it they have analysed, and arranged in such a form, as to show at a glance, both the general anemometrical character of the climate of the North Eastern Counties, and the particular variations observable in different districts of them. It may, perhaps, be advisable for them to take the present opportunity of saying that they have analysed, and arranged, in a similar way, the records they have received of temperature, humidity, and pressure. So that the general tables under these heads, together with the very copious returns of rainfall, exhibit a conspectus of the climate of the district more full and perfect than has hitherto been produced, and one which cannot fail to be both interesting and valuable, in a high degree, to all students of Meteorology. They hope that it may be possible in future years to make these general tables still more complete, by the kindness of the numerous correspondents of the Club supplying, in all cases where it is possible, those particulars which are needed for embodiment in them.

RELATIVE PREVALENCE, DIRECTION, AND AMOUNT OF WIND IN THE SEVERAL MONTHS OF 1871.

STATIONS.	JANUARY.								FEBRUARY.							
	N. ½ E.–E.		E. ½ S.–S.		S. ½ W.–W.		W. ½ N.–N.		N. ½ E.–E.		E. ½ S.–S.		S. ½ W.–W.		W. ½ N.–N.	
	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force
North Sunderland	3	1·0	12	1·6	14	1·2	2	2·0	2	1·3	8	2·6	16	1·9	2	2·8
Alnwick	3	0·6	8	0·9	17	0·9	3	1·2	3	0·7	5	1·2	17	1·4	2	1·3
Rothbury	10	...	3	...	8	...	10	...	7	...	6	...	9	...	6	...
Cresswell	0	...	13	...	12	...	6	...	1	...	7	...	13	...	7	...
Wallington	5	...	4	...	10	...	12	..	5	...	4	...	13	...	6	...
Whitley	2	2·5	8	2·2	16	1·6	5	1·4	3	1·7	8	2·3	14	2·4	3	4·7
Cullercoats	6	1·7	6	1·6	12	1·5	7	1·3	2	2·0	9	1·4	11	1·4	6	1·8
North Shields (I.)	1	3·0	6	1·3	17	1·4	7	1·1	3	1·7	6	1·6	16	1·4	3	1·8
South Shields	3	1·4	6	1·6	17	1·3	4	1·3	1	2·3	7	2·0	15	1·9	3	2·7
St. John's, Weardale	5	...	8	...	12	...	6	...	2	...	8	...	15	...	3	...
Hendon	5	...	5	...	19	...	2	...	1	...	9	...	16	...	2	...
Seaham Hall	5	1·2	6	1·8	13	1·1	7	0·9	6	1·8	6	2·0	8	2·0	8	2·1
Seaham	5	1·7	7	2·4	13	1·8	5	1·9	2	1·0	9	2·1	12	2·5	4	2·5
Sedgefield	5	1·3	5	1·5	16	1·2	5	1·1	4	1·3	6	1·3	16	1·8	2	0·8
Acklam	4	1·3	9	1·5	14	1·6	4	1·8	2	2·0	6	1·9	15	2·2	5	2·3
Darlington	9	...	6	...	13	...	3	...	1	...	12	...	15	...	0	...
Gainford	5	...	2	...	9	...	14	...	5	...	4	...	11	...	8	...
Average	4	1·7	7	1·7	14	1·4	6	1:4	3	1·7	7	1·9	14	1·9	4	2·4

STATIONS.	MARCH.								APRIL.							
	N. ½ E.–E.		E. ½ S.–S.		S. ½ W.–W.		W. ½ N.–N.		N. ½ E.–E.		E. ½ S.–S.		S. ½ W.–W.		W. ½ N.–N.	
	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force
North Sunderland	3	2·3	11	1·6	15	1·8	2	2·0	7	1·6	10	1·2	6	0·8	7	1·1
Alnwick	2	0·9	4	0·9	18	1·5	5	1·0	8	0·6	11	0·8	4	1·1	6	0·8
Rothbury	3	...	1	...	13	...	14	...	11	...	0	...	3	...	16	...
Cresswell	4	...	8	...	13	...	6	...	9	...	9	...	9	...	3	...
Wallington	6	...	2	...	9	...	14	...	14	...	5	...	3	...	7	...
Whitley	3	1·5	3	2·0	20	2·8	3	2·8	4	2·1	11	1·4	4	1·4	8	1·8
Cullercoats	5	1·7	3	1·5	13	1·4	10	1·7	10	1·8	9	1·7	2	1·0	9	1·4
North Shields (I.)	4	1·9	3	2·0	19	1·6	4	2·1	6	1·3	8	1·9	8	1·1	8	1·6
South Shields	4	1·1	3	1·3	19	1·9	5	2·3	9	1·7	9	1·7	3	1·8	7	1·9
St. John's, Weardale	3	...	4	...	18	...	6	...	6	...	10	...	7	...	7	...
Hendon	2	...	7	..	16	...	5	...	6	...	7	...	10	...	6	...
Seaham Hall	5	1·0	7	1·6	11	1·8	8	1·5	11	1·2	3	1·0	5	1·4	11	1·2
Seaham	4	2·3	7	1·7	10	2·4	8	2·6	8	1·6	6	1·8	7	1·6	4	1·6
Sedgefield	4	1·6	3	2·7	22	1·7	2	1·3	7	1·2	7	1·0	12	1·2	4	1·3
Acklam	2	2·0	6	2·5	14	2·4	9	2·5	9	1·2	5	2·1	8	1·9	8	2·3
Darlington	8	...	2	...	18	...	3	...	12	...	9	...	5	...	4	...
Gainford	1	...	2	...	12	...	16	...	7	...	2	...	5	...	16	...
Average	4	1·7	5	1·9	15	2·0	7	2.0	9	1·5	7	1·5	6	1·4	8	1·6

STATIONS.	MAY.								JUNE.							
	N. ½ E.–E.		E. ½ S.–S.		S. ½ W.–W.		W. ½ N.–N.		N. ½ E.–E.		E. ½ S.–S.		S. ½ W.–W.		W. ½ N.–N.	
	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force	Days	Force
North Sunderland	3	1·0	6	1·3	3	1·5	19	1·8	6	1·1	8	1·4	2	0·5	14	2·0
Alnwick	11	0·5	7	0·7	7	0·8	3	1·2	11	0·6	9	0·6	4	0·6	3	0·9
Rothbury	12	...	2	...	15	...	2	...	12	...	6	...	3	...	9	...
Cresswell	17	...	3	...	3	...	8	...	18	...	7	...	5	...	0	...
Wallington	10	...	3	...	5	...	11	...	17	...	4	...	5	...	3	...
Whitley	7	1·6	5	1·3	3	2·2	6	2·6	15	2·4	9	1·5	0	...	3	1·3
Cullercoats	8	2·5	8	1·1	6	1·3	9	1·4	11	1·5	12	0·8	2	1·3	5	1·5
North Shields (I.)	11	1·5	5	1·2	3	1·2	11	1·6	20	1·7	4	1·0	3	1·2	3	1·2
South Shields	14	1·6	8	1·6	4	1·6	5	2·1	12	1·4	8	1·3	2	1·6	8	2·4
St. John's, Weardale	6	...	8	...	3	...	14	...	11	...	4	...	4	...	11	...
Hendon	4	...	4	...	3	...	19	...	10	...	4	...	5	...	11	...
Seaham Hall	19	1·4	3	1·7	2	1·0	7	2·0	17	1·9	4	1·5	2	1·5	6	1·5
Seaham	16	2·4	6	2·3	6	2·0	1	5·0	15	3·1	4	1·5	4	1·5	3	1·7
Sedgefield	7	0·9	10	1·0	7	1·1	7	1·6	11	1·5	1	1·0	5	1·2	13	1·6
Acklam	9	1·4	4	1·8	6	1·7	12	1·9	7	1·2	6	0·7	4	0·8	13	2·3
Darlington	17	...	3	...	3	...	7	...	19	...	2	...	8	...	1	...
Gainford	...	...	...	...	...	...	...	...	11	...	1	...	3	...	15	...
Average	11	1·6	5	1·5	5	1·5	9	2·2	13	1·8	6	1·2	4	11	7	1·7

STATIONS.	JULY.								AUGUST.							
North Sunderland	1	0·5	4	1·0	21	1·5	5	1·3	1	0·5	11	1·0	15	2·1	4	1·6
Alnwick	1	0·5	3	0·7	23	1·0	2	0·7	1	0·5	11	0·6	18	1·2	0	...
Rothbury	2	...	2	...	22	...	5	...	4	...	4	...	20	...	3	...
Cresswell	2	...	1	...	19	...	9	...	2	...	2	...	20	...	7	...
Wallington	2	...	2	...	20	...	5	...	2	...	10	...	14	...	5	...
Whitley	1	1·5	10	1·6	16	1·8	4	1·5	2	1·0	9	1·4	15	2·1	4	3·3
Cullercoats	5	0·7	6	0·4	15	0·3	5	1·5	0	...	6	1·3	18	1·6	6	1·4
North Shields (I.)	3	1·3	2	1·0	17	1·4	7	1·7	3	1·3	7	0·9	16	1·4	5	2·1
St. John's, Weardale	0	...	5	...	20	...	6	...	3	...	7	...	19	...	2	...
Hendon	1	...	2	...	23	...	4	...	...	...	...	...	...	...	...	...
Seaham Hall	0	...	3	1·3	22	1·1	6	1·3	2	0·8	5	1·1	21	1·4	2	1·0
Seaham	...	...	...	...	...	...	...	...	3	...	5	...	17	...	4	...
Sedgefield	1	1·0	6	1·1	19	1·8	5	1·6	3	1·2	8	1·2	16	1·8	3	1·7
Acklam	3	1·5	3	0·8	21	1·4	4	1·8	3	0·8	4	1·5	22	1·3	2	2·0
Darlington	2	...	7	...	22	...	0	...	8	...	13	...	10	...	0	...
Gainford	1	...	7	...	16	...	6	...	0	...	13	...	10	...	8	...
Average	2	1·1	4	1·0	20	1·3	5	1·5	2	0·9	8	1·2	17	1·7	4	1·9

STATIONS.	SEPTEMBER.								OCTOBER.							
North Sunderland	9	1·3	7	1·4	8	1·6	6	1·3	1	3·0	17	1·3	7	1·1	6	0·8
Alnwick	11	0·7	5	0·8	8	0·8	5	0·8	2	1·2	7	1·0	18	0·9	4	0·8
Rothbury	13	...	4	...	9	...	4	...	3	...	5	...	15	...	8	...
Cresswell	11	...	12.	...	3	...	4	...	0	...	16	...	12	...	3	...
Wallington	9	...	8	...	8	...	5	...	3	...	6	...	14	...	7	...
Whitley	14	1·9	5	1·8	9	1·9	2	1·8	4	3·0	8	1 6	15	1·4	3	2·4
Cullercoats	10	1·4	11	1·2	5	1·1	4	1·1	3	1·8	14	1·4	7	0·9	7	1·1
North Shields (I.)	10	1·8	7	1·4	8	1·1	5	1·6	1	4·0	9	1·9	15	1·2	5	1·1
St. John's, Weardale	9	...	6	...	6	...	9	...	3	...	11	...	15	...	2	...
Hendon	...	...	...	...	...	...	...	...	1	...	8	...	18	...	2	...
Seaham Hall	14	1·5	3	1·0	9	1·4	4	1·8	5	1·8	10	1·6	10	1·7	6	1·2
Seaham	16	...	1	...	5	...	1	...	...	...	...	...	...	...	...	...
Sedgefield	8	2·1	8	1·7	7	1·2	7	2·4	3	3·0	7	2·2	18	1·7	3	2·3
Acklam	14	1·1	9	1·1	3	0·8	4	2·3	5	0·9	9	1·8	15	1·7	2	2·0
Darlington	12	...	2	...	14	...	2	...	2	...	10	...	17	...	2	...
Gainford	10	...	4	...	7	...	8	...	...	...	...	...	...	...	...	...
Average	11	1·6	6	1·4	7	1·3	5	1·8	3	2·5	10	1·7	14	1·4	4	1·6

STATIONS.	NOVEMBER.								DECEMBER.							
North Sunderland	9	2·2	9	1·4	7	1·3	5	2·6	4	1·9	8	1·0	17	1·6	2	2 5
Alnwick	8	0·9	5	1·0	11	0·9	6	1·2	2	0·7	2	1·0	21	1·4	6	0·9
Rothbury	7	...	3	...	8	...	12	...	4	...	2	...	8	...	17	...
Cresswell	9	...	9	...	5	...	7	...	3	..	4	...	19	...	5	...
Wallington	7	...	4	...	5	...	14	...	6	...	0	...	11	...	13	...
Whitley	2	1·0	6	2·1	12	1·7	9	1·4	4	4·0	1	3·0	16	2·0	8	2·3
Cullercoats	8	1·5	6	1·4	8	1·4	8	1·6	3	1·8	8	1·3	12	1·3	8	1·4
North Shields (I.)	9	2·2	3	1·7	10	1·2	8	2·1	3	2·8	3	1·0	16	1·5	8	1·9
St. John's, Weardale	7	...	6	...	7	...	10	...	1	...	3	...	17	...	10	...
Hendon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Seaham Hall	10	1·8	3	2·0	7	1·9	10	1·8	7	2·0	6	1·7	13	1·7	4	1·7
Seaham	8	2·2	3	3·3	7	0·9	11	1·2	4	1·6	2	1·0	17	1·3	8	1·0
Sedgefield	7	2·1	5	2·4	8	1·8	10	2·4	2	2·0	4	2·3	16	2·4	9	2·1
Acklam	8	1·5	4	0·8	7	2·4	11	2·0	7	0·6	1	3·5	17	1·7	6	2·0
Darlington	8	...	11	...	2	...	9	...	8	...	5	...	9	...	9	...
Gainford	9	...	6	...	6	...	9	...	...	...	...	...	...	...	...	...
Average	8	1·8	6	1·9	7	1·6	9	1·9	4	2·1	4	1·9	15	1·7	8	1·9

A glance at the general table of wind will show how it has been constructed. It exhibits the number of days the wind blew from each quadrant, in each month of the year, at each of a large number of stations; and, for many of the stations, it gives the average force with which it blew from each quadrant. The quadrants are headed N. ½ E.—E., E. ½ S.—S., &c., to show that all winds between N. and E., including E. but excluding N., are reckoned in the first quadrant; all between E. and S., including S. but excluding E., in the second quadrant; all between S. and W., including W. but excluding S., in the third quadrant; and all between W. and N., including N. but excluding W., in the fourth quadrant. The headings of the columns indicate the mode of reckoning clearly, leaving nothing doubtful or burdensome to the memory.

The following are a few subsidiary tables, summarising, in a separate form, a portion of the results embodied in the general table.

I.

Average Duration and Force of Wind from Different Quadrants, FOR WHOLE DISTRICT, *in the several Months of* 1871.

MONTHS.	N. ½ E.–E.		E. ½ S.–S.		S. ½ W.–W.		W. ½ N.–N.	
	Days	Force	Days	Force	Days	Force	Days	Force
January	4	1·7	7	1·7	14	1·4	6	1·4
February	3	1·7	7	1·9	14	1·9	4	2·4
March	4	1·7	5	1·9	15	2·0	7	2·0
April	9	1·5	7	1·5	6	1·4	8	1·6
May	11	1·6	5	1·5	5	1·5	9	2·2
June	13	1·8	6	1·2	4	1·1	7	1·7
July	2	1·1	4	1·0	20	1·3	5	1·5
August	2	0·9	8	1·2	17	1·7	4	1·9
September	11	1·6	6	1·4	7	1·3	5	1·8
October	3	2·5	10	1·7	14	1·4	4	1·6
November	8	1·8	6	1·9	7	1·6	9	1·9
December	4	2·1	4	1·9	15	1·7	8	1·9
Whole Year	74	1·7	75	1·6	138	1·5	76	1·8

II.

Relative Prevalence of Wind from Different Quadrants at the several Stations, IN WHOLE YEAR, 1871, *given in days.*

STATIONS.	N. ½ E.—E.	E. ½ S.—S.	S. ½ W.—W.	W. ½ N.—N.
North Sunderland..............	49	111	131	74
Alnwick..........................	63	77	166	45
Rothbury	88	38	123	106
Cresswell	76	91	133	65
Wallington	86	52	117	102
Whitley	61	83	140	58
Cullercoats......................	71	98	111	84
North Shields (I.)	74	63	148	74
St. John's, Weardale	56	80	143	86
Seaham Hall	101	59	123	79
Sedgefield	62	70	162	70
Acklam	73	66	146	80
Darlington.......................	106	82	136	40
Average for Whole District ...	74	75	137	74

The slight discrepancies in the last line of this and of the preceding table are caused, partly, by the rejection of fractions in calculating the figures given in table I., and, partly, by the difference in the number of stations employed in the two cases.

III.

Estimated Force of Wind, FROM ALL QUADRANTS, *at the Different Stations, in the several Months of* 1871.

STATIONS.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Average for whole year.
Alnwick	0·9	1·2	1·2	0·8	0·6	0·6	0·9	0·9	0·7	0·9	1·0	1·2	0·9
Durham	0·7	1·0	1·0	0·6	0·6	0·5	0·6	0·6	0·5	0·6	0·7	0·9	0·7
North Sunderland ...	1·4	2·1	1·9	1·2	1·6	1·5	1·3	1·6	1·4	1·3	1·8	1·6	1·6
Whitley	1·8	2·5	2·5	1·6	1·6	1·9	1·7	2·0	1·9	1·7	2·1	2·4	2·0
Cullercoats	1·6	1·5	1·5	1·6	1·6	1·2	0·6	1·5	1·2	1·3	1·5	1·4	1·4
North Shields (I.) ...	1·4	1·5	1·6	1·5	1·4	1·5	1·4	1·4	1·5	1·4	1·8	1·6	1·5
Seaham Hall	1·2	2·0	1·6	1·6	1·5	1·7	1·2	1·3	1·4	1·6	1·9	1·8	1·6
Sedgefield	1·2	1·5	1·7	1·1	1·1	1·4	1·6	1·5	1·8	1·9	2·1	2·2	1·5
Acklam	1·6	2·1	2·4	1·8	1·7	1·5	1·4	1·3	1·2	1·6	1·8	1·6	1·7
Average for Whole District	1·5	1·9	1·9	1·5	1·5	1·5	1·3	1·5	1·5	1·5	1·9	1·8	1·6

In this table the figures given for Alnwick and Durham are equivalent to the velocity in miles per hour at those stations printed on a later page. It is therefore the average force throughout the twenty-four hours of the day. At all the other stations the force given is the average force at the time of observation, generally 9 or 10 A.M. The difference, as will be seen, is very striking. Alnwick and Durham are omitted in calculating the average given in the last line. In the general table the force of wind given for Alnwick is similarly the average force throughout the twenty-four hours, and is omitted in the same way in calculating the average in the last line.

The editors have been favoured with several interesting particulars from different stations which it has not been possible to include in the general table.

Among these is the following furnished by Mr. J. J. Plummer, of the Observatory, Durham.

Relative Prevalence of Wind from Different Quarters, at Durham Observatory, 1871.

QUARTERS.	Times noted.	Percentage of whole.	Average Percentage of whole for 4 years.
North	75	10·27	9·35
North-East	73	10·00	9·38
East	70	9·59	7·38
South-East	28	3·84	3·87
South	174	23·84	22·97
South-West	105	14·38	14·20
West	122	16·71	18·79
North-West	70	9·59	10·79
Calm	13	1·78	3·23

The observations, on which the above is founded, were made twice every day throughout the year, or seven hundred and thirty times in all.

Mr. Plummer has also forwarded a return of the mean velocity of the wind per hour for each month of the year, which is combined in the annexed table with similar information kindly furnished to the Club from Alnwick Castle.

Mean Velocity of the Wind, in miles per hour, in the several Months of 1871, at Alnwick Castle, and at Durham University.

MONTHS.	Alnwick.	Durham.	MONTHS.	Alnwick.	Durham.
January	12·61	10·31	July	12·74	8·20
February	17·25	13·67	August	13·21	8·33
March	17·24	13·99	September	10·40	6·93
April	10·83	8·57	October	13·00	8·08
May	9·05	8·36	November	13·93	10·46
June	7·83	7·67	December	16·94	12·02
Mean for Whole Year............Alnwick, 12·92; Durham, 9·72.					

In the above the figures for Alnwick are obtained by taking the mean between the greatest and least velocities, attained by the wind each day, as the mean velocity of the wind for that day.

Accidental errors crept into the return of the "calculated average velocity" of the wind at Alnwick in the Meteorological Report for last year. The numbers given are generally twice as great as they should have been. The following are the correct figures, and it is recommended that they should be altered in the report for 1870 with a pen.

Calculated Average Velocity of the Wind, in miles per hour, at Alnwick, in the several Months of 1870.

MONTHS.	Velocity.	MONTHS.	Velocity.
January	12·6	July	11·1
February	16·4	August	8·9
March	13·5	September	12·3
April	16·2	October	15·3
May	16·0	November	11·4
June	11·9	December	15·0
Mean for Whole Year.................. 13·4.			

Similar errors occurred in the last three months of the preceding year, 1869.

Mr. George Clayton Atkinson, of Wylam, has kindly furnished the percentage of wind from each quarter, and the mean direction of the wind in each month, at Wylam. These interesting results are appended below. The percentage of wind from each quarter at Wylam may be compared with the percentage of wind from each quarter at Durham given on a preceding page. The differences will be seen to be very striking.

Percentage of Wind from Different Quarters, at Wylam, in 1871.

QUARTERS.	Percentage.	QUARTERS.	Percentage.
North	4·6	South	2·0
North-East	19·7	South-West	12·6
East	8·2	West	36·3
South-East	9·4	North-West	7·2

Mean Direction of the Wind, at Wylam, in the several Months of 1871.

MONTHS.	Mean Direction.	MONTHS.	Mean Direction.
January	W. 5° S.	July	W. 4° S.
February	W. 15° S.	August	W. 23° S.
March	W. 23° S.	September	N. 24° E.
April	E. 12° N.	October	W. 10° S.
May	N. 12° E.	November	N. 18° W.
June	E. 24° N.	December	W. 22° N.
Mean for Whole Year	W. 20° N.		

The following table, contributed by Mr. T. W. Backhouse, of West Hendon House, Sunderland, gives the result of observations made daily at frequent intervals. It will be seen from it that, as far as observed, the greatest proportion of rain fell with the wind from S.E., at Hendon, in 1871, which, Mr. Backhouse remarks, is unusual.

Duration, in hours, of Wind, from each Quarter, at Hendon, in 1871, *with the amount of Rain which fell with each, and the Yearly Ratio of the same.*

QUARTERS.	Hours.	Rain.	Yearly Ratio.
North	669	1·35	17·7
North-East	392	1·39	31·1
East	686	3·37	43·0
South-East	922	5·10	48·5
South	917	1·91	8·7
South-West	1497	1·88	5.1
West	1776	2·25	11·1
North-West	546	1·34	21·5
Uncertain	1355	4·71	30·4

MEAN D

Mean Daily Temp.	Mean Temp. of Warmest Day.	Day.
40·8	52·0	1
40·9	50·5	3
39·3	51·5	4
38·0	48·0	1
39·9	51·5	3,
38·0	49·4	3
41·1	50·5	6
43·3	52·3	1
36·6	51·0	2
40·7	57·5	2
40·6	54·5	1
39·7	51·0	1
39·2	54·3	2
40·3	52·3	..
42·9	...	..
60·6	62·5	1,
59·1	62·5	
59·6	61·5	
58·8	58·5	
60·0	63·5	1
57·8	61·7	1
61·1	65·5	
57·5	61·0	1,
59·4	58·5	1
60·8	65·1	
61·0	62·5	
62·2	64·0	
60·2	62·7	..
66·0	...	..

EXTREME AND MEAN DAILY TEMPERATURES IN THE SEVERAL MONTHS OF 1871.

STATIONS.	JANUARY.						FEBRUARY.						MARCH.					
	Mean Temp. of Warmest Day.	Day.	Mean Temp. of Coldest Day.	Day.	Monthly Range of Daily Temps.	Mean Daily Temp.	Mean Temp. of Warmest Day.	Day.	Mean Temp. of Coldest Day.	Day.	Monthly Range of Daily Temps.	Mean Daily Temp.	Mean Temp. of Warmest Day.	Day.	Mean Temp. of Coldest Day.	Day.	Monthly Range of Daily Temps.	Mean Daily Temp.
North Sunderland	42·5	14	19·0	1	23·5	32·6	50·0	19	30·0	12	20·0	40·8	52·0	19	32·5	15	19 5	43·5
Alnwick	41·5	14	18·5	1	23·0	31·9	49·5	19	31·5	11	18·0	40·9	50·5	3	31·0	15	19·5	43·2
Rothbury	43·5	15	20·5	1	23·0	30·8	48·5	19	29·5	11	19·0	39·3	51·5	4	29·0	15	22·5	42·6
Cresswell (9 A.M.)	41·5	14	12·5	1, 2	29·0	29·3	46·5	19	25·5	12	21·0	38·0	48·0	12	23·5	15	24·5	39·1
Meldon	...	...	...	...	...	...	48·5	19	31·0	11	17·5	39·9	51·5	3, 25	28·5	15	23·0	43·8
Wallington	41·6	14	16·2	1	25·4	29·8	46·7	19	30·2	11	16·5	38·0	49·4	3	24·6	15	24·8	40·8
North Shields (I.)	40·0	14, 15	19·0	2	21·0	32·2	49·0	19	31·5	12	17·5	41·1	50·5	6	31·5	15	19·0	43·3
South Shields	43·0	14	17·7	1	25·3	34·1	51·5	19	34·0	12	17·5	43·3	52·3	12	33·9	15	18·4	45·7
St. John's, Weardale (9 A.M.)	40·0	14	14·0	2	26·0	29·8	45·0	19	26·0	11	19·0	36·6	51·0	25	27·0	15	24·0	39·8
Seaham Hall	39·0	14, 15	14·5	1	24·5	30·0	51·0	19	32·0	11	19·0	40·7	57·5	21	32·0	15	25·5	42·9
Sedgefield	38·5	14	11·5	1	27·0	31·4	48·6	19	28·5	12	20·1	40·6	54·5	18	33·0	15	21·5	44·2
Darlington	40·5	14	7·5	1	33·0	28·9	49·0	19	28·5	12	20·5	39·7	51·0	19	31·5	28	19·5	42·6
Gainford	38·9	15	11·0	1, 2	27·9	28·6	49·0	19	27·5	1	21·5	39·2	54·3	25	31·5	15	22·8	42·9
Average	40 9	...	15·5	...	25·4	31·0	49·2	...	30·4	...	18·8	40·3	52·3	...	30·8	...	21·5	43·2
Greenwich	...	...	...	...	...	33·4	...	...	...	...	...	42·9	...	...	...	...	...	45·9

STATIONS.	APRIL.						MAY.						JUNE.						STATIONS.
	Mean Temp. of Warmest Day.	Day.	Mean Temp. of Coldest Day.	Day.	Monthly Range of Daily Temps.	Mean Daily Temp.	Mean Temp. of Warmest Day.	Day.	Mean Temp. of Coldest Day.	Day.	Monthly Range of Daily Temps.	Mean Daily Temp.	Mean Temp. of Warmest Day.	Day.	Mean Temp. of Coldest Day.	Day.	Monthly Range of Daily Temps.	Mean Daily Temp.	
North Sunderland	50·5	12 13 28	35·0	11	15·5	42·7	57·0	20	43·0	17	14·0	49·2	61·0	30	47·5	3	13·5	53·0	North Sunderland.
Alnwick	51·5	28	37·0	6, 9	14·5	42·1	55·0	30	40·5	17	14·5	48·1	59·0	16, 30	46·0	2, 3, 5	13·0	51·0	Alnwick.
Rothbury	50·5	28	37·0	5, 10	13·5	42·0	58·5	22	39·5	17	19·0	48·9	59·5	30	44·0	23	15·5	51·6	Rothbury.
Cresswell (9 A.M.)	48·5	12	30·5	8	18·0	40·9	59·0	22	37·5	17	21·5	48·5	61·0	30	46·0	3	15·0	53·0	Cresswell (9 A.M.).
Meldon	53·0	28	37·0	18	16·0	44·4	57·5	30, 31	44·5	3, 15	13·0	51·5	62·5	16	46·5	22	16·0	54·6	Meldon.
Wallington	48·7	13	35·5	9	13·2	41·4	56·2	31	35·5	17	20·7	47·4	57·4	16	40·5	22	16·9	51·6	Wallington.
North Shields (I.)	50·0	13	40·0	3, 7, 11	10·0	43·3	56·5	30	41·5	17	15·0	48·3	60·0	30	48·0	3	12·0	52·3	North Shields (I.).
South Shields	52·9	13	41·3	10	11·6	46·6	60 0	30	42·9	17	17·1	51·6	63·0	30	50·8	7	12·2	56·0	South Shields.
St. John's, Weardale (9 A.M.)	49·0	14, 28, 29	35·0	18	14·0	41·6	60·0	30	35·0	17	25·0	48·3	56·0	17	43·0	9	13·0	50·1	St. John's, Weardale (9 A.M.).
Seaham Hall	51·0	12	33·0	8	18·0	43·0	55·0	20, 31	39·5	5	15·5	48·3	60·5	19, 29	45·0	2	15·5	...	Seaham Hall.
Sedgefield	51·6	27	38·3	3, 18	13·3	43·8	59·0	24	41·0	15	18·0	48·7	61·3	14	45·5	22	15·8	51·4	Sedgefield.
Darlington	51·0	16, 27	35·0	25	16·0	43·8	60·0	31	40·0	16	20·0	46·5	64·5	15	45·0	22	19·5	53·3	Darlington.
Gainford	...	...	...	...	...	...	...	...	...	...	...	...	62·5	14, 16	47·5	2	15·0	54·8	Gainford.
Average	51·1	...	36·9	...	14·2	43·3	57·5	...	40·8	...	16·7	48·9	61·0	...	46·0	...	15·0	53·0	Average.
Greenwich	...	...	...	...	...	49·5	...	...	...	...	...	53·3	...	...	...	...	...	57·1	Greenwich.

STATIONS.	JULY.						AUGUST.						SEPTEMBER.					
North Sunderland	68·0	14	55·5	3, 26	12 5	59·9	68·5	11	54·0	22	14.5	60·6	62·5	1, 4	46·5	30	16·0	53·8
Alnwick	66·0	14	54·5	1	11·5	58·5	67·0	11	53·0	29	14·0	59·1	62·5	1	44·5	30	18·0	52·5
Rothbury	66·0	14	55·0	25	11·0	58·1	70·0	11	53·5	22	16·5	59·6	61·5	1	41·5	29, 30	20·0	51·5
Cresswell (9 A.M.)	68·0	14	52·5	3	15·5	59·6	68·0	11	50·5	29	17·5	58·8	58·5	1	40·5	29	18·0	50·6
Meldon	69·0	14	53·5	29	15·5	59·2	70·0	12	52·5	26	17·5	60·0	63·5	11	41·0	29	22·5	52·3
Wallington	66·5	14	51·8	12	14·7	56·0	67·1	12	51·1	5	16·0	57·8	61·7	11	39·8	27	21·9	50·1
North Shields (I.)	65·5	14	54·5	3	11·0	59·5	71·0	11	56·5	22, 27, 29	14·5	61·1	65·5	1	46·0	29	19·5	54·2
St. John's, Weardale (9 A.M.)	61·0	16	48·0	3	13·0	55·4	68·0	12	52·0	26	16·0	57·5	61·0	1, 2	42·0	25, 26, 30	19·0	49·1
Seaham Hall	66·0	14	51·0	23	15·0	58·0	69·0	11	50·0	21	19·0	59·4	58·5	11	42·0	27	16·5	51·8
Sedgefield	68·0	13	53·0	3	15·0	58·2	69·5	11	53·0	22	16·5	60·8	65·1	1	44·1	29	21·0	53·0
Darlington	64·0	28	54·5	9, 13, 19, 21	9·5	58·4	77·5	12	55·0	22	22·5	61·0	62·5	1	42·0	29	20·5	53·5
Gainford	64·8	14	52·8	3	12·0	58·3	69·2	12	54·1	22	15·1	62·2	64·0	1	42·5	29	21·5	52·7
Average	66·4	...	53·6	...	12·8	58·4	69·9	...	53·3	...	16·6	60·2	62·7	...	43·0	...	19·7	52·5
Greenwich	...	...	...	...	...	63·3	...	...	...	...	...	66·0	...	...	...	..	...	58·9

STATIONS.	OCTOBER.						NOVEMBER.						DECEMBER.						
North Sunderland	55·5	27	41·5	11	14·0	49·5	48·5	1	31·5	19	17·0	39·4	47·0	18	31·5	5	15·5	38·8	North Sunderland.
Alnwick	56·5	27	39·5	10	17·0	48·1	47·0	1, 2	32·0	19	15·0	39·0	45·5	18	31·5	5	14·0	38·5	Alnwick.
Rothbury	53·0	19	38·0	10	15·0	46·6	44·5	1, 2	30·0	20	14·5	36·6	43·0	18	29·0	5	14·0	36·4	Rothbury.
Cresswell (9 A.M.)	56·5	19	32·5	10	24·0	44·3	46·0	2	23·5	19	22·5	35·5	48·0	18	23·0	5	25·0	36·1	Cresswell (9 A.M.).
Meldon	53·5	19, 26	38·0	10	15·5	45·8	45·5	1	28·0	19	17·5	35·5	42·5	18	24·5	5	18·0	35·1	Meldon.
Wallington	53·2	27	37·2	21	16·0	45·2	44·4	1, 2	27·0	19	17·4	35·4	44·4	18	26·5	5	17·9	34·7	Wallington.
North Shields (I.)	56·5	19	40·5	10	16·0	48·4	49·0	1	32·0	13, 19	17·0	39·3	45·0	25	30·0	5	15·0	38·7	North Shields (I.)
St. John's, Weardale (9 A.M.)	58·0	19	38·0	12	20·0	44·8	43·0	1	27·0	13	16 0	34·3	44·0	18, 24	27·0	4	17·0	35·0	St. John's, Weardale (9 A.M.).
Seaham Hall	57·5	20	40·0	10	17·5	47·4	48·5	1	31·5	19, 21	17·0	38·0	43·5	18	28·0	8	15·5	36·9	Seaham Hall.
Sedgefield	58·0	18	40·5	10	17·5	48·0	46·7	1	29·8	19	16·9	37·8	46·5	18	26·3	8	20·2	38·0	Sedgefield.
Darlington	57·5	18	38·0	10	19·5	47·5	45·0	2, 4	24·0	19	21·0	36·3	43·0	29	22·5	8	20·5	34·6	Darlington.
Gainford	...	...	...	...	...	...	47·0	1	26·3	23	20·7	36·4	55·6	18	27·6	8	28·0	37·9	Gainford.
Average	55·7	...	39·2	...	16·4	47·4	46·6	...	29·2	...	17·4	37·4	45·6	...	27·7	...	17·9	37·0	Average.
Greenwich	...	...	...	...	...	50·3	...	...	...	...	...	38·0	...	...	...	...	...	38·2	Greenwich.

