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OF THE

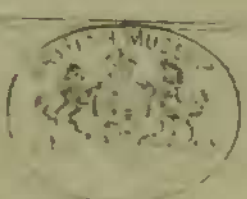
Norfolk and Norwich

NATURALISTS' SOCIETY;

PRESENTED TO THE MEMBERS FOR

1883—84.

VOL. III.—PART V.



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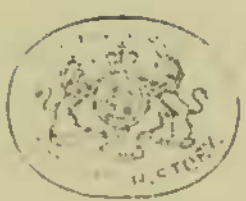

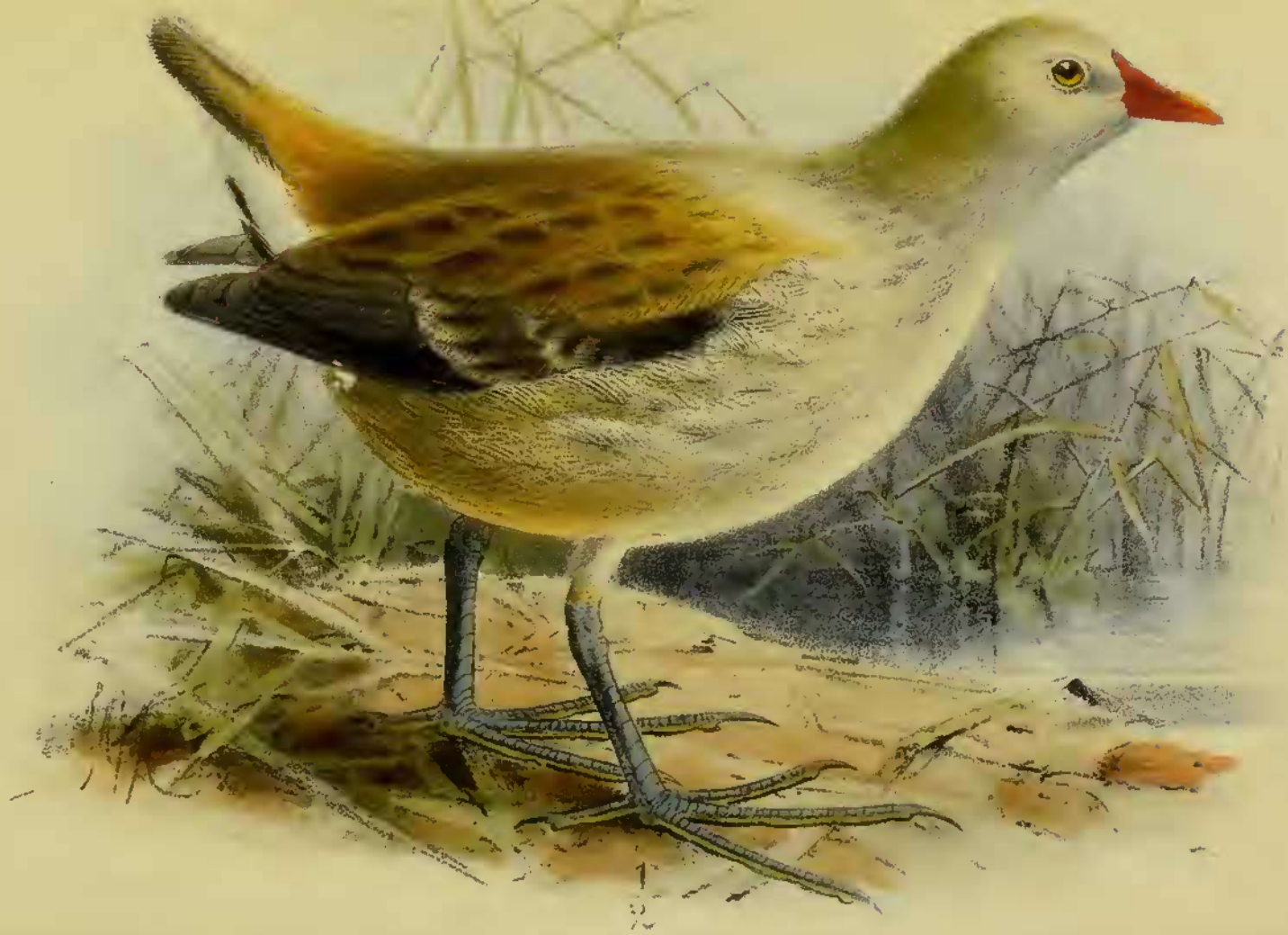

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The Treasurer in Account with the Norfolk and Norwich Naturalists' Society, Year ending 24th March, 1884.

Dr.	£	s.	d.
To Balance from last year	27	17	7
,, Subscriptions :—			
1 for 1881—82	0	5	0
6 ,, 1882—83	1	10	0
189 ,, 1883—84	47	5	0
1 ,, 1883—84	0	10	0
4 ,, 1884—85	1	0	0
	50	10	0
,, Additional payments for monthly summons	0	16	0
,, Sale of *Transactions*	4	8	6
,, Interest	1	4	5
	£84	16	6

Cr.	£	s.	d.
By Fletcher & Son, for Printing *Transactions*, 1882—83	36	15	0
,, Stevenson & Co., for Printing	1	8	9
,, Goose & Co., for ditto	2	1	6
,, G. Quinton, Binding	1	13	6
,, Gratuity to Doorkeeper	0	10	0
,, Postage, Stationery, and Carriage	6	9	0
,, Museum Subscription	2	2	0
,, Assistant-Secretary's Salary	5	0	0
,, Balance in hand	28	16	9
	£84	16	6

LIFE MEMBERSHIP FUND.

	£	s.	d.
To Balance from last year	39	9	7
,, 7 Compositions for Membership	21	0	0
,, Interest	0	15	9
	£61	5	4

By Balance in Post Office Savings Bank ... £61 5 4

25th March, 1884.

Examined and found correct.

STEPHEN WM. UTTING, *Auditor.*

List of the publications received by the Society as Donations or Exchanges from March, 1883, to March, 1884.

ANDERSON (R. J., M.D.).

Pamphlets, viz., The Morphology of the Omohyoid Muscle. Division of the Scaphoid Bone of the Carpus. Thickness of the Human Skull. Diameters of Human Vertebræ. Abnormal arrangement of Peritoneum. Abnormality of Vertebral Artery. Case of Epispadias. Morphology of Muscles of Tongue and Pharynx. An Astragalo-scaphoid bone in Man. Abnormal arrangement of Thyroid Arteries. A variety of the Mylopharyngus. A Palatine branch from the middle Meningeal Artery. Respiratory excitation and depression. Note on Apnœa and Heat Dyspnœa. Ueber secundäre Wirkung vom Herzen auf Muskeln. Ueber einige Muskelanomalien. 1878—1882. In one vol. Sm. 8vo.

From Professor Newton, F.R.S.

BALFOUR (PROFESSOR FRANCIS MAITLAND).

The Anatomy and Development of Peripatus Capensis. [Reprinted from "The Quarterly Journal of Microscopical Science," for April, 1883.] pp. 56. 8vo.

From Professor Newton, F.R.S.

BALFOUR (PROFESSOR F. M., LL.D.) and PARKER (W.N.).

On the Structure and Development of Lepidosteus. [From "The Philosophical Transactions of the Royal Society," 1882. pp. 359—442.]

From Professor Newton, F.R.S.

BATH.

Proceedings of the Bath Natural History and Antiquarian Field Club. Vol. v. no. 2. 8vo. *Bath*, 1883

From the Bath Field Club.

BELFAST.

Annual Report and Proceedings of the Belfast Naturalists' Field Club. Series ii. vol. ii. parts 2 and 3. 8vo.

Belfast, 1883

From the Belfast Naturalists' Field Club.

BELTREMIEUX (EDOUARD).

Faune du département de la Charente-Inférieure. pp. 94. [Extrait des Annales de l'Academie de la Rochelle.] 8vo.

La Rochelle, 1864

From Professor Newton, F.R.S.

BELGIUM.

Annales de la Société Belge de Microscopie. Tomes 7 et 8. 8vo.

Bruxelles, 1883

From La Société Belge de Microscopie.

Annales de la Société Royale Malacologique de Belgique. Tome 17 (troisième série, tome 2). Année 1882. Roy. 8vo.

Bruxelles, 1883

From La Société Royale Malacologique de Belgique.

BENNETT (ARTHUR, F.L.S.).

On Najas Marina, L., as a British Plant. [Re-printed from the "Journal of Botany," for December, 1883.] pp. 2, with one plate. 8vo.

From the Author.

BERWICKSHIRE.

Proceedings of the Berwickshire Naturalists' Club. Vol. x. no. 1. 8vo. 1883

From the Berwickshire Naturalists' Club.

BIRDS.

The Architecture of Birds. The Domestic Habits of Birds. The Faculties of Birds. [Library of Entertaining Knowledge.] 3 vols. 12mo. *Lond.* 1831—35

From Mr. C. B. Wharton, F.Z.S.

Report on the Migration of Birds. Fourth Report, 1882. pp. 106. *Lond.* 1883

From Mr. John Cordeaux.

BONAPARTE (PRINCE CH.).

Additions et Corrections au Coup d'œil sur l'Ordre des Pigeons, et à la partie correspondante du Conspectus Avium de S.A. Monseigneur le Prince Ch. Bonaparte. pp. 9. 4to. 1856

From Professor Newton, F.R.S.

BRANDT (DR. ALEXANDER).

Kurge Bemerkungen über Aufrechtstehende Mammuthleichen Zusammengestellt. 8vo. pp. 16. Moskau, 1868. [From Bulletin de la Soc. Imp. des Naturalistes de Moscou, no. 3, 1867.]

From Professor Newton, F.R.S.

BRANDT (J.F.).

Spicilegia Ornithologica Exotica. Fasciculus i. 4to.

Petropoli, 1839

Auffindung zweier Backenzähne des Elasmotherium im Gouvernement Saratow. pp. 2. Einige Worte zur Ergänzung meiner Mittheilungen über die Naturgeschichte des Mammuth. pp. 5. Uber die Reste eines in Italien bei Aqui in den untern Schichten des mittlern Miocän entdeckten jungen Squalodons. pp. 2. [Extraits des Mélanges Biologiques tires du Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg. 1864—72.]

From Professor Newton, F.R.S.

BREMEN.

Systematisches Verzeichniss der naturhistorischen Sammlung der Gesellschaft Museum. Erste Abtheilung. Voegel. pp. 126. 4to. *Bremen*, 1844

From Professor Newton, F.R.S.

BRIDGMAN (J.B., F.L.S.).

Further additions to Mr. Marshall's Catalogue of British Ichneumonidæ. [From "The Transactions of the Entomological Society." June, 1883, pp. 139—171.]

From the Author.

BRISTOL.

Proceedings of the Bristol Naturalists' Society. New Series, vol. iv. part 1. 8vo. *Bristol*, 1883

From the Bristol Naturalists' Society.

CARDIFF.

Cardiff Naturalists' Society. Report and Transactions. Vol. xiv. 8vo. *Cardiff*, 1883

From the Cardiff Naturalists' Society.

COPE (E.D.).

On the Vertebrata of the Bone Bed in Eastern Illinois. [From the Proceedings of the American Philosophical Society, 1877. pp. 53—64.] 8vo.

On some Extinct Reptiles and Batrachia from the Judith River and Fox Hills Beds of Montana. pp. 20. [From the Proceedings of the Academy of Natural Sciences of Philadelphia, Dec. 1876.] 8vo.

From Professor Newton, F.R.S.

CORRY (THOMAS H., M.A., F.Z.S.).

The Movements of Fluids in Plants. 8vo. pp. 72. 1881.

From Professor Newton, F.R.S.

CROYDON.

Proceedings and Transactions of the Croydon Microscopical and Natural History Club, from Feb. 15th, 1882, to Jan. 10th, 1883. 8vo. *Croydon*, 1883

From the Croydon Club.

CUNNINGHAM (D. J., M.D.).

The Dissector's Guide: being a Manual for the use of Students. 2 vols. Sm. 8vo. *Edinb.* 1879

From Professor Newton, F.R.S.

DOWDESWELL (G. F., M.A., F.L.S.).

The Micro-Organisms which occur in Septicæmia. pp. 12. [Re-printed from the "Quarterly Journal of Microscopical Science," January, 1882.] 8vo.

From Professor Newton, F.R.S.

DUBALEN (P. E.).

Catalogue critique des Oiseaux observés dans les départements des Landes, des Basses-Pyrénées et de la Gironde. pp. 68. [Extrait des Actes de la Société Linnéenne de Bordeaux, t. xxviii. 5e liv. 1872.] 8vo. *Paris*, 1872

From Professor Newton, F.R.S.

EASTBOURNE.

Transactions of the Eastbourne Natural History Society. Vol. i. part 3. New series. 8vo. *Eastbourne*, 1883

From the Eastbourne Natural History Society.

EDINBURGH.

Transactions and Proceedings of the Botanical Society. Vol. xiv. part 3. 8vo. *Edinburgh*, 1883

From the Edinburgh Botanical Society.

ELLIOT (DANIEL GIRAUD).

A Monograph of the Bucerotidæ, or Family of the Hornbills. Introduction, pp. xxxii. Folio. Published for the Subscribers by the Author. 1882

From Professor Newton, F.R.S.

ESSEX.

Transactions of the Essex Field Club. Part 7. 8vo. *Buckhurst Hill*, 1883

From the Essex Field Club.

GLASGOW.

Proceedings of the Natural History Society of Glasgow. Vol. v. part 2, 1881—82. 8vo. *Glasgow*, 1883

From the Natural History Society of Glasgow.

HAAST (JULIUS VON, Ph.D., F.R.S., Professor of Geology in Canterbury College, N.Z. University).

Geology of the Provinces of Canterbury and Westland, New Zealand. A Report comprising the Results of Official Explorations. 8vo. *Christchurch*, 1879

From Professor Newton, F.R.S.

HADDON (PROF. ALFRED C., M.A.).

On Budding in Polyzoa. [Re-printed from "The Quarterly Journal of Microscopical Science," for October, 1883.] pp. 45. 8vo.

From Professor Newton, F.R.S.

HASTINGS.

The Natural History of Hastings and St. Leonards and the Vicinity. First supplement. 12mo. *Hastings*, 1883

From the Rev. E. N. Bloomfield, M.A.

HICKSON (SYDNEY J.).

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From the Yorkshire Naturalists' Union.

ADDRESS.

Read by the President, Mr. H. M. Upcher, F.Z.S., *to the Members of the Norfolk and Norwich Naturalists' Society, at their Fifteenth Annual Meeting, held at the Norfolk and Norwich Museum, March 27th, 1884.*

Ladies and Gentlemen—When you did me the honour to elect me as your President, you also assured me that you would deal leniently with me in case of any shortcomings. I feel that I have trespassed to the utmost on your leniency; and am fully aware of my shortcomings, in not attending more regularly the pleasant and instructive meetings held in this room. But I was unable in the winter to undertake the night journeys which would have enabled me to do so. In return for your generous kindness, I have now to inflict upon you a paper of unlimited length and unparalleled dulness.

During the past year fourteen new members have been elected; whereas we have been fortunate enough only to lose five; of these, two were by death, viz., Rev. John Bailey and Mr. Alfred Master. Three have discontinued. So we now number two hundred and forty-six members, an increase of nine this year.

The financial state of the Society is in a flourishing condition.

I will now, with your permission, briefly allude to some of the papers which have been read during the past year.

At the first meeting, in April, the Secretary read some interesting extracts from General Norgate's diary, on Natural History in India, giving a curious account of the habits of several species of Ants. The ways and customs of these busy little folk have been much inquired into in England of late, and it is interesting to know that there are as many as thirty-four or thirty-five British species.

At the May meeting, the Rev. J. A. Laurence read extracts from a letter from his brother, relating to some forms of insect life in Australia. The Rev. E. F. Linton read a paper on a botanical ramble in the Breadalbane Mountains. He also read a paper on the variation in the colours of Flowers, especially in regard to Albinism, in which he showed that the plants whose flowers most often varied to white were those which had blue or purplish flowers, giving a list of fifteen blue and thirty-four purple-flowering plants which did so; and also added a list of about half a dozen plants, with usually white flowers, which sometimes turned to purple or pink.

At the September meeting, the Rev. W. Barlee exhibited and presented to the Society some beautiful photographs taken on the occasion of their visit to Aylsham and Blickling. Miss Barnard exhibited some interesting botanical specimens. A paper, by Mr. J. Whitaker, on Albinism and the variation of plumage in Birds, was read; also a supplementary paper on the same subject by Mr. J. H. Gurney, Jun.; and an interesting discussion followed. But both papers and discussion seem to prove that there is still a wide field open for discovery in the subject of Albinism. Mr. F. Kitton gave the result of a microscopic examination of the feathers of the so-called Tawny Water-hen. A coloured illustration of this bird has been presented to the Society by Mr. J. H. Gurney, Jun., and will form the frontispiece to the present volume.

At a meeting of the Journal Committee, held the same evening, a most important resolution was carried, on the motion of Mr. Stevenson, seconded by Mr. Southwell, to the effect that those members who had prepared lists of the Fauna and Flora of the County should be requested to make supplementary lists for the forthcoming number, the concluding part of the third volume of the 'Transactions.' These gentlemen having most kindly acceded to this request, the lists of the Fauna and Flora will, in the next number, be presented complete up to the present date. The importance of this I need not impress upon you, ladies and gentlemen. This addition makes the lists immensely valuable

and is a great feather in the Society's cap. And I am sure all lovers of Nature will most cordially thank those who have so willingly and kindly assisted in bringing about this grand work.

At the November meeting, Mr. G. F. Buxton exhibited the head of a very fine Reindeer killed in Norway; also some skins and heads of Chamois killed in the Alps and the Pyrenees, pointing out the difference in the size and colour of the animals inhabiting the two districts. Mr. R. M. Christy read a paper on the inter-breeding of the Thrush and Blackbird.

On January 29th Mr. Harmer read a paper by his son, Mr. Sidney F. Harmer, on "Darkness and Eyes," proving how the visual organs of animals which have lived during many successive generations in total, or nearly total darkness, exhibit much departure from the normal type, as exemplified by cases drawn from the cave animals, deep-sea forms, pelagic animals, and parasites which live within the bodies of their hosts. Mr. Clement Reid contributed a paper on "Norfolk Amber;" and an interesting account of a volcanic eruption in Australia was sent by the Rev. J. A. Laurence. Mr. J. H. Gurney, Jun., also sent a paper upon the occurrence of the Arctic Blue-throated Warbler, referring to the appearance of that species at Blakeney last Autumn, in unusual numbers, as observed by Mr. G. E. Power.

At the meeting in February some botanical notes by Mr. Arthur Bennett were read, from which we learn that some additions to the County Flora have been made during the past year, and that two of the species added were also new to the British list. A paper was contributed by Mr. C. Reid on recent additions to the Fauna and Flora of the Cromer Forest-bed. Mr. Southwell read a paper on "The Fens and Fen-folk." From scanty sources, he had picked out an interesting account of these ancient folk, who, by those living outside the Fen Country, seem generally to have been looked upon as closely resembling the Newts in their ditches, even in the details of webbed feet and speckled bellies.

Three expeditions were made last Summer;—one to Woodgate, by invitation of R. J. W. Purdy, Esq., and Blickling Park and

Gardens, by permission of the Marchioness of Lothian; one, in July, to Melton Constable Park, by permission of Lord Hastings; and one, in August, to Fritton Lake and Woods, by permission of Sir S. Crossley and Mr. H. E. Buxton.

Some valuable additions to the library have been received, especially those presented by Professor Newton.

We exchange 'Transactions' with twenty-six other Societies.

This evening, instead of taking you with me into the depths of any new theory as revealed by science,—when I should be trying to tell you what you already know far better than I do myself,—and leaving on record the driest paper you have ever listened to, I would rather leave my name associated with this Society in an endeavour to stir up in the country a spirit of protection towards those wanderers from other lands which now and then seek a home with us. We like our country to enjoy a reputation for hospitality. We should each and all of us feel it as a slur upon ourselves, if any illustrious stranger who visited our shores met with the same sort of reception that a certain royal personage lately experienced from our neighbours across the Channel. Then why should we change our nature towards the feathered visitors who honour us with their presence? It is really grievous to think of the certain fate that awaits any rare stranger on its arrival in this country. I feel that their protection cannot be obtained by any law or laws. But is it too much to hope that, by means of this and kindred societies, the knowledge of Natural History may be more and more widely diffused: and that, as by a wider and more general knowledge of the different branches of Natural History, the exquisite beauty and marvellous adaptation of the several parts of each separate specimen, making together such a perfect whole, whether bird or beast, fish or flower, are understood and appreciated,—such knowledge bringing more and more clearly to light the infinite wisdom of the Almighty Creator,—so to know will be to love and admire? and to love and admire must be to protect.

The same arguments apply to the protection of those species, which, formerly numerous, are now, I fear, becoming yearly fewer

in number. Of course, in some cases, the force of circumstances, by which I would include drainage and the better cultivation of land, has driven some species from localities which they formerly inhabited. But the root of the evil is the insatiable greed of collectors; and, as the result of that, the ridiculously fancy prices * attached to home-killed specimens, and authenticated home-laid eggs. As also the much to be deplored system of some collectors, who have no conscience, of offering to local men such a price to collect eggs, which it would be more than human nature for them to resist, and then using such eggs for the purpose of exchange and barter.

We have had an example of this during the last year, which must have made the blood of every Norfolk lover of birds to boil. It seems that a pair of Montagu's Harriers, trusting to the history of their ancestors, fixed upon the county of Norfolk as a fit locality for their spring and summer residence. This becoming known to a blood-thirsty ruffian of the genus insatiable, nothing short of robbery and murder would satisfy him. So, waiting till the old bird had laid her eggs, and begun to set on them, knowing that, at that time, Mrs. Montagu would be less suspicious and more easily approached, he planned and carried out his cowardly assault. Mrs. Montagu, bleeding and wounded, I believe, escaped his clutches; but, of course, the nest was sacrificed. I think the lovers of Nature in Norfolk should most emphatically protest against this unwarrantable intrusion by an outsider; and that all such destroyers should, by force of public opinion, be made to feel that, if they cannot enjoy the works of Nature themselves, they have no business to prevent others from doing so.

The Harriers—how different from the time when Lubbock described the Marsh Harrier as the Norfolk Hawk!—are becoming more and more scarce. No doubt the increase of drainage has a good deal to do with this.

* Since writing the above, I have seen an account of the sale of Mr. Harper's collection of British Moths and Butterflies, at which one specimen realized £13: and a single series of the common Tiger Moth sold for £90.

The Ruff and Reeve, as breeders amongst us, are, I fear, only represented by a single pair, if even they remain, though annually a few immature birds visit us in August or September, at which time I have generally seen some at Feltwell and Hockwold.

The 'trips' of Dotterel (*Eudromias morinellus*), formerly so regular in their appearance, are now scarcely ever seen in our fen country.

What more lovely sight is there than a flock of Terns fishing along the shore, or up one of our tidal harbours, every movement so full of grace and vivacity as they wheel, hover in mid-air, and then, with closed pinions, descend like lightning-flashes into the rippling waters below? What is to be their fate? Colonies, I am glad to say, still breed at Blakeney, Wells, Brancaster, Thornham, and Wolverton. But egging is carried on to such an extent, and an annually increasing number of pot-hunters, who appear as soon as the close time ends, and shoot everything or at everything that comes within range, bid fair soon to exterminate them. The colony at Brancaster has, I hear, already suffered much from these causes. Some eggs taken from the Wells colony have, I hear, been indentified as belonging to *Sterna artica*, now known, or I should rather say unknown, as *S. macrura*. The close time, from general accounts, seems to have answered well. A great many more Snipe and Duck have bred in the County since its introduction, but the difficulty is to suit all interests. The time that suits inland waters does not suit the coast. For the coast shooting, including our tidal harbours and estuaries proper, the close season should begin later and end later. This was my original contention. I wrote a letter in the 'Field' to that effect, when the subject was first introduced, and I still believe it to be the right principle. If that cannot be carried out, then Wigeon and Brent Geese should be struck out of the list of birds protected by the bill. It is very hard upon those people who look to gunning for a livelihood, to be obliged to give it up just as—as very often happens—the best time is coming for Wigeon and Brent Geese, especially as there is no corresponding benefit derived. The close time for the coast should extend later into the autumn, so that the

birds, Terns, Ringed Dotterel, &c., bred there should have time to get strong enough on the wing to protect themselves; whilst the home-bred Duck, &c., if left undisturbed, would get a good "hold" on the feeding-grounds, and would act as decoys to the first flights of foreign fowl.

Mallard seem to have been fairly numerous for an open winter; Wigeon scarce, or perhaps spotty.

Inland decoys give a bad return for the season, and account for a very small quantity of Teal. It is curious that so little mention is made of the marked difference in the home-bred and foreign Ducks (*A. boschas*). The home-bred birds are heavier in weight, lighter in colour, and the flesh also is lighter. The foreign Ducks are smaller, and neater in form, the plumage darker, and the flesh also dark. Sir R. Payne-Galwey, in his excellent book, 'The Fowler in Ireland,' remarks: "This difference is so well known to fowlers and dealers, that sixpence is added to the price of what are termed the large Mallard, this extra amount being expected and given by buyer and seller respectively." I have very seldom seen this difference alluded to. The Shelduck still nests between Wells and Hunstanton, but is no longer to be found to the east of Wells. The Oyster-catcher is also to be found in the same locality, but very much reduced in numbers. The Ringed Plover (*Ægialitis hiaticula*) keeps up its numbers from Salthouse to Lynn. Of the migrant waders it is difficult to speak with certainty, as regards increase or decrease, as one species seems generally largely to preponderate over the others, and accounts differ so much from different places. Stints seem to have been generally plentiful. Knot scarce in the Lynn and Brancaster districts, but fairly plentiful at Blakeney, where Bar-tailed Godwit have also been more abundant this year than for some years past. But I fear that the Grey Plover and Godwit visit us in smaller quantities than formerly. Mr. G. Cresswell informs me that he has seen more Velvet Scoters (*Œdemia fusca*) than usual between Wolverton and Hunstanton. Mr. A. Napier of Holkham has kindly sent me several interesting Ornithological notes from the Wells district. He tells me that, in December, a very large White Hawk was observed for several days

on the saltings at Wells, though he was never fortunate enough to fall in with it himself. One of the gunners there told him he had several times got within sixty or seventy yards of it, and described it as nearly white, or rather like a "speckled Mow," and very nearly as big as an Eagle. It is a pity this fine bird was not seen by any one who could have put a name to it.

I will give, in his own words, a striking instance of the boldness of the Merlin. "One day last October, I was on the saltings at Wells, and, having seen five Curlew settle in a creek, I endeavoured to circumvent the varmint, but could not get near them, as the tide was flowing. Just as I had given them up, a Merlin passed by me a few yards off, going like lightning. The moment he cleared the edge of the creek, up rose the Curlew, and he had one in a moment. Such a collapse I never saw; the Curlew simply doubled up, and went down all of a heap." One cannot help thinking that the Hawk must have been tempted by the birds rising right under him at the moment, for, plucky though he is, he would hardly have chosen such a big bird to tackle in open weather. Mr. Napier also tells me that a Berniele Goose has occasionally paired with a Canada Goose on the lake at Holkham. This is curious, as there are no tame Bernicles on the lake; and the Berniele is one of the rarest Geese to be met with on the coast.

The Pink-footed Geese, in spite of the mild weather, are, or were last week, in large flocks on the marshes near Wells. This is unusually late.

On the 1st of January this year my brother heard and saw a Wryneck at Sheringham. He tells me the following story of would-be cannibalism on the part of Hooded Crows (*C. cornix*). When in Holland last year, he shot at a Crow sitting on the shore, with a rifle. The bird, badly wounded, tried to fly, but lit again directly. Presently other Hoodies, scenting blood, arrived on the scene, and sat round the wounded bird, evidently intent on devouring him, as soon as all power of resistance on his part had ceased. When the poor bird apparently could no longer endure the sight of its would-be devourers, it attempted to fly

away; but, as soon as it rose, one of the others swooped at it like a Hawk, and knocked it to the ground. My brother then sent a boy to pick it up, and found that it had been killed quite dead by the blow. Last year we heard some curious facts about Rooks in India: let me tell you the history of two tame ones, which my boys picked up two years ago, blown out of their nest. They were kept in a little aviary just outside my study door, and afforded strong oral and nasal evidence of their existence. Mrs. E. Sparke, with whom we were living at Hockwold Hall, took a great fancy to them. She fed them with soaked bread out of a doll's spoon. One of them, in its voracity, *bolted spoon and all* one day. By a prompt application of finger and thumb, the spoon was retrieved from the lowest depths; but for a long time that bird could not speak out of a whisper. The birds grew lusty and strong, except that one never was able to make a good fly of it, as the feathers in his wing which had been cut did not moult clean. They lived entirely out of doors. I say entirely, that is, when we could keep them out; for, at last, we had to put wire-netting to the drawing-room window, as they insisted upon coming in, and sitting upon the chair-backs. These Rooks came from a rookery in the rectory grounds, about a quarter of a mile off. There was a branch of it in the trees round the garden at the hall; and, I think, this is the curious part of the story, that, though the tame Rooks were fed regularly in the garden, yet I never saw one of the wild Rooks come down to feed with them, or attempt to carry off any of their food. All through the next breeding-season the wild Rooks took no notice of the tame birds, or the tame birds of them. It was a dead cut. I doubt much if, up to this time, the tame birds had ever gathered any food for themselves. They would follow Mrs. Sparke like a dog. They would often come and sit on the dining-room window-ledge, and tap at the glass. Anybody in the room might get up, and they would take no notice; but as soon as Mrs. Sparke moved, they would set up their wings, and begin to squall at once. In the autumn Mrs. Sparke moved to Feltwell, two miles off. The Rooks, after being shut up for a day or two, were let out in the

kitchen-garden there. One stayed about a fortnight, and then flew back to Hockwold, where it met with a violent death. The other soon after disappeared. Certainly these black gentlemen are curious folk.

I am glad to say the Short-eared Owl (*Asio brachyotus*), for which Messrs. Newton and Dresser have selected the name "*accipitrinus*," is still a summer resident in Feltwell Fen; but, as the last undrained portion is now formed into a drainage district, I fear it will soon have notice to quit.

I am very glad to have been able to identify a new bird for our Norfolk list this year—the White Wagtail (*Motacilla alba*). I saw a pair of these birds for three or four days in the beginning of last September, on the lawn just outside my study window at Feltwell. I have no doubt there were some immature birds as well; but I was undergoing the misery of trying to arrange my goods and chattels, having just moved up from Hockwold, so that I am afraid I did not pay as much attention to them as they deserved. There were several other Wagtails (*M. lugubris*) on the lawn at the same time, so the difference was most marked. As *Motacilla alba* is the prevailing species across the Channel, it is curious that they are not more common with us. Some may ask: "Why did you not shoot one to make doubly sure?" I am glad to say such a thought did not enter my head. And this brings me again to my starting-point, that we should endeavour to obtain protection for those birds which are indigenous to the country, but which are, from various causes, perilously near extinction, as well as for those rare visitors which might be induced to stop and breed with us.

There is no lack of encouragement for such an effort. Look at the case of the Gadwall, which, from a pair or two caught at Southacre Decoy, and turned out at Narford, have not only thoroughly stocked that place, but have spread over most of our inland waters in large numbers.

Norfolk and Norwich led the way in the first Fishery Exhibition, held in this city, and which resulted in that splendid International Exhibition held last year in London. Let Norfolk and Norwich

take the lead again; and let this Society do its utmost to persuade men to deal more leniently with rare migrants, and to take more care of those interesting birds which still make a home among them, to a few of which I have shortly alluded. And let us prove that, to lovers of Nature at least, the converse of the old proverb is true; viz., "that a bird in the hand is *not* worth two in the bush." I do not say this simply as a closet Naturalist, for I have been brought up almost with a gun in my hand; but there is a time to shoot, and there is a time not to shoot. Though I have dwelt principally on birds, I would not confine my remarks to them, but include all other branches of Natural History. Look for instance at the grand Swallow-tailed Butterfly. Its little world is getting terribly small in our county. Let those be persuaded, who still have the privilege of possessing it on their lands, to do all they can to preserve it, and stop that trade in chrysalises.

So also with the Flora. Cannot the voice of public opinion be brought to bear upon those who thoughtlessly purchase roots of Ferns and Flowers, to adorn for a few short hours their rooms and balconies, at the expense of woods and hedgerows. The trade is so great, that round many of our large towns, Flowers and Ferns are nearly extinct. That great body of excursionists who have to bear the blame of every evil, from cutting names on a tree to chipping a tombstone, are greatly responsible in this matter. It is not enough to pick a flower or a frond, but the root must be taken home as a memorial of the trip. Would not the country, without its Ferns and Flowers, be deprived of half its charms? I remember an old story, dear to me in my youth, called "Eyes and No Eyes." Should not such societies as ours try to remove the possibility of "no eyes" existing any longer? I say, encourage every boy and every girl to take up some branch of science as a hobby. Only let the hobby be of a useful and elevating character, and it will always prove a blessing and a constant joy. Take Natural History alone, and what a field is opened! And, as the different branches of it, or any one of them, are mastered or better understood, the mind is exalted by the study of the works of God to see in the various laws

of Nature in operation throughout the universe, infinite sublimity, grandeur, and perfection, and is led to exclaim with Cowper ('The Task,' bk. v.):

> "His are the mountains, and the valley his,
> And the resplendent rivers. His to enjoy
> With a propriety that none can feel
> But who, with filial confidence inspired,
> Can lift to Heaven an unpresumptuous eye,
> And smiling say: 'My Father made them all!'
> Are they not his by a peculiar right,
> And by an emphasis of interest his,
> Whose eye they fill with tears of holy joy,
> Whose heart with praise, and whose exalted mind
> With worthy thoughts of that unwearied love,
> That planned, and built, and still upholds, a world
> So clothed with beauty for rebellious man."

I.

ON THE "HAIRY" VARIETY OF THE MOORHEN (*GALLINULA CHLOROPUS*).

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

Read 25th September, 1883.

All varieties among birds are curious; particularly when their *raison d'être* is not clear. Why should the so-called Sabine's Snipe be so uniform? Why should certain islands produce a melanism of the Blackcap, and others an albinism of the Raven? Do buff-coloured Sparrows lay abnormal eggs; and is a Liliputian Tit-lark, such as was killed at Brighton (now in Mr. Monk's collection at Lewes), merely a dwarf, or something else? What makes a Greenfinch and a Siskin turn yellow, and why are pied Ring Ouzels always pied about the head, and why do Bramblings sometimes have black chins? A hundred such questions might be asked, and the solution of them made an interesting problem, without touching on the two kindred fields of hybridism and climatic variation.

The "hairy" Moorhen is a variety which, looking only to the prevailing colour of its plumage, might not inaptly be termed the tawny Moorhen.* Its rufous back has in more than one instance suggested hybridism with the Land-rail.† It is however no hybrid, but a variety simple and pure, and as strange and unaccountable a one as has ever been recorded. Attention

* I have used the term "hairy" as applied to these Moorhens, but I admit it is not quite a satisfactory word. Professor Newton suggests "decorticated" as a better epithet. Mr. Stevenson prefers "hairlike."

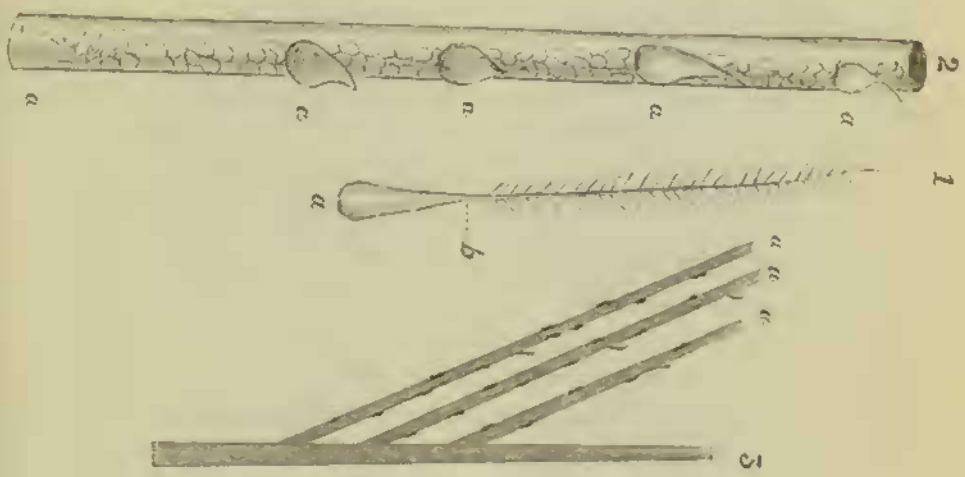
† A hybrid between a Moorhen and a Coot is said to have been obtained in America ('Ibis,' 1884, p. 216.)

was first prominently drawn to it by Mr. Henry Stevenson, in 'Birds of Norfolk' (vol. i. p. 421), and I cannot do better than summarize his description of one in his collection, killed at Lakenham near Norwich.—Upper parts of the plumage reddish orange, over shades of greyish black, this singular appearance being caused by each feather having the basal half black, the anterior portion only having a reddish hue. Sides of the head dull black, slightly tinged with greyish white, as also the chin and throat. Under parts greyish white. *The whole of the plumage resembling rather hair than feathers, owing to the absence of the barbules* from the anterior portion of the vane of each feather.

The barbs of the feathers of an ordinary Moorhen may be described in the same terms as the feathers of any other bird. They are narrow, tapering, and fixed at their basis to the stem of the feather on either side. The interstices between the barbs are filled up by the barbules, pointed processes, which stand in the same relation to the barbs as the barbs do to the stem.* In the "hairy" Moorhen, these barbules are wanting. This is apparent to the naked eye; but we fortunately have the result of a microscopical examination. Mr. F. Kitton, who contributed some notes to the 'Birds of Norfolk' (*l.c.*), has since examined two more specimens, No. 4 and No. 11 of my list. Speaking of Mr. Stevenson's bird,—No. 6,—he considers that the absence of the barbules has produced the alteration in colour and the rough appearance of the bird, and that this hair-like or worn condition of plumage may be accounted for by inability to perform the usual moult. He further considers that the barbules of the feathers have been broken off; and that this operation has been caused, or at any rate assisted, by the Moorhen's preening itself. In some notes laid before the Society, referring to the specimen now under consideration, Mr. Kitton says: "I first examined the barbules with a low power, which however did not display much beyond their hair-like structure, and the internal cells. I afterwards macerated the feather in a weak solution of caustic potash, and proceeded to examine it with a higher magnifying power,—one of 400 diameters,—

* *Cf.* Professor Parker's description of Integument and Feathers, in the article "Birds" ('Encyclopædia Britannica,' vol. iii. p. 727). Some of Professor Parker's remarks are taken from Professor Huxley's 'Anatomy of Vertebrated Animals.'

and obtained some good views of the flattened sides of the barbs, and very clearly distinguished the remains of the lower part of the barbules. This I think clearly indicates that the barbs had once been furnished with barbules, but from some cause they had become denuded."



FEATHER OF "HAIRY" MOORHEN.

Fig. 1. Barbule (perfect), magnified 400 times.

Fig. 2. Barb showing remains (*a a a a a*) of barbule, corresponding to the portion marked *a b* in figure 1. Magnified 400 times.

Fig 3. Part of shaft with tips of barbs and shaft (*a a a*) broken off, (the barbs when perfect taper off to a point). The feathers on Museum specimen are also in this condition.* The remains of the barbules are indicated by the dark marks on the sides of the barbs. Magnified 30 times.

Inability to moult may partly account for the hairiness of the plumage; but not entirely so I think; for if such were the case, we should have many instances of cage birds and domestic birds developing a hirsute plumage; but I never heard of anything of the kind.† Bald Bullfinches and Blackbirds are not uncommon; but I never heard of a hairy one. If they cannot get through the moult, they are seized with dizzy fits and die. Pheasants assume

* As doubtless are the other ten specimens in my list which have not been submitted to the microscope, though the plumage of some of them is more rough to the touch than others.

† Except in one instance, of a Grey Brahma Hen at Staines, for a knowledge of which I am indebted to Mr. Bond, who says it had feathers exactl like hair.

every phase of variety imaginable; but their plumage never acquires the appearance of hair. Canaries are to be met with in as many plumages as a Ruff; but their feathers always remain feathers, and nothing else.

I can hardly think that the removal of the barbules, whether shed naturally or not, is enough to account for the tawny colour. If the tips of a growing feather of some normal bird be removed, the base of which is of a different colour, a change is given to the bird's aspect; but nothing of this kind has taken place in the "hairy" Moorhen. Its feathers have not been shortened: they have been, so to speak, macerated; having lost not only their barbules, but the soft substance, as it were, of the whole vane of each feather, and with this substance has gone a great deal of the colouring matter. That these Moorhens are suffering from disease in some form I feel sure,—rare as disease, which is not traceable to some cause, is among Water-birds in a wild state,—but whether they are hatched with this disease, which may be only a cutaneous one, preventing their moult, or whether their not moulting aggravates or originates it, it is impossible to say. On the other hand, most of the examples certainly have a fairly healthy appearance; and Mr. Stevenson, who examined the body of his, says it showed no signs of anything wrong. The question therefore must remain an open one for the present.

Hawks, Gulls, and other birds may sometimes be found in which a few of the wing or tail feathers have assumed a hairlike character, and even—as in the case of a *Parra* (a bird which bears considerable resemblance to a Moorhen) kindly lent me by Professor Newton—a great portion of the body feathers. These cases are, in a degree, like the Moorhen under consideration; but only in a degree; for in the Moorhen the peculiarity extends over the whole body. The 'hairy" Moorhen bears a resemblance to the breed of fowls called Silky Fowls, and to the Apteryx and the Cassowary. The back of an Apteryx has a rough feeling, if stroked; and the feathers are attenuated and partially destitute of barbules at the end. In most of these Moorhens there is one peculiarity noticeable, and that is, the presence of from six to twelve transverse bars on the greater wing-coverts, which have the appearance of being impressed or indented, and which seem to be caused, not so much by the absence of colour, as by the extreme thinness of the barbs,—a

thinness which Professor Newton ascribes to the decay and falling off of the cortex.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

The counties in which examples have occurred are, Nottinghamshire, Cambridgeshire, Hampshire, Suffolk, Sussex, and Norfolk; and one has been obtained at Athlone in Ireland. In Norfolk five, if not seven, have occurred. We have not the dates of all, but three occurred in November, one in December, two in March, and one in April. Those dates show that some of the birds had passed through more than one moulting period, and that they cannot be all young birds, as I at first supposed. Neither are they all of one sex; as the two Norwich examples were male and female by dissection. These two, though obtained twenty years apart, were shot in the same parish, I believe. I may here remark that there is nothing to indicate that it is an hereditary variety; though it is not unlikely in the case of the Norwich (Nos. 6 and 11 in the list given below) and the Sussex examples (Nos. 8 and 10)—the

latter having been obtained in parishes only five miles apart—that the same birds were the parents in both cases. It would be quite impossible to reconcile the theory of an hereditary variety with the moult theory.

In the following list, I have prefixed a dagger (†) to those I have examined. Should any one who reads these pages happen to know of any other specimens, I should be very glad to be informed of them.

1. Whittlesford, Cambridgeshire. Seen in the flesh many years ago, by Mr. F. Bond, but not preserved.

2. Bramford, Suffolk. December, 1847. 'Zoologist,' p. 2067.

†3. Buckenham, Norfolk. November, 1857. In the Cambridge Museum. Formerly in Professor Newton's possession. This is the specimen I have figured.

? Burston, Norfolk. } Possibly identical with two of the others.
? Ditto. } *Vide* 'Birds of Norfolk' (*l.c.*).

†4. Ludham, Norfolk. In the Norwich Museum. This is smaller than the other specimens, which are all the size of an ordinary Moorhen.

†5. Yarmouth, Norfolk. In the Saffron Walden Museum. This specimen is now much faded.

†6. ♀, Norwich. March, 1863. In Mr. H. Stevenson's collection.

7. Blackwater, Hampshire. ? 1860. The same mentioned by Mr. Stevenson as having been sent to Reading to be stuffed (*l.c.*). In the collection of Mr. F. Bond.

†8. Plumpton, near Brighton. November, 1878. In Sir John Crewe's collection. This is the lightest I have seen, the underparts being quite white, and the back a bright orange-red; and the texture of its plumage is the most hairlike.

†9. Nottinghamshire. 1880. In Mr. J. Whitaker's collection. I understand that a figure of it is to appear in Moseley's 'British Birds,' now publishing.

†10. Isfield, Sussex. ? March, 1883. In the possession of Colonel King.

†11. ♂, Norwich. April, 1883. T. E. Gunn, 'Zoologist,' 1884, p. 8. This is the darkest and the nearest to the normal Moorhen both in colour and texture. It was exhibited at a meeting of the Linnean Society, March 6th, 1884.

†12. Athlone, Ireland. November, 1883.

In almost, if not quite every species of British bird, white or pied individuals are recorded to have been found; but the Moorhen alone seems to be subject to this hairlike variation of plumage. It is, however, not free from partial albinism; and a few such instances have come under my notice; but the feathers have been of the normal texture, or very nearly so. I have a pied Moorhen, killed at Peterborough; two have been obtained in Norfolk; and Mr. John Marshall has two, of which he has been good enough to send me coloured sketches. Between those birds and the subject of this paper there is no connection.

Through the kindness of Professor Newton, I am able to illustrate these few notes with a plate by Mr. Keulemans of the bird in the Cambridge Museum (No. 3). The frontal shield has apparently shrunk away; but, as I suppose it must have been there when the bird was alive twenty-seven years ago, I have had it copied, together with the colour of the legs and beak, from some of the more recent specimens.* The woodcuts at page 583 represent a flank feather and a middle tail-feather (Figs. 4 and 5), with corresponding feathers from an ordinary adult Moorhen (Figs. 6 and 7) for comparison.†

* For the partially diagramatic drawing from which Figs. 1, 2, and 3 (p. 583) were engraved, and for the explanation of the figures I am indebted to Mr. F. Kitton, Hon. F.R.M.S.

† Mr. Kitton having been good enough to make a microscopical examination of some feathers of the white Asiatic Silky Fowl (alluded to at p. 584), I append some remarks by him: "The shaft of the Silky Fowl's feather tapers to a point as delicate as those of the barbs and near the apex has the appearance of white horsehair. It is barbed nearly to the tip, the barbs are sometimes branched (bifid and trifid) and traces of barbules are not infrequent up to the apex, the latter becoming more developed as the barb approaches its point of attachment to the shaft, where they become jointed like a Bamboo."

Mr. W. B. Tegetmeier says that the silky character of the feathers is one which occasionally occurs in other breeds of fowls, as in the Cochin ('Poultry Book,' p. 221).

II.

DO THE BLACKBIRD AND THE THRUSH EVER INTERBREED?

By Robert Miller Christy.

(Communicated by Mr. J. H. Gurney, Jun.).

Read 27th November, 1883.

Both Addison and Goldsmith seem to have been of the opinion that the trite old saying, "Birds of a feather flock together," applied also invariably to their breeding. The former, more than a century and a half ago, wrote, in the 'Spectator,' some elegant Latin lines upon the subject; and, later, Goldsmith produced a short poem, which seems to be merely an expression of Addison's sentiment in the English language. He says:—

"* * * The patriot bird pursues
His well-acquainted tints and kindred hues;
Hence, through their tribes, no mixed, polluted flame,
No monster breed, to mark the groves with shame;
But, the chaste Blackbird, to his partner true,
Thinks black alone is Beauty's favourite hue."

Experience has, however, compelled me to call in question a little the correctness of the opinion of these poetic gentlemen, that one bird is invariably true to its own species; for it is now some years since my attention was drawn to the fact, that, there is evidence which proves that the Blackbird and the Thrush—two species which rather closely resemble one another in their size, habits, and manner of nesting—do occasionally pair and nest together.

Since that time, I have always been careful to note down any such occurrences as have come under my own observation, or that I have seen recorded in any ornithological work; and, in order to draw attention to the subject, I have now put together all the information so obtained for the purpose of sifting it.

I. A nest, built in a Laurel bush, in the garden of a relative at Great Saling, Essex, was reported to me in the first week of April, 1877, by the finder, who assured me that, of the six eggs the nest contained, two were undoubtedly Thrushes', two were unmistakably Blackbirds', and two were precisely intermediate in their colouring. The bird was not noted. I did not see the eggs; but, two months later, I was shown the nest—a typical Thrush's.

II. During May, 1877, a friend found a nest in private grounds near York. It was almost without mud, and evidently a Blackbird's; but, of the four eggs which it contained, two were certainly Thrush's, and the remaining two Blackbirds'. The eggs I saw, but not the nest. There was no suspicion or probability of any one having exchanged the eggs.

III. A few weeks later, and in the same grounds, I found a normal Blackbird's nest, containing four well-fledged young Thrushes. The parents, too, were both of that species.

IV. In Loudon's 'Magazine of Natural History'* the following appears under heading, "Hybrid Birds between the Throstle and the Blackbird in a state of Nature:"—"With respect to the Throstle, I recollect a singular instance. In the garden of James Hankin, a nurseryman, at Ormskirk in Lancashire, a Throstle and Blackbird had paired. This was well known to a number of individuals, myself amongst them. During two successive years the birds reared their broods, which were permitted to fly, and evinced in all respects the features of strongly-marked hybrids.—Henry Berry, Bootle, near Liverpool, August 27th, 1834."

V. In 'Science Gossip,'† "G. T. B." says that, in the beginning of the preceding April, he found a Blackbird's nest nearly built. Several days later he found it to contain four eggs, which were, in all respects, true Blackbirds', except that one possessed the black spots of a Thrush's egg as well as the Blackbird's markings. On one occasion a Thrush was observed sitting, when a Blackbird was singing close by. Only one young one survived, and that turned out a Blackbird, but the old Thrush was very solicitous on its behalf.‡

* Vol. vii., 1834, p. 598. † November, 1877, p. 263.

‡ This record was reprinted (I suppose for the sake of reference) in almost exactly the same words, before another note on the same subject (see Case VI.) in 'Science Gossip' for February, 1878, p. 43.

VI. In the same periodical,* "G. T. B." of Bradford Abbas, writes that he has several times found nests at the tops of Fir-trees built of sticks outside, lined with moss, hay, &c., like Blackbirds', and containing eggs like those of the Thrush, but with pale-reddish markings instead of black. In no case has he seen the birds. Mr. H. Kerr of Bacup, writing a little later,† points out what seems obvious from the description given above, namely, that the nests and eggs were those of the Missel Thrush. He thinks Blackbirds and Thrushes would never pair together. "G. T. B.," however,‡ somewhat indignantly denies this, and says: "The eggs I saw were pale blue speckled like a Blackbird's, and spotted with the deep claret markings of the Song Thrush as well." Of the nest, he says that it was in a hedge about six feet from the ground: "The outside was rather roughly constructed of Mosses interwoven with Grasses, and the lining was grass cemented with mud."

VII. In May, 1877, Mr. H. Richardson of Newcastle showed me a Thrush's egg, one of three which he took from an unlined nest, apparently belonging to a Blackbird, near that city.

VIII. Mr. J. T. Gumersall of Gt. Ayton, Yorkshire, records § that, being out on a walk late in March, he saw two Blackbirds and a Thrush fly from a Hawthorn bush. Looking into it he "found a true Blackbird's nest built of old hay, &c., with a lining of mud, and then relined with hay, but, curious to say, it contained three eggs of the Thrush; there were no signs of their being crossed."

IX. A. F. Griffith of Cambridge writes in 'Science Gossip:'‖ "Last year, on May 9th, I found a Blackbird's nest containing three Blackbirds' eggs and a Thrush's." A Blackbird sat upon the nest, but he is not aware whether or not the eggs were hatched.

X. In the same periodical,¶ S. A. Brennan of Allan Rock, Co. Tyrone, writes: "In the Island of Howth my daughter saw a cock Blackbird sitting on a nest where, previously, a hen Thrush had been sitting. There were young ones in the nest, which was

* 'Science Gossip,' February, 1878, p. 43.

† 'Science Gossip,' May, 1878, p. 191.

‡ 'Science Gossip,' January, 1879.

§ 'Science Gossip,' August, 1878, p. 189, and 'Natural History Journal, May, 1878, p. 72.

‖ 'Science Gossip,' September, 1878, p. 209.

¶ 'Science Gossip,' November, 1878, p. 262.

not lined. There can be no doubt as to the identity, as it was remarked by others."

XI. The Rev. J. G. Wood says:* "I once took a Blackbird's nest, in which the eggs were so curiously marked, that no one could have decided whether they belonged to a Blackbird or a Thrush."

XII. Mr. J. T. Green writes:† "It may interest some of my fellow-readers of 'Science Gossip' to know that I have found a Blackbird's nest with four eggs and five Thrushes, in it."

XIII. The Rev. A. C. Smith of Calne, in speaking of the various cases of two birds laying in the same nest, says:‡ "The Blackbird will occasionally lay eggs closely resembling those of the Song Thrush, thereby proving the affinity of the various members of the genus *Turdus*. Indeed, one such egg of the Blackbird, taken by myself in this place, I forwarded, many years since, to Mr. Hewitson, who thought it worthy of a place in the last edition of his work; but, then, all the eggs in that nest were alike in colouring and marking." From this description it seems at least possible that the eggs were the produce of a hybrid union.

XIV. The Rev. J. C. Atkinson, in speaking of the spots on Blackbirds' eggs, says: Sometimes they disappear altogether, or very nearly, and leave the egg with a strong resemblance to the little spotted Thrush's egg (Yarrell, vol. i. p. 204; Hewitson, vol. i. p. 63). To such an extent is this the case, that a year or two since I was misled into assuming that four eggs which I found in a nest, with all the characters of a Blackbird's nest, must most certainly, from their colour and markings, be assigned to a Thrush original, and not to a Blackbird."

XV. In Dresser's 'Birds of Europe'§ appear some observations quoted from the 'Ibis' for 1863, to which magazine they were communicated by Count Salvadori in 1863. They are to the effect that, in November, 1861, he purchased a live bird in Florence, which, so far as its size, colour, bill, legs, feet, and upper parts were concerned, appeared to be a Song Thrush; but the lower parts were almost entirely black, except that the edge of each feather was

* 'Natural History of Birds,' p. 140.
† 'Science Gossip,' March, 1879, p. 67.
‡ 'Zoologist,' February, 1880, p. 59.
§ Article "Song Thrush" (vol. ii. p. 15).

lightly coloured; round the neck was a narrow ring of yellowish-white feathers; some of the feathers on the belly were white, and all those beneath the tail. After a short time the ring of feathers on the neck disappeared, and, by about August (? 1863), the black feathers had been replaced by others, when it came to be a normal Thrush, but shortly afterwards it escaped. Count Salvadori considers it to have been a hybrid between the Blackbird and the Thrush; but its change of plumage seems to indicate that it was more probably a melanistic variety of the latter.

XVI. In the same work* occurs the following remark in reference to known or probable instances of hybridity between the two species:—"There is one in the British Museum presented by Mr. A. D. Bartlett." I am indebted to Mr. Bartlett for replies to my inquiries concerning this bird. He says that it was taken near London, that "the late Mr. Edward Blyth, myself, and others, could arrive at no other conclusion than that it was a hybrid. The plumage was very intermediate as well as the size and form." Mr. Bowdler Sharpe has very kindly searched for and found the specimen in the British Museum, but agrees with me in thinking that it is not a hybrid. According to Mr. Seebohm's determination it is a melanistic variety of the Missel Thrush. The bird is labelled: "British. Received from Mr. Bartlett in exchange, Nov. 1844. Total length 10 ins., wing from carpal joint $5\frac{3}{4}$, tail 4 ins.; 3rd primary longest; 2nd and 4th equal. A. D. B." The bill is shorter, thicker, and more conical than is usual with the Blackbird or Missel Thrush. The upper part of the head, neck, back, wings, and tail are of an almost uniform russet-brown, a shade darker than is usual in the Missel Thrush, but lightest over the tail and the outer margins of the secondaries. The under parts are of a dark brownish-black, the feathers on the chin tipped with dirty white. Some feathers on the breast, and others down the middle of the stomach, are rather broadly edged with dirty yellowish-white; ventricles and under tail-coverts all of the same colour; legs very light (probably faded).

Macgillivray refers to a specimen† which I have little doubt is another melanism of the Missel Thrush. He says: "A bird in the Museum of the University of Edinburgh is, in all probability

* Article "Blackbird" (vol. ii. p. 15).

† 'History of British Birds,' vol. ii. p. 117.

a hybrid between the Missel Thrush and Blackbird, the upper parts being similar to those of a young Missel Thrush, while on the lower black is the predominant colour, as it also is on the head, and although there are irregular light-coloured markings on the neck and breast, there are none of the triangular or roundish spots seen in the Missel Thrush. The individual may possibly be a melanistic variety, but the two cases of matrimonial union between the Blackbird and Song Thrush recorded in this work authorize us to suppose that similar unions may take place between the Blackbird and Missel Thrush." However this may be, an instance of a somewhat similar nature has been observed and recorded by Mr. J. H. Gurney,* who states that in April, 1869, a pair of Missel Thrushes built a nest near Tottenham, and incubation was proceeding when, on May 3rd, the cock bird disappeared, having probably been shot. On the morning of the 5th or 6th the hen bird, who had continued to sit, was seen in company with a Song Thrush. They were often afterwards seen together, and once the Song Thrush was observed to fly into the tree with food. Up to the 9th of June, when the young had flown, they were still observed together.

XVII. The instance already referred to (instances VI. and XVI.) as mentioned by Macgillivray† is as follows:—"Mr. Wier has favoured me with the following notice respecting a matrimonial union between a Blackbird and a Thrush. '* * * Mr. Russell, of Moss-side, my next neighbouring proprietor, and his brother informed me that about the conclusion of the winter of 1836 a male Blackbird and a female Thrush fed occasionally together within a short distance of their house. At the commencement of Spring their attachment increased, and they carried on a regular course of flirtation which eventually ended in matrimony. After a good deal of consultation the pair at length determined to build their nest in a bush which hung over what our Scotch folk call a "farret brae." I did not see their eggs, as they had four young ones before their nest was discovered, so cunningly had they concealed it.'"

XVIII. Several years ago I saw in the bird gallery of the old British Museum a nest without any mud lining, and apparently

* Article "Missel Thrush," 'Zoologist,' 1869, p. 1874, and 'Birds of Europe,' vol. ii. p. 13.

† 'History of British Birds,' vol. ii. p. 91.

a Blackbird's, but containing one true Thrush's egg. It was taken in Regent's Park in 1874.

Mr. J. H. Gurney, Jun., has been kind enough to supply me with the following note:—In the collection of Mr. Henry Stevenson is a variety of the Blackbird, shot in Norfolk (exact locality not remembered) November 1st, 1881, which looks as if it might be a hybrid between that species and the Ring Ouzel, having a light-brown pectoral gorget rather lower down than in a Ring Ouzel, and some light-brown patches on the upper parts. In other respects it resembles a cock Blackbird with the crown and back very dark. The bill is now dark-brown, and does not appear to have ever had any yellow in it.

With this I conclude the list of cases which, thus far, I have been able to collect. I think that there is sufficient evidence to warrant the belief that cases of hybridization between these two species do sometimes occur in nature. At all events, such good authorities as Macgillivray and Mr. Dresser see nothing very extraordinary in such being the case; while Professor Newton, speaking of the Blackbird in his edition of Yarrell's 'History of British Birds,'* says: "This species will breed with the Song Thrush, and in one case on record [see Case IV.], hybrids were produced from such a union in two successive years." Mr. J. H. Gurney, Jun., makes some very interesting remarks on the subject,† although he confesses that he is "not a great believer in Blackbird and Thrush hybrids." After alluding to several of the instances already quoted, he says: "I have an instance of a Thrush which turned nearly black in confinement, its owner thinking that in his absence it had been changed; but with proper food it reverted to the normal colour."‡ The birds spoken of in Case XVI. may have been of the same nature as this one. He continues: "I have seen a Blackbird killed at Reigate with large patches of brown upon it, very singularly

* Vol. i. p. 282. † 'Zoologist,' June, 1883, p. 256.

‡ [This was a similar instance to Count Salvadori's tame Thrush (No. XV). In both instances hempseed must have been the cause of the black colour. I have a Thrush with a tendency to melanism which I bought of Mr. Davey, a bird-dealer in Camden Town. I expect it had had hemp. Instances of Bullfinches being turned black by hempseed are very numerous.—J. H. Gurney, Jun.]

marked, yet the brown not the mottled brown of a Thrush. A cock Blackbird will occasionally retain large patches of the brown of immaturity to the spring following its birth, when it would be about a year old, as some young Rooks retain their nasal bristles a twelvemonth or more. A Blackbird in this state might at first sight be supposed to be a hybrid. Many continental collections in countries where the *chasse aux grives* is largely carried on, as at Berlin, Turin, and Marseilles, have most curious varieties of the Thrush tribe, including, possibly, some hybrids. The subject is interesting, owing to the dissimilarity of the two birds; though, indeed, they are not more dissimilar than the Greenfinch and the Linnet. Probably among closely-allied species there are far more hybrids than we are aware of." There are, however, several suppositions by which we may account for some, at least, of the foregoing instances, without necessarily supposing them to be cases of interbreeding. For example, two different species of bird have before now not unfrequently been known to lay in the same nest; and there can, I think, be no manner of doubt that No. XII. is a case in point; while, possibly, Nos. II. and IX. belong to this class. Then there are many people, not intimately acquainted with birds, who are unaware that the female Blackbird is not of the deep black of the male, but of a dark brown, and spotted on the breast and throat. The young, too, are striped and spotted all over with reddish-brown, and, like the female, might easily be mistaken for the Thrush by ignorant persons; indeed, it is possible that this has been the case in Nos. IV., X., and VIII., and, perhaps, V. The Blackbird and the Thrush both use mud in the construction of their nests, but different individuals do so to a very different extent. If the former were, on any occasion, to employ more mud than usual, or the latter to use less, error might thus arise, judging only from the nest; and, perhaps, Nos. III., VII., and XVIII. are cases of this. As those gentlemen I have quoted, who speak of the variability of Blackbirds' eggs, bring forward nothing to prove that such eggs are not the result of a hybrid union, we may as well take the benefit of the doubt, and say that it is at least possible that they were so, although the absence, so far as I know at present, of adult birds presenting unmistakable marks of hybridism certainly opposes this view. Setting aside, however, all doubtful cases, there still remain several which, although not sufficient thoroughly

to establish the fact of the interbreeding of the two species, still point strongly in that direction.

There seem to be in Nature several analogous cases in which two closely-allied species, not only often, but habitually, interbreed. This appears to be the case, among the Molluscs, with *Helix nemoralis* and *H. hortensis;* among plants, with *Primula vulgaris* and *P. veris;* and also, probably, in the genera *Viola*, *Rosa*, *Rubus*, *Verbascum*, &c. But perhaps the best-known instances occur among the birds. That of the interbreeding of the Carrion and Hooded Crows will at once suggest itself. This has been known to take place frequently in Scotland, and occasionally in England; but in Russia and Siberia it appears to be carried out on a most astonishingly extensive scale. Mr. H. Seebohm has given a most interesting account of his observations upon the hybridization of these two species, in the 'Ibis' for 1878. It seems that the whole of Russia and Western Siberia is one vast colony of Hooded Crows; Eastern Siberia, on the other hand, is an equally vast colony of Carrion Crows. In the wide intermediate region, about one-fourth of the Crows are pure Hoodies, one-fourth pure Carrions, and the remaining half are hybrids of every description. Mr. Seebohm also says of the Grey Shrikes *Lanius excubitor* and *L. major:* "After my experience of the Crows, I should not be surprised to find that on the boundary line of their geographical distribution they occasionally, if not habitually, intermarry." It seems also impossible to doubt, after what Professor S. F. Baird has said in his 'Report on the Pacific Railroad Survey,' that the various members of the genus *Carpodacus* habitually interbreed; while two members of the genus *Colaptes* (*C. auratus* and *C. mexicanus*) appear to afford an instance very similar to that of the Crows. The former abound in all the Eastern States; the latter in all the Western; and the two run into one another in the central region through a most extraordinary variety of hybrids. Doubtless other instances would not be hard to find.

Note.—In consequence of Mr. Christy's absence from England, the above paper has not been revised by him.—[Ed.]

III.

ON THE OCCURRENCE OF A FLOCK OF THE ARCTIC BLUE-THROATED WARBLER *(ERITHACUS SUECICA)* IN NORFOLK.*

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

Read 29th January, 1884.

The subject of this notice is a well-known summer visitant to the north of Europe,† and an occasional straggler to Great Britain. It has been known as occurring in Norfolk, since September, 1811, when an adult male, in my father's collection, was found dead at Yarmouth ('Zoologist,' vol. i. p. 180). In September, 1867, another —from the description apparently a young male—was identified by Mr. J. R. Griffith, among a party of Wheatears, Tit-larks, and other small migratory birds, which alighted upon a ship off the Norfolk coast ('Zoologist,' p. 1014). In September, 1881, a third was shot by Mr. G. E. Power, at Cley, while consorting with Redstarts and Whitethroats (Trans. Norfolk and Norwich Nat. Soc. 1881—2, pp. 346, 350). These are all the recorded occurrences in Norfolk, of a bird hitherto considered very rare, but which can hardly be accounted so any longer; for last September, as our Society is aware, no less than nine were shot at Blakeney by one of our members—Mr. F. D. Power; while another, now in the collection of the Rev. Dr. Churchill Babington, was obtained on the south

* The Bluethroats have generally been placed in the genus *Ruticilla;* but I follow Mr. H. Seebohm, who in his 'British Birds' uses the generic name of *Erithacus*, and the English appellation of "Arctic Bluethroat" for the red-spotted species, as distinct from the white-spotted. It is quite unlike a Redstart in its actions, seeming rather to link the Redstart and the Robin.

† Our Museum contains a good series in the "Wolley Collection," from Lapland.

bank of Breydon Broad; and besides these, it is certain that at least a score more were seen at Blakeney by Mr. Power, which passed on in safety. From Mr. Power's Ornithological Journal, which he has lent me for the use of this paper, I make the following extracts; premising, that Blakeney and the adjoining parish of Cley comprehend extensive mud-flats, and many tempting sand-hills covered with stunted herbage, and Marram-grass, Sea-lavender and Yellow Poppy, reaching for about a mile in a kind of peninsula,—a most tempting locality for small birds, and annually frequented by Redstarts and other Insessores in September.

Mr. Power's Ornithological Journal :—

"September 13th. Wind light N. Yellow Wagtails and Wheatears numerous.

September 14th. Wind light E. Very fine. Blue-throated Warbler, eight or ten seen in the short cover, near beach. Four obtained, three males and one female. All birds of the year. Redstarts in about the same numbers, with a few Tree Pipits, one Robin, many Wheatears, and two Common Whitethroats.

September 15th. Wind N.N.W., light. First Grey Wagtail observed. Around the furthest sand-hill (*i.e.* the westernmost) found perhaps two dozen Bluethroats, easily got at, and examined here. Took three more (two males and one female, all immature like the preceding specimens), with Wheatears, a few Redstarts, one Lesser Whitethroat, one Chiffchaff, one Goldcrest, two or three Tree Sparrows, and two Rock Pipits seen. Two flocks of Larks passed, going west.

September 17th. Wind N.E. Searched the sand-hills, but saw no Bluethroats. One Tree Pipit, one Stonechat, and a number of Black-headed Buntings.

September 18th. Wind stiff S., becoming E.S.E. during the day. Meadow Pipits arrived in numbers.

September 19th. Wind light S.E.

September 20th. Wind stiff N. Swallows and Martins passing south-west.

September 21st. Wind W. A number of Thrushes. Fresh appearance of Redstarts. Sedge Warbler.

September 22nd. Wind N.N.E. First Snow Bunting. Several Martins observed. On the further sand-hills found two Bluethroats, and bagged both, immature male and female, with one Redstart, one Robin, and one Chiffchaff."

From these precise memoranda it would seem that the Bluethroats came in just the sort of company they might have been expected in; viz., with Tree Pipits, Wheatears, Yellow Wagtails,

and Greater Whitethroats, and this company probably arrived with a light wind from the north. On the 13th, the day before they were noticed, the wind was light N. On the 12th it was light N.E. or E.N.E., and on the 11th it was N.N.E.

On the 17th the wind was N.E., and they probably left Blakeney, and, migrating against it, got as far as Yarmouth or Lowestoft "denes." On the 18th, it was S., and pursuing the coast southwards they most likely crossed the Channel. On the 19th Mr. Power noted that birds of all kinds were very scarce at Blakeney, remarking in a letter to me that he had never seen the place more blank.*

The two birds shot by Mr. Power on the 22nd, at Blakeney, were, I imagine, a later arrival; and if, as is most probable, they came on the previous day, it was with a west wind, *i.e.*, a contrary wind.†

On the same day a Bluethroat was shot on the coast of Northumberland, as I learn from Mr. T. H. Archer; and the day before, one was identified, but not shot, at Teesmouth. ‡

Later than the 22nd we have no note of their appearance at Blakeney. Mr. Power was out on the 23rd, 24th, and 25th, and saw none. I was over the same ground on the 29th, and met with no better luck. It however does not necessarily follow that they had all passed on. Another is said to have been obtained much later, in Northumberland, the exact date of which I could not procure.

The only other Bluethroat I heard of was on the Isle of May,—the earliest of all,—for a knowledge of which I am indebted to Mr. J. A. Harvie-Brown, who informs me it was seen on

* Dr. Babington's Bluethroat, obtained at Yarmouth, was shot on the morning of the 15th, the day after they were first noticed at Blakeney, and was probably a solitary bird which had separated from the flock, as Mr. Lowne, the birdstuffer, went out the same afternoon, at my request, to the place where it was killed, and could see no others.

† Mr. John Cordeaux, who has paid great attention to migration on the east coast, considers that it may be laid down as an axiom, that, with southerly or westerly winds, not amounting to gales, normal migration to our east coast in autumn is the rule (see 'Report on Migration,' 1881, p. 39). No wind at all suits small birds best. It seems, when bent on migration, they will make the passage with a light cross wind, but very rarely indeed with a wind which is due in their favour.

‡ These were recorded in the 'Field.'

September 2nd, and satisfactorily identified by the intelligent lighthouse-keeper there, Mr. Agnew.*

The ten Norfolk Bluethroats were all immature, as were the two which occurred in September, 1867, and September, 1881. Seven of them had a pretty fair blue chest-band; and under that a rufous band, with a well-developed throat-spot of a white colour, leading off into rufous. These seven clearly belong to the Arctic or Red-spotted *Erithacus suecica*. They all, Mr. Power informs me, with the exception of one, which was too much shot to be sure about, proved to be males. The remaining three proved to be females, with white throat-spots, without any rufous, except that in one the spot was distinctly tinged buff. At first sight these three might be supposed to be the White-spotted Bluethroat (*E. cyaneculus*); but taking into consideration the companionship in which they were found, and the remarks of Mr. Seebohm in his 'British Birds,' I have no doubt they are really Arctic Bluethroats (*E. suecica*) also.†

Mr. Seebohm's experience, after a full examination of a very large series, is, that immature females are always indistinguishable, and even adult females sometimes (*l. c.* part i. p. 269). His remarks on the subject will repay reading,‡ but are too long to quote here.

Mr. Power has liberally presented one of his Bluethroats to the Norwich Museum, another to Mr. Stevenson, and two to me. One I received in the flesh, and, after I had skinned it, submitted the gizzard to Mr. F. Norgate for minute examination. Mr. Norgate found its contents to be forceps of two earwigs, a cocoon of a small moth (probably one of the Tineina), two small univalve shells, two skins of larvæ, and the elytra and other hard parts of many small beetles. I took the following measurements while in the

* Mr. Agnew tells me, on August 31st the wind was W. light; on September 1st, in the forenoon, W. light, in the afternoon, S.E. light; on the 2nd, E.S.E. gale and haze. His bird probably crossed the sea before the wind changed to the east.

† And likewise the example shot by Mr. Power's brother—Mr. G. E. Power—in 1881, though it was recorded as *E. cyaneculus* (*l. c.* p. 350).

‡ There is nothing unlikely in the White-spotted Bluethroat (*E. cyaneculus*) occurring in Norfolk some day. It is the commoner species in Holland, and I saw a well-marked specimen in Heligoland—where it occurs sometimes—when there last June, at the shop of Aeüchens the birdstuffer; but at present it seems exceedingly doubtful if it has occurred anywhere in Great Britain, allowing due weight to Mr. Seebohm's observations.

flesh:—Length 5·8 in., tarsus 1 in., expanse 8·5 in.* As I happened to be in Yarmouth when Dr. Babington's bird was killed, I was enabled, through the kindness of Mr. Lowne, to take its measurements also, and, as it was perfectly fresh, the colour of the soft parts:—Eye, dark brown; mouth, pale orange-yellow; legs, pale brown; toes, rather lighter. Length, 6 in.; tarsus, 1 in. In two of Mr. Power's males the tarsus measured as much as 1·2 in. It has been said that *E. suecica* always has a longer tarsus than *E. cyaneculus*.

IV.

ON NORFOLK AMBER.

By Clement Reid, F.G.S.

Read 29th January, 1884.

During a stay of several years on the Norfolk coast, my attention was drawn to the Amber thrown up by the waves, usually after easterly winds. But the many difficulties of Norfolk Geology, and the numerous other problems to be attacked, prevented my making more than a passing allusion to the subject in the Memoir on the Geology of Cromer. Last summer, however, two holiday visits to the coast enabled me to collect further information; and these notes are now brought together, principally in the hope that they may lead other workers to continue the observations.

Amber is found on the Norfolk coast, usually mixed with the sea-weed thrown up by the Spring gales. Mr. Savin has also obtained a small quantity from the Cromer Forest-bed at one or two spots, but I can learn of no other instance in which the Amber was found in place. The only resin-yielding trees in the Forest-bed are the Scotch and Spruce Firs, and perhaps the Silver Fir and

* This bird was a male.

Pinus montana.* Of these the resin is found, very little altered. True Amber is the product of a different Conifer,—the extinct *Pinites succinifer*, Goepp.,—which we have no reason to believe survived to so late a period as the Newer Pliocene.† The absence of this tree, and also the occurrence of large quantities of rolled jet associated with the Amber, lead one to think that in the Cromer Forest-bed, they are both merely present as worn fragments washed out of an older and underlying deposit.‡

After long searching unsuccessfully for other evidence of the geological age of the Norfolk Amber, a specimen placed in my hands a few months ago seems to indicate that the Amber-bearing bed is probably the same as—perhaps even nearly continuous with—the well-known deposit on the Prussian coast. Though three or four pounds weight of Amber are annually gathered near Cromer, included insects are extremely rare. Continued inquiry has only resulted in the tracing of four specimens, two of which cannot now be found. The third was picked up on the beach about a year ago by Mr. William Mayes, of Church Street, Cromer, in whose possession it still is. It is a clear wine-coloured piece, containing well-preserved specimens of the larvæ of *Aphis*, a cast skin of a Spider, and a *Chrysotus*, considered by Mr. G. H. Verrall to show characters found in some of the extinct Baltic forms. A fourth specimen, from Yarmouth beach, kindly lent me quite recently by Mr. A. S. Foord, F.G.S., is also transparent and wine-coloured, and contains three flies. Two of these Mr. Verrall—who I must thank for his examination of the specimens—refers to the genus *Leia*, both probably belonging to the same species; the third he refers with doubt to *Cecidomyia*.

Unfortunately, Loew, who studied the Diptera of the Baltic Amber, appears never to have published his species, all the information he supplies being, that he knows twenty-six distinct species of Amber *Leia*, and so on with other genera, without giving either names or descriptions.§ Mr. Verrall believes that the descriptions were contained in a manuscript work never published. Under these circumstances, nothing further can be done in the identification of

* See Saporta, 'Le Monde des Plantes' (1879), p. 349.

† See Goeppert and Menge, 'Die Flora des Bernsteins' (4to).

‡ See also Reid, 'Geology of Cromer,' p. 133.

§ Loew, 'Ueber den Bernstein und die Bernsteinfauna' (Mescritz, 1850).

the Amber insects of Norfolk with those of Prussia, till the latter are properly described.

Though the fossils do not yield sufficient evidence on which to correlate the deposits on opposite sides of the North Sea, yet, taken with the geological structure of Norfolk, they point to the original continuity of the bed from Prussia to within a short distance of the English coast. The known eastward dip of the strata in Norfolk, and the thickness of the London Clay at Yarmouth, ought to bring on Upper Eocene and Oligocene beds within a short distance of the coast. Thus the Amber-bearing deposit may have to be added to the list of formations represented in England, if its occurrence within the three-mile limit of the territorial waters could be proved.

The quality of the Norfolk Amber—if I may judge by what has passed through my own hands—is very good, but apparently there is a larger proportion of dark transparent lumps, and less clouded and light yellow than is found in Prussia. Mr. A. S. Foord has kindly cut and examined a microscopic section of clouded Amber for me, and finds that the opacity is due to minute air-bubbles. The size varies much, most of the pieces being small and broken. Mr. Savin has a mass weighing eleven and a half ounces, and it is said that a piece in the possession of Mr. Barker is much larger. The majority of the collections were made in Suffolk, where Amber is perhaps still more abundant, but the character is the same. Further north Amber is also found on the Lincolnshire and Yorkshire coasts; but, from the difficulty of obtaining authentic specimens, it has been thought advisable to confine these notes to Norfolk.

It is possible that some of the worked Amber found in English tumuli may have been made out of native material; but it seems more probable that it was imported, for the manufacture would only be understood in a district where the raw material was comparatively plentiful. Though the present annual yield is more than sufficient to account for all the ancient Amber ornaments yet found in England,—if we may consider it a fair criterion of the former supply,—yet it must be remembered that, were it not for the constant gathering of sea-weed for manure, nearly all the pieces would be overlooked, and destroyed by the waves.

V.

DARKNESS AND EYES

[Abstract].

By Sidney F. Harmer, B.A., B.Sc.

Read 29th January, 1884.

The visual organs of animals which have lived during many successive generations in total, or nearly total, darkness, exhibit much departure from the normal type. Such animals may be grouped as follows :—(1) Those that inhabit caves. (2) Deep-sea forms. (3) Pelagic animals. (4) Parasites which live within the bodies of their hosts.

The Cave animals have been especially studied in the United States and in Austria; as, for example, in the Mammoth Cavern in Kentucky, which consists of many miles of perfectly dark galleries, excavated by the action of water on the limestone rock; and in many others in different parts of North America. The Austrian caverns are smaller, and are situated to the north of the Adriatic Sea, near Trieste.

Schiödte has divided the Cave fauna into four groups. The *Shade* animals, which are found near the mouths of the caverns, and which differ little from those living outside; *Twilight* animals, inhabiting darker recesses;—these have small eyes, the comparative absence of light having rendered their visual organs of little use;—*the Cave animals proper*, of which a large proportion are perfectly blind; and, lastly, animals inhabiting the stalactite caverns of Austria, which are all quite blind. These last show remarkable adaptations for climbing over the pillars of stalagmite, in which occupation they spend most of their time.

One of the most interesting animals of the Austrian caves is the blind newt-like *Proteus anguinus*. It has small eyes, but they are completely covered by the skin, so as to be useless; their structure

is quite embryonic, and the lens altogether absent. A parallel case is presented among ourselves by the common Mole, the eyes of which show similarly an arrested embryonic character.

Several species of blind fish are known from the caves in America and Cuba, all of which are white in colour. Some of them, however, possess eyes which are imbedded deeply in the tissues of the head. Many blind insects are met with; in some species the eyes are rudimentary, in others entirely wanting, even in the larval condition. On the other hand, there are found some spiders which possess eyes, although they cannot apparently be of any service to them. Perhaps such cases may be explained by the supposition that these forms are comparatively recent immigrants, or that some animals may be subject to less modification than others, even when exposed to the same conditions. A consideration, however, of the whole subject, shows that, in the case of animals inhabiting caves, there is a tendency towards the reduction, or atrophy, of their visual organs.

The same result is arrived at by the study of the deep-sea fauna, although we find a somewhat anomalous mixture of blind forms with others possessing moderately developed or sometimes enormous eyes. This is probably to be accounted for by the fact, that a large number of animals inhabiting great depths are phosphorescent. Many of the deep-sea Coelenterates are luminous, such as the Sea-pens (Pennatulidæ) and the Gorgonian Corals. Pennatula is exceedingly brilliant. Umbellularia, which occurs at depths as great as two thousand four hundred fathoms, attains a length of three-and-a-half feet, and gives out a very strong light. Many deep-sea, and some pelagic fish are phosphorescent. In the former, the whole system of the lateral line becomes enormously developed, with great cavities in different parts of the body, especially in the head. These cavities are filled with mucus, which also covers most of the body; and in perfectly fresh specimens the mucus is usually luminous. Many fish also possess, imbedded in the different parts of their skin, particularly in the ventral region, round shining bodies, sometimes simple and glandular, without ducts, but connected with the spinal nerves; at other times in the form of chambers, filled with fluid, and coated behind by a membrane, which in some cases exhibits a structure not unlike that of a retina, with a well-developed bi-convex lens in front. These latter

may be regarded either as accessory eyes, or as phosphorescent organs; but, as many fish which possess them have also well-developed cephalic eyes, as for example, the Ribbon-fish *Trachypterus*, it is possible that they may be, as it were, bull's-eye lanterns, the lens performing the function of concentrating the light given out by the posterior part of the organ. Animals which are dredged from great depths often reach the surface dead, and almost falling to pieces, in consequence of the expansion of their contained gases, owing to the removal of the great pressure of the water, and it is possible, therefore, that many deep-sea forms, which have not been hitherto supposed to be phosphorescent, are in reality so. At great depths phosphorescence is the only light which can be supposed to exist; for Forel, in experiments on the Lake of Geneva, found that in no case was sensitized paper affected by light at a depth greater than one hundred fathoms. There is a serious difficulty in accounting for the existence of the phosphorescent animals themselves, as in many cases they belong to groups which have no eyes, and in others are blind representatives of families, the members of which usually possess eyes. Many of the lower animals, however, though not provided with visual organs, are perfectly able to distinguish between light and darkness, as, for example, Hydra, the freshwater Polype, which has, when kept in a jar, the habit of coming to the side nearest to the light. The higher animals, as we know by experiment, are insensible to light, except through the medium of their eyes, and it is difficult in such cases to understand of what use the phosphorescence of blind animals can be to them. A fish, *Ipnops*, living at great depths, has completely lost its eyes, their place being taken by two large metallic-looking phosphorescent organs,—one instance out of many of highly organised animals, which are blind, equalling in their phosphorescent power those which possess well-developed eyes. Some zoologists suppose that in such cases the phosphorescence is an accident, occurring in the normal metabolism of its possessor; but it seems more reasonable to believe that in some, although at present unexplained, manner, it is of service, even to forms which are quite blind.

It cannot be doubted that phosphorescence must be very useful to animals possessing eyes. Günther gives a figure of a fish (*Chiasmodus*) which lives at a depth of fifteen hundred fathoms,

and has large eyes, which was caught, having swallowed another fish many times larger and heavier than itself—the ventral body-wall, with the stomach, protruding very far beyond its usual position.

A large proportion of the deep-sea fauna belongs to groups, none of the members of which (in the adult condition) possess eyes, such as Sponges, Actinozoa, Polyzoa, and Brachipods; but there are others, the members of which are, under ordinary circumstances, endowed with organs of vision, which, at abyssal depths, are represented by forms either totally blind, or with eyes which have become rudimentary and functionless. Of these may be mentioned Worms, the greater number of which are blind at depths greater than five hundred fathoms; among the Crustacea, Petalopthalamus, one of the Mysidæ found at a depth of from eight hundred to sixteen hundred fathoms, which possesses long eye-stalks without eyes, but with large spheroidal chitinous plates in their place, and without any trace of visual apparatus. In some of the deep-sea Crayfish the eyes are functionless, and in Willemœsia—allied to the Rock Lobster—wanting; and numerous other similar instances might be given. Many deep-sea fish are blind; but there are some which are provided with extremely large eyes; while in others the eyes are of the normal character, or even smaller than usual. In the case of some Schizopods, which are found at a depth of sixteen hundred fathoms, accessory eyes have been developed. Gnathophausia has an eye on each second maxilla or third jaw. Euphausia has eight accessory eyes on the ventral surface of its thorax and abdomen, while Thysanopoda has eight pairs. A gigantic Ostracod, an inch long, with large eyes, was obtained from a great depth; and an Amphion, the larval stage of a form allied to Palinurus, the Rock Lobster, has eyes which are borne on stalks as long as the whole body of the animal.

The connection of pelagic animals with the subject is not at first sight obvious. A large proportion of these, however, are nocturnal in their habits. Weismann has shown that nearly the entire fauna of the Lake of Constance oscillates in level with the increase or diminution of light. It does not descend during the day to a depth greater than that at which sensitized paper is affected, but at night it reappears on the surface. The eyes of such animals, which are so constructed as to enable them to see

by night, would probably be injured by exposure to the full rays of the sun. Chun has shown that the Ctenophora of the Bay of Naples execute periodic movements of a similar kind; and the Naturalists of the "Challenger" expedition found that tracts of sea, which during the day appeared perfectly barren, would at night teem with organic life of all kinds. Many pelagic forms, like those inhabiting great depths, are furnished with abnormally large eyes, suited to their nocturnal habits. The surface of the sea is at night, as is well known, often brilliantly illuminated by the phosphorescence of such animals as Noctiluca, which may occur along the English coast in numbers prodigious enough to cause a glass of water taken from the sea to appear quite milky; or as Phyllosoma, Ascidians which form colonies some inches in length, and occasionally cover the surface of the water, on a quiet night, for miles.

Among pelagic animals, a Worm, Alciope, has extraordinarily large eyes, which fill up most of its head. The eyes of the Cephalopods, or Cuttlefish, are among the most perfect organs of the kind met with among invertebrates, resembling in their general features the typical vertebrate eye, without, however, having any true homology with it in detail. The Hyperinæ, a sub-order of the Amphipod Crustaceans, possess eyes of an enormous size, as do the larvæ of many of the higher Crustaceans, such as the Glass-crab (Phyllosomata).

With regard to ento-parasites, it is almost universally the case that such forms are blind.

To recapitulate: it is difficult to account for the existence of animals with well-developed eyes inhabiting caves which no ray of light enters, except by supposing they are recent immigrants, or that disuse does not affect some forms so quickly as others; while, as to similarly endowed deep-sea and pelagic species, it would seem that the presence of phosphorescent animals must be of great advantage to them. The existence of phosphorescence itself cannot be satisfactorily accounted for; but its presence in so many widely different forms shows that it must have a meaning, and it can hardly fail in some way to be of use to its possessors. Blind animals in caves, as well as in the deep sea, are usually provided with specially acute organs of hearing or touch, the latter in the form of long antennæ or other appendages, as in the Crustacea; or of

long tactile hairs, like those of the blind Centipede (Spirostrephon) in the Mammoth Cave; or of fleshy processes on the head, lower jaw, or fins of many fish.

The action of Natural Selection on animals migrating into caves, or penetrating into the deeper abysses of the ocean, has doubtless tended to perpetuate, first individuals, and then races with abnormally large eyes; or else by favouring those, which, from the possession of tactile organs, or from some other cause, have been able to exist without light, has produced forms to which light is perfectly useless, which forms have in many cases lost the function of their eyes, and often the eyes themselves. But in company with these two groups we meet with animals but little departing from the normal in the structure of their eyes, of which they can make little or no use.

Much has still to be done in the investigation of the mode of life of deep-sea and cave animals, and of the influences to which they are exposed, and such inquiry can hardly fail to be attended with results alike interesting and important to science.

VI.

THE FENS AND FEN-FOLK.

By Thomas Southwell, F.Z.S.

Read 26th February, 1884.

There is probably no portion of Great Britain, of like extent, possessed of more varied and interesting associations than the great plain forming parts of the counties of Lincolnshire, Northamptonshire, Huntingdonshire, Cambridgeshire, Suffolk, and Norfolk, and known as "Fen-land." Throughout its length and breadth, for more than a thousand years a ceaseless conflict has been waged between the natives of the plain and their insidious enemy, the devastating flood. In times of yore, the old sea-rovers, ascending in their barges its numerous navigable rivers, penetrated, on their marauding expeditions, far into the Fen country, plundering the inhabitants and spreading destruction around. Its monastic establishments were long celebrated equally for their wealth as for the architectural beauty of their houses; and it was here that Norman William encountered the final and most determined opposition to his imperious will. The past Fauna and Flora of this unique district were of surprising richness; its present fertility is unmatched; and its inhabitants were, until quite recently, *sui generis*.

A glance at the map of this great "Level"—extending from south to north a length of seventy-three miles, and in breadth seventy-six miles, with an area of one thousand three hundred and six square miles—will indicate how severe and protracted has been the struggle to render habitable this large tract of now fertile country. Its surface, unbroken by any considerable elevation, is intersected by numerous rivers; and the curious picture it presents upon the Ordnance Map, shows the extent of the scars and scratches inflicted upon its surface in the form of drains, large and small, with the object of leading away its too-abundant waters. This happy consummation was not arrived at without

much opposition from the inhabitants, as well as almost insurmountable engineering difficulties, the people clinging most pertinaciously to their half-drowned swamps, and even resorting to physical force to retard the onward march of improvement. This strong conservative feeling was no new development. From the time of the Roman Conquest, all through the troubles of the Saxon and Norman periods, the Fen-men were the last to change; and, almost to the present day, the inhabitants of this isolated district have maintained their deeply-rooted aversion to innovation.

There is every reason to believe that the impenetrable fastness of the Fens sheltered a remnant of the Celtic inhabitants of Eastern England for ages after the Saxons had established themselves as masters of the country; and Mr. Freeman* believes it possible that here and there an outlying settlement may have lingered on even to the days of William. In like manner, the Isle of Ely was one of the last spots of English soil which yielded to the Norman's conquering sword; and yet, again, two hundred years after, "the land which had thus sheltered the last relics alike of British and English independence, sheltered the last relics of the party which had fought for the freedom of England by the side of Simon of Montford."

I propose, however, in this paper, to treat of what is known of the physical aspect of the Fens, and of the condition of its inhabitants in days gone by, rather than of the part they took in the stirring events of the past, restricting myself to only a passing reference to the process by which this watery wilderness has been gradually reclaimed.

The early attempts at reclamation attributed to the Romans appear to have been chiefly directed to keeping back the tidal waters of the Wash, and preventing the overflow of the rivers by means of embankments along their courses; but it was probably the occupants of the religious houses who made the first real advances in drainage. Peterborough and Ely, from very early times, each had their monasteries, the former on the borders of the Fens, and the latter on a site elevated above the reach of the waters; but as yet the fastness of the impenetrable Fen itself had never been invaded. However, about the commencement of the eighth century, in the days of Conrad King of Mercia,

* 'History of the Norman Conquest of England,' vol. iv. p. 470.

a holy man named Guthlac, searching for a habitation wherein to pass a life of penance, "by Divine guidance" came, on St. Bartholomew's day, to a "solitary desert island" in the midst of a dismal Fen of vast extent, and inhabited by devils of monstrous shape. Here the holy man found a congenial locality to exhibit his asceticism; "and in a hollow, on the side of a heap of turf, built himself a hut."

Guthlac seems to have had a lively existence at first, the devils casting him over head and ears into the foul Fen, or dragging him through Brambles and Briers "for the tearing of his limbs;" but, eventually, St. Bartholomew, in consideration of Guthlac having come into his residence on the saint's own particular day, came to his assistance with a scourge, which proved too much for the devils, and Guthlac was left in peace. After fifteen years passed in this lonely retreat, and probably in not altogether fruitless efforts to influence, by his example, the rough men of Mercia, Guthlac died in the odour of sanctity, and to his memory rose the stately Abbey of Crowland. The holy man had pitched upon an excellent site for his cell; for, although surrounded by Fen, Crowland itself stands upon a firm foundation of gravel; and the famous Barnack quarries, within easy distance by water-carriage, supplied materials for the construction of the Abbey.

Lands were lavished, and privileges speedily conferred without stint on the Abbey of Crowland, which soon became one of the richest of the many religious houses in Fen-land; and there can be no doubt that the monks of Crowland did all in their power to increase the value and productiveness of their estates, an example which was doubtless followed by the other religious houses, much to their advantage, and greatly to the improvement of the country around. Eastern England abounds with inestimable architectural gems, left us by the religious communities, which in too many cases have simply served as quarries to furnish raw material for hideous structures of more modern date, or to supply metal for road-making; and we are only just beginning to estimate these models of perfect taste at their true value, and to take means for their preservation.