[S OF 1871.

aximum.	Mean Daily Minimum.	Mean Daily Range.	JUNE. Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	STATIONS.
3	41·1	16·2	72	30	37	5	35	60·2	45·5	14·7	North Sunderland.
5	41·7	12·8	69	16	37	5	32	56·0	45·9	10·1	Alnwick.
9	37·9	22·0	71	27	33	5	38	61·0	42·2	18·8	Rothbury.
8	37·2	28·6	76	16	31	5	45	67·1	42·3	24·8	Meldon.
7	36·0	22·7	72	2	29	5	43	62·2	41·0	21·2	Wallington.
8	41·0	15·8	...	...	...	...	...	56·8	48·3	8·5	North Shields (S.).
8	43·8	10·0	66	30	43	5	23	56·1	48·4	7·7	North Shields (I.).
3	43·9	15·4	72	30	43	5 27	29	63·6	48·3	15·3	South Shields.
5	39·6	19·9	71	17	35	5	36	61·1	44·1	17·0	Wylam.
2	44·3	16·9	...	...	...	...	...	62·9	48·3	14·6	Bywell.
5	39·2	18·3	...	...	...	...	...	59·8	43·0	16·8	Allenheads.
	...	19·3	72	...	37	...	35	...	...	15·6	Durham.
2	37·4	21·8	...	...	...	...	...	...	...	...	Seaham Hall.
7	40·7	16·0	70	16	39	22	31	57·4	45·4	12·0	Sedgefield.
	44·3	...	...	...	40	22	...	...	47·9	...	Acklam.
3	36·6	19·7	75	14 16	33	27	42	65·4	41·2	24·2	Darlington.
	...	...	77	27	37	5	40	64·4	45·2	19·2	Gainford.
3	40·3	18·4	71·9	...	36·5	...	35·8	61·0	45·1	17·4	Average.
4	42·1	22·3	...	...	...	...	...	66·3	47·9	18·4	Greenwich.
			DECEMBER.								
2	34·7	9·5	54	18	25	5	29	44·7	33·0	11·7	North Sunderland.
5	35·4	7·1	52	18	26	5	26	42·7	34·3	8·4	Alnwick.
0	30·2	12·8	52	18	22	5	30	42·6	30·1	12·5	Rothbury.
8	29·3	12·5	48	18 30	15	5	33	40·7	29·5	11·2	Meldon.
3	30·4	9·9	46	18	20	23	26	38·5	30·9	7·6	Wallington.
6	34·8	9·8	...	...	...	...	...	44·4	34·0	10·4	North Shields (S.).
1	36·5	5·6	52	18	26	5	26	42·3	35·1	7·2	North Shields (I.).
5	35·4	9·1	52	18	25	5	27	43·8	34·3	9·5	South Shields.
4	31·9	13·5	58	19	22	5	36	44·8	32·6	12·2	Wylam.
2	34·3	10·9	...	...	...	...	...	45·0	35·0	10·0	Bywell.
7	30·5	9·2	...	...	...	...	...	39·6	30·5	9·1	Allenheads.
	...	8·5	52	...	23	...	29	...	...	9·2	Durham.
4	32·5	10·9	53	18	19	7	34	42·8	30·9	11·9	Seaham Hall.
8	33·7	8·1	52	18	18	8	34	42·0	34·0	8·0	Sedgefield.
	33·0	...	...	...	22	8	...	...	35·1	...	Acklam.
5	30·0	12·5	50	18	15	8	35	39·4	29·8	9·6	Darlington.
3	31·4	9·9	52	18	19	8	33	42·8	33·0	9·8	Gainford.
·8	32·8	10·0	51·8	...	21·2	...	30·6	42·4	32·6	9·9	Average.
·2	32·7	10·5	...	...	...	...	...	42·2	34·2	8·0	Greenwich.

TEMPERATURE.

The principal results furnished to the Club, under the head of temperature, have been arranged in two general tables. One of these is concerned entirely with absolute temperatures, that is to say, with the temperatures actually reached and recorded at definite points of time, the other is concerned with daily temperatures, that is to say, with temperatures representing the means of those which actually occurred during successive periods of twenty-four hours.

The construction of the tables will be readily understood. The first gives for each station, and each month in the year, the highest maximum indicated by the thermometer, together with the day on which it occurred, the lowest minimum indicated, together with the day, the difference between the two, or monthly range, the mean of all the daily maxima, the mean of all the daily minima, and the difference between these latter, or mean daily range. The second table gives for each station, and each month, the mean temperature of the warmest day, that is, of the warmest period of twenty-four hours, reckoned from midnight to midnight, the mean temperature of the coldest day, the difference between them, or monthly range of daily temperature, together with the mean daily temperature throughout the month.

In each table the average of each column of figures relating to temperature is given for the whole district, and similar particulars for Greenwich are given in juxtaposition in order to facilitate comparison. In computing the average of each column in the second table, the figures for Cresswell and St. John's, Weardale, are not included, as they are obtained in a different way from the rest. At all the other stations half the sum of the maximum and minimum temperatures of the day is taken as the mean temperature of the day. At Cresswell and St. John's, Weardale, the actual temperatures observed at 9 A.M. are taken. These are purposely given uncorrected "for diurnal range," because it does not appear certain that the Greenwich tables of diurnal range are applicable to observations made in a district so differently situated and so distant.

ABSOLUTE AND AVERAGE EXTREMES AND RANGE OF TEMPERATURE IN THE SEVERAL MONTHS OF 1871.

STATIONS.	JANUARY.								FEBRUARY.							
	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.
North Sunderland	48	14	15	1	33	37·6	27·5	10·1	54	18, 19	23	12	31	45·7	35·8	9·9
Alnwick	46	14	13	27	33	36·2	27·5	8·7	52	19	26	12	26	45·0	36·7	8·3
Rothbury	48	15	10	27	38	37·3	24·2	13·1	56	19	23	12, 13	33	45·3	33·2	12·1
Meldon	...	...	3	1, 2	...	...	23·2	...	54	18, 19	25	12	29	45·2	34·7	10·5
Wallington	45	14	5	1	40	35·8	23·8	12·0	50	14, 18, 19	25	12	25	42·5	33·5	9·0
North Shields (S.)	...	...	...	...	...	37·9	29·5	8·4	...	...	...	...	...	44·0	36·6	7·4
North Shields (I.)	45	14	12	2	33	35·2	29·2	6·0	52	18, 19	27	12	25	44·1	38·0	6·1
South Shields	48	14	11	1	37	37·9	30·3	7·6	55	19	29	12	26	47·3	39·2	8·1
Wylam	50	15	7	1	43	38·4	25·8	12·6	56	19	26	12	30	46·9	35·6	11·3
Bywell	...	...	...	...	...	38·7	29·6	9·1	...	...	...	...	...	47·3	37·7	9·6
Allenheads	...	...	...	...	...	34·2	23·4	10·8	...	...	...	...	...	41·8	33·6	8·2
Durham	47	...	6	...	41	...	...	9·3	54	...	24	...	30	...	...	8·8
Seaham Hall	44	13, 14	10	2, 4	34	34·8	25·2	9·6	54	25	25	12	29	46·0	35·3	10·7
Sedgefield	44	13	3	1	41	35·6	27·1	8·5	53	25	21	12	32	44·7	36·4	8·3
Acklam	...	...	14	4	...	...	27·2	...	...	...	23	12	...	...	37·1	...
Darlington	48	7	0	1	48	33·8	23·9	9·9	55	18	22	12	33	44·4	35·0	9·4
Gainford	46	6	−3	1	49	35·9	21·3	14·6	54	27	23	12	31	45·1	33·2	11·9
Average	46·6	...	7·6	...	39·2	36·4	26·2	10·0	53·8	...	24·4	...	29·2	45·0	35·7	9·4
Greenwich	...	...	...	...	...	37·4	29·3	8·1	...	...	...	...	...	48·3	37·5	10·8

STATIONS.	MARCH.								APRIL.							
	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.
North Sunderland	64	25	24	15	40	50·8	36·2	14·6	61	12	26	11	35	49.4	36·0	13·4
Alnwick	60	3	25	15	35	49·0	37·3	11·7	57	28	27	11	30	47·4	36·8	10·6
Rothbury	67	4	19	15	48	51·6	33·5	18·1	59	28	24	7, 8	35	50·3	33·6	16·7
Meldon	70	25	15	15	55	53·3	34·2	19·1	68	29	22	11	46	54·6	34·2	20·4
Wallington	68	25	12	15	56	48·6	33·0	15·6	60	29	18	11	42	49·4	33·3	16·1
North Shields (S.)	...	...	...	...	...	49·1	37·6	11·5	...	...	...	...	...	48·7	37·5	11·2
North Shields (I.)	55	3, 4, 6, 25	26	15	29	48·0	38·6	9·4	56	12	33	7	23	47·0	39·6	7·4
South Shields	58	6, 25	25	15	33	51·3	40·1	11·2	59	26	32	11	27	53·1	40·1	13·0
Wylam	69	26	19	15	50	52·3	35·3	17·0	63	29	26	7	37	52·3	35·7	16·6
Bywell	...	...	...	...	...	53·0	38·0	15·0	...	...	...	...	...	53·0	38·9	14·1
Allenheads	...	...	...	...	...	48·4	34·2	14·2	...	...	...	...	...	47·9	34·1	13·8
Durham	66	...	23	...	43	...	...	14·8	62	...	27	...	35	...	...	15·7
Seaham Hall	61	19	22	15	39	50·2	35·6	14·6	65	4	22	11	43	50·4	35·5	14·9
Sedgefield	70	18	25	15	45	51·4	37·0	14·4	61	27	28	7	33	50·3	37·2	13·1
Acklam	...	...	26	15	...	...	38·7	...	...	...	30	9	...	...	39·2	...
Darlington	66	22, 25	21	15	45	51·8	33·4	18·4	64	27	23	8	41	52·6	34·9	17·7
Gainford	68	3	22	15	46	52·6	33·2	19·4	...	...	...	...	...	...	...	...
Average	64·8	...	21·7	...	43·4	50·8	36·0	14·9	61·3	...	26·0	...	35·6	50·5	36·4	14·3
Greenwich	...	...	...	...	...	55·0	36·7	18·2	...	...	...	...	...	57·8	41·2	16·6

STATIONS.	MAY.								JUNE.							
	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.
North Sunderland	70	22	32	17	38	57·3	41·1	16·2	72	30	37	5	35	60·2	45·5	14·7
Alnwick	65	22	32	17	33	54·5	41·7	12·8	69	16	37	5	32	56·0	45·9	10·1
Rothbury	75	22	25	17	50	59·9	37·9	22·0	71	27	33	5	38	61·0	42·2	18·8
Meldon	76	22	24	17	52	65·8	37·2	28·6	76	16	31	5	45	67·1	42·3	24·8
Wallington	74	22	23	17	51	58·7	36·0	22·7	72	2	29	5	43	62·2	41·0	21·2
North Shields (S.)	...	...	...	...	...	56·8	41·0	15·8	...	...	...	...	...	56·8	48·3	8·5
North Shields (I.)	63	22, 30	33	17	30	53·8	43·8	10·0	66	30	43	5	23	56·1	48·4	7·7
South Shields	70	30	33	17	37	59·3	43·9	15·4	72	30	43	5, 27	29	63·6	48·3	15·3
Wylam	77	25	27	17	50	59·5	39·6	19·9	71	17	35	5	36	61·1	44·1	17·0
Bywell	...	...	...	...	...	61·2	44·3	16·9	...	...	...	...	...	62·9	48·3	14·6
Allenheads	...	...	...	...	...	57·5	39·2	18·3	...	...	...	...	...	59·8	43·0	16·8
Durham	77	...	28	...	49	...	...	19·3	72	...	37	...	35	...	...	15·6
Seaham Hall	69	30	28	17	41	59·2	37·4	21·8	...	...	...	...	...	...	...	...
Sedgefield	75	24	30	17	45	56·7	40·7	16·0	70	16	39	22	31	57·4	45·4	12·0
Acklam	...	...	35	2, 4, 17	...	...	44·3	...	...	...	40	22	...	...	47·9	...
Darlington	80	24	25	17	55	56·3	36·6	19·7	75	14, 16	33	27	42	65·4	41·2	24·2
Gainford	81	25	28	17	53	...	...	...	77	27	37	5	40	64·4	45·2	19·2
Average	73·2	...	28·8	...	44·9	58·3	40·3	18·4	71·9	...	36·5	...	35·8	61·0	45·1	17·4
Greenwich	...	...	...	...	...	64·4	42·1	22·3	...	...	...	...	...	66·3	47·9	18·4

STATIONS.	JULY.								AUGUST.							
	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.
North Sunderland	78	14	46	1	32	68·5	51·3	17·2	79	10	42	22	37	69·2	52·0	17·2
Alnwick	71	14	48	1	23	64·4	52·6	11·8	75	11	44	22	31	65·9	52·3	13·6
Rothbury	75	14	45	1, 24, 27, 30	30	67·5	48·7	18·8	85	7	39	22	46	70·1	49·0	21·1
Meldon	79	14	40	29	39	71·0	47·4	23·6	86	10	37	22	49	72·6	47·5	25·1
Wallington	75	14	39	1	36	65·5	46·5	19·0	83	9	35	22	48	69·5	46·0	23·5
North Shields (S.)	...	...	...	...	...	62·1	49·8	12·3	...	...	...	...	...	65·6	51·3	14·3
North Shields (I.)	71	15	51	1	20	64·8	54·2	10·6	78	11	49	22	29	66·5	55·6	10·9
South Shields	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wylam	75	15, 17	43	30	32	68·5	50·0	18·5	84	11	38	22	46	71·9	49·8	22·1
Bywell	...	...	...	...	...	69·9	52·5	17·4	...	...	...	...	...	70·8	53·2	17·6
Allenheads	...	...	...	...	...	61·8	46·5	15·3	...	...	...	...	...	66·0	48·7	17·3
Durham	76	...	46	...	30	...	...	17·7	83	...	41	...	42	...	...	20·2
Seaham Hall	75	16, 17	40	19, 20	35	67·6	48·3	19·3	80	9, 11	40	20, 21, 22	40	70·2	48·5	21·7
Sedgefield	73	16	46	30	27	65·7	50·6	15·1	81	11	39	22	42	69·8	51·8	18·0
Acklam	...	...	47	4	...	...	54·4	...	...	...	48	5, 22	...	...	57·0	...
Darlington	78	28	44	3, 9, 11, 13, 19	34	70·1	46·6	23·5	90	12	36	22	54	72.9	49·1	23·8
Gainford	72	15	44	29	28	66·3	50·2	16·1	82	12	40	22	42	73·0	51·4	21·6
Average	74·8	...	44·5	...	30·5	66·7	50·0	17·1	82·2	...	40·6	...	42·2	69·6	50·9	19·2
Greenwich	...	...	...	...	...	72·6	54·0	18·6	...	...	...	...	...	78·1	53·8	24·3

STATIONS.	SEPTEMBER.								OCTOBER.							
	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.
North Sunderland	76	1	42	22	34	60·0	47·6	12·4	60	13, 27	32	11	28	54·9	44·1	10·8
Alnwick	70	1	41	14, 29	29	57·4	47·6	9·8	61	27	30	10	31	53·5	42·7	10·8
Rothbury	75	3	34	29	41	60·2	42·8	17·4	62	15, 18	25	10	37	54·5	38·7	15·8
Meldon	76	1	32	29	44	62·1	42·5	19·6	62	15	24	10	38	54·4	37·3	17·1
Wallington	70	11	31	29	39	59·1	41·1	18·0	61	18	23	10	38	52·7	37·6	15·1
North Shields (S.)	...	...	...	...	...	57·2	46·8	10·4	...	...	...	...	...	54·0	42·9	11·1
North Shields (I.)	71	1	41	29	30	58·0	50·3	7·7	60	19	34	10	26	52·2	44·5	7·7
South Shields	...	...	...	...	...	...	...	...	62	19	33	10	29	...	...	...
Wylam	75	2, 3	35	29	40	62·0	44·3	17·7	66	19	27	10	39	56·4	39·2	17·2
Bywell	...	...	...	...	...	...	...	...	...	...	...	...	...	57·9	43·3	14·6
Allenheads	...	...	...	...	...	56·5	42·8	13.7	...	...	...	...	...	51·4	40·1	11·3
Durham	74	...	36	...	38	...	...	13·2	62	...	28	...	34	...	...	12·2
Seaham Hall	74	1	34	30	40	60·3	43·3	17·0	65	19	31	11	34	54·8	39·9	14·9
Sedgefield	74	1	38	29	36	58·9	47·1	11·8	63	18	30	10	33	53·6	42·4	11·2
Acklam	...	...	40	23, 26, 27	...	...	47·6	...	...	...	31	10	...	...	43·3	...
Darlington	80	1	31	29	49	63·7	43·3	20·4	72	5	26	10	46	56·5	38·5	18·0
Gainford	73	1	34	29	39	60·1	45·3	14·8	...	...	...	...	...	...	...	...
Average	74·0	...	34·5	...	38·3	59·7	45·2	14·6	63·0	...	28·8	...	34·4	54·4	41·0	13·4
Greenwich	...	...	...	...	...	67·5	50·3	17·2	...	...	...	...	...	58·6	41·9	16·7

STATIONS.	NOVEMBER.								DECEMBER.							
	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Highest Maximum.	Day.	Lowest Minimum.	Day.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.
North Sunderland	51	6	24	19	27	44·2	34·7	9·5	54	18	25	5	29	44·7	33·0	11·7
Alnwick	49	14	25	19	24	42·5	35·4	7·1	52	18	26	5	26	42·7	34·3	8·4
Rothbury	48	6, 15	20	19, 20	28	43·0	30·2	12·8	52	18	22	5	30	42·6	30·1	12·5
Meldon	49	2	18	19	31	41·8	29·3	12·5	48	18, 30	15	5	33	40·7	29·5	11·2
Wallington	48	2	17	19	31	40·3	30·4	9·9	46	18	20	23	26	38·5	30·9	7·6
North Shields (S.)	...	...	...	...	...	44·6	34·8	9·8	...	...	...	...	...	44·4	34·0	10·4
North Shields (I.)	50	1	28	19	22	42·1	36·5	5·6	52	18	26	5	26	42·3	35·1	7·2
South Shields	51	1	27	19	26	44·5	35·4	9·1	52	18	25	5	27	43·8	34·3	9·5
Wylam	61	1	19	19	42	45·4	31·9	13·5	58	19	22	5	36	44·8	32·6	12·2
Bywell	...	...	...	...	...	45·2	34·3	10·9	...	...	...	...	...	45·0	35·0	10·0
Allenheads	...	...	...	...	...	39·7	30·5	9·2	...	...	...	...	...	39·6	30·5	9·1
Durham	49	...	22	...	27	...	...	8·5	52	...	23	...	29	...	...	9·2
Seaham Hall	50	2	23	18	27	43·4	32·5	10·9	53	18	19	7	34	42·8	30·9	11·9
Sedgefield	49	15	23	19	26	41·8	33·7	8·1	52	18	18	8	34	42·0	34·0	8·0
Acklam	...	...	19	19	...	...	33·0	...	...	...	22	8	...	...	35·1	...
Darlington	50	1–5, 14	15	19	35	42·5	30·0	12·5	50	18	15	8	35	39·4	29·8	9·6
Gainford	50	15	19	19	31	41·3	31·4	9·9	52	18	19	8	33	42·8	33·0	9·8
Average	50·4	...	21·4	...	29·0	42·8	32·8	10·0	51·8	...	21·2	...	30·6	42·4	32·6	9·9
Greenwich	...	...	...	...	...	43·2	32·7	10·5	...	...	...	...	...	42·2	34·2	8·0

It may be as well to state that, in these tables, minimum temperatures are always assigned to the day on which they are read, and maximum temperatures to the same day when the reading is taken in the evening, but to the day before when the reading is taken in the morning.

Appended are some subsidiary tables, for the most part summarising, in a separate form, a portion of the results embodied in the general tables; but, in the case of the last, including additional results from several stations, which could not conveniently be introduced directly in the general tables. The remarks made above, respecting the averages in the second general table, apply equally to those in the subsidiary tables.

I.

Average of Results, given in the two general Tables of Temperature for the different Stations, FOR WHOLE DISTRICT, *in the several Months of* 1871.

MONTHS.	Highest Maximum.	Lowest Minimum.	Monthly Range.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Mean Temp. of Warmest Day.	Mean Temp. of Coldest Day.	Monthly Range of Daily Temps.	Mean Daily Temp. throughout Month.
January	46·6	7·6	39·2	36·4	26·2	10·0	40·9	15·5	25·4	31·0
February	53·8	24·4	29·2	45·0	35·7	9·4	49·2	30·4	18·8	40·3
March	64·8	21·7	43·4	50·8	36·0	14·9	52·3	30·8	21·5	43·2
April	61·3	26·0	35·6	50·5	36·4	14·3	51·1	36·9	14·2	43·3
May	73·2	28·8	44·9	58·3	40·3	18·4	57·5	40·8	16·7	48·9
June	71·9	36·5	35·8	61·0	45·1	17·4	61·0	46·0	15·0	53·0
July	74·8	44·5	30·5	66·7	50·0	17·1	66·4	53·6	12·8	58·4
August	82·2	40·6	42·2	69·6	50·9	19·2	69·4	53·3	16·6	60·2
September	74·0	34·5	38·3	59·7	45·2	14·6	62·7	43·0	19·7	52·5
October	63·0	28·8	34·4	54·4	41·0	13·4	55·7	39·2	16·4	47·4
November	50·4	21·4	29·0	42·8	32·8	10·0	46·6	29·2	17·4	37·4
December	51·8	21·2	30·6	42·4	32·6	9·9	45·6	27·7	17·9	37·0
Average for Whole Year	...	...	...	53·1	39·4	14·1	...	...	...	46·1

The figures in the columns headed "Range," in the above, differ slightly from those obtained by subtraction of the figures in the preceding columns, in consequence of their having been obtained independently, from a number of stations not always coincident with the stations from which the figures in the preceding columns were obtained.

II.

Summary of Results, given in the two general Tables of Temperature for the several Months of 1871 FOR WHOLE YEAR, *at the different Stations*

STATIONS.	Highest Maximum.	DATE.	Lowest Minimum.	DATE.	Yearly Range.	Mean Temp. of Warmest Day.	DATE.	Mean Temp. of Coldest Day.	DATE.	Yearly Range of Daily Temps.	Mean Daily Temp. throughout Year.
North Sunderland	79	Aug. 10	15	Jan. 1	64	68·5	Aug. 11	19·0	Jan. 1	49·5	47·0
Alnwick	75	Aug. 11	13	Jan. 27	62	67.0	Aug. 11	18·5	Jan. 1	48·5	46·1
Rothbury	85	Aug. 7	10	Jan. 27	75	70·0	Aug. 11	20·5	Jan. 1	49·5	45·3
Cresswell (9 A.M.)	...	......	...	......	...	68·0	July 14 Aug. 11	12·5	Jan. 1,2	55·5	44·5
Meldon	86	Aug. 10	3	Jan. 1,2	83	70·0	Aug. 12	...	......	...	...
Wallington	83	Aug. 9	5	Jan. 1	78	67·1	Aug. 12	16·2	Jan. 1	50·9	44·0
North Shields (I.)	78	Aug. 11	12	Jan. 2	66	71·0	Aug. 11	19·0	Jan. 2	52·0	46·8
South Shields	...	......	11	Jan. 1	...	...	......	17·7	Jan. 1	...	...
Wylam	84	Aug. 11	7	Jan. 1	77	70·0	Aug. 11	20·5	Jan. 1	49·5	46·8
St. John's, Weardale (9 A.M.)...	...	......	...	......	...	68·0	Aug. 12	14·0	Jan. 2	54·0	43·5
Durham.............................	83	......	6	......	77	...	......	...	......	...	46·5
Seaham Hall.......................	80	Aug. 9,11	10	Jan. 2,4	70	69·0	Aug. 11	14·5	Jan. 1	54·5	...
Sedgefield	81	Aug. 11	3	Jan. 1	78	69·5	Aug. 11	11·5	Jan. 1	58·0	46·3
Acklam	...	......	14	Jan. 4	...	...	......	...	......	...	...
Darlington	90	Aug. 12	0	Jan. 1	90	77·5	Aug. 12	7·5	Jan. 1	70·0	45·5
Gainford	82	Aug. 12	-3	Jan. 1	85	69·2	Aug. 12	11·0	Jan. 1,2	58·2	...
Average for Whole District ...	82·2	......	7·6	......	75·4	69.9	......	16·0	......	54·1	45·8

III.

Mean Daily Temperature, at Eighteen different Stations, and at Greenwich, throughout the several Months of 1871.

STATIONS.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Average for whole Year.
North Sunderland	32·6	40·8	43·5	42·7	49·2	53·0	59·9	60·6	53·8	49·5	39·4	38·8	47·0
Alnwick	31·9	40·9	43·2	42·1	48·1	51·0	58·5	59·1	52·5	48·1	39·0	38·5	46·1
Rothbury	30·8	39·3	42·6	42·0	48·9	51·6	58·1	59·6	51·5	46·6	36·6	36·4	45·3
Cresswell (9 A.M.)	29·3	38·0	39·1	40·9	48·5	53·0	59·6	58·8	50·6	44·3	35·5	36·1	44·5
Meldon	...	40·0	43·8	44·4	51·5	54·7	59·2	60·1	52·3	45·9	35·6	35·1	...
Wallington	29·8	38·0	40·8	41·4	47·4	51·6	56 0	57·8	50·1	45·2	35·4	34·7	44·0
North Shields (S.)	33·7	40·3	43·4	43·1	48·9	52·6	56·0	58·5	52·0	48·5	39·7	39·2	46·3
North Shields (I.)	32·2	41·1	43·3	43·3	48·3	52·3	59·5	61·1	54·2	48·4	39·3	38 7	46·8
South Shields	34·1	43·3	45·7	46·6	51·6	56·0	...	...	...	...	40·0	39·1	...
Wylam	32·1	41·2	43·8	44·0	49 6	52·6	59·3	60·9	53·2	47·8	38·7	38·7	46·8
Bywell	34·2	42·5	45·5	46·0	52·8	55·6	61·2	62·0	...	50·6	39·8	40·0	...
Allenheads	28·8	37·7	41·3	41·0	48·4	51·4	54·2	57·4	49·7	45·8	35·1	35·1	43·8
St. John's, Weardale (9 A.M.)	29·8	36·6	39·8	41·6	48·3	50·1	55·4	57·5	49·1	44·8	34·3	35·0	43·5
Durham	30·6	40·2	43·6	43·8	49·4	52·8	59·0	61·9	53·3	47·9	37·3	37·7	46·5
Seaham Hall	30·0	40·7	42 9	43·0	48·3	...	58·0	59·4	51·8	47·4	38·0	36·9	...
Sedgefield	31·4	40·6	44·2	43·8	48·7	51·4	58·2	60·8	53·0	48·0	37·8	38·0	46·3
Darlington	28·9	39·7	42·6	43·8	46·5	53·3	58·4	61·0	53·5	47·5	36·3	34·6	45·5
Gainford	28·6	39·2	42·9	...	...	54·8	58 3	62·2	52·7	...	36·4	37·9	...
Average for Whole District	31·3	40·3	43·3	43·4	49·2	53·0	58·3	60·2	52·4	47·8	37·8	37·5	46·2
Greenwich	33·4	42·9	45·8	49·5	53·3	57·1	63·3	66·0	58·9	50·3	38·0	38·2	49·7

The average for the whole district, for the whole year, at the end of the last line but one, is the average of the horizontal column, as including the results of a greater number of data than the vertical column under which it stands. The average of the vertical column, omitting Cresswell and St. John's, Weardale, is 45·9.

Besides the observations and results, embodied in the foregoing, and in the general tables, the editors have been favoured with several other communications of an interesting and valuable character.

Among these are records of extremely low temperatures occurring during the year 1871, at Wark Rectory, in the valley of the North Tyne. These have been kindly furnished to the Club by the Rev. Hugh Taylor; and the striking difference between them and the lowest recorded at most of the other stations makes the editors regret, still more than they have hitherto, the paucity of observations received by the Club from so interesting and important a locality. No greater service could be rendered to the meteorology of the district than the careful record of observations, at a few stations in the valley of the North Tyne, by some of the numerous members of the Club resident amid its picturesque scenes.

The following are the temperatures and dates alluded to. The thermometer used was situated about four feet from the ground, facing the north, and was eighteen inches distant from a wall covered with ivy. The height of the thermometer above the river level was considered to be about sixty feet.

Minimum Temperatures recorded at Wark in the Year 1871.

Date.	Temperature.	Date.	Temperature.
March 15	5	June 26..............	28
May 17	18	June 27..............	30
June 3	28	August 22...........	32
June 5	26	September 14	28
June 22..............	29	October 10	18
June 24..............	29	November 19	13
June 25..............	32		

From Durham Mr. J. J. Plummer has forwarded, in addition to the particulars given for Durham in the general tables, the average of the same for the twelve years extending from 1860 to 1871. This valuable information is given in the subjoined table. The results for the year 1871, as given in the general tables, are printed side by side with the averages for the twelve years, in order to admit of more ready comparison.

Results of Observations of Temperature at Durham Observatory, for the year 1871, together with the Mean of similar results FOR TWELVE YEARS, *from 1860 to 1871 inclusive.*

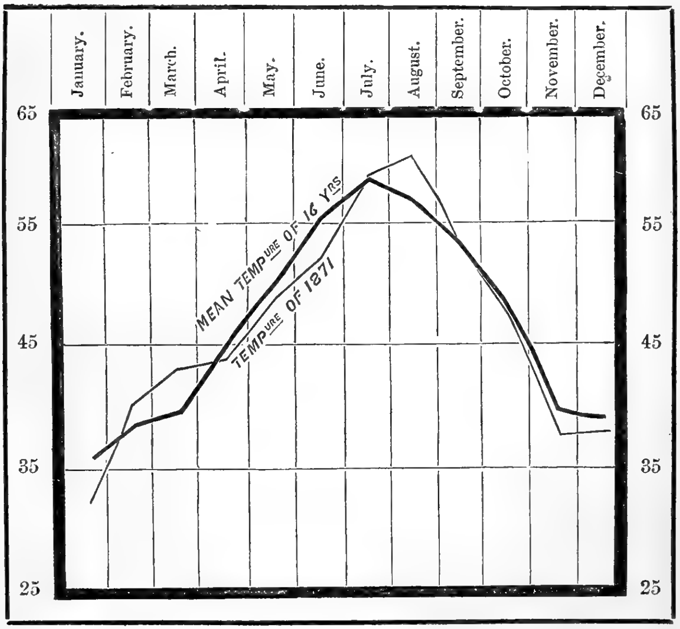
MONTHS.	Highest Maximum, 1871.	Mean Monthly Maximum, 1860–1871.	Difference.	Lowest Minimum, 1871.	Mean Monthly Minimum, 1860–1871.	Difference.	Mean Daily Temp., 1871.	Mean Daily Temp., 1860–1871.	Difference.	Mean Daily Range, 1871.	Mean Daily Range, 1860–1871.	Difference.
January	46·7	52·4	−5·7	6·1	17·5	−11·4	30·6	36·1	−5·5	9·3	9·3	0·0
February	53·5	54·1	−0·6	24·1	21·6	+2·5	40·2	38·8	+1·4	8·8	10·2	−1·4
March	66·2	58·1	+8·1	23·4	22·4	+1·0	43·6	39·6	+4·0	14·8	12·9	+1·9
April	62·0	68·0	−6·0	26·5	28·7	−2·2	43·8	45·8	−2·0	15·7	16·5	−0·8
May	77·0	73·8	+3·2	28·0	30·3	−2·3	49·4	50·6	−1·2	19·3	18·1	+1·2
June	72·2	77·5	−5·3	36·8	36·9	−0·1	52·8	56·0	−3·2	15·6	18·3	−2·7
July	75·8	80·6	−4·8	45·6	40·6	−1·0	59·0	59·1	−0·1	17·7	19·5	−1·8
August	83·0	79·1	+3·9	40·7	40·5	+0·2	61·9	58·3	+3·6	20·2	18·2	+2·0
September	73·7	72·0	+1·7	36·2	36·6	−0·4	53·3	54·6	−1·3	13·2	16·1	−2·9
October	62·1	65·3	−3·2	28·3	29·6	−1·3	47·9	48·3	−0·4	12·2	13·0	−0·8
November	49·0	55·6	−6·6	22·2	25·0	−2·8	37·3	40·7	−3·4	8·5	10·9	−2·4
December	51·8	53·5	−1·7	23·2	21·0	+2·2	37·7	38·2	−0·5	9·2	8·9	+0·3
Average for whole period	...	...	...	...	...	...	46·5	47·2	−0·7	13·7	14·3	−0·6

Mr. G. C. Atkinson has kindly furnished a similar comparison of the mean daily temperature for each month of 1871, with the average mean daily temperature for each month of the last sixteen years, at Wylam. He has also represented the same graphically in the diagram annexed.