We hear much of the pride, love of power, and inordinate greed for temporalities displayed by the ecclesiastics in the height of their prosperity; but the benefits they conferred in return are too often forgotten; nevertheless, they played a very important part in the

"making of England." The estates which fell to them, by reason of the religious enthusiasm, the superstition, or the blood-guiltiness of the powerful of the land, or were obtained by other means, which the holy fathers were adepts at employing, were wisely and beneficially administered; and in the seclusion of the monastic establishment, all through the long dark ages of ruthless conquest and transition, was kept alive the spark of that gentler life enjoined by the Master, which, however dimmed it might be by worldly passion, would, but for them, have been in danger of becoming totally extinct. That their influence was for good, the peaceful end of many an ill-spent life bears testimony—the youth and manhood, spent in cruelty and oppression, ending in penance and acts of charity. Call it superstition, if you will; but it cannot be regarded otherwise than as a happy consummation. We can readily picture to ourselves the softening influence which came over the hardened Canute, as, with his Queen Emma by his side, on the eve of the feast of the "Purification of our Lady," he bade his warriors approach softly, as he, fixing his eyes upon the Church, listened to the monks of Ely:—

> "Merie sungen ðe Muneches binnen Ely.
> ða Cnut ching reu ðer by.
> Roþeð cnites noer the land.
> And here ye þes Muneches sæng."*

Many a phantom must have passed before the mind's eye of the blood-stained old Viking, as the monks sang; and we cannot help contrasting the monarch who, in all humility, placed his crown on the head of the crucifix at Winchester, and governed his people so wisely, with the cruel and impetuous Dane who scrupled so little as to the means by which that crown had been made secure.

The monks served their purpose admirably, and have passed away. Peace be to their ashes! Let us neither look too closely into the history of their later days, nor at the motives of those who despoiled them of their riches.

On the occasion of another visit paid by Canute to Ely, the Fen was frozen over, at which, though it did not alter his purpose, he was "sorrowful and much troubled." Then comes a glimpse of Fen-life in the eleventh century. "Howbeit," says Dugdale,† "putting

* 'Liber Eliensis,' p. 202 (ed. Stewart, 1848).

† 'History of Embanking' (second edition, folio) p. 184.

his trust in God, being then upon Soham Mere, he contrived to be drawn upon a slead over the ice; and for his better security (considering the danger of the passage) that one should go before him, to try the way. But it so fell out, that as he stood thus consulting, a lusty and big man, and an inhabitant of the isle, who for his corpuleney was ealled Brithmer Budde, eame before him, and offered to lead the way; whereupon the King followed on the slead, all that beheld him admiring his boldness; and eoming safe thither, eelebrated that solemnity aecording as he had wont, with great joy: and in gratitude to the said Brithmer, made him, with all his posterity, free men for ever."

A halo of romanee is shed over the last days of English independenee in the Isle of Ely, by the knightly deeds of one Hereward, of whom tradition tells much more than history. This much, however, is certain: Hereward held the isle against King William till he was at length betrayed by those for whom he fought so nobly; he escaped with his life, and probably, eventually, became reconciled to the King. The legends which reeord his deeds invariably represent him as a man of restless energy, fearless in battle, and generous to his vanquished foe. His end was as violent as his life had been. Surprised and attaeked by a band of his Norman foes, he fell at last wounded in the back, sixteen Frenehmen lying dead at his feet; the misereant who haeked off his head swearing that so valiant a man he had never seen, and that, had there but been three more in the land like him, the Frenehmen would have been slain, or driven out of England.

Interesting as this episode in the history of the Fens is, from a purely historic point of view,—for, although the records of Hereward's exploits are mainly legendary, of the eorreetness of the main features of his defenee of the isle against King William there ean be no doubt,—it possesses still greater interest to us from the light whieh it sheds upon the condition of the Fen eountry and its inhabitants eight hundred years ago. These faets and legends have been skilfully wrought by Mr. C. MaeFarlane into a eharming little "Old English Novelet," entitled 'The Camp of Refuge;' whilst, to the late Charles Kingsley, the same subjeet supplied the material for his equally eharming 'Hereward the Wake.' In these two delightful books, so graphic a picture is presented of what must have been the mode of life, and, perhaps, even the line of thought,

both in cloister and camp in those stirring times,—the details from all available sources being filled in with so masterly a hand,—that it is needless to repeat what has already been so well told; nor will space allow me to do more than give, in addition to those already quoted, a few condensed extracts from the interesting accounts of the Fens, to be found in Dugdale's 'History of Embanking,' and quoted by him from the manuscript Life of St. Guthlac, William of Malmesbury, the Register of Ramsey Abbey, and other ancient sources. It appears, however, that the whole level of the Fens, previous to the execution of the great drainage works in the middle of the seventeenth century, was one vast morass, with here and there an "island," slightly more elevated than the surrounding bog. These islands were approachable, at first, only by water, but subsequently by artificial causeways. The rivers meandered through the boggy soil, slow in current and tortuous in course, and were quite unequal to the task of conveying the superabundant waters to the sea. In winter the flood-waters from the uplands, added to frequent incursions from the sea, caused the rivers and water-courses to overflow and submerge vast tracts of land which were comparatively dry in summer; so that, for the greater part of the year, the whole country presented the appearance of one vast lake. That this state of things continued with very slight abatement to the commencement of the great drainage works in the sixteenth century there is very little doubt, but there is singularly little information upon the subject. Even to the present day the low-lying lands are subject to inundations from excessive rainfall, or the breaking of the banks which hold back the water.* In Lincolnshire, the proverb, "All the carts that come to Crowland are shod with silver," is even now not forgotten. "Venice and Crowland, *sic Canibus Catulos*," says Fuller, "may count their carts alike; that being sited in the sea, this in a morasse and fenny ground, so that an horse can hardly come to it. But whether this place since the draining of the Fens hath acquired more firmness than formerly is unknown to me."† There was also a curious old saying, more expressive than polite, which I remember to have heard

* For a graphic account of one of these eruptions, which occurred in 1796, see an article entitled "The Great Drowned," in the 'Leisure Hour' for 1877 (pp. 487—490).

† 'Worthies of England' (1662), 4to edition (1811), ii. p. 6.

frequently in Lincolnshire when a boy, ascribing very remarkable properties to the cows and pigs of that county. It ran: "Lincolnshire, where the pigs dung soap and the cows dung fire," and alluded to the primitive practice of converting pigs' dung into a "lye," for washing purposes, and to the storage of dried cow-dung for winter fuel;—the latter suggestive of the treeless nature of the country in which the practice prevailed. Frogs were called "Holland Waits," and sometimes "Lincolnshire Nightingales."

It is not to be imagined that a great improvement like the drainage of the Fens, which involved such an entire change in the face of the country, and, consequently, in the habits of the people, could be carried out without serious opposition. The first act for the drainage of the Bedford Level was passed in 1578; but, owing to vexatious litigation, and even more active opposition still, the work was not accomplished till 1653. Dugdale tells us that the "almost barbarous sort of lazy and beggarly people," who lived by fishing and fowling of course, dreaded the loss of their occupation, which was sure to follow the subsidence of the waters, and opposed the improvement by all means in their power, one of which was the making of "libellous songs to disparage the work." He gives one of these songs, which is curious, but too long to quote entire. It is headed the "Powtes' Complaint," and in it the fishes call upon the waters to assemble, under the lead of "good old Captain Flood," "who was never known to fail us," and beg Eolus, Neptune, and the Moon also to lend their aid:—

"For we shall rue it, if 't be true, that Fens be undertaken,
And where we feed in Fen and Reed, they'll feed both Beef and Bacon."

"Away with boats and rudder, farewell both boots and skatches,
No need of one nor th'other, men now make better matches;
Stilt-makers all and tanners shall complain of this disaster;
For they will make each muddy lake for Essex calves a pasture."

Sir Cornelius Vermuyden, a celebrated Dutch engineer, who had settled in this country, and had already done good work, suffered so severely from popular prejudice, that not only was his scheme for draining the Bedford Level rejected, in consequence of his being an "alien," but also at Dagenham, where, having in 1621 repaired the banks which hitherto had been too weak to protect the level against the violence of the tide, the people refused to

pay the tax levied for his remuneration, whereupon the King assigned him certain lands by way of recompense, which, let us hope, he got. But even worse fortune befell the worthy Knight in 1642, at Hatfield Chase. There, previously to his draining operations, the country was full of wandering beggars, but, afterwards, from the demand for agricultural labour, wages were doubled. Nevertheless, after Vermuyden and his partners had entered upon possession of what belonged to them by agreement, and had built a town called Sandtoft, "with a church therein; placing a minister there; whereunto resorted above two hundred families of French and Walloon Protestants (fled out of their native country for fear of the Inquisition, only to enjoy the free exercise of their religion here)," the inhabitants, claiming common right, and under pretence of raising an army for the protection of the King, "broke down the fences and inclosures of four thousand acres, destroyed all the corn growing, and demolished the houses built thereon." After this they broke other banks, watching the breaches with muskets in their hands, to prevent their being repaired, and forcing the inhabitants "to swim away like ducks."* This lawless destruction continued till seventy-four thousand acres of land were under water. Fuller† thus refers to the discontent of the Fen people: "Tell them of the great benefit to the publick, because where a Pike or Duck fed formerly, now a Bullock or Sheep is fattened; they will be ready to return that if they be *taken* in *taking* that Bullock or Sheep, the rich owner indicteth them for felons; whereas that Pike or Duck were their own goods, only for their pains of catching them. So impossible is it that the best project, though perfectly performed, should please

* This incident suggested to Harriet Martineau the subject of the charming little story, the first of the "Playfellow" series, entitled the 'Settlers at Home.' Long after the Fens were drained, the "Redfurns" were still represented by the hardy race of men who took up their abode on some lonely marsh on the shores of the Wash, often in a hut-boat lying high and dry in some creek, and gained a precarious living by their nets and guns; or by the men who squatted down in the midst of the "Broads," as graphically described by the Rev. Richard Lubbock in the oft-quoted passage (p. 129-30 second edition) of the 'Fauna of Norfolk.' These are even now represented by the shore gunners of the Wash, and the eel-setters and fishermen of the Norfolk Broads.

† *Op. cit.* vol. i. p. 152.

all interests and affections." In fact, they would exclaim with Hudibras:

> "The law condemns the man or woman
> Who steals the goose from off the common,
> But lets the greater felon loose,
> Who steals the common from the goose!"

Dugdale very ingeniously argues, with regard to the dreaded scarcity of fowl, that when the country is drained there will be an increase in the number of "rivers, chanels, and meres," which form the principal resorts of the fowl, and their numbers will probably be augmented in consequence; also, that the fish and fowl will be more easily taken within the restricted bounds than in the more open water; added to which, the decoys planted on the drained lands would capture a much larger number of fowl than could be secured by any other means formerly used. We fear that all these arguments would be insufficient to convince the hardy Fen-men, who lived by their nets and guns, that the latter state of things was preferable to the former.

The chief feature in the animal life found in the Fens in days gone by must have been the great abundance of birds and fishes. When William the Conqueror lay with an army before the Isle of Ely, vainly attempting to force the remnant of the English who had taken refuge in this their last stronghold to surrender, it is said, that, but one only of his soldiers succeeded in entering the isle alive. This man, Beda by name, was taken prisoner by Hereward's men, and after being treated with kindness was allowed to return to the King's camp. The account he gives to William of what he witnessed in the Isle of Ely, of the strength of its position, "compassed about with huge waters and fens, as it were with a strong wall," of the multitude of wild animals both in the woods and near the Fens: as also of fish found in the waters, and fowl which are bred there, or visit the Fens, especially in the winter season, must have given the King but slight hopes of reducing the brave defenders of this natural stronghold by starvation.* Dugdale, also, quoting the register of Ramsey Abbey, after expatiating upon its strong insular position, and the beauty of its surroundings, says its waters, especially Ramsey Mere, abound with Eels and "Pikes of an extraordinary bigness," "and although both fishers and fowlers cease neither day nor night to haunt it, yet is there always

* 'Liber Eliensis' (ed. Stewart), pp. 231, 232.

of fish and fowl no little store." At a much later period, early in the seventeenth century, Drayton, in Song 25 of the "Polyolbion" (Holland's Oration), in a most interesting passage enumerates the Birds found in the Fens; and Fuller* thus writes of the quality and excellence of the Lincolnshire fowl:—

> "Lincolnshire may be termed the *Aviary* of England, for the *Wild-foule* therein; remarkable for their,
>
> 1. *Plenty;* so that sometimes, in the month of August, *three thousand Mallards*, with *Birds* of that *kind*, have been caught at one draught, so large and strong their *nets;* and the like must be the Reader's belief.
> 2. *Variety;* no man (no not Gesmar himself) being able to give them their proper names, except one had gotton Adam's *Nomenclator* of Creatures.
> 3. *Deliciousnesse; Wild-foule* being more *dainty* and *digestable* than *Tame* of the same kind, as spending their *grossie* humours with their *activity* and constant motion in flying."

In the middle of the eighteenth century, the same state of things obtained in the East Fen, and is graphically described in a most interesting passage, though too long to quote, in Gough's edition of Camden's 'Britannia.'† The same author, speaking of Crowland, also tells us that, "their greatest gain is from the fish and wild ducks that they catch, where are so many, that in August they can drive into a single net three thousand ducks; they call these pools their corn-fields; for there is no corn grown within five miles."

* *Op. cit.* vol. ii. p. 2.

† Vol. ii. (1806) pp. 380-381. The East Fen is now drained and cultivated; but there still remains a tract of country, though not in Fen-land, but in our own county of Norfolk, which greatly resembles the East Fen of past days in that happy admixture of water and dry land, interspersed with reed-beds and dwarf marsh trees and shrubs, so acceptable as breeding quarters for Wild-fowl. Though apparently unknown to the old writers on such matters, the Norfolk Broads were as rich, if not richer, in marsh and water-breeding birds than any of the localities they love to expatiate upon, and they long remained unchanged, after the more famous resorts were drained and deserted by their former inhabitants. Although we have lost the Godwit, Ruff, Black Tern, Avocet, and Bittern, still, in the present year, eight out of the nine species of Duck which are known to breed in England, are still nesting in this county, and seven of these may be found together in one favoured locality of no very considerable extent. Happily they are most rigorously protected; but I question whether any other district in England of like extent can claim as many species of this family as regular breeders.

The population of such a unique country, as might be expected, was *sui generis*; and the life of a Fen-man, could it be written from a Naturalist's point of view, would, indeed, be interesting; but the material is now alas of the scantiest. There is a curious poem extant —for a sight of which I am indebted to Mr. J. J. Colman, M.P.— purporting to be the "Life of a Fen-man;" but, although it gives some interesting glimpses of the Fen-man's mode of life and occupation one hundred years ago, the author utterly fails to avail himself of the fine opportunity which offered of immortalizing himself.*

In the introduction, the author thus describes the isolated condition of the dwellers in the Fens:—"The Fen is a vast plain, intersected with various natural and artificial rivers, defended with high banks, to prevent the overflowing of the high country floods in their passage to the sea. On these banks the inhabitants, for their better security, erect their miserable dwellings, at a great distance sometimes from each other, and very remote from their parish churches, to which they rarely resort, unless to a wedding, a christening, or a burying. So that they seem to be cut off from the community, and are deprived of almost every advantage of social life. It is a rare thing to meet with a village of twenty houses together, unless in their towns, from which they are many miles distant. They are, therefore, excluded every opportunity of the very lowest education, and few of them arrive at a higher erudition than to be able to read and write." The life of hardship and privation endured by this

> "Humble race of men,
> Alike amphibious, by kind Nature's hand
> Form'd to exist on water or on land,"

is thus described by our Fen-Parson in one of his prose notes:— "The life of a North American savage is vastly preferable to his. They both live by their gun. The one traverses the woods and mountains in search of his prey, and retires at night to a warm cabin, with plenty of fuel to warm the rigour of the climate; the other in a little skiff, which a puff of wind would overset, paddles about the water till the evening, and comes home wet and cold to his miserable hut, and lies scarcely dry and warm all night

* "The Inundation; or, The Life of a Fen-man: A Poem. By a Fen-Parson." (Lynn: W. Whittingham). 20pp. 4to. No date, but published about the year 1771.

in his bed. The American Indian also bears a near resemblance to our hero; as a fisherman he has his canoe, and ventures upon the shoals in search of fish; he has also his favourite dog to attend him, and hopes that as he is his constant and faithful companion in this life, he will be in another.

> 'But thinks admitted to that equal sky,
> His faithful dog shall bear him company.'"

The Parson's poetic description of the Fen-man's daily life is not quite so gloomy as his prose; but it will be seen that a help-meet is here introduced—perhaps the former description applied only to a bachelor.

> "He rises early, and he late takes rest,
> And sails intrepid o'er the wat'ry waste;
> Waits the return of shot-seal * on the lake,
> And listens to the wild-fowl's distant quack,
> At dusk steers homeward with a plenteous freight,
> The crazy vessel groans beneath the weight.
> A tidy house-wife waits his coming home,
> Gets dry apparel, and cleans up her room.
> Prepares a cheerful fire, brings out her hoard,
> And spreads a homely plenty o'er his board.
> To vend her fowl the dearest mart she tries,
> And with the profit household wants supplies.
> The Capital's ev'n feasted with her store,
> And London carriers whistle at his door."

And the cottage, brightened by the presence of a thrifty house-wife, is thus described:—

> "His little hut, which by the bank-side stood,
> Cover'd with coat of sedge, and walls of mud,
> Where each domestic use one room supplies,
> His victuals here he dresses, here he lies:
> A little lattice to let in the day,
> With half-extinguished light and glimm'ring ray."

In a note to the line, "London carriers whistle at the gate," the author indulges in some remarks upon "the luxury of the Metropolis," which are curiously characteristic of the times. He says: "There are a set of people call'd Kedgers, who, *when the country can be travelled over* [!], call regularly at the Fen-men's houses to buy their fish and fowl at a vast price, and send them up

* 'Flight-time.'

to town, by the butter-boats, or sell them to the higlers that keep London market. But what is that to the extravagance of a Norwich weaver, who sends a special messenger from thence to Caxon,* which is near one hundred miles, to meet the north country carrier with fresh salmon." And, again: "It is almost incredible to believe, what great advantage the skilful Fen-man makes of his winter shooting, in a drowned year, and in the following summer of his fish. By the overflowing of Whittlesea Mere, and other great reservoirs of fish, the whole country is plentifully stocked with them." After an overflow of Whittlesea Mere, when the waters retired, they were said to have "folded;" and at that time the dykes and rivers would be found full of fish, which had escaped from the Mere during the flood, and afforded ample harvests to the Fen-men. Another very considerable source of profit was the Smelt-fishery. Large quantities of these fish were taken, then as now, when they came up the rivers to spawn, and a single share in this fishery was known to amount to fifty pounds.

Our Fen-Parson refers to the malarious emanations from the sodden Fen, and draws a loathsome picture of the "Genius" of the place, "pale Febris," as "she shiver'd o'er a cow-dung† smoky fire," and laments the absence of health, even when plenty smiles the fairest:—

> "The moory soil, the wat'ry atmosphere,
> With damp, unhealthy moisture fills the air.
> Thick, stinking fogs, and noxious vapours fall,
> Agues and coughs are epidemical."

It is probable that malarious fevers would be more prevalent during the drainage of the Fens than when they were still more or less in a state of nature; and the writer has vivid recollections of his sufferings as a boy from "intermittent" fever, which was at that time prevalent at Lynn, it may be in consequence of the cutting of the Eau brink canal, which led the course of the river Ouse direct from St. Germains to the town of Lynn, leaving the old and sinuous course of the river to wharp up. The cut, which was

* Caxton is a small market-town in Cambridgeshire, and is situated at the point where the road from Norwich *viâ* Newmarket and Cambridge first strikes the great north road, about twelve miles north of Royston.

† *Cf.* p. 616.

opened in 1821, had been completed twenty years; but as Dr. Maclean* has shown, marshes are not, as a rule, dangerous, when abundantly covered with water; and that it is only when the water's level is lowered, and the saturated soil is exposed to the drying influence of a high temperature, and the direct rays of the sun, that the poison is evolved in abundance; the circumstances were, therefore, at that time, most favourable for the dissemination of the malarial germs, not only the freshly-turned soil and margins of the cut being exposed, but also the old bed of the river, which took many years to drain and bring into cultivation. This state of things lead to a most pernicious abuse of opiates, laudanum being consumed by the Fen-folks, by whom it was at first used as a prophylactic against malarious fever, or as an antidote to the periodic attacks—in quantities altogether astonishing. Happily, with the disappearance of the disease, the abuse of the remedy has gradually ceased; and at the present time, although, doubtless, there are many confirmed elderly laudanum-drinkers in Fen-land, it is a practice which is fast dying out, and will, it is to be hoped, cease with the present generation of elders. Ague was familiarly known as the "Bailiff of Marshland."

A very eccentric character, named William Hall—who loved to style himself "Antiquarian Hall," "Will Will-be-So," or "Fen Bill Hall"—died at Lynn in 1825. Hall was born on June 1st (old style), 1748, at Willow Booth, then a small island "of but few perches" in extent, in the Lincolnshire Fens, near Heckington Ease, in the parish of South Kyme. He has left behind him some doggerel verses, now very scarce, entitled 'A Chain of Incidents relating to the state of the Fens from earliest accounts to the present time.' Printed by W. G. Whittingham of Lynn in 1812 for the author, and sold by him only. Price one shilling. This "sketch of local history" only reached its third number, and the only copy I have seen is in the library of the British Museum. It is a curious mixture of odds and ends in prose and doggerel verse, but is interesting from the references it contains to the state of the Fens in the author's early days, and the occasional glimpses it reveals of the life led by the "Fen slodgers" more than one hundred years ago.

* Quain's 'Dictionary of Medicine:' article "Malaria."

In his "prefatory salutation" he thus addresses his reader (p. 3):—

"All hail! esteem'd aquatic friend,
Since both our aims are for one end;
To tell those that's not seen much water,
In days of yore what was the matter;
Announce to th' public we are penman,
By narrating the lives of Fen-men."

Of the place of his birth he speaks as follows:—

"Kynme God knows,
Where no corn grows,
Nothing but a little hay,
And the water comes,
And takes it all away.
Where Ducks by scores travers'd the Fens,
Coots, Didappers, Rails, Water-hens,
Combin'd with eggs, to change our pot.
Two furlongs circle round the spot.*
Fowl, fish, all kinds the table grac'd,
All caught within the self same space;
As time revolv'd, in season fed,
The surplus found us salt and bread;
Your humble servant, now your penman,
Liv'd thus a simple, full-bred Fen-man."

With regard to his imperfect education, he begs the reader's indulgence, the first twenty years of his life having been passed five miles from church or school, amid conversation of the "lowest, vulgar kind," with only six months' schooling:

"Pray sirs, consider, had you been
Bred where whole winters nothing's seen
But naked floods for miles and miles,
Except a boat the eye beguiles;
Or Coots, in clouds, by Buzzards teaz'd.
Your ear with seeming thunder seiz'd
From rais'd decoy,—there Ducks on flight,
By tens of thousands darken light;
* * * *
Who liv'd for months on stage of planks,
'Midst Captain Flood's most swelling pranks,
Five miles from any food to have,
Yea often risk'd a watery grave."

* Referring to Willow Booth, the place of his birth, Hall appends the following note:—"Then an island of but few perches. The author was the last person living who was born upon it."

In a foot-note at page 6 he thus explains the line, "From rais'd decoy," &c. :—"This was the six hundred Decoy ; the pond, about three acres of water, well sheltered and distant from disturbance, became so great an asylum, that I have heard divers decoymen say it was apparently impossible for an egg to be dropped without hitting one. Our house was a full mile parallel distance ; and when they were disturbed, any stranger would suppose it distant thunder. It is the author's intention to devote a part of the work under the *life of a low Fen-man*, where he will descant more largely upon Decoys, having never seen but one rational writer on the subject, and he has manifested that he knows nothing of the theory." The author, unfortunately, never carried out his intention of writing "rationally" upon decoying, with a knowledge of the practice added; and decoys themselves had almost become things of the past before any accurate description of their construction and working was written.

Such was the early life and training of this eccentric individual. Of his summer occupation, when following his calling, the following quotation from page 11 will give some idea :—

"Born in a coy, and bred in a mill,
Taught water to grind, and Ducks for to kill ;
Seeing Coots clapper claw, lying flat on their backs,*
Standing upright to row, and crowning of jacks ;
Laying spring nets for to catch Ruff and Reeve,
Stretched out in a boat with a shade to deceive.
Taking Geese, Ducks, and Coots, with nets upon stakes,
Riding in a calm day for to catch moulted Drakes ;
Gathering eggs to the top of one's wish,
Cutting tracks in the flags for decoying of fish.
Seeing Rudds run in shoals 'bout the side of Gill sike,
Being dreadfully venom'd by rolling in slake ;
Looking hingles, and sprinks, trammels, hoop-nets, and teamings,
Few persons I think can explain all their meanings."

* This, doubtless, alludes to the defensive attitude assumed by the Coot when fighting or hard pressed. Gill sike, mentioned lower down, is the name of an old drain in the Holland Fen; and *slake* is, probably, an accumulation of stagnant mud. In a Commission of Sewers, 1616—17, slake is more than once referred to as a stoppage of the water (Wells' 'Bedford Level,' vol. ii. p. 47, &c.). As to the meaning of "crowning of jacks," I cannot venture a suggestion, beyond that it was most likely some method of capturing Pike.

The above is a most interesting catalogue of the numerous out-door occupations of a Fen-man, and of the modes and engines formerly used in fishing and fowling. It is impossible here even to enumerate, much more to describe in detail the various forms of nets and snares employed at the time Hall wrote, or the ingenious resources made use of for approaching fowl, as well as the multifarious nets and devices for capturing the fish which so abounded; but much interesting information with regard to fowling and bird-netting in the Fens and on the shores of the Wash will be found in Mr. Stevenson's 'Birds of Norfolk' (vol. ii. p. 111, *et seq.*,) and in the late Mr. Dawson Rowley's 'Ornithological Miscellany' for July, 1877 (part 10, pp. 354—373); also in Folkard's 'The Wildfowler' (third edition), chapters ii. and iii. Of his winter occupation Hall says nothing; but, doubtless, reed-cutting occupied much of his time; his domestic Geese also required his attention, and these, with the Duck decoy, would provide ample employment for the shortened days. During frosty weather, constant attention was required at night, after the decoy had "risen," to break and remove the ice, thus keeping the water open as an attraction for the Ducks, without which they would desert the decoy in hard weather. Subsequently Hall set up as a cow-keeper, and ended his days as a dealer in second-hand books at Lynn, his 'Antiquarian Library' being situated near the "Globe Hotel," in a street leading from the Tuesday Market-place to Common Staithe Quay.

Until of late years Goose-keeping formed one of the great industries of the Fens, and found employment for a race of aquatic shepherds known as "Gozzards" or Gooseherds. These men bred the Geese in the Fens, and, as the shepherds of the land have their sheep-shearing, so had they their goose-plucking; the one flock yielding wool, the other feathers. This cruel process was performed four or five times a year. Pennant says they were plucked five times in the year, the first plucking at Lady-day being for both body and wing feathers, the remaining four for body feathers only. Even goslings of six weeks old were not spared, their tails were plucked "to habituate them early to what they were to come to." It was also believed that early plucking tended to increase the succeeding growth of feathers. Of course it was asserted that the operation was painless; but all authorities agree that in cold weather

many of the denuded fowls perished. In Lord Orford's 'Voyage round the Fens' (1774),* the writer mentions that, in passing over Deeping Common, in driving from Peterborough to Spalding, he passed large flocks of Geese which had recently been subjected to the inhuman custom of plucking for their down, and that their feathers were mostly bloody, and many were found dead near the road in consequence of this operation. The Geese were collected at the proper season; and, after being fattened, were driven in vast flocks to the London market. Carts accompanied the flocks to pick up the "lame Geese," but upon the whole they did their daily march of ten miles in as many hours fairly well. Geese which had

* This is a most disappointing book from a Naturalist's point of view. I first became acquainted with it from a manuscript copy in the possession of Mr. Anthony Hamond of Westacre, but have since seen a printed copy entitled 'A Voyage round the Fens,' and published by Edwin White, French-gate, Doncaster (107 pp.), no date, but the introduction by J. W. Childers bears date Cantley, July, 1868. The voyage was undertaken by George, third Earl of Orford, who is chiefly noteworthy from his having sold the fine collection of pictures made by his grandfather, the Prime Minister, Sir Robert Walpole, at Houghton Hall, to the Empress of Russia, with the fate of which we are all acquainted. Lord Orford, commanding a fleet of yachts, consisting of "four sail of the line," three "tenders," one "Bumkitch," and one "victualler," left Lakenheath on 17th July, 1774, and, sailing through Lakenheath New Lode ("Straits of Martin"), entered the Little Ouse, thence on to Denver Sluice, through Salter's Lode Dyke, and along the new Podike (?), by Nordelph, Outwell, and Upwell, to March. Then along the old Nene to Palmer's Bridge ("Whore's Nest"), five miles past Ramsey Mere. Two miles farther on they entered Whittlesea Dyke, and, passing through the Mere and Fasset's Sluice, the entrance to the old Nene river was reached; thence by Fasset's Bridge and Horsey Bridge they passed to Peterborough, and by Stanground Sluice into Morton's Leam back to Whittlesea and Trundle Meres, and, "through a very narrow channel enclosed with remarkably high weeds," returned to Ramsey Mere. Thence back again by March, &c., to "High Bridge, Straits of Martin," from whence they started, arriving on the 6th August, after a twenty-one days' cruise. There are three separate accounts of the voyage, first, by Mr. Thomas Roberts, volunteer on board the fleet; second, by George Farrington, volunteer on board the fleet; and, third, "The Admiral's Journal of the Voyage round the Fens," by Lord Orford. As I have said, the amount of Natural History is singularly small; there are some remarks on the appearance and manners of the inhabitants, more particularly of "the sex." The chief interest of the voyage is topographical, the yachts having sailed through channels now closed, and across meres now under cultivation,—a course never to be repeated.

been frequently plucked, and old Ganders, were known as "Cagmags," and had the reputation of being exceedingly tough and dry,—a reputation which was probably well deserved, more especially if they had attained to anything like the natural limit of their existence, which is said to extend to a hundred years. A large flock of Geese filling the road is really a very pretty sight; but in the present day it is rarely seen;* the greatly diminished quantities of Geese now reared in Fen-land (owing to the inclosure of common land and the decreased demand for quills and feathers) being sent to market ready dressed; a few are still sent alive, but they travel by rail in crates. In the sketch of "Fen Bill Hall" already quoted, the writer gives his experiences as a "Gozzard," and mentions that his flock of brood Geese alone required three coombs (twelve bushels) of corn for their daily consumption. In the year 1774 a very wet harvest was experienced, and he tells us: "I had previously given from £6 to £8 per last (twenty-one coombs) for Goose corn; that winter I bought for £3. I had just so many brood Geese as took three coombs of oats per day for their maintenance" (part 2, p. 9). Another authority, quoted in Rowley's 'Miscellany,' says that one thousand fatting Geese will consume five twelve-stone sacks of oats per night.

Whilst rushing rapidly through the once impenetrable Fens, comfortably reclining in a luxuriously-appointed railway-train, it is difficult for the traveller to conceive of the obstacles which rendered locomotion all but impossible in days gone by. Even in summer, the soil was too soft to allow wheeled carriages to pass over it; but when rendered spongy and boggy by rain or flood, it must—except in the few elevated spots which occurred, with vast interspaces of bog between them—have been altogether impassable. So long as the country was covered with a sheet of water, communication with the "islands" was easy enough, by means of the light boats used by the natives; but when, in winter, ice formed thick enough to prevent the passage of boats, but not sufficiently strong to bear the

* Flocks are occasionally seen passing through the streets of Norwich to a depôt, at which some five thousand are annually fatted by Mr. Bagshaw; but they are Dutch birds, just off a long voyage by sea and rail, and sadly draggled in appearance, presenting a great contrast to the vast flocks of clean smooth-plumaged birds the writer remembers to have seen in the streets of Spalding many years ago.

weight of a man, then, indeed, the inhabitants must have had a hard time of it. We have already seen King Canute at his wits'-end under such circumstances, when the lusty Brithmer came to his assistance, and piloted him across the Fen; but once let the ice be sufficiently solid to bear his weight, and the Fen-man, fastening on his skates, was as free as the birds of the air, and almost as rapid in his motions. Nor have his descendants of the present day suffered the art to fall into decay, the Fens of Cambridgeshire being noted for producing some of the fastest skaters in England. In the charming little novel by C. MacFarlane, entitled the 'Camp of Refuge,' before referred to, the men of Holland are represented as coming, trooping across the Fens, to join Hereward, mounted on stilts, and by way of expressing their devotion to the victorious Lord of Brunn, and their confidence in him as a leader—like desperate invaders, who are determined to conquer or to die, and burn their ships to cut off any chance of retreat—so these amphibious men cast away the stilts which formed their only means of locomotion. In the song already quoted,* the "stilt-makers" are enumerated amongst those who would suffer disaster from the draining of the Fens; and, whilst regretting that the prediction should have proved only too true, and that this graceful mode of getting across country should have degenerated into the familiar "jumping-pole," we have still cause for congratulation that in skating, at least, the Fen-men have not lost their cunning.

After the drainage of the Fens, several large sheets of water, called "Meres" were left. Of these the principal were, Soham, Ramsey, Trundle, Ugg, and Whittlesea Meres, and the numerous pieces of water in the East and West Fens: these are now all drained. Whittlesea Mere, the most extensive, was drained in 1851 and 1852; and, by this means, some three thousand acres of land were brought into cultivation; and now rich crops of golden corn are produced, where, thirty years ago, the harvest was restricted to the wild-fowler, the fisherman, and the reed-cutter.†

* *Antea* p. 616.

† For a very interesting account of the draining of Whittlesea Mere, as well as much information in Fen matters, see two articles, entitled "Fen and Mere," by Cuthbert Bede, in 'Leisure Hour' for 1877 (pp. 296 and 331, and note at p. 607 of the same volume).

Very little now remains of the old Fen by which an idea can be formed of its former appearance, and it is only when in a state of flood that one of its aspects can be fully realized. Nothing can be more dreary and depressing than crossing the dead level of black sodden soil in winter or early spring; but in summer or early autumn, when the fields are one blaze of brilliant yellow from the blossoming Mustard and Cole-seed, and the deep rich green of the Mangolds and Turnips, or the sombre patches of Beans are lighted up by fields of ripening corn, glowing like richest gold, the whole canopied by a lofty sky of almost Italian depth of colour, then it must be admitted the prospect is one of great beauty, and the wealth of colour extending as far as the eye can penetrate, before blending with the blue distance, closes in a landscape such as only the "golden plain" can present. But if (in the words of Kingsley),* "they have a beauty of their own, these great Fens even now when they are dyked and drained, tilled and fenced, a beauty as of the sea, of boundless expanse and freedom. Much more had they that beauty eight hundred years ago, when they were still, for the most part, as God had made them, or rather was making them even then." Very beautiful is the whole passage, but too long to quote.

Far away in the old Fen stretched the boundless levels of stately Reeds bending their purpled crowns to the passing breeze, ever and anon revealing brief glances of the silver waters beyond—or, the rolling sea of sedge, flecked by the shadows of the passing clouds, spread out like the sands of the shore. Here the green turf was decked with the brightness of a thousand flowers, and the air,—heavy with the fragrance of the stately Meadow-sweet,—was gay with the beauteous forms of the lovely Butterflies, which flitted from flower to flower; the voices of the numerous water-fowl, swimming in and out amongst the Reeds, adding the charm of life to a scene almost perfect in its beauty; whilst over all floated a drowsy hum, far off, and indistinct:

> "And the wavy swell of the soughing Reeds,
> And the wave-worn horns of the echoing bank,
> And the silvery Marsh-flowers that throng
> The desolate creeks and pools among,
> Were flooded over with eddying song."

* 'Hereward the Wake,' vol. i. pp. 16—18.

VII.

ON RECENT ADDITIONS TO THE FAUNA AND FLORA OF THE CROMER FOREST-BED.

By Clement Reid, F.G.S.

Read 26th February, 1884.

Some additions have been made to the list of fossils from the Cromer Forest-bed since the Memoir was published;* but, as the cliff sections have lately been very obscure, my two visits during the past year have only yielded a few fresh forms. From the Mundesley Unio-bed I obtained the following unrecorded Plants and Entomostraca.

Plants.

(Determined by James Britten, F.L.S.)

Bidens tripartita.
Euphorbia?

Entomostraca.

(Determined by G. S. Brady, M.D., F.R.S.)

Cypris ovum, Jurine.
Cypris gibba, Ramdohr.
Cyrinopsis obesa, B. and R.
Candona candida, Müller.
Candona lactea, Baird.
Darwinella stevensoni, B. and R.

Apparently this is the first occurrence of the genus *Darwinella* in a fossil state. It is at present confined to a few British localities, and Belgium, and has also been found in a sub-fossil state in the bed of Whittlesea Mere.

* See 'Geology of the Country around Cromer,' pp. 62—80.

The following species of Mammals can also be added :—

Cervus tetraceros, Mackie* (Bravard MS.).

This was determined by Professor Boyd Dawkins† from a specimen found by me in the estuarine Forest-bed at East Runton. The species, though new to England, was already known from the Pliocene Beds of Peyrolles, in the Puy de Dôme.

Ovibos moschatus, Blainv.

Determined by Professor Boyd Dawkins from a specimen in the possession of Mr. A. F. Buxton, believed to have been found at Trimingham. Through the kindness of Mr. Buxton, I have had an opportunity of examining the skull, and feel no doubt that it is a genuine Forest-bed specimen. It is certainly not dredged, for the angles are unworn; there are no marine organisms on it, and the loose sand inside is not sea-sand. Under the microscope the sandy matrix is exactly like the coarse quartz-sand of the Forest-bed, and not like the sand of the Glacial deposits or shore. A quartzite pebble impacted in a cavity also agrees with the peculiar pebbles found in the Forest-bed.

Hyæna crocuta, Zimm., var. spelæa, Goldf.

Determined by Mr. E. T. Newton from a specimen found at Kessingland,‡ and subsequently from another obtained by Mr. A. C. Savin in the estuarine Forest-bed at Overstrand.

* 'Geologist' (vol. iv. 1861, p. 465), and re-described by Professor Boyd Dawkins, in Quart. Journ. Geol. Soc. vol. xxix. p. 575.

† Quart. Journ. Geol. Soc. vol. xxxiii. p. 416.

‡ Geol. Mag. dec. ii. vol. x. p. 404.

VIII.

PLANTS NEW TO NORFOLK, WITH NOTES ON OTHER SPECIES.

By Arthur Bennett, F.L.S.

Read 26th February, 1884.

The year 1883 did not pass without the County Flora being added to; and when I say that two species were so added, and both these also additional British plants, it shows that the careful investigation of its broads and coasts will repay examination, for there are still several other West European plants that may well be expected in East Anglia, both from the distributive and climatal point of view.

If there are any of our members who would undertake this search, I shall be pleased to give the names, probable dates, and most likely places to search in, or any other information I am able to afford.

The first to be named is

Ononis repens, Lin., var. horrida, Lange. For the last three or four years I have known that the Ononis of the coast sand-hills represented a plant not mentioned in our Floras; but the want of access to authentic specimens of Dumortier's *maritima*, and the verdict of M. Crepin, of Brussels (to whom I sent specimens) that "Dumortier's plant, so named, was unarmed," made me hesitate what to call it, until I came across the description of *O. repens*, var. *horrida*, Lange, in Wilkholm's and Lange's 'Prod. Flor. Hispanicæ.' With this my specimens seemed to agree so well, that, to make sure, I sent some to Professor Lange, of Copenhagen. His reply was very satisfactory. It was: "The specimens you kindly send of Ononis are exactly what I do mean by *O. repens*, var. *horrida*." He also kindly sent me a paper on it, published in the Copenhagen 'Oversigt d. k. D. Vidensk. Selsh. Forhandl.' for 1873. There I find this var. *horrida* was (then) only known from Spain, all the others being the type "var. *inermis*, Lange." Dumortier's *maritima*

he identifies with this type, and says that Ray and Dillenius record the type from "Yarmouth, Deal, and Cornwall." I have not found this, as yet, at Yarmouth; as, although the young ones are unarmed, all have spines by the third year's growth.

Last-year specimens of the Cornish Ononis were sent to the Exchange Club, and when I saw them I at once identified them as Lange's *inermis*. Probably the Lowestoft Denes Ononis belongs to one of these forms; but I have only seen a scrap, sent me by a lady at Reigate, Surrey, too immature to safely determine.

Lathyrus palustris, Lin. As the Rev. E. F. Linton has observed, it will be well to note the present existence of this rare, and, I fear, decreasing species.

Potter Heigham, July, 1883. Arthur Bennett.

Near Acle, with *Peucedanum palustre*. July, 1883. A. B.

Callitriche obtusangula, Le Gall. Ormsby. Mr. H. G. Glasspoole. An addition of a sub-species to the Flora.

Senecio palustris, Lin. I am glad to say that not only is this plant still existent, but "holding its own." Last July, accompanied by Mr. and Mrs. F. Hanbury, I had the pleasure of pointing out five specimens in flower, and about twenty not flowering, near Filby.

About nine miles from this station it also occurs, and again on the Suffolk border.

Cuscuta Epilinum, Weihe. I have specimens gathered at Welney, in 1853, by Mr. E. T. Bennett; an additional locality to those given by the Rev. Kirby Trimmer.

Sturmia Loeselii, Reich. Still grows at Roydon. In great abundance in a Fen in Mr. Geldart's district "E." Messrs. Hanbury and Holmes, July, 1883. For obvious reasons, the locality is not given nearer.

Potamogeton plantagineus, Du Croz. Sparingly in a ditch between Acle and Halvergate. Arthur Bennett, July, 1883. A rare plant in Norfolk.

Potamogeton (mucronatus, auct.) friesii, Rup. Acle, in great abundance. Messrs. Hanbury and Bennett, July, 1883.

It may be interesting to note that I found a specimen of this in the Herbarium of the Rev. Hugh Davies, author of 'Welsh Botanology,' labelled "Yarmouth, 1800. D. Turner."

Najas marina, Lin., p. p. Hickling Broad, and extending into Heigham Sounds in fair quantity. 21st July, 1883. M. and

A. Bennett. A plant, not only new to Norfolk, but to Great Britain, which one of my daughters and myself—my daughter being the actual discoverer—had the pleasure of finding last July. It was growing in from four to ten feet of water, accompanied by *Chara stelligera*, *polyacantha*, *aspera*, &c.

It is widely distributed in Europe, occurring in Scandinavia to France, and Belgium to Russia, also in Asia; more sparingly in Africa, America, and Australasia.

It is an interesting addition to our Flora, because it is not a critical species, and there can be no question of its being indigenous.

Carex trinervis, Degland. Another addition to Norfolk, and also to Great Britain, yet one that might well have been expected; indeed, M. Crepin, in his interesting 'Notes sur quelques plantes rares, ou critiques de la Belgique,' expresses his surprise it had not been found on the English coasts. Its history may be told in a few words. Last December, accompanied by Mr. W. W. Reeves, I was spending an evening with Mr. H. G. Glasspoole (whom many of you know well), and looking over his duplicates, when I saw, among other *Carices*, four specimens of a *Carex* which I felt sure was *trinervis*, Deg. But they were young; and I sent one of the smaller specimens to M. Lloyd, of Nantes. His reply was: "I believe your specimen is *trinervis*, but it would be well to get more developed specimens." Since then I have carefully examined the largest specimen (kindly given me by Mr. Glasspoole), and compared it with the beautiful plates in Boott's 'Illustrations of the genus *Carex*,' and with a series of specimens from the West of France, and I have no doubt it is the plant of Degland.

Dr. Boott remarks: "Drejer (in his Symbolæ), allies this species to *C. glauca* and *C. hispida*; the affinity, I think, is with the last." Most authors rank it near *C. vulgaris*, or *C. acuta*. Other names for it are *C. frisica*, Koch, and *C. acuta*, var. *nervosa*, C. A. Meyer. It is strictly a West European plant, occurring on the sand-dunes of the coast of Schleswig, the East and West Friesian Islands, Holland, Belgium, West of France, and, rarely, in Portugal.

Mr. Glasspoole's specimens were gathered either in 1869 or 1870, but he does not recollect the exact locality; however, where it does occur, it usually grows in abundance, and he hopes to refind it this year (1884).

Carex extensa, Good. Still grows at Cley. July, 1883.

Mr. F. Hanbury. I have specimens gathered by Mr. G. Fitt in 1843, and by Mr. Priest in 1844, at Caistor, both of which I owe to the kindness of Mr. Glasspoole.

Sclerochloa procumbens. Near the Fish Wharf, Yarmouth, 1877. A. Bennett.

Banks of the Bure, near Yarmouth, with *S. distans*, 1883. A. Bennett.

Only one locality is given by the Rev. K. Trimmer in his Flora, *i.e.* "The Meals, Stiffkey."

Chara aspera, Willd. In profusion at Hickling Broad, covering acres of the bottom, to the exclusion of almost all other aquatic vegetation. I believe this to be the Poehard Grass mentioned by Mr. Southwell in the second edition of Lubbock's 'Fauna of Norfolk.'

Somerton Broad, 1883. H. Groves.

Chara polyacantha, A. Br. Sparingly at Aele, 1883. A. Bennett.

Sparingly at Hickling Broad and Heigham Sounds.

Somerton Broad. Messrs. Hanbury and Holmes, 1883.

Both the two last additional species for this County.

Chara hispida, Lin.
Chara foetida, A. Br.
Nitella opaca, Ag.
} Acle, 1883. A. Bennett.

Chara Stelligera, Bauer. A third station for this species can now be recorded,—Somerton Broad,—"where it is plentiful on one side of the broad." July, 1883. Messrs. Hanbury and Holmes.

Norfolk is still the only county in which this plant has been gathered, but I should quite expect it in Suffolk.

Frankenia lævis. Is still abundant at Cley. July, 1883. Mr. and Mrs. F. Hanbury.

Not as occurring in Norfolk, but because so interesting a 'find,' I would name *Corynephorus canescens*, P. de B. 'On the sandy warren near Lakenheath, Suffolk,' July, 1883. Messrs. King and Druce. A (present) inland station for a sand-dune species, and another link in the chain of evidence for the 'Breek lands.' It should be looked for between Thetford and Brandon, on the Norfolk side.

IX.

EARTHQUAKES AND SUBSIDENCES IN NORFOLK.

By Horace B. Woodward, F.G.S.

(Of the Geological Survey of England).

Read 25th March, 1884.

In the peaceful agricultural county of Norfolk our thoughts are not often directed to those grand and awful workings of Nature, elsewhere too well known in the form of volcanoes. Happily for us, and for mankind in general, the districts ravaged by volcanic action have remained very much the same during historic times. Nevertheless here and there the associated phenomena of earthquakes have unexpectedly and painfully aroused attention to the instability of the earth's crust, and led to the uncomfortable feeling that home on *terra firma* (in certain situations at any rate) may be no more secure than life on the ocean wave.

A study of the geological history of England clearly proves that our country has during several epochs in the past been affected by great volcanic eruptions. The fiery records are preserved more particularly in the hilly country that lies to the north and west; and they are to be deciphered from the old lava-flows and ash-beds, and the altering or metamorphism of neighbouring strata.

Long ages have elapsed since the last of these eruptions, but even in our own county some of the relics have been handed down to us. An old writer remarked, on account of the variety of its soils, that "all England may be carved out of Norfolk," and to a certain extent this has really taken place. For the boulder clays and gravels, so well shown in the cliff sections east of Weybourn, and scattered over the length and breadth of the county, contain fragments from nearly every British rock-formation. And among these we find boulders of granite, gneiss, mica-schist, basalt, and greenstone, that tell the tale of volcanic action in the distant past when their parent rocks were formed, altered, or erupted.*

* Some of the igneous and metamorphic rocks are probably of Scandinavian origin.

Earthquakes are, however, occasionally felt in England, even in Norfolk, and then we read of persons alarmed, or slumberers disturbed by the violent rattling of window-frames and pictures, the clatter of jugs and basins, the opening of doors, and the ringing of bells; while much serious damage may be done to old and decayed buildings.

Similar manifestations of disturbance are sometimes afforded to those who reside near a railway, or in a road along which much heavy traffic passes. The vibration of the house is felt, and this shaking due to the passage of heavy bodies on the earth's surface, is naturally not very unlike that which would be caused by the passage of the equivalent to a heavy body acting on the earth's crust from beneath.

Earthquakes are due to internal pressure, which acts either in a wave-like form, commencing feebly in one place, attaining a maximum force further on, and finally dying away, as if the energy were exhausted; or again, the pressure acts on a centre, the force dying away in ripples in continually widening circles.

Such earthquake waves are of a very varied nature. Those which make themselves known to us are no doubt, and fortunately so, of a comparatively mild form; but others are often sufficiently violent to rupture the earth's surface; and if they undulate beneath the sea-bottom, the waters are violently agitated, and may cause much destruction of life and property when the waves are forced over the land.

These phenomena are indeed catastrophic, and although this term has been much abused, there is a tendency now-a-days to admit, that while uniformity has prevailed in the laws regulating life and matter, yet catastrophic effects are ever and anon produced by agents governed by these same laws. Thus, as the Rev. O. Fisher has pointed out, any pressure affecting the earth's crust might accumulate enormously before the crust yielded, but when ruptured a sudden movement might take place.*

While earthquakes accompany and often precede volcanic eruptions, so they sometimes cease to occur when the outburst takes place; but it is remarkable that they are felt in our own country, and in other lands far away from active volcanoes. Hence, if due

* Quart. Journ. Geol. Soc. vol. xvii. p. 4.

to similar causes, the subterranean forces must in these instances exhaust themselves in producing the earthquakes without giving rise to volcanic eruption. Professor Judd remarks that "there can be no doubt that in the great majority of instances the forces originating earthquake vibrations and volcanic outbursts are the same, and independent lines of reasoning have conducted us to the conclusion that these forces operate at very moderate distances from the earth's surface."* The distances he mentions are from seven or eight to thirty miles.

While several distinct causes may help to originate volcanic action, the actual eruption is now mainly attributed to the escape of imprisoned watery vapour and gases. Still we have yet much to learn on this subject, for Professor A. H. Green says: "What it is that starts the wave we do not exactly know. But earthquakes always precede great volcanic eruptions, and in their case may be reasonably supposed to be produced by the jar occasioned when imprisoned steam rends asunder a rocky barrier that has held it in. It is therefore not unlikely that some similar action originates all earthquakes."†

Some earthquakes, however, may be simply due to shrinkage and fracture of the earth's crust, and of such disturbances we have abundant evidence in the joints, faults, and contortions seen in our rocks in many places, as on the Devonshire coast near Torquay and Clovelly; but not in Norfolk, for there the contortions in the Drift are due to glacial action.

The oxidation of metallic substances in the interior of the earth is also admitted to be a likely source of local disturbance.

The following is a list of all the earthquakes affecting Norfolk of which I have been able to obtain a record, the principal authorities being given below, or cited with the record:—

Principal Authorities.

Rev. Francis Blomefield. 'An Essay towards a Topographical History of the County of Norfolk.' 5 vols. (vols. 3 to 5 by the Rev. C. Parkin). Folio. Fersfield and Lynn.

R. Mallet. 'The Earthquake Catalogue of the British Association, 1852—1858.' Reprinted 1858.

* 'Volcanoes' (1881), p. 344.

† 'Physical Geology' (1882), p. 387.

1165. *January* 26. A great earthquake here,* and all over Norfolk, Suffolk, and Cambridgeshire, so that many could not keep themselves on their feet, and the bells rang in several steeples with the shock of it (Blomefield ; Mallet, p. 27).

1199. *May* 22. A great one in Somersetshire and Norfolk (Prestwich, Geol. Mag. vol. vii. p. 541). This is apparently the same as that mentioned by Mr. Mallet as occurring in 1201 : "Persons were thrown from their feet."

1382. Earthquake felt in Norfolk (Gunn, Proc. Arch. Inst., Norwich, 1847, p. xvi.).

1480. *December* 28. A very great earthquake in Norwich and Norfolk, and almost all over England, by which many buildings were shaken down, and much damage done in many places (Blomefield).

1487. An earthquake felt here on St. Thomas's day (Blomefield).

1580. *Wednesday* in *Easter* week. "Being all over the city, and every body surprised with the shaking of their houses, beds, and furniture, it was soon perceived to be a shock of an earthquake" (Blomefield). This may be the same as the earthquake recorded by Mr. Mallet as occurring at 6 p.m. on April 6th ; it was felt in Northern Europe, and was very violent in England ('Report,' p. 62).

1601. This year, on *Christmas* Day, at noon, another shock of an earthquake was felt here (Blomefield). Mr. Mallet mentions that an earthquake was felt in London on December 24th of this year ('Report,' p. 66).

1692. *September* 8. An earthquake was perceived at *Norwich*, and in that neighbourhood, but not much (Blomefield).

1705. *November* 11. In England, extending from Leeds to Bristol and from Norwich to Liverpool. Vibrating from S.W. to N.E. The wind had been S.W., and afterwards changed to N.W., followed by rain and suffocating heat. The motion of the earth was accompanied by a subterranean rolling noise (Phil. Trans. 1796, p. 353 ; Mallet, p. 34).

1757. *January* 10. "On Monday last [January 10th], between 2 and 3 in the morning, we had a slight shock of an earthquake, preceded by a rumbling noise in the air . . . . It was likewise felt in Yarmouth, Diss, South Walsham, Loddon, Easton, Sprowston, &c., at the same moment of time. The direction was from east to west" ('Norwich Mercury,' 15th January, 1757). Blomefield, who says that "Fish died in ponds by sudden withdrawal of water," incorrectly gives the date as 1756.

* Blomefield's records refer to Norwich.

Judging from Mr. Mallet's Record, most of the earthquake shocks here noted were not felt beyond the British Isles, and some were very local. And it is strange that the great earthquake of Lisbon (Nov. 1st, 1755) does not appear to have produced much effect in this country, for Mr. Mallet observes (p. 168) that "in the British Isles actually sensible shocks were felt in but few places."

Connected with this subject of earthquakes and volcanoes is that of the upheaval or depression of the land to which I have alluded on a former occasion.* This upheaval is evident enough when we contemplate the Norwich Crag, the Chalk, or any other deposit that must have been accumulated beneath the sea.

In treating of the causes of these changes of level, Lyell, in his latest work, spoke vaguely, for he says :—

"Whether we ascribe these changes to the expansion of solid matter exposed to hydrothermal action, or to the melting of rock, or to the solidification of mineral masses, in whatever conjectures we indulge, we cannot doubt that, at some unknown depths the structure of the crust of our globe is gradually undergoing very important modifications."†

Thus we have the change of material from one place to another, as in a volcanic eruption, and the filling in of cavities from which material had been ejected, by subsidence of the ground. Only in very recent years have the effects of deposition and denudation been taken into account. The subject has been dealt with by the Rev. O. Fisher, who concludes that the earth's crust is about twenty-five miles in thickness, and that it must be in a condition of approximate hydrostatical equilibrium, so that any considerable addition of load will cause any region to sink, or any considerable amount denuded off an area will cause it to rise.‡ These views coincide with those expressed on earth tremors, minute vibrations which appear to be influenced by barometric pressure.

Subsidences of land in small tracts of ground are produced in several ways, both naturally and artificially.

Naturally, they occur through the dissolution of Limestone

* 'Scenery of Norfolk,' Trans. Norfolk and Norwich Nat. Soc. *antea*, p. 439.

† 'Principles of Geology,' edit. xi. vol. ii. p. 197.

‡ 'Physics of the Earth's Crust,' p. 275.

rocks by acidulated water, or of rock-salt by springs carrying away the brine. Owing to the former cause, falls have taken place in several parts of Norfolk, as at Horsford,* where the Chalk has been eroded in pipes or hollows, into which the superincumbent strata "cave in," or tumble. Mr. A. W. Morant has pointed out, that, when the sewage of Norwich was conveyed on to the farm at Whitlingham, the land upon which it was discharged was soon covered with circular holes, usually from three to five feet in diameter, and of various depths; and on one occasion the ground suddenly subsided for a space of twenty-one feet in diameter, and to a depth of twelve feet. These were evidently due to the "sand-galls" in the Chalk, and to the washing in of material by the excess of water.†

Heavy rains or earthquakes may promote these falls, just as either may promote landslips. The great landslip which took place at Lyme Regis on Christmas Day, 1839, created much consternation in the neighbourhood. Volcanoes and earthquakes were assigned as the cause, and one individual wrote "A brief account of the Earthquake," which was published in London, to show that the phenomenon was prophesied in the Revelations.

In September, 1275, the body of the church on Glastonbury Tor was thrown down by an "earthquake,"—the tower alone remained, and it is there still. I have wondered whether the foundations of the church were partially undermined by springs carrying away portions of the Oolitic sands on which the church was built. This might readily have taken place through the springs which issue at the base of the sands where they rest on the Lias. It is difficult to understand how an earthquake shock could throw down the nave of the church without upsetting the steeple.

At Mannington and Briston in Norfolk, small subsidences of the land have been recorded; and I was informed that Mannington Mere arose from a subsidence that took place in 1704. In the same neighbourhood two sinkings occurred in 1718; one had a diameter of eighteen feet and a depth of nine feet, and another a diameter of thirty-three feet and a depth of nearly twelve feet. These happened in a tract of ground where Glacial Sands

* Arderon, Phil. Trans. vol. xliii. p. 527.

† 'Engineer,' vol. li. p. 123.

rest on Glacial Marl. And the sinkings were attributed by Mr. P. Le Neve, who described them, to springs carrying away quicksand.*

At Briston, in 1788, two holes were formed by subsidence, in a similar tract of ground; one was sixty feet in diameter with a depth of twenty-seven feet, and the other was ninety feet in circumference.† These sinkings, as well as those at Mannington, may have been partly aided by dissolution of the Chalk beneath the Glacial Drift; but the explanation given by Mr. Le Neve is well worth consideration, and it accords with some suggestions I made on the lowering of the level of a country by subterranean denudation in my paper on the 'Scenery of Norfolk.'

Artificially, subsidences have been produced by mining excavations, and they have sometimes occurred at Norwich and other parts of Norfolk by the breaking in of the roof of an old gallery driven into the Chalk.

One might conclude that it is unwise to build one's house on a calcareous rock, or on a porous soil overlying it. On the contrary, sand is considered an excellent foundation, when it occupies some extent of ground, maintains a thickness of about ten feet, and is itself based on a firm foundation; for it accommodates itself to a weight, and is not so yielding as clay.

P.S.—Strange to say, since this paper was communicated to the Society, we have been disturbed by an earthquake, which manifested unusual energy, and must rank as one of the most serious on record in this country. Originating at Colchester, it extended as far as Norfolk, having been felt in a feeble form at Lynn, Fakenham, Norwich, Diss, and Yarmouth. I hope to contribute some particulars of this earthquake at a future meeting of the Society.—H. B. W.

* Phil. Trans. vol. xxx. p. 766.

† Gentleman's Mag. vol. lviii. p. 649.

X.

NOTES ON THE HERRING FISHERY OF 1883.

By Thomas Southwell, F.Z.S.

Read 25th March, 1884.

The history of the Herring Fishery for the past season, unlike the chequered voyage of last year, has been one continued success. Commencing at Lowestoft early in March, the takes were very fair and the prices equally good. In April, 1523 lasts were taken, which sold as high as £15 or £16 per last (13,200 fish). One owner is said to have cleared £1220 in ten weeks. In April the fishery still continued good, and, in addition, some very large catches of Mackerel were made, one boat having landed from a single voyage sufficient to realize £300. The total catch for what may be termed the spring voyage, amounted to 2718 lasts for Lowestoft and 343 lasts for Yarmouth, where the spring fishing is not prosecuted to any extent. As to the quality of these spring Herring there cannot be two opinions, and, except that they are useful for bait, it is much to be regretted that the fishery from Lowestoft appears to be on the increase.

During the months of June and July 46 lasts were landed at Yarmouth, and in August 915 lasts, but during the same three months, only 92 lasts were brought into Lowestoft.

The autumn voyage may be said to commence in September, and again the weather was propitious and the deliveries good, nearly equalling the totals of 1882, which for September and October were unprecedentedly large. In the first week in October 2583 lasts were delivered at the Yarmouth wharf in six days; and on the 29th, 700 lasts were delivered at Yarmouth, and between 300 and 400 lasts at Lowestoft in one day; but in November the quantities of fish taken at both ports were even greater. For the week ending Wednesday, November 14th, 730 boats landed at Yarmouth 2479 lasts of fish, some of the boats bringing in as many as 10 to 19 lasts, and it is said that already single boats had realized from £1000 to £2000. Saturday, November 17th, was a red-letter day for the Herring boats. Both the old and new markets at Lowestoft were insufficient to admit the landing of all the fish simultaneously; and it is said that 1400 lasts were landed in that

day's delivery, selling at an average of £10 per last. At Yarmouth the deliveries were on the same scale. Boats were coming in all the day heavily loaded, their gunwales nearly level with the water; and others reported that, so great was the number of Herrings in their nets that it was impossible to get all of them in, and part of the nets, had to be cut away. This continued, with one brief interval of bad weather (on the 19th), till the end of the month, the result being, that at Yarmouth 9441 lasts were landed, and at Lowestoft 5049. The heavy weather, which commenced early in December, brought to an end one of the best seasons for both owners and fishermen which has been known for many years, and with comparatively very little loss of life and property.

The great success of the season's fishery, it will be seen, was due to the enormous takes of November.

The importance of the Herring Fishery, from a commercial point of view, to the Eastern Counties, will be better seen by the following figures. The total catch for the year, for the ports of Yarmouth and Lowestoft, was 30,335 lasts, equal to 400,422,000 fish, which, at the moderate estimate of £15 per last, represent a money value of £455,025. Each last is estimated to weigh 25 cwt. The quantity of wholesome food thus contributed by the bountiful ocean in this one species of fish alone amounted to 37,919 tons.

For the following returns I am again indebted to Mr. H. Teasdel, Jun., Corporation Accountant at Yarmouth, and Captain Massingham, Harbour-master of Lowestoft.

RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1883.

		Yarmouth.			Lowestoft.		
		Lasts (13,200).	Thousands (1320).	Hundreds (132).	Lasts (13,200).	Thousands (1320).	Hundreds (132).
	January	—	—	—	—	—	—
	February	—	—	—	—	—	8
Spring	March	57	9	2	405	—	2
	April	238	3	3	1523	4	4
	May	47	5	6	790	—	3
	June	11	8	3	21	8	8
Summer	July	34	9	—	1	11	7
	August	915	5	7	69	5	1
	September	2192	9	3	83	4	—
	October	5815	2	7	2282	—	9
Autumn	November	9441	1	3	5049	8	1
	December	919	9	7	433	5	1
		19,675	4	1	10,660	9	4

XI.

METEOROLOGICAL NOTES, 1883.

By A. W. Preston.

Read 25th March, 1884.

January.

The thermometer, on the first day of 1883, stood at 55 degrees, a height which was not again attained until April 1st. The weather, until the 24th, was variable, but mild and open, and with a considerable rainfall. On the 24th it became colder, and snowstorms occurred on that evening, and on the morning of the 27th. Mildness, however, again set in, and continued to the end of the month. The barometer which, on the 23rd, stood at 30.56, by the morning of the 26th fell to 20.10, and these readings were the extremes of the month. The highest temperature recorded was 55 degrees on the 1st, and the lowest 29 degrees on the 23rd, the mean of the month being 39.1. Frosts occurred on nine nights only. The wind was chiefly from the south and west; and the rainfall 2.30 in. Rain fell on eighteen days; the heaviest fall on one day being, on the 24th, 0.51 in.

February.

The first fifteen days of this month were characterized by continued mildness and excessive rainfall, no less than 2.25 in. of rain falling during that period. The remainder of the month was dry, warm, and sunny, and of a character rarely to be met with so early in the year. No remarkably high readings of the thermometer were registered, but the unusual amount of bright sunshine and absence of rain rendered the second half of this month a pleasing contrast to the first. The highest reading of the barometer was on the 23rd (30.68), and the lowest on the 2nd (29.08).

The barometer oscillated much throughout the month. The thermometer was highest on the 28th (54 degrees), and lowest on the 16th (32 degrees); the last named being the only occasion throughout the month that the temperature fell as low as the freezing point. The mean of the month was 42.2; and southerly and westerly currents again predominated. Rain fell on fifteen days; 0.44 in. being recorded for the 10th. No snow all the month. Total rainfall, 2.63 in.

March.

This remarkable month entered with a continuance of the summer-like weather which characterized the latter half of February, and, during the first five days, the sky was nearly cloudless, and no rain fell. Up to this date, the winter had, throughout, been unusually mild; snow had fallen on four days only, and very slight frosts had occurred. On the 6th March a most extraordinary change took place, winter setting in with a severity that had not been experienced since January, 1881. Snow fell almost daily till the 28th, and there were sharp frosts nightly. On the 9th the temperature fell to 23 degrees, and on the 23rd to 25 degrees. It is stated that, in some parts of Norwich, the thermometer on the grass fell to 11 degrees on the night of the 9th. On the evening of the 29th, a welcome change to warmth occurred, which continued to the end of the month. The barometer was highest on the 3rd (30.71), and lowest on the 25th (29.23). Thermometer highest on the 31st (52 degrees), and lowest on the 9th (23 degrees); mean temperature, 35.3 degrees. This was the coldest March since 1845 (which is stated to be the most severe on record), but the mean temperature of March, 1845, was but two-tenths of a degree colder than that of March, 1883. Northerly and easterly winds prevailed. Frosts occurred on twenty-one nights; snow fell on eighteen days, and rain on two days. The total fall for the month was 2.31 in., the heaviest downfall being on the 8th, when 0.38 in. of melted snow was registered.

April.

Entered with warm, sunny weather which continued till the 6th, when cold easterly winds prevailed for a week, after which it was

warm to the 20th. During this period no rain fell, but a heavy fall occurred on the last-named day (0.53); and the weather became cold and ungenial to the end of the month, with snow and sleet showers on the 23rd. The barometer was highest on the 6th (30.63), and lowest on the 28th (29.49). The thermometer highest on the 5th and 18th (68 degrees), and lowest on the 23rd (30 degrees); the mean being 47.9, and frosts on the nights of the 1st, 9th, and 23rd. The wind was chiefly from the east; and the rainfall 1.77 in., rain having fallen on nine days only.

May.

This month may be divided into two parts; the period from the 1st to the 12th being of a cold and very ungenial character, and that from the 13th to 31st of a most summer-like description. Showers of rain, hail, snow, and sleet occurred on the 2nd, 3rd, 4th, and 5th, and cold rains and much dulness prevailed to the 12th, the thermometer in no case exceeding 60 degrees. On the 13th the winterly weather suddenly gave place to the most perfect summer, which continued without intermission to the end of the month. Vegetation, which had hitherto been backward, at once pushed forward with great rapidity, and by the end of the month was in advance of the average. Great heat at times prevailed. The barometer was highest on the 17th (30.40), and lowest on the 8th (29.54). The thermometer highest on the 24th (81 degrees), and lowest on the 4th (34 degrees), the mean of the month being 54.3. The wind was chiefly northerly and easterly during the first half of the month, and southerly during the second half. Rain fell on eleven days; but the total for the month was but 1.19 in., of which 0.25 in. fell on the 26th.

June.

The fine weather with which May ended continued during the first half of June with a remarkably clear atmosphere, the heat being somewhat tempered with easterly breezes. It became unsettled and rainy for a few days about the 14th, but on the 22nd the warm weather returned, and great heat ensued till the end of the month, with occasional night rains. The two last days of the month were the hottest of the year, 82 degrees being attained.

On the 30th, between 5 and 7 p.m., two disastrous thunderstorms passed over Norwich, much damage being done by the electric fluid, both to life and property. The barometer was highest on the 13th (30.29), and lowest on the 15th (29.68). The thermometer highest on the 29th and 30th (82 degrees), and lowest on the 17th (43 degrees), the mean temperature being 59.2. The prevailing current was easterly. Rain fell on fourteen days; the heaviest fall being 0.63 in. on the 15th, and the total for the month was 2.88 in.

July.

The fine and hot weather continued up to the 12th inst., the heat being very oppressive on the first three days, 79, 81, and 81 degrees respectively being recorded. On the 13th cold, wet, and gloomy weather, similar to that so frequently experienced in the summers of recent years, set in, and continued to the end of the month. During this period there were only three days on which rain did not fall, and temperature did not once exceed 69 degrees. There was much thunder at times. The barometer attained 30.09 on 1st and 26th, and fell to 29.50 on the 21st. The thermometer registered 81 degrees on the 2nd and 3rd, and 45 degrees on the night of the 20th; and the mean temperature was 60.4. Westerly and north-westerly winds predominated. There were twenty-one days on which rain fell, the heaviest fall (0.35 in.) on the 20th, and the month's total, 2.39 in.

August.

Up to the 11th, although not so cold and wet as during the last three weeks of July, the weather still continued somewhat unsettled, but on this day a fine, sunny, and dry period, such as had not been known in August for many years, set in, and continued to the end of the month. During this period, but a quarter of an inch of rain fell; the sun shone from a nearly cloudless sky for many days together, and the harvest, which, in the neighbourhood of Norwich, was not commenced until the 12th, was completed by the end of the month. The thermometer was above 70 degrees every day from the 18th to the 31st, with the exception of the 29th, when it attained 69 degrees. Not a single thunderstorm occurred throughout the month. The barometer was highest on

the 19th (30.30), lowest on the 10th (29.57). The highest temperature recorded was 80 degrees on the 13th, and the lowest 45 degrees on the 19th; the mean of the month being 62.3. The wind was principally from the west, and rain fell on eight days, the total fall for the month being but 0.77 in.

September.

September opened with one of the severest storms of wind and rain that had been experienced for a long time past. On the morning of the 2nd the barometer fell to 28.95, and a furious gale prevailed all day. The weather continued rather unsettled to the 11th, but a return of the fine weather which characterized August then set in, and continued to the 24th, and during this fortnight no rain whatever fell, except about a quarter of an inch on the evening of the 20th. Many warm and cloudless days occurred in succession, the thermometer on some occasions recording upwards of 70 degrees. The last week of the month was unsettled. The barometer was highest on the 13th (30.20), and lowest on the 2nd (28.95), this being the lowest reading throughout the year. The thermometer registered 72 degrees on the 17th and 19th, and 43 degrees on the 5th and 29th, the mean temperature being 58. The wind was chiefly westerly, and rain fell on sixteen days, the heaviest fall being 0.35 in. on the 16th. Total rainfall of the month, 3.08 in.

October.

An extraordinary quantity of rain fell during the first five days, no less than 2.56 in., which was more than two-thirds of the total fall of the entire month. The weather then became somewhat changeable and unsettled, but the last week of the month was very fine and warm. The barometer attained the height of 30.44 on the 8th, and fell to 29.36 on the 3rd. Highest temperature, 63 degrees (25th); lowest, 37 degrees (21st); mean, 51.2. The wind was principally from the south and west. Rain fell on seventeen days; the heaviest fall (0.87 in.) on the 1st; and the total for the month, 3.52 in. This was the wettest month of 1883, but the total fall was not much more than half that of October, 1882.

November.

Almost constant mildness prevailed throughout this month, and the weather was, for the most part, very unsettled and changeable. Rain fell on no less than twenty-two days, but on no occasion (except the 4th, 5th, 17th, and 30th) were the falls excessive. Only two slight frosts occurred throughout the month. The weather was very fine during the last week, and the singular fiery red appearance of the sky at sunrise and sunset attracted much attention. This phenomenon was observed, in a less degree, throughout the winter. The highest barometrical reading was 30.40 on the 1st, and the lowest 29.01 on the 6th. The thermometer was highest on the 25th (56 degrees), and lowest on the 11th (30 degrees). The mean temperature of the month was 37.5. The wind was again chiefly from the south and west. The heaviest rainfall was on the 5th (0.89 in.); and the total for the month, 3.37 in.

December.

A brief taste of winter was experienced during the first week of this month; but, although the snowstorms were heavy, the frosts were but slight, and the rain of the 10th drove away whatever snow remained upon the ground. Although this sudden advent of cold was regarded by many as a precursor of a severe winter, the remainder of the month was marked by extreme mildness, and, indeed, the season has throughout been abnormally mild. A severe gale occurred on the 12th, followed by unsettled weather to the 24th, but during Christmas week dense wet fogs abounded, rendering the atmosphere unpleasant in the extreme. The sun was totally obscured from December 23rd to January 6th. The barometer was highest (30.52) on the 25th, and lowest (29.53) on the 15th. Highest temperature recorded, 54 degrees on the 14th; lowest, 27 degrees on the 6th. Frosts on eight nights only; mean temperature, 38.5. Westerly and southerly currents again prevailed. Rain fell on seventeen days, and snow on three days. Total rainfall of the month, 2.25 in.

Summary.

The weather of 1883 was, on the whole, far more favourable than that of many years past, and the summer was the finest experienced since 1874. A very severe March followed an abnormally mild winter, and this was succeeded by a cold and changeable spring up to the 12th May, when fine and hot weather set in, and continued, with but little intermission, till the middle of July. A month's cold and unsettled weather then ensued, but gave place to about six weeks' genial sunshine and temperate heat in August and September. The autumnal equinox brought great rains, and the autumn and remainder of the year was mild and changeable, with the exception of a week's winterly weather early in December. The hottest days of the year were June 29th and 30th (maximum thermometer, 82 degrees); but 80 degrees and upwards were also attained on May 24th, July 2nd and 3rd, and August 13th. It will thus be seen that, although the summer was fine and warm, no excessive heat was registered as in some summers (*e.g.*, 1868, 1870, 1873, 1874, 1876, and July, 1881). The coldest night was on March 9th, thermometer 23 degrees. The rainfall, although in excess of the average, was 6½ in. less than that of previous year, the total being 28.46 in.

Month.	BAROMETER.				THERMOMETER.					RAINFALL.		DIRECTION OF WIND.							
	Highest.	Date.	Lowest.	Date.	Highest.	Date.	Lowest.	Date.	Mean.	Rain.	No. of days on which 0.01 or more fell.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
JAN. .	30.56	23	29.10	26	55°	1	29°	23	39.1	2.30	18	0	0	7	7	6	4	6	1
FEB. .	30.68	23	29.08	2	54	28	32	16	42.2	2.63	15	0	0	1	1	11	6	8	1
MARCH.	30.71	3	29.23	25	52	31	23	9	35.3	2.31	20	7	4	9	1	2	2	2	4
APRIL .	30.63	6	29.49	28	68	5 & 18	30	23	47.9	1.77	9	4	3	7	2	8	2	3	1
MAY .	30.40	17	29.54	8	81	24	34	4	54.3	1.19	11	8	5	2	2	6	4	3	1
JUNE .	30.29	13	29.68	15	82	29 & 30	43	17	59.2	2.88	14	2	4	8	3	6	3	1	3
JULY .	30.09	1 & 26	29.50	21	81	2 & 3	45	20	60.4	2.39	21	1	1	1	3	3	7	5	10
AUG. .	30.30	19	29.57	10	80	13	45	19	62.3	0.77	8	3	1	0	2	5	7	10	3
SEPT. .	30.20	13	28.95	2	72	17 & 19	43	5 & 29	58.0	3.08	16	3	2	1	2	7	5	9	1
OCT. .	30.44	8	29.36	3	63	25	37	21	51.2	3.52	17	5	1	1	2	2	7	13	0
NOV. .	30.40	28	29.01	6	56	25	30	11	42.8	3.37	22	1	0	0	3	5	7	7	7
DEC. .	30.52	25	29.53	15	54	14	27	6	42.5	2.25	20	5	2	0	1	3	8	8	4
TOTALS										28.46	191	39	23	37	29	64	62	75	36

XII.

REVISED LIST OF VERTEBRATA FROM THE FOREST-BED SERIES.

By E. T. Newton, F.G.S.

Communicated by Clement Reid, F.G.S.

Read 25th March, 1884.

VERTEBRATA.

Pisces.

**Raia batis*, Montagu	... ...	Common Skate.
*—— *clavata*, Belon	... ...	Thornback.
**Acanthias vulgaris*, Risso.	...	Piked Dog-fish.
**Galeus canis*, Linn.	... ...	Tope.
Acipenser, sp. ...	... ...	Sturgeon.
Platessa, sp. ...	... ...	Plaice.
**Gadus pollachius?* Linn.	...	Pollack.
—— *morrhua*, Linn. ...	...	Codfish.
**Fish otoliths*, two species.	...	Undetermined.
Tinca vulgaris, Cuv. ...	...	Tench.
Abramis brama, Linn. ...	...	Bream.
Leuciscus erythrophthalmus, Linn.	...	Rudd.
—— *rutilus*, Linn. ...	...	Roach.
—— *cephalus?* Linn.	...	Chub.
Barbus vulgaris? Flem.	...	Barbel.
Esox lucius, Linn. ...	...	Pike.
Platax Woodwardi, Ag.	...	Extinct.
Acerina vulgaris? Cuv. ...	...	Ruff.
Perca fluviatilis, Linn. ...	...	Perch.

* The species with asterisk are Weybourn Crag only.

Amphibia.

Triton cristatus, Laur.	Common Warty Newt.
Bufo, sp.	Toad.
Rana esculenta, Linn.	Edible Frog.
—— *temporaria*, Linn. ...	Common Frog.

Reptilia.

Pelias berus, Linn.	Viper.
Tropidonotus natrix, Linn. ...	Common Snake.

Aves.

Anser, sp.	Goose.
Anas?	Duck.

Several species undetermined.

Mammalia.

Delphinus delphis? Linn. ...	Dolphin.
——— sp. (? = *D. tursio*). ...	
Monodon monoceros, Linn. ...	Narwhal.
Balænoptera?	Whales.
Elephas primigenius, var.? Blumb.	Mammoth. Extinct.
——— *meridionalis*, Nesti. ...	Extinct.
——— *antiquus*, Falc.	Extinct.
Myogale moschata, Linn. ...	Russian Desman.
Sorex vulgaris, Linn.	Common Shrew.
——— *pygmæus?* Pallas.	Lesser Shrew.
Talpa Europæa, Linn.	Mole.
Mus sylvaticus, Linn.	Long-tailed Field Mouse.
Sciurus vulgaris, Linn.	Squirrel.
Arvicola arvalis, Pallas. ...	Extinct in Britain; living in Central Europe.
——— *arvalis*, var. (*? A. nivalis* Martins.)	Extinct in Britain; living in the Alps and Pyrenees above 4,000 feet.
——— *amphibius?* Linn. ...	Water Vole.
——— *glareolus*, Schreb. ...	Bank Vole.
——— *gregalis*, Pallas.	Extinct in Britain; living in Eastern Siberia.
——— *intermedius*, Newton. ...	Extinct.

Castor Europæus, Owen. ..	Beaver.
Trogontherium Cuvieri, Owen. ...	Extinct.
Cervus bovides, Gunn, MS. ...	Extinct.
——— *capreolus?* Linn. ...	Roe deer.
——— *Carnutorum?* Laugel. ...	Extinct.
——— *Dawkinsi*, Newton. ...	Extinct.
——— *elaphus?* Linn.	Red deer.
——— *Etueriarum?* C. & J. ...	Extinct.
——— *Fitchii*, Gunn, MS. ...	Extinct.
——— *Gunnii*, Dawkins, MS. ...	Extinct.
——— *latifrons*, Johnson. ...	Extinct.
——— *megaceros?* Hart. ...	Irish Elk. Extinct.
——— *Polignacus*, Robert ...	Extinct.
——— *Sedgwickii*, Fale. (*? C. dicranios*, Nesti.) ...	Extinct.
†——— *tetraceros*, Maekie. ...	Extinct.
——— *verticornis*, Dawkins. ...	Extinct.
Caprovis Savinii, Newton. ...	Extinct.
†*Ovibos moschatus*, Blainv. ...	Musk Ox.
Bos primigenius? Bojanus. ...	Ox.
Sus scrofa, Linn.	Pig.
Hippopotamus major, Owen. ...	Hippopotamus.
Rhinoceros megarhinus? Christol. ...	Extinct.
——— *Etruscus*, Faleoner ...	Extinct.
Equus Stenonis, Cocchi. ...	Extinct Horse.
——— *caballus-fossilis*, Rütimeyer.	Horse.
Phoca, sp.	Seal.
Trichechus Huxleyi, Lankester ...	Extinct Walrus.
Martes sylvatica, Nilsson. ...	Marten.
Machairodus, sp.	Extinct.
Felis?	
†*Hyæna crocuta*, Zim. (var. *spelæa*, Goldf.)	Hyæna.
Canis vulpes? Linn.	Fox.
—— *lupus*, Linn.	Wolf.
Gulo luscus, Linn.	Glutton.
Ursus spelæus, Blumb.	Cave Bear. Extinct.
—— *ferox-fossilis?* Busk. ...	Bear.

† These species are recent additions to the list.

XIII.

MAMMALIA OF NORFOLK.

(Additions to Part I. of the Fauna of Norfolk.*)

By Thomas Southwell, F.Z.S.

Read 25th March, 1884.

In 1871 our Society commenced publishing a series of articles on the Fauna and Flora of the County of Norfolk, which have been continued from time to time. To most of these lists large additions have been made since their publication, and the completion of the third volume of our 'Transactions' has been thought a favourable occasion to bring them up to the present date. In some instances the additions have been so numerous, and the changes in arrangement or nomenclature so considerable, that it has been thought desirable to reprint them with the fresh matter incorporated. In other cases a supplementary list only is given. To the Land and Fresh-water, and the Marine Mollusca, so little has been added, that no fresh lists are given; and there are several branches of Marine Zoology which, to the great regret of the Committee of our Society, are at present quite unrepresented. Any of our members having the facilities for studying these branches, will, by doing so, render a great service to the Natural History of the county. It is contemplated in future to bring the lists up to date at the conclusion of each successive volume of our Transactions.

The following list of the Mammalia found in the county of Norfolk (to the Reptilia and Amphibia there have been no additions) must be considered as supplemental to my lists published by the Society in 1871, and be read in connection with the same. Where nothing worthy of note regarding the species has come to my knowledge during the past thirteen years, the name is simply

* See Trans. Norfolk and Norwich Nat. Soc. vol. i. (1870—71) p. 71.

repeated. Where additional information is given, it is as much condensed as possible, reference being given to sources whence fuller information may be obtained. Species new to the list are marked with an asterisk (*). The species to be removed from the previous list are three in number, the Oared Shrew, the Greenland Right-whale, and the Black Rat. Seven new species are added; viz., the Parti-coloured Bat, Lesser Shrew, Grey Seal, the Dormouse, Red Field Vole, Atlantic Right-whale, and Pilot Whale, increasing the total from thirty-seven to forty-one species. I have some hesitation in admitting the Dormouse, for reasons which will be given; but as it was, doubtless, at one time indigenous to this county, I have decided to give it the benefit of the doubt; it is quite possible it may never have wholly ceased to exist in some parts of the county. In the list of Reptilia and Amphibia no change has been made.

Since the publication of my contribution in 1871, the list of "The Mammalia of Essex," by Mr. Henry Laver, F.L.S., and that of Yorkshire,* by Mr. W. Denison Roebuck, F.L.S.,—both published in 1881, but by the kindness of their respective authors corrected for me to the present date,—together with the Catalogue of the Mammalia of Northumberland and Durham, by Messrs. Mennell and Perkins, published in 1863—enable me to make a comparison between the Mammalian Fauna of Norfolk and those of the counties named, thus, notwithstanding the absence of published lists for Suffolk and Lincolnshire, fairly representing the distribution of the members of this group on the eastern coast of England from the Thames to the Tweed.

In order to facilitate this comparison, I have constructed a table, showing the species occurring in each county, side by side with a complete list of those found in England. The latter is compiled from Bell's 'British Quadrupeds' (second edition), and includes only the species found in the southern division of the kingdom, of these Bell enumerates seventy-three. From these I have deducted the Pine Martin, which is now proved not to be a British species; the Fallow Deer and Roe Deer, neither of which exist in a truly wild state in England; the Greenland Right-whale, which it is extremely improbable has ever been met with in our seas; and the

* Messrs. Clarke and Roebuck's 'Vertebrate Fauna of Yorkshire.'

Broad-fronted Beaked Whale, which has proved to be the adult male of the Common Beaked Whale; and have added one species, *Vespertilio dasycneme* (Boie) (on the authority of Dr. Dobson), leaving sixty-nine species.

By this table, which I append, it will be seen that in the county of Essex there are thirty species, which are of constant occurrence, and probably all breed, and might, in that county, almost be called residents: these are marked R in the Table. In this number I include one Cetacean, viz., the Common Porpoise. There are nine species marked A, which must be considered accidental visitors; viz., Common Seal, the Common, Rudolphi's and Lesser Rorquals, Sperm Whale, Beaked Whale (*Hyperoodon*), Grampus, and Bottle-nose Dolphin, also the Hooded Seal which was taken in the Orwell, in the county of Suffolk, but, as this river empties into Harwich Harbour, Mr. Laver claims it for Essex also; and two marked E, which are probably extinct, but have occurred too recently to be omitted altogether, viz., Marten and Black Rat, making a total of forty-one species out of sixty-nine in the general list. Mr. Laver also suspects the Gray Seal of having occurred on the Essex coast.

In Norfolk there are twenty-eight residents, or regular visitors. I again include the Porpoise, which is abundant every season; also the Common and Grey Seals, which have both been known to produce young on our coast. Of accidental visitors there are ten; viz., Parti-coloured Bat, Ringed Seal, Atlantic Right-whale, Common and Lesser Rorquals, Sperm Whale, Beaked Whale, Grampus, Pilot Whale, and White-beaked Dolphin. The indigenous races of two others are probably extinct, but individuals have occurred recently—viz., the Marten and Badger, and one other, the Dormouse—which it is possible may have been re-introduced; making a total of forty-one species out of sixty-nine.

In Yorkshire there are thirty-two species which come under the first class R, in which I include the Marten, Badger, and the Red Deer (marking the latter as doubtful), for, although remaining only in a semi-domesticated state in parks, Mr. Roebuck believes in some instances they are, "in all probability, the lineal descendants of the wild stock which formerly inhabited the surrounding districts." Of the second class A, there are thirteen individuals, including the Hairy-armed Bat, which has occurred only on a single occasion;

the Common and Grey Seals, the Common, Sibbald's, and Lesser Rorquals, the Sperm, Beaked, and Pilot Whales, the Grampus, Bottle-nose and White-beaked Dolphins, and the Narwhal, which Mr. Roebuck records as "very doubtful." The Broad-fronted Beaked Whale (*H. latifrons*), which is included in Mr. Roebuck's list, I omit, as it has proved to be the adult male of *H. rostratum*. Yorkshire, according to the standard I have adopted, thus possesses forty-three species, and two others, which must be considered doubtful (marked ?), out of a total of sixty-nine.

For the list of the mammals of NORTHUMBERLAND and DURHAM I am indebted to the Catalogue by Messrs. Mennell and Perkins, published by the Tyneside Naturalists' Field Club in 1863. These gentlemen enumerate fifty-nine species, commencing with *Homo sapiens*, and including all the domestic animals; but on submitting the list to the same rules by which we have been guided in determining which species should be retained or which rejected in the preceding counties, precisely the same number remain with which Yorkshire has been credited. Of these, thirty species come under class R; under class A, I include eleven species, some of which, perhaps, should be more properly placed in the preceding section, as Daubenton's Bat, Reddish-grey Bat, and Whiskered Bat, about each of which one would be glad of more recent information; four others, marked with a ?, viz., the Serotine (which may possibly have been a Noctule), the Wild Cat, Atlantic Right-whale, and Red Deer, I think must be considered doubtful.

In addition to these may be mentioned the Hooded Seal, taken in the Orwell (claimed for both Essex and Suffolk), now in the Ipswich Museum, also an undoubted specimen of the Narwhal, which was taken in the year 1800, near Boston, in Lincolnshire. We may therefore claim for the Eastern Coast of England, certainly, fifty-three, perhaps, also, the Serotine, Wild Cat, and Red Deer, or fifty-six species, out of the total number of sixty-nine.

I have little doubt that one or two additional species of Bat might be added to the Norfolk list if that group were more carefully studied. I also think it highly probable that the Bottle-nose Dolphin *(D. tursio)* is not unfrequent off our coast at certain seasons of the year; and I am surprised at the absence of the

Common Dolphin *(D. delphis)* from at least the Essex and Norfolk lists.

Although not included in the body of the list, the domestic breeds peculiar to the county are too interesting, and their probable origin too suggestive, to be passed over without a brief notice. There is scarcely an isolated district in the United Kingdom which has not produced its own peculiar race of domesticated animals admirably suited to the conditions under which they exist. Many of these local races have disappeared in modern times by cross-breeding or other causes, and others of a more generalized type have succeeded them. But in a few instances very conspicuous breeds are still produced in particular districts: as, for instance, the heavy breeds of Lincolnshire and Cambridgeshire Horses, and the hardy miniature breeds of Exmoor and the Scotch Islands, which are very little altered from their original purity by artificial breeding. So also with Cattle and Sheep. It seems probable that climate and soil, added to unconscious selection by the breeder, in the first place, followed by more intelligent cultivation of what was found most suitable to the surroundings, and intensified by inheritance—almost imperceptibly, at length produced the race which became the recognized favourite of the district in which it was developed, and, as such, it would be valued and preserved. Youatt very truly remarks, that, "in all the different districts of the kingdom we find various breeds of Sheep beautifully adapted to the locality which they occupy. No one knows their origin; they are indigenous to the soil, climate, and pasturage, the locality on which they graze; they seem to have been formed for it and by it."*

My excuse for entering at what may be considered undue length upon the question of these local races, is, that they must soon disappear; what there is good in them will be absorbed to improve some inferior point in the highly composite breeds which now find favour; and many of the qualities which gave them value in the estimation of the farmers of the past generation will no longer stand them in stead; artificial food and shelter, and the facilities afforded by railways of rapid transit, rendering the breeder in the present day independent of constitutional peculiarities formerly

* 'The Sheep' (1873), p. 312.

considered of great advantage; weight of wool and early maturity being now of the first importance.

The Norfolk Cart Horse has, I suppose, now almost disappeared. Marshall speaks of the race as, in his time (about 1780), "almost entirely worn out." They were a "small brown-muzzled breed, light boned, but stood hard work and hard keep in a remarkable manner." As to the origin of the Norfolk and Suffolk Trotting Horses, now commonly known by the older name, "Haekneys," Mr. Euren ventures a suggestion that "it may be that the Norsemen, when they settled in this district, brought with them the northern active, hardy, clean-limbed horses, such as are yet capital trotters in North Europe, and that these horses, crossed with the descendants of Roman Horses, established the type."* There is no doubt, however, that whatever their origin, the influences of soil and climate were largely instrumental in the development of the Norfolk Haekneys. Their famous trotting qualities are of no modern origin, for Mr. Euren, in his remarks on the early history of the Norfolk Trotting Horse, calls attention to a letter from Margaret Paston, written about the year 1465, to her husband, Sir John Paston, in which she tells him "there be bought for you three horses at St. Faith's fair, and all be trotters, right fair horses." There is also an Act, passed in the thirty-third year of the reign of Henry VIII. (1542), which, in order to maintain the breed of saddle horses, provides that every person of wealth and quality should maintain Trotting Stallions, in number according to his wealth, and especially enacts that no Cart Horse or Sumpter Horse should be reckoned for the purposes of the Act as a Trotting Horse. And when we consider that our ancestors possessed no other means of locomotion, we can quite appreciate the wisdom of an Act which insures the continuance of a race of Horses so serviceable both in times of peace and war.