Mean Daily Temperature at Wylam, for each month of 1871, *together with the Mean of the same* FOR SIXTEEN YEARS, *from* 1856 *to* 1871 *inclusive.*

MONTHS.	Mean Daily Temperature, 1871.	Mean Daily Temperature, 1856–1871.	Difference.	MONTHS.	Mean Daily Temperature, 1871.	Mean Daily Temperature, 1856–1871.	Difference.
January......	32·10	36·92	—4·82	July............	59·29	59·28	+0.01
February ...	41·24	39·27	+1·97	August	60·85	57·74	+3·11
March	43·81	40·70	+3·11	September ...	53·18	54·75	—1·57
April	44·03	46·06	—2·03	October	47·82	48·02	—0·20
May	49·55	50·95	—1·40	November ...	38·65	40·86	—2·21
June	52·60	56·63	—4·03	December ...	38·69	39·47	—0·78

Mean Daily Temperature of 1871, 46·81. Mean Daily Temperature of 1856–1871, 47·55. Difference, —0·74.



Mr. Atkinson has also supplied a table of the yearly maxima and minima, and of the warmest and coldest days, in each of the eighteen years, from 1854 to 1871, inclusive, together with other information of an important and interesting character.

Extremes of Temperature at Wylam, in each of the EIGHTEEN YEARS, 1854–1871.

YEARS.	Yearly Maximum.	DATE.	Yearly Minimum.	DATE.	Yearly Range.	Mean Temp. of Warmest Day.	DATE.	Mean Temp. of Coldest Day.	DATE.	Yearly Range of Daily Temps.
1854	82·0	Sept. 3	4·0	Jan. 3	78·0	72·0	July 22	14·5	Jan. 3	57·5
1855	85·0	June 28	1·5	Feb. 16, 17	83·5	69·0	July 13	11·3	Feb. 17	57·7
1856	92·0	Aug. 1	7·0	Dec. 4	85·0	79·0	Aug. 2	16·5	Dec. 4	64·5
1857	84·0	June 25	12·0	Feb. 4	72·0	68·0	June 25	24·5	Feb. 4	43·5
1858	84·5	June 15	14·0	Mar. 8	70·5	72·5	June 14	24·5	Feb. 3	48·0
1859	84·0	Aug. 24	10·0	Dec. 17	74·0	73·0	June 12	19·5	Dec. 17	53·5
1860	74·0	July 5	3·0	Dec. 25, 29	71·0	62·0	July 14, 16	15·5	Dec. 29	46·5
1861	80·0	June 13, 21	4·0	Jan. 8	76·0	67·0	June 21	8·0	Jan. 18	59·0
1862	73·0	May 17 June 2 Aug. 18	13·0	Mar. 4	60·0	63·0	Aug. 12, 14 28	26·0	Mar. 4	37·0
1863	82·0	July 10	23·0	Feb. 16 Mar. 12 Dec. 28	59·0	67·5	July 10	30·5	Dec 28	37·0
1864	81·5	July 18	15·0	Jan. 5, 7	66·5	66·5	July 18	22·5	Jan. 6	44·0
1865	83·5	June 20	10·0	Feb. 15	73·5	68·5	Sept. 8	22·5	Feb. 15	46·0
1866	86·0	July 12	17·0	Mar. 2	69·0	71·0	July 12	27·0	Mar. 2	44·0
1867	83·0	Aug. 13, 14	7·0	Jan. 2, 5	76·0	70·5	Aug. 13	17·0	Jan 2	53·5
1868	88·5	July 15	22·0	Jan. 4	66·5	74·3	July 16	29·0	Jan. 4	45·3
1869	91·0	Aug. 28	13·0	Dec. 28	78·0	71·0	July 21	24·0	Dec. 28	47·0
1870	88·0	July 23	8·0	Dec. 23	80·0	73·0	July 23	16·0	Dec. 24	57·0
1871	84·0	Aug. 10	7·0	Jan. 1	77·0	70·0	Aug. 11	20·5	Jan. 1	49·5
Av.	82·5	July 16	11·0	Jan. 20	71·5	68·9	July 21	20·5	Jan. 15	48·4

Mr. Atkinson has added to his other claims upon the gratitude of the Club by sending, in addition to the foregoing, an exceedingly important and comprehensive table, printed below, the compilation of which must have involved great labour, and the contents of which represent many thousands of observations. It gives the mean daily maximum, mean daily minimum, mean daily range, and mean daily temperature, at Wylam, for every month, in each of the eighteen years from 1854 to 1871. It gives also the average of the same for the whole period. From it, and from the table just given, the following, among many other interesting facts, may be deduced.

In the eighteen years, 1854 to 1871, at Wylam:—

The warmest years were 1857 and 1868, with mean daily temperature 49·2.

The coldest year was 1860, with mean daily temperature 44·9.

The warmest month was July, 1870, with mean daily temperature 62·2.

The coldest month was February, 1855, with mean daily temperature 27·6.

The warmest day was August 2nd, 1856, with mean temperature 79.

The coldest day was January 18th, 1861, with mean temperature 8.

The highest point reached was 92·0, on August 1st, 1856.

The lowest point fallen to was 1·5, on February 17th, 1855.

The average date of warmest day was July 21st, with average mean temperature 68·9.

The average date of coldest day was January 15th, with average mean temperature 20·5.

The average date of yearly maximum was July 16th, and average yearly maximum 82·5.

The average date of yearly minimum was January 20th, and average yearly minimum 11·0.

The greatest yearly range of absolute temperature was 85, in 1856; the least, 59, in 1863.

The greatest yearly range of mean daily temperature was 64·5, in 1856; the least, 37, in 1862 and 1863.

The extreme range of absolute temperature, in the whole eighteen years, was 90·5; the extreme range of mean daily temperature, in the same period, 71.

The year with the greatest mean daily range was 1855, the mean daily range being 18·2; the year with the least mean daily range was 1867, the mean daily range being 14·3.

Average Extremes and Range of Temperature, and of the Year, for Eighteen

MO.	JANUARY.				FEBRUARY.				MARCH.			
YEARS.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Mean Daily Temp.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Mean Daily Temp.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Mean Daily Temp.
1854	42·9	29·6	13·3	36·3	48·6	32·9	15·7	40·8	55·8	35·6	20·2	45·7
1855	44·4	23·8	20·6	34·1	36·1	19·1	17·0	27·6	44·0	30·2	13·8	37·1
1856	43·2	30·2	13·0	36·7	48·3	33·4	14·9	40·8	48·5	33·3	13·2	40·9
1857	40·8	31·0	9·8	35·9	46·6	31·2	15·4	38·9	45·5	35·0	10·5	40·2
1858	45·3	31·4	13·9	38·3	42·3	28·7	13·6	35·5	48·4	33·2	15·2	40·8
1859	49·1	34·0	15·1	41·6	47·1	34·3	12·8	40·7	51·9	39·1	12·8	45·5
1860	43·4	31·4	12·0	37·4	40·5	27·6	12·9	34·1	45·4	32·0	13·4	38·7
1861	42·1	29·5	12·6	35·8	49·1	33·4	15·7	41·2	50·3	35·4	14·9	42·8
1862	43·0	33·8	9·2	38·4	45·4	36·1	9·3	40·8	45·2	33·9	11·3	39·5
1863	44·5	38·4	6·1	41·5	48·9	35·7	13·2	42·3	52·9	37·2	15·7	45·0
1864	40·5	28·4	12·1	34·5	41·7	27·8	13·9	34·7	45·1	31·6	13·5	38·4
1865	41·6	29·1	12·5	35·4	40·4	28·8	11·6	34·6	44·4	31·2	13·2	37·8
1866	46·9	35·4	11·5	41·2	45·6	32·8	12·8	39·2	45·3	32·3	13·0	38·8
1867	38·3	26·1	12·2	32·2	48·8	37·2	11·6	43·0	42·7	29·7	13·0	36·2
1868	43·7	33·5	10·2	38·5	49·7	36·5	13·2	43·1	52·1	35·9	16·2	44·0
1869	45·9	35·3	10·6	40·6	51·2	38·1	13·1	44·7	44·5	32·0	12·5	38·3
1870	42·0	31·0	11·0	36·5	41·3	30·7	10·6	36·0	47·8	33·1	14·7	40·5
1871	38·4	25·8	12·6	32·1	46·9	35·6	11·3	41·2	52·3	35·3	17·0	43.8
Av.	43·1	31·0	12·1	37·1	45·5	32.2	13·3	38·9	47·9	33·7	14·2	40·8

MO.	JULY.				AUGUST.				SEPTEMBER.			
1854	67·3	51·4	15·9	59.4	69·6	51·0	18·6	60·4	69·2	46·2	23·0	57·7
1855	72·4	50·2	22·2	61·4	65·7	49·7	16·0	57·7	68·1	45·6	22·5	56·9
1856	71·6	48·8	22·8	60·2	70·4	51·6	18·8	61·0	63·4	44·4	19·0	53·9
1857	70·0	49·4	20·6	59·7	69·9	54·1	15·8	62·0	65·9	48·4	17·5	57·2
1858	67·4	47·9	19·5	57·6	69·9	49·9	20·0	59·9	66·2	46·7	19·5	56·5
1859	71·8	50·7	21·1	61·3	71·2	50·2	21·0	60·7	64·6	41·2	23·4	52·9
1860	66·8	46·6	20·2	56·7	63·5	46·1	17·4	54·8	61·2	39·6	21·6	50·4
1861	67·5	49·3	18·2	58·4	69·2	52·5	16 7	61·0	62·0	45·6	16·4	53·8
1862	65·0	47·8	17·2	56·4	66·4	49·8	16·6	58·1	64·0	43·2	20·8	53·6
1863	69·0	46·4	22·6	57·7	67·6	48·6	19·0	58·1	59·8	45·4	14·4	52·6
1864	67·6	48·9	18·7	58·2	66·3	44·9	21·4	55·6	64·0	45·2	18·8	54·6
1865	71·1	50·3	20·8	60·7	65·9	49·1	16·8	57·6	71·4	49·6	21·8	60·5
1866	67·2	50·2	17·0	58·7	65·0	50·0	15·0	57·5	60·6	46·0	14·6	53·3
1867	65·7	49·3	16·4	57·5	68·9	49·5	19·4	59·2	62·4	47·9	14·5	55·2
1868	71·8	51·7	20·1	61·7	70·4	51·7	18·7	61·0	65·1	48·6	16·5	56·8
1869	72·2	51·9	20·3	62·0	68·0	47·4	20·6	57·8	63·5	49·3	14·2	56·4
1870	71·9	52·6	19·3	62·2	69·0	48·6	20·4	58·8	65·7	44·5	21·2	55·1
1871	68·5	50·0	18·5	59·3	71·9	49·8	22·1	60·9	62·0	44·3	17·7	53·2
Av.	69·1	49·6	19·5	59·4	68·3	49·7	18·6	59·0	64·4	45·6	18·8	55·0

Mean Daily Temperature, at Wylam, in each Month Years, from 1854 *to* 1871.

APRIL.				MAY.				JUNE.				MO.
Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Mean Daily Temp.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Mean Daily Temp.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Mean Daily Temp.	YEARS.
58·8	35·7	23·1	47·3	62·0	41·4	20·6	51·7	66·0	47·8	18·2	56·9	1854
53·2	34·6	21·6	45·4	54·0	36·2	17·8	45·1	67·7	46·8	20·9	57·3	1855
58·0	37·8	20·2	47·9	60·2	42·0	18·2	51·1	65·0	47·8	17·2	56·4	1856
52·1	36·8	16·3	44·4	62·5	43·6	18·9	53·0	69·8	47·1	22·7	58·5	1857
54·3	34·5	19·8	44·4	61·4	41·4	20·0	51·4	73·8	49·2	24·6	61·5	1858
51·8	34·7	17·1	43·3	61·5	38·2	23·3	49·9	65·7	48·4	17·3	57·1	1859
49·7	33·3	16·4	41·5	61·3	42·6	18·7	51·9	61·5	45·8	15·7	53·7	1860
53·0	36·9	16·1	44·9	59·6	42·4	17·2	51·0	66·2	49·5	16·7	57·9	1861
53·7	37·6	16·1	45·7	62·4	43·8	18·6	53·1	63·0	46·7	16·3	54·9	1862
57·4	39·0	18·4	48·2	58·9	41·9	17·0	50·5	65·2	47·9	17·3	56·5	1863
56·8	39·0	17·8	47·9	61·3	42·0	19·3	51·6	64·7	46·6	18·1	55·7	1864
57·8	39·8	18·0	48·8	60·7	44·8	15·9	52·7	68·1	48·3	19·8	58·2	1865
52·1	37·6	14·5	44·9	57·7	37·5	20·2	47·6	66·1	48·0	18·1	57·1	1866
54·9	41·1	13·8	48·0	56·8	42·1	14·7	49·5	64·1	48·7	15·4	56·5	1867
54·6	38·5	16·1	46·6	63·7	44·6	19·1	54·1	68·9	47·0	21·9	58·0	1868
58·3	37·7	20·6	48·0	52·0	39·0	13·0	45·6	63·7	44·7	19·0	54·2	1869
58·6	38·5	20·1	48·6	61·8	43·3	18·5	52·6	67·2	48·2	19·0	57·7	1870
52·3	35·7	16·6	44·0	59·5	39·6	19·9	49·6	61·1	44·1	17·0	52·6	1871
55·0	37·1	17·9	46·1	59·9	41·5	18·4	50·7	66·0	47·4	18·6	56·7	Av.

OCTOBER.				NOVEMBER.				DECEMBER.				MO.
57·3	40·4	16·9	48·9	47·7	34·5	18·2	41·1	46·7	33·3	13·4	40·0	1854
58·9	39·5	19·4	49·2	49·7	35·9	13·8	42·8	42·7	29·9	12·8	36·3	1855
58·7	43·9	14·8	51·3	47·1	33·2	13·9	40·2	48·1	30·1	18·0	39·1	1856
58·5	41·0	17.5	49·7	51·4	39·0	12·4	45·2	51·9	38·8	13·1	45·3	1857
55·7	39·5	16·2	47·6	46·5	34·1	12·4	40·3	44·1	33·3	10·8	38·7	1858
55·5	38·3	17·2	46·9	47·2	33·5	13·7	40.3	39·9	27·9	12·0	33·9	1859
55·5	40·5	15·0	48·0	44.6	33·9	10·7	39·3	37·8	27·0	10·8	32·4	1860
59·0	41·9	17·1	50·5	47·2	32·6	14·6	39·9	44·5	31·8	12·7	38·0	1861
57·2	40·9	16·3	49·0	44.7	28·8	15·9	36·8	47·4	38·2	9·2	42·8	1862
55·9	40·8	15·1	48·4	50·7	38·2	12·5	44·4	48·6	35·6	13·0	42·1	1863
54·0	41·8	12·2	47·9	48·5	35·7	12·8	42·1	44·6	35·4	9·2	40·0	1864
55·8	39·6	16·2	47·7	49·8	33·5	16·3	41·7	48·3	35·7	12·6	42·0	1865
56·6	43·9	12·7	50·3	49·3	35·5	13·8	42·4	48·6	35·3	13·3	42·0	1866
55·3	39·1	16·2	47·2	48·1	36·0	12·1	42·1	45·7	32·9	12·8	39·3	1867
54·7	35·9	18·8	45·3	45·1	34·1	11·0	39·6	47·9	35·8	11·1	41·9	1868
55·2	41·6	13·6	48·4	47·9	34·7	13·2	41·3	41·8	31·0	10·8	36·4	1869
55·7	38·9	16·8	47·3	46·8	32·1	14·7	39·5	40·3	27·6	12·7	34·0	1870
56·4	39·2	17·2	47·8	45·4	31·9	13·5	38·7	44·8	32·6	12·2	38·7	1871
56·4	40·4	16·0	48·4	47·7	34·3	13·4	41·0	45·2	32·9	12·3	39·0	Av.

The following are the means of the preceding for each year.

Yearly Means of Temperature, at Wylam, for Eighteen Years, from 1854 *to* 1871.

YEARS.	Mean Daily Maximum.	Mean Daily Minimum.	Mean Daily Range.	Mean Daily Temp.	YEARS.
1854	57·7	39·9	17·8	48·8	1854
1855	55·0	36·8	18·2	45·9	1855
1856	56·9	39·7	17·2	48·3	1856
1857	57·1	41·3	15·8	49·2	1857
1858	56·3	39·2	17·1	47·7	1858
1859	56·4	39·3	17·1	47·8	1859
1860	52·6	37·2	15·4	44·9	1860
1861	55·8	40·1	15·7	47·9	1861
1862	54·8	40·1	14·7	47·4	1862
1863	56·6	41·3	15·3	48·9	1863
1864	54·6	38·9	15·7	46·8	1864
1865	56·3	40·0	16·3	48·1	1865
1866	55·1	40·4	14·7	47·7	1866
1867	54·3	40·0	14·3	47·2	1867
1868	57·3	41·1	16·2	49·2	1868
1869	55·4	40·2	15·2	47·8	1869
1870	55·7	39·1	16·6	47·4	1870
1871	55·0	38·7	16·3	46·8	1871
Average	55·7	39·6	16·1	47·7	Average.

To the above may be added the following table of highest and lowest mean temperatures of each several month.

Highest and Lowest Mean Temperatures of each several Month, at Wylam, in the Eighteen Years, 1854 *to* 1871.

MONTHS.	Warmest.			Average Mean Temp. for 18 Years.	Coldest.			MONTHS.
	Year.	Mean Temp.	Above Average.		Below Average.	Mean Temp.	Year.	
January	1859	41·6	4·5	37·1	5·0	32·1	1871	January.
February	1869	44·7	5·8	38·9	11·3	27·6	1855	February.
March	1854	45·7	4·9	40·8	4·6	36·2	1867	March.
April	1865	48·8	2·7	46·1	4·6	41·5	1860	April.
May	1868	54·1	3·4	50·7	5·6	45·1	1855	May.
June	1858	61·5	4·8	56·7	4·1	52·6	1871	June.
July	1870	62·2	2·8	59·4	3·0	56·4	1862	July.
August	1857	62·0	3·0	59·0	4·2	54·8	1860	August.
September	1865	60·5	5·5	55·0	4·6	50·4	1860	September.
October	1856	51·3	2·9	48·4	3·1	45·3	1868	October.
November	1857	45·2	4·2	41·0	4·2	36·8	1862	November.
December	1857	45·3	6·3	39·0	6·6	32·4	1860	December.

Humidity.
)0
}4
'8
}1
'9
}2
R.
)1
)4
)2
35
)1
)1

HUMIDITY.

It is a matter for regret that there are so few observers of humidity, considered as a separate branch of meteorology from rainfall, in the district. The receipt of a greater number of trustworthy observations of simultaneous readings of dry and wet bulb thermometers would be highly esteemed. The observations require care in making, as errors in reading are very apt to arise, and, though apparently small at the time, produce grave discrepancies in the results. The instrument also requires frequent attention. At the same time care and attention are all that is required. The observations entail the expenditure of but little time and labour, and are amongst the most valuable for personal use at the time, as well as amongst the most useful for scientific discussion at the year's end.

The stations, from which the editors are able to give results for the year 1871, are five:—North Sunderland, Rothbury, North Shields, Durham, and Sedgefield. They have embodied them in a general table. In this they have given the station, and hour, at which the observations, upon which the results are based, were made, the mean monthly reading of the dry bulb, the mean monthly reading of the wet bulb, and the mean relative humidity. By this latter term is meant the proportion of moisture, present in the air, to the whole amount of moisture the air could have contained, at its existing temperature, had it been saturated. Those who are interested in this department of meteorology can, from the data given, work out, by the aid of Glaisher's excellent hygrometrical tables, all other hygrometrical results which they may desire.

Subjoined is a subsidiary table, summarising the results embodied in the general table, first, for the whole district, secondly, for the whole year.

MEAN AMOUNT OF HUMIDITY IN THE SEVERAL MONTHS OF 1871.

STATIONS.	JANUARY.			FEBRUARY.			MARCH.			APRIL.			MAY.			JUNE.		
	Mean Temp. Dry Bulb.	Mean Temp. Wet Bulb.	Mean Relative Humidity.	Mean Temp. Dry Bulb.	Mean Temp. Wet Bulb.	Mean Relative Humidity.	Mean Temp. Dry Bulb	Mean Temp. Wet Bulb.	Mean Relative Humidity.	Mean Temp. Dry Bulb.	Mean Temp. Wet Bulb.	Mean Relative Humidity.	Mean Temp. Dry Bulb.	Mean Temp. Wet Bulb.	Mean Relative Humidity.	Mean Temp. Dry Bulb.	Mean Temp. Wet Bulb.	Mean Relative Humidity.
North Sunderland (10 A.M.) ...	33·5	32·6	90	42·4	41·0	89	45·0	43·3	87	44·9	44·0	93	52·5	50·6	87	53·8	52·3	90
Rothbury (9 A.M.)	30·2	29·8	93	39·0	38·0	92	42·3	40·8	89	42·1	40·8	90	52·7	49·5	80	53·1	50·7	84
North Shields (I., 8 A.M.)	32·1	31·6	93	40·6	39·6	92	42·0	39·8	84	43·2	41·2	84	49·4	45·9	76	51·8	48·5	78
Durham (10 A.M. and 10 P.M.)..	31·6	30·2	81	40·4	39·0	89	43·0	40·5	81	43·2	40·9	82	48·8	46·1	81	51·2	48·4	81
Sedgefield (9 A.M.)	30·2	29·6	90	39·9	38·7	90	42·9	40·4	82	44·6	41·9	80	51·9	48·0	75	52·5	49·3	79
Average..............	...	...	89	...	...	90	...	...	85	...	...	86	...	...	80	...	...	82

	JULY.			AUGUST.			SEPTEMBER.			OCTOBER.			NOVEMBER.			DECEMBER.		
North Sunderland (10 A.M.). ...	63·0	61·4	90	62·3	60·7	91	55·6	54·2	91	49·6	48·6	93	40·3	39·0	90	39·3	38·2	91
Rothbury (9 A.M.).	60·5	57·0	80	61·7	58·5	82	52·5	50·7	88	...	...	...	37·4	36·6	93	36·5	35·8	94
North Shields (I., 8 A.M.).......	59·5	55·3	75	60·4	56·4	76	53·0	50·5	83	47·5	46·0	90	38·7	36·9	86	39·1	38·1	92
Durham (10 A.M. and 10 P.M.)..	58·3	55·2	81	61·5	57·2	76	52·4	49·6	81	47·4	45·8	89	37·3	35·9	88	38·8	37·0	85
Sedgefield (9 A.M.)...............	59·9	55·4	74	62·5	58·3	76	53·3	50·2	79	47·0	45·3	88	36·5	34·8	86	36·6	35·5	91
Average.	...	...	80	...	...	80	...	...	83	...	...	90	...	...	89	...	...	91

Mean Relative Humidity in 1871.

FOR WHOLE DISTRICT.				FOR WHOLE YEAR.	
MONTHS.	Humidity.	MONTHS.	Humidity.	STATIONS.	Humidity.
January	89	July	80	North Sunderland	90·2
February	90	August	80	Rothbury	87·7
March	85	September	83	North Shields (I.)	84·1
April	86	October	90	Durham	82·9
May	80	November	89	Sedgefield	82·5
June	82	December	91		
Average for Whole Year...... 85·5				Average for Whole District, 85·5.	

Mr. J. J. Plummer, of Durham Observatory, has kindly furnished also the following record of the mean estimated amount of cloud. The scale is from 0 to 10.

Mean estimated amount of CLOUD, *at Durham Observatory, in the several Months of* 1871.

MONTHS.	Cloud.	MONTHS.	Cloud.
January	6·21	July	7·03
February	7·70	August	3·92
March	5·74	September	7·23
April	7·52	October	5·85
May	5·90	November	5·61
June	7·23	December	6·59
Average for Whole Year.................. 6·38.			

PRESSURE.

The general table of Pressure is formed on a similar plan to those of Wind, Temperature, and Humidity, which have preceded it. It gives, in addition to the names of the stations, their height, as far as has been ascertained, above the level of the sea, the greatest and least pressures in each month, with the dates, the monthly range of pressure, and the mean daily pressure. Where the height of the barometer has been corrected for temperature the fact is indicated by the letter *t* annexed to

EXT

STATIONS.	Height in Feet above Level of Sea.	Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range
		JANUARY.				
North Sunderland	69	30·15	24	28·34	16	1·81
Alnwick	...	30·10	24, 27 28, 30 31	28·25	16	1·85
Cresswell	96	30·35	27, 28	28·63	16	1·72
Wallington	398·5	29·88	24	28·26	16	1·62
Cullercoats	...	30·30	30	28·52	15	1·78
North Shields (S. *t. d.*)	125	...	...	...	...	1·75
North Shields (I.)	...	30·30	24	28·51	16	1·79
South Shields	38	30·32	24	28·57	16	1·75
Wylam (*t. h.**)...	60	30·36	27	28·47	16	1·89
Bywell (*t. d.*)	86·5	...	...	...	...	1·75
Allenheads (*t. d.*)	1360	...	...	...	...	1·66
Durham	352·4	...	...	...	...	1·73
Seaham Hall	80	30·22	24, 29 30, 31	28·51	16, 17	1·71
Seaham	...	30·24	27	28·58	16	1·66
Sedgefield	360	30·31	30	28·59	16	1·72
Average	...	30·22	...	28·48	...	1·74
Greenwich (*t. d.*)	...	...	...	...	...	1·36
		JULY.				
North Sunderland	69	29·86	16, 31	29·00	26	0·86
Alnwick	...	29·78	16	28·85	26	0·93
Cresswell	96	30·10	6, 7 16, 17	29·30	25, 26	0·80
Wallington	398·5	29·70	16	28·86	26	0·84
Cullercoats	...	30·09	17	29·31	26	0·78
North Shields (S. *t. d.*)	125	...	...	...	...	0·88
North Shields (I.)	...	30·08	16	29·15	26	0·93
South Shields	38	...	...	...	...	...
Wylam (*t. h.**)	60	30·02	16	29·15	25	0·87
Bywell (*t. d.*)	86·5	...	...	...	...	0·91
Allenheads (*t. d.*)	1360	...	...	...	...	0·89
Durham	352·4	...	...	...	...	0·90
Seaham Hall	80	29·99	5, 6	29·22	26	0·77
Seaham	...	30·12	16	29·29	26	0·83
Sedgefield	360	30·08	16	29·15	26	0·93
Average	...	29·98	...	29·13	...	0·87
Greenwich (*t. d.*)	...	...	...	...	...	0·83

* At Wylam, the correction *h* is applied to the last column only (mean daily press

the name of the station, where it has been corrected for diurnal range by the letter *d*, where it has been corrected for height above the sea-level by the letter *h*. This latter correction appears to have been made only in the case of Wylam. In computing the averages, given in the line above Greenwich, Wylam has, for this reason, been omitted, and the averages may therefore be compared with the results exhibited for Wylam, as well as with those shown for Greenwich. Two subsidiary tables are given below, summarising some of the principal results embodied in the general table. The absence of complete details respecting some of the stations, and in particular respecting Allenheads, makes these subsidiary tables less perfect than the editors could have wished.

In addition to the subsidiary tables, a third is given, containing the mean monthly pressure, and the mean monthly range of pressure, at Durham Observatory, for the twenty-two years, 1850–1871. These interesting particulars have been supplied by Mr. J. J. Plummer, and are printed side by side with the same results for 1871, as embodied in the general table, for comparison.

I.

Average Extremes and Range of Pressure, and Mean Pressure, FOR WHOLE DISTRICT, *in the several Months of* 1871.

MONTHS.	Greatest Pressure.	Least Pressure.	Monthly Range.	Mean Daily Pressure.
January	30·22	28·48	1·74	29·52
February	30·17	29·18	0·98	29·64
March	30·42	29·20	1·22	29·72
April	30·13	28·95	1·17	29·54
May	30·30	29·51	0·78	29·85
June	30·23	29·37	0·85	29·73
July	29·98	29·13	0·87	29·50
August	30·35	29·26	1·11	29·72
September	30·34	29·19	1·16	29·68
October	30·34	28·97	1·38	29·65
November	30·22	29·26	0·97	29·77
December	30·29	29·15	1·16	29·71
Average for Whole Year	30·25	29·14	1·12	29·67

EXTREMES AND RANGE OF PRESSURE, AND MEAN PRESSURE, IN THE SEVERAL MONTHS OF 1871.

STATIONS.	Height in Feet above Level of Sea.	JANUARY. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	FEBRUARY. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	MARCH. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.
North Sunderland	69	30·15	24	28·34	16	1·81	29·56	30·18	28	29·08	5, 20	1·10	29·67	30·35	28	29·05	12	1·30	29·76
Alnwick	...	30·10	24, 27, 28, 30, 31	28·25	16	1·85	29·49	29·90	1	28·98	20	0·92	29·60	30·30	28	29·00	13	1·30	29·69
Cresswell	96	30·35	27, 28	28·63	16	1·72	29·79	30·35	21, 28	29·43	20	0·92	29·95	30·55	1, 28, 29	29·35	13	1·20	30·02
Wallington	398·5	29·88	24	28·26	16	1·62	29·35	29·94	28	28·80	20	1·14	29·46	30·10	28	28·90	12	1·20	29·55
Cullercoats	...	30·30	30	28·52	15	1·78	...	30·10	22	29·20	20	0·90	...	30·44	29	29·29	13	1·15	...
North Shields (S. *t. d.*)	125	...	...	...	...	1·75	29·69	...	...	...	...	1·00	29·81	...	...	...	...	1·24	29·87
North Shields (I.)	...	30·30	24	28·51	16	1·79	29·71	30·30	28	29·24	5	1·06	29·85	30·51	28	29·25	12	1·26	29·91
South Shields	38	30·32	24	28·57	16	1·75	29·75	30·24	21	29·34	20	0·90	29·90	30·53	28	29·30	12	1·23	29·96
Wylam (*t. h.**)	60	30·36	27	28·47	16	1·89	29·78	30·17	22	29·31	20	0·86	29·89	30·54	28	29·37	13	1·17	29·98
Bywell (*t. d.*)	86·5	...	...	...	...	1·75	29·63	...	...	...	...	0·90	29·75	...	...	...	...	1·23	29·83
Allenheads (*t. d.*)	1360	...	...	...	...	1·66	28·24	...	...	...	...	0·85	28·37	...	...	...	...	1·16	28·45
Durham	352·4	...	...	...	...	1·73	29·38	...	...	...	...	1·11	29·49	...	...	...	...	1·19	29·55
Seaham Hall	80	30·22	24, 29, 30, 31	28·51	16, 17	1·71	29·71	30·13	21, 22	29·25	20	0·88	29·77	30·44	29, 30	29·21	12, 13	1·23	29·86
Seaham	...	30·24	27	28·58	16	1·66	29·70	30·23	28	29·26	5	0·97	29·84	30·48	28	29·29	12	1·19	29·93
Sedgefield	360	30·31	30	28·59	16	1·72	29·75	30·36	28	29·26	5	1·10	29·89	30·51	28	29·32	12	1·19	29·94
Average	...	30·22	...	28·48	...	1·74	29·52	30·17	...	29·18	...	0·98	29·64	30·42	...	29·20	...	1·22	29·72
Greenwich (*t. d.*)	...	...	...	...	...	1·36	29·65	...	...	...	...	1·20	29·85	...	...	...	...	1·24	29·88

APRIL. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	MAY. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	JUNE. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	Height in Feet above Level of Sea.	STATIONS.
30·02	6, 7	28·89	19	1·13	29·60	30·21	28	29·36	3	0·85	29·90	30·12	26	29·29	18	0·83	29·79	69	North Sunderland.
30·00	6, 7	28·80	19	1·20	29·51	30·15	7, 28	29·35	4	0·80	29·84	30·10	26	29·15	18	0·95	29·71	...	Alnwick.
30·30	7	29·10	19	1·20	29·84	30·45	7	29·55	4	0·90	30·16	30·35	26	29·50	18	0·85	30·03	96	Cresswell.
29·82	6	28·69	19	1·13	29·39	29·98	29	29·23	4	0·75	29·67	29·92	1	29·08	18	0·84	29·58	398·5	Wallington.
30·20	7	29·06	19	1·14	...	30·36	7	29·60	4	0·76	...	30·30	26	29·48	19	0·82	...	...	Cullercoats.
...	...	...	...	1·20	29·70	...	...	...	...	0·74	30·01	...	...	...	...	...	29·84	125	North Shields (S. *t. d.*).
30·16	6, 7	28·97	19	1·19	29·73	30·35	28	29·56	4	0·79	30·04	30·27	26	29·43	18	0·84	29·93	...	North Shields (I.).
30·25	6	29·02	19	1·23	29·80	30·43	7	29·68	4	0·75	30·11	30·35	26	29·41	19	0·94	29·99	38	South Shields.
30·26	6	29·07	19	1·19	29·82	30·36	7	29·57	4	0·79	30·05	30·29	26	29·34	18	0·95	29·63	60	Wylam (*t. h.**).
...	...	...	...	1·13	29·65	...	...	...	...	0·75	29·95	...	...	...	...	...	29·83	86·5	Bywell (*t. d.*).
...	...	...	...	1·10	28·28	...	...	...	...	0·71	28·58	...	...	...	...	0·78	28·48	1360	Allenheads (*t. d.*).
...	...	...	...	1·18	29·37	...	...	...	...	0·72	29·68	...	...	...	...	0·85	29·57	352·4	Durham.
30·15	6, 7, 8	28·97	19, 20	1·18	29·68	30·33	6, 7	29·51	4	0·82	30·03	30·25	25	29·49	18	0·76	29·88	80	Seaham Hall.
30·18	6	28·97	19	1·21	29·72	30·38	7	29·60	4	0·78	30·05	30·36	26	29·46	18	0·90	29·95	...	Seaham.
30·22	6	29·03	19	1·19	29·76	30·36	7	29·62	4	0·74	30·05	30·27	26	29·43	18	0·84	29·94	360	Sedgefield.
30·13	...	28·95	...	1·17	29·54	30·30	...	29·51	...	0·78	29·85	30·23	...	29·37	...	0·85	29·73	...	Average.
...	...	...	...	1·04	29·65	...	...	...	...	0·58	29·91	...	...	...	...	0·76	29·76	...	Greenwich (*t. d.*).