There is plenty of evidence extant as to the great staying powers of the old Norfolk breeds, both of Hackneys and Cart Horses, and Marshall, whilst regretting that by injudicious crossing the latter valuable race should have been lost, adds: "Had the original Norfolk breed [of Cart Horse] been crossed with these [the Suffolk

* "The Hackney Horse: as it is, and as it was" ('Live Stock Journal Almanac, 1874,' p. 52).

breed] instead of the Slugs of the Fens, the product could not have failed of being excellent." When we remember how strongly he advocated a similar cross between the Cattle of the two counties, which has since been cultivated with such excellent results, we cannot but regret that the opportunity of carrying out his suggestion has been lost. The modern Hackney Horse is, undoubtedly, the result of a mixture of Barb, old English, and Norfolk blood.*

Mr. Lubbock remarks that Norfolk never possessed any distinct breed of "Black Cattle." This is quite true, but there long existed a race which Marshall † described in 1780—82 as "a Hereford in miniature," the favourite colour being a blood-red with a white or a mottled face, "the horns clean, middle-sized, and bent upward." They were a small, hardy, thriving race, fatting freely and maturing early. Towards the end of the last century this race was crossed with an equally valuable polled variety peculiar to the neighbouring county of Suffolk, the general colour of which was also blood-red, red and white, or yellowish-cream, and the result, although Marshall feared that the native hardness of the Norfolk breed and their quality of fatting quickly at an early age might be injured by the innovation, has been the now celebrated "Red-polled Cattle." A little jealousy appears at first to have existed with respect to the honour of the origin of this breed, each county claiming to fasten its own cognomen upon the race; but all difference has now been settled, and the breed is fully recognized, having its own 'Herd Book,' as the Red-polled Cattle. Youatt says, the old Norfolk Horned Cattle were undoubtedly supplanted or modified by the Galloways, either accidentally or by reason of their superior form and quality, retained by the farmers and naturalized in the county, and adds, "to a certain degree he succeeded, and thus the Polled Cattle gradually gained upon the horned ones, and at length became so much more numerous and profitable than the old sorts, that they began to be regarded as the peculiar and native breed of the county.

This is, however, pure guesswork on the part of Mr. Youatt; and Mr. Low ('Domesticated Animals of the British Isles'),

* See Introduction, vol. i., 'Hackney Stud Book.'

† 'Rural Economy of Norfolk' (first edition), vol. i. p. 324.

a Scotch authority, states that the same has been said of the Suffolk race, but he very significantly points out that the Suffolk Polled Cattle "has as much the characteristics of a different native breed as the Galloway itself," and this would, doubtless, apply with equal force to the old Norfolk variety. However that may be, there can be no doubt the blending of the Norfolk and Suffolk varieties has produced a very perfect animal, of which both counties may well be proud, and any attempts at further crossing have proved unsatisfactory. Mr. H. F. Euren, the editor of the 'Herd Book,' tells me that the animals whose breeding is known to have been true during the last fifty years or more give the best results now.

Far more ancient than any local race of cattle are two herds, at present to be seen in Norfolk, the one at Blickling Park, the property of the Marchioness of Lothian, and the other at Woodbastwick, belonging to Mr. Albemarle Cator. Unfortunately, as will be seen, neither herd has, of late, been maintained in its original purity; but by careful selection the characteristic features of the race from which they sprung have been maintained, and so strongly does the original strain assert itself, that probably they differ little in appearance from their remote ancestors. These fine cattle, although now fully domesticated, are the descendants of the British Wild Ox *(Bos primigenius)*. Mr. Storer, in his 'Wild White Cattle of Great Britain,' traces their descent from the "wild bulls" of Blakeley, in Lancashire, through the old herd, which formerly existed in Middleton Park, Lancashire, the seat of the Asshetons, whence they were brought by Sir Harbord Harbord, Bart. (created Baron Suffield in 1786, and who married a daughter of Sir Ralph Assheton) to Gunton Park in 1765. The Gunton herd died out previous to 1853, but before this happened, some of the cattle had been transferred to Blickling, then the seat of the Hon. William Assheton-Harbord, who had married Caroline, daughter and heiress of the Earl of Buckinghamshire, to whom Blickling belonged. The descendants of these continued to thrive at Blickling till almost exterminated by the cattle plague, since which time they have been more than once crossed by Red Short-horned Bulls, and, subsequently, by a White Polled Bull with black ears and nose. The present flock consists of three Cows, four Steers, one Bull, and ten Calves.

The origin of the Woodbastwick herd, according to Mr. Storer, was also direct from Gunton, some of the white cattle having been purchased by the late Mr. Cator about the year 1840, at a sale of Lord Suffield's White Polled Cattle. Mr. Cator, however, tells me that only one cow was then purchased. This was, in the first instance, bulled by a pure Hereford, and from this strain came the red noses and ears, which have, till of late, distinguished the Woodbastwick herd, those at Blickling having the corresponding parts black. It appears, however, that the reverse colours were sometimes produced in either herd, and that a mutual understanding existed between their owners, that when a red-eared calf was produced at Blickling, Mr. Cator was to have the refusal of it for the Woodbastwick herd; and *vice-versa*. This interchange of calves was very beneficial to both herds, and to it Mr. Cator was, in all probability, indebted for his success in establishing the breed. Mr. Cator has, however, at different times, in addition to the Hereford, employed a Red Short-horned Bull, and on two subsequent occasions White Short-horned Bulls; and, lastly, a half-bred Polled Angus. The latter has improved the deficient points in the older race, and restored the black ears and noses. The herd at present consists of fourteen Cows of the old red-eared variety, and seven over-year Heifers, thirteen Yearlings, and one very promising young Bull (all perfectly marked),—the black-eared descendants of the Angus cross. The original strain still asserts itself very strongly, and the young Bull perfectly resembles Mr. Storer's engraving from the picture still preserved at Gunton Hall, of one of the old Gunton Bulls.

These cattle are very fine-looking animals, somewhat deficient in the hind-quarters, but very deep chested. Colour, pure white, with the exception of the ears and noses, which are now black in both herds; they are said to graze quickly; are excellent beef, very gentle in all their habits, and fair milkers. It is impossible to see these picturesque-looking beasts without being struck by their appearance, even should their origin be at the time unknown.

Perhaps the most conspicuous local breed of domesticated animals in this county is the old Norfolk Sheep, now becoming very rare amongst us. These hardy, long-legged creatures, with handsome, well-set heads, adorned with spiral horns, and looking as thoroughbred as a herd of deer, were admirably suited to the

vast open tracts of country, covered with sparse short herbage, so characteristic of the higher parts of Norfolk. On this scant pasture they would do well, under circumstances altogether unsuitable to a less hardy and active race. So long as the country remained in this condition, no breed of sheep could have been found more suited to the soil and surroundings, which, indeed, had probably made them what they were; but owing to improved cultivation, smaller inclosures, and their impatience of close folding, they have gradually been crossed with, or supplanted by other breeds, till at present, the few flocks remaining belong almost exclusively to those who farm rather for pleasure than profit, and owe their continued existence to their handsome appearance and the excellence of their mutton, rather than to any pecuniary considerations.

The immediate descendants—probably by selection—of this breed are the variety now known as the Suffolk Black-faced Sheep, the ewes of which are eagerly sought after for the production of the now celebrated cross-breed Suffolk and Down.

MAMMALIA.

Order CHIROPTERA.

Fam. Vespertilionidæ.

1. Plecotus auritus (Linn.). Long-eared Bat.

2. Synotus barbastellus (Schreb.). Barbastelle.

Not a rare Bat in Norfolk, and seems generally distributed throughout the county.

3. Vesperugo noctula (Schreb.). Noctule. Common.

4. Vesperugo pipistrellus (Schreb.). Pipistrelle.

5. *Vesperugo discolor (Natterer). Parti-coloured Bat.

Mr. Hancock has an individual of this species in his possession, which was taken in the rigging of a vessel in the Yarmouth Roads in the year 1834. *Vide* Trans. Norfolk and Norwich Nat. Soc. vol. i. (1873—4), p. 80.

6. Vespertilio nattereri (Kuhl.). Reddish-grey Bat.

This species is by no means rare in Norfolk. It mostly frequents houses and out-buildings. In the adjoining county of Suffolk, Mr. Rope has on several occasions taken it hybernating in the interior of a plaster image in a summer-house in the midst of a wood at Blaxhall. Mr. Norgate found one in a nesting-box, placed in a hole in a wall for Titmice, at Sparham.

Order INSECTIVORA.

Fam. Erinaceidæ.

7. Erinaceus europæus (Linn.). Hedgehog.

Fam. Talpidæ.

8. Talpa europæa (Linn.). Mole.

Of twenty-five dozen Moles, taken at Clippesby, thirty individuals were white. This variety is quite common in the low-lying lands in the neighbourhood of Oby and Clippesby. I am informed that mixed broods are never found, all the young ones of the same brood being either white or black. In six pregnant moles, which I examined, four contained four young ones each and two only three.

Fam. Soricidæ.

9. Sorex vulgaris (Linn.). Common Shrew.

10. *Sorex pygmæus (Pallas.). Lesser Shrew.

The Lesser Shrew was first identified as a Norfolk animal from a specimen killed by Mr. Frank Norgate, on Sparham Heath, in June, 1874, since which time it has been frequently met with. Mr. Edward Bidwell has an albino of this species from Thetford.

11. Sorex (Crossopus) fodiens (Pallas.). Water Shrew.

The typical form of the Water Shrew, with the under parts pure white, is rare in Norfolk; the form, formerly known as *Sorex remifer*, with the dark under-parts and chestnut throat, being much more frequent; but I have met with specimens presenting almost every intermediate variety of colouring.

Order CARNIVORA.

Fam. Canidæ.

12. Canis vulpes (Linn.). Fox.

Fam. Mustelidæ.

13. Martes sylvatica (Nilss.). Marten.

The late Mr. Edward R. Alston, in a paper read before the Zoological Society of London, in June, 1879 (P.Z.S. 1879, pp. 468—472), has shown that there is no evidence whatever of the existence of the true *M. foina* at any time in Britain, and that the British animals usually referred to that species are really pale-breasted individuals or faded specimens of *M. sylvatica*. As late as the year 1811, in the adjoining county of Suffolk, on an estate of 4,000 acres, as many as forty-three Martens were killed in one year (Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 224), and old men speak of its having been met with in Norfolk at the commencement of the present century, the first twenty years of which probably saw the last of the native race. From time to time, however, stray individuals are killed, two having come to my knowledge since the publication of my first list. In 1864, a female was trapped at Kelling, by a gamekeeper in the employ of Captain Bird, and is now in that gentleman's possession, at Little Waltham Hall, Essex (*cf.* Zool. 1872, p. 146). Another was trapped at Hevingham, near Norwich, on 9th July, 1878. It came into the possession of Mr. T. E. Gunn, birdstuffer, of Norwich, but to whom he disposed of it I am not aware. That these were escapes, I have no doubt, although unable to trace them. To show how easily this may occur, I was informed by a friend, that some years ago an undergraduate at Cambridge surprised him by stating that from time to time a considerable number of live Martens had been sent to him from Ireland, several of which had escaped and were then living at large in his neighbourhood, in the South of England; the same thing may well have happened in Norfolk without its being suspected.

14. Mustela vulgaris (Linn.). Weasel.

A beautiful little female, the under parts pure white, which extended to the left leg and foot, was killed at Northrepps in December, 1876. On the 25th November, 1878, I saw a female Weasel, also from Northrepps, in which the front and sides of the

head were quite white, and white hairs were appearing all over the body, especially on the flanks. This change of colour in the Weasel appears to be very rare. Mr. Cordeaux detected a Weasel carrying off a full-grown frog, food apparently more suitable for the Polecat than this species.

15. Mustela erminea (Linn.). Ermine, Stoat.

The mild winter of 1872—3 was remarkable for the number of white, or partially white, Stoats, which found their way to the Norwich birdstuffers. The winter of 1873—4 was also remarkably mild, but quite a number of white Stoats were killed, some as late as the month of March. Mr. Gurney states, that in the winter of 1878, he saw at the three principal birdstuffers' in Norwich, six Stoats, in which the ermine dress was completely assumed, and twenty-one others in which the change was partial, though in several cases nearly complete. In a birdstuffer's room, at Thetford, in 1882, I counted forty-one white, or nearly white, Stoats, not all killed in one year, but he assured me they were only a fair accumulation in the way of his business. The change of colour in this species does not appear to depend upon the severity of the weather to such a degree as is generally believed, and where it does occur in snowless weather the white Stoat forms a very conspicuous object, much to its disadvantage.

16. Mustela putoria (Linn.). Polecat.

This animal is rapidly becoming very rare in Norfolk. In the account of vermin killed in Suffolk in 1811, thirty-one Polecats and four hundred and sixteen Stoats are mentioned.

17. Lutra vulgaris (Erxl.). Otter.

This animal is still abundant in Norfolk, its great stronghold being the "Broads," whence it strays to all the streams in the county. With us it is decidedly a winter breeder, and the usual number of young is two or three; only once out of the many instances in which I could satisfactorily ascertain the number of young have I known four produced. Thirty-seven pounds is the greatest weight I have known it to attain here. For an account of its mode of existing in the Broads, see Trans. Norfolk and Norwich Nat. Soc. vol. i. (1872—3), p. 79; also vol. iii. (1877), p. 172.

18. Meles taxus (Schreb.). Badger.

The only instances of the occurrence of the Badger in Norfolk which have come to my knowledge since my list was published are, one killed at Holkham, in November, 1875, and a female trapped on Kelling Heath, in March, 1877; probably both stragglers.

Fam. Phocidæ.

19. Phoca vitulina (Linn.). The Common Seal.

The late Mr. Cresswell of Lynn—who during many years' shooting and fishing in the great estuary of the Wash lying between the counties of Norfolk and Lincolnshire enjoyed exceptional opportunities of observing these animals—has repeatedly told me that the extensive and solitary tracts of sand-bank, left bare by every retiring tide, are frequented by large numbers of Seals; and Mr. Cordeaux, who has also had very favourable opportunities for observation in the same locality, writes me that "there is a considerable colony of Seals in these waters, far more than is generally supposed, and many young are undoubtedly born in the course of each season." On the actual sea-coast they are seldom seen; it is to the lonely sand-banks, far out in the Wash, which are rarely approached by man, that they resort. The Seal occasionally ascends fresh-water streams, but it seldom penetrates to such a distance as recorded by Mr. Gurney in the Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 423, where he mentions one having been killed in the river Ouse on the 18th November, 1881, at Bluntisham, about forty miles in a direct line from the sea (many more following the course of the river), and another having been seen at Earith Bridge, a short distance below Bluntisham, on the 3rd of the following December. A few years ago an old lighterman at Earith caught a Seal alive near the same place, which became so tame that it would answer to his call, and come out of the river to be fed. After some months it met with the usual fate of pets.

20. Phoca hispida (Schreb.). Ringed or Marbled Seal.

Killed on the Norfolk coast in 1846.

21. * Halichœrus gryphus (Fab.). Grey Seal.

An old female and young one, killed on a sand-bank in the

Wash on 29th December, 1881 (*vide* Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 415). A young female of this species was also killed on Breydon on the 28th November, 1882. The latter I saw in the flesh, and prepared the skull, which is now in the Norwich Museum. I had more than once been told of the occurrence of Seals, which I suspected to be of this species, but had no opportunity of verifying.

Order CETACEA.

Fam. Balænidæ.

22. *Balæna biscayensis (Eschricht).

I include this species with some hesitation; but if Messrs. Paget's entry, "*Balæna mysticetus*—Common Whale—a small one taken near Yarmouth, July 8th, 1784," refers to a Right Whale at all,—which at that date there is no reason why it should not do,—it can only indicate this species. The entry is so precise, and there were so many men then living in Yarmouth who had taken an active part in the Northern Whale Fishery, that it seems improbable a Fin Whale should have been mistaken for a true Balæna.

Fam. Balænopteridæ.

23. Balænoptera musculus (Linn.). Common Rorqual.

Since my list was published in 1871, a Whale of this species came on shore at Happisburgh on the 1st March, 1875; and on the 9th August of the same year, another was found floating dead in the Lynn Roads.

24. Balænoptera rostrata (Fab.). Lesser Rorqual.

Fam. Physetrridæ.

25. Physeter macrocephalus (Linn.). Sperm Whale.

26. Hyperoödon rostratum (Chemnitz). Beaked, or Bottle-nose Whale.

Gray's *H. latifrons* is now proved to be the adult male of this species (*vide* Trans. Norfolk and Norwich Nat. Soc. vol. iii. p. 476).

Fam. Delphinidæ.

27. Orca gladiator (Lacép.). Killer, Grampus.

28. * Globicephalus melas (Trail). Pilot Whale.

A female, washed on shore near Mundesley, on 29th January, 1879.

29. Phocæna communis (F. Cuv.). Porpoise.

Two fœtal young ones were taken from a Porpoise, caught at Yarmouth, on 7th December, 1881.

30. Delphinus albirostris (Gray). White-beaked Dolphin.

This species, which was first recorded from Norfolk in 1845, has since occurred on our coast in April, 1866; March, 1876; August, 1879; March, 1880; and September, 1881. The latter, a very young one, with the umbilical cord still attached. This species seems much more frequent than was formerly supposed, probably having been overlooked. The Yarmouth fishermen assure me it is well known to them, and all apply to it the name of "Scoulter." Certainly the Porpoise is not so called by them, but it is quite possible that this name is also applied to *D. tursio*, and it may be some other species also. It is exceedingly difficult to obtain precise information on such points from the fishermen unless the specimens are actually before them.

Order RODENTIÆ.

Fam. Sciuridæ.

31. Sciurus vulgaris (Linn.). Squirrel.

The appetite of the Squirrel is almost omnivorous. It has been seen to eat the young bird from a nearly hatched egg. It is not surprising, therefore, that Fungi, from their nitrogenous nature, should be favourite morsels with them. Mr. J. H. Gurney, Jun., has seen them eating Oak-apples, or it may be breaking them up in search of the larvæ which they contain, and Mr. Durnford ('Zoologist,' S. S., p. 3272) states that it takes to the water readily, and swims with ease.

Fam. Myoxidæ.

32. * Muscardinus avellanarius (Linn.). Dormouse.

The only evidence of the existence of this species in Norfolk till quite recently, with which I was acquainted, was of a rather ancient

date. In 'Paget's Natural History of Great Yarmouth' (1834), the author says "this species is occasionally seen in small woods, &c." In 1838 appeared in the 'Edinburgh Journal of Natural History,' conducted by William Macgillivray (vol. i. 1835—1839), an article entitled a 'Sketch of the Natural History of the neighbourhood of Norwich,' by J. M [acgillivray], in which the Dormouse is spoken of as one of "the less common quadrupeds" met with at Cossey. I have also, from several other sources, been informed that "forty or fifty years ago" the Dormouse was found in Norfolk. On the other hand, Mr. Lubbock (1845) distinctly states that he could not verify its occurrence, and admits the species on the authority of Paget's list. Mr. Gurney has been equally unsuccessful in establishing its claim; and although I have made constant inquiries for the last twenty years, and have more than once been told of the occurrence of the Dormouse, I have found either that some other species was mistaken for it, or that the statement could not be substantiated. Under these circumstances, I reluctantly formed the conclusion that this interesting species had become extinct in this county, notwithstanding there were suitable localities in abundance for its home.

Quite recently there has been a correspondence in the 'Field' on the distribution of the Dormouse in England, and I was surprised in reply to some remarks of mine, at receiving a letter from Mrs. Bazett Haggard, of Kirby Cane Hall, informing me that in February, 1882, she had seen a Dormouse in the parish of Geldestone, which some woodmen had just found in a dormant state in some dead leaves amongst the stumps of Hazel. Subsequent inquiry has shown that this species is met with in the parishes of Gillingham, Geldestone, and Stockton, all situated in the south-east corner of Norfolk. It does not occur on the opposite side of the river Waveney, on which the villages mentioned are situated; and Mr. Rope tells me that, in the adjoining county of Suffolk, he can only hear of it with certainty in the neighbourhood of Long Melford and Lavenham, near the borders of Essex, in which latter county it seems to be fairly abundant.

From Mr. W. M. Crowfoot, of Beccles, I learn that about forty years ago the late Mr. J. Kenick turned off six or seven Dormice procured from Surrey, but he adds that the animal is now so common at Geldestone, that his informant doubts whether they

can all have sprung from these Surrey specimens; and he cites the distance to which they have spread, in support of this view; an opinion which Mr. Crowfoot seems to share.

I cannot ascertain for certain that the Dormouse is found in any other part of Norfolk, although, as I have before said, there are suitable localities in plenty; and it certainly seems strongly in favour of those found in the neighbourhood of Geldestone having sprung from Mr. Kenick's introduced specimens, that the species should be restricted to a small area of the south-east corner of the county. I should, however, attach great weight to Mr. Crowfoot's opinion.

Fam. Muridæ.

33. Mus minutus (Pall.). Harvest Mouse.

Large numbers of this pretty little animal are sometimes killed on the removal of corn stacks in winter, oat stacks being their favourite hibernating quarters. Mr. Gurney has known forty killed from one oat stack. On the 8th January, at Blaxhall (Suffolk), Mr. G. T. Rope was present at the removal of a barley stack, in which were "a great number of Harvest Mice, many more of this species being found than of *M. musculus*." This is the only instance in which Mr. Rope had met with Harvest Mice in a barley stack.

34. Mus sylvaticus (Linn.). Long-tailed Field Mouse.

35. Mus musculus (Linn.). House Mouse.

[Mus rattus (Linn.). Black Rat.

Probably extinct in this county. I think it likely that *Mus alexandrinus* is sometimes mistaken for this species. An individual of the latter species, which was killed at a wharf in Norwich, was shown to me in the flesh in August, 1881. Between March and May, 1882, I received from the same locality three Rats, which I believe to be hybrids between *M. alexandrinus* and *M. decumanus*. The first received closely resembled *M. alexandrinus* in colour and texture of fur, and length of upper jaw, but in size and length of tail approached *M. decumanus*. No. 2 also bore the foreign strain strongly marked, but was more like the English Rat in general outline; the third was even more robust. The two latter appeared in all respects identical with Thompson's *Mus Hibernicus* (*cf.* 'Natural

History of Ireland,' vol. iv. pp. 16—18). I have given a full description of these supposed hybrids in the Trans. Norfolk and Norwich Nat. Soc. vol. iii. pp. 419—421.]

36. Mus decumanus (Pall.). Brown Rat.

37. Arvicola amphibia. Water Vole.

The black variety is common in this county. Mr. Lubbock says that those of the normal type are considerably the larger, and that he has "never observed a brown and black one together, but that the colours always correspond." An albino Water Vole was killed at Castle Acre in September, 1872.

38. Arvicola agrestis (De Selys.). Common Field Vole.

Mr. Lubbock speaks of this species as "*the* Mouse of the marshes, the staff of life, as it were, of the Weasel and the Kestrel Hawk."*

39. * Arvicola glareolus (Schreb.). Red Field Vole, Bank Vole.

I have received several specimens of this animal from various localities in Norfolk. It is probably much more frequent than is generally supposed.

Fam. Leporidæ.

40. Lepus europæus (Pall.). Common Hare.

In addition to the varieties mentioned in my former list, "a beautiful specimen of a Black Hare, captured at Merton, the seat of Lord Walsingham," is recorded in Morris' 'Naturalist,' vol. viii. (1858) p. 97.

41. Lepus cuniculus (Liv.). Rabbit.

The black or "silver-grey" race of Rabbits has long been established about Thetford and Brandon. In Gage's 'History and Antiquities of Hengrave' (page 190) occurs the following extract from the 'Household Book' of Thomas Kytson, October, 1573:— "For baiting my Mr. his horse at Brandon, &c. . . . For vj Black Coney skins, to fur my Mres. night gown iiij^{s}. iiij^{d}."

* In the second edition of Lubbock's 'Fauna of Norfolk' (p. 10) I have inadvertently quoted this remark as applied by Mr. Lubbock to *M. sylvaticus*, and avail myself of this, the first opportunity of correcting the error.

Comparative Table of Essex, Norfolk, Yorkshire, and Northumberland and Durham Mammalia.

		Essex.	Norfolk.	Yorks.	Northd. & Durm.	Remarks.
1	Lesser Horseshoe Bat ...	...	...	R	...	
2	Greater Horseshoe Bat ...	...	...	...	...	
3	Barbastelle	R	R	...	...	
4	Long-eared Bat	R	R	R	R	
5	Serotine	...	...	...	?	This was probably a Noctule.
6	Parti-coloured Bat	...	A	...	...	
7	Noctule	R	R	R	...	
8	Hairy-armed Bat	...	...	A	...	
9	Pipistrelle	R	R	R	R	
10	Vespertilio dasycneme ...	...	...	...	...	
11	Daubenton's Bat	R	...	...	A	
12	Reddish-grey Bat	R	R	R	A	
13	Bechstein's Bat	...	...	...	...	
14	Mouse-coloured Bat	...	...	...	...	
15	Whiskered Bat	R	...	R	A	
16	Hedgehog	R	R	R	R	
17	Mole	R	R	R	R	
18	Common Shrew	R	R	R	R	
19	Lesser Shrew	R	R	R	R	
20	Water Shrew	R	R	R	R	
21	Wild Cat	...	...	...	?	
22	Fox	R	R	R	R	
23	Marten	E	E	R	R	
24	Weasel	R	R	R	R	
25	Stoat	R	R	R	R	
26	Polecat	R	R	R	R	
27	Otter	R	R	R	R	
28	Badger	R	E	R	R	
29	Walrus	...	...	...	...	
30	Common Seal	A	R	A	R	
31	Ringed Seal	...	A	...	...	
32	Harp Seal	...	...	...	...	
33	Grey Seal	...	R	A	R	
34	Hooded Seal	A	...	...	...	Now in Ipswich Museum.
35	Atlantic Right-whale ...	...	A	...	?	
36	Hump-backed Whale	...	...	...	A	
37	Common Rorqual	A	A	A	A	
38	Sibbald's Rorqual	...	...	A	...	
39	Rudolphi's Rorqual	A	...	...	...	
40	Lesser Rorqual	A	A	A	A	
41	Sperm Whale	A	A	A	A	
42	Beaked or Bottle-nose Whale	A	A	A	A	
43	Cuvier's Whale	...	...	...	...	Mr. Roebuck considers this not quite satisfactory, but one was taken at Boston, in Lincolnshire, in 1800.
44	Sowerby's Whale	...	...	...	...	
45	Narwhal	...	...	?	...	
46	White Whale	..	...	...	...	
47	Grampus	A	A	A	A	
48	Risso's Grampus	...	...	...	...	
49	Pilot Whale	...	A	A	A	
50	Porpoise	R	R	R	R	
51	Common Dolphin	...	...	...	...	
52	Bottle-nose Dolphin	A	...	A	...	
53	White-sided Dolphin	...	...	...	...	
54	White-beaked Dolphin ...	...	A	A	A	
55	Red Deer	...	...	?	?	
56	Wild White Cattle	...	...	...	R	
57	Squirrel	R	R	R	R	
58	Dormouse	R	R	R	R	
59	Harvest Mouse	R	R	R	R	
60	Long-tailed Field Mouse ...	R	R	R	R	
61	House Mouse	R	R	R	R	
62	Black Rat	E	...	R	R	
63	Brown Rat	R	R	R	R	
64	Water Volo	R	R	R	R	
65	Field Vole	R	R	R	R	
66	Red Field Vole	R	R	R	R	
67	Common Hare	R	R	R	R	
68	Varying Hare	...	...	...	...	
69	Rabbit	R	R	R	R	
		41	41	43	41	
	Doubtful	0	0	2	4	
		41	41	45	45	

Note. Since the foregoing paper passed through the press, two circumstances have come to my knowledge, which are so interesting, that I am unwilling to allow the present opportunity of alluding to them to be lost, and by permission of the Editor I am allowed to append this note.

In instituting a comparison between the Fauna of the counties intervening between the rivers Thames and Tweed, in only the most northern could I even allude to the Wild Cat (*Felis catus*), and then only as a probably extinct species. My surprise and pleasure may therefore be imagined at receiving, on the 23rd June, a letter from Mr. Cordeaux, informing me of the recent occurrence in the county of Lincolnshire of one of these animals, of which he enclosed me a beautiful photograph, representing an animal apparently identical in all respects with the best descriptions and figures of the true *F. catus*.

Mr. Cordeaux very kindly gave me the following information with regard to this interesting occurrence :—"The Cat, a fine old Tom, was obtained in the early part of March, 1883, by Mr. Arthur Belton, of Bullington, near Wragby, when out with his gun in a small plantation near Bullington Wood. His Dog, a small terrier, brushed the Cat from beneath some Brambles; instead of taking to flight, it instantly attacked the Dog, which it severely mauled. Mr. Belton was obliged to run to the rescue, when the Cat took to an Oak-tree, crouching between two branches above the bole. Seeing that it was apparently making preparations to spring, he fired at its face, and brought it down. Mr. Belton states it had been seen at various times in the neighbourhood for many years past. It was subsequently received in the flesh by Mr. W. Barber of Lincoln, skinned and set up by him, and remains in his possession, where I examined it, and had a photograph taken. I also compared it with a Scotch example, shot many years since in the Forest of Mar, as also with the best written descriptions. There cannot be the slightest doubt that it is a genuine Wild Cat (*Felis catus*.)

"Bullington Wood is part of a great chain of woodlands extending from near Wragby to the neighbourhood of Peterborough, large tracts of which have never known a keeper or been preserved for game. Cats are known to have bred wild there for generations, so that there is no improbability that the subject of this notice

may claim descent from the old British Wild Cat. That it should be a reversion from the domestic breed to the wild type is scarcely probable, unless we are prepared to allow for a strong admixture of original blood coming from pure ancestors, which at no distant period inhabited the district. Bullington Wood is remarkable as being the last haunt of the Kite in Lincolnshire: a pair nested there in 1870. The Pine Marten still lingers in the district, examples being obtained almost every year; and the Polecat is extremely common."

My second note has reference to the Edible Frog (*Rana esculenta*), which was by some considered, if not indigenous to the Fens of Cambridgeshire, certainly a very old inhabitant of that district. On the draining of the Fens it was thought to have migrated into Norfolk; still from the undoubted fact of a large number of these animals having been introduced into this county at various times about the year 1837, by Mr. George Berney, the weight of evidence seemed largely in favour of those found in Norfolk having descended from Mr. Berney's importations.

Recently, however, Mr. G. A. Boulenger* has examined a number both of old Cambridgeshire and recent Norfolk specimens, and to his great surprise finds that they all belong to a very distinct race peculiar to Italy, and not to the typical form which occurs in Central Europe. Mr. Boulenger concludes thus: "It is clear to me, therefore, that all the specimens, the capture of which has hitherto been recorded, whether from Cambridgeshire or Norfolk, are not the descendants of those introduced by Mr. Berney, but are of Italian origin. By whom, and when, they were introduced in this country I cannot venture to suggest."† The suggestion that these creatures may have been introduced from Italy, like *Helix pomatia*, by "Roman monks," thus seems to be rendered much more probable; but it still may be possible that Mr. Berney accidentally imported Italian Frogs from Belgium and the north of France; and it will be interesting to examine a larger number of specimens, with a view to ascertaining whether Mr. Berney's French Frogs still survive in any part of Norfolk.—T. S.

* 'Zoologist,' 1884, p. 265. † *l. c.* p. 269.

XIV.

FAUNA AND FLORA OF NORFOLK.

(Additions to Part IV., Fishes.)

By John Lowe, M.D.

Read 26th February, 1884.

Since the publication of the former list of the Fishes of Norfolk in 1873 there have not been many additional species recorded. There are, however, some of considerable interest; and some observations worthy of note. For most of these I am indebted to Mr. Southwell, who, with his usual assiduity, is always keenly on the alert in regard to everything pertaining to the Natural History of the County.

Species new to the list are marked with an asterisk (*).

Gasterosteus pungitius (L.). Ten-spined Stickleback.

"Mr. F. Norgate writes, 23rd February, 1883: 'Is abundant in meadow drains at Sparham.' Mr. Louis Buxton also found it not uncommon in his lake at Bolwick Hall, 1881."—T. S.

Sclena aquila (Risso). Maigre.

The third Norfolk specimen of this rare fish is recorded in the 'Times' of November 1st, 1875, by Mr. Tregellas of Brompton, as having been caught near Yarmouth. It was 4 ft. 9 in. long, and weighed seventy-five pounds. "It is in the possession of Mr. Charles, Arabella Row, Pimlico."

Scomber scomber (L.). Mackarel.

Mr. R. D. Massingham, Harbour-Master of Lowestoft, in a letter to Mr. Southwell, November 9th, 1875, comments on the unusual fact of a large number of Mackarel having been taken at that late season of the year. He says: "The large quantity of Mackarel landed at our market this autumn is a very unusual thing, as they are only caught on this coast in May and June."

Scomber thynnus (L.). Tunny.

Mr. Southwell writes, November 29th, 1876: "A fine Tunny was east ashore at Bacton on the 24th inst. It was in an exhausted state, but not dead. Yesterday I saw it in Norwich. It is a beautiful fish, measuring 9 ft. 4 in. in length."

Zeus faber (L.). Dorce.

One taken in a Lobster-pot off Sheringham, October 1st, 1881."—T. S.

* Capros aper (Cuv.). Boar-fish.

Has not been previously recorded as occurring in Norfolk. Mr. A. Patterson of Yarmouth (July 9th, 1881) found a specimen on a shrimper's board. It had been caught the same morning. It measured five inches in length, and was of a lovely carmine colour. Mr. Southwell informs me that a second specimen was found dead on Yarmouth beach on the 1st May, 1882.

The Boar-fish was first recorded as having been taken off the British coast in 1825, when it was regarded as so great a rarity as to be worthy of presentation to Her Majesty the Queen. Since that time it has occurred, in some numbers, on the south coast, scarcely a year passing without its being met with. In 1877 it was taken in great numbers on the south coast, and one found as far north as Grimsby. In 1879 it was again numerous on the south and east coast, where it is met with every year, occasionally in very large numbers.

Brama Raii (Bl.). Ray's Bream.

Mr. J. H. Gurney, in writing of this rare species, of which only two examples had been previously recorded, says: "Miss Gurney of Northrepps (November 9th, 1821) made an accurate drawing of a full-sized fish of this species, which was found, after a storm, on Cromer beach."

Xiphias gladius (L.). Sword-fish.

In the 'Lynn Advertiser,' July 18th, 1879, there is a notice of one caught in a Mackarel-net at Sheringham by Matthew Scotter. It measured 9 ft. 6 in. Mr. Southwell mentions another of the same size, which was stranded on the beach at Palling, October 30th, 1881; and a third was taken off Wolferton Creek, October 30th, 1883,

which measured 5 ft. 6 in., and the sword 3 ft. 2 in; and a fourth at Burnham Overy, November 13th, 1882, which measured 10 ft. long, and weighed 400 lbs. Another was taken about the same time at Lowestoft.

* Gobius niger (L.). Rock Goby.

The late Mr. F. J. Cresswell informed me that he had taken a specimen of this fish at Hunstanton, June 13th, 1876. He compared it carefully with Couch's figure, and had not the least doubt of its being this species. This is the first instance of its occurrence on the Norfolk coast.

Anarrhicas lupus (L.). Wolf-fish.

Mr. Gurney writes that "one measuring 36½ in. long was washed up on Cromer beach, 6th August, 1874."

* Trachypterus arcticus (Günth.). Deal-fish.

The first Norfolk specimen of this rare and singular fish was seen at Cole's, naturalist, Norwich, by Mr. Southwell, from whom I received the following note of its capture:—"It was taken in a drift-net by the 'Butterfly,' Wells, W. J. Hardman, on October 8th, 1879. It measures 53 in. long, 10. in. deep; thickness, about 1 in. After being purchased by Mr. T. J. Mann of Bishop Stortford, and exhibited at the Norwich Fisheries Exhibition, it was presented by that gentleman to the Norwich Museum, where it now is." Mr. Southwell's interesting account of this fish is published in the present volume of the 'Transactions of the Norfolk and Norwich Naturalists' Society' (p. 95).

Lota vulgaris (Cuv.). Burbolt.

The figure in 'Day's British Fishes' (pt. iv. p. 312) is from one caught in the river Thet, where it is not uncommon.

Raniceps trifurcatus (Flem.). Lesser Forkbeard.

"Two taken off Cromer, December, 1836."—Miss Gurney's 'Diary' (Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 21).

Motella tricirrata (Bl.). Three-bearded Rockling.

"One at Northrepps, December 24th, 1833."—Miss Gurney's 'Diary.'

* Rhombus megastoma (Nilss.). Sail Fluke.

Norfolk Estuary : June 18th, 1875.—R. Elwes, Esq.

This is the only specimen which I have seen. It is hitherto unrecorded as a Norfolk species.

* Solea aurantiaca (Günth.). Lemon Sole.

Several examples of this fish, caught in the Norfolk Estuary, have been sent to me by Mr. John Devonshire, Lynn.

Salmo salar (L.). Salmon.

Mr. Southwell informs me that one was taken on January 15th, 1869, below the New Mills, which weighed 15 lbs., and is now in the possession of Mr. C. J. Greene, Norwich. On January 29th, 1869, he saw one in the Norwich Fish-market, weighing 17½ lbs., which was taken by some boys in the flooded meadows at Trowse. And on February 6th, 1884, a male Kelt, measuring 37 in. and weighing 13 lbs., was taken, under similar circumstances, in a ditch on Trowse Common.

Salmo ferox (J. and S.). Lake Trout.

"Mr. J. J. Colman, M.P., has, I am informed, hatched a large number of ova of this species, which have been turned out into the streams around Norwich, but with little success."—Mr. Southwell in Lubbock's 'Fauna.'

Salmo fontinalis. American Brook Trout.

"Mr. C. L. Buxton has placed a large number of these fish in a stream at Bolwick, and, although at first they seemed to thrive, they have since disappeared. The Fish Acclimatization Society has hatched out and deposited a large number of various species of Salmonidæ in the rivers of Norfolk and Suffolk, but I cannot learn that their efforts have, at present, been attended with much success."—T. S.

Tinca aurea. Golden Tench.

Mr. F. Buckland writes (1876) that "these were first brought over by Sir Stephen Lakeman from Pomerania, at the time of the dinner of the Acclimatization Society in St. James' Hall." They

have, in recent years, been introduced into various parts of the county, and seem to have fairly established themselves.

Tinca vulgaris (Yar.). Tench.

The late Mr. Johnson of Watlington informed me that, in the ponds there, wherever Tench and Roach and Perch are found together, the former are always large, and there are few young ones to be seen; where there are no other fish the young Tench are numerous, and they never attain to a large size.

Orthagoriscus mola (L.). Sun-fish.

Miss Gurney records one found on Overstrand beach, November 13th, 1836.—Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 21.

Lamna cornubica (Gm.). Porbeagle.

"Yesterday a young Porbeagle Shark was found alive, stranded on Overstrand beach. It was 25½ in. long from snout to tail."—J. H. G., in lit., November 12th, 1880 (T. S.).

Alopecias vulpes (Gm.). Thrasher.

Mr. Southwell mentions one, caught in herring-nets off Lowestoft, September 28th, 1879: and another example, from the same locality, and caught under similar circumstances, on October 22nd, 1881. It measured: body, 6 ft. 6 in.: tail 6 ft. 4 in.

* Torpedo vulgaris (Yar.). Torpedo.

Mr. Levy of Lowestoft (December 1st, 1883) had a fine specimen, taken in a trawl-net off that place. The sketch which Mr. Levy sent me leaves no doubt that this was correctly named.

"One found alive on the beach at Sea Palling, and preserved by Gunn of Norwich, February 23rd, 1883."—T. S.

Squatina vulgaris (Gray). Monk-fish.

"I saw one exhibited by fishermen on the beach at Lowestoft, August 5th, 1874."—T. S.

Petromyzon marinus (L.). Sea Lamprey.

"One, 28½ in. long, caught in Barton Broad, June 18th, 1873, attached to a Tench, which it had commenced to eat."—T. S.

Mr. Southwell has forwarded me a list of Fish of unusual size, which have been taken in the last few years.

Trout (*Salmo fario*). Caught at Fakenham Mills, July 26th, 1879 ; 9 lbs. 6¾ ozs.

Perch. Taken on Ormesby Broad in 1879, weighing 4½ lbs. It took a smaller Perch, which had already taken a Brandling. On May 6th, 1882, a Perch, 4½ lbs., and 18 in. long, was taken at Trowse Hythe.

Bream weighing 11½ lbs. was caught in a pond at Beeston Regis on June 17th, 1879. ♂ fish, very dark in colour, 26 in. long, 10 in. deep, and 26 in. in girth. A ♀ taken at Thorpe, in the Yare, on June 23rd, weighed 8¾ lbs., and measured 23 in. long, and 19½ in. in girth.

Roach. T. Lord of Norwich caught a Roach at Ranworth on July 31st, 1883. 3 lbs. ; length, 17 in. ; girth, 12½ in.

Pike. Two Pike, caught on 17th February, 1880, in two different localities in Norfolk, both with rod and line, measured respectively 47 and 46 in. in length. The former weighed 36 lbs., and the latter 30½ lbs. ; they were both full females. Mr. Gunn says that he has never met with a male Pike weighing more than 20 lbs. Eleven Pike, taken by rod and line in Norfolk in the season of 1879—80, weighed respectively 36, 30½, 26, 24½, 27, 25, 23, 22, 21, 24, and 22 lbs. ; total, 281 lbs.

XV.

ADDITIONS TO THE LIST OF THE LEPIDOPTERA OF NORFOLK.*

By Charles G. Barrett.

Read 25th March, 1884.

Ten years have elapsed since the publication of a List of the Lepidoptera of this County, and the response to the appeal then made to the Entomologists of the Northern and Western parts of the County has been so satisfactory, that upwards of a hundred species have been added. The time seems therefore to have come when these additions should be recorded in the proceedings of this Society.

At the same time it will be desirable to make a few corrections—excluding species which were erroneously introduced into the List, and correcting the names of others which have been the subjects of more recent investigation.

Diurni.

Leucophasia sinapis. Linn. This species was inserted in the Norfolk List on the authority of Mr. E. A. Atmore. He has since discovered that he had been misled. The specimens were not taken in Norfolk. It must therefore be expunged.

Hesperia paniscus. Fab. The Rev. H. Williams vouches for the capture of a specimen of this very local species, in his presence, at Croxton, by William Cole.

Nocturni.

Sesia formiciformis. Esp. One specimen was taken at Brundall, in 1879, by Mr. J. B. Bridgman. He found it sitting on a flower.

* See Trans. Norfolk and Norwich Nat. Soc. vol. i. 1873–4 (Supplement).

MACROGASTER ARUNDINIS. Hüb. This is one of the species which were remarkable from being found only in the Fens of Cambridgeshire. It had become rare there, and was threatened with extinction, when, in 1873, eggs were sent to me, at Norwich, by Mr. F. D. Wheeler, obtained by him from a female Moth captured at Wicken Fen. These I took to Ranworth Fen, and there inserted them into the leaf-sheaths of a number of stems of the Common Reed *(Arundo phragmites)*. Five years afterwards (June, 1878) two males of this curious Moth were captured by Mr. W. H. B. Fletcher, in the immediate vicinity of the same Reed-beds at Ranworth. There is room, therefore, to hope that the species has established itself in a locality from which it is little likely to be exterminated.

LIMACODES TESTUDO. W.V. Taken by Mr. F. Norgate, at Cawston, Drayton, and Felthorpe.

SETINA IRRORELLA. Linn. Mr. Norgate informs me of the occurrence of a single specimen of this very local Moth, at Foxley Wood. Such occurrences as this, and that of *Hesperia paniscus* at Croxton, seem to indicate the immigration of chance specimens of these species seeking for a suitable home.

LITHOSIA HELVOLA. Ochs. (DEPLANA, Esp.) Mr. W. H. Thornthwaite, of London, reported the occurrence of four specimens in the County several years ago. He at that time collected great numbers of insects, some of them of extreme rarity, by means of powerful lamps.

GEOMETRÆ.

OPORABIA FILIGRAMMARIA. H.S. I fear introduced into the list in error. The Norwich specimen was certainly only *dilutata*. It is a very improbable species so far south.

Emmelesia unifasciata. Haw. Taken, rarely, at Hingham, by Mr. E. A. Atmore.

Eupithecia pulchellata. Steph. Found at Croxton and neighbourhood, by the Rev. H. Williams.

„ lariciata. Frr. Found in Larch plantations, at Merton, by Lord Walsingham, and at Shouldham and Myntlyn by Mr. Atmore.

„ subnotata. Hüb. Taken at Wootton by Mr. Atmore, but not commonly.

„ campanulata. H.S. Larvæ of this obscure species were found at Merton some years ago by the Rev. H. H. Crewe.

Lobophora hexapterata. W.V. Taken at Barton Bendish, near Lynn, by Mr. Atmore; but very local.

„ lobulata. Hüb. Taken in gardens at Croxton by the Rev. H. Williams.

Ypsipetes rubberata. Frey. Taken by the Rev. H. Williams at Kilverstone and West Tofts.

Melanippe rivata. Hüb. Captured at Bawsey, near Lynn, by Mr. Atmore.

Pseudo-Bombyces.

Cerura bicuspis. Bork. Two larvæ of this rare species were found at Aylsham, in 1881, by Mr. F. Norgate, who has also noticed empty cocoons at Sparham. The latter tantalizing evidences have also been found at Merton.

Clostera anachoreta. H.S. An experiment tried some years ago, of turning out larvæ of this very local species on the sallows at Barton Turf, seems to have been successful, the species being to all appearance established there.

Noctuæ.

Agrotis agathina. Dup. This beautiful species has been found, not uncommonly, by Mr. Atmore, on heath-blossom, at Bawsey, near Lynn.

Noctua flammatra. Fab. A single example of this great rarity was obtained by Mr. W. H. Thornthwaite, in 1875, by means of light, in Norfolk.

Noctua neglecta. Hüb. Taken by the Rev. H. Williams in his garden at Croxton. It was previously known to occur at Brandon, close to the Norfolk border.

Teniocampa miniosa. W.V. Found at Foxley Wood, by Mr. F. Norgate; but not commonly.

Euperia fulvago. W.V. A single specimen of this very local species is reported taken by Mr. Upcher at Tivetshall.

Dianthecia irregularis. Hufn. According to information received from the Rev. H. Williams, this species is to be found in the larva state at Croxton, Thetford, Brettenham, and wherever in that district its food plant (*Silene otites*) occurs. It is, however, extremely difficult to rear, almost every larva being destroyed by Ichneumon parasites.

Cucullia scrophulariæ. W.V. Larvæ which seem to belong to this very rare species have been found by the Rev. H. Williams, at Croxton, and by Mr. F. D. Wheeler, at Bramerton.

Heliothis armigera. Hüb. The capture of about twenty specimens in Norfolk, by means of light, is reported by Mr. W. H. Thornthwaite.