Stations	Height	JULY. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	AUGUST. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	SEPTEMBER. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.
North Sunderland	69	29·86	16, 31	29·00	26	0·86	29·56	30·25	28	28·95	24	1·30	29·73	30·25	13, 14, 16	29·13	27	1·12	29·77
Alnwick	...	29·78	16	28·85	26	0·93	29·44	30·20	28	29·12	18	1·08	29·68	30·20	14	29·05	28	1·15	29·67
Cresswell	96	30·10	6, 7, 16, 17	29·30	25, 26	0·80	29·82	30·50	28	29·45	17	1·05	30·06	30·50	13, 14, 15	29·35	28	1·15	30·02
Wallington	398·5	29·70	16	28·86	26	0·84	29·36	30·00	28	28·86	24	1·14	29·57	30·00	14	28·90	27	1·10	29·55
Cullercoats	...	30·09	17	29·31	26	0·78	...	30·50	28	29·50	18	1·00	...	30·50	14	29·36	28	1·14	...
North Shields (S. *t. d.*)	125	...	...	...	...	0·88	29·66	...	...	...	...	1·13	29·89	...	...	...	...	1·19	29·87
North Shields (I.)	...	30·08	16	29·15	26	0·93	29·71	30·42	28	29·38	18	1·04	29·95	30·41	14	29·21	27	1·20	29·91
South Shields	38	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...
Wylam (*t. h.**)	60	30·02	16	29·15	25	0·87	29·70	30·43	28	29·17	25	1·26	29·92	30·39	14	29·24	28	1·15	29·89
Bywell (*t. d.*)	86·5	...	...	...	...	0·91	29·60	...	...	...	...	1·26	29·81	...	...	...	...	...	...
Allenheads (*t. d.*)	1360	...	...	...	...	0·89	28·29	...	...	...	...	1·12	28·50	...	...	...	...	1·02	28·45
Durham	352·4	...	...	...	...	0·90	29·36	...	...	...	...	1·04	29·57	...	...	...	...	1·29	29·53
Seaham Hall	80	29·99	5, 6	29·22	26	0·77	29·67	30·33	28	29·41	18	0·92	29·88	30·39	12, 13, 14	29·33	28	1·06	29·85
Seaham	...	30·12	16	29·29	26	0·83	29·77	30·55	28	29·27	24	1·28	30·01	30·44	14, 16	29·29	30	1·15	29·95
Sedgefield	360	30·08	16	29·15	26	0·93	29·77	30·42	28	29·37	24	1·05	29·95	30·41	14	29·11	27	1·30	29·91
Average	...	29·98	...	29·13	...	0·87	29·50	30·35	...	29·26	...	1·11	29·72	30·34	..	29·19	...	1·16	29·68
Greenwich (*t. d.*)	...	...	...	...	...	0·83	29·69	...	...	...	...	1·05	29·86	...	...	...	...	1·26	29·72

OCTOBER. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	NOVEMBER. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	DECEMBER. Greatest Pressure.	Day.	Least Pressure.	Day.	Monthly Range.	Mean Daily Pressure.	Height	Stations
30·22	10	28·87	1	1·35	29·65	30·12	19	29·16	8	0·96	29·92	30·18	7	29·02	28	1·16	29·76	69	North Sunderland.
30·20	10	28·80	1	1·40	29·60	30·10	5, 19	29·02	8	1·08	29·75	30·19	8	28·95	28	1·24	29·72	...	Alnwick.
30·50	10	29·15	1, 2	1.35	29·93	30·38	19	29·43	8	0·95	30·04	30·45	8	29·33	28	1·12	30·01	96	Cresswell.
30·00	12	28·71	1	1·29	29·48	29·87	19	28·98	8	0·89	29·58	29·95	8	28·92	28	1·03	29·38	398·5	Wallington.
30·42	10	29·12	2	1·30	...	30·34	5	29·34	8	1·00	...	30·23	11	29·12	28	1·11	...	...	Cullercoats.
...	...	...	...	1·46	29·80	...	...	...	...	1·00	29·94	...	...	...	...	1·19	29·77	125	North Shields (S. *t. d.*).
30·39	10	28·96	1	1·43	29·86	30·30	19	29·32	8	0·98	29·98	30·41	8	29·21	28	1·20	29·95	...	North Shields (I.).
30·44	10	29·19	2	1·25	29·95	...	...	29·36	8	...	29·99	30·41	13	29·26	28	1·15	29·98	38	South Shields.
30·41	10	29·13	2	1·28	29·82	30·32	19	29·87	14	0·45	29·94	30·41	8	29·18	28	1·23	29·88	60	Wylam (*t. h.**).
...	...	...	...	1·40	29·76	...	...	...	...	0·95	29·89	...	...	...	...	1·18	29·85	86·5	Bywell (*t. d.*).
...	...	...	...	1·35	28·38	...	...	...	...	0·92	28·49	...	...	...	...	1·18	28·48	1360	Allenheads (*t. d.*).
...	...	...	...	1·42	29·48	...	...	...	...	1·00	29·59	...	...	...	...	1·17	29·57	352·4	Durham.
30·29	12	28·95	1	1·34	29·77	30·22	18, 19	29·36	7, 8	0·86	29·88	30·28	7, 8	29·26	27, 28	1·02	29·87	80	Seaham Hall.
30·46	11	28·98	1	1·48	29·94	30·24	1, 19	29·32	8	0·92	29·95	30·35	8, 13	29·12	28	1·23	29·93	...	Seaham.
30·44	10	28·98	1	1·46	29·87	30·39	5	29·33	8	1·06	30·06	30·45	8	29·26	28	1·19	29·97	360	Sedgefield.
30·34	...	28·97	...	1·38	29·65	30·22	...	29·26	...	0·97	29·77	30·29	...	29·15	...	1·16	29·71	...	Average.
...	...	...	...	1·39	29·79	...	...	...	...	0·99	29·82	...	...	...	...	1·10	29·93	...	Greenwich (*t. d.*).

* At Wylam, the correction *h* is applied to the last column only (mean daily pressure), in each month. A further correction, also, is applied to the same column in each month, "to bring the results into accordance with the daily mean of Scarboro', Shields, and Leith, as published in the Meteorological Chart, issued daily from the Meteorological Office Westminster."

II.

Extremes and Range of Pressure, and Mean Pressure, at the several Stations, FOR WHOLE YEAR, 1871.

STATIONS.	Greatest Pressure.	DATE.	Least Pressure.	DATE.	Yearly Range.	Mean Daily Pressure throughout Year.
North Sunderland	30·35	Mar. 28	28·34	Jan. 16	2·01	29·72
Alnwick	30·30	Mar. 28	28·25	Jan. 16	2·05	29·64
Cresswell	30·55	Mar. 1, 28 29	28·63	Jan. 16	1·92	29·97
Wallington	30·10	Mar. 28	28·26	Jan. 16	1·84	29·49
Cullercoats	30·50	Aug. 28 Sept. 14	28·52	Jan. 15	1·98	...
North Shields (S.)	...	......	...	......	...	29·82
North Shields (I.)	30·51	Mar. 28	28·51	Jan. 16	2·00	29·88
Wylam	30·54	Mar. 28	28·47	Jan. 16	2·07	29·86
Bywell	...	......	...	......	...	29·78
Allenheads	...	......	...	......	..	28·42
Durham........................	...	......	...	......	...	29·51
Seaham Hall..................	30·44	Mar. 29, 30	28·51	Jan. 16, 17	1·93	29·82
Seaham	30·55	Aug. 28	28·58	Jan. 16	1·97	29·90
Sedgefield	30·51	Mar. 28	28·59	Jan. 16	1·92	29·91
Average for Whole District	30·44	......	28·47	......	1·97	29·67
Greenwich.....................	...	......	...	......	...	29·79

Mean Daily Pressure and Range of Pressure, in each Month, at Durham Observatory, for the Year 1871, *together with the Means of similar results* FOR TWENTY-TWO YEARS, *from* 1850 *to* 1871, *inclusive.*

MONTHS.	Mean Daily Pressure, 1871.	Mean Daily Pressure, 1850-1871.	Difference.	Monthly Range, 1871.	Mean Monthly Range, 1850-1871.	Difference.
January	29·376	29·378	—·002	1·728	1·532	+·196
February.........................	29·487	29·512	—·025	1·108	1·451	—·343
March	29·552	29·488	+·064	1·191	1·387	—·196
April	29·372	29·536	—·164	1·183	1·196	—·013
May	29·684	29·554	+·130	0·717	0·979	—·262
June...............................	29 569	29·551	+·018	0·848	0·904	—·056
July	29·357	29·513	—·156	0·896	0·886	+·010
August	29·574	29·512	+·062	1·036	0 944	+·092
September	29·529	29·525	+·004	1·291	1·224	+·067
October	29·484	29·432	+·052	1·420	1·379	+·041
November	29·592	29·504	+·088	1·001	1·456	—·455
December	29·574	29·473	+·101	1·170	1·481	—·311
Average for whole period...	29·513	29·498	+·015	1·132	1·235	—·103

ONTIN

Place.	Saughtree.		Kieldar.		Falstell.	
Height of Gauge... Above Sea Level	760 feet.		673 feet.		in.	
Above Ground...	10 inches.		1 ft. 6 in.		3 feches.	
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.
	Inches.		Inches.		Inches.	
January	2·04	12	2·24	8	1·17	18
February	3·84	23	3·62	12	2·99	16
March	2·34	11	2·98	13	2·06	14
April	4·18	21	4·15	20	4·00	20
May	1·14	11	1·53	4	1·21	12
June	3·10	11	2·46	7	2·21	14
July	6·42	29	5·26	24	4·74	25
August	2·17	14	3·16	11	2·49	8
September	2·47	10	2·72	9	2·03	16
October	3·76	20	4·35	17	3·99	20
November	2·80	13	4·04	10	1·66	20
December	5·50	19	7·16	18	5·90	21
Total for 1871	40·76	194	43·67	153	34·55	204
,, 1870	......	...	......	...	......	195
,, 1859	......	...	......	...	......	204
,, 1868	......	...	......	...	......	199
,, 1867	......	...	......	...	......	227
,, 1866	......	...	......	...	......	230
,, 1865	......	...	......	...	......	186
,, 1864	......	...	......	...	......	188
,, 1863	......	...	......	...	......	198
,, 1862	......	...	......	...	......	199
,, 1861	......	...	......	...	......	213
,, 1860	......	...	......	...	......	259
,, 1859	......	...	......	...	......	182
,, 1858	......	...	......	...	......	165
,, 1857	......	...	......	...	......	...
,, 1856	......	...	......	...	......	...
Average of Years	......	...	......	...	......	178 9 yrs.
Difference in 1871 from Mean	......	...	......	...	......	+26 Days

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RAINFALL FOR 1871 (Continued).

TYNE DISTRICT.

Place.	Saughtree.		Kieldar.		Falstone.		Byrness.		Otterburn.		Haltwhistle, Unthank Hall.	
Height of Gauge … Above Sea Level	760 feet.		673 feet.				700 feet.		500 feet.		380 feet.	
Height of Gauge … Above Ground…	10 inches.		1 ft. 6 in		3 feet.		2 „		1 foot.		9 inches.	
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.	
January	2·04	12	2·24	8	1·17	11	No returns recorded for 1871.	...	No returns recorded for 1871.	...	2·33	14
February	3·84	23	3·62	12	2·99	18		...		...	2·17	17
March	2·34	11	2·98	13	2·06	11		...		...	1·63	12
April	4·18	21	4·15	20	4·00	20		...		...	3·45	20
May	1·14	11	1·53	4	1·21	5		...		...	1·27	8
June	3·10	11	2·46	7	2·21	10		...		...	2·27	11
July	6·42	29	5·26	24	4·74	24		...		...	4·63	27
August	2·17	14	3·16	11	2·49	12		...		...	2·34	8
September	2·47	10	2·72	9	2·03	13		...		...	4·40	14
October	3·76	20	4·35	17	3·99	18		...		...	2·78	18
November	2·80	13	4·04	10	1·66	9		...		...	1·81	14
December	5·50	19	7·16	18	5·90	22		...		...	3·93	21
Total for 1871	40·76	194	43 67	153	34·55	173	28·12	...	26·45	...	33·01	185
„ 1870	......	...	......	...	......	...	34·35	170	29·88	...	26·90	162
„ 1869	......	...	......	...	......	...	37·26	187	34·06	145	33·07	189
„ 1868	......	...	......	...	......	...	......	...	31·59	154	......	...
„ 1867	......	...	......	...	......	...	......	...	36·02	...	......	...
„ 1866	......	...	......	...	......	...	......	...	......	...	......	...
„ 1865	......	...	......	...	......	...	......	...	......	...	......	...
„ 1864	......	...	......	...	......	...	......	...	......	...	......	...
„ 1863	......	...	......	...	......	...	......	...	......	...	......	...
„ 1862	......	...	......	...	......	...	......	...	......	...	......	...
„ 1861	......	...	......	...	......	...	......	...	......	...	......	...
„ 1860	......	...	......	...	......	...	......	...	......	...	......	...
„ 1859	......	...	......	...	......	...	......	...	......	...	......	...
„ 1858	......	...	......	...	......	...	......	...	......	...	......	...
„ 1857	......	...	......	...	......	...	......	...	......	...	......	...
„ 1856	......	...	......	...	......	...	......	...	......	...	......	...
Average of Years	......	...	......	...	......	...	33·24 3 years	...	31·60 3 years.	149 2 yrs	30·99 3 years.	168 3 yrs
Difference in 1871 from Mean	......	...	......	...	......	...	......	...	......	...	+2·92 Inches.	+17 Days

Place.	Bellingham, Hesleyside.		Allenheads.		Park End, Hexham.		Whittle Dean Reservoir.	Hallington Village.	Fawcett.	Woodford.	Camphill, Gunnerton.	Green Crag.	Valley of No. Tyne.
Height of Gauge … Above Sea Level	420 feet.		1369 feet.		276 feet.		400 feet.	469 feet.	563 feet.	500 feet.	676 feet.	800 feet.	300 feet.
Height of Gauge … Above Ground…	3 ft. 10 in.		9 inches.		4 inches.		10 inches.	10 inches.	19 inches.	19 inches.	10 inches.	10 inches.	10 inches.
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Quantity.	Quantity.	Quantity.	Quantity.	Quantity.	Quantity.
	Inches.		Inches.		Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
January	Monthly returns not furnished.	...	3·17	25	2·53	...	0·90	2·17	1·69	2·04	1·78	1·69	1·90
February		...	4·49	27	1·33	...	1·42	2·16	1 90	1·78	1·85	2·01	1·61
March		...	2·60	19	1·04	...	0·98	1·32	1·07	1·27	1·38	1·63	1·24
April		...	3·05	26	3·46	...	3·18	3·35	3 41	3·41	3·65	3·66	3·31
May		...	1·52	14	0·98	...	0·40	0·65	0·48	0·51	0 67	0·90	0·75
June		...	3·09	20	2·74	...	4·07	2·23	2·17	2·18	2·33	2·32	2·38
July		...	4·46	30	3·42	...	3·18	3·13	3·03	2·72	2·61	3·12	3·10
August		...	2·34	14	2·75	...	2·40	3·22	3·29	3·77	3·75	4·05	4·00
September		...	6·76	19	2·91	...	3·87	4·61	4·29	3·85	3·58	3·68	3·07
October		...	4·29	22	3·08	...	2·78	2·82	2·75	2·89	2·71	2·85	2·67
November		...	3·00	23	2·47	...	2 46	1·85	1·72	1·76	1·52	1·37	1·80
December		...	3·99	26	3·07	...	1·36	3·11	2·79	3·13	3·41	4·21	2·89
Total for 1871	32·46	86	42·76	265	29·78	...	27·00	30·62	28·59	29·31	29·24	31·49	28·72
„ 1870	31·99	74	44·29	248	25·16	162	19·38	26·19	23·26	25·56	24·84	25·58	22·89
„ 1869	49·52	108	54·40	267	33·43	201	23·06	28·54	26·96	29·36	20·90	30·59	29·20
„ 1868	......	...	56·40	266	34·33	203	23·77	28·69	27·08	29·17	30·60	29·89	30·11
„ 1867	......	...	49·45	268	28·53	216	23·39	25·07	25·66	29·65	29·95	28·49	26·97
„ 1866	......	...	56·84	287	41·83	228	33·45	33·42	31·35	33·84	34·18	34·28	33·45
„ 1865	......	...	44·42	248	29·80	...	......	......	......	......	......	......	......
„ 1864	......	...	43·24	258	29·02	...	25·92	27·70	26·25	26·08	23·09	27·69	24·96
„ 1863	......	...	54·01	...	41·77	...	27·09	32·66	31·56	30·25	32·31	30·40	31·31
„ 1862	......	...	44·20	281	34·76	...	24·32	27·62	25·95	24·93	29·45	22·19	26·68
„ 1861	......	...	49·35	282	31·07	...	......	......	......	......	......	......	......
„ 1860	......	...	59·15	297	31·04	...	......	......	......	......	......	......	......
„ 1859	......	...	47·70	259	......	...	......	......	......	......	......	......	......
„ 1858	......	...	37·21	229	26·00	...	......	......	......	......	......	......	......
„ 1857	......	...	41·79	...	25·68	...	......	......	......	......	......	......	......
„ 1856	......	...	45·48	...	45·87	...	......	......	......	......	......	......	......
Average of Years	37·39 3 years.	89 3 yrs	48·15 16 years.	251 13 yrs	32·60 15 years.	202 5 yrs	25·26 9 years.	28·94 9 years.	27·41 9 years.	28·68 9 years.	29·38 9 years.	28·93 9 years.	28·25 9 years.
Difference in 1871 from Mean	−5·53 Inches.	−3 Days	−5·39 Inches.	+15 Days	−2·82 Inches.	...	+1·74 Inches.	+1·98 Inches.	+1·18 Inches.	+0·63 Inches.	−0·4 Inches.	+2·56 Inches.	+0·47 Inches.

Place.	Bywell.		Wylam.		Stamfordham Ground.	Shotley Hall.		Newcastle, 30, Rye Hill.		Newcastle, Deaf and Dumb Institution.		Newcastle, Lit. and Phil. Institution.	
Height of Gauge … Above Sea Level	8 ft. 6 in.		60 feet.		400 feet.	312 feet.		200 feet.		200 ft. 9 in.		105 feet.	
Height of Gauge … Above Ground…	6 inches.		5 „		1 foot.	3 inches.		1 ft. 6 in.		6 inches.		7 inches.	
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.
	Inches.		Inches.		Inches.	Inches.		Inches.		Inches.		Inches.	
January	1·50	18	1·26	11	1·25	1·11	11	1·27	10	1·35	19	0·30	3
February	2·46	16	1·54	8	2·20	1·89	9	1·48	12	1·70	19	0·37	3
March	1·20	14	0·88	12	0·76	1·30	8	0·68	13	0·83	15	0·37	7
April	3·40	20	3·61	18	3·61	2·72	16	3·12	19	3·31	23	3·04	14
May	0·90	12	0·88	7	0·74	1·14	8	1·47	7	1·53	23	0·60	4
June	3·60	14	3·13	11	3·25	2·40	12	2·98	11	2·82	11	1·87	7
July	4·40	25	2·85	21	3·55	2·91	22	2·57	21	2·77	23	2·00	14
August	3·77	8	0·87	8	1·32	0·82	24	0·79	5	0·97	5	0·87	7
September	3·48	16	5·28	13	5·27	5·93	16	4 76	14	4·57	19	4·68	15
October	3·30	20	2·78	15	0 83	2·54	14	2·57	14	2·55	19	2·91	14
November	3·28	20	2·11	16	2·27	2·25	14	1·97	16	1·91	17	1·67	14
December	2·24	21	1·50	13	1·46	1·90	10	1·79	17	1·85	15	2·83	14
Total for 1871	33·53	204	26 69	153	26 51	26·96	144	25·45	159	26·16	219	20·91	116
„ 1870	25·84	195	24·43	154	26·15	25·47	118	22·61	144	25·10	181	23 58	109
„ 1869	24·97	204	25·15	157	24·93	26·22	148	25·48	179	24·78	155	30·01	160
„ 1868	27·70	199	26·43	131	25·41	28·01	148	......	...	24·51	154	26·25	175
„ 1867	27·55	227	22·38	144	25·53	......	...	......	...	......	...	22·29	134
„ 1866	29·19	230	29·81	173	30·09	......	...	......	...	......	...	22·19	169
„ 1865	29·82	186	29·67	156	27·41	......	...	......	...	......	...	21·24	124
„ 1864	28·81	188	27·57	206	26·93	......	...	......	...	......	...	......	...
„ 1863	28·49	198	28·39	185	28·60	......	...	......	...	......	...	......	...
„ 1862	26·49	199	24·68	211	26·00	......	...	......	...	......	...	......	...
„ 1861	23·80	213	23 58	...	26·22	......	...	......	...	......	...	19·58	...
„ 1860	38·00	259	31·38	...	35·26	......	...	......	...	......	...	27·40	...
„ 1859	27·34	182	25·15	...	27·85	......	...	......	...	......	...	18·41	...
„ 1858	21·88	165	18·20	...	29·19	......	...	......	...	......	...	13.29	...
„ 1857	27·55	...	24·47	...	28·86	......	...	......	...	......	...	16·43	...
„ 1856	29·82	...	29·25	...	35·06	......	...	......	...	......	...	21·22	...
Average of Years	28·88 16 years.	178 9 yrs.	26·07 16 years.	167 yrs.	28·75 16 years.	26·60 4 years.	139 yrs	24·52 3 years.	160 3 yrs.	25·14 4 years.	177 4 y	21·75 13 years.	137 7 yrs
Difference in 1871 from Mean	+4·65 Inches.	+26 Days	+0·62 Inches.	−14 Days	−2·24 Inches.	+0·30 Inches.	+5 Days	+0·93 Inches.	+1 Days	+1·02 Inches.	+42 Days	−1·56 Inches.	−21 Days

Place.	Wallsend.		North Shields, Rosella Place.		North Shields, Clementhorpe.		North Shields, Low Lights.		Tynemouth Pier Works		South Shields, Marine School.	
Height of Gauge … Above Sea Level	100 feet.		125 feet.		150 feet.		12 feet.		61 ft. 10 in.			
Height of Gauge … Above Ground…	6 inches		1 foot.		1 foot.		3 ft. 1 in.		1 ft. 2 in.			
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.	
January	1·18	...	1·13	17	0·93	12	1·00	12	0·66	8	1·16	16
February	1.88	...	1·97	18	1·59	13	1·84	13	1·85	17	1·84	15
March	0·67	...	0·69	13	0·44	9	0·53	11	0·54	11	0·64	16
April	3·72	...	3·79	23	3·51	17	3·49	17	3·32	19	3·33	20
May	1·36	...	1·59	13	1·50	11	1·44	10	1·19	13	1·34	12
June	2·63	...	2·54	13	2·38	10	2·71	11	2·92	14	2·49	13
July	3·53	...	3·79	27	3·34	23	3·17	22	3·49	27	......	...
August	0·89	...	0·96	6	0·95	6	0·94	4	0·94	6	......	...
September	4·28	...	4·01	18	3·99	17	3·92	18	4·74	18	......	...
October	2·37	...	1 96	17	1·77	14	1·80	13	1 83	15	1·54	15
November	1·77	...	1·84	20	1·43	17	1·68	17	1·68	17	1·54	18
December	1·76	...	1·91	19	1·57	14	1·59	14	1·66	17	1·51	18
Total for 1871	25·89	...	26·18	204	23·40	163	24·11	162	24·82	183	......	...
„ 1870	23·90	...	25·22	172	21·74	152	23·65	149	23·38	173	......	...
„ 1869	24·35	91	23·93	166	20·70	163	22·12	160	22·62	174	......	...
„ 1868	24·49	118	23·35	178	20·92	174	22·46	171	21·01	170	......	..
„ 1867	25·24	...	26·61	163	......	...	22·49	175	24·22	...	......	...
„ 1866	26·65	...	25·39	188	......	...	26·62	192	23·68	...	......	...
„ 1865	27·29	...	26·89	130	......	...	25·56	142	23·47	...	......	...
„ 1864	27·82	...	26·00	...	......	...	27·60	...	......	...	......	...
„ 1863	26·24	...	24·70	...	......	...	24·74	224	......	...	......	...
„ 1862	25·68	...	28·01	...	......	...	28·01	260	......	...	......	...
„ 1861	24·62	...	24·76	...	......	...	24·76	264	......	...	......	...
„ 1860	34·12	...	32·19	...	......	...	32·18	290	......	...	......	..
„ 1859	23·51	...	......	...	......	...	......	...	......	...	......	...
„ 1858	......	...	......	...	......	...	......	...	......	...	......	...
„ 1857	......	...	......	...	......	...	......	...	......	...	......	...
„ 1856	......	...	......	...	......	...	......	...	......	...	......	...
Average of Years	26·14 13 years.	...	26·10 12 years.	171 yrs	21·71 4 years.	163 yrs	25·38 12 years.	199 11 yrs	23·31 7 years.	175 yrs	......	...
Difference in 1871 from Mean	+0·28 Inches.	...	+0·08 Inches.	+35 Days	+1·69 Inches.	...	−1·27 Inches.	−37 Days	+1·51 Inches.	+8 Days	......	...

L FOR

Place.	Dinsdale, near Darlington.		Darlington (Southend).		Darli- (Brink-	erland, Hendon -ouse.		S
Height of Gauge... Above Sea Level	54 feet.		150 feet.		160	2 feet.		
Height of Gauge... Above Ground...	2 ,,		10 inches.		1	1 foot.		
Month.	Quantity.	Days on wh Rain fell.	Quantity.	Days on wh Rain fell.	Quantit	ty.	Days on wh Rain fell.	Qu
	Inches.		Inches.		Inches	s.		In
January	No returns for 1871.	...	Monthly returns not furnished.	...	0·80	1	22	
February		...		...	1·60	7	21	
March		...		...	0·55	6	20	
April		...		...	3·00	5	22	
May		...		...	0·70	3	19	
June		...		...	4·90	0	20	
July		...		...	4·07	9	28	
August		...		...	0·95	4	9	
September		...		...	4·40	5	4*	
October		...		...	1·50	0	18	
November		...		...	0·80	3	17	
December		...		...	1·20	7	17	
Total for 1871	......	...	21·10	...	23·47	0	...	2
,, 1870	23·39	146	21·15	...	19·65	1	158	2
,, 1869	26·32	155	24·03	125	25·75	5	160	2
,, 1868	24·96	187	37·25	...	21·75	9	...	2
,, 1867	26·66	175	40·79	...	......	.	...	2
,, 1866	29·95	...	38·71	...	......	.	...	2
,, 1865	22·50	...	27·05	...	......	.	...	3
,, 1864	......	...	22·11	...	......	.	...	
,, 1863	......	...	19·26	...	......	.	...	
,, 1862	......	...	21·24	...	......	.	...	
,, 1861	......	...	32·83	...	......	.	...	
,, 1860	......	...	31·86	...	......	.	...	
,, 1859	......	...	27·65	...	......	.	...	
,, 1858	......	...	......	...	......	.	...	
,, 1857	.. ...	...	......	...	......	.	...	
,, 1856	......	...	......	...	......	.	...	
Average of Years	25·51 6 Years.	...	26·46 13 years.	...	22·65 4 years.	9 rs.	159 2 yrs	2 7
Difference in 1871 from Mean	......	...	—5·35 Inches.	...	+0·82 Inches.	6 s.	—1 Day.	— In

NOTES ON THE RAINFALL OF 1871.

Mr. Symons reports that on the whole July was the month of greatest rainfall throughout the British Isles, although it was surpassed in England by September, and in Wales by October. By far the driest month was May, and it was almost equally dry in all parts of the country.

January.—Rainfall above the average in South Wales, parts of Devon, Worcester, and Kent; below it in all other places; and less than half the average in the Midland Counties, Yorkshire, and some stations in Scotland.

February.—In England the fall was above the average, except in Kent, Oxfordshire, and Leicester. It was above it at all the Welsh stations, and at most of those in Scotland and Ireland. In Skye only three-quarters average, and on East Coast of Scotland it was more than double the usual amount.

March.—Much drier than usual.

April.—Quite a contrast to the previous month. At most stations it was more than twice the average, at many it was more than three times the average, and in the counties of Fife and Forfar it was more than four times the average.

May.—A very dry month, the rainfall scarcely half the average.

June.—Another rather dry month, but not uniformly so.

July.—Much more wet than usual. At a great many stations the fall was twice the average, and at some two and a half times. It seems to have been uniformly wet over the whole of the British Isles.

August.—The ordinary rainfall was not half the average.

September.—The rainfall of this month was very irregularly distributed. It was very much below the average in Scotland and the West of Ireland; near its normal value in North Wales; and about two or two and a half times its usual amount in South Wales and throughout England.

RAINFALL FOR 1871.

TEES DISTRICT.

Place.	Dinsdale, near Darlington.		Darlington (Southend).		Darlington (Brinkburn).		Hartlepool, Haugh Lighthouse.		Greta Bridge.		Egglescliffe, near Yarm.		Sedgefield, Durham County Asylum.		Gainford.	
Height of Gauge... Above Sea Level	54 feet.		150 feet.		160 feet.		36 feet.		431 feet.		80 feet.		360 feet.		251·8 feet.	
Height of Gauge... Above Ground...	2 „		10 inches.		1 foot.		5 inches.		5 inches.		1 foot.		10 inches.		1 foot.	
Month.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.	
January	No returns for 1871.	...	Monthly returns not furnished.	...	0·80	3	1·12	11	1·70	4	0·44	8	0·97	11	1·07	13
February		...		...	1·60	8	1·72	15	2·70	7	1·43	16	1·54	14	1·54	14
March		...		...	0·55	6	0·58	11	1·69	11	0·64	9	0.66	9	1·07	11
April		...		...	3·00	9	3·10	19	2·60	13	2·38	17	3·07	9	2·86	16
May		...		...	0·70	6	1·67	12	0·74	3	2·02	8	1·74	12	1·28	6
June		...		...	4·90	6	3·39	17	3·10	10	3 98	18	3·48	10	3·20	14
July		...		...	4·07	17	5·40	25	3·47	18	4·83	25	4·62	20	3·11	29
August		...		...	0·95	3	1·05	8	1·18	6	1·08	7	0·66	7	1·25	7
September		...		...	4·40	8	6·29	16	6·45	12	5·29	16	5·46	13	5·52	12
October		...		...	1·50	9	2·39	17	2·52	17	1·99	14	2·78	16	1·98	20
November		...		...	0·80	8	1·91	15	1·11	13	1·61	12	1·86	13	1·22	13
December		...		...	1·20	8	2·07	17	1·93	10	1·65	14	1·46	18	1·87	16
Total for 1871	......	...	21·10	...	23·47	91	30·69	183	29·19	124	27·34	164	28·40	162	25·97	171
„ 1870	23·39	146	21·15	...	19·65	83	23·78	174	25·61	90	20·89	153	23·39	151	21·62	142
„ 1869	26·32	155	24·03	125	25·75	102	24·50	...	30·98	129	23·74	186	28·88	194	26·75	...
„ 1868	24·96	187	37·25	...	21·75	97	......	...	28·89	...	20·38	167	26·93	206	......	...
„ 1867	26·66	175	40·79	...	......	...	......	...	22·24	...	23·23	175	25·56	238	......	...
„ 1866	29·95	...	38·71	...	......	...	......	...	29·42	...	26·27	...	30·27	...	......	...
„ 1865	22·50	...	27·05	...	......	...	......	...	26·73	...	......	...	25·57	...	......	...
„ 1864	......	...	22·11	...	......	...	......	...	24·26	...	......	...	......	...	......	...
„ 1863	......	...	19·26	...	......	...	......	...	26·25	...	......	...	......	...	......	...
„ 1862	......	...	21·24	...	......	...	......	...	25·84	...	......	...	......	...	......	...
„ 1861	......	...	32·83	...	......	...	......	...	24·54	...	......	...	......	...	......	...
„ 1860	......	...	31·86	...	......	...	......	...	30·28	...	......	...	......	...	......	...
„ 1859	......	...	27·65	...	......	...	......	...	26·74	...	......	...	......	...	......	...
„ 1858	......	...	......	...	......	...	......	...	21·56	...	......	...	......	...	......	...
„ 1857	.. ...	...	......	...	......	...	......	...	23·93	...	......	...	......	...	......	...
„ 1856	......	...	......	...	......	...	......	...	27·30	...	......	...	......	...	......	...
Average of Years	25·51 6 Years.	...	26·46 13 years.	...	22·65 4 years.	93 4 yrs.	26·32 3 years.	178 2 yrs.	28·51 17 years.	114 3 yrs.	23·64 6 years.	169 5 yrs.	27·00 7 years.	190 5 yrs.	24·78 3 years.	156 2 yrs.
Difference in 1871 from Mean	......	...	—5·35 Inches.	...	+0·82 Inches.	...	+4·37 Inches.	+5 Days	+0·68 Inches.	+10 Days.	+3·70 Inches.	—5 Days	+1·40 Inches.	—28 Days	+1 19 Inches.	+15 Days

WEAR DISTRICT.