„ peltigera. W.V. One specimen, also taken by Mr. Thornthwaite.

„ scutosa. Schl. Among Mr. Thornthwaite's captures were also two specimens of this extremely rare species. He is reticent about the exact locality of his captures, but I believe them to be perfectly genuine.

Ophiodes lunaris. W.V. A single example of this—another of the rarest of British Moths—was taken by means of a lamp by Mr. F. D. Wheeler, at Stratton Strawless, in 1878.

Deltoides.

Schrankia turfosalis. Woeke. Found in plenty, in extremely restricted boggy localities at North Wooton and Bawsey, by Mr. Atmore.

Pyralides.

Endotricha flammealis. W.V. Found by Mr. Wheeler near Norwich, by Lord Walsingham at Merton, and rather frequently by Mr. Atmore at Lynn, Bawsey, Myntlyn, and Leziate. It was previously known to be common near Lowestoft, just outside the Norfolk boundary.

Margarodes unionalis. Hüb. A single specimen of this very rare Moth was obtained at Yarmouth, on June 15th, 1880, by Mr. Wheeler. It was found by Mrs. Wheeler, sitting on a Grass-stalk, on the sand-hills.

Eudorea ingratella. Zell. Taken by Mr. Atmore, at Hingham. Previously known to occur at Brandon, just outside the County.

Crambites.

Crambus hamellus. Thunb. Found pretty commonly at Croxton, Little Saxton, and neighbourhood, by the Rev. H. Williams and Dr. Battershell Gill: also at Bawsey by Mr. Atmore.

Ephestia ficella. Dougl. This species must be expunged from the County List. It was included from imperfect knowledge of the difficult group to which it belongs. In its stead the two following are inserted.

,, ficulella. Barrett. Norwich, Lynn,—in corn, seed, and oilcake warehouses.

,, passulella. Barrett. Norwich, Lynn, with the last species; sometimes abundant in the dock warehouses at Lynn.

EPHESTIA SEMIRUFA. Haw. The supposed specimen, recorded with some doubt, was certainly *Elutella*. This name must therefore be expunged.

PHYCIS BETULÆ. Goetz. Found in the larva state at Merton and Bawsey, and reared.

TORTRICES.

TORTRIX CRATÆGANA. Hüb. Found by Mr. Atmore, at Barton Bendish, but extremely local.

" LAFAURYANA. Ragonot. Mr. Atmore had the good fortune, in 1880, to add this interesting species to the British fauna. It occurs in an extremely restricted locality near Lynn, where it seems well established and not scarce among its food-plant—*(Myrica gale)*. I believe that no other British locality is yet known, and sincerely hope that it may be protected from extermination in this one spot.

PERONEA RUFANA. W.V. A single specimen was taken at North Wooton by Mr. Atmore.

" PERPLEXANA. Barrett. It has been found necessary to characterize this as a distinct species from the very puzzling group to which it belongs. Several specimens taken in Ranworth Fen were recorded, in error, as *P. tristana*.

" TRISTANA. Hüb. Must therefore be expunged.

" LORQUINIANA. Dup. (DICTYOPTERYX ULIGINOSANA, Bent.) This interesting and very local species appears to have quite recently spread from its previously known localities in Cambridgeshire into Norfolk, several specimens having been found in the year 1878 by Messrs. Fletcher and Wheeler, in Ranworth Fen, in which well-worked locality it had never before been noticed.

PENTHINA CAPREANA. Hüb. One specimen, taken at North Wooton, by Mr. Atmore.

" SELLANA. Hüb. Recorded at Croxton by the Rev. H. Williams.

Mixodia rubiginosana. H.S. (bouchardana, Dbl.) This scarce northern species appears to have been introduced into Norfolk from Scotland, several specimens having been taken by Mr. W. A. Atmore, in June, 1882, at Shouldham, among Firs, which were brought when young from that country.

Sciaphila pasivana. Hüb. Found at Castle Rising, and pretty generally in the Lynn district, by Mr. E. A. Atmore.

Phoxopteryx uncana. Hüb. Bawsey, near Lynn.

Phlæodes demarniana. Fisch. Three specimens have been taken at Wormegay and Bawsey, in 1881-2-3, by the Messrs. Atmore.

Steganoptycha rufimitrana. H.S. This rare species, only recently added to the British fauna, has been captured and also reared from *Abies cephalonica* at Merton, by Lord Walsingham. Its only other known British locality is Cambridge.

Halonota brunnichiana. W.V. Croxton; not scarce.

„ signatana. Dougl. Barton Bendish, among *Prunus padus*; not common.

Coccyx splendidulana. Gn. Merton, Bawsey, Runcton: frequent among Oaks.

„ ochsenheimeriana. Zell. This lovely little species has recently been added to the British fauna by Lord Walsingham, who has taken it in some numbers among *Abies cephalonica*, at Merton.

„ nigricana. H.S. This rare species—also a recent addition to the British fauna—has been taken by Lord Walsingham, at Merton, among the same species of Fir. Its only other known British locality is in Herefordshire.

Carpocapsa grossana. Haw. Taken at Croxton by the Rev. H. Williams.

Stigmonota nitidana. Fab. (redimitana, Gn.) Found at Tottenham by Lord Walsingham, and at North Wooton by Mr. Atmore.

Stigmonota weirana. Dougl. Taken at Croxton, among Beech, by the Rev. H. Williams.

,, erectana. Barrett. The only known specimen of this extremely lovely little Moth was taken among Broom (*Spartium scoparium*) at Merton, by the Hon. Beatrice de Grey.

Catoptria conterminana. H.S. Found at Hingham by Mr. Atmore, but scarce.

Eupœcilia dubitana. Hüb. Gaywood, Croxton; scarce.

,, hybridella. Hüb. Hingham; scarce.

,, vectisana. West. Taken in plenty by Mr. Atmore in salt-marshes at Hunstanton.

,, manniana. T.R. One specimen at Bawsey, by Mr. Atmore; a rare species.

Tineina.

Solenobia triquetrella. Hüb. This name must be expunged. In its stead may be entered—

,, lichenella. Zell. Brandon, abundant; only females obtained.

Scardia corticella. Curt. (emortuella, Z.) Taken at North Wooton by Mr. Atmore; but scarce.

Tinea bistrigella. Haw. Bawsey, North Wooton; common among Birch.

Incurvaria pectinea. Fab. Bawsey; among Birch.

,, œhlmanniella. Hüb. Wormegay, Bawsey; local.

,, capitella. Linn. Lynn; about Currant-bushes.

Adela rufimitrella. Scop. Taken at Wormegay, on flowers of Ranunculus.

Swammerdamia oxyacanthella. Z. Lynn; among Hawthorn.

Scythropia crataegella. Linn. Rather common in the Lynn district among Hawthorn.

Yponomeuta vigintipunctatus. Retz. Taken at Hickling Fen by Mr. Wheeler, and once at Carbrooke by Mr. Atmore.

Depressaria scopariella. W.V. This name must be entered instead of *D. atomella*, which is incorrectly included, and must be expunged.

,, nervosa. Haw. Taken at Hoveton by Mr. F. Norgate.

GELECHIA POPULELLA. Linn. Lynn, Shouldham, Wormegay, Croxton; common on Poplar and Sallow.

,, NIGRA. Haw. (CAUTELLA, Z.) Croxton, Lynn, on Poplar; not common.

,, MOROSA. Zell. An obscure species, and previously overlooked; but I remember finding the larva feeding in tops of *Lysimachia vulgaris*, in Ranworth Fen, while in Norfolk.

,, POLITELLA. Dougl. Bawsey, Wormegay.

,, SIMILIS. Dougl. Bawsey.

,, SCRIPTELLA. Hüb. Bawsey, Hingham.

,, HUBNERI. Hw. (?) Reported from Croxton by the Rev. H. Williams.

,, OBSOLETELLA. Fisch. Hunstanton; in salt marshes.

,, INSTABILELLA. Dougl. Near Hunstanton.

,, ATRIPLICELLA. Fisch. Like the two last, taken near Hunstanton by Mr. Atmore.

,, ALBICEPS. Zell. Lynn.

,, SUBOCELLEA. Steph. Merton; scarce.

MACROCHILA MARGINELLA. Fab. Merton, Stanford; among Juniper.

ARGYRESTHIA SPINIELLA. Zell. Lynn, Wooton; local.

ORNIX SCOTICELLA. Stn. Bawsey.

COLEOPHORA FABRICIELLA. Vill. North Runcton; common among *Trifolium pratense*.

STATHMOPODA PEDELLA. Linn. This is, perhaps, the most interesting of Mr. Atmore's numerous additions to the list of Tineina. It is not only a singular and beautiful species, but most uncertain, appearing occasionally in plenty, and disappearing for many years. Mr. Atmore, however, found it at Bawsey rarely in 1878 and 1879, and much more plentifully in 1882 and 1883. It appears to be there confined to a few old Alders.

LAVERNA VINOLENTELLA. H.S. Norwich; among Crab-apple, formerly mixed with *L. atra*.

ELACHISTA APICIPUNCTELLA. Stn. Taken at Bawsey and Wormegay by Mr. Atmore; seldom found so far south.

,, OCHREELLA. Stn. Wormegay, Bawsey.

Lithocolletis emberizæpennella. Bouch. Wormegay, Myntlyn; among Honeysuckle.

,, aucupariella. Scott. Bawsey; reared from larvæ in leaves of Mountain Ash.

Bucculatrix demaryella. Dup. Bawsey.

Nepticula anomalella. Goe. Myntlyn.

,, catharticella. Stn. Croxton.

,, argentipedella. Zell. Bawsey.

,, tityrella. Dougl. Middleton.

,, angulifasciella. Stn. Bawsey.

,, gratiosella. Stn. Bawsey, North Runcton.

,, marginecolella. Stn. North Runcton.

,, glutinosæ. Stn. Bawsey; among Alder.

Pterophorina.

Oxyptilus parvidactylus. Haw. Taken in a lane, at Croxton, by the Rev. H. Williams.

,, distans. Zell. This name must be substituted for *O. latus*, the correction having been ascertained in correspondence with the late lamented Professor Zeller, and by comparison with authentic specimens.

Additional Notes on Lepidoptera already recorded in the Norfolk List.

As will readily be supposed, the industry and skill of the Norfolk Entomologists has not merely resulted in the discovery of species not previously known to occur in the county, but has supplied an immense number of additional localities for species already recorded.

Where these additional items of information refer to scarce or local species, or to species not fully noticed in the original list, it seems desirable that a record should be kept of them.

For localities situated around King's Lynn—Bawsey, Barton Bendish, Wooton, Myntlyn, Wormegay, Hingham, Hunstanton, &c.—we are indebted to the constant and indefatigable exertions of Mr. E. A. Atmore of Lynn; for captures at Sparham, Cawston,

Felthorpe, Dilham, Drayton, and Foxley and Hockering Woods, to Mr. F. Norgate, formerly of Sparham; for those at Croxton and other places round Thetford, to the Rev. H. Williams of Croxton; for those on the Merton estate to Lord Walsingham; and for many in the Norwich and Fen districts to Mr. F. D. Wheeler.

Argynnis paphia. Linn. Abundant at Foxley wood.

Apatura iris. Linn. Abundant at Foxley wood.

Macroglossa fuciformis. Linn. Wormegay, Middleton, Drayton.

Sesia culiciformis. Linn. Dilham.

„ bembeciformis. Hüb. Found by Mr. Norgate commonly at Foxley, Hockering, Sparham, Hindolvestone, and Kerdistone.

Procris statices. Linn. Found abundantly near Lynn by Mr. Atmore.

Nola confusalis. H.S. Common at Foxley, Sparham, and Hockering.

Lithosia aureola. Hüb. Lynn, Sparham, Hockering. Common at Foxley wood.

„ quadra. Linn. Merton, Barton Bendish, and Drayton.

Spilosoma fuliginosa. Linn. Sparham and Billingford.

Liparis chrysorrhœa. Linn. Sparham.

„ salicis. Linn. Barton Turf, Clenchwarton, Lyng, and Hickling.

„ monacha. Linn. Foxley wood.

Demas coryli. Linn. Foxley wood.

Trichiura crataegi. Linn. Lynn, Sparham, Hockering, and Foxley.

Eurymene dolabraria. Linn. Wooton, Middleton.

Selenia illustraria. Hüb. Thetford, Barton Bendish.

„ lunaria. W.V. Merton.

Ennomos fuscantaria. Haw. Not uncommon in the fens of the Bure.

„ erosaria. W.V. Common in the fens of the Bure.

Biston hirtaria. Linn. A fine dark variety has been taken by the Rev. H. Williams near Watton.

Phorodesma bajularia. W.V. Lynn.

Ephyra porata. Linn. Lynn.

„ trilinearia. Bork. Common near Croxton.

Hybia auroraria. Gn. Merton, Hingham.

Acidalia subsericeata. Haw. Bawsey, Barton; abundantly at Stratton Strawless.

,, emutaria. Hüb. Croxton.

,, inornata. Haw. Wooton.

Corycia taminata. W.V. Abundant at Wormegay, and apparently rather common in the woods of West Norfolk.

Numeria pulveraria. Linn. Hingham.

Abraxas ulmata. Fab. Aylsham; common at Castle Rising among Wych Elm.

Emmelesia affinitata. Steph. Wooton; common at Castle Rising.

Eupithecia succenturiata. Linn. Wooton, Hingham.

,, pygmæata. Hüb. Common at Wormegay.

,, irriguata. Hüb. Merton.

,, indigata. Hüb. Myntlyn.

,, absynthiata. Linn. Merton, Hingham.

,, dodoneata. Gn. Lynn; not common.

,, exiguata. Hüb. Lynn, Bawsey.

,, coronata. Hüb. Merton, Bawsey, Hingham.

Anticlea sinuata. W.V. Beachamwell; scarce.

Coremia quadrifasciaria. Linn. Generally common in West Norfolk, and found rather plentifully last year near Norwich.

Cidaria sagittata. Fab. Thetford.

Chesias obliquaria. W.V. Bawsey; scarce.

Drepana falcula. W.V. Foxley, Drayton, Alderford, Felthorpe, Wormegay, and Barton Bendish.

Stauropus fagi. Linn. Thetford, Drayton, Hockering wood.

Petasia cassinea. Fab. Merton, Sparham, Hockering, and Foxley wood.

Clostera curtula. Linn. Hingham.

Notodonta camelina. Linn. Common at Foxley wood.

,, cucullina. W.V. Morton and Sparham; many larvæ found at Merton in 1876.

,, dictæa. Linn. Merton.

,, dictæoides. Esp. Merton.

,, dromedarius. Linn. Merton, Foxley, Drayton, Whitwell, Aylsham, Bawsey, and Wooton.

Notodonta trepida. Fab. Merton, Croxton, Drayton, and Stratton Strawless.

„ dodonea. W.V. Merton, Thetford, and Stratton Strawless.

Cymatophora diluta. W.V. Common at Foxley wood.

„ flavicornis. Linn. Frequent at Wooton.

„ ridens. Fab. Common at Drayton and Felthorpe.

Acronycta alni. Linn. Aylsham, Sall, Stratton Strawless.

Senta ulvæ. Hüb. Merton.

Tapinostola elymi. Tr. Snettisham; Mr. Atmore.

Nonagria cannæ. Ochs. Near Stalham.

Caradrina alsines. Bork. Merton.

Agrotis puta. Hüb. Hingham.

„ saucia. Hüb. Reared from the larva at Lynn; taken at Dilham, and commonly at Sparham.

Tripilena fimbria. Linn. Common at Foxley wood.

„ subsequa. W.V. Croxton.

Noctua glareosa. Esp. Sparham, Croxton, West Winch.

„ rhomboidea. Tr. Hackford, Sparham.

Tracilea pinipenda. Esp. Drayton; common at Cawston and Heydon; abundant near Lynn.

Orthosia suspecta. Hüb. Bawsey.

Xanthia silago. Hüb. Wooton, Sparham; common at Foxley wood.

„ gilvago. Esp. Lynn, Myntlyn.

Tethea subtusa. W.V. Croxton; frequent at Lynn.

„ retusa. Linn. Merton, Hingham.

Eremobia ochroleuca. W.V. Hunstanton, Hackford.

Epunda viminalis. Fab. Common at Foxley wood.

Aplecta nebulosa. Tr. Myntlyn, Foxley and Hockering woods.

Hadena atriplicis. Linn. Croxton, Middleton, and Bawsey.

Xylina rhizolithia. W.V. Sparham, Hockering, Foxley, Whitwell, Reepham, and Sall.

Cucullia chamomillæ. W.V. Mr. W. H. Thornthwaite reports the capture of seven or eight specimens in Norfolk.

Heliothis marginata. Fab. Merton, Whitwell, Sparham; common at Foxley wood. Larvæ found feeding on sallow by Mr. Norgate.

Heliothis dipsacea. Linn. Barton Bendish.

Heliodes arbuti. Fab. Croxton.

Brephos parthenias. Linn. Near Lynn.

Plusia v-aureum. Gn. Hingham.

Catocala fraxini. Linn. One at Hunstanton.

Phytometra ænea. W.V. Bawsey; common at Cawston.

Hypenodes costæstrigalis. Steph. Wooton; frequent.

Aventia flexula. Fab. Hingham, Wooton, Bawsey, and Myntlyn.

Ebulea verbascalis. W.V. Bawsey and Croxton.

Spilodes palealis. W.V. Captured and reared at Croxton by the Rev. H. Williams, and taken at the same place and at Thetford by Dr. Battershell Gill of London; also found at Booton by Mr. Norgate, and one from a chalk pit at Barton Bendish, seen by Mr. Atmore.

Eudorea lineola. Curt. Croxton, Hingham; scarce.

„ truncicolella. Stn. Lynn.

Crambus latistrius. Haw. Croxton, Bawsey.

„ warringtonellus. Zell. Croxton, Bawsey; taken at Hunstanton, by Mr. Harold Ruston.

„ fascelinellus. Hüb. A second locality, found at Hunstanton by Mr. H. Ruston.

„ chrysonuchellus. Scop. Croxton; abundant.

Schœnobius mucronellus. Scop. Merton.

„ gigantellus. W.V. Merton.

Anerastia Farrella. Curt. I have lately ascertained that the original specimens were taken near Yarmouth. One of them is in the possession of Mr. G. W. Bird of London, who also possesses Mr. Farr's collection and diary. Other specimens are in Mr. F. Bond's collection. In 1881 this most interesting species was rediscovered by Mr. E. A. Atmore, on coast sand-hills, near Hunstanton. He has met with it in both subsequent years, taking in all sixteen specimens.

Homœosoma nebulella. Hüb. Croxton; plentifully.

Cryptoblabes bistriga. Haw. Two specimens have been taken at Shouldham by Mr. W. A. Atmore.

Plodia interpunctella. Hüb. In warehouses at Lynn.

Phycis carbonariella. Fisch. Bawsey, scarce; Croxton. The Rev. H. Williams notices its curious habit of resting only on the burnt patches on the Heaths, with which its black colour closely assimilates.

„ abietella. W.V. Croxton.

„ roborella. W.V. Croxton, Bawsey.

Rhodophæa consociella. Hüb. Wooton, Croxton.

„ advenella. Zinck. Croxton, Bawsey.

„ marmorea. Haw. Croxton.

Oncocera ahenella. W.V. Barton Bendish; scarce.

Galleria cereana. Linn. Common at Croxton and Sparham.

Meliphora alveariella. Gn. Croxton and Sparham. The Rev. H. Williams remarks respecting the last two species, both of which infest bee-hives, that they are only destructive to neglected hives, seldom feeding on new wax, but preferring that which has been allowed to remain in the hive several years. He considers *Cereana* by far the more destructive of the two.

Halias quercana. W.V. Foxley wood, Croxton; common in the larva state.

Sarrothripa revayana. W.V. Croxton, Felbrigge.

Tortrix cinnamomeana. Tr. Merton.

„ icterana. Fröl. Wooton, Hingham.

Dichelia grotiana. Fab. Deopham, Bawsey, Wooton, and Hingham; frequent.

Peronea mixtana. Hüb. Wooton, Bawsey.

„ cristana. W.V. Merton.

Ptycholoma lecheana. Linn. Myntlyn, Wooton; frequent.

Penthina ochroleucana. Hüb. Myntlyn, Croxton.

Antithesia salicella. Linn. Croxton, Hingham, Clenchwarton; local.

Sericoris bifasciana. Haw. Croxton, Bawsey.

„ micana. Hüb. Croxton, Hingham.

Orthotænia antiquana. Hüb. Wormegay, Myntlyn, Carbrooke; not common.

„ ericetana. Burt. Merton, Bawsey; among Mint.

Cnephasia lepidana. Curt. Merton.
Sciaphila nubilana. Hüb. Lynn.
Phoxopteryx siculana. Hüb. North Wooton, Hingham.
„ inornatana. H.S. Wooton, Hingham.
„ diminutana. Haw. Wooton, Bawsey.
Grapholitha nigromaculana. Haw. Merton.
Phlæodes immundana. Fisch. Bawsey, Wormegay.
Pœdisca occultana. Doug. Merton; among Larch.
Halonota bimaculana. Doug. Wooton.
„ foeneana. Linn. Wooton.
„ nigricostana. Haw. Bawsey.
„ ephippana. Hüb. (Populana). Wooton, Merton.
Olindia ulmana. Hüb. Lynn, Hingham.
Heusimene fimbriana. Steph. Bawsey.
Retinia turionana. Linn. Lynn, Croxton.
„ pinivorana. Zell. Bawsey, Wooton.
Stigmonota internana. Gn. North Wooton.
Catoptria fulvana. Steph. Croxton.
„ citrana. Hüb. Croxton.
Tricheris mediana. W.V. Bawsey, Wooton.
Choreutes scintillulana. Hüb. Wormegay, Holme-next-sea.
Lobesia reliquana. Hüb. Wormegay, Wooton.
Eupœcilia nana. Haw. Wooton, Bawsey, Croxton.
„ albicapitana. Cooke. Middleton; scarce.
„ atricapitana. Steph. Wormegay.
„ geyeriana. H.S. Near Lynn.
„ degreyana. Mc L. Croxton.
Argyrolepia baumanniana. W.V. Hingham; scarce.
„ sub-baumanniana. Wilk. Ashill, Croxton.
„ badiana. Hüb. Bawsey, Wooton.
„ cnicana. Dbl. Croxton, Wooton.
Tortricodes hyemana. Hüb. Croxton.
Tinea misella. Zell. Merton, Wooton.
„ semifulvella. Haw. Wooton.
Lampronia quadripuncta. Fab. Wormegay.
Adela fibulella. W.V. Bawsey.
Cerostoma sequella. Linn. Carbrooke.
„ vittella. Linn. Wooton, Tilney.
Ypsolophus sylvellus. Linn. Hingham, Carbrooke.

Harpipteryx scabrella. Linn. Croxton.
Enicostoma lobella. W.V. Merton.
Depressaria subpropinquella. Stn. Lynn.
„ pulcherrimella. Stn. Merton; one specimen.
Gelechia atrella. Haw. Merton.
„ lathyri. Stn. Irstead.
„ pictella. Zell. Merton, Croxton.
Cleodora cytisella. Curt. Abundant at Bawsey; but very local.
Sophronia parenthesella. Linn. Croxton; common at Merton in 1883.
Œcophora minutella. Linn. Merton.
Æchmia dentella. Stn. Merton.
Tinagma resplendella. Doug. Wormegay.
Argyresthia præcocella. Zell. Merton.
„ dilectella. Zell. Wooton.
Coleophora inflatæ. Stn. Croxton.
„ viminetella. Stn. Larvæ found on *Myrica gale* near Lynn.
Cosmopteryx lienigiella. Zell. Wormegay, Shouldham.
Batrachedra pinicolella. Zell. Wooton, Merton.
Lithocolletis hortella. Fab. Middleton.
Phyllocnistis suffusella. Zell. Merton.
Bohemannia quadrimaculella. Boh. Bawsey; very local, but not rare.
Oxyptilus teucrii. Greening. Merton, Croxton, Bawsey.
Leioptilus microdactylus. Hüb. Croxton.
Aciptilia galactodactyla. Hüb. Foxley and Hockering woods.

XVI.

FAUNA AND FLORA OF NORFOLK.

Hemiptera.

(Heteroptera and Homoptera.)

By James Edwards.

Read 26th February, 1884.

In laying before the Society an extended and corrected list of the Hemiptera known to occur in this County, I feel it necessary to take leave in a becoming manner of the list of those insects which you did me the honour to publish in the year 1878 (vol. ii. p. 490). The chief fault of that list is, that it has grown old; for, although the nomenclature therein employed is the best that was then attainable, our increased knowledge of these insects has been accompanied by great changes in that respect; and, moreover, the time which has elapsed has enabled me to elaborate certain views of my own with regard to the Homopterous division which I have adopted in the present list.

During the past five years I have taken every opportunity to extend my range in search of Hemiptera, working successively the coast-sands of the east and north-west parts of the county, the salt-marshes at Hunstanton and Wells, the half-reclaimed bog and warren of the Felthorpe district, the Horning and Ranworth marshes, and the sandy district north-east of Brandon (a most disappointing locality for the Hemipterist, where I speedily found myself ankle-deep in sea-sand, without the advantage of the exhilarating influence of a sea-breeze), while my energetic friend Mr. Thouless has lately made a very successful raid on one of the oldest and most extensive of the plantations, which in this county do duty for natural woods. I think, therefore, that the four hundred and seven species now recorded, although by no means to be regarded as an exhaustive catalogue, may be taken as fairly representative of the Hemipterous Fauna of this county. It is somewhat gratifying to find that we have four species, which, so far as my present information goes (and large numbers of Hemiptera

from distant localities have passed through my hands during the past few years), in this country are only found in Norfolk; viz.—

Lygus atomarius. Meyer. This species occurs at Stratton Strawless on a fine example of the Silver Fir. I have now had the colony of this insect under observation for three years, and although it shows no desire to extend its range to adjacent trees, I am glad to say that its numbers are not perceptibly diminished. Although these insects were no doubt originally introduced with the tree on which they are found, they must have been denizens of Norfolk for many generations. It appears to be a rare species on the Continent.

Idiocerus herrichii. Kbm. The occurrence of this fine species on a single very ordinary-looking tree of *Salix alba*, at the same place as the last-mentioned, is very puzzling. It occurs very rarely, and the destruction of the tree which it inhabits (not at all an unlikely circumstance, judging from its state of dilapidation the last time I saw it), would probably mean the extinction of the species in Britain.

Idiocerus poecilus. H.S. This insect, which is the *Id. Heydenii* of my previous list, occurs on Lombardy Poplar. It is all but extinct in its original locality at Cossey, where the Poplars are all either dead or dying, and I was therefore very pleased to take a single example off a young and flourishing tree at Wacton during the past season.

Idiocerus aurulentus. Kbm. I found one example of this species amongst some insects taken off Lombardy Poplar at Cossey some years ago. I have not detected any others, but it is very likely to be passed over in the net as *Id. H-album*.

It is much to be regretted that the insect-fauna of Norfolk has not been more thoroughly investigated, for from the peculiar situation and physical conditions of the county, much may be done, even in the humble capacity of local faunist; but although there seems to be no lack of persons ready to rush hither and thither, in order to overcome and slay a few Butterflies and Moths, the number of entomological *workers* is very few indeed. Possibly the disfavour with which Entomologists are regarded by land-(and water-)owners and occupiers may have something to do with this; for I certainly have been able to find very few places where one is not confronted by a notice that trespassers will be prosecuted; while, to

turn one's boat up a dyke is to insure, not only present molestation, but a chain of circumstances, the pecuniary cost of which few persons care to incur, to say nothing of the inconvenience of a compulsory attendance before country magistrates. A few years since I had a week's collecting in the neighbourhood of Deal and Dover, where I was much surprised at the very different state of affairs, for so long as the pedestrian abstains from absolute damage, he is practically at liberty to roam whithersoever he will. It is needless for me to point out what would be the fate of the man who essayed, sweeping-net in hand, to walk through a plantation here about the middle of May. Truly the Norfolk Entomologists' lines have not fallen in pleasant places. Mousehold Heath is to be taken away from us; and there is said to be a movement on foot to petition the Society for the Prevention of Cruelty to Animals for an officer to inspect our killing-bottles, and see that the corks fit properly.

The study of the Hemiptera-Homoptera, which it is my chief business to advocate here, is one of more than ordinary interest, owing to the comparatively little attention which has hitherto been paid to these insects in this country, and the consequent probability of new species occurring; and although they are not very imposing in point of size, they yield to no order of insects in beauty of form and delicate, though generally somewhat sober, coloration. Owing to their jumping habits, some small amount of tact and prowess is necessary for their capture, while from the very delicate organization of many species, their mounting and ultimate preservation is well calculated to promote the exercise of that very desirable quality, patience.

In this country Homoptera are generally carded, but inasmuch as very important structural characters are found on the under side, I much prefer pinning them all close to the scutellar angle of the right wing-case; and if a sufficiently fine pin is used, and the pinning operation be conducted with a due amount of care, the most delicate specimen may be mounted without the least distortion. For a working collection, what is generally known as "setting out" is neither necessary nor desirable. The position of the pin is a matter of very great importance, and experience has shown that the place above indicated is the least objectionable, because the pin, passing through the metasternum, gets a firm hold of the insect, while the scutellum remains perfectly intact; and in those

cases where it is necessary to examine the neuration of the wings, the left elytron may be raised, and the wing expanded without any damage to the specimen. For very small and delicate insects it is necessary to use the varnished-steel or silver-wire pins, prepared especially for micro-insects, fixing them in a small block of pith impaled on a strong pin; and in order to insure a successful preparation of certain very fragile species, such as Typhlocybidæ, and some of the smaller Delphacidæ and Deltocephali, especially if they are not quite mature, it is sometimes desirable to expose them to the action of the atmosphere for a few hours, to give them the opportunity of parting with some of their superfluous moisture before attempting to pin them. For pinning the larger species, I strongly recommend the finer sizes of black Vienna pins, cut down to the length of an English No. 8, and run through the specimen for two-thirds of their length. English black pins are both clumsy and brittle. The preservation of one's collection is of the first importance, and fortunately is, with ordinary care, easily accomplished. Our three great enemies are,—verdigris, mould, and mites. By using the pins above mentioned we obviate the first of these; and by keeping our store-boxes *well* supplied with camphor, the two latter may be effectually prevented. The identification of the species is not an easy matter at the present time, but English descriptions of most of our species are to be found scattered through the pages of several volumes of the 'Entomologist's Monthly Magazine.'

The foregoing remarks apply solely to the Homoptera. The Heteroptera should be carded, and their identification is rendered comparatively easy by Mr. Saunders' excellent 'Synopsis.'

HEMIPTERA.

HETEROPTERA.

Gymnocerata.

Scutelleridæ.

Corimelæna scarabæoides. Linn. Scarce.

Odontoscelis fuliginosus. Linn. "Sand-hills at Burnham:" Curtis.

Podops Inunctus. Fab. Scarce. I have taken but one example.

Cydnidæ.

Sehirus bicolor. Linn. Common.
" albomarginatus. Fab. Not common.
" picipes. Fab. Sand-hills, Yarmouth; scarce.

Pentatomidæ.

Ælia acuminata. Linn. "Caistor near Yarmouth in June:" Curtis.
Podisus luridus. Fab. Scarce. I beat one example from Birch, and have one or two others from Mr. F. Norgate.
Pentatoma verbasci. De Gear. One example from Mr. F. Norgate.
" viridissima. Poda. "On Firs, very common:" Paget's 'Yarmouth.'

Acanthosomidæ.

Piezodorus lituratus. Fab. On Furze and Broom, not common.
Acanthosoma griseum. Linn. } Common on various trees in
" dentatum. De Gear. } autumn.
" hæmorrhoidale. Linn. Not so common as the two preceding species.
Picromerus bidens. Linn. Not common.
Tropicoris rufipes. Linn. Abundant.

Coreidæ.

Bathysolen nubilus. Fall. One example from Mr. F. Norgate.
Dascycoris hirticornis. Fab. Household Heath; rare.
Therapha hyoscyami. Linn. "Caister marrams on *Ononis*, rare:" Paget's 'Yarmouth.'
Myrmus miriformis. Fall. Not uncommon in dry situations. Two examples of the developed form have occurred.
Chorosoma schillingi. Schm. Coast sands.
Alydus calcaratus. Linn. Household Heath.

Berytidæ.

Berytus cognatus. Fieb. In Moss.
" clavipes. Fieb. "Norfolk:" Curtis.

Lygæidæ.

Gastrodes ferrugineus. Linn. Abundant on Scotch Firs.
„ abietis. Linn. In cones of Spruce Fir, Merton Park.
Plociomerus fracticollis. Schill. Rare—a Fen insect.
Nysius thymi. Wolff. Dry places, especially coast-sands.
Scolopostethus adjunctus. D. and S. Not uncommon in dry places.
„ affinis. Schill. Not common.
„ ericetorum. Leth. Common under Heath.
„ contractus. H.-S. In Moss.
Calyptonotus pini. Linn. Scarce—at roots of Heath, &c., in sandy places.
„ pedestris. Panz. Not uncommon—under bark of Whitethorn, &c.
Trapezonotus agrestis. Panz. Common in sandy places.
Macrodema microptera. Curt. In Moss in sandy places.
Drymus sylvaticus. Fab. } Common in Moss, dead leaves,
„ brunneus. Sahl. } &c.
Rhyparochromus dilatatus. H.-S. Moss, &c., in sandy places.
„ chiragra. Fab. Not common in Moss.
„ prætextatus. H.-S. "Mouschold Heath:" Curtis.
Peritrechus luniger. Schill. Heathy places; not uncommon.
Plinthisus brevipennis. Latr. Dry sandy places; uncommon.
Acompus rufipes. Wolff. Marshes; somewhat rare.
Stygnocoris sabulosus. Schill. } Common in sandy places.
„ arenarius. Hahn. }
Heterogaster urticæ. Fab. Lynn; one example from Mr. Bridgman.
Ischnorhynchus didymus. Zett. On Birch.
„ geminatus. Fieb. On Heath.
Cymus glandicolor. Hahn. } Found by sweeping in damp places.
„ clavicullus. Fall. }
„ melanocephalus Fieb. }
Chilacis typhæ. Perris. In heads of *Typha latifolia*.

Tingididæ.

Piesma quadrata. Fieb. } Found by sweeping and under herbage; the first more particularly on the coast.
„ laportei. Fieb. }
„ capitata. Wolff. }

SERENTHIA LÆTA. Fall. Local; Dunston Common by sweeping.
MONANTHIA CARDUI. Linn. On Thistles.
„ DUMETORUM. H.-S. On old Whitethorns.
„ HUMULI. Fal. On *Myosotis*.
DEREPHYSIA FOLIACEA. Fall. Occasionally by sweeping.
DICTYONOTA STRICHNOCERA. Fieb. On dwarf Furze and in Moss.
ACALYPTA PARVULA. Fall. Common in Moss.
„ CERVINA. Germ. In Moss; one example only.

CAPSIDÆ.

MIRIS CALCARATUS. Fall.
„ LÆVIGATUS. Linn. } Common by sweeping.
„ HOLSATUS. Fab. Very local in this county; Dunston Common.
MEGALOCERÆA ERRATICA. Linn. Common by sweeping.
„ LONGICORNIS. Fall. Not common.
„ RUFICORNIS. Fall.
LEPTOPTERNA DOLOBRATA. Linn. } Common by sweeping.
„ FERRUGATA. Fall.
PANTILIUS TUNICATUS. Fab. Common on Birch in the Autumn.
LOPUS GOTHICUS. Linn. On *Rubus idæus;* not common.
PHYTOCORIS DISTINCTUS. D. and S. On Poplar, &c.; scarce.
„ LONGIPENNIS. Flor.
„ POPULI. Linn. } Common by beating.
„ TILIÆ. Fab.
„ VARIPES. Boh.
„ ULMI. Linn. } Common by sweeping.
ONCOGNATHUS BINOTATUS. Fab.
CALOCORIS STRIATELLUS. Fab. On Sallow.
„ ROSEO-MACULATUS. De G. By sweeping; not common.
„ INFUSUS. H.-S. On Oak; scarce.
„ CHENOPODII. Fall. By sweeping; not uncommon.
„ BIPUNCTATUS. Fab. On Nettles, &c.; very abundant.
RHOPALOTOMUS ATER. Linn. Not common by sweeping.
CAPSUS LANIARIUS. Linn. Very abundant.
„ SCUTELLARIS. Fab. Hindolveston: Dr. Power.
LIOCORIS TRIPUSTULATUS. Fab. Common on Nettles, &c.
DICHROOSCYTUS RUFIPENNIS. Fall. On Scotch Fir; very local.

Pœciloscytus gyllenhali. Fall. } Occasionally by sweeping.
„ unifasciatus. Fab. }

Lygus pabulinus. Linn. }
„ contaminatus. Fall. }
„ viridis. Fall. } All more or less common by
„ lucorum. Meyer. } sweeping.
„ spinolæ. Meyer. }
„ pratensis. Fab. }

„ Kalmii. Linn. } By sweeping *Umbelliferæ*.
„ pastinacæ. Fall. }

„ cervinus. H.-S. On Ash trees.

„ rubricatus. Fall. On Scotch Firs.

„ atomarius. Meyer. Stratton Strawless, on Silver Fir; rare.

Camptobrochis lutescens. Schill. On Lime, &c.

Monalocoris filicis. Linn. } Common on Ferns.
Bryocoris pteridis. Fall. }

Pithanus Mærkeli. H.-S. Common by sweeping.

Globiceps selectus. Fieb. Scarce. One ♀ example only by sweeping.

„ flavonotatus. Boh. }
Cyllocoris histrionicus. Linn. } Common on Oaks, &c.
Campyloneura virgula. H.-S. }
Ætorhinus angulatus. Fall. }

Chlamydatus ambulans. Fall. } Sweeping in damp places, not
„ caricis. Fall. } common.

Byrsoptera rufifrons. Fall. Both sexes are about equally common with us.

Systellonotus triguttatus. Linn. Household Heath.

Dicyphus globulifer. Fall. Occasionally by sweeping.

„ annulatus. Wolff. On *Ononis* on the coast.

„ epilobii. Reut. Common on *Epilobium*.

„ stachydis. Reut. Occasionally by sweeping.

„ pallidicornis. Fieb. On *Stachys*; common.

Macrolophus nubilus. H.-S. Occasionally by sweeping.

Malacocoris chlorizans. Block. On Hazel; not uncommon.

Pilophorus bifasciatus. Fab. On Scotch Fir; scarce.

Stiphrosoma leucocephalum. Linn. By sweeping, one example.

Heterocordylus tibialis. Hahn. On Broom. } Rather common.
„ unicolor. Hahn. On *Genista*. }

ORTHOCEPHALUS SALTATOR. Hahn. Under *Ononis*, Yarmouth sand-hills; rare.

LOXOPS COCCINEUS. West. On Ash trees, not rare.

ORTHOTYLUS STRIICORNIS. Kbm. Occasionally on various trees.

,, VIRIDINERVIS. Kbm. } On Elm in company.
,, PRASINUS. Fall. }

,, SCOTTI. Reut. On Plum trees?

,, NASSATUS. Fab. } Common on Alders.
,, FLAVINERVIS. Kbm. }

,, TENELLUS. Fall. On Hazel; local.

,, DOUGLASI. Saund. } On Broom. *Douglasi* is scarce; the others are common.
,, CONCOLOR. Kbm.
,, CHLOROPTERUS. Kbm.
,, BICOLOR. D. and S.

,, RUBIDUS. Puton. A coast insect. I have only taken one example of the red form: this was on the sand-hills at Yarmouth. The green form was very abundant under *Atriplex portulacoides*, at Wells, in August last.

,, ERICETORUM. Fall. A common heath-loving species.

HETEROTOMA MERIOPTERA. Scop. Very common on Nettles, &c.

MACROCOLEUS MOLLICULUS. Fall. Occasionally by sweeping.

,, PAYKULLI. Fall. On *Ononis*; not uncommon.

AMBLYTYLUS AFFINUS. D. and S. By sweeping in damp places; rare.

TINICEPHALUS OBSOLETUS. D. and S. On Furze and Broom.

CONOSTETHUS SALINUS. Sahl. A remarkable insect which closely mimics the green form of *Orthotylus rubidus*, in company with which it occurs, but from which it is abundantly structurally distinct. The proportion of the *Conostethus* to the *Orthotylus* seems to be about ten per cent. The only specimens I have seen are from a salt-marsh at Hunstanton.

ONCOTYLUS DECOLOR. Fall. By sweeping Grasses.

HARPOCERA THORACICA. Fall. On Sallow and Oak; scarce.

PHYLUS MELANOCEPHALUS. Linn. On Oak; scarce.

,, PALLICEPS, Fieb. With the preceding species; common.

,, AVELLANÆ, H.-S. On Hazel, &c.

Atractotomus magnicornis. Fall. On Firs; not common.
Psallus betuleti. Fall. On Birch; scarce.
„ ambiguus. Fall. On Apple trees; not uncommon.
„ variabilis. Fall. Very common on Oaks.
„ obscurellus. Fall. On Firs.
„ Rotermundi. Scholtz. On white Poplar.
„ sanguineus. Fab. On Sallow.
„ lepidus. Fieb. On Ash trees.
„ roseus. Fall. On Sallow and Birch.
„ alnicola. D. and S. On Alder.
„ varians. H.-S. Very common on Oak.
Plagiognathus albipennis. Fall. On *Artemisia maritima*; rare.
„ viridulus. Fall. } Very common on Nettles, &c.
„ arbustorum. Fab. }
„ Roseri. H.-S. On Willow; not common.
„ pulicarius. Fall. Scarce. Occurs occasionally in various situations.
„ saltitans. Fall. Among short Grass, North Denes, Yarmouth; Mousehold Heath.

Microphysidæ.

Microphysa pselaphiformis. West. Occasionally by sweeping.
„ elegantula. Baer. One ♀ on bark of black Poplar.

Anthocoridæ.

Tetraphleps vittatus. Fieb. On Larch, Fir, &c.
Acompocoris pygmœus. Reut. Common on Fir trees.
„ alpinus. Reut. On Scotch Fir; very rare.
Temnostethus pusillus. H.-S. On Oaks; not common.
Anthocoris nemorum. Linn. } Very common by beating and
„ nemoralis. Fab. } sweeping.
Xylocoris ater. Duf. Under bark.
Triphleps minuta. Linn. } By sweeping, and on Furze bushes
„ nigra. Wolff. } when in bloom.
Lyctocoris campestris. Fab. Common in haystack refuse, &c.

Acanthidæ.

Acanthia lectularia. Linn. Difficult to meet with, but doubtless common.

" pipistrelli. Jen. Concerning this species Lord Walsingham writes: "About twelve years ago, at Merton Hall, the ceiling was removed in order to remove a colony of Bats which had for many years occupied the spaces between the rafters, having obtained access from the outside. There was an immense accumulation of the dung of these Bats, and on examination I found in it larvæ of some Coleoptera, and two specimens of a *Cimex* (?) *Acanthia* (not *lectularia*) which was probably the rare *A. pipistrelli*. I had no doubt about the species at the time, but put the specimens aside in the hope that I might meet with some Hemipterist who might care to possess them. I am unable to say where they are, and it is not probable that I can find them." I may add that I had some further correspondence with his Lordship upon the subject, the result of which was to leave no doubt in my mind that his insects were really *A. pipistrelli*.

Ceratocombidæ.

Ceratocombus coleoptratus. Zett. Moss, dead leaves, &c.; scarce.

Reduviidæ.

Ploiaria vagabunda. Linn. On Fir trees.

" culiciformis. De G. A few examples have been taken crawling on the walls of a counting-house in Norwich.

Reduvius personatus. Linn. Occasionally found flying in the vicinity of fowls' houses in the evening.

Coranus subapterus. De G. Said to be found under *Erodium*. All my specimens are from Mr. F. Norgate.

Nabidæ.

Nabis lativentris. Boh. } Common by sweeping.
„ major. Costa. }
„ flavomarginatus. Scholtz. Widely distributed, but scarce by sweeping.
„ limbatus. Dahl. } Common by sweeping; the last on heaths.
„ ferus. Linn. }
„ rugosus. Linn. }
„ ericetorum. Scholtz. }

Saldidæ.

Salda pilosa. Fall. Salt-marshes, Wells and Hunstanton.
„ lateralis. Fall. Salt-marshes, Hunstanton.
„ littoralis. Linn. Salt-marshes, Wells.
„ orthochila. Fieb. This species exhibit a remarkable exception to the usual habits of the genus. All the other *Saldæ* delight in muddy places, or the margins of streams and ponds; but this abounds on Mousehold Heath under *Erica*.
„ pallipes. Fab. Salt-marshes, Wells.
„ saltatoria. Linn. Very common.
„ Cocksii. Curt. } Fen species.
„ cincta. H.-S. }

Hydrometridæ.

Hydrometra stagnorum. De G. Very common.

Gerridæ.

Gerris rufoscutellata. Latr. A dead ♀ was found by Mr. Thouless floating on the surface of a pond on Mousehold Heath, on 15th March, 1884.
„ thoracica. Schum. } All more or less common.
„ gibbifera. Schum. }
„ lacustris. Linn. }
„ odontogaster. Zett. }
„ argentata. Schum. }
Microvelia pygmæa. Duf. }

Veliidæ.

Velia currens. Fab. Common.

Hebridæ.

Hebrus pusillus. Fall. Common in very wet Moss.

Nepidæ.

Ranatra linearis. Linn. Recorded on the authority of Mr. F. Norgate.

Nepa cinerea. Linn. Very common.

CRYPTOCERATA.

Naucoridæ.

Aphelocheirus æstivalis. Fab. If reticence on the part of its captor tends to the preservation of an insect, this species ought long to flourish.

Naucoris cimicoides. Linn. Not common.

Notonectidæ.

Notonecta glauca. Fab. } Common.
var. furcata. }

,, maculata. Fab. I think this should be regarded as specifically distinct. I possess undoubted examples from some pits at Felthorpe.

Plea minutissima. Fab. Common.

Corixidæ.

Corixa geoffroyi. Leach. Common.
,, affinis. Leach. Apparently scarce.
,, præusta. Fieb. Apparently scarce.
,, concinna. Fieb. Apparently scarce.
,, hieroglyphica. Duf. } All more or less common.
,, stali. Fieb.
,, linnæi. Fieb.
,, sahlbergi Fieb.
,, striata. Fieb.
,, falleni. Fieb.
,, distincta. Fieb.
,, mæsta. Fieb.
,, fabricii. Fieb.
,, limitata. Fieb.
,, fossarum. Leach.