Place.	Stanhope Castle.	St. John's, Wolsingham.		Wolsingham.		Ushaw College.		Durham Observatory.		Sunderland, West Hendon House.	
Height of Gauge... Above Sea Level	670 feet.	927 feet.		464 feet.		600 feet.		352 ft. 5 in.		132 feet.	
Height of Gauge... Above Ground...	3 „	1 foot 1 inch.		1 foot.		10 inches.		4 ft. 6 in.		1 foot.	
Month.	Quantity.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.
	Inches.	Inches.		Inches.		Inches.		Inches.		Inches.	
January	Monthly returns not furnished.	1·57	10	1·80	21	1·17	12	0·86	11	0·91	22
February		2·53	15	2·44	18	1·78	14	1·69	15	1·67	21
March		1·76	13	1·53	14	0·93	12	0·70	8	0·66	20
April		3·38	15	2·55	15	3·12	16	3·23	14	2·95	22
May		1 53	8	1·40	10	1·89	10	1·85	8	1·13	19
June		3·31	13	3·14	11	3·41	14	2·85	12	2·70	20
July		3·32	22	3·13	19	3·35	19	3·05	20	3·69	28
August		2·87	10	2·88	7	1·49	6	0·88	5	0 64	9
September		6·11	15	5·73	14	5·03	14	4·64	15	4·25	4*
October		3·02	19	2·54	14	2·35	14	1·90	16	1·50	18
November		1·50	11	2·04	15	1·56	15	1·63	12	1·63	17
December		2·70	15	2·35	15	1·80	16	1·41	18	1·57	17
Total for 1871	32·82	33·60	166	31·53	173	27·88	162	24·69	154	23·30	...
„ 1870	31·52	29·27	146	31·18	166	24·86	159	24·66	165	22·91	158
„ 1869	44 16	30·87	167	36·70	177	26·82	163	29·56	169	24·25	160
„ 1868	39·68	38·53	199	......	...	25·75	174	30·77	191	21·29	...
„ 1867	32·33	32·53	192	......	...	25·85	159	19·45	...	......	...
„ 1866	41·24	36·90	218	......	...	31·26	190	25·10	...	......	...
„ 1865	......	28·91	199	......	...	29·73	168	24·51	...	......	...
„ 1864	......	......	...	......	...	24·59	...	23·24	...	......	...
„ 1863	......	......	...	......	...	28·90	...	24·09	...	......	...
„ 1862	......	......	...	......	...	22·95	..	21·82	...	......	...
„ 1861	......	......	...	......	...	26·03	...	24·28	...	......	...
„ 1860	......	......	...	......	...	......	...	30·33	...	......	...
„ 1859	......	......	...	......	...	......	...	21·57	...	......	...
„ 1858	......	......	...	......	...	......	...	18·73	...	......	...
„ 1857	......	......	...	......	...	......	...	26·55	...	......	...
„ 1856	......	......	...	......	...	......	...	29·65	...	......	...
Average of Years	36·92 6 years.	32·91 7 years.	183 Days	33·13 3 years.	172 3 yrs.	26.78 11 years.	168 7 yrs.	26·78 16 years.	144 4 yrs.	22·99 4 years.	159 2 yrs
Difference in 1871 from Mean	—4·10 Inches.	+0·69 Inches.	—17 Days	—1·60 Inches.	+1 Day.	+1·10 Inches.	—6 Days	—1·82 Inches.	+10 Days	+0·36 Inches.	—1 Day.

* Imperfect.

COAST DISTRICT.

Place.	North Sunderland.		Cresswell.	Howick.		Whitley, The Vicarage.		Whitley Convalescent Home.	Earsdon.		Tynemouth Pier Works.		Seaham Hall.	
Height of Gauge... Above Sea Level	69 feet.		96 feet.	120 ft. 6 in.		82 feet.		18 feet.	185 feet.		61 ft. 10 in.		80 feet.	
Height of Gauge... Above Ground...	1 ft. 2 in.		...	10 inches.		9 inches.		9 inches.	2 feet 10 inches.		1 ft. 2 in.		1 foot.	
Month.	Quantity.	Days on which Rain fell.	Quantity.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.
	Inches.		Inches.	Inches.		Inches.		Inches.	Inches.		Inches.		Inches.	
January	1·17	14	1·24	0·94	3	1·04	15	1·41	1·06	8	0·66	8	2·27	...
February	2·31	16	2·10	2·85	8	1·96	17	1·82	1·77	11	1·85	17	2·01	...
March	0·93	15	0·46	0·40	3	0·29	14	0·28	0·48	7	0·54	11	0·46	...
April	3·53	22	3·47	3·96	8	3·53	12	3·52	2·43	16	3·32	19	2·59	...
May	1·37	10	1·30	1·28	6	1·14	15	1·08	1·49	9	1·19	13	1·49	...
June	1·19	12	2·14	1·39	3	2·63	13	2·23	2·41	12	2·92	15	2·69	...
July	2·82	19	2.64	4·25	17	3·38	19	3·06	3·36	23	3·49	27	3·93	...
August	1·12	9	1·46	1·33	6	1·23	5	1·23	1·16	5	0·94	6	0·76	..
September	2·75	17	4·06	3·19	13	3·17	15	3·17	3·86	17	4·74	18	4·97	...
October	2·26	17	2·11	2·85	15	2·12	14	1·82	1·64	12	1·83	15	1·59	...
November	1·72	20	1·69	1·28	10	1·71	15	1·35	1·55	15	1·68	17	2·34	...
December	1·46	15	1·09	1·88	7	1·70	18	1·85	2·13	14	1·66	17	1·56	...
Total for 1871	22·63	186	23·77	25·50	99	23 84	172	22·82	23·34	149	24·82	183	26·66	...
„ 1870	22·57	179	20·55	22·99	120	21·79	115	15·12	21·04	119	23·38	173	21·63	102
„ 1869	20·09	173	19·61	22·66	130	23·03	...	8 months	21·85	129	22·68	174	24·22	132
„ 1868	23·23	162	19·82	25·22	124	25·37	...	......	......	...	21·05	170	22·56	145
„ 1867	24·40	170	19·95	24·98	159	23·45	...	......	......	...	24·22	...	23·61	151
„ 1866	25·75	189	26·37	28·88	168	28·35	...	......	......	...	23·68	...	28·32	154
„ 1865	32·47	...	25·78	28·64	...	26·99	..	......	......	...	23·47	...	26·07	...
„ 1864	......	...	22·42	22·01	...	26·64	...	......	......	...	......	...	22·74	...
„ 1863	......	...	21·38	18·34	...	......	...	......	......	...	......	...	26·15	...
„ 1862	......	...	24·77	19·30	...	......	...	......	......	...	......	...	......	...
„ 1861	......	...	20·46	18·30	...	......	...	......	......	...	......	...	......	...
„ 1860	......	...	26·78	27·48	...	......	...	......	......	...	......	...	......	...
„ 1859	......	...	20·55	18·84	...	......	...	......	......	...	......	...	......	...
„ 1858	......	...	19·43	22·51	...	......	...	......	......	...	......	...	......	...
„ 1857	......	...	20·76	20·77	...	......	...	......	......	...	......	...	......	...
„ 1856	......	...	24·88	22·58	...	......	...	......	......	...	......	...	......	...
Average of Years	24·44 7 years.	176	22·32 16 years.	23·07 16 years.	136 6 yrs	24·93 8 years.	143 2 yrs.	......	22·07 3 years.	132 3 yrs.	23·32 7 years.	125 4 yrs.	24·66 9 years.	136 5 yrs.
Difference in 1871 from Mean	—1·81 Inches.	+10 Days	+1·45 Inches.	+2·43 Inches.	—37 Days	—1·19 Inches.	+29 Days	......	+1·27 Inches.	+17 Days	+1·50 Inches.	+58 Days	+2 Inches.	...

COQUET, WANSBECK, AND ALN DISTRICTS.

Place.	Harbottle		Meldon Park, Morpeth.		Wallington.		Rothbury.		Brinkburn Priory.		Lilburn Tower.	Glanton Pike.	Millfield, near Wooler.	Middleton Hall, nr. Belford
Height of Gauge... Above Sea Level	500 feet.		...		398 ft. 6 in.		400 feet.		300 feet.		300 feet.	534 feet.	200 feet.	...
Height of Gauge... Above Ground...	1 foot.		...		1 foot.		...		1 foot.		6 „	...	4 inches.	...
Month.	Quantity.	Days on which Rain fell	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Days on which Rain fell.	Quantity.	Quantity.	Quantity.	Quantity.
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.	Inches	Inches.	Inches.
January	......	...	1·40	*	1·54	. .	1·95	3	1·32	6	Monthly returns not furnished.	1·88	0·52	1·44
February	......	..	2·82	7	3·03	...	4·07	10	3·03	11		2·25	3·20	2·60
March	......	...	0·68	12	1·07	...	0·95	5	0·91	10		1·47	1·39	1·11
April	1·79	8	4·01	23	4·78	...	4·25	13	4·45	19		3·64	4·40	4·20
May	1·12	5	1·02	9	0·96	...	1·01	5	1·01	6		0·99	1·12	1·24
June	2·03	7	3·00	13	2·83	...	2·79	7	2·86	9		2·81	2·82	2·11
July	2·98	18	2·90	24	3·29	...	1·14	6	3·25	18		4·51	2·80	1·09
August	1·37	5	1·72	8	1·87	...	1·40	4	0·29	5		1·52	1·47	1·51
September	3·76	12	5·04	19	5·15	...	3·92	9	4·69	12		2·31	4·00	4·09
October	3·58	13	2·86	17	3·19	...	3·00	10	4·58	15		3·32	2·32	2·28
November	2·54	10	2·04	20	2·22	...	2·33	12	2·93	13		2·58	3·65	2·76
December	3·00	15	1·82	17	2·26	...	2·58	8	1·90	10		2·89	1·98	1·55
Total for 1871	22·17	93	28·49	...	32·19	209	29·39	92	31·22	134	25·44	30·17	29·13	25·98
„ 1870	9 months	...	......	...	28·81	203	27·24	67	29·36	...	23·27	25·38	23 84	19·20
„ 1869	......	...	......	...	29·25	193	26·94	86	25·24	...	23·97	25·[illegible]4	23·34	25·20
„ 1868	......	...	......	...	31·47	209	25·54	79	26 69	...	27·42	30·15	27·51	29·20
„ 1867	......	...	......	...	28·99	198	16·25†	...	33·68	...	26·61	27·82	24·45	24·19
„ 1866	......	...	......	...	......	...	......	...	33·87	...	30·02	35·06	32·18	26·89
„ 1865	......	...	......	...	......	...	......	...	32·45	...	30·39	34·26	28·65	28·92
„ 1864	......	...	......	...	......	...	......	...	29·54	...	31·97	28·69	......	30·10
„ 1863	......	..	......	...	......	...	......	...	......	...	25·86	30·09	......	......
„ 1862	......	...	......	...	......	...	......	...	......	...	30·04	27·12	......	......
„ 1861	......	...	......	...	......	...	.. ...	...	......	...	26·17	27·10	......	......
„ 1860	......	...	......	...	......	...	......	...	......	...	......	......	......	......
„ 1859	......	...	......	...	......	...	......	...	......	...	25·98	......	......	......
„ 1858	......	...	......	...	......	...	......	...	......	...	24·27	......	......	......
„ 1857	......	...	......	...	......	...	......	...	......	...	27·11	.. ...	......	......
„ 1856	......	...	......	...	......	...	......	...	......	...	32·90	......	......	......
Average of Years	......	...	......	...	30·14 5 years.	202 5 yrs.	27·27 4 years.	81 4 yrs	30·25 8 years.	134	27·43 15 years.	29 18 11 years.	27·01 7 years.	26·19 8 years.
Difference in 1871 from Mean	......	...	......	...	+2·09 Inches.	+7 Days	+2·22 Inches.	+11 Days	+0·97 Inches.	...	—1·99 Inches.	+0·99 Inches.	+2·12 Inches.	—0·21 Inches.

* Part of Month Estimated.

† Imperfect.

October.—The fall of this month was pretty evenly distributed. It was rather in excess along a belt running from Penzance to York, but in other parts it was only between half and three-quarters of its usual amount.

November.—This month was a dry one, very few stations (except in Scotland) having half their average fall; those in the South East of England not one quarter of it.

December.—Slightly below the average in the South of England, in Scotland, and in Ireland, and slightly above it in the North of England and in parts of Wales.

EXTREMES OF RAINFALL IN 1871.

The following returns are taken from Mr. Symons' valuable yearly publication on "British Rainfall.

ENGLAND.

GREATEST.	INCHES.	LEAST.	INCHES.
Seathwaite, Westmorland ...	115·15	Pampisford Hall, Cambridge	18·60
Grasmere (Easedale Tarn) ...	92·00	Royston..........................	19·07
Dartmoor Prison Garden......	79·63	Cambridge Observatory	19·12

WALES.

GREATEST.	INCHES.	LEAST.	INCHES.
Beddgelert	110·89	Maes-y-dre	24·63
Aberdare	81·60	Llanerch St. Asaph	27·12
Dylive	70·70	Brymbo..........................	28·23

SCOTLAND.

GREATEST.	INCHES.	LEAST.	INCHES.
Bridge of Orchy	137·82	Invershin	26·18
Loch Lomond (Firkin)	97·80	Dingwall Academy	22·19
Ballachulish	83·59	Logie, Coldstone	24·27

IRELAND.

GREATEST.	INCHES.	LEAST.	INCHES.
Killarney	62·72	Agolah	24·17
Letterkenny	52·63	Dublin (Fitzwilliam Square)	25·37
Ballyhyland	47·41	Portarlington	28·51

RAIN AND SNOW.

	JANUARY.		FEBRUARY.		MARCH.		DECEMBER.		TOTAL.	
	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.
1854	3·65	14	0·39	5	0·29	5	1·75	15	31·10	147
1855	1·27	10	2·61	16	2·02	13	1·05	11	24·23	139
1856	1·67	14	1·55	11	0·14	4	4·51	13	29·25	146
1857	2·54	13	1·15	7	2·48	15	0·42	8	24·47	133
1858	0·46	4	0·51	5	0·80	7	1·40	14	18·23	127
1859	0·63	12	0·75	15	1·95	7	2·95	17	25·45	153
1860	4·10	20	1·77	16	2·19	20	4·53	25	31·38	219
1861	0·89	15	2·97	14	1·84	19	1·04	16	23·54	200
1862	2·10	16	1·48	16	3·61	24	0·92	19	24·68	211
1863	3·50	23	0·55	9	2·10	14	1·35	14	28·39	185
1864	0·76	13	1·96	21	3·79	20	3·05	22	27·57	206
1865	1·21	14	1·50	14	1·54	17	1·00	14	29·67	161
1866	1·63	17	2·61	16	2·99	20	1·83	13	29·81	173
1867	4·08	22	0·67	8	1·85	18	1·84	11	22·40	144
1868	3·15	18	1·89	14	1·72	8	3·93	24	26·43	132
1869	1·97	12	1·56	13	1·89	15	2·77	18	25·15	157
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			·43	148
									·69	153
									·267	16,300

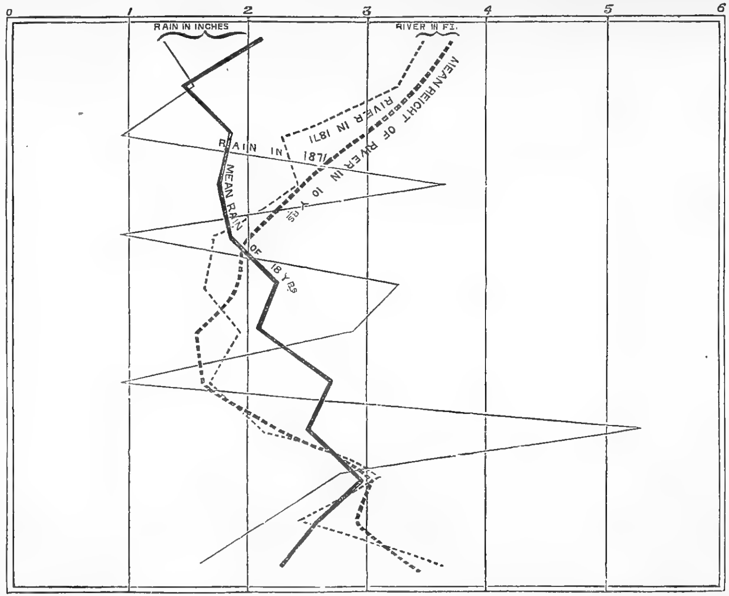
1 inches

an inch
which is
w was in

Ballyhyland .... 47·41 | Portarlington 2

Diagram of Rainfall at Wylam in 1871, *with Mean for* 18 *Years; and Height of Tyne, at Wylam Bridge, in* 1871, *with Mean for* 10 *Years.*

Rainfall.	1871.		1854–1871.	
	Inches.	Days.	Inches.	Days.
Jan. ...	1·26	11	2·04	14·6
Feb. ...	1·54	8	1·52	12·5
Mar. ...	0·88	12	1·86	14·0
April...	3·61	16	1·78	11·7
May ...	0·88	7	1·83	11·7
June...	3·13	11	2·25	11·5
July ...	2·85	21	2·06	12·0
Aug....	0·87	8	2·67	14·5
Sept....	5·28	13	2·50	14·7
Oct. ...	2·78	15	2·96	14·5
Nov....	2·11	16	2·54	15·3
Dec. ...	1·50	13	2·25	15·9
Totals.	26·69	151	26·26	163



Height of Tyne.	1871.	1862–71.
	Feet.	Feet.
Jan....	3·46	3·72
Feb....	3·24	3·42
Mar....	2·25	2·97
April...	2·40	2·54
May ...	1·70	2·03
June...	1·60	1·85
July ...	1·90	1·53
Aug....	1·64	1·66
Sept....	2·06	2·23
Oct. ...	3·08	3·06
Nov....	2·40	2·89
Dec....	3·75	3·42
Means.	2·46	2·61

RAIN AND SNOW AT WYLAM FOR 18 YEARS (FROM 1854 TO 1871, BOTH INCLUDED).

	JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.		TOTAL.	
	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days	Amount	Days.	Amount	Days.
1854	3·65	14	0·39	5	0·29	5	0·52	5	2·18	18	4·00	10	3·29	17	6·52	20	0·52	8	2·53	9	5·16	21	1·75	15	31·10	147
1855	1·27	10	2·61	16	2·02	13	0·22	5	1·35	10	3·85	15	1·33	12	3·60	15	0·31	4	3·59	13	2·73	15	1·05	11	24·23	139
1856	1·67	14	1·55	11	0·14	4	2·27	13	3·37	16	2·90	15	1·71	9	3·85	13	4·83	16	1·03	11	1·42	11	4·51	13	29·25	146
1857	2·54	13	1·15	7	2·48	15	2·82	12	1·39	12	2·27	7	1·43	10	2·90	8	3·22	13	1·56	13	2·29	15	0·42	8	24·47	133
1858	0·46	4	0·51	5	0·80	7	0·61	7	0·79	13	1·63	8	3·40	11	1·94	17	2·91	14	1·66	17	2·12	10	1·40	14	18·23	127
1859	0·63	12	0·75	15	1·95	7	3·16	19	0·27	3	2·01	10	3·00	11	1·80	13	2·63	17	3·66	12	2·64	17	2·95	17	25·45	153
1860	4·10	20	1·77	16	2·19	20	0·97	14	2·21	14	3·58	18	2·71	14	2·13	21	1·11	15	3·02	19	3·06	23	4·53	25	31·38	219
1861	0·89	15	2·97	14	1·84	19	1·17	13	0·71	10	2·17	17	3·37	25	1·76	14	2·63	19	1·23	13	3·76	25	1·04	16	23·54	200
1862	2·10	16	1·48	16	3·61	24	1·34	16	2·60	18	3·17	19	1·91	20	3·47	15	1·30	14	1·87	18	0·91	16	0·92	19	24·68	211
1863	3·50	23	0·55	9	2·10	14	1·04	16	1·22	14	3·89	17	1·29	9	2·91	20	3·14	21	3·96	17	3·14	11	1·35	14	28·39	185
1864	0·76	13	1·96	21	3·79	20	1·04	11	2·73	14	1·16	16	0·67	17	1·58	17	1·99	26	6·67	18	2·17	21	3·05	22	27·57	206
1865	1·21	14	1·50	14	1·54	17	1·24	10	4·56	16	0·63	3	2·56	8	2·36	22	0·32	4	9·51	21	2·74	18	1·00	14	29·67	161
1866	1·63	17	2·61	16	2·99	20	3·52	12	1·15	7	1·23	12	3·22	12	3·65	20	4·54	24	0·70	10	2·74	10	1·83	13	29·81	173
1867	4·08	22	0·67	8	1·85	18	1·84	12	2·22	11	1·53	8	2·81	14	2·00	12	2·03	15	0·94	9	0·59	4	1·84	11	22·40	144
1868	3·15	18	1·89	14	1·72	8	3·60	13	0·77	5	0·54	2	0·57	4	2·23	8	4·26	13	1·31	11	2·46	12	3·93	24	26·43	132
1869	1·97	12	1·56	13	1·89	15	2·07	10	3·86	16	1·45	7	0·29	7	1·25	10	2·94	17	2·13	14	2·97	15	2·77	18	25·15	157
1870	1·55	15	1·94	17	1·35	11	1·01	5	0·72	7	1·40	12	0·63	5	2·39	8	1·07	11	4·81	22	2·73	15	4·83	20	24·43	148
1871	1·26	11	1·54	8	0·88	12	3·61	18	0·88	7	3·13	11	2·85	21	0·87	8	5·28	13	2·78	15	2·11	16	1·50	13	26·69	153
Mean	2·040	14·6	1·522	12·55	1·857	14·00	1·781	11·72	1·832	11·72	2·252	11·50	2·058	12·00	2·677	14·50	2·502	14·67	29·59	14·55	2·541	15·28	2·258	15·89	26·267	16,300

In these 18 years the greatest fall in one year was 31·38 inches in 1860. The greatest number of wet days was 219 in the same year. The month of greatest fall was October, 1865, when 9·51 inches of Rain fell; the day of greatest fall was on the 18th of the same month—the amount in 24 hours being 2·30 inches.

The year of least Rain was 1858, only 18·23 inches being received in the guage; this was also the year of fewest wet days, as there were only 127 days on which more than one hundredth of an inch of water—or melted Snow—fell. The month of March, 1856, was the dryest month, only 0·14 of Rain falling; and June, 1868, had the fewest wet days, viz., 2. With regard to the Snow (which is counted, in a melted form, as Rain, and included in the Rain table), it only fell once, during the 18 years, so late as May; and twice, so early as October. 76 per cent. of the annual fall of Snow was in the first three months of the year. The greatest amount in one year was 6·27 in 1864; and the least 0·93 in 1858;—the greatest amount in one day was 1·80 on December, 26, 1856.

SNOW (INCLUDED IN ABOVE TABLE) SEPARATELY.

	JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.		OCTOBER.		NOVEMBER.		DECEMBER.		TOTAL.	
	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.	Amount	Days.
1854	1·35	4	0·11	1	...	...	0·01	1	...	...	...	...	2·31	8	0·43	1	4·21	15
1855	1·05	9	2·18	14	0·61	5	...	...	...	...	...	...	...	...	0·54	3	4·38	31
1856	0·14	2	0·60	2	...	...	...	...	...	...	...	...	0·46	3	2·40	4	3·60	11
1857	1·21	6	0·70	3	0·89	3	0·08	2	...	...	...	...	...	...	...	...	2·88	14
1858	...	...	0·27	2	0·66	4	...	...	...	...	...	...	...	...	...	...	0·93	6
1859	0·13	2	0·08	1	...	...	0·27	1	...	...	0·20	1	0·04	1	0·69	3	1·41	9
1860	1·06	5	1·44	8	0·04	1	...	...	1·31	1	...	...	0·08	1	...	...	3·93	16
1861	0·27	5	0·30	2	0·17	1	...	...	...	...	...	...	0·69	4	...	...	1·43	12
1862	0·15	2	0·28	3	1·55	7	...	...	...	...	...	...	0·28	2	...	...	2·26	14
1863	0·28	1	...	...	1·31	4	...	...	...	...	...	...	...	...	...	...	1·59	5
1864	0·49	2	1·27	14	3·26	12	0·13	2	...	...	...	...	...	...	1·12	4	6·27	34
1865	0·50	3	0·96	6	0·94	7	...	...	...	...	...	...	...	...	...	...	2·40	16
1866	0·03	1	1·20	1	1·03	4	...	...	...	...	...	...	...	...	0·26	1	2·52	7
1867	3·61	19	...	...	1·06	12	...	...	...	...	...	...	...	...	0·99	4	5·66	35
1868	1·38	8	...	...	...	...	1·42	2	...	...	...	...	0·70	1	...	...	3·50	11
1869	...	...	0·01	1	1·32	11	...	...	...	...	0·03	1	0·21	2	0·55	2	2·12	17
1870	...	...	1·14	8	1·11	4	...	...	...	...	...	...	1·97	5	1·75	8	5·97	25
1871	0·63	6	0·32	2	0·32	5	...	...	...	...	...	...	...	...	0·36	2	1·63	15
Totals	12·28	75	10·86	62	14·27	80	1·91	8	1·31	1	0·23	2	6·74	27	9·09	32	56·69	293

MONTHLY HEIGHT OF TYNE AT WYLAM BRIDGE FOR 10 YEARS (IN FEET).

	JAN.	FEB.	MAR.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.	Mean.	Highest.	Date.	Lowest.	Date.
1862	2·50	2·17	2·93	2·71	2·44	3·23	2·50	2·45	1·48	4·37	2·21	3·30	2·69	16·0 ft.	Oct. 22	1 ft.	Sept.&c.
1863	5·00	3·28	2·22	2·45	2·65	2·94	1·27	1·09	3·39	3·29	4·39	3·00	2·91	17·5 ,,	Jan. 1	0·7 ,,	Aug.&c.
1864	3·10	3·30	3·83	2·40	1·60	1·75	1·19	0·99	2·16	3·60	2·30	3·30	2·46	16·5 ,,	Mar. 15	0·7 ,,	July,&c.
1865	2·64	3·20	2·50	1·78	1·50	1·63	1·33	1·90	1·14	3·06	3·11	3·16	2·26	13·0 ,,	Oct. 17	0·7 ,,	Oct., &c.
1866	4·80	3·60	3·36	3·14	1·67	1·38	1·65	3·00	3·94	4·14	3·87	3·62	3·18	15·5 ,,	Oct. 30	1· ,,	Often.
1867	4·90	3·60	3·20	3·50	2·80	1·80	1·90	1·60	2·10	2·10	1·71	4·00	2·77	14·0 ,,	Jan. 8	1· ,,	Often.
1868	3·06	4·15	3·95	2·90	1·87	1·22	0·93	1·27	2·12	2·54	2·91	3·69	2·55	16·0 ,,	{Jan 14} {Dec 31}	0·8 ,,	July,&c.
1869	3·60	4·90	2·80	2·40	2·10	1·30	1·20	1·56	2·69	1·90	4·30	3·06	2·64	17·5 ,,	Feb. 8	1· ,,	Often.
1870	3·92	2·83	2·70	1·70	2·00	1·57	1·48	1·10	1·30	2·50	1·67	3·27	2·17	11·0 ,,	{Jan. 8} {Dec 15}	1 ,,	Often.
1871	3·46	3·24	2·25	2·40	1·70	1·60	1·90	1·64	2·06	3·08	2·40	3·75	2·46	14·0 ,,	Jan. 17	1·3 ,,	June.
Mean	3·718	3·422	2·974	2·538	2·033	1·845	1·535	1·660	2·228	3·058	2·887	3·415	2·609				

On December 7, 1856, there was a flood which rose to 19 feet of the guage.

Mr. Atkinson states the zero of his scale of feet on South Pier of Wylam Bridge to be 14·38 above the ordnance zero; and the fall of the river between the Crow Tree Bank at Ovingham and Wylam Bridge (4,525 yards) to be 12·02 feet, or 4·68 feet per mile.

Mr. Procter has again recorded the observations on the depth of the wells at the Low Lights, North Shields. They are as follows:—

MONTHLY DEPTH OF WATER IN THREE WELLS.

1871.	11 Ft. Deep. No. 1.		23 Ft. Deep. No. 2.		15 Ft. Deep. No. 3.		Depth.
	Ft.	In.	Ft.	In.	Ft.	In.	
January	8	2	19	11	12	3	Taken 4 times.
February	8	2	20	1	12	6	,, 3 ,,
March	8	1	19	7	10	4	,, 3 ,,
April	8	2	19	9	11	2	,, 3 ,,
May	8	2	19	4	10	4	,, 3 ,,
June	7	10	19	1	9	10	,, 3 ,,
July	7	11	19	4	9	1	,, 4 ,,
August	7	5	18	8	7	11	,, 3 ,,
September	7	8	18	4	8	3	,, 2 ,,
October	8	2	20	0	11	8	,, 4 ,,
November	8	2	19	10	11	4	,, 4 ,,
December	8	2	20	3	12	5	,, 2 ,,

NOTES ON PLANTS.

In addition to the large amount of information contained in the tables, comprising the budding, leafing, blossoming, and fall of the leaf, of forest trees and shrubs, the sowing, gathering, and yield, of grain and other crops, the blossoming and yield of standard fruit trees, and the flowering of wild plants, &c., in 1871, the editors have received many valuable notes from different stations, which are arranged under their respective months below.

Mr. Coppin has kindly furnished the Club, as in former years, with a very interesting table of the flowering of wild and garden plants, in the neighbourhood of Tynemouth. This has, for greater convenience, been printed on the same sheet with a portion of the other tables.

January.—

Acklam.—Winter aconite in flower on the 17th.

Gainford.—Hepatica in flower on the 20th.

February.—

Wallington.—Roses suffered very much from the frost, especially the China roses, many of which were killed down to the

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BLOSSOMING OF WILD FLOWERS, 1871.

WILD FLOWERS	ROTHBURY.	CRESS-WELL.	MELDON.	WAL-LINGTON.	NORTH SHIELDS (C).	SEAHAM HALL.	ACKLAM.	GRETA BRIDGE.
	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.
Anemone	April 14	April 1	Mar. 23	Mar. 22	......	April 1	April 18	April 8
Bulbous Crow-foot	May 11	April 8	May 29	May 16	May 8	May 10	May 20	......
Coltsfoot	......	Mar. 25	Mar. 24	Mar. 18	Feb. 24	Feb. 23	Mar. 9	......
Cowslip	April 15	April 16	May 1	April 8	April 21	April 10	April 13	May 3
Dandelion	April 20	Mar. 28	April 15	Mar. 24	April 27	April 1	Mar. 8	April 30
Forget-me-not	June 10	June 1	May 27	June 11	......	May 20	May 18	April 26
Garlic	......	July 12	May 23	May 26	......	May 10	May 22	May 15
Hyacinth	......	May 25	May 9	May 24	......	May 16	May 26	May 23
Lily of the Valley	......	May 15	May 25	May 22	......	May 27	May 12	June 1
Marsh Marigold	......	May 2	May 5	April 15	......	April 20	April 19	......
Pilewort	......	April 1	Mar. 25	Mar. 21	Mar. 15	Mar. 10	Mar. 13	......
Primrose	Mar. 19	Mar. 21	Mar. 27	Mar. 1	April 6	Mar. 10	April 16	Mar. 30
Red Poppy	......	July 12	July 10	......	......	May 30	June 17	Sept. 6
Stitchwort	......	May 20	May 19	May 24	Mar. 3	May 6	May 10	May 23
Snowdrop	Feb. 28	Feb. 20	Feb. 15	Feb. 8	......	Feb. 2	Feb. 7	Feb. 9
Strawberry	......	April 12	May 23	Mar. 24	......	April 1	May 15	May 15
Veronica Chamædrys	......	May 20	May 21	May 27	May 4	May 10	May 5	......
Violet	......	Mar. 20	May 21	Mar. 1	Mar. 25	Mar. 8	Mar. 9	April 12

BLOSSOMING AND YIELD OF STANDARD FRUIT TREES, &c., 1871.

STANDARD FRUIT TREES, &c.	CRESSWELL.		MELDON.		WALLINGTON.		NORTH SHIELDS (C)	SEAHAM HALL.		ACKLAM.		GRETA BRIDGE.	
	In Blossom.	Yield.	In Blossom.	Yield.	In Blossom.	Yield.	In Blossom.	In Blossom	Yield.	In Blossom.	Yield.	In Blossom.	Gathered.
Apple	May 12	Scarce	May 2[illegible]1	Not half crop...	May 12	Quarter crop ...	May 6	......	Scarce	May 5	Very bad	May 20	October 14
Cherry	April 15	Partial	May [illegible]4	Very bad	May 1	Failure	April 17	......	Partial	April 21	Good	April 22	June 20
Pear	April 15	Partial	May [illegible]9	Fair	May 7	Failure	April 21	......	Scarce	April 26	Moderate	......	......
Plum	April 15	Good	May [illegible]4	Good	April 25	Failure	...	......	Scarce	April 8	Scarce	April 23	October 6
Currant	April 8	Plentiful	May 7 (bl'k) April 29 (red)	Good	April 13	Abundant ...	Mar. 28	April 1	Partial	April 18	Good	April 16	July 1
Gooseberry	Mar. 30	Partial	April 4	Very bad	April 1	Abundant	Mar. 29	April 1	Partial	Mar. 30	Good	Mar. 20	July 30
Raspberry	June 6	Partial	June 16	Good	June 12	Abundant	......	May 30	Good	June 5	Good	May 15	July 21
Strawberry	May 25	Partial	May 16	Good	May 16	Abundant	May 6	May 30	Good	May 19	Good	May 22	July 23

SOWING, YIELD, &c., OF GRAIN AND OTHER CROPS, 1871.

CROPS.	MELDON.			WALLINGTON.			WHITLEY.	NORTH. SHIELDS (C)	SEAHAM HALL.	ACKLAM.		
	Sown.	Cut, or Gathered.	Yield.	Sown.	Cut, or Gathered.	Yield.	Sown.	Cut, or Gathered.	Yield.	Sown.	Cut, or Gathered.	Yield.
Barley	....	Aug. 28	Very good	....	....	....	......	Aug. 22	....	Mar. 28	Aug. 22	Good.
Beans	....	....	....	....	....	....	Feb. 16	......	....	Mar. 4	Sept. 21	Good.
Hay	....	July 10	Extra good	Old Land...	July 12	Heavy	......	......	....	....	July 7	Fair.
Mangold	May 13	....	Good	....	....	....	......	......	Good	April 20	Oct. 20	Good.
Oats	....	Aug. 26	Good	April 7	Sept. 15	Good	......	Aug. 26	Good	Mar. 25	Aug. 29	Moderate.
Pease	....	Sept. 18	Fair	....	....	....	Feb. 15	......	Good	Mar. 1	Aug. 15	Fair.
Potatoes	May 12	Sept. 25	Fair	May 16	Oct. 8	Good	Feb. 20	......	Good	April 6	Sept. 18	Moderate.
Turnips	....	....	Very good	June 5	Oct. to Dec.	Large & good.	......	......	Good	May 17	Oct. 31	Good.
Wheat	Oct. 25	Sept. 12	Very good	....	....	....	......	Aug. 29	Good	Mar. 6	Aug. 31	Good.

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BLOSSOMING, &c., OF FOREST TREES AND SHRUBS, 1871.

FOREST TREES AND SHRUBS.	ROTHBURY.				CRESSWELL.				MELDON.				WALLINGTON.			
	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Bud.	In Leaf.	In Blossom	Divested of Leaves.
Alder	April 6	April 28	......	Oct. 26	......	May 15	Mar. 25	Nov. 10	Mar. 31	May 24	Mar. 27	Nov. 16	April 5	April 30	Mar. 19	Oct. 28
Ash	......	May 26	......	Oct. 14	......	June 8	Mar. 25	Oct. 25	April 22	May 30	May 24	Nov. 4	April 12	May 22	April 25	Oct. 23
Barberry	April 11	April 26	......	Nov. 4	......	May 1	April 28	Nov. 5	Mar. 12	April 30	June 8	Dec. 1	Mar. 8	April 1	May 24	Nov. 24
Beech	......	May 3	......	Nov. 6	......	May 20	May —	Nov. 20	April 1	May 13	May 31	Nov. 26	Mar. 25	May 1	May 13	Oct. 27
Birch	April 12	May 10	......	Oct. 29	......	May 20	Mar. 25	Nov. 1	Mar. 29	May 9	May 3	Oct. 26	Mar. 24	May 8	May 26	Nov. 4
Black Thorn	......	......	......	......	Mar. 25	May 27	April 16	Nov. 1	Mar. 6	April 29	April 27	Nov. 9	Mar. 8	April 18	May 12	Nov. 6
Bramble	......	April 18	......	Dec. 13	......	May 1	June 20	Nov. 20	Feb. 12	April 1	June 30	......	Mar. 16	May 1	July 30	......
Broom	......	......	May 2	......	......	May 12	April 16	Nov. 1	Mar. 27	May 18	May 24	Nov. 8	Mar. 18	May 15	May 27	Nov. 4
Elder	Mar. 8	April 4	......	Nov. 19	......	April 15	June 20	Oct. 25	Feb. 4	Mar. 14	July 7	Dec. 3	Feb. 12	Mar. 22	June 28	Nov. 26
Elm	......	......	......	......	......	May 20	Mar. 20	Oct. 20	Mar. 25	May 15	April 3	Oct. 24	April 15	May 20	Mar. 20	Nov. 14
Flowering Currant	Mar. 10	April 16	......	Nov. 10	Mar. 1	April 16	Mar. 20	Nov. 4	Feb. 12	Mar. 18	April 18	Nov. 15	Feb. 22	Mar. 16	April 1	Nov. 26
Hawthorn	......	......	May 14	Nov. 4	Mar. 25	April 15	May 23	Nov. 10	Mar. 3	April 24	June 1	Dec. 1	Mar. 1	April 13	May 30	Nov. 1
Hazel	......	......	......	......	......	May 15	Feb. 28	Nov. 6	Feb. 17	May 8	Feb. 17	Nov. 29	Mar. 1	April 18	Mar. 3	Nov. 28
Holly	......	......	......	......	......	......	May 20	......	April 20	June 10	June 5	Sept. 14	Mar. 26	June 1	May 28	July 15
Honeysuckle	......	Mar. 16	......	Nov. 9	......	Mar. 20	July 4	Nov. 8	Feb. 4	Mar. 16	June 27	Dec. 4	Jan. 10	Mar. 1	June 2	Dec. 2
Laburnum	......	......	......	......	Mar. 25	May 18	June 18	Nov. 8	Mar. 30	May 20	June 7	Nov. 13	Mar. 10	April 28	June 13	Oct. 25
Larch	......	......	......	......	......	April 8	Mar. 30	Nov. 1	Mar. 4	April 14	April 1	Nov. 15	Mar. 3	April 10	April 20	Nov. 8
Lilac	Mar. 16	......	May 25	......	Mar. 20	May 1	May 20	Nov. 6	Feb. 24	April 14	May 27	Nov. 10	Mar. 1	April 1	June 5	Nov. 10
Lime	......	......	......	......	......	May 12	July 4	Oct. 25	Mar. 30	May 11	July 25	Oct. 24	Mar. 16	May 17	Aug. 10	Oct. 26
Mountain Ash	......	April 16	May 20	Nov. 14	April 12	May —	May 12	Oct. 25	Mar. 20	April 24	May 25	Oct. 24	Mar. 12	April 17	May 27	Oct. 30
Oak	......	......	... ..	......	......	May 20	May 20	Nov. 25	April 24	May 29	June 9	Dec. 6	April 22	May 30	June 6	Dec. 6
Poplar	......	......	......	......	(Ontario)	May 1	Mar. 20	Oct. 20	Mar. 29	May 27	April 17	Nov. 9	Feb. 24	Mar. 25	......	Oct. 18
Privet	......	......	......	......	......	......	July 8	......	Mar. 30	May 9	July 24	......	Feb. 28	Mar. 28	July 4	......
Rose	......	......	......	......	April 12	April 20	June 25	Nov. 15	Mar. 24	May 8	July 1	Dec. 4	Mar. 6	April 18	July 6	Nov. 28
Sallow	......	......	......	......	April 12	April 20	Mar. 21	Nov. 10	Mar. 14	April 29	Mar. 14	Nov. 7	Mar. 8	Mar. 18	Mar. 18	Nov. 26
Sycamore	April 8	May 1	.... .	Nov. 4	April 12	May 1	May 10	Oct. 25	Mar. 12	April 27	May 19	Oct. 27	Mar. 1	April 8	April 30	Oct. 20
Whin	......	......	Mar. 29	......	.. ...	......	Mar. 30	......	Mar. 29	May 12	April 29	Nov. 11	Mar. 20	May 20	April 28	......

FOREST TREES AND SHRUBS.	NORTH SHIELDS (C).		SEAHAM HALL.				ACKLAM.				GRETA BRIDGE.			
	In Leaf.	In Blossom	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Bud.	In Leaf.	In Blossom	Divested of Leaves.	In Bud.	In Leaf.	In Blossom	Divested of Leaves.
Alder	......	......	April 10	May 30	Mar. 1	......	Mar. 31	May 1	Mar. 10	Nov. 4	......	......	......	......
Ash	......	......	May 15	May 29	April 19	......	April 17	May 27	Mar. 31	Oct. 24	May 20	June 1	......	Nov. 19
Barberry	......	......	April 2	May 16	July 15	......	Mar. 13	April 12	June 16	Nov. 13	......	......	......	......
Beech	......	......	April 2	May 12	......	Oct. 20	April 28	May 13	May 17	Oct. 30	Mar. 18	......	Mar. 18	Nov. 12
Birch	......	......	April 2	May 30	......	......	April 13	May 1	April 18	Nov. 2	......	......	......	......
Black Thorn	......	April 15	Mar. 3	May 13	April 8	......	Mar. 10	April 29	April 7	Nov. 6	... .	......	April 16	......
Bramble	......	......	Mar. 3	April 4	June 10	......	Mar. 6	April 14	June 1	Dec. 4	......	......	......	......
Broom	......	May 24	April 2	May 18	......	......	Mar. 23	April 28	May 17	......	......	......	June 3	Nov. 6
Elder	......	......	Mar. 4	May 10	June 30	......	Feb. 14	Mar. 30	June 30	Nov. 7	......	......	June 28	Dec. 12
Elm	......	......	Mar. 10	April 20	April 5	Oct. 11	Mar. 16	April 19	Mar. 6	Oct. 31	......	......	......	......
Flowering Currant	......	Mar. 28	Mar. 10	April 21	Mar. 20	......	Feb. 16	Mar. 13	Mar. 13	Nov. 7	Feb. 28	Mar. 20	Mar. 23	Nov. 1
Hawthorn	......	May 23	Mar. 9	April 17	May 26	......	Mar. 16	April 5	May 16	Nov. 4	Mar. 25	......	June 1	......
Hazel	......	......	Mar. 10	May 30	Mar. 1	......	Mar. 10	April 14	Feb. 14	Nov. 9	......	......	......	......
Holly	......	......	April 2	......	......	June —	April 12	May 15	May 18	July 1	......	......	May 20	......
Honeysuckle	......	......	Mar. 4	Mar. 10	June 26	......	Feb. 10	Mar. 18	June 24	Nov. 18	Feb. 16	......	......	......
Laburnum	......	May 22	Mar. 8	May 29	May 29	......	Mar. 25	April 29	May 20	Nov. 1	Mar. 16	......	June 7	Nov. 14
Larch	......	......	Mar. 20	April 15	......	......	Mar. 7	Mar. 30	April 12	Nov. 14	......	......	......	......
Lilac	......	May 21	Mar. 6	April 14	May 20	......	Mar. 2	April 10	May 13	Oct. 27	Mar. 1	May 22	June 2	Nov. 3
Lime	......	......	Mar. 31	May 18	......	......	Mar. 30	May 8	July 1	Oct. 21	......	......	......	......
Mountain Ash	......	May 19	April 10	May 20	May 30	......	Mar. 20	April 17	May 18	Oct. 26	......	......	......	......
Oak	......	......	April 15	May 26	......	......	April 15	May 12	May 22	Nov. 15	May 12	May 23	......	......
Poplar	......	......	Mar. 11	April 21	Mar. 12	......	Mar. 16	April 24	Mar. 8	Oct. 30	......	......	......	......
Privet	......	......	Mar. 11	April 19	July 1	......	Mar. 10	April 6	June 26	Nov. 23	......	......	......	......
Rose	......	......	Mar. 6	April 11	June 16	......	Mar. 2	April 7	June 20	Nov. 27	......	......	June 30	......
Sallow	......	......	Mar. 10	April 10	Mar. 15	......	Mar. 10	April 12	Mar. 18	Oct. 27	......	......	......	......
Sycamore	May 5	......	Mar. 13	April 19	May 10	......	Mar. 8	April 7	May 1	Oct. 31	Mar. 15	......	......	Dec. 12
Whin	......	Mar. 10	April 10	......	Mar. 3	......	Mar. 23	April 26	Mar. 17	Mar. 2	......	......	Mar. 20	......

ground, and in others large old branches were destroyed. Several of the pine tribe, and many hardy shrubs, were more or less injured. Half the stock brocoli plants were destroyed.

Acklam.—Chickweed in flower on the 20th.

March.—

Acklam.—Hellebore, crocus, snowflakes, primrose, and other plants, in flower on the 1st. Apricots in bloom on the 7th. Black Prince strawberry in bloom on the 29th.

April.—

North Shields.—Cherry in bloom on the 13th.

Bywell.—Cherry in bloom on the 10th.

May.—

Wallington.—The severe frost on the 17th nearly destroyed the crops of cherries, plums, pears, and apples. The strong northerly winds did much damage, not only to the fruit trees, but also to the forest trees. Many of the beech trees had every leaf destroyed. Ash trees were so much injured that many of the leaf buds never burst, and others were delayed two or three weeks before breaking. The bloom on the horse chestnuts, laburnums, and lilacs, was entirely destroyed, the flower spikes turning black and falling off a few days afterwards.

With respect to the potato disease Mr. Hedley writes:—"For the last fifteen years I have observed with great attention the first symptoms of potato blight. It showed itself this year (1871) in the month of May, after several weeks of heavy rain, as in previous years. I have invariably first observed it on the haulm below the surface of the soil, and not first on the leaves, as so many observers contend. On pulling up a side stalk or two, and examining carefully the haulm, from the surface of the soil to the base of the root, I have always found the rind damped in places all round the stem. By carefully watching these symptoms week after week, these spots are seen gradually to increase in size, and to become crusted, and of a brown colour, cutting off the supply of sap to the leaves, which then become spotted and yellow, and rapidly die."

North Shields.—Lilac in bloom on the 27th. Mountain ash in bloom on the 18th.

Simonburn.—The frost on the 17th turned all the leaves of the beech trees brown, giving the roadsides the appearance of winter.

Wark.—Potatoes were cut down to the ground on the 17th; many young gooseberries were destroyed; apple and cherry blossoms were killed; the trees in a beechwood at Chipchase lost their leaves.

Acklam.—About the 9th, many young apricots and plums fell off. About the 23rd, many currants, gooseberries, and plums fell off, having the appearance of being scorched, caused no doubt by severe frost.

Gainford. About the 11th potatoes saved by watering. On the 17th potatoes cut down to the ground.

June.—

Whitley.—First dish of new potatoes on the 21st.

Seaham Hall.—In the early part of the month severe winds from the north-east scorched the leaves of trees.

Acklam.—Cold stormy weather on and about the 6th and 7th, blew leaves fruit and branches from the trees. Vegetation suffered much at this time.

July.—

Whitley.—First dish of peas on the 4th.

Simonburn.—The beech trees, which lost all their leaves in May, have put forth fresh foliage.

August.—

Acklam.—The potato disease bad in this neigbourhood. Harvest general at the close of the month.

September.—

Meldon.—Harvest work very much retarded by long continuance of wet weather: much corn damaged.

Wallington.—Harvest work much interfered with by rain.

October.—

Acklam.—Wheat-sowing proceeding on the 26th. Potatoes

FLOWERING OF PLANTS A

WILD PLANTS GROWING WITHIN THREE MILES OF TYNEMOUTH.	Date of Flowering.	
Tussilago farfara (coltsfoot)	Feb. 24	Sn
Veronica hederifolia (ivy-leaved speedwell)	Mar. 1	Cr
Lamium album (white dead nettle)	Mar. 3	Cr
Lamium purpureum (red dead nettle)	Mar. 7	Cr
Ranunculus ficaria (pilewort)	Mar. 15	Re
Ribes grossularia (gooseberry)	Mar. 26	Re
Viola canina (dog violet)	Mar. 25	Da
Taraxacum officinale (dandelion)	Mar. 27	Re
Primula vulgaris (primrose)	April 6	Go
Prunus spinosus (blackthorn)	April 15	Ja
Primula veris (cowslip)	April 21	Ch
Glechoma hederacea (ground-ivy)	April 20	Ke
Veronica chamædrys (germander speedwell)	May 4	St
Trifolium pratense (purple clover)	May 8	Li
Ranunculus bulbosus (bulbous crowfoot)	May 8	Bl
Potentilla anserina (silver weed)	May 18	Pu
Mountain ash	May 19	La
Cratægus oxyacanthus (hawthorn)	May 23	
Broom	May 24	

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Mar. 18	Plenti
uly 24	Scarce
une 28	Scarce
une 10	Scarce
......	None
ug. 28	Scarce
ar. 25	Plentif
une 5	Scarce
......	...
uly 4	Scarce
pril 12	Scarce
......	...
eb. 8	Swarm Honey
ar. 22	Plentif
ay 7	Abund

IGRATOR

MIGRATORY BIRDS.	SAUGHTREE, KIELDAR. Arrival.	HARBOTTLE. Arrival.		WHITLEY. Arrival.
Black Cap	....	....	..	....
Chiff Chaff	....	....	..	....
Corncrake	....	....	..	May 10
Cuckoo	....	April 29	..	April 28
Fieldfare	....	....	..	....
Martin	....	....	..	....
Redstart	....	....	..	....
Redwing	....	....	..	....
Snow Bunting	....	....	..	....
Swift	....	....	..	....
Swallow	April 26	April 11	..	....
Wheatear	....	....	..	....
Willow Wren	....	....	..	....
Woodcock	....	....	..	....
Yellow Wagtail	....	....	..	....

late in being stored, rather small, much diseased, and not keeping well.

November.—

Acklam.—Apples and pears stored, not keeping well.

December.—

Meldon.—Large trees uprooted, and others deprived of their large branches, by a strong gale on the 18th.

NOTES ON BIRDS AND INSECTS.

The following interesting particulars are supplementary to the tables which embody information, received from many stations, respecting the times of arrival and departure, and the prevalence, of migratory birds, and the time of appearance and the prevalence of insects. Mr. Thomas Thompson, of Winlaton, has, as in former years, kindly furnished the Club with a record of the dates of the nesting of birds at Winlaton, which, for greater convenience of reference, has been printed with the other tables.

February.—

Acklam.—Thrushes and redbreasts singing on the 6th. Starlings singing on the 7th. Ladybirds numerous on the 8th. Partridges pairing on the 14th. Moths seen on the wing on the 15th. Larks singing on the 25th.

March.—

Acklam.—Wagtails seen on the 21st.

April.—

Cleadon.—Cuckoo heard on the 26th.

Seaham Hall.—Whitethroat seen on the 28th.

Darlington.—Swallow seen on the 14th.

Greta Bridge.—Cuckoo heard on the 7th.

May.—

Seaham Hall.—Pied flycatcher arrived on the 3rd. Mr. Draper writes—"In this month a large quantity of snails appeared in the hot-house, which must have been brought with some fresh

FLOWERING OF PLANTS AT TYNEMOUTH, 1871.

WILD PLANTS GROWING WITHIN THREE MILES OF TYNEMOUTH.	Date of Flowering.	PLANTS GROWING IN GARDEN NEAR NORTH SHIELDS.	Date of Flowering.
Tussilago farfara (coltsfoot)	Feb. 24	Snowdrop	Feb. 8
Veronica hederifolia (ivy-leaved speedwell)	Mar. 1	Crocus—yellow	Feb. 20
Lamium album (white dead nettle)	Mar. 3	Crocus—white	Mar. 1
Lamium purpureum (red dead nettle)	Mar. 7	Crocus—purple	Mar. 3
Ranunculus ficaria (pilewort)	Mar. 15	Red flowering currant (against E. wall)	Mar. 4
Ribes grossularia (gooseberry)	Mar. 26	Red flowering currant (standard)	Mar. 28
Viola canina (dog violet)	Mar. 25	Daffodil	Mar. 12
Taraxacum officinale (dandelion)	Mar. 27	Red currant	Mar. 28
Primula vulgaris (primrose)	April 6	Gooseberry	Mar. 29
Prunus spinosus (blackthorn)	April 15	Jargonelle pear	April 15
Primula veris (cowslip)	April 21	Cherry tree	April 17
Glechoma hederacea (ground-ivy)	April 20	Keswick codling	May 6
Veronica chamædrys (germander speedwell)	May 4	Strawberry	May 6
Trifolium pratense (purple clover)	May 8	Lily of the valley	May 12
Ranunculus bulbosus (bulbous crowfoot)	May 8	Blue hyacinth	May 12
Potentilla anserina (silver weed)	May 18	Purple lilac	May 21
Mountain ash	May 19	Laburnum	May 22
Cratægus oxyacanthus (hawthorn)	May 23		
Broom	May 24		

APPEARANCE AND PREVALENCE OF INSECTS, 1871.

INSECTS.	CRESSWELL.		MELDON.		WALLINGTON.		NORTH SHIELDS (C).	SEAHAM HALL.		ACKLAM.	
	App.	Prevalence.	App.	Prevalence.	App.	Prevalence.	App.	App.	Prevalence.	App.	Prevalence.
Small White Butterfly	May 1	Plentiful	Mar. 16	Plentiful	Mar. 18	Plentiful	March 22	April 2	...	April 11	Few.
Holly Blue Butterfly	July 1	Scarce	...	...	July 24	Scarce	...	...	Rare	July 18	Scarce.
Lesser Heath Butterfly	May —	Plentiful	...	...	June 28	Scarce	...	...	...	...	...
Orange Tip Butterfly	May 20	Scarce	...	...	June 10	Scarce	...	...	...	May 17	Very few.
Painted Lady Butterfly	...	...	...	...	...	None seen	...	...	...	Mar. 20	Few.
Red Admiral Butterfly	Aug. 20	One seen	May 7	Scarce	Aug. 28	Scarce	...	...	Common	April 27	Many.
Tortoise Shell Butterfly	...	...	...	...	Mar. 25	Plentiful	...	May 6	Rare	June 14	Plentiful.
Brimstone Moth	...	...	...	...	June 5	Scarce	...	...	...	...	...
Currant Moth	...	...	...	...	...	...	...	...	...	...	...
Ghost Moth	...	...	...	...	July 4	Scarce	...	...	...	...	...
Small Dagger Moth	...	...	...	...	April 12	Scarce	...	...	...	...	...
Cockchafer	...	...	June 21	Scarce	...	...	...	April 1	Rare	...	...
Hive Bee	Mar. 23	...	Feb. 8	Swarm, June 17.	Feb. 8	Swarms few. Honey scarce.	...	...	A good year	Mar. 2	Abundant.
Humble Bee	Mar. 23	Plentiful	Mar. 27	Numerous	Mar. 22	Plentiful	March 25	Mar. 27	Common	Mar. 3	Very many.
Wasp	April 30	Plentiful	April 20	Very numerous	May 7	Abundant	...	April 2	Rare	Mar. 17	Very few.

NESTING OF BIRDS AT WINLATON, 1871.

BIRDS.	Date.	BIRDS.	Date.
Dipper	Mar. 15	Sand Piper	May 16
Common Thrush Hedge Sparrow	Mar. 20	Kestrel Sparrow Hawk Pied Wagtail	May 18
Long-eared Owl Peewit	Mar. 28	Grasshopper Warbler Wood Wren	May 25
Cushat Carrion Crow	April 7	Yellow Wagtail Tree Pipit	Mar. 29
Long-tailed Titmouse Golden-crested Wren	April 25	Garden Warbler Black Cap Bullfinch	June 4
Ring Ouzel Grey Wagtail Golden Plover Snipe Red Grouse	April 29	Lesser Redpole	June 10
		House Sparrow	Aug. 17
Water Hen	May 1	House Martin (Young birds nearly able to fly)	Sept. 15
Jay Chiffchaff Blue Titmouse Marsh Titmouse	May 10		

ARRIVAL, DEPARTURE, &c., OF MIGRATORY BIRDS, 1871.

MIGRATORY BIRDS.	SAUGHTREE, KIELDAR.	HARBOTTLE.	ROTHBURY.			CRESSWELL.			MELDON.	WALLINGTON.			WHITLEY.	NORTH SHIELDS (C).	BYWELL.	ALLENHEADS.	WINLATON.		SEAHAM HALL.			ACKLAM.		
	Arrival.	Arrival.	Arrival.	Departure.	Prevalence.	Arrival.	Departure.	Prevalence.	Arrival.	Arrival.	Departure.	Prevalence.	Arrival.	Arrival.	Arrival.	Arrival.	Arrival.	Departure.	Arrival.	Departure.	Prevalence.	Arrival.	Departure.	Prevalence.
Black Cap	...	...	...	...	...	April 8	...	...	...	May 4	Aug. 12	Scarce	...	...	...	...	...	...	April 29	Sept. —	Rare	...	...	None seen.
Chiff Chaff	...	...	...	...	...	April 6	...	...	...	...	...	...	...	...	...	...	...	...	April 6	Sept. 25	Common	...	...	...
Corncrake	...	...	May 20	...	Scarce	June 4	...	Scarce	June 10	May 5	Sept. 16	Scarce	May 10	...	...	...	...	Oct. 5	...	...	Not heard	May 4	July 20	Much heard.
Cuckoo	...	April 29	April 24	June —	Plentiful	April 25	...	Heard once	April 29	April 28	June 16	Numerous	April 28	April 24	May 2	May 6	...	...	April 27	July —	...	April 24	June 21	Much heard.
Fieldfare	...	...	Oct. 30	...	Very plentiful	Oct. 4	Mar. —	Plentiful	...	Oct. 30	Mar. 24	Numerous	...	...	...	...	Oct. 26	...	...	May 20	...	...	...	...
Martin	...	...	May 1	...	Very few	...	...	...	...	April 20	Aug. 16	Very scarce	...	...	...	...	...	...	May 10	...	Rare	May 8	Aug. 9	Few.
Redstart	...	...	...	...	...	May 6	...	...	...	April 25	Aug. 28	Numerous	...	...	...	...	...	...	...	...	Common in Aug	...	...	...
Redwing	...	...	...	...	...	Oct. 4	Mar. —	Plentiful	...	Oct. 30	Mar. 24	Numerous	...	...	...	...	...	...	...	...	Several seen	...	...	...
Snow Bunting	...	...	...	...	...	...	...	...	...	Oct. 27	Mar. 10	Numerous	...	...	...	...	...	...	...	...	...	...	...	...
Swift	...	...	...	...	...	...	...	...	...	May 30	Aug. 22	Scarce	...	...	...	...	...	...	June 20	...	Rare	May 18	Aug. 26	Few.
Swallow	April 26	April 11	April 26	Sept. 20	Scarce	April 26	Sept. 10	Plentiful	April 29	April 20	Oct. 6	Numerous	...	April 23	April 22	April 28	...	...	April 23	...	...	April 17	Sept. 25	Very many.
Wheatear	...	...	...	...	...	...	...	...	...	April 30	Sept. 29	Scarce	...	Mar. 25	...	...	...	...	April 24	...	Common	...	...	...
Willow Wren	...	...	...	...	...	April 25	Sept. —	Plentiful	...	April 16	Sept. 20	Numerous	...	...	...	...	...	...	April 19	...	Common	...	...	...
Woodcock	...	...	...	...	...	Oct. 1	Mar. —	Scarce	...	Nov. 2	April 10	Scarce	...	...	...	...	Oct. 5	...	...	...	Rare	...	...	...
Yellow Wagtail	...	...	...	...	...	April 1	Oct. —	Scarce	April 20	April 20	Sept. 28	Scarce	...	Feb. 28	...	...	...	...	...	...	...	...	...	...

soil from the woods. They were said to be a species of *Planorbis*, had flat brown shells, and were very destructive. The mining leaf insect (*Phytomyra ilicis*) has been very common, causing the leaves to turn yellow in May. I expect the same insect will be common in 1872, as I find most of the leaves have been probed."

Acklam.—Caterpillars on the gooseberry bushes on the 13th. Bats flying about on the 19th.

June.—

Acklam.—The ladybirds, which had been numerous, had disappeared on the 23rd.

July.—

Acklam.—Both moths and caterpillars, numerous.

August.—

Wallington.—Wasps very numerous and destructive. Mr. Hedley writes—"The wasps would, in a very short time, have destroyed the whole crop of fruit, had not their nests been diligently sought out and destroyed. No fewer than sixty-five wasps' nests were found within half-a-mile of the garden. My experience is that a fine clear day is the most suitable for seeking and destroying the nests of these insects, and that a bottle of coal tar is the most effectual weapon against them. From this I pour into the nest as much of the liquid as it will take. I find this method the most sure and ready means of killing the insects, attended with the least labour and expense."

Seaham Hall.—Night-jar seen on the 5th. Numerous redstarts arrived on the 7th, waiting for their departure: they all disappeared again towards the end of the month.

Acklam.—The magpie moth more prevalent than usual at the beginning of the month. Caterpillars very destructive to plants of the cabbage tribe about the middle of the month. Large flocks of starlings in full song about the 19th. Swarms of white butterflies towards the end of the month.

September.—

Seaham Hall.—Young birds of the pied flycatcher arrived in the woods on the 11th: they disappeared about the 20th. The smaller willow wren, chiff-chaff, and flycatcher, arrived on the 25th, waiting for the time to depart.

Acklam.—Dragonflies on the 12th. Bats on the 13th. Lady-birds again appeared on the 23rd.

October.—

Wallington.—In this, and the two succeeding months, large flocks of fieldfares, redwings, and mountain finches, seen.

Winlaton.—Corncrake heard for the last time on the 5th. Jacksnipe seen on the 12th. Fieldfare seen on the 26th.

Darlington.—Swallows departed on the 24th. They had not been numerous during the season.

November.—

Wallington.—Pied woodpecker seen in a wood on the 2nd. Large flock of the long-tailed titmouse passed through a wood on the 24th.

Winlaton.—Waxwing seen near Gibside on the 8th.

Acklam.—Woodcock shot on the 3rd. Starlings numerous on the 12th.

December.—

Wallington.—Large flock of snow buntings seen in the neighbourhood; also a sparrow with white wings seen at Hartington.

The portion of the Report comprised under the heads of wind, temperature, humidity, pressure, and the notes on plants, birds, and insects, together with the general tables belonging to these subjects, has been prepared and edited by the Rev. R. E. Hooppell, M.A., LL.D., F.R.A.S., Principal of the Winterbottom Nautical College, South Shields. For the remainder the Rev. R. F. Wheeler, M.A., is responsible.

The observations recorded have this year been supplied by the following contributors:—

Alnwick	His Grace the Duke of Northumberland, Alnwick Castle, by Major Holland.
Allenheads	T. Sopwith. Esq., F.R.S.
Belford..................................	T. J. Leather, Esq., Middleton Hall.
Byrness	Rev. J. Nicholson.