Cymatia Bonsdorffi. Sahl. }
„ coleoptrata. Fab. } Marsh ditches; not common.

HOMOPTERA.

Cicadina.

Membracidæ.

Centrotus cornutus. Linn. Foxley wood.

Issidæ.

Issus coleoptratus. Fab. "Norfolk:" Curtis.

Cixiidæ.

Cixius cunicularius. Fab. }
„ nervosus. Linn. } Found by beating various trees
„ pilosus. Ol. } in early summer.

Delphacidæ.

Asiraca clavicornis. Fab. Found occasionally by sweeping.
Delphax pulchella. Curt. By searching in marshes.

Liburnia notula. Germ. }
„ lineola. Germ.
„ guttula. Germ.
„ elegantula. Boh.
„ collina. Boh.
„ distincta. Flor.
„ forcipata. Boh.
„ pellucida. Fab.
„ discolor. Boh.
„ striatella. Fall.
„ extrusa. Scott.
„ fieberi. Scott.
„ leptosoma. Flor.
„ niveimarginata. Scott.
„ cognata. Fieb.
„ limbata. Fab.
„ mesomela. Boh. } All the species of *Liburnia* seem to be attached to Grasses, and are to be obtained by sweeping.

Dicranotropis hamata. Boh. Common by sweeping.

STIROMA NASALIS. Boh. Foxley wood.
„ PTERIDIS. Boh. On *Pteris*; very local.
„ ALBOMARGINATA. Curt. Not common by sweeping.

CERCOPIDÆ.

APHROPHORA ALNI. Fall. On Alders; very common.
„ SALICIS. De Geer. On Sallow; Horning, Foxley wood.
PHILÆNUS SPUMARIUS. Linn.
„ CAMPESTRIS. Fall.
„ EXCLAMATIONIS. Thun.
„ LINEATUS. Linn.
} Common by sweeping.

LEDRIDÆ.

LEDRA AURITA. Linn. On Oaks; not common.

ULOPIDÆ.

ULOPA RETICULATA. Fab. Under Furze; very common.

PAROPIIDÆ.

MEGOPHTHALMUS SCANICUS. Fall. Generally distributed and common.

TETTIGONIDÆ.

EVACANTHUS INTERRUPTUS. Linn. Not usually common. I once found it in the utmost profusion on *Pteris* on the coast.
„ ACUMINATUS. Fab. Not uncommon by beating Hazel, &c.
TETTIGONIA VIRIDIS. Linn. Common by sweeping in damp places.

ACOCEPHALIDÆ.

EUPELIX PRODUCTA. Germ. In heathy places; not common.
STRONGYLOCEPHALUS AGRESTIS. Fall. One ♂ example in a marsh at Colney.
ACOCEPHALUS RUSTICUS. Fab. Very abundant.
„ ALBIFRONS. Linn. Common. An excessively variable species. I have a graduated series varying from the type form to *A. polystolus* of Scott.
„ RIVULARIS. Don. Common and generally distributed.

Bythoscopidæ.

Macropsis lanio. Linn. On Oaks; very common.
Bythoscopus alni. Schr. On Alder.
„ rufusculus. Fieb. On Sallow.
„ flavicollis. Linn. Very abundant; chiefly on Birch.
Pediopsis cereus. Germ. On Osiers and Sallows; not uncommon.
„ virescens. Fab. On Osiers.
„ impurus. Boh. On Sallow; not common.
„ fuscinervis. Boh. I took three examples of the true insect of this name off Aspen.
„ nassatus. Germ. } Occasionally by sweeping.
„ scutellatus. Boh. }
„ tibialis. Scott. Common by sweeping.
Idiocerus adustus. H.-S. On Willow; very common.
„ varius. Fab. On Osiers; scarce.
„ herrichii. Kbm. On *Salix alba*; very local.
„ tremulæ. Estl. Curtis thought he had taken this species in Norfolk.
„ laminatus. Flor. On Poplar.
„ lituratus. Fall. On Sallows and Willows; not common.
„ poecilus. H.-S. This is the *Heydenii* of my former list; it occurs on Lombardy Poplar.
„ vitreus. Fab. = H. album. Fieb. On Poplars.
„ aurulentus. Kbm. On Lombardy Poplar.
„ fulgidus. Fab. On Poplars generally; very common.
„ populi. Linn. On Aspen; local.
„ confusus. Flor. Very common on Sallow.
„ albicans. Kbm. On White Poplar; common.
Agallia puncticeps. Germ. } Common by sweeping.
„ venosa. Germ. }

Jassidæ.

Doratura stylata. Boh. Coast sands; not common.
Allygus mixtus. Fab. } By beating various trees.
„ commutatus. Scott. }
Thamnotettix dilutior. Kbm. On Oaks.
„ prasinus. Fall. Occasionally by sweeping.

THAMNOTETTIX SUBFUSCULUS. Fall.
,, SPLENDIDULUS. Fab. } Common by sweeping.
,, CROCEA. Schäff.

LIMOTETTIX STRIOLA. Fall. By sweeping in a salt-marsh at Hunstanton.

,, 4-NOTATA. Fab.
,, VIRESCENS. Fall. } Common by sweeping.

,, FRONTALIS. Schäff. Occurs amongst Grasses in damp places.

CICADULA SEXNOTATA. Fall. Very common.

,, VARIATA. Fall. Occasionally by sweeping.

,, SEPTEMNOTATA. Fall. A marsh insect.

GNATHODUS PUNCTATUS. Thun. Occasionally by beating Fir trees in winter and spring.

ATHYSANUS GRISESCENS. Zett.
,, SORDIDUS. Zett.
,, PICEUS. Scott.
,, OBSOLETUS. Kbm.
,, PLEBEJUS. Fall.
,, OBSCURELLUS. Kbm.
} All more or less common by sweeping Grasses.

DELTOCEPHALUS ABDOMINALIS. Fab.
,, ASSIMILIS. Fall.
,, PASCUELLUS. Fall.
,, PUNCTUM. Flor.
,, PROPINQUUS. Fieb.
,, FALLENI. Fieb.
,, SABULICOLA. Curt.
,, STRIATA. Linn.
,, SOCIALIS. Flor.
,, OCELLARIS. Sahl.
,, PULICARIS. Fall.
,, DISTINGUENDUS. Flor.
,, FLORI. Fieb.
} With the exception of *D. sabulicola*, which is a coast insect, and *D. socialis*, which I have only taken at Barton Bendish, all the Deltocephali are more or less common by sweeping.

TYPHLOCYBIDÆ.

ALEBRA ALBOSTRIELLA. Fall. Chiefly on Oaks.

DICRANONEURA FLAVIPENNIS. Zett. Occasionally by sweeping.

,, CITRINELLA. Zett. Amongst Grasses in damp places.

,, VARIATA. Hardy. Not common by sweeping.

Cybus smaragdula. Fall. On Willows, &c.; abundant.

Chlorita viridula. Fall.
" flavescens. Fab. } By beating Firs in winter and spring.

Eupteryx vittatus. Linn. On low plants in damp places.
" notatus. Curt. Very rarely by sweeping.
" stachydearum. Hardy. On various Labiatæ; very common.
" urticæ. Fab.
" pictus. Fab. } On Nettles; abundant.
" signatipennis. Boh. On *Spiræa*; very local.
" abrotani. Dougl. Very abundant on Southernwood.
" germari. Zett. On Scotch Firs; common.
" pulchellus. Fall. Most common on Oaks.

Typhlocyba jucunda. Schäff. On Alder; common.
" 10-punctata. Fall. Abundant on Sallow.
" debilis. Dougl. One ♀ example from Beech. This species continues very rare; only about four examples are known.
" ulmi. Linn. On Elm; abundant.
" quercus. Fab. On Oaks; abundant.
" nitidula. Fab. Sometimes common on Elm, but very uncertain in its appearance.
" geometrica. Schr. On Alder and Willow; not common.
" tenerimma. Schäff. Common on Bramble.
" aurovittata. Dougl. On Oak *bushes* in hedges, late in autumn; not common.
" Douglasi. Edwards.
" gratiosa. Boh. } Common on Beech.
" crataegi. Dougl. On Whitethorn; not uncommon.
" Lethierryi. Edwards. On Beech, occasionally.
" rosæ. Linn. Very abundant on Roses.

Zygina alneti. Dahl. On Alder and Hazel.
" tiliæ. Geoff. Only on Firs in winter and spring.
" blandula. Rossi. By sweeping low plants in the autumn; abundant.
" parvula. Boh. On Blackthorn; scarce.
" scutellaris. Schäff. Amongst Grasses, Dunston Common; rare.

PSYLLINA.

Liviidæ.

Livia juncorum. Latr. Not common.

Aphalaridæ.

Rhinocola ericæ. Curt. Mousehold Heath; local.
„ aceris. Linn. On Maple; local.
Aphalara exilis. Weber et Mohr.
„ calthæ. Linn. } Occasionally by sweeping.

Psyllidæ.

Psyllopsis fraxinicola. Forst. On various trees and bushes; common.
„ fraxini. Linn. Common on young Ash trees.
Psylla pruni. Scop. Common on Blackthorn.
„ costatopunctata. Forst. = ferruginea. Forst. On various trees and bushes occasionally.
„ costalis. Flor.
„ peregrina. Forst. = cratægicola. Flor. } On Whitethorn.
„ mali. Schdbg. On Crab-apple.
„ visci. Curt. On Mistletoe.
„ pineti. Flor. Common on Fir trees.
„ salicicola. Forst. On Sallows; not common.
„ hartigii. Flor. = sylvicola. Leth. Occasionally by sweeping.
„ Lowii. Scott. Not uncommon on Birch.
„ Forsteri. Flor.
„ alni. Linn. } Common on Alder.
„ buxi. Linn. Common on Box trees.
„ spartii. Guer.
Arytæna genistæ. Latr. } Common on Broom.

Triozidæ.

Trioza urticæ. Linn. Abundant on Nettles, &c.
„ galii. Först. Occasionally by sweeping.
„ remota. Först. = hæmatodes. Först.
„ albiventris. Först.
„ rhamni. Schrk. } By beating Fir trees in winter and spring.

XVII.

FAUNA AND FLORA OF NORFOLK.

Part VI. Flowering Plants and Ferns.

Additions and Corrections.*

By Herbert D. Geldart.

Read 25th March, 1884.

It having been determined to print additional lists of the Fauna and Flora of our County, to bring those already published up to the present date at the close of the third volume of the Society's 'Transactions,' the following list is presented as containing all the additions known to the compiler. Among them will be found two species new to Great Britain,—*Naias marina*, discovered by Mr. Arthur Bennett, F.L.S., in Hickling Broad; and *Carex trinervis*, collected some years since in the neighbourhood of Yarmouth, probably at Caistor, by Mr. Hampden G. Glasspoole, and recently identified by Mr. Bennett.

Omitting the genera *Rubus*, *Rosa*, and *Salix*, in which no two authorities seem able to agree as to what forms should be considered entitled to rank as species, the following indigenous species have been added to the list:—*Ranunculus Lenormandi*, *Stellaria nemorum*, *Geranium rotundifolium*, *Lythrum hyssopifolia*, *Œnanthe fluviatilis*, *Erigeron canadense*, *Veronica spicata*, *Statice binervosa*, *Polygonum mite*, *Rumex pratensis*, *Gagea lutea*, *Carex ericetorum*, *Equisetum variegatum*, *Chara tomentosa*, *polyacantha*, and *aspera*. Besides these, *Hypericum hircinum*, *Potentilla norvegica*, *Crepis setosa*, *Linaria purpurea*, *Stachys annua*, *Euphorbia esula*, *Bromus maximus*, *madritensis*, and *tectorum*, though they have certainly

* The lists to which the present list is supplemental are, "Flowering Plants and Ferns," Section I. and II. (Trans. of the Norfolk and Norwich Nat. Soc. vol. ii. pp. 74—110, and pp. 229—242), and "Norfolk Naiadaceæ and Characeæ" (vol. iii. pp. 379—383).

occurred can hardly be considered native, though some of them may be pretty firmly established in their localities.

The remaining entries refer to sub-species, or varieties, or are given as extending the distribution of species further through the four divisions of the county, or in a very few instances as confirmations of previously published distribution.

Callitriche autumnalis is erased from the list as a probable error; also *Rumex aquaticus*, from the extreme improbability of a species of distinct northern distribution not otherwise occurring south of Yorkshire being found in the county; no dried specimen of it is known to exist, nor can the entries recording it now be verified.

I have specially to thank Mr. Arthur Bennett, the Rev. E. F. Linton, and Dr. Lowe for sending notes, and reading over and correcting these additions.

DICOTYLEDONOUS PLANTS.

Ranunculaceæ.

Thalictrum majus. Sm. . . . . — — — w.
Dersingham, Dr. Lowe.

Ranunculus peltatus. Fries.
b, floribundus . . . . c. — — —
Sprowston, Rev. E. F. Linton.

,, trichophyllus. Chaix. . . . — — sc. —
Arminghall, Rev. E. F. Linton.
Norfolk "w." Top. Bot. 2nd ed.

,, lenormandi. Schultz.
Norfolk "e." Top. Bot. 2nd ed.

Papaveraceæ.

Papaver lecoquii. Lam. . . . . c. — — —
Crostwick, Rev. E. F. Linton.

Fumariaceæ.

Fumaria parviflora. Lam. . . . . — — — w.
Near Lynn, Mr. Bray, Mr. H. G. Glasspoole.

Cruciferæ.

Cardamine sylvatica. Link.
In Mr. H. C. Watson's "c." division.

Violaceæ.

Viola hirta. Linn.
Norfolk "c." Top. Bot. 2nd ed.

Polygalaceæ.

Polygala depressa. Wender. . . . . c. — — w.
Near Yarmouth, Dr. Trimen.
Docking, Mr. Fryer.

Caryophyllaceæ.

Silene conica. Linn. . . . . — — sc. —
Thetford, Rev. H. Williams.

Stellaria nemorum. Linn. . . . . — — — w.
Winch, Dawson Turner, Br. Mus. Herb.

Arenaria serpyllifolia. Linn.
b, leptoclados. . . . . c. — sc. —
Mousehold & Thetford, Rev. E. F. Linton.

Alsine tenuifolia. Crantz. . . . . — — sc. —
Croxton, Rev. H. Williams.
Thetford, Rev. E. F. Linton.

Spergularia neglecta. Syme. . . . c. — — —
Yarmouth, Mr. Arthur Bennett.

„ marginata. Syme. . . . . — — — w.
Holme, Blow.

Illecebraceæ.

Scleranthus biennis. Reuter. . . . . c. — — —
Mousehold, Rev. E. F. Linton.

Hypericaceæ.

Hypericum hircinum. Linn. . . . . — nc. — —
Planted at Holkham, Rev. E. F. Linton.

GERANIACEÆ.

GERANIUM ROTUNDIFOLIUM. Linn. . . . — — sc. —
Thetford, Rev. E. F. Linton.

ERODIUM MARITIMUM. Linn.
Norfolk "w." Top. Bot. 2nd ed.

LEGUMINIFERÆ.

ULEX NANUS. Forst. [true] . . . . e. — — —
Ormesby, Mr. H. G. Glasspoole.

ONONIS REPENS
var. HORRIDA. Lange . . . e. — — —
Coast sand-hills, Mr. A. Bennett.

,, SPINOSA. Linn. . . . . — — sc. —
East Harling and Garboldisham,
Rev. E. F. Linton.

MEDICAGO SYLVESTRIS. Fries. . . . . e. — sc. —
Sprowston, Rev. E. F. Linton.
Thetford, Rev. H. Williams.

,, MINIMA. Lam. . . . . — — sc. —
Croxton, Mr. F. Norgate.
Thetford, Rev. E. F. Linton.

VICIA ANGUSTIFOLIA
b, Bobartii. Forst. . . . — — — w.
Leziate, Dr. Lowe.

ROSACEÆ.

AGRIMONIA ODORATA. Mill. . . . . e. — — —
Ormesby, Mr. H. G. Glasspoole.
Caistor, Mr. Arthur Bennett.

POTENTILLA PROCUMBENS. Sib. . . . . e. — — —
Sprowston, Rev. E. F. Linton.

,, NORVEGICA. Linn. . . . . e. — — —
Thorpe, Miss A. M. Barnard.

RUBUS PLICATUS. W. and N. . . . . — — — w.
Wolferton Woods, Dr. Lowe.

,, AFFINIS. W. and N. . . . . — — — w.
Wolferton Woods, Dr. Lowe.

,, BORRERI. Bell Salt. . . . . e. — — —
Sprowston, Rev. E. F. Linton.

RUBUS ROSACEUS. Weihe. . . . . e. — — —
Sprowston, Rev. E. F. Linton.

„ KŒHLERI var. CAVATIFOLIUS. Müll.
Norfolk "e." Top. Bot. 2nd ed.

ROSA MOLLISSIMA Willd.
East Norfolk, Arthur Bennett.

„ TOMENTOSA. Sm. . . . . — — — w.
Babingley and South Wootton, Dr. Lowe.

„ „ var. SUBGLOBOSA. Sm. . : — — sc. —
Between Swainsthorpe and Swardeston, Mr. Arthur Bennett.

„ MICRANTHA. Sm. . . . . e. — — —
Between Ormesby and Filby, Mr. Arthur Bennett.

„ CANINA

„ var. WATSONI. Baker. . . . — — sc. —
Between Swardeston and Swainsthorpe, Mr. Arthur Bennett.

„ „ LUTETIANA. Leman. . . . e. — — —
Sprowston, Rev. E. F. Linton.

„ „ DUMALIS. Bechst. . . . e. — — —
Sprowston, Rev. E. F. Linton.

„ „ VERTICILLACANTHA. Merat. . . e. — — —
Sprowston, Rev. E. F. Linton.

„ „ CORIIFOLIA. Fries. . . . e. — — —
Sprowston, Rev. E. F. Linton.

„ „ FRONDOSA. Stev. . . . e. nc. sc. —
Sprowston, Horsford, & Earlham, Rev. E. F. Linton.

„ „ ARVATICA. Puget. . . . e. — — —
Near Filby, Mr. Arthur Bennett.

„ „ SURCULOSA. Woods . . . — — sc. —
Tivetshall, Mr. Arthur Bennett.

LYTHRACEÆ.

LYTHRUM HYSSOPIFOLIA. Linn. . . . . — — sc. —
Heigham, Miss A. M. Barnard.

ONAGRACEÆ.

EPILOBIUM OBSCURUM. Schreb. . . . . e. — — —
Filby, Mr. Arthur Bennett.

HALORAGIACEÆ.

[CALLITRICHE AUTUMNALIS. Kutz.
Should be erased and insert]
CALLITRICHE HAMULATA. Kutz. . . . . e. — — w.
Ranworth, Rev. E. F. Linton.
,, OBTUSANGULA. Le Gall. . . . . e. — — —
Ormesby, Mr. H. G. Glasspoole.

UMBELLIFERÆ.

ŒNANTHE FLUVIATILIS. Coleman. . . . . e. — — —
Heigham Sounds and Hickling,
Mr. Arthur Bennett.

RUBIACEÆ.

GALIUM TRICORNE. With. . . . . e. — — —
Yarmouth, Mr. Arthur Bennett.

COMPOSITÆ.

FILAGO APICULATA. G. E. Smith.
Norfolk "e." and "w." Top. Bot.
2nd ed.
,, MINIMA. Fries. . . . . — — sc. —
Thetford, Rev. E. F. Linton.
GNAPHALIUM LUTEO-ALBUM. Linn. . . . — ne. — —
Wells, Rev. E. F. Linton.
SENECIO VULGARIS. Rayed form. . . . . e. — — —
Yarmouth, Rev. E. F. Linton.
,, PALUSTRIS. D.C. . . . . — — — w.
Methwold Fen. Herb. Mr. H. C.
Watson.
ERIGERON CANADENSE. Linn. . . . . — — sc. —
Croxton, Mr. F. Norgate.
TRAGOPOGON GRANDIFLORUS. Bosw. . . . e. — — —.
Norwich, Rev. E. F. Linton.
[Possibly introduced with Grass-seeds.]

Taraxacum officinale
var. erythrospermum . . . c. — — — —
Sprowston, Rev. E. F. Linton.
var. lœvigatum . . . . c. — — — —
Yarmouth, Rev. E. F. Linton.
Crepis setosa. Haller. . . . . — nc. — —
Godwick, Mr. H. G. Glasspoole.
,, biennis. Linn. . . . . c. — — —
Thorpe, Rev. E. F. Linton.
Hieracium umbellatum. Linn.
Norfolk "w." Top. Bot. 2nd ed.

Scrophulariaceæ.

Linaria purpurea. Mill. . . . . — — sc. —
Thetford, Mr. F. Norgate.
Veronica spicata. Linn. . . . . — — — w.
Bawsey. Herb. Br. Mus.
,, montana. Linn. . . . . — — sc. —
Arminghall, 1882, Rev. E. F. Linton.
[Stachys annua. Linn.] . . . . . — nc. — —
Hellesdon [introduced], Mr. Burcham.

Plumbaginaceæ.

Statice binervosa. G. E. Smith . . . — nc. — —
Wells and Holkham, Rev. E. F. Linton.

Plantaginaceæ.

Plantago lanceolata
var. timbali. Jordan. . . . c. — — — —
Sprowston, Rev. E. F. Linton.

Chenopodiaceæ.

Atriplex babingtonii. Woods. . . . c. — — —
Yarmouth, Mr. Arthur Bennett.
,, deltoidea. Bab.
Norfolk "c." and "w." Top. Bot. 2nd ed.

Polygonaceæ.

[Rumex aquaticus. Linn.
Should be erased, as very improbable, and the entries not now to be verified.]

Rumex pratensis. M. and K. . . . . e. — — —
Sprowston, 1881, Rev. E. F. Linton.

,, obtusifolius. Linn.

a, friesii. G. and G. . . . . e. — — —
Yarmouth, Mr. Arthur Bennett.

Polygorum mite. Schrank. . . . . — nc. — —
Newton St. Faith's, Rev. E. F. Linton.

,, raii. Bab. . . . . e. — — —
Yarmouth, Rev. E. F. Linton.

,, aviculare.

var. arenastrum . . . . . e. nc. — —
Hellesdon, Rev. E. F. Linton.
Yarmouth, Mr. Arthur Bennett.

Euphorbiaceæ.

Euphorbia esula. Linn. . . . . — nc. — —
Sparham, Mr. F. Norgate.

Amentiferæ.

Quercus sessiliflora. Sm. . . . . e. — — —
Sprowston, Rev. E. F. Linton.

Betula alba. Linn.

var. verrucosa . . . . . e. — — —

,, pubescens . . . . . e. — — —
Sprowston, Rev. E. F. Linton.

Salix russelliana. Sm. . . . . e. — — —
Ranworth, Rev. E. F. Linton.

,, acuminata. Sm. . . . . — nc. sc. —
Saham & Tuck's Wood. Herb. Sm.
Hellesdon, Rev. E. F. Linton.

MONOCOTYLEDONOUS PLANTS.

Naiadaceæ.

Potamogeton rufescens. Schrad. . . . — — — — w.
River near Santon, Rev. Dr. Hind.

Ruppia spiralis. Hartm.
Norfolk "w." Fryer, Top. Bot. 2nd ed.

„ rostellata. Koch. . . . . — nc. — — —
Wells, Rev. E. F. Linton.

Naias marina. Linn.
Hickling Broad, Mr. A. Bennett, 1883 . . . . . c. — — —

Alismaceæ.

Alisma ranunculoides. Linn.
var. repens . . . . . c. — — —
Filby, Mr. Arthur Bennett.

Orchidaceæ.

Orchis incarnata. Linn. . . . . c. — — —
Filby, Mr. Arthur Bennett.

Epipactis ovalis. Bab. . . . . — nc. — —
Docking, Mr. H. C. Watson.

Liparis læselii. Rich. . . . . c. — — —
Ranworth, Mr. A. W. Preston.

Malaxis paludosa. Sw. . . . . — — sc. —
Roydon (Diss), Miss A. M. Barnard.

Liliaceæ.

Ornithogalum umbellatum. Linn. . . . — — — w.
Magdalen, Dr. Lowe.

Allium vineale. Linn. . . . . c. — — —
Sprowston, Rev. E. F. Linton.

„ ursinum. Linn. . . . . — — sc. —
Arminghall, Rev. E. F. Linton.

Gagea lutea. Ker. . . . . — — — w.
Castle Rising, Dr. Lowe.

Juncaceæ.

Juncus gerardi. Lois. . . . . — nc. — —
Wells, Rev. E. F. Linton.

Cyperaceæ.

Carex arenaria. Linn. . . . . — — sc. —
Santon, Mr. Arthur Bennett.
var. ligerica. Gay. . . . . — — — w.
Castle Rising, Mr. Fryer.
„ teretiuscula. Good . . . — — sc. —
Roydon Fen, Rev. E. F. Linton.
„ præcox. Jacq. . . . . — — sc. —
Thetford, Mr. Arthur Bennett.
„ ericetorum. Poll. . . . . — — sc. —
Santon, Mr. Arthur Bennett.
„ paludosa. Good.
b, kochiana . . . . . — — sc. —
Santon, Mr. Arthur Bennett.
„ trinervis. Degl. . . . . c. — — —
Caistor Denes (probably), Mr. H. G. Glasspoole.

Gramina.

Phleum pratense. Linn.
b, nodosum . . . . . c. — sc. —
Sprowston and Thetford, Rev. E. F. Linton.
Aira uliginosa. Weihe. . . . . — nc. — —
Stratton Strawless.
Avena pratensis. Linn. . . . . — — sc. —
Thetford, Rev. E. F. Linton.
„ elatior. Linn. . . . . c. nc. sc. w.
[Omitted in first list.]
Kœleria cristata. Pers. . . . . — — sc. —
Thetford, Rev. E. F. Linton.
Sclerochloa borreri. Bab. . . . . c. — — —
Yarmouth, Mr. Jordan.

Festuca ambigua. Le Gall. . . . . — — sc. —
Santon, Mr. Arthur Bennett.
Rushford, Rev. E. F. Linton.

Bromus maximus. Desf.
,, madritensis. Linn.
,, tectorum Linn.
} in Saintfoin. Sprowston, Rev. E. F. Linton.
[casuals, H.D.G.]

Triticum pungens. B. and S.
Norfolk "c." Top. Bot. 2nd ed.

ACOTYLEDONOUS PLANTS.

Filices.

Botrychium lunaria. Sm. . . . . — — sc. —
Thetford, Rev. H. Williams.

Equisetaceæ.

Equisetum variegatum. Schleich. . . . — — sc. —
Croxton, Rev. H. Williams.

Characeæ.

Chara tomentosa. Linn. . . . . c. — — —
Hundred Stream, Mr. A. Bennett.

,, polyacantha. A. Br. . . . c. — sc. —
Acle, Hickling, &c., Mr. A. Bennett.
Roydon (Diss), Rev. E. F. Linton, June 11th, 1883.

,, aspera. Willd. . . . . c. — — —
Hickling. Mr. Arthur Bennett.
Somerton. Mr. Groves.

XVIII.

FAUNA AND FLORA OF NORFOLK.

(Additions to Part III.)

FUNGI.

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

Read 25th March, 1884.

In October, 1872,* I had the honour of submitting to the Society a list of Fungi, which had been recorded from various parts of the county. This list embraced upwards of eight hundred species. In the twelve years which have since then elapsed, very nearly seven hundred species have been found, new to the county. Many of these are of great interest and rarity, several not having occurred elsewhere in Britain. For instance, two magnificent species, *Boletus sulphureus* and *Helvella infula* have been found at Brandon, growing, both of them, upon sawdust.† Neither of these Fungi have as yet been met with elsewhere in England, nor in Great Britain, except at one station in the north of Scotland (Rothiemurchus). *Boletus sulphureus* was found some years ago by my friend the Rev. Dr. Keith, growing upon the immense heaps of saw dust at the last named place. A few years afterwards (November, 1876) I was fortunate in finding two or three specimens at Brandon. This circumstance, curious enough in itself, would hardly have made much impression upon my mind, had it not happened that in 1879 I visited Rothiemurchus, partly with the view of again gathering the *Boletus*, which had ceased to appear at Brandon. Dr. Keith, however, informed me that it had disappeared as completely from Rothiemurchus as it had done from Norfolk. During my excursions, however, I was rewarded

* Trans. Norfolk and Norwich Nat. Soc. vol. ii. (1872—73), pp. 28—78.

† *Ibid.* vol. ii. (1876—77), p. 260.

by gathering a few small specimens of *Helvella infula*, a fungus which had never before been found in Great Britain. This was in the month of September. After my return home I visited Brandon, in November, and there found numerous magnificent specimens of the *Helvella*; some of them were eight or ten inches in height. Separated as these two localities are by some six hundred miles from each other, it is very remarkable that they should simultaneously produce two such rare species. Upon inquiry it appears that when the Eastern Counties Railway was first constructed, a ship load of fir wood was brought to Lynn from the Forest of Rothiemurchus, and used principally for sleepers. The probability is, that the mycelium of these fungi was thus imported into the county. Our knowledge of the life history of the larger fungi is very meagre, but it is a matter of common observation amongst mycologists that while the commoner species of Agarics recur annually in exactly the same spot, yet with many of the rarer species this annual recurrence does not take place. In our country fungologists are now by no means weak in point of numbers, and, moreover, they are all enthusiasts, more or less. Yet nowhere else have these two fungi—which are exceptionally large in size, and otherwise such striking plants, as not easy to be overlooked—been found except at the two places above mentioned. It is worth remarking further, that when they first appeared they were very abundant in point of numbers, but that after recurring two or three years they became each year less numerous, and finally disappeared. Doubtless they will reappear, either here or elsewhere. What becomes of them in the meantime is a question which can be more easily speculated upon than solved. The appearance of rare fungi at long intervals is further illustrated by the magnificent *Geaster coliformis*, which, after nearly a century's absence from the county, was refound at Grimstone in 1880. *Verpa digitaliformis* occurred at North Wootton in 1871, and although I visited the spot annually for several years, I was never able to meet with it again. In 1875, however, it occurred in great abundance at Terrington St. Clement's; but, although I have rigorously examined this habitat year after year, it has never, up to the present time, reappeared. That exceedingly rare Fungus, *Cordyceps capitata*, that Sowerby had sent to him from near Holt, towards the end of the last century, which grows parasitically

upon one of the Truffles (*Elaphomyces granulatus*) has been refound near Mattishall by the Rev. Canon Du Port.

In the accompanying list the arrangement is, mainly, that employed by Dr. Cooke in his 'Hand-book of British Fungi.' This valuable work, to which British Mycology owes so much, is now out of print. In the thirteen years which have passed since it was published, much light has been thrown upon the life history of fungi generally; facts that were then startling and novel have been substantiated by numerous observers. Notably is this the case with our knowledge of the physiology of the *Uredines*, hence it has been absolutely necessary to modify the arrangement of the genera and species of this group. The nomenclature adopted is that employed by Dr. G. Winter in his new edition of Rabenhorst's 'Kryptogamen Flora.' The *Pyrenomycetes* have been arranged after the method of Professor Saccardo in his 'Sylloge Fungorum.' Of this group alone, somewhere between six and seven thousand species have been described from various parts of the world. It is not to be wondered that botanists, who make these particular fungi their special study, should feel grateful to Professor Saccardo for his valuable work in which the descriptions of more than six thousand are collected and arranged. To Mr. Frank Norgate and to Mr. J. Harvey Bloome my thanks are due for the help they have given me in the work of compiling this list. The Rev. Canon Du Port has, during the past four or five years, most industriously studied the *Hymenomyces*, and to his labours the large increase of these fungi, as denizens of Norfolk, is mainly due.

Fam. I. HYMENOMYCETES. *Order* I. AGARICINI.

AGARICUS (AMANITA) MAPPA. Fr.
" " PANTHERINUS. D.C.
" " EXCELSUS. Fr.
" " NITIDUS. Fr.
" " VAGINATUS. Bull. VAR. FULVA.
" " ADNATUS. Fr.
" (LEPIOTA) FRIESII. Lasch.
" " ACUTESQUAMOSUS. Weinm.
" " METULÆSPORUS. B. and Br.

AGARICUS (LEPIOTA) CEPÆSTIPES. Sow.
,, ,, CARCHARIAS. Pers.
,, ,, CINNABARINUS. A. and S.
,, ,, POLYSTICTUS Berk.
,, ,, SEMINUDUS. Lasch.
,, ,, MEDULLATUS. Fr.
,, (ARMILLARIA) MUCIDUS. Schrad.
,, (TRICHOLOMA) SEJUNCTUS. Sow.
,, ,, PORTENTOSUS. Fr.
,, ,, REPLENDENS. Fr.
,, ,, ALBO-BRUNNEUS. Fr.
,, ,, USTALIS. Fr.
,, ,, SCALPTURATUS. Fr.
,, ,, COLUMBETTA. Fr.
,, ,, IMBRICATUS. Fr.
,, ,, MACRORHIZUS. Lasch.
,, ,, SAPONACEUS. Fr.
,, ,, LASCIVUS. Fr.
,, ,, INAMŒNUS. Fr.
,, ,, CARNEUS. Bull.
,, ,, ALBUS. Schæff. VAR. CÆSARIATUS.
,, ,, PANÆOLUS. Fr.
,, ,, BREVIPES. Bull.
,, ,, HUMILUS. Fr.
,, ,, EXSCISSUS. Fr.
,, ,, SUBPULVERULENTUS. Pers.
,, ,, SORIDIDUS. Fr.
,, (CLITOCYBE) HIRNEOLUS. Fr.
,, ,, CANDICANS. Pers.
,, ,, DEALBATUS. Fr.
,, ,, GIGANTEUS. Fr.
,, ,, INCILIS. Fr.
,, ,, EXPALLENS. Pers.
,, ,, BRUMALIS. Fr.
,, ,, METACHROUS. Fr.
,, (COLLYBIA) LONGIPES. Bull.
,, ,, PLATYPHYLLUS. Fr.
,, ,, FODIENS. Kalch.
,, ,, SEMITALIS. Fr.

AGARICUS (COLLYBIA) DISTORTUS. Fr.
,, ,, XANTHOPUS. Fr.
,, ,, STIPITARIUS. Fr.
,, ,, INGRATUS. Schum.
,, (MYCENA) FLAVO-ALBUS. Bolt.
,, ,, AMMONIACUS. Fr.
,, ,, ZEPHIRUS. Fr.
,, ,, RUGOSUS. Fr.
,, ,, FILOPES. Bull.
,, ,, SPEIREUS. Fr.
,, ,, DESCOPUS. Lev.
,, (OMPHALIA) HYDROGRAMMUS. Fr.
,, ,, LEUCOPHYLLUS. Fr.
,, ,, SPHAGNICOLA. Berk.
,, ,, CÆSPITOSUS. Bolt.
,, ,, UMBELLIFERUS. L. VAR. VIRIDE. Fl. Dan.
,, ,, HEPATICUS. Batsch.
,, ,, DEMISSUS. Fr.
,, ,, GRISEUS. Fr.
,, ,, SETIPES. Fr.
,, (PLEUROTUS) CORTICATUS. Fr.
,, ,, SUBPALMATUS. Fr.
,, ,, LIGNATILIS. Pers.
,, ,, EUOSMUS. Berk.
,, ,, MITIS. Pers.
,, (VOLVARIA) BOMBYCINUS. Schæff.
,, ,, TAYLORI. Berk.
,, ,, PARVULUS. Weinm.
,, (PLUTEUS) PETASATUS. Berk.
,, ,, SALICINUS. Pers.
,, ,, NANUS. Pers. VAR. LUTESCENS. Fr.
,, ,, CHRYSOPHÆUS. Schæff.
,, ,, PHLEBOPHORUS. Ditm.
,, (ENTOLOMA) SINUATUS. F.
,, ,, LIVIDUS. Bull.
,, ,, PLACENTA. Batsch.
,, ,, BLOXHAMI. Berk.
,, ,, JUBATUS. Fr.
,, ,, RHODOPOLIUS. Fr.

AGARICUS (ENTOLOMA) NIDOROSUS. Fr.
,, ,, PERSOONIANUS. Ph. and Pl.
,, (CLITOPILUS) MUNDULUS. Lasch.
,, ,, UNDATUS. Fr.
,, ,, CRETATUS. B. and Br.
,, (LEPTONIA) SERRULATUS. Pers.
,, ,, EUCHROUS. Pers.
,, ,, ASPRELLUS. Fr.
,, (NOLANEA) PASCUUS. Pers.
,, ,, PISCIODORUS. Cés.
,, ,, PICEUS. Kalch.
,, (ECCILIA) RHODOCYLIX. Lasch.
,, (CLAUDOPUS) DEPLUENS. Batsch.
,, (PHOLIOTA) TERRIGENUS. Fr.
,, ,, COOKEI. Fr.
,, ,, EREBIUS. Fr
,, ,, TOLULARIS. Bull.
,, ,, CAPISTRATUS. Cooke.
,, ,, ÆGERITA. Fr.
,, ,, HETEROCLITUS. Fr.
,, ,, AURIVELLUS. Batsch.
,, ,, ADIPOSUS. Fr.
,, ,, UNICOLOR. Fl. Dan.
,, ,, PUMILIS. Fr.
,, ,, MYCENOIDES. Fr.
,, (INOCYBE) LANUGINOSUS. Bull.
,, ,, PYRIODORUS. Fr.
,, ,, BONGARDII. Weinm.
,, ,, ASTEROSPORA. Quel.
,, ,, CÆSARIATUS. Fr.
,, ,, TRECHISPORUS. Berk.
,, ,, TRICHOLOMA. A. and S.
,, (HEBELOMA) FASTIBILIS. Fr.
,, ,, FIRMUS. Pers.
,, ,, VERSIPELLIS. Fr.
,, ,, MESOPHÆUS. Fr.
,, ,, SINAPIZANS. Fr.
,, ,, CRUSTULINIFORMIS. Bull.
,, ,, SUBTESTACEUS. Batsch

AGARICUS (HEBELOMA) LONGICAUDUS. Pers.
" " PETIGINOSUS. Fr.
" (FLAMMULA) LENTUS. Pers.
" " ALNICOLA. Fr.
" INOPUS. Fr.
" " SAPINEUS. Fr.
" " LIQUIRITIÆ. Pers.
" (NAUCORIA) HAMADRYAS. Fr.
" " ANGUINEUS. Fr.
" " PEDIADES. Fr.
" " SCORPIOIDES. Fr.
" (GALERA) SPARTEUS. Fr.
" " PYGMÆO-AFFINIS. Fr.
" " SPHAGNORUM. Pers.
" (CREPIDOTUS) ALVEOLUS. Lasch.
" " MOLLIS. Schæff.
" (PSALLIOTA) SYLVATICUS. Schæff.
" " ECHINATUS. Roth.
" (STROPHARIA) SQUAMOSUS. F.
" " STERCORARIUS. Fr.
" " ALBO-CYANEUS. Desm.
" (HYPHOLOMA) PYROTRICHUS. Holms.
" " CANDOLLEANUS. Fr.
" " LEUCOTEPHRUS. B. and Br.
" " EGENULUS. B. and Br.
" (PSILOCYBE) ERICÆUS. Pers.
" " UDUS. Pers.
" " BULLACEUS. Bull.
" " COMPTUS. Fr.
" (PSATHYRA) CONOPILEUS. Fr.
" " SPADACEO-GRISEUS. Schæff.
" " BIFRONS. Berk.
" (PANEOLUS) PHALÆNARUM. Fr.
" " PAPILIONACEUS. Fr.
" (PSATHYRELLA) CRENATUS. Lasch.
COPRINUS STERQUILINUS. Fr.
" RADIATUS. Fr.
" HEMEROBIUS. Fr.
BOLBITIUS BOLTONI. Fr.

Cortinarius (Phlegmacium) largus. Fr.
" " multiformis. Fr.
" " cumatilis. Fr.
" " porphyropus. Fr.
" " sebaceus. Fr.
" " russus. Fr.
" (Myxacium) elatior. Fr.
" " mucifluus. Fr.
" " delibutus. Fr.
" " cristallinus. Fr.
" (Hermocybe) ochroleucus. Fr.
" " diabolicus. Fr.
" " spilomeus. Fr.
" " sanguineus. Wulf.
" (Telomonia) torvus. Fr.
" " evernius. Fr.
" " hinnuleus. Fr.
" " hemitrichius. Fr.
" " paleaceus. Fr.
" (Hydrocybe) armeniacus. Fr.
" " castaneus. Fr.
" " rigens. Fr.
" " scandens. Fr.
" " decipiens. Fr.
" " fasciatus. Fr.
Paxillus leptopus. Fr.
Hygrophorus cossus. Fr.
" russo-coriaceus. B. and Br.
" fornicatus. Fr.
" mucronellus. Fr.
" calyptræformis. Berk.
" chlorophanus. Fr.
Gomphidius gracilis. Berk.
Lactarius intermedius. Kromb.
" controversus. Fr.
" insulsus. Fr.
" trivialis. Fr.
" vividus. Fr.
" flexuosus. Fr.

LACTARIUS PYROGALUS. Fr.
,, PARGAMENUS. Fr.
,, VELLEREUS. Fr.
,, PIPERATUS. Fr.
,, PALLIDUS. Fr.
,, QUIETUS. Fr.
,, THEIOGALUS. Fr.
,, CREMOR. Fr.
,, VOLEMUS. Fr.
,, MITISSIMUS. Fr.
RUSSULA ADUSTA. Fr.
,, DELICA. Fr.
,, FURCATA. Fr.
,, ROSACEA. Fr.
,, LEPIDA. Fr.
,, XERAMPELINA. Fr.
,, VESCA. Fr.
,, CYANOXANTHA. Fr.
,, CONSOBRINA. Fr.
,, FŒTENS. Fr.
,, QUELETII. Fr.
,, OCHROLEUCA. Fr.
,, INTEGRA. Fr.
,, DECOLORANS. Fr.
CANTHARELLUS LOBATUS. Fr.
NYCTALIS PARASITICA. Fr.
MARASMUS URENS. Fr.
,, ERYTHROPUS. Fr.
,, CAUTICINALIS. Fr.
LENTINUS COCHLEATUS. Pers.
PANUS TORULOSUS. Fr.
LENZITES FLACCIDA. Fr.

Order II. POLYPOREI.

BOLETUS BADIUS. Fr.
,, SANGUINEUS. With.
,, SULPHUREUS. Fr.
,, SUBTOMENTOSUS. Fr.

Boletus pachypus. F. var. amarus.
,, impolitus. Fr.
,, æstivalis. Fr.
,, erythropus. Pers.
Polyporus lentus. Fr.
,, schweinitzii. Fr.
,, melanopus. Fr.
,, picipes. Fr.
,, lucidus. Fr.
,, epileucus. Fr.
,, chioneus. Fr.
,, cæsius. Fr.
,, nidulans. Fr.
,, rutilans. Fr.
,, fumosus. Fr.
,, cuticularis. Fr.
,, spumeus. Fr.
,, radiatus. Fr.
,, violaceus. Fr.
,, viridans. B. and Br.
,, terrestris. Fr.
,, obducens. Fr.
,, molluscus. Fr.
,, vaillantii. Fr.
Trametes rubescens. Fr.
,, mollis. Fr.
Merulius aureus. Fr.
,, pallens. Berk.
,, serpens. Tode.

Order III. Hydnei.

Hydnum ochraceum. Pers.
,, aureum. Fr.
,, stipatum. Fr.
Tremellodon gelatinosum. Pers.
Irpex obliquus. Fr.
,, quercinum. Fr.
Phlebia radiata. Fr.
Odontia fimbriata. Pers.

Order IV. AURICULARINI.

THELEPHORA CLAVULARIS. F.
" CRISTATA. Fr.
STEREUM RUBIGINOSUM. Fr.
" TABACINA. Fr.
" FRUSTULOSUM. Fr.
" RUGOSUM. Fr.
" PINI. Fr.
" ACERINA. Fr.
AURICULARIA LOBATA. Sowm.
CORTICIUM SULPHUREUM. Fr.
" CORRUGATUM. Fr.
" TYPHÆ. Fckl.
" CUTANEANUM. Fr.
CYPHELLA CATILLA. W.G.S.

Order V. CLAVAREI.

CLAVARIA BOTRYTIS. Pers.
" CONTORTA. Holms.
" FISTULOSA. Fr.
" INCARNATA. Weinm.
PTERULA MULTIFIDA. Fr.

Order VI. TREMELLINI.

TREMELLA VISCOSA. Berk.
" EPIGÆA. B. and Br.
" MORIFORMIS. Eng. Bot.
NÆMATELIA ENCEPHALA. Fr.
DACRYMYCES VIOLACEUS. Fr.
" CHRYSOCOMUS. Tul.

Fam. II. GASTEROMYCES. *Order* VII. HYPOGEI.

HYMENOGASTER LUTEUS. Vitt.
" VULGARIS. Tul.
" CITRINUS Vitt.
" OLIVACEUS. Vitt.

Order X. Myxomycetes.

Didymium squamulosum. A. and S.
Badhamia utriculosa. Berk.
Cribraria argillacea. Pers.
„ aurantiaca. Fr.
Arcyria incarnata. Pers.
„ cinerea. Schum.
Trichia fallax. Pers.
Licea cylindrica. Fr.
Polyangium vitellinum. Ditm.

Fam. III. Coniomycetes. *Order* XII. Sphæronemei.

Phoma subordinaria. Desm.
„ destructiva. Plow.
Sphæronema lycopersici. Plow.
Diplodia mutila. Fr.
„ herbarum. Lev.
„ viticola. Desm.
„ syringæ. Awd.
„ sapinea. Fr.
Hendersonia elegans. Berk.
„ graminicola. Lev.
Vermicularia atramentaria. B. and Br.
Piggotia asteroidea. B. and Br.
Leptoria ulmi. Kze.
„ polygonorum. Desm.
„ epilobii. West.
„ fraxini. Desm.
„ castanecola. Desm.
„ urticæ. Desm.
„ unedinis. Rob.
Phyllosticta sambuci. Desm.
„ primulæcola. Desm.
Cheilaria carpini. Lev.
Ascochyta armoraciæ. Feke.
Excipula strigosa. Fr.
„ petiolicola. Feke.
Dinemasporium fimeti. Ph. and Pl.