Bywell	Mr. John Dawson.
Brinkburn, Morpeth	C. H. Cadogan, Esq.
Cresswell	Rev. J. E. Leefe, M.A. Mr. Forsyth.
Darlington, Southend	H. Pease, Esq.
Darlington, Brinkburn Gardens	Mr. Henry Ward.
Dinsdale Rectory, Darlington	Rev. J. W. Smith, M.A.
Durham, Ushaw College	Rev. Dr. Gillow.
Durham Observatory	John J. Plummer, Esq.
Eaglescliffe, near Yarm	Rev. Canon Hull, M.A.
Earsdon	John Taylor, Esq.
Falstone	Mr. N. Hedley.
Gainford	A. Atkinson, Esq.
Glanton Pike	F. W. Collingwood, Esq.
Greenwich	James Glaisher, Esq., F.R.A.S.
Harbottle	Mr. T. Thompson.
Hartlepool	J. Howkins, Esq , C.E.
Haltwhistle	Rev. Dixon Brown, M.A., Unthank Hall.
Hexham, Park End	M. A. Ridley, Esq.
Howick	Earl Grey, K.G., per Mr. F. Moor.
Kieldar	Mr. William Spence.
Lilburn Tower	Mr. John Deas.
London	J. G. Symons, Esq.
Middlesbro', Acklam Hall	Mr. Hebblethwaite.
Meldon, near Morpeth	Mr. John Finlay.
Millfield, near Wooler	G. A. Grey, Esq.
Newcastle-on-Tyne	Robert Foster, Esq., 30, Rye Hill. G. Lyall, Esq., Lit. & Phil. Society. Mr. W. Neill, Deaf & Dumb Institution. R. Haswell, Esq., St. Nicholas' Buildings.
North Shields	John Coppin, Esq. J. R. Procter, Esq. R. Spence, Esq. Mr. Humble, Mr. Irwin, Post Office.
North Sunderland	Rev. F. R. Simpson, M.A.
Otterburn	Rev. T. Wearing.
Rothbury	Sir W. G. Armstrong, D.C.L.
Saughtree	Mr. J. J. Bell.
Seaham	Mr. R. Draper, Seaham Hall Gardens. Mr. G. H. Aird, Londonderry Office.

Sedgefield, Durham	Robert Smith, Esq., M.D.
Shotley	Mr. Coulson, Shotley Hall.
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Stamfordham	Rev. J. F. Bigge, M.A.
Sunderland	T. W. Backhouse, Esq., West Hendon House.
Thorpe Grange, Greta Bridge	T. Dodgson, Esq.
Tynemouth	P. J. Messent, Esq. C. B. Goldston, Esq.
Wallington	Mr. Hedley, Wallington Hall Gardens. Mr. Arthur Dixon.
Wallsend	J. W. Dees, Esq.
Whitley	Rev. R. F. Wheeler, M.A. Mr. C. Roope, Convalescent Home.
Whittle Dene Company's Reservoirs,	D. D. Main, Esq.
Winlaton	Thomas Thompson, Esq.
Wolsingham (St. John's)	C. J. Backhouse, Esq.
Wolsingham	Amos Mitchell, Esq.
Wylam	G. C. Atkinson, Esq., Wylam Hall.

XXI.—*Miscellaneous Notices and Observations.*

Ray's Bream.—A specimen of this rather scarce fish was sent to me in the autumn of 1870, by a Sunderland fishmonger. It had been taken in a dying condition, in a pool on the beach not far from Seaham Harbour. Couch, in his work on British Fishes, states that this is the way in which it has mostly been caught. Its natural habitat is probably in deep water.—*George S. Brady, Sunderland, May,* 1872.

Notes on Crabs.—During the lowest spring-tides in September of last year, I found, in the pools on the beach near low-water mark, at Seaton Carew, several living specimens of the beautiful *Portumnus variegatus.* Though Mr. Hodge had, some years ago, observed the exuviæ of the same crab in considerable numbers on the Castle Eden beach, it has not heretofore, I believe, been taken alive in our district. In the same pools, at Seaton Carew, *Portunus holsatus* occurs plentifully ; and I have likewise taken a few specimens in similar situations at Sunderland. Mr. T. W.

Backhouse, has sent me a good specimen of *Corystes Cassivelaunus*, cast up on the sands at Seaton Carew; and, from a fisherman at Whitburn, I have received a fine example of *Atelecyclus heterodon*, which was taken alive in a rock pool.—*George S. Brady, Sunderland, May*, 1872.

The Pied Flycatcher at Long Benton.—On the 15th of this month (May, 1872), a living specimen of the Pied Flycatcher (*Muscicapa luctuosa*, Temm.) was brought to me in a comatose state, having been struck on the skull by a shot thrown from a catapult. Early that morning it was observed in the grounds of John Middleton, Esq., and was shortly knocked over by a lad employed in his gardens. Another individual was seen in my brother's garden the following day, but wisely took its departure a few hours afterwards, to, I hope, less dangerous quarters. Both specimens were observed feeding on flies, and were so tame as to admit of a very near approach.

Another indigenous species, the Spotted Flycatcher (*M. grisola*, Linn.), is not uncommon with us, and breeds about gardens, &c., where it may frequently be seen capturing and devouring the white butterflies; but the present one is only an occasional visitor, and has never, to my knowledge, rested here. It may be remarked that Bewick (Brit. Birds, I., 211, Ed. 1832) mentions a pair of these birds killed at Benton, so that our manners, in this matter at least, have not changed since his time.

The new gun act has been most successful in putting an end to the dangerous popping which used to prevail all over this district, especially on holidays. Could we not have another act for the protection of our rare and harmless visitants, many of which are slain by idle boys, with large shot thrown from toy "catapults," in the use of which, some of them become so expert as to be able to bring down birds at surprising distances. —*Thomas John Bold, Long Benton.*

Euphorbia amygdaloides.—This species, for which only one locality (near Long Horsley) is recorded in the "New Flora" of Messrs. Baker and Tate, was found last year in a field at Overacres, near Elsdon, by Mr. G. A. Lebour.

Echinocardium cordatum,—though found abundantly cast up on some beaches in our district, has not been commonly met with in a living state. A week ago, when dredging two miles off Marsden, in a depth of about ten fathoms, I brought up a large number of specimens (at least fifty) in a small quantity of material, not exceeding, probably, fourteen pounds in weight. The bottom consisted of muddy sand, mixed with a large proportion of decaying vegetable matter and coal dust, and with the exception of a few small Amphipoda and Cumacea, together with numerous small sand-stars and brittle-stars, contained no other living things of more than microscopic size. The specimens of Echinocardium, some of which have been sent to the Museum of the Natural History Society, were much under the usual size, the longest being only one inch and three-eighths in length.—*George S. Brady, Sunderland, June 17th,* 1872.

Early appearance of a Bat.—Waterton, in his Essays on Natural History, records the appearance of a bat in Wakefield on the 3rd of January, 1848; it may therefore possibly be worthy of record that, on the 13th of January, 1871, when the thermometer in a north exposure (there was no sunshine) stood at 30° Fahrenheit, and had been, during the night and up to 8 A.M., as low as 20°, a long-eared bat (*Vespertilio auritus,* Linn.) was seen flying about in a shrubbery at Denham, Bucks, about an hour after mid-day. It was seen by five persons, two of whom, including the writer, were able to distinguish the species. —*Edward Mounsey, Denham, 13th January,* 1871.

Sirex gigas, taken near Wooler.—I have just received a fine large female of *Sirex gigas,* Linn., which was captured in a fir wood at Langleyford, near Wooler, by Mr. James Hardy last week, and, at his request, will mount it for our Museum collection. It is a rare insect with us, and the few examples I have seen had mostly been got on the banks of the Tyne, where they might have been brought in timber-laden vessels. This, however, must be, I think, truly indigenous. The larvæ live upon the solid wood of fir trees, to which when numerous they do great damage, by running longitudinal galleries in their stems, thus admitting air and moisture, and causing the death of the trees. This insect appears to be abundant in Germany, and in the north of Europe, where it makes sad havoc in the pine forests. In this country it appears to occur most plentifully in the South, although it has been found as far north as Edinburgh.—*Thomas John Bold, Long Benton, July* 30, 1872.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, GEORGE CLAYTON ATKINSON, ESQ., AT THE TWENTY-SIXTH ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-ON-TYNE, ON THURSDAY, APRIL 18TH, 1872.

GENTLEMEN,—In closing the duties of President of the Tyneside Field Club, so flatteringly conferred upon me, I beg to lay before you a *résumé* of our out-door proceedings of the year, accompanied by a few observations of my own.

May 25.—Lintz Green, on the Derwent, was the first of our pleasant FIELD MEETINGS. It was merely an afternoon's excursion, the party leaving Newcastle by the 2·5 train. The day, however, was wet, so it was just as well that the distance from home was not farther, nor the time occupied, longer. Rowland's Gill and the gardens at Gibside were visited; after which some of the party availed themselves of the hospitality of Mr. J. D. Bush, while the rest went on and visited the paper mills of the Messrs. Annandale.

After tea at Rowland's Gill, Mr. Thompson exhibited a specimen of the Long-eared Bat (*Vespertilio auritus*) taken at Styford a few days before.

June 27.—Bywell.—A beautiful day brought together a party of about a hundred, of whom nearly one-fifth were ladies. They went from Newcastle at 1·45 and left the train at Wylam, where they passed through the pretty grounds at Wylam Hall, and then by the river-side—a most beautiful walk—to Ovingham. After lingering a while in the churchyard there, admiring the fine old church, and greatly interested in the tomb of my old friend Thomas Bewick, whose remains lie within a few feet of the west side of the tower, which bears a tablet to his memory, they wandered on in broken groups to Bywell. As they left the spot, I could scarcely help yielding to a sort of reverie that he was with us, and mingling cheerily in our pursuits. A hale, well-built, hearty old man appeared among us, on leaving the church-yard; clad in black, with breeches, and worsted stockings fitting tightly and neatly upon a well formed leg; he wore a rather broad-brimmed black hat, and walked with a stick, though so actively and firmly, that there seemed no necessity for its use. He hailed me courteously, with a cheery —"How do you do, Mr. Atkinson; you have a gay party with you to-day!" "Yes," I said, "and you see we have ladies among us, sir!" His eye beamed with kindness as he glanced at them, and he paused and turned to me saying, almost solemnly, "Oh, sir, be as kind to them as ever you can!" Joining a portion of the party, he said, "I dare say you would like, now you have seen the tomb, to see the birthplace of Bewick? I will accompany you, if you please, so far on your way, and point out Cherryburn." So we turned down the village of Ovingham, the children (rather scared at first by the largeness of our party) running out and placing themselves before him, fondly and fearlessly looking up into his kindly face (for everything seemed to love him); and fondly he returned their looks, patting the curly head of one, poking with his stick the ribs of another, and chatting away to those near him, in a simple, honest, powerful way, that was irresistibly attractive. "Oh," he said, "you do well to get away from the town, and see as much of God's works as you can; I suppose you each of you follow up some particular branch of Natural History, and endeavour to make it as attractive as possible to your companions. Many a one in my time have I smittled with a love of Ornithology. Well, well, you will find life all too short to exhaust the simplest subject; and you will discover that the more you learn, the less you will find that you really know.

> " What is discovered only serves to show,
> How little's known, to what is yet to know.

Why, sir, it would take a man his lifetime to write the history of a spider."

We wandered on, on the charming walk towards Bywell, till we reached a point in the road, about three-quarters of a mile west of Ovingham, commanding a view of Eltringham and Cherryburn ; here he paused, and turning a quid of tobacco (which was lodged inside his lower lip) with his tongue, he stepped nimbly on to the southern bank of the lane, and pointed with his stick over the hedge to the south towards the place of his birth. A dense cloud of smoke from the coke ovens came, rolling down the valley at that moment and concealed the view. A sad exclamation—half groan, half sigh—burst from the old man, and with a melancholy ejaculation of "Poor Tyneside!" our companion disappeared from among us, and we went on our way. Pursuing the charming river-side walk we soon reached Bywell. Mr. G. Fenwick, of the hall, had kindly thrown open his beautiful lawn garden to our inspection; after enjoying which, we adjourned to Mr. Trotter's inn for tea, and reached home in the evening.

July 27.—Woodburn.—Leaving Newcastle at 11·35, a party of sixty, including several ladies, reached Reedsmouth about 1·30, where they separated into two, one part walking up the Reed to Woodburn; the other, over the hills past Sir Wm. Armstrong & Co.'s ironstone mines, to the same point.

The walk over the hills of some three or four miles was very pleasant, and the weather delicious.

On the arrival of the party at Reedsmouth, they were met by Mr. Mundle, the intelligent manager of the mines, who accompanied the hill party during the day. At the mines he explained the Geology of the district, and the mining operations very clearly, aided by a capital section of the strata which he had constructed, comprising a depth of about one hundred and forty fathoms.

These explanations, accompanied by comments and observations from Mr. Howse and others, rendered this part of the day's proceedings highly interesting and instructive; especially as to the Geology of this part of Northumberland, and contemporaneous strata in other districts. It is to be regretted, however, that the upper strata of Mr. Mundle's section cannot at present be directly connected with the lower ones of Westgarth Forster's section, of the Coal and Mountain Limestone formation. The break occurs between the whin sill and the top of this section, and cannot be very considerable. It is to be hoped, that at no distant period, the intermediate strata may be ascertained, and a complete section of the Northumberland strata, from the New Red, down to the Old Red Sandstone, obtained. One very puzzling fact in the identification of the strata, is the way in which the several beds of limestone (which in the Midland Counties form one thick stratum) become split up and divided as they approach the north; and are therefore more difficult to recognise and identify, although fossils peculiar to, and characteristic of, some of the seams, are beginning to be recognised. These, however, before being received and accepted as infallible means of identification, must be rigidly tested by observation, and then the value of characteristic fossils is great indeed. It is to be hoped that *Saccammina Carteri*, discovered by Sir Walter Trevelyan near Wallington, and since found rather abundantly in the four-fathom limestone (but in no other bed), may prove to be so, of that bed of the Limestone, as, though insignificant in size, it is conspicuous in appearance.*

Mr. Howse mentioned, in connexion with the section of strata shown to us to-day, that in a depth of about a hundred fathoms, there are ten alternations of marine and fresh-water deposits.

The mining operations now going on, consist in the separation of ironstone nodules of excellent quality, from a bed of blue shale or clay, about thirty feet thick, in which they are scattered, something like plums and currants in a cake; in consequence of the shale bed lying generally at the surface of the ground, and parallel to it, it is often cut through from top to bottom in

* Since the above was in print, Mr. Howse tells me he has found *Saccammina Carteri*, in the *Great Limestone*, near Bollishope, on Alston Moor.

the course of the operations, all the nodules picked out as they are come to, the debris being thrown behind, and the unworked face of the bed standing like a little precipice of thirty feet high.

Armstrong & Co. are not, however, the first workers of this ironstone; for more than thirty years ago, I visited this place (which is characteristically named the "*Steel*") and found large collections of the nodules, which had been dug out and carefully stored in heaps at some distant period, looking like rusted cannon balls among the grass. Mr. Mundle to-day pointed out some of the old pits by which the ironstone had probably been worked; they were to be seen in section where the perpendicular face of the shale bed happened to cut through them, as pits of nine or ten feet in diameter, penetrating from top to bottom of the bed; and after being used, they had been filled up by the debris of the shale: no doubt they had led to tunnelled workings below, as the remains of oak props and timbering is found occasionally by the present miners. Our party was told that these old workings are attributed to the Romans; but, on questioning Mr. Mundle, found that not a single Roman coin, carved stone, or metal implement, with the exception of a small iron pick or axe, had been found during Armstong & Co.'s very extensive workings.

Portions of charcoal are found near the mines, which indicate that the ironstone had been smelted on the spot, with the charcoal of trees, then abounding in the neighbourhood. A band of coarse limestone, seven or eight inches thick, runs through the shale bed rather above the middle, which is one mass of fossils; the nodules of ironstone also frequently contain shells; on rare occasions the *Lingula Scotica*. Our party to-day found several very nice fossils.

The hill party, after leaving the mines, bent their way over the high ground eastward to Risingham, where the rudely carved Roman figure, called Robert of Risingham, cut on the side of a portion of rock partially covered with herbage, was pointed out by some of our friends who had been there before, and without whose guidance it could scarcely have been found. Thence through the Roman station of *Habitancum*, and so to the trysting place, which bore the convivial name of Brandy Bank. Those who had gone from Reedsmouth by the valley met the hill party here, and after an excellent dinner all joined the train, and got to Newcastle about nine in the evening.

August 17.—Cotherstone.—The distance of to-day's rendezvous necessitated an early start from Newcastle (at 5.20 A.M.), and rendered the party a smaller one than a shorter expedition might have commanded. Twenty-three members of the Club arrived at Cotherstone soon after 8 A.M., where a capital breakfast awaited them at the clean, tidy, little hotel, the Red Lion. After breakfast they placed themselves under the guidance of the Rev. William East, and walked by the foot bridge across the Tees, to a bold, square-fronted rock, which projects from the upper parts of its woody banks, and bears the name of Percy Mort, looking very like the ruins of an old castle: the view from it is very extensive and pleasing. Re-crossing the river by the same bridge, the party rambled down the other side, to some curious excavatians in the sandstone rock at the level of the water, called the Fairy Cupboards. The steep banks of the river on both sides are richly wooded and abundant in wild plants. Near the Fairy Cupboards I saw some of the largest fronds of the hart's tongue fern that I remember; they were upwards of eighteen inches long. On the way thither from the bridge, in passing through a field called Woden's Croft, the green Hellebore, a large, conspicuous, and rather rare plant, was found in some abundance, unfortunately its flowers were long passed. During the day were found also *Cystopteris fragilis*, *Asplenium Adiantum-nigrum*, *Lastræa oreopteris*, &c.

A curious ant track was seen in Woden's Croft, extending for a distance of some forty yards, from a large ants' nest towards the river; it was about two inches wide, thronged with ants going to and from the river; the grass through which it passed was about two inches high, the road-way itself quite bare and trodden; and along the sides, whether from the formic acid of their bodies, or from the mere friction of the passers to and fro, the herbage was quite dead and almost red in colour.

After leaving the Fairy Cupboards, a detour of one and a half miles was made to the head of Deepdale, along which the party walked to Barnard Castle—a beautiful walk it is, though somewhat longer than time permitted them to take leisurely—and having to join the train at a certain hour, the dinner was somewhat hurried. The day, however, was a very enjoyable one, and some young ladies, who went through the entire walk of ten or a dozen miles, seemed as fresh as any of the party at last.

The River Balder, Woden's Croft, and Thorsgill, suggested our Scandinavian ancestry, who

> Gave their Gods the land they won.
> Then, Balder! one bleak garth was thine,
> And one sweet brooklet's silver line:
> And Woden's Croft did title gain
> From the stern father of the slain.—*Rokeby, Canto IV.*

September 14 and 15.—Wooler and its neighbourhood was the next meet of the Club, which unfortunately I could not personally attend. Twenty members left Newcastle at 9.5 A.M., arriving at Belford at 11.30, from whence carriages took them to Chatton and Chillingham. Near the latter, the party was met by Mr. Jacob Wilson, agent to the Earl of Tankerville, who led them across the fell to Chillingham Castle; here, through the kindness of the Earl of Tankerville, a splendid luncheon awaited them, which was highly appreciated. Adjourning to the magnificent park, a view of the wild cattle was obtained; now a herd of sixty-six, which possesses the singular interest of being, I believe, the only herd in Great Britain, which has always occupied the same ground as its progenitors. The heronry was next visited, containing about a score of nests.

There is something highly pleasing in seeing these old denizens of the land surviving, and likely to survive; and as painful to see them gradually becoming extinct among us. It is scarcely credible—a dozen years ago it would have been quite incredible—that I have not seen a magpie for four or five years. They seem all to have been shot down by gamekeepers; their quaint, sidelong hop and rogueish cock of the head and saucy cackle, are now seen and heard but rarely, and we cannot doubt that in a few years the bird will be extinct. Probably in this case, the keepers may act conscientiously in destroying poor Mag, for sooth to say he *is* fond of eggs and young game; but sometimes they have less excuse for their destruction of the *feræ naturæ*. In 1860 I spent some weeks in Sutherlandshire, and was much surprised at not seeing a single eagle, though wandering through the wildest of the land. I remarked upon it to a keeper who accompanied me on a morning's walk. "Ah!" he said, "we get forty shillings a head for them." "But," said I, "they don't do much harm, do they?" "Oh no," says he, "not half so much as these hoody crows, which watch the sheep where they are thrown on their backs in a furrow, pick out their eyes, and wait till they die, to eat them at leisure. The eagles live chiefly on the blue hares, which are as much vermin as rabbits in England, and on very rare occasions carry off a lamb. But we get forty shillings a head for them!"

The Fearn Islands have been familar to me for nearly fifty years, and the successful preservation of the sea fowl upon them has been a source of much gratification to me, as it must have been to all feeling men. Nevertheless, several kinds of fowl, have I believe, disappeared from them and from the neighbourhood. About the year 1830, the little tern bred abundantly in a recess in the high sandy sea bank between Bamborough Castle and Holy Island; at that time I found more than a dozen eggs laid on the flat sandy and gravelly floor of this dry bay, into which, on rare occasions, the tide seemed to flow; and I might have got many more, as there were, I dare say, forty or fifty pairs of old birds flying about. It has long ceased to breed there. The green cormorant or shag at that time, and for ten years later, bred sparingly in the deep gulley of the rock, opposite the pinnacles on the Fearns. I looked in vain for it a few years since.

The shell-drake also, which made its nest in the rabbit holes on Holy Island then, has, I suspect, also disappeared.

Some twenty years since, a few pairs of the Dotterel were annually shot on Newcastle Town Moor, about the third week in April; on their way, probably, to the Cumberland Mountains to breed (on two of them, Robinson and Grasmoor, I knew them to do so); they were sold at that time of day, at ninepence a piece, and were much in request for dressing trout flies. The last record I have of their being shot on the moor, is on April the 25th, 1857. Mrs. Pape, one of the poulterers who generally had them for sale, tells me, however, that she has had them till six or seven years since, but in gradually decreasing numbers, and that the last were sold at four or five shillings each, for fly dressing.

On the other hand, some kinds of birds seem to have increased in numbers. My old friend Mr. Bewick used to say, he had to wait twelve years before he could obtain a missel-thrush to engrave from; now their harsh note is very prominent and universal in our spring choir.

And about forty years since, the starling was a somewhat uncommon bird in this neighbourhood, while at the present day they are only exceeded in number by the sparrow.

Possibly, the ingenious reason of my friend, Mr. John Hancock, for the increase of the starling may apply equally to the missel thrush; viz., that the sparrow-hawks, which were great persecutors of the starling, have, like the magpie, been nearly exterminated by gamekeepers, and now their old victims flourish and increase uninterruptedly.

To resume, however, the proceedings of the day: after seeing the wild cattle and the heronry, the party returned to Chillingham Castle, where tea was provided for them; and then, after a visit to the adjacent church, they walked to Wooler, and dined and slept at the Red Lion.

September 15.—At 9 A.M. they walked to Langley Ford; some of the members ascending Cheviot, and enjoying the splendid view which it commands. They returned to the Red Lion to dinner, drove afterwards to Alnwick, and reached Newcastle at 11.2 P.M.

October 12.—St. Mary's Island was the last gathering place of the season; about forty members attended; on their way along the shore they were courteously conducted by Dr. Philipson over that admirable and useful institution, the Prudhoe Convalescent Home, with the order and comfort of which they were much struck. After this they sauntered along to the Island, where tea was provided. An interesting paper was afterwards read by Mr. H. Adamson, solicitor, North Shields, relating to St. Mary's Island. He referred to the church which once stood there, and which he stated to have been an offshoot of the old Abbey of Tynemouth, but of which no vestige now remains. The only guide to the sacred spot where the ancient chantry stood, is a little inlet in the rocks, where the fishermen still run for shelter when caught by the storm, known by the name of St Mary's Bay.

Tradition tells, that in the sanctuary, a lamp always burned to warn the passing mariners. In the tower hung a bell, which was rung to summon aid in case of wrecks upon the coast; and a cemetery was attached, wherein the bodies of the victims of the storm were buried; and in which interments took place till about a century ago.

The pleasant excursions of the year were thus brought to a close; and, although they may partake rather more of the nature of pic-nics, than of strictly scientific explorations, they certainly present exceedingly favourable opportunities and inducements for healthy exercise, and association with what is instructive and beautiful in creation.

The view entertained in America, of such meetings, may be gathered from the following extract from the "American Naturalist" (quoted in "Nature," Vol. IV., p. 307):—"Among the signs of the scientific life of the present day in America, one of the most encouraging is the increasing frequency and enthusiasm, of those delightful occasions of scientific study, intercourse, and recreation, called Field Meetings."

Our interest is, of course, more especially directed to the notabilia of our own district; and the observation and record of them has been so ably and felicitiously dealt with from time to time, by members more competent than myself, that little more has remained for me to do than to present this sketch of our meetings, during my term of office, with such observations upon them as occurred to me.

We all recognise and approve of the preservation of all nature's works, animate and inanimate; my predecessors in this chair have frequently alluded to and enforced it, and it is gratifying to have ground for believing, that in the North of England, there is not so much destruction of small birds by—I must call them—Cockney sportsmen—as in some other parts.

But there is a lamentable amount of destruction going on wholesale, incessantly, and increasingly, by our manufactures—I speak not at this time of the fish of our rivers—but of much that is beautiful of the vegetable creation; a destruction that can never be repaired. We can only lament and remember the beautiful denes and hanging woods, or the handsome single trees that were, but are not.

Many have gone, many are going; poisoned gradually by the smoke, or more suddenly by the chemical fumes from our manufactories.

But they are not all yet gone; and I would venture to suggest, what has before been mentioned by some of my predecessors, that a descriptive record be made in our Transactions, of the most remarkable individual trees of the district; and also (which I think would add much to the value of the record, as well as to the popularity of the Transactions), that all remarkable trees be photographed on a uniform and convenient scale, and the photographs published with the record.

Since our last Annual Meeting, one of our most industrious and scientific members has been taken from among us, of whom we have now to mourn the loss. "Nature" thus justly speaks of him (Vol. IV., p. 387):—

"We regret to record the death at Seaham Harbour, on September the 17th, 1871, after a short illness, at the age of thirty-eight, of Mr. George Hodge, an accomplished naturalist. Although, from his retiring and unassuming disposition, little known beyond the naturalist circle of the north, George Hodge realised, as few do realise, the objects of a local naturalist. Living on a portion of the north-east coast, the marine fauna of which was practically uninvestigated when he first settled there, he made its patient and honest study the business of the scanty leisure left him by heavy business responsibilities. How far he succeeded, is best evidenced by the Natural History Transactions of Northumberland and Durham, the favourite medium of publication for his careful observations and exquisite drawings of the lower animal forms.

"During a temporary residence in Newcastle, he was Secretary to the Natural History Society, and was to the last a valuable member of its Committee.

"Mr. Hodge was a most enthusiastic dredger; and if he could get a boat to sea on a fine day—this being even more of a desideratum with him than with most men, as he was easily upset—he was perfectly happy. The last two dredging expeditions conducted by the Tyneside Naturalists' Field Club, with grants from the British Association, were undertaken chiefly by him, in conjunction with Mr. G. S. Brady.

"The Echinodermata were his favourite subjects of study; but he was also specially interested in the Zoophytes, Pycnogons, Crustacea, and marine Acari, among all of which he had done good work. To his influence chiefly may be ascribed the very useful and flourishing Natural History Club of Seaham Harbour, in whose proceedings he always took great interest."

Among his contributions to the Transactions of the Tyneside Field Club are the following:—

Vol. IV., p. 188—"*On the occurrence of the Phoca vitulina at Seaham Harbour.*"

Vol. IV., p. 319—"*Contributions to the Zoology of Seaham Harbour.*"

Vol. V., p. 41—"*On the growth of the Rays of the common Brittle-star, Ophiocoma rosula.*"

Vol. V., p. 62—"*On the occurrence of Uraster glacialis at Seaham Harbour.*"

Vol. V., p. 78—"*Contributions to the Marine Zoology of Seaham Harbour.*"

Vol. V., p. 124—"*Observations on a species of Pycnogon, Phoxichilidium coccineum.*"

Vol. V., p. 209—"*Meteorological Notes on Seaham Harbour.*"

Vol. V., p. 281—"*Report on Pycnogonoidea.*" (*Dredging Report*, 1862).

Vol. V., p. 296—"*On a new Sand-star, Ophiura Normani.*"

Vol. V., p. 298—"*Contributions to the Marine Zoology of Seaham Harbour.*"

Vol. VI., p. 189—"*Reports on Pycnogonoidea and Echinodermata.*" (*Dredging Reports*, 1863).

Vol. VI., p. 195—"*List of British Pycnogonoidea, with descriptions of new species.*"

His contributions to the Transactions of the Natural History Society of Northumberland and Durham were—

Vol. I., p. 41—"*Reports on Pycnogonoidea and Echinodermata.*" (*Dredging Reports*, 1862–4).

Vol. IV., p. 120—"*Catalogue of Echinodermata of Northumberland and Durham.*"

I am happy to be able to announce that the Natural History Society has secured his valuable collections.

The Field Meetings for 1872 were arranged to be held as follows:—

May	Bothal.
June	Dunstanborough.
July	Featherstone.
August	Chartners and Fallowlees Loughs.
September	Helmsley (Yorkshire).
October	Marsden.

The Treasurer's report (see p. 529) was read and adopted.

The Committee was instructed to take measures for obtaining information respecting the remarkable trees of the district, and to publish in the Transactions photographs of any which they thought it desirable so to illustrate.

The following gentlemen were elected officers of the Club for the year 1871–72:—

PRESIDENT.

Henry B. Brady, Esq., F.L.S.

VICE-PRESIDENTS.

E. C. Robson, Esq.	T. J. Bold, Esq.
Rev. J. E. Leefe, M.A.	Joseph Blacklock, Esq.

Ralph Carr Ellison, Esq.	Edward Charlton, Esq., M.D.
Rev. J. F. Bigge, M.A.	Rev. G. C. Abbes, M.A.
D. Embleton, Esq., M.D.	Rev. A. M. Norman, M.A.
R. Ingham, Esq.	Rev. J. C. Bruce, LL.D.
Sir W. C. Trevelyan, Bart.	Rev. A. Bethune, M.A.
T. Sopwith, Esq., F.R.S.	E. J. J. Browell, Esq.
Rowland Burdon, Esq.	Rev. R. F. Wheeler, M.A.
Rev. H. B. Tristram, LL.D.	G. S. Brady, Esq., C.M.Z.S.
George Wailes, Esq.	G. C. Atkinson, Esq.

TREASURER.

Robert Y. Green.

SECRETARIES.

Thomas Thompson.	D. P. Morison.

LOCAL SECRETARIES.

Durham, John Booth.	*Hexham*, Rev. W. T. Shields.

Morpeth, W. Creighton.

COMMITTEE.

Thomas Atthey.	Richard Howse.
James Clephan.	William Maling.
William Dinning.	A. F. Marecco.
D. O. Drewett.	G. H. Philipson, M.D.
John Hancock.	Joseph Watson, jun.
Albany Hancock.	W. M. Wake.

AUDITORS.

J. S. Foster.	T. P. Barkas.

THE following gentlemen were elected members of the TYNESIDE NATURALISTS' FIELD CLUB during the year 1871–72:—

At the ANNIVERSARY MEETING, 1871:—Messrs. Geo. Deighton and Matthew Barrow, Sunderland; S. D. Humble, Gateshead; Charlton Humble, Jesmond; George A. Lebour, Woodburn; T. W. Bunning, Newcastle.

At the FIRST FIELD MEETING:—Messrs. F. Raine, Durham; Isaac Clark, Blaydon; R. Kekwick, Sunderland; J. J. Forster, J. G. Wasserman, W. C. Gibson, W. Johnston, Newcastle; Dr. G. Lunge, Westoe.

At the SECOND FIELD MEETING:—Rev. A. Johnson, Bywell; Messrs. Faraday Spence, Low Heaton; Joseph Heslop and James Young, South Shields; J. W. Crichton and John Sharp, Gateshead; M. H. Robson and G. O. Owen, Newcastle; James C. Soulsby, Jarrow; Benj. Levy, Bishopwearmouth; Dr. Taylor Smith, Monkwearmouth; Rev. J. A. C. Maughan, Mickley.

At the THIRD FIELD MEETING:—Messrs. G. C. Potts, Gateshead; J. Hope, jun., Hexham; Henry Wilson and T. Sharp, Newcastle; C. H. Wilcox, Whitburn; Joseph Millard, Morpeth; T. H. Vint, South Shields; J. F. F. Common, North Shields; Rev. R. Powell Powell, Bellingham.

At the FOURTH FIELD MEETING:—Mr. John S. Gaine, Sunderland.

At the FIFTH FIELD MEETING:—Messrs. John Engledow, Newcastle; R. F. Cook, Gateshead; Samuel Morrison, North Shields.

At the SIXTH FIELD MEETING:—Messrs. James Bradford and George Bradford, Bunkers Hill; Jas. Nicholson, South Shields.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

Dr.

1871.	£	s.	d.
To Balance in hand	17	17	1
" Subscriptions	146	10	0
" Sale of "Transactions"	1	19	6
	£166	6	7

Cr.

1871.	£	s.	d.
By Printing "Transactions"	103	6	1
" Printing Circulars and Postage	39	12	0
" Commission on collecting Subscriptions	6	17	3
" Sundries	8	0	7
1872.			
" Balance	8	10	8
	£166	6	7

1871, April 18.—Examined and found correct,

T. P. BARKAS, }
J. S. FORSTER, } AUDITORS.

TYNESIDE NATURALISTS' FIELD CLUB.

LIST OF MEMBERS, OCTOBER 20TH, 1872.

Abbs, Rev. Geo. Cooper, B.A., Cleadon Hall.
Abbs, Henry, Rock Lodge, Roker.
Abraham, John, Liverpool.
Adamson, C. M., Newcastle.
Adamson, William, Newcastle.
Adamson, Charles H., North Shields.
Adamson, Henry, North Shields.
Adamson, Horatio A., North Shields.
Adamson, L. W., Newcastle.
Alcock, Samuel, jun., Sunderland.
Anderson, Joseph, Newcastle.
Anderson, Charles, South Shields.
Angas, C. H., Sunderland.
Angus, Charles, Newcastle.
Angus, Thomas, Gateshead.
Appleton, J. R., Durham.
Armstrong, George, Newcastle.
Armstrong, Luke, M.R.C.S., Newcastle.
Armstrong, Leonard, South Shields.
Atkin, David, Newcastle.
Atkinson, G. C., Wylam Hall.
Atkinson, Amos, Newcastle.
Atkinson, W. H., Tynemouth.
Atthey, Thomas, Gosforth Colliery.

Backhouse, Edward, Sunderland.
Backhouse, Jas. Edward, Darlington.
Backhouse, T. W., Sunderland.
Bainbridge, William, jun., South Shields.
Balfour, F. M., Cambridge.
Barkas, T. P., Newcastle.
Barnes, T. W., Durham.
Barron, James, M.R.C.S., Sunderland.
Barry, George, Newcastle.
Bass, Charles, Newcastle.
Bates, J. P., North Shields.
Bell, Henry, Newcastle.
Bell. I. L., Newcastle.
Bell, John Thos., Monkwearmouth.
Bell, Robert, South Shields.
Belt, Thomas, Newcastle.
Benson, William, Hexham.
Bethune, Rev. Angus, Seaham Harbour.
Bewicke, T. J., Allenheads.
Bigge, Rev. J. F., M.A., Stamfordham Vicarage.
Bird, Rev. C., Chollerton Vicarage.
Blacklock, Joseph, Newcastle.
Blain, Thomas, Sunderland.
Blair, Robert, Harton.
Blake, Fred., Newcastle.
Bold, Thomas John, Long Benton.
Bolton, Andrew, M.D., Newcastle.
Booth, George R., Sunderland.
Bousfield, W. C., Newcastle.
Bourne, William, M.A., M.D., North Shields.
Bowman, Hugh, Gateshead.
Bowman, R. B., Gateshead.

Bowman, Walter, Gateshead.
Boyd, Edward F., Durham.
Bradford, Jas., Bunker Hill, Fence Houses.
Bradford, George, Bunker Hill, Fence Houses.
Bramwell, J., M.D., North Shields.
Brady, G. S., M.R.C.S., Sunderland.
Brady, Henry B., F.L.S., Newcastle.
Branford, W. E., Newcastle.
Brett, J. F., jun., Newcastle.
Brewis, George, Newcastle.
Briggs, R. S., Sunderland.
Britton, J. J., Newcastle.
Broadbent, S. W., South Hetton.
Brooks, J. C., Wallsend.
Broughton, Rev. Reginald, Long Benton.
Browell, Edward J. J., East Boldon.
Brown, Rev. Dixon, Unthank Hall.
Brown, Rev. J. J., Silksworth, Durham.
Brown, John, Newcastle.
Brown, Peter, Newcastle.
Brown, Philip, M.D., Blaydon.
Brown, Thomas W., Sunderland.
Browne, J. L., North Shields.
Bruce, Rev. J. C., LL.D., F.S.A., Newcastle.
Bruce, Gainsford, London.
Brumell, G. A., Newcastle.
Buck, Robert, Sunderland.
Bulman, Thomas, Newcastle.
Bunning, T. W., Newcastle.
Burdon, Rowland, Castle Eden.
Burnup, Edwin, Newcastle.
Burnup, M., M.D., Newcastle.
Burnup, John, jun., Newcastle.
Burnet, Rev. W. R., Sunderland.
Burnett, Jacob, Tynemouth.
Burrell, R. A., Durham.
Bush, John A., Newcastle.
Cadogan, C. H., Brinkburn Priory.
Cail, Septimus A., Newcastle.
Candlish, John, M.P., Sunderland.
Capper, Cawthorne J., Newcastle.
Carr, Rev. H. B., M.A., Whickham.
Carr, John, North Shields.
Carr, William C., Newcastle.
Challoner, J. S., Newcastle.
Charlton, Edward, M.D., Newcastle.
Charlton, Ernest, Hesleyside.
Charlton, Thomas, North Shields.
Charlton, Wm. Henry, Hesleyside.
Charlton, William, Newcastle.
Chartres, William, Newcastle.
Clark, Isaac, Blaydon-on-Tyne.
Clark, John, Featherstone.
Clark, Thomas T., North Shields.
Clark, William, Gateshead.
Clarke, W. H., North Shields.
Clay, William, Newcastle.
Clayton, John, Newcastle.
Clapham, Henry, Gateshead.
Clapham, R. C., Walker.
Clephan, R. C., Newcastle.
Clephan, James, Newcastle.
Clephan, Joseph, Newcastle.
Cobb, Joseph, Sunderland.
Cochrane, William, Gosforth.
Common, J. F. F., North Shields.
Cook, R. F., Gateshead.
Cooke, M. C., London.
Cooke, Thomas, Newcastle.
Coppin, John, North Shields,
Corder, Alexander, Sunderland.
Corder, Francis, Sunderland.
Coward, James, Gosforth.
Cowen, J. A., Blaydon Burn.
Cowen, Joseph jun., Stella House.
Cox, J. H., Sunderland.
Coxon, S. B., Usworth Hall.
Craggs, Thomas, West Cramlington.
Crawford, B. C., Walker.

Crawford, F. S., Newcastle.
Crawshay, Edmund, Bensham.
Creighton, William, Morpeth.
Crichton, J. W., Gateshead.
Crookes, St. John, Pensher.
Crossling, Thomas, Newcastle.
Crossling, William, Newcastle.
Cruickshank, Alexander, Gateshead.
Culley, W. T., Copeland Castle.
Cumming, William, Middle Herrington, Sunderland.
Curle, Walter, Monkton.
Cust, Rev. D. M., Seaham Harbour.

Daggett, William, Newcastle.
Daglish, John, Newcastle.
Dale, Henry, North Shields.
Dale, J. H. South Shields.
Dale, J. B. South Shields.
Dance, T. W., Gateshead.
Davis, John, Sunderland.
Davison, Joseph, Newcastle.
Davison, Edwin C., Sunderland.
Dawson, B., South Shields.
Dees, R. R., Newcastle.
Deighton, George, Sunderland.
Denham, J. S., South Shields.
De Mey, W. F., M.D., Newcastle.
Dickson, William, Alnwick.
Dickinson, J. G., Newcastle.
Dickinson, Robert, Newcastle.
Dickinson, William, Newcastle.
Dinning, William, Newcastle.
Dixon, A. W., Seaham Harbour.
Dixon, Robert, Newcastle.
Dixon, Robert, Bensham.
Dixon, William, Sunderland.
Dixon, W. H., M.D., Sunderland.
Dodds, Edwin, Low Fell.
Dodds, G. A., North Shields.
Dodds, M. S., Newcastle.
Dodsworth, Frederick, Newcastle.
Dodsworth, W. V., Newcastle.
Donkin, A. S., M.D., Sunderland.
Douglas, James, Winlaton.
Douglas, John, Gateshead.
Downie, Henry, Newcastle.
Draper, Robert, Newcastle.
Drewitt, D. O., Jarrow Hall.
Dunn, A. M. Newcastle.
Dunn, Henry, Newcastle.
Dwarris, Rev. B. E., Bywell.

Easten, William, Newcastle.
Ellis, Robert K. A., Sunderland.
Ellison, Ralph Carr, Dunston Hill.
Elsdon, William B., Newcastle.
Elwin, Robert, Sunderland.
Embleton, Dennis, M.D., Newcastle.
Engledow, John, Newcastle.
Eno, James C., Newcastle.

Fairbairn, Robert, Gateshead.
Fairbairn, W. S., Sunderland.
Falconar, J. B., Newcastle.
Fawcus, John, North Shields.
Featherstone, Rev. T., Tynemouth.
Featherstonhaugh, Albany, Roker.
Featherstonhaugh, Rev. W., M.A., Edmondbyers.
Featherstonhaugh, Edward, Roker.
Fell, H. B., Biddick.
Fenwick, J. W., North Shields.
Fenwick, John, North Shields.
Fenwick, G. W., Newcastle.
Fenwick, George, North Shields.
Finch, Rev. T., Morpeth.
Forrest, William, Newcastle.
Forster, G. B., Backworth.
Forster, James S., Newcastle.
Forster, John, Winlaton.
Forster, J. J., Newcastle.
Forster, Robert, Newcastle.
Forth, Robert, North Shields.

Fothergill, Joseph, Tynemouth.
Fothergill, J. M., Newcastle.
Fothergill, Thomas, Bishop Auckland.
France, George T., Felling.
Francis, Matthew, M.R.C.S., Sunderland.
Frazer, Donald, Newcastle.

Gaine, J. S., Sunderland.
Garrett, John, Newcastle.
Gibb, C. J., M.D., Newcastle.
Gibson, Charles, M.D., Newcastle.
Gibson, Charles, North Shields.
Gibson, W. C., Newcastle.
Gibson, W. W., Hexham.
Gibson, J. P., Hexham.
Gillie, John, Westoe.
Gillies, Alexander, Gateshead.
Gillies, William, Gateshead.
Glaholm, J. P., Newcastle.
Glendinning, John, Newcastle.
Glover, John, Jesmond.
Goddard, D. H., Newcastle.
Gooch, T. L., Saltwell.
Gourley, Rev. G. M., Blanchland.
Gowland, G. H., Sunderland.
Graham, John, Sunderland.
Greaves, John, Newcastle.
Greener, Martin, Sunderland.
Green, Edward, Newcastle.
Green, R. Y., Newcastle.
Green, William, jun., Winlaton.
Green, C. R., Gateshead.
Green, C. H., South Shields.
Greenwell, Robert A., Newcastle.
Grey, C. J., Dilston.
Grey, Edward Bacon, Styford.

Haggie, R. H., Newcastle.
Hall, Frederick, Newcastle.
Hall, George, Kent.
Hall, Rev. G. R., Birtley, near Wark.
Hall, James, Newcastle.
Hall, John, Newcastle.
Hall, Thomas, Winlaton.
Hancock, Albany, Newcastle.
Hancock, John, Newcastle.
Hare, John, Newcastle.
Hardy, H. G., Byers Green.
Harris, Charles, Newcastle.
Harrison, J. A., Killingworth House.
Haswell, F., R.N., North Shields.
Havelock, Michael, Newcastle.
Hawdon, William, Sunderland.
Headlam, Right Hon. T. E., M.P., London.
Heald, Joseph, Newcastle.
Hedley, T. F., Sunderland.
Henderson. M., Newcastle.
Henderson, Robert, Newcastle.
Henderson, William, Durham.
Henzell, W. M., Newcastle.
Hepple, W., Newcastle.
Heslop, Joseph, South Shields.
Heslop, R. Oliver, Newcastle.
Hicks, J. M., Newcastle.
Hill, H. A., North Shields.
Hinde, Rev. J. S., Cramlington.
Hitchcock, Rev. W. M., Whitburn.
Hobkirk, Wm., Cramlington Colliery.
Hodgkin, Thomas, Newcastle.
Hodgson, James, Newcastle.
Hodgson, S. S., Sunderland.
Hodgson, William, Darlington.
Holmes, W. H., Newcastle.
Hooppell, Rev. R. E., M.A., South Shields.
Hope, John, jun., Hexham.
Hope, William, Sunderland.
Hopper, Rev. W. R., Sunderland.
Houen, A. C., Newcastle.
Howarth, Thomas L., Sunderland.
Howchin, Rev. Walter, Morpeth.

Howse, Richard, Newcastle.
Hudson, R. M., Sunderland.
Hughes, T. W. Newcastle.
Humble, Charlton, Jesmond, Newcastle.
Humble, S. J., Gateshead.
Humble, Thomas, M.D., Newcastle.
Hunt, A. H., Birtley.
Hunton, Christopher, North Shields.
Hunter, Rev. Joseph, Newcastle.
Huntley, D. P., Sunderland.
Hutchinson, Cuthbert, Whitburn.
Hutchinson, John, Sunderland.
Hutchinson, Joseph, Durham.
Hutchinson, William, Newcastle.
Hutton, John, Newcastle.

Iliff, Arthur, Roker.
Iliff, Rev. G., Sunderland.
Ingham, Robert, Westoe.
Irving, George, Newcastle.

Jackson, Daniel, M.D., Hexham.
Jackson, Thomas, North Shields.
Jackson, Thos., jun., North Shields.
Jeffrey, Allan, Winlaton.
Jenkins, Rev. Edward, North Shields.
Jones, Rev. John, Dunston.
Jones, John, Middlesbro'.
Johnson, Alfred, Gateshead.
Johnson, Rev. A., Bywell, Stocksfield.
Johnson, R. I., Newcastle.
Jordon, Joseph, Newcastle.

Kaye, William, Newcastle.
Kekwick, R., Sunderland.
Kell, John, Newcastle.
Kelman, William, Sunderland.
Kennedy, J. F., Newcastle.
Kidd, Robert, North Shields.
Kidson, John, Sunderland.
Kirkby, J. W., Pirnie Colliery, Fife.
Knothe, Rudolph, Newcastle.

Laidler, G. G., Newcastle.
Lamb, J, C., jun., Ryton.
Lawson, Professor Alexander, Oxford.
Lawson, Rev. E., Longhurst Hall.
Lawson, George S., Sunderland.
Lawson, J. W., South Shields.
Leathart, James, Newcastle.
Lebour, George A., Woodburn.
Legge, Alfred, Newcastle.
Legge, John, Houghton-le-Spring.
Legge, L. C., Houghton-le-Spring.
Leefe, Rev. J. E. Cresswell.
Leitch, T. C., North Shields.
Levy, Benjamin, Sunderland.
Lister, Clement, Newcastle.
Livesey, Frank, Tynemouth.
Lowe, Rev. Joseph, Haltwhistle.
Lowrey, E., Newcastle.
Lowry, Richard, Newcastle.
Luckley, George, Newcastle.
Luke, Thomas, Sunderland.
Lunge, Dr. G., South Shields.
Lyall, George, South Shields.

Mack, Robert, Newcastle.
Maling, E. A., Sunderland.
Maling T. C., Ouseburn.
Maling, William, Newcastle.
Marreco, Prof. A. F., Newcastle.
Mather, Edward, Newcastle.
Matthew, G.. Sunderland.
Matthews. R., South Hetton.
Maughan, Rev. J. A. C., Stocksfield.
McAllum, C. O., Newcastle.
McDonald, A. E., Newcastle.
McLean, Hugh, M.D., Corbridge.
McQueen, G. B., Gateshead.
Mein, John, Newcastle.

Messent, Philip, C.E., Tynemouth.
Metcalfe, J. S., Tynemouth.
Meynall, E. J., Durham.
Millard, Jos., Morpeth.
Miller, Thos. R., Newcastle.
Milling, John, Newcastle.
Moffatt, William, Newcastle.
Moor, W. T., Newcastle.
Moore, A. J., Sunderland.
Moore, John, Sunderland.
Moore, J. M., South Shields.
Moore, John, Durham.
Moore, William, Sunderland.
Moore, William, Newcastle.
Morgan, G. B., Sunderland.
Morland, John, Gateshead.
Morland, Thomas, Gateshead.
Morison, D. P., Bulman's Village.
Morrison, H. M., Newcastle.
Morrison, Samuel, North Shields.
Morton, Rev. Henry, South Shields.
Mounsey, Edward, Denham.
Murray, William, M.D., Newcastle.
Muschamp, W., Gateshead.

Neville, Samuel, Newcastle.
Nesham, T. C., Newcastle.
Newall, R. S., F.R.A.S., Ferndene, Gateshead.
Newton, Rev. J. H., B.A., Cambo.
Nicholson, James, South Shields.
Nicholson, William, Winlaton.
Noble, Capt. A., Elswick.
Norman, Rev. A. M., Burnmoor Rectory.

O'Brien, W., M.D., South Shields.
Ogilvie, Joseph, North Shields.
Oliver, John T., Newcastle.
Oliver, W. A., Sunderland.
Owen, G. O., Tynemouth.

Paris, W. H., Sunderland.
Park, A. D., Newcastle.
Park, John, Newcastle.
Pattison, Thomas, Newcastle.
Pattinson, J., Newcastle.
Pattinson, Joseph, Newcastle.
Pearman, G. W., Sunderland.
Pearson, W. H. Sunderland.
Pearson, William, Newcastle.
Peart, S., M.D., North Shields.
Peacock, Reginald, Sunderland.
Peacock, Septimus, Sunderland.
Pecket, G. C., Sunderland.
Peele, Richardson, Durham.
Peile, George, Shotley Bridge.
Pemberton, R. L., Sunderland.
Philipson, G. H., M.D., Newcastle.
Philipson, John, Newcastle.
Philipson, J. A., Newcastle.
Philipson, L. W., Newcastle.
Pilkington, Edward, Sunderland.
Popplewell, John, North Shields.
Porrett, J. C., Sunderland.
Porteous, John, Milton, Carlisle.
Potter, Addison, Heaton Hall.
Potts, G. C., Gateshead.
Potts, R. H., Sunderland.
Powell, Rev. R. P., Bellingham.
Powley, W., Durham.
Price, John, Sunderland.
Proctor, B. S., Newcastle.
Proctor, Matthew, Elswick.
Proctor, N. H., Ouseburn.
Procter, W. W. Newcastle.
Prosser, Thomas, Newcastle.
Pruddah, Edward, Hexham.
Punshon, N., Newcastle.

Reay, John, Sunderland.
Redmayne, J. M. Newcastle.
Redmayne, R. R., Gateshead Fell.
Reed, Edward, Newcastle.
Reed, J. R., Sunderland.

Reid, David, Newcastle.
Reid, George, Newcastle.
Reid, James, Newcastle.
Reid, John C., M.D., Newbiggen-by-the-Sea.
Reid, W. B., Newcastle.
Richardson, Edward, Newcastle.
Richardson, John George, Monkton.
Richardson, J. M., Newcastle.
Ridley, Samuel, Newcastle.
Ridley, W. B., Newcastle.
Ritson, Thomas F., Sunderland.
Robb, William David, Newcastle.
Roberts, Thomas, Newcastle.
Robertson, David, F.G.S., Glasgow.
Robertson, W. L., Durham.
Robinson, W. S., Sunderland.
Robson, E. C., Sunderland.
Robson, Frederick, Newcastle.
Robson, J. B., Newcastle.
Robson, J. E., Hartlepool.
Robson, Jas., South Shields.
Robson, M. H., Newcastle.
Robson, S. H., Sunderland.
Robson, S. S., Sunderland.
Robson, W. C., Newcastle.
Rolf, A. G., M.R.C.S., Gateshead.
Rowell, George, Newcastle.
Ryder, Martin, Sunderland.
Ryder, William, Newcastle.

Sample, Thomas, Morpeth.
Sansom, Thomas, Newcastle.
Saunders, Thomas, Bellister Castle.
Scholefield, Henry, Newcastle.
Scorfield, E. S., Newcastle.
Scott, George, South Shields.
Scott, Henry, Newcastle.
Scott, Stephen, Newcastle.
Scott, Thomas, South Shields.
Sharp, John, Gateshead.
Sharp, Thomas, Newcastle.
Shaw, Frederick, South Shields.
Shiel, George, Sunderland.
Shield, G. R., Newcastle.
Shield, John, jun., Newcastle.
Shields, John, Durham.
Shields, Rev. W. T., Hexham.
Shooter, Rev. John, North Shields.
Short, John, North Shields.
Shorthose, John, Hartford Bridge.
Shotton, Edward, North Shields.
Sibun, James, Sunderland.
Siddle, Robert, Sunderland.
Simey, Ralph, Sunderland.
Simpson, J. B., Ryton.
Skelton, William, Sunderland.
Smart, Collin, Sunderland.
Smiles, Henry, Newcastle.
Smith, Taylor, M.D., Monkwearmouth.
Smith, R. A., M.D., Sunderland.
Smithson, William, Newcastle.
Snowball, James, Gateshead.
Sopwith, T., F.R.S., F.G.S., London.
Soulsby, J. C., Jarrow.
Spence, C. J., North Shields.
Spence, Faraday, Low Heaton House.
Spence, J. F., North Shields.
Spence, J. F., jun., North Shields.
Spencer, J. P., North Shields.
Spence, Joseph, North Shields.
Spence, Robert, North Shields.
Spence, Thomas, North Shields.
Spencer, Michael, Newburn.
Spencer, Thomas, Ryton.
Stanger, J., Newcastle.
Steel, Thomas, Sunderland.
Stephens, Thos., M.D., North Shields.
Stephens, Thos., jun., North Shields.
Stephenson, Thomas, Newcastle.
Stevenson, A. S., Tynemouth.
Stevenson, Archibald, South Shields.
Stevenson, J. A., Newcastle.

Stokoe, Thomas, Newcastle.
Storey, Samuel, Sunderland.
Stout, G., South Shields.
Straker, John, Tynemouth.
Straker, Joseph Henry, Tynemouth.
Sutherland, B. J., Newcastle.
Sutherland, Robert, North Shields.
Swallow, John, South Shields.
Swallow, John, jun., South Shields.
Swan, Joseph, Newcastle.
Swan, J. W., Newcastle.
Swan, Robert, London.
Swanston, William, Newcastle.
Swithinbank, G. E., Newcastle.

Tate, R. M., North Shields.
Taylor, Rev. Hugh, Wark Rectory.
Taylor, Hugh, Chipchase Castle.
Taylor, John, Newcastle.
Temperley, W. A., Hexham.
Temperley, Nicholas, Newcastle.
Temple, William, Newcastle.
Tennant, Henry, York.
Thackray, Wm., jun., Sunderland.
Thiedman, Rudolph, Newcastle.
Thirkell, W. T., Sunderland.
Thompson, George, Winlaton.
Thompson, C., jun., Winlaton.
Thompson, J. T., Winlaton.
Thompson, James, Sunderland.
Thompson, Thomas, Winlaton.
Thompson, Thomas, Sunderland.
Tidswell, William, Newcastle.
Todd, Thomas, Jarrow.
Tone, J. C., Sunderland.
Tone, William, Sunderland.
Tone, William, jun., Sunderland.
Trevelyan, Sir W. C., Bart., Morpeth.
Tristram, Rev. H. B., M.A., F.L.S., Greatham.
Turnbull, Edward, West Hartlepool.
Tweddell, G. M., Stokesley.

Vermehren, H. W. M., Newcastle.
Vint, Robert, Sunderland.
Vint, T. H., South Shields.

Wake, W. M., Sunderland.
Wailes, George, Newcastle.
Wailes, W. S., Newcastle.
Wait, James, jun., South Shields.
Wait, John, jun., North Shields.
Wallis, Robert, M.R.C.S., Stocksfield.
Walton, Robert, Newcastle.
Warden, G. C., jun., Tynemouth.
Warden, Walter H., Tynemouth.
Warkwick, John, Newcastle.
Wasserman, J. G., Newcastle.
Watson, Henry, Millfield House, Newcastle.
Watson, J. W., Bensham Grove.
Watson, Joseph, jun., Gateshead.
Watson, Mason, Newcastle.
Watson, R. S., Newcastle.
Watson, Robert, Newcastle.
Watson, T. C., Newcastle.
Watson, T. E., Newcastle.
Waugh, J. G., London.
Wayman, J. W., Sunderland.
Welford, George, M.R.C.S., Sunderland.
West, Tuffen, Frensham, Surrey.
Westmacott, Percy, Benwell Villa.
Wheeler, Rev. R. F., Whitley.
Wheldon, John, London.
Wiener, Martin, Sunderland.
Wilcox, C. H., Whitburn.
Williamson, John, South Shields.
Williamson, Sir Hedworth, Bart., M.P., Whitburn Hall.
Wilson, Charles, Sunderland.
Wilson, E. J., Liverpool.
Wilson, G. A., Newcastle.
Wilson, Henry V., Newcastle.

Wilson, Henry, Newcastle.
Wilson, Henry, South Shields.
Wilson, John, Newcastle.
Wilson, John, North Shields.
Wilson, Joseph, Cleadon.
Wilson, Joseph, Newcastle.
Wilson, R. H., M.D., Gateshead.
Wilson, Thomas, Newcastle.
Winter, John M., Newcastle.
Wood, Lindsay, Newcastle.
Wood, Peter, Sunderland.
Wright, J., jun., South Shields.

Youll, John G. Newcastle.
Young, C. H., Newcastle.
Young, Emmanuel, North Shields.
Young, Frederick, South Shields.
Young, James, South Shields.
Young, Oliver, Newcastle.
Young, Thomas, South Shields.

HONORARY MEMBERS.

Airey, Sir G. B., F.R.S., Greenwich Observatory.
Baker, J. G., Kew Gardens.
Bate, C. Spence, Plymouth.
Glaisher, James, F.R.S., Lewisham.
Jones, Prof. T. Rupert, F.G.S., Farnborough.
Mennell, H. T., F.L.S., London.
Oliver, Prof. D., Kew Gardens.
Perkins, V. R., Wooton-under-Edge.
Sedgwick, Prof. A., F.R.S., Cambridge.
Philips, Prof. John, F.R.S., Oxford.

NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

REPORT READ AT THE ANNIVERSARY MEETING APRIL 22ND, 1871.

R. S. NEWALL, ESQ., V.P., IN THE CHAIR.

In consequence of certain negotiations with the authorities of the Newcastle-upon-Tyne College of Physical Science, in progress at the usual period for holding the Anniversary Meeting of this Society, and concerning which it was hoped that, by a little delay, a satisfactory Report might be presented to the members, considerably more than a year has been allowed to elapse since your Committee gave account of its stewardship. To chronicle the doings of a society constituted like ours is, under ordinary circumstances, a very simple matter—it is but to reproduce an almost stereotyped record of usefulness limited by comparatively small pecuniary resources, economical administration of the funds secured by a moderate share of public interest, and the gradual extension of the Museum by presentation and purchase—and our present Report need be no exception to the rule.

Public interest in the Society, judged by the number of visitors to the Museum, does not materially flag, and this is, so far as it goes, satisfactory; but the number of members of the Society is, and has been for many years, almost stationary, the roll being much smaller than it was when the population and wealth of the town and district were less than one half what they at present are. Indeed, during the last year or two the roll of members has somewhat decreased, the fresh accessions having been insufficient to fill the vacancies in our ranks arising from natural causes. As the annual subscriptions form a very important item in the income of the Society, this is a circumstance much to be regretted, but it is one that might be easily altered by a little effort on the part of the present members.

The arrangements for the establishment of a College of Physical Science in Newcastle have been watched with extreme interest by your Committee, and they have willingly acted with the Executive of that institution whenever their co-operation seemed to be desired. Your Committee cannot avoid expressing some disappointment that no arrangements have as yet been made for the recognition of Biological Science as a subject of study in the College: they have, however, the assurance of the Executive that this arises only from the present insufficiency of funds to endow another professorship, and under these circumstances the Committee have granted temporarily the free use of the Society's collections for teaching purposes, to the professors and students of the College, subject only to such restrictions as are found necessary for their safe-keeping. Minutes of the Executive of the College, copies of which have been sent to your Committee, show the entire acceptance by that body of the views which have been expressed by your Committee as to the relation which should subsist between the two institutions.

Since the last Anniversary Meeting, not only your Committee, but the whole Society, has had to deplore the decease of its late junior Secretary, Mr. George Hodge. In him science has lost a loving devotee, and his brother zoologists a genial, unassuming, ever-friendly colleague. His researches were chiefly connected with the results of dredging on the coast of Durham, and they were interrupted some years prior to his death by his removal from Seaham to Newcastle. There seemed every prospect of a renewal of his interesting labours on his return to Seaham in 1869, but his career was cut short by a rapily fatal illness. It was during his brief residence in Newcastle that he became more actively interested in the working of our Society, and during this period he cheerfully gave his time and labour in its service.*

Your Museum has been enriched by several important recent donations. Of these the most prominent is the large and beautiful collection of fossils formed by M. R. Pryor, Esq., of Trinity College, Cambridge. The value of this gift to the Society can scarcely be over-rated, for it represents copiously, and by characteristic specimens, named in accordance with the accepted types in the Woodwardian Museum, and excellently mounted, the fossil fauna of the Secondary and Tertiary strata of the Eastern Counties. By its means our meagre collections in these departments are brought up to a standard of completeness which the geological position of our own district left us little hope of attaining.

The Society is indebted to Hugh Taylor, Esq., of Chipchase Castle, for a gift of specimens of British birds, sufficient in number to lessen materially the list of desiderata. The gift, and the manner of giving, were alike highly gratifying to your Committee.

* It may not be out of place to append a list of the contributions to zoological science which have appeared from time to time in the Transactions of the Tyneside Naturalists' Field Club, and our own Society, from the pen of our late colleague, Mr. Hodge.

1858.—"On the occurrence of the Seal (*Phoca vitulina*) at Seaham Harbour." Trans. T. N. F. C., Vol. IV.

1859.—"Contributions to the Zoology of Seaham Harbour." *Ibid.*

1861.—"On the common Brittle-star (*Ophiocoma rosula*), with some remarks on the growth of the rays and their appendages." *Ibid*, Vol. V.

"On *Uraster glacialis*, at Seaham Harbour." *Ibid.*

"Dredging at Seaham Harbour;" Note on *Corymorpha nutans*, &c. *Ibid.*

"On a New Hydroid Zoophyte (*Podocoryne Alderi*)." *Ibid.*

"Observations on a species of Pycnogon (*Phoxichilidium coccineum*, Johnston), with an attempt to explain the order of its development." *Ibid.*

1862.—"Report on the Pycnogonoidea (Dogger Bank Dredging, 1862), with description of two new species (*Pallene attenuata* and *Nymphon brevirostre*)." *Ibid.*

"On a new Sand-star of the genus *Ophiura* (*O. Normani*), found on the Coast of Northumberland and Durham." *Ibid.*

"On some undescribed Marine Acari (*Halacarus granulatus*, *H. oculatus*, *Pachygnathus minutus*, and *Leptognathus falcatus*)." *Ibid.*

1863.—"Report on the Pycnogonoidea" and "Report on the Echinodermata" (Dredging Report, 1863). *Ibid*, Vol. VI.

"List of the British Pycnogonoidea, with description of several (seven) new species."

1864.—"Report on the Pycnogonoidea" and "Report on the Echinodermata" (Dredging Report, 1862–4, Summary). Nat. Hist. Trans. Northd. and Durham, Vol. I.

1871.—"A catalogue of the Echinodermata of Northumberland and Durham. *Ibid.* Vol. IV.

Your Committee has also to report the donation of twenty pounds to the funds of the Society from the Misses Bewick. In addition to the fact that every increase to its its funds augments the usefulness of the Society, this gift is highly prized as a testimony of the interest of the donors in the Museum with which the honoured name of their father is so intimately associated.

The Entomological collections, especially the Coleoptera, have of late received much attention from Mr. T. J. Bold, who has not only presented the Society with many of its desiderata, but, by his careful revision of the series already in the Museum, has given to it a new and greatly enhanced value.

By purchase the additions to the Museum have also been considerable. A series of models of Mollusca and one of Medusæ, by Herr Blatschka, of Dresden, have been obtained, and the curators are thereby enabled further to elaborate their scheme of a classified series of illustrations of the animal kingdom for educational purposes. These models form easily understood representations of classes otherwise very imperfectly exhibited in public collections.

The series of British birds has also been materially increased both in number and completeness, by accepting opportunities as they have chanced to arise for purchasing desiderata. But the most important purchase authorized by your Committee has been that of the Cabinet of Marine Invertebrata formed by the late Mr. George Hodge. The Society thereby secures to the Museum the type specimens on which many species, especially interesting to north country Naturalists, have been founded, and acquires a large general collection in Marine Zoology, particulaly rich in Echinodermata and Crustacea, and very valuable as a supplement to that of the late Mr. Alder.

The Museum buildings have, since the last Anniversary Meeting, required some general repairs, and considerable outlay has been entailed in the fitting up of new cabinets. These have been conducted with due regard to the economical administration of the funds of the Society.

The Treasurer's statement, appended to this Report, shows a small balance in hand on the current account.

THE TREASURER IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY.

CURRENT ACCOUNT FROM 10TH MAY, 1870, TO 22ND OF APRIL, 1872.

1870.	Dr.	£	s.	d.
May 10.	To Balance brought forward	103	19	1
	,, Subscriptions from Members	275	2	0
	,, Ditto from Associates	29	5	0
	,, Contribution from Institute of Mining Engineers	40	0	0
	,, Ditto from Literary and Philosophical Society	80	0	0
	,, Fine Arts Society, on account of Arrears of Rent	69	4	0
	,, Amount received for Admissions	223	9	0
	,, Rents for Sign Boards affixed to the buildings	14	0	0
	,, W. T. Moor, One Year's Rent for supports in the East wall of the Museum	0	2	6
	,, Donation from Misses Bewick, Gateshead	20	0	0
	,, College of Medicine (Half cost of small Printing Press)	1	8	8
		£856	10	4

1870.	Cr.	£	s.	d.
	By Salaries of Keeper of Museum and Assistant	215	5	0
	,, Payments to Mr. R. Howse, as Curator	16	10	6
	,, Tradesmen's Accounts and Sundries	171	8	3
	,, John Clayton, Esq., Two Years' Interest, less Income Tax	156	13	4
	,, Fire Insurance	30	0	0
	,, W. T. Moor, acknowledgment for Window Lights	0	2	6
	,, Share of cost of Printing Transactions	26	6	3
	,, Contribution to Tyneside Naturalist Field Club towards Publishing Fund	20	0	0
	,, E. Charlesworth, Esq., for Collection of Potton Fossils	9	15	6
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