Asteroma prunellæ. Purt.
Discella carbonacea. B. and Br.
,, desmazierii. B. and Br.

Order XIII. Melanconiei.

Coryneum disciforme. Kze.
,, kunzei. Conda.
,, umbonatum. Tul.
,, beyerinckii. Oud.
Pestalozzia guepini. Desm.
Cheirospora botryspora. Fr.

Order XIV. Torulacei.

Torula stilbospora. Corda.
,, abbreviata. Corda. var. sphæriæformis.
,, hysterioides. Corda.
Sporidesmium scuteltata. B. and Br.
Septonema elongatispora. Preuss.
Sporochismæ mirabile. B. and Br.
Echinobotryum atrum. Corda.
Acalyptospora nervisequia. Desm.
Gymnosporium physicæ. Kuhn.

Order XV. Uredinei.

Uromyces (Micruromyces) ficariæ. Lev.
,, (Hemiuromyces) alchemillæ. Pers.
,, (Autoeuromyces) polygoni. Pers.
,, ,, betæ. Kuhn.
,, ,, salicorniæ. D.C.
,, ,, limonii. Lev.
,, (Heteruromyces) poæ. Rbh.
,, ,, junci. Desm.
,, ,, dactylidis. Otth
Puccinia (Leptopuccinia) buxi. D.C.
,, ,, verrucosa. Schultz.
,, ,, circææ. Pers.

Puccinia (Leptopuccinia) asteris. Duby.
,, ,, malvacearum. Corda.
,, (Micropuccinia) ægopodii. Schum.
,, (Hemipuccinia) baryi. B. and Br.
,, ,, scirpi. D.C.
,, ,, oblongata. Link.
,, ,, iridis. D.C.
,, ,, suaveolens. Pers.
,, ,, bullata. Pers.
,, ,, hydrocotyles. Pers.
,, (Pucciniopsis) bunii. D.C.
,, ,, smyrnii. Corda.
,, (Eupuccinia) tragopogi. Pers.
,, ,, adoxæ. D.C.
,, ,, pimpinellæ. Link.
,, ,, caltheæ. Link.
,, (Heteropuccineæ) graminis. Pers.
,, ,, rubigo-vera. D.C.
,, ,, molineæ. Tul.
,, ,, poarum. Niels.
,, ,, magnusiana. Korn.
,, ,, sessilis. Schum.
,, ,, obscura. Schröt.
Phragmidium subcorticatum. Schrank.
,, fragariæ. D.C.
,, rubi. Pers.
,, violaceum. Schultz.
,, rubi-idæi. Pers.
Melampsora betulina. Desm.
,, hypericorum. D.C.
,, circææ. Schum.
Coleosporium euphrasiæ. Schum.
Cæoma mercurialis-perennis. Pers.
Æcidium periclymeni. Schum.

Order XVI. Ustilagineæ.

Ustilago candollei. Tul.
,, olivacea. Tul.
,, rudolphi. Tul.

Fam. IV. Hypomycetes. *Order* XVII. Isariaei.

Ceratium hydnoides. A. and S.

Order XVIII. Stilbacei.

Tubercularia granulata. Pers.
" nigricans. Link.
" vulgaris. Tode.
" persicina. Desm.
Fusarium lateritium. Nees.
Myrothecium roridum. Tode.
Illosporium roseum. Fr.
" carneum. Fr.

Order XIX. Dematiei.

Periconia calicioides. Berk.
Helminthosporium tiliæ. Fr.
" arundinaceæ. Corda.
Helicoma mulleri. Corda.
Cladosporium dendriticum. Walls.
" bacilligerum. Mont.
" lycopersici. Plow.

Order XX. Mucedinei.

Nematogonium aurantiacum. Desm.
Botrytis agaricina. Ditm.
Oidium aureum. Link.
" balsamii. Mont.
Dactylium dendroides. Fr.
" roseum. Berk.
" lycopersici. Plow.
Fusidium geranii. West.
" cylindricum. Corda.
" asteris. Ph. and Pl.
Myxotrichum deflexum. Berk.
Ramularia armoracea. Fckl.
" destructiva. Ph. and Pl.

Order XXI. PERONOSPOREI.

PERONOSPORA NIVEA. Ung.
,, PARASITICA. Pers.
,, SORDIDA. Berk.
CYSTOPUS CUBICUS. Strauss.

Order XXII. SEPEDONIEI.

FUSISPORIUM KUHNEII. Fckl.
,, SOLANI. West.

Fam. V. PHYSOMYCETES. *Order* XXIV. MUCORNEI.

PILOBOLUS RORIDUS. Schum.
ACROSTALAGMUS CINNABARINUS. Corda.
ENDOGONE LACTIFLUA. B. and Br.

Order XXV. SAPROLEGNIEI.

SAPROLEGNIA FEROX. Kutz.

Fam. VI. ASCOMYCETES. *Order* XXVIII. ELVELLACEI

MORCHELLA SMITHIANA. Cooke.
,, GIGAS. Pers.
HELVELLA INFULA. Schæff.
PEZIZA ANCILIS. Rehm.
,, CORIUM. Weber.
,, BULBOSA. Hedw.
,, SUCCOSA. Berk.
,, FIBRILLOSA. Curr.
,, CEREA. Sow.
,, MACROCALYX. Riess.
,, MELLEA. Cooke and Plow.
,, SEPIATRA. Cooke.
,, PURPURASCENS. Pers.
,, LÆTI-RUBRA. Cooke.
,, FASCICULARIS. A. and S.
,, SEPULTA. Fr.
,, HIRTA. Schum.
,, CARNEOSANGUINEA. Fckl.
,, SCUTELLATA. Linn.

Peziza thelebloides. A. and S.
,, cocotina. Cooke.
,, palearum. Desm.
,, crucipila. Phil.
,, dalmeniensis. Cooke.
,, cupressina. Batsch.
,, subtilissima. Cooke.
,, clandestina. Bull.
,, albo-violascens. A. and S.
,, schumacheri. Fr.
,, rufo-olivacea. A. and S.
,, hyalina. Pers.
,, apala. B. and Br.
Tapesia domestica. Sow.
,, cæsia. Pers.
Hymenoscypha curreyana. Tul.
,, pseudo-tuberosa. Rehm.
,, strobilina. Fr.
Mollisia clavus. A. and S.
,, vinosa. A. and S.
,, atrovirens. Pers.
,, lacustris. Fr.
,, hepatica. Batsch.
,, atrata. Pers.
,, ulcerata. Ph. and Pl.
,, epithalina. Ph. and Pl.
Helotium æruginosum. Fr.
,, pallescens. Fr.
,, claro-flavum. Berk.
,, salicellum. Fr.
,, epiphyllum. Fr.
Patellaria clavispora. B. and Br.
Cenangium ferruginosum. Fr.
Saccobolus violascens. Boud.
,, neglectus. Boud.
Ascophanus carneus. Pers.
,, testaceus. B. and Br.
Stictis berkeleyana. Du R. and Lev.
Ascomyces tosquinetii. West.

Order XXIX. TUBERACEI.

TUBER ÆSTIVUM. Vitt.
,, RUFUM. Pico.
ELAPHOMYCES GRANULATUS. Fr.

Order XXX. PHACIDIACEI.

PHACIDIUM PINI. Fr.
,, REPANDUM. Fr.
RHYTISMA MAXIMUM. Fr.
,, SALICINUM. Fr.

Fam. VII. PYRENOMYCETES.

Sub.-Fam. I. PERISPORACEÆ.

PODOSPHÆRIA TRIDACTYLA. (Wallr.)
ERYSIPHE MONTAGNEI. Lev.
,, GRAMINIS. D.C.
CAPNODIUM SALICINUM. Mont.

Sub.-Fam. II. SPHÆRIACEÆ.

Section I. ALLANTOSPOREÆ

VALSA ABIETIS. Fr.
,, SORDIDA. Nits.
,, NIVEA. (Hoffm.)
EUTYPELLA MICROSPORA. (C. and P.)
EUTYPA SCABROSA. (Bull.)
,, VELUTINA. (Wallr.)
DIATRYPELLA FAVACEA. (Fr.)
,, TOCCIEANA. D.N.

Section II. PHÆOSPOREÆ.

SORDARIA COPROPHILA. (Fr.)
,, MINUTA. Fckl.
,, FIMISEDA. C. and D.N.
,, CURVULA. D.B.
,, CAUDATA. (Curr.)

Hypocopra fimicola. (Rob.)
,, discospora. (Awd.)
,, vesticola. (Berk.)
Coprolepa merdaria. (Fr.)
,, equorum. (Fckl.)
Anthostoma cubiculare. (Fr.)
Xylaria pedunculata. (Dicks.)
Hypoxylon miniatum. Cooke.
Nummularia lutea. (A. and S.)
,, gigas. Ph. and Plow.

Section III. Hyalosporæ.

Læstadia perpusilla. (Desm.)
,, carpinea. (Fr.)
Gnomoniella devexa. (Desm.)
Ditopella farcta. (B. and Br.)
Cryptosporella hypoderma. (Fr.)

Section IV. Hyalodidymæ.

Sphærella salicicola. Fr.
,, cratægi. Fckl.
,, pinoides. (B. and Br.)
,, atomus. Desm.
,, brunneola. Fr.
,, scirpi-lacustris. Awd.
Didymella applanata. (Niessl.)
,, superflua. (Awd.)
,, bryoniæ. (Fckl.)
Gnomonia graphis. Fckl.
Epicymatia vulgaris. Fckl.
Melanopsamma ruborum. (Lib.)
Lentomita ligneola. (B. and Br.)
Venturia ditricha. (Fr.)
,, glomerata. Cooke.
,, potentillæ. (Fr.)
Melanconis modonia. Tul.
Diaporthe (Ch.) detrusa. (Fr.)

Diaporthe (Cit.) salicella. (Fr.)
" " syngenesia. (Fr.)
" (Eu.) spiculosa. (A. and S.)
" " pulla. (Nits.)
" " samaricola. Ph. and Plow.
" " arctii. (Larch.)
" " dulcamara. Nke.
" " pantherina. (Berk.)
" (Tet) sarothamni. Awd.
" " wibbel. Nits.
" " rostellata. (Fr.)
" " vepris. (De Lacr.)
" " resecans. Nits.
" " scobina. Nits.
" " discutiens. (Berk.)
" " blepharodes. (B. and Br.)
" " ryckholtii. (West.)
" " importata. Nits.
" " putator. Nits.
" " spina. Fckl.

Section V. Pleodidymle.

Didymosphleria palustris. (B. and Br.)
" diplospora. (Cooke.)
" acerina. Rehm.
Marsariella curreyi. Tul.
Delitschia bisporula. Hans.
" winteri. Plow.
Valsaria insitiva. Cés and De Not.
" cincta. Curr.

Section VI. Pleophragmle.

Massaria fœdans. Fr.
" inquinans. (Tode.).
Leptosphleria clivensis. (B. and Br.)
" aparines. (Fckl.)

Leptosphæria michotii. (West.)
,, marram. (Cooke.)
,, typharum. (Desm.)
,, juncina. (Awd.)
,, nigrans. (Desm.)
,, nardi. (Fr.)
,, maritima. (C. and Plow.)
,, norfolicæ. (Cooke.)
,, claræ. (C. and A.)
,, culmifraga. (Fr.)
,, graminis. (Fckl.)
,, rubelloides. (Plow.)
,, pontiformis. (Fckl.)
Clypeosphaeria hyperici. (Plow.)
Chætosphæria innumera. (B. and Br.)
Melanomma fuscidulum. Sacc.
,, epochnii. (B. and Br.)
Trematosphæria anglica. Sacc.
Sporomia intermedia. (Awd.)
,, lignicola. Ph. and Pl.
Aglaospora profusa. (Fr.)
Pseudovalsa aucta. (B. and Br.)
Kalmusia hemitapha. (B. and Br).
,, hypotephra. (B. and Br.)

Section VII. Hyalophragmiæ.

Metasphæria bitorulosa. (B. and Br.)
,, sabuletorum. (B. and Br.)
Lasiosphæria helicoma. (Ph. and Plow.)
,, ovina. (Pen.)
,, scabra. (Curr.)
Melomastia friesii. Nits.
Calospora innesii. (Curr.)

Section VIII. Dictyosporæ.

Pleomassaria siparia. (B. and Br.)

Karstenula rhodostoma. (A. and S.)
Pleospora vulgaris. Niessl.
,, rubicunda. Niessl.
,, infectoria. Fckl.
,, heleocharidis. Karst.
,, scirpicola. (D.C.)
,, typhicola. (Cooke.)
,, culmorum. (Cooke.)
,, subriparia. (Cooke.)
,, rubelloides. (Plow.)
Pyrenophora trichostoma. (Fr.)
,, pileocomes. (Reb.)
Cucurbitaria berberidis. (Pers.)
,, rhamni. (Nees.)
,, dulcamarae. Fr.
Fenestella lychi. (Duby.)

Section IX. Scolecospora.

Linospora capreae. (D.C.)
Sillia ferruginea. (Pers.)
Cryptospora suffusa. Fr.

Sub-Fam. III. Hypocreaceae.

Section I. Hyalosporae.

Eleutheromyces subulatus. (Fode.)
Selinia pulchra. (Wint.)

Section II. Pleosporae.

Spileroderma episphlerium. (Ph. and Plow.)
Melanospora parasitica. Tul.

Section III. Hyalodidymae.

Hypomyces asterosporus. Tul.
,, chrysospermus. Tul.
,, rosellus. (A. and S.)
,, broomeanus. Tul.

HYPOMYCES TERRESTRIS. (Plow. and Boud.)
,, BERKELEYANUS. Plow. and Cooke.
,, CANDICANS. Plow.
,, VIRIDIS. A. and S.
,, TULASNEANUS. Plow.
,, VIOLACEUS. (Fr.)
,, LINKII. Tul.
,, CERVINUS. Tul.
,, BARYANUS. Tul.
NECTRIA RIBIS. (Todc.)
,, PUNICEA. (K. and S.)
,, DITISSIMA. Tul.
,, AQUIFOLIA. (Fr.)
,, LICHENICOLA (Cés.)
,, LECANODES. Cés.
,, FIBRICOLA. Plow.
,, PEZIZA. (Todc.)
,, MAMMOIDEA. (Ph. and Plow.)
SPHÆROSTILBE AURANTIACA. Tul.
HYPOCREA LENTA. Todc.
,, RIGENS. (Fr.)
,, AUREO-VIRIDIS. Plow.
,, DELICATULA. Tul.
,, LACTEA. Fr.

Section V. PHRAGMOSPORÆ.

CALONECTRIA PLOWRIGHTIANA. Sacc.
,, OCHRACEO-PALLIDA. (B. and Br.)
GIBBERELLA FLACCA. (Wallr.)

Section VI. DICTYOSPORÆ.

PLEONECTRIA LAMYII. (Desm.)

Section VII. SCOLECOSPORÆ.

CLAVICEPS PURPUREA. (Fr.)
,, NIGRICANS. Tul.

Sub-Fam. IV. DOTHIDEACEÆ.

Section I. HYALOSPOREÆ.

PHYLLACHORA EPITYPHA. (Cooke.)

Section II. HYALODIDYMEÆ.

DOTHIDELLA BETULINA. (Fr.)
SCIRRHIA RIMOSA. A. and S.

Sub-Fam. VI. LOPHIOSTOMACEÆ.

Section IV. HYALOPHRAGMIEÆ.

LOPHIOTREMA HEDERÆ. (Fckl.)
„ CRENATUM. (Pers.)
„ SEXUNCLEATUM. (Cooke.)

Section V. PHÆOPHRAGMIEÆ.

LOPHIOSTOMA QUADRINUCLEATUM. Karst.
„ CAULIUM. (Fr.)

Fam. VII. HYSTERIACEÆ.

Section IX. SCOLECOSPOREÆ.

LOPHIODERMIUM JUNIPERINUM. (Fr.)

XIX.

FAUNA AND FLORA OF NORFOLK.

Diatomaceæ.

By F. Kitton, Hon. F.R.M.S.

Read 25th March, 1884.

Since the publication of Part VII. of the Norfolk Fauna and Flora * I have added several genera and species to the list of Diatoms found in this County. The system of classification proposed by Prof. H. L. Smith has now been generally adopted by Diatomists; instead, therefore, of only giving a list of the additional forms, I have prepared a new catalogue in accordance with his system, and have, moreover, arranged the species of each genus in alphabetical order.

I take this opportunity of correcting one or two errors in my introduction to the previous list. On page 337 I credit William Arderon with the discovery of the first Diatom (the "Oat-animal"). I subsequently found that an anonymous contributor to the 'Philosophical Transactions' (see the abridged series 1703), in a communication entitled, "Remarks on M. Leeuwenhoek's Observations on Green Weeds and Animalcula," accurately describes and figures (pt. 1 fol. 8), but without naming it, what we now know as *Tabellaria flocculosa*.

Arderon was probably the discoverer of the first Norfolk Diatom. On page 338, line 4 from bottom, for *Dendroteres* read *Liparogyra*. The present list comprises 65 genera and 345 species: 5 genera in the old catalogue have been deleted and 11 added, and 81 have been added to the species.

* Trans. Norfolk and Norwich Nat. Soc. vol. ii. (1876—77) p. 336.

Sub-Class Algæ. Natural Order Diatomaceæ.

Tribe I.—RAPHIDIEÆ.

Family I.—Cymbelleæ.

Genus Amphora Ehrenberg.

A. affinis. (Kütz.) Mouth of the Bure, ditches at Breydon.
A. arcus. (Greg.) Sand-washings, Hunstanton, Wells.
A. arenaria. (Donk.) Same localities as the preceding.
A. Grevilliana. (Greg.) Same localities as the preceding.
A. minutissima. (Sm.) Ormesby Broad.
A. ovalis. (Sm.) Hethersett; frequent in fresh-water ditches.
A. salina. Breydon.

Genus Cocconema Ehrenberg.

C. cistula. Ehr. Frequent in most fresh-water gatherings.
C. cymbiforme. Ehr. Ditches, Heigham, Whissonsett, Flordon, Horning.
C. lanceolatum. Ehr. Heigham, Ormesby: common.
C. parvum. (Sm.) Costessey, Flordon: rare.
C. scotica. (Sm.) Costessey: rare.

Genus Cymbella Agardh.

C. Ehrenbergii. (Kg.) More or less common in fresh-water ditches.
C. maculata. (Kg.) Whissonsett, Flordon, Horning, Hickling.

Genus Encyonema Kützing.

E. cæspitosum. (Ralfs.) Ormesby Broad.
E. prostratum. (Kg.) Ormesby Broad and ditches.

Family II.—Naviculeæ Ehrenberg.

Genus Mastogloia Thwaites.

M. Braunii. (Grun.) Breydon.
M. Dansei. Thw. Breydon.
M. Smithii. Thw. Breydon.

Genus Navicula Ehrenberg.

N. ambigua. Ehr. Whissonsett, Ormesby, Breydon, Holt.

N. amphisbaena. (Bory.) Frequent in all fresh-water localities.

N. anglica. (Ralfs.) Osier Car,* Heigham, Whissonsett, Ormesby.

N. atomoides. (Kg.) Osier Car, Heigham.

N. apis. Ehr. Hunstanton Sands.

N. appendiculata. (Kg.) Osier Car, Heigham.

N. bacillaris. (Greg.) Whissonsett, Ormesby.

N. bacillum. Ehr. First observed as a British species in a gathering made at Hickling in 1867.

N. Barclayana. (Greg.) Hunstanton, Wells.

N. Bohemica. Ehr. Ditches at Breydon.

N. borealis. Ehr. In washings from Moss gathered from the trunk of an Elm, Norwich, Hickling.

N. Brebissonii. (Kg.) Horning Fen.

N. cancellata. (Donk.) Wells: rare.

N. cardinalis. Ehr. (=pinnularia. Sm.) Hickling Broad.

N. clutheensis. (Greg.) Hunstanton, Wells, Breydon.

N. crassinervia. (Bréb.) Whissonsett, Edgefield, Ormesby, St. Faith's Newton.

N. cruciformis. (Donk.) Wells, Hunstanton: frequent.

N. crucicula. (Sm.) Breydon, Wells, Lynn.

N. cyprinus. Ehr. Breydon, Wells, Yarmouth, Hunstanton, Lynn.

N. cuspidata. (Kg.) Whissonsett, Ormesby, Holt, Breydon. The habitat in the last-named locality was a brackish-water ditch. It differed from the type form in the sides being slightly rounded.

N. didyma. (Kg.) Hunstanton, Wells.

N. digito-radiata. (Greg.) Ormesby.

N. distans. (Sm.) Stomachs of Noctilucæ, Yarmouth; Hunstanton, Wells, in sand-washings.

N. elegans. (Sm.) Yarmouth, in salt-water ditches; Breydon, Wells.

N. Elginensis. (Greg.) Ormesby, Whissonsett.

N. elliptica. (Kg.) Breydon, Whissonsett, Flordon.

* This locality is now the site of the Eastern and Midlands Railway Station.

N. FASCIATA. (Lagerstadt.) Osier Car, Heigham.
N. FIRMA. (Kg.) Frequent in fresh-water ditches.
N. FORTIS. (Kg.) Hunstanton, Wells.
N. FULVA. Ehr. Horning Fen.
N. GASTRUM. Ehr. Osier Car, Heigham.
N. GENTILIS. (Donk.) Whissonsett, Ormesby, Costessey.
N. GIBBA. Ehr. Holt, Flordon, Costessey.
N. GIBBERULA. (Kg.) Ormesby, Hickling, Whissonsett, Breydon.
N. GIGAS. Ehr. Hickling Broad (this is the *Pinnularia nobilis* of Wm. Smith, but not of Ehrenberg; the true *P. nobilis* has, I believe, not been found in this country.
N. GLOBICEPS. (Greg.) Found by Professor Gregory in gathering from Flordon, sent to him by the late Thos. Brightwell, Esq., F.L.S. It has not been detected in any subsequent gatherings.
N. GRANULATA. (Bréb.) Wells, Hunstanton, and Brancaster Sands.
N. HEBES. (Ralfs.) Ormesby.
N. HENNEDYI. (Sm.) Breydon: very rare.
N. HUMEROSA. (Bréb.) Wells, Hunstanton, and Brancaster Sands.
N. HUMILIS. (Donk.) Whissonsett, Flordon, Costessey, Horning, Holt.
N. INTEGRA. (Sm.) Yarmouth, in a brackish-water ditch.
N. KOTZSCHYANA. (Grun.) Osier Car, Heigham.
N. LEVISSIMA. (Kg.) Ormesby, Horning Fen.
N. LIBER. (Sm.) Wells.
N. LINEATA. (Greg.) Wells: rare.
N. LITTORALIS. (Donk.) Hunstanton.
N. LYRA. Ehr. Wells, Breydon: rare.
N. MARINA. (Ralfs.) Breydon, Wells, Yarmouth, Hunstanton: rare.
N. MAXIMA. (Greg.) Hunstanton, Wells.
N. MENISCULUS. (Schumann) var. UPSALIENSIS. (Grunow.) Breydon.
N. MINUTULA. (Kg.) Wells, Hunstanton.
N. MUTICA. Kg. Osier Car, Heigham.
N. NODOSA. (Sm.) Osier Car, Heigham.
N. OBLONGA. (Kg.) Horning, Ormesby, Whissonsett, Costessey (a very common species).

N. OVALIS. (Kg.) Breydon, Hunstanton, Brancaster.

N. PALPEBRALIS. (Sm.) Wells, Hunstanton, and Brancaster Sands.

N. PEREGRINA. Ehr. Breydon ditches; common in brackish-water localities.

N. PERMAGNA var. (Bailey.) Breydon.

N. PLACENTULA. Ehr. Osier Car, Heigham.

N. PUNCTATA. (Kg.) Heigham, Whissonsett.

N. PUSILLA. Osier Car, Heigham.

N. RADIOSA. (Kg.) Ormesby, Runham, Horning, Whissonsett, Costessey.

N. RADIOSA var. ACUTA. (Grun.) Ormesby.

N. RECTANGULATA. (Greg.) Wells, Hunstanton, and Brancaster Sands.

N. RETUSA. (Bréb.) Wells.

N. RHOMBOIDES. Ehr. Edgefield, Ormesby, Whissonsett, Flordon.

N. RHYNCOCEPHALA. (Kg.) Flordon, Whissonsett.

N. SALINARUM. (Grun.) Breydon.

N. SCULPTA. Ehr. Breydon.

N. SCUTELLOIDES. (Greg.) Ormesby.

N. SERIANS. (Kg.) Edgefield Heath; frequent in fresh-water gatherings.

N. SPHAEROPHORA. (Kg.) Whissonsett: very plentiful, frequent in fresh-water ditches. This species is the "Oat-animal" of W. Arderon, who found it in "Spring Gardens," Norwich, in 1754 (see Baker's "Employment for the Microscope"); previously to this only two species of Diatomaceæ had been discovered.

N. SUBIMPRESSA. Grun. Breydon.

N. SUBSALINA. (Donk.) Breydon, Yarmouth, Lynn.

N. UNDOSA. Ehr. Ormesby Broad; Osier Car, Heigham.

N. VARIANS. (Greg.) Osier Car, Heigham; Whissonsett.

N. VIRIDIS. (Sm.) Common in all fresh-water gatherings.

N. VIRIDULA. Ehr. Forma parva. Breydon.

Genus SCOLIOPLEURA Grunow.

S. CONVEXA. (Sm.) Wells, Breydon.

S. TUMIDA. (Bréb.) Wells, Hunstanton, Lynn, Breydon.

S. WESTII. (Sm.) Wells, Yarmouth.

Genus Brebissonia Grunow.

B. Boeckii. (Kg.) Breydon.

Genus Stauroneis Ehrenberg.

S. acuta. (Sm.) Whissonsett: rare.
S. anceps. Ehr. Horning Fen.
S. Cohnii. (Hilse.) Moss, Osier Car, Heigham.
S. gracilis. Ehr. Whissonsett, Ormesby.
S. Gregorii. (Grun.) Breydon.
S. Leguman. (Kg.) Moss, Osier Car, Heigham.
S. salina. (Sm.) Ditches, Breydon, Yarmouth, Burgh St. Peter.
S. spicula. (Hickie.) Burgh: very rare.

Genus Amphipleura Kützing.

A. pellucida. (Kg.) Ormesby; not uncommon in this locality.

Genus Schizonema Agardh.

S. comoides. (Agardh.) Yarmouth.
S. crucigerum. (Sm.) Burgh St. Peter.
S. Grevillii. (Agardh.) Yarmouth; growing on the posts of the Britannia Pier.

Genus Colletonema Brébisson.

C. eximium. (Thw.) River Bure, Breydon Ditches.
C. neglectum. (Thw.) Forma minor. Breydon.
C. vulgare. (Thw.) Breydon.

Genus Berkleya Greville.

B. Dillwynii. (Grun.) Breydon Marshes.

Genus Stictodesmis Greville.

S. craticula. (Ehr.) Whissonsett, Ormesby, Costessey.

Genus Amphiprora Ehrenberg.

A. alata. (Kg.) Very fine in a ditch at Caister, near Yarmouth; common in salt and brackish water.
A. constricta. (Sm.) The river Bure, near Yarmouth.

A. ELEGANS. (Greg.) Hunstanton and Wells Sands.
A. LEPIDOPTERA. (Greg.) Hunstanton and Wells Sands.
A. MARINA. (Grun.) Burgh St. Peter.
A. MAXIMA. (Greg.) Hunstanton and Wells.
A. PALUDOSA. Sm. Breydon.

Genus PLEUROSIGMA Smith.

P. AESTUARII. Sm. Hunstanton Sands.
P. AFFINE. (Grun.) Breydon.
P. ANGULATUM. Sm. Breydon, Burgh St. Peter, Mouth of the Bure, Wells.
P. ATTENUATUM. Sm. Whissonsett; abundant in a ditch running into Ormesby Broad.
P. BALTICUM. Sm. Breydon Ditches.
P. ELONGATUM. Sm. Breydon, Wells.
P. FASCIOLA. Sm. Mouth of the Bure, Breydon.
P. HIPPOCAMPUS. Sm. In most brackish-water localities.
P. INTERMEDIUM. Lynn.
P. LACUSTRE. Sm. Whissonsett, Poringland, Ormesby.
P. MARINUM. (Donk.) Wells, Hunstanton.
P. NORMANII. (Ralfs.) Stomachs of Noctilucæ, Yarmouth.
P. QUADRATUM. Sm. Breydon, Wells, Brancaster.
P. SPENCERI. Sm. Whissonsett, Ormesby.
P. STRIGILIS. Sm. Runham, plentiful; rare in brackish water, Breydon.
P. STRIGOSUM. Sm. Yarmouth, Wells, Breydon, Hunstanton.
P. TRANSVERSALE. Sm. Stomachs of Noctilucæ, Yarmouth.

Genus TOXONIDEA Donkin.

T. GREGORIANA. Donk. } Frequent in sand-washing,
T. INSIGNIS. Donk. } Hunstanton, Wells.

Family III.—GOMPHONEMEÆ.

Genus RHOIKOSPHENIA Grunow.

R. CURVATA. (Sm.) Yarmouth, plentiful; not uncommon in fresh-water ditches.

Genus Gomphonema Agardh.

G. acuminatum. (Ehr.) Costessey, Flordon, Horning, Ormesby: common

G. acuminatum var. laticeps. Grun. Osier Car, Heigham.

G. auritum. (Braun.) Horning Fen.

G. geminatum. Ag. Ormesby, rare; Heacham, plentiful.

G. insigne ? (Greg.) Osier Car, Heigham.

G. olivaceum. (Ehr.) St. Faith's Newton, Heigham, Flordon, Whissonsett.

G. Puiggiana. (Grun.) Ormesby (new to Britain).

G. turris. (Ehr.) Ormesby.

G. vibrio. (Ehr.) St. Faith's Newton, Heigham, Flordon, Whissonsett.

Family IV.—ACHNANTHEÆ.

Genus Achnanthes Borg.

A. brevipes. Ag. Lynn; a few detached frustules in a sand-washing, Hunstanton.

A. linearis. (Sm.) Yarmouth, Ormesby.

A. longipes. Ag. In a tide-pool, Cromer: rare.

A. pennæformis ? (Grev.) Ditch, near Vauxhall Station, Yarmouth.

A. subsessilis. Breydon: rare.

A. ventricosa. (Ehr.) Moss, Osier Car, Heigham. The only British habitat known to me.

Genus Achnanthidium Kützing.

A. flexellum. Bréb. Ormesby, Flordon, Whissonsett, Costessey: rare.

Family V.—COCCONEIDEÆ.

Genus Cocconeis Ehrenberg.

C. pediculus. Ehr. Ormesby, Flordon, Horning, Whissonsett.

C. placentula. Ehr. Same localities as the preceding species.

C. scutellum. Ehr. On *Zostera marina*, Yarmouth; on *Cladophora*, Scratby; on *Ptilota plumosa*, Cromer.

Genus Campyloneis Grunow.

C. Grevillii. (Sm.) Sand-washing, Hunstanton : rare.

Genus Anorthoneis Grunow.

A. excentrica. (Donk.) Sand-washings, Hunstanton, Wells.

Tribe II.—PSEUDO-RAPHIDEÆ.

Family VI.—Fragilarieæ.

Genus Epithemia Kützing.

E. constricta. (Sm.) Breydon ditches.
E. gibba. Kg. Horning, Ormesby, Whissonsett, Heigham.
E. gibba. Forma minuta. Osier Car, Heigham.
E. musculus. Kg. Breydon ditches.
E. ocellata. Kg. Flordon Fen.
E. sorex. Flordon Fen.
E. succincta. Bréb. Osier Car, Heigham.
E. turgida. Kg. Horning, Ormesby, Whissonsett.
E. ventricosa. Kg. Breydon ditches.
E. zebra. Kg. Breydon ditches.

Genus Eunotia Ehrenberg.

E. arcus. Ehr. St. Faith's Common.
E. gracilis. Ehr. Same locality as preceding species.
E. paludosa. (Grun.) Stratton Strawless.
E. pectinalis. (Kg.) Osier Car, Heigham ; Ormesby.
E. pectinalis var. undulata. Ralfs. Edgefield.
E. tetraodon. Ehr. St. Faith's Common ; Edgefield near Holt.

Genus Meridion Agardh.

M. circulare. Ag. Fresh-water ditch, Yarmouth ; Costessey.

Genus Glyphodesmis Grunow.

G. Williamsonii. (Sm.) Stomachs of *Noctiluca miliaris*, Yarmouth.

Genus Rhaphoneis Ehrenberg.

R. amphiceros. Ehr. Sand-washings, Hunstanton ; Breydon.
R. surirella. Ehr. Same locality as preceding species.

Genus Asterionella Hassell.

A. Bleakeleyii. (Sm.) Sand-washings, Yarmouth.

A. elegans. (Heiberg.) Sediment from water supply, Norwich. I have not detected any Diatoms in the water since the reservoirs have been covered over.

A. formosa. Hass. Ormesby Broad. In a pond on Mousehold Heath.

Genus Synedra Ehrenberg.

S. acicularis. (Sm.) Breydon.

S. affinis. (Kg.) Breydon; Scratby, growing on *Cladophora rupestris*.

S. affinis var. tabulata. Ditch near Vauxhall Station, Yarmouth.

S. capitata. Ehr. Flordon, Ormesby, Whissonsett, Poringland, Horning.

S. delicatissima. (Sm.) Ormesby.

S. investiens. (Sm.) Growing on *Cladophora rupestris*, Scratby.

S. minutissima. (Kg.) Whissonsett, Ormesby: rare.

S. pulchella. (Kg.) Occurring in most salt and brackish-water localities.

S. pulchella var. Smithii. Grun. Ditch near Vauxhall Station, Yarmouth.

S. radians. (Sm.) Frequent in fresh-water localities.

S. radians var. (Sm.) Flordon, Ormesby.

S. ulna. Ehr. Flordon, Ormesby, Whissonsett, Poringland, Costessey.

S. vaucheria. (Kg.) Ormesby.

Genus Sceptroneis Ehrenberg.

S. subtilis. (Grun.) Breydon.

Genus Fragilaria Lyngbye.

F. capucina. (Desm.) Heigham, Costessey, St. Faith's Newton.

F. construens. (Ehr.) var. binodis. Grun. Ormesby Broad.

F. construens. (Ehr.) Ormesby Broad.

F. Harrisonii. (Sm.) Forma parva. Ormesby.

F. mutabilis. (Sm.) Osier Car, Heigham; Hellesdon Bridge; Ormesby.

F. PARASITICA. (Sm.) Ormesby Broad.

F. PARASITICA. (Sm.) var. CONSTRICTA. Grun. Ormesby Broad.

F. PARASITICA var. TRIGONA. Grun. =*Triceratium exiguum.* (Sm.) Ormesby Broad. This curious little form was discovered by H. G. Glasspoole, Esq., of Ormesby, in 1843, and may still be found in the same locality, which is, I believe, its only known habitat.

F. TENUICOLLIS. (Heiberg.) Ormesby Broad.

F. VIRESCENS. (Ralfs.) Heigham, Whissonsett, Horning.

Genus CAMPYLOSIRA Grunow.

C. CYMBELLIFORMIS. (Schmidt.) Stomachs of Noctilucæ, Yarmouth.

Genus LICMOPHORA Agardh.

L. ABBREVIATA. (Kg.) Attached to Seaweed growing on a buoy at Scratby.

L. EHRENBERGII. (Kg.) Growing on *Ceramium rubrum*, Cromer.

Genus DIATOMA Decandolle.

D. ELONGATUM. (Ag.) Norwich water supply (see note to Asterionella).

D. GRANDE. (Sm.) Ormesby ditches running into the Broad.

D. VULGARE. (Ag.) Poringland.

Genus DENTICULA Kützing.

D. KÜTZINGII (Grun.) var. MAJOR. Ormesby, Horning.

Family VII.—TABELLARIEÆ.

Genus TABELLARIA Ehrenberg.

T. FENESTRATA. (Kg.) Ormesby.

T. FLOCCULOSA. (Dillwyn.) Ormesby, Horning, Hickling, Heigham.

Genus GRAMMATOPHORA Ehrenberg.

G. MARINA. (Kg.) Scratby, growing on Algæ; Cromer, ditto.

G. SERPENTINA. (Kg.) Cromer; sand-washings, Hunstanton.

Genus STRIATELLA Agardh.

S. UNIPUNCTATA. Ag. Growing on Algæ in tide-pools, Cromer.

Genus Rhabdonema Kützing.

R. arcuatum. Kg. Cromer, growing on *Ceramium rubrum*.
R. minutum. Kg. Cromer.

Genus Cymatopleura Smith.

C. apiculata. Sm. Whissonsett: rare.
C. elliptica. Sm. Horning, Hickling, Holt, and many other localities.
C. solea. Sm. Found with preceding species.

Genus Nitzschia Hassell.

N. apiculata. Greg. Breydon.
N. angusta. Sm. Costessey, Weston, Whissonsett.
N. bilobata. (Sm.) Breydon.
N. debilis. (Grun.) Osier Car, Heigham.
N. diminuta. (Grun.) Breydon.
N. dubia. (Sm.) Breydon, Mouth of the Bure, salt-water ditches.
N. fasciculata. Grun. Growing on the piles of Yarmouth Jetty.
N. gracilis. (Sm.) Hunstanton, Wells, Breydon.
N. hyalina. (Greg.) Hunstanton, sand-washings.
N. hungarica. (Grun.) Breydon, ditch near Vauxhall Station, Yarmouth.
N. linearis. (Sm.) Whissonsett, Ormesby, Horning.
N. minutissima (Sm.) Moss, Osier Car, Heigham; not uncommon on wet walls.
N. navicularis. (Bréb.) Ditch near Vauxhall Station, Yarmouth.
N. obtusa. (Sm.) Whissonsett, Flordon, Horning.
N. plana. (Sm.) Breydon, Wells.
N. panduriformis. (Greg.) Sand-washings, Hunstanton, Wells.
N. punctata. (Sm.) Hunstanton, Wells.
N. rectiuscula. (Grun.) Breydon.
N. scutellum. (Sm.) Breydon: rare.
N. sigma. (Sm.) Frequent in all salt and brackish-water ditches.
N. sigma var. rigida. Grun. Breydon.
N. sigma var. scabra. Cleve. Breydon.
N. sigmoidea. (Sm.) Ormesby ditches, Horning, Flordon.
N. socialis. (Greg.) Rare in the Hunstanton sand-washings.
N. spathulata. (Sm.) Found with the above, but very rare.

N. SPECTABILIS. (Ehr. nec Sm.) Horning.

N. SUBSALINA FORMA CAPITELLATA. Grun. Breydon.

N. TRYBLIONELLA. (Hantzsch.) Breydon ditches, frequent; Hunstanton, Wells, Yarmouth.

Genus HANTZSCHIA Grunow.

H. AMPHIOXYS. (Sm.) Common in Moss from Osier Car, Heigham. Rare in soil attached to the roots of *Equisetum*, growing on the banks of Wensum, Hellesdon.

H. AMPHIOXYS var. VIVAX. (Sm.) Sand-washings, Hunstanton, Wells, Braneaster.

H. MARINA. (Donk.) Same localities as the above species.

H. VIRGATA. (Roper.) As above.

Genus SURIRELLA Turpin.

S. APICULATA. (Sm.) St. Faith's Common.

S. BISERIATA. (Bréb.) Hickling, Whissonsett, Tittleshall.

S. BRIGHTWELLII. (Sm.) Abundant in a gathering made by the late Thos. Brightwell, Esq., at Titchwell, but rare in other localities.

S. CONSTRICTA. (Sm.) In a ditch near Breydon, very rare.

S. GEMMA. (Ehr.) Abundant in a gathering from the North River, Yarmouth, more or less frequent in all brackish-water localities.

S. LINEARIS. (Sm.) Hickling, Costessey, Tittleshall: not common.

S. LINEARIS var. AMPHIOXYS. A. Schmidt. Horning.

S. MÖLLERIANA. (A. Schmidt.) Breydon marshes.

S. OVALIS. (Bréb.) Breydon, Burgh, Titchwell: rare.

S. OVATA. (Kg.) Frequent in slightly brackish or fresh-water ditches; abundant in a ditch at Lynn, Keswick.

S. SALINA. (Sm.) Breydon.

S. SPIRALIS. (Kg.) Tittleshall. so far as I know the only Norfolk habitat.

S. SPLENDIDA. (Kg.) Hickling, Costessey, Tittleshall—rare.

S. STRIATULA. (Turp.) Abundant and fine in the ditches at Breydon.

S. SUBSALSA. (Sm.) Breydon: very rare. (I have compared the Norfolk form with Professor Smith's specimens, and find they are identical. The figure in his Synopsis is not correct.)

Genus Campylodiscus Ehrenberg.

C. bicostatus. (Sm.) Ditches at Breydon : rare.

C. clypeus. Ehr. Ditches at Breydon ; very fine and abundant in a ditch near the "Berney Arms." First found recent by the late Robert Wighan, Esq., of Norwich.

C. costatus. (Sm.) Whissonsett, Hickling, Tittleshall.

C. echeneis. Ehr. Breydon—rare.

C. parvulus. (Sm.) Hunstanton, Breydon—rare.

C. Ralfsii. (Sm.) Wells, Hunstanton.

Tribe III.—CRYPTO-RAPHIDEÆ.

Family IX.—Chaetocereæ.

Genus Rhizosolenia Ehrenberg.

R. alata. (Brit.)
R. imbricata ,,
R. setigera ,,
R. Shrubsolii ,,
R. styliformis ,,

Found in the stomachs of *Noctiluca miliaris*, Yarmouth. Thos. Brightwell, Esq., F.L.S., was the first to observe the identity of the living forms with the fossil remains found by Prof. Ehrenberg in the Virginian deposits.

Genus Ditylum Bailey.

D. trigonum. Bail. Stomachs of *Noctiluca miliaris*, Yarmouth (=*Triceratium undulatum*, Bri.)

Genus Chaetoceros Ehrenberg.

C. ? armatum. (West.) Yarmouth Sands. This doubtful Diatom is frequently found at low water, forming a greenish-brown pellicle on the wet sand.

C. bacteriastum. (Wallich.) Stomachs of *Noctiluca miliaris*, Yarmouth.

C. Wighamii. (Bri.) In a ditch near the "Berney Arms," Breydon.

Family X.—MELOSIREÆ.

Genus Melosira Agardh.

M. arenaria. (Moore.) Plentiful in a ditch at Hellesdon ; rare in other localities.

M. BORRERI. (Grev.) Ditches, Breydon, and near Vauxhall Station, Yarmouth.

M. MARINA. (Sm.) Stomachs of *Noctiluca miliaris*, Yarmouth.

M. NUMMULOIDES. (Dillwyn.) Ditch near Vauxhall Station, Yarmouth.

M. ORICHALCEA. (Kg.) Common in fresh-water ditches.

M. PUNCTATA. (Sm.) Ormesby: rare.

M. VARIANS. (Ag.) Common in fresh-water localities.

M. WESTII. (Sm.) Hunstanton: very rare.

Genus LIPAROGYA Ehrenberg.

L. SPIRALIS. (Ehr.) In washings from Moss taken off the trunk of an Elm on Earlham Road, Norwich.

Family XI.—BIDDULPHIEÆ.

Genus ISTHMIA Agardh.

I. ENERVIS. (Ehr.) Cromer.

I. NERVOSA. (Kg.) Cromer, growing on *Ceramium rubrum*.

Genus EUCAMPIA Ehrenberg.

E. BRITTANICUS. (Sm.) Stomachs of *Noctiluca miliaris*, Yarmouth: very rare.

E. STRIATUS. (Stolterfoth.) I give this on the authority of a drawing (unpublished) made for Mr. Brightwell, by Tuffen West, and I have no doubt Mr. Brightwell found it in some of his Noctilucæ preparations, as figures of *Triceratium undulatum*, Bri., are on the same paper.

E. ZODIACUS. Ehr. Stomachs of Noctilucæ, Yarmouth: rare.

Genus BIDDULPHIEÆ Gray.

B. AURITA. (Lyngbye.) Breydon. Stomachs of *Noctiluca miliaris* Yarmouth (River Nene, W. S. Smith).

B. BAILEYI. (Sm.) Stomachs of *Noctiluca miliaris*, Yarmouth.

B. RADIATUS. (Sm.) Breydon: rare.

B. RHOMBUS. (Sm.) Breydon, Wells; mud from Yarmouth Harbour.

B. TURGIDA. (Sm.) Breydon: rare.

Genus Triceratium Ehrenberg.

T. alternans. (Bail.) Stomachs of *Noctiluca miliaris*, Yarmouth, Hunstanton Sands: rare.

T. ? Biddulphia. Heiberg. Mud from Breydon and Yarmouth Harbour: rare.

T. favus. Ehr. Breydon and Yarmouth mud.

Genus Amphitetras Ehrenberg.

A. antediluviana. (Ehr.) I have only found a few specimens on Sea-weed from Cromer.

Genus Lithodesmium Ehrenberg.

L. ? malleus. (Bri.) Stomachs of *Noctiluca miliaris*, Yarmouth. I place this form in the above genus with considerable hesitation. Mr. Brightwell refers it to Triceratium, to which it seems to have less affinity. It is probably not a Diatom.

Family XII.—EUPODISCEÆ.

Genus Eupodiscus Ehrenberg.

E. argus. Ehr. Mud from Yarmouth Harbour: rare.

Genus Auliscus Ehrenberg.

A. sculptus. (Sm.) Mud from Yarmouth Harbour: rare.

Family XIII.—HELIOPELTEÆ.

Genus Actinoptychus Ehrenberg.

A. splendens. (Roper.) Yarmouth Harbour mud: rare.

A. undulatus. (Kg.) Stomachs of *Noctiluca miliaris*, abundant. Yarmouth, Breydon, Hunstanton.

Family XIV.—ASTEROLAMPREÆ.

Not represented.

Family COSCINODISCEÆ.

Genus Hyalodiscus Ehrenberg.

H. radiatus. Breydon, Hunstanton, Yarmouth.

Genus Cyclotella Kützing.

C. compta. Kg. Ormesby.
C. Dallasiana. (Sm.) Breydon.
C. Kützingiana. (Thw.) Fresh and brackish water; Ormesby, Breydon, Flordon, River Bure.
C. Meneghiniana. (Kg.) var. rectangulata. Grun. Ormesby, Horning, Costessey, Whissonsett.
C. operculata. Kg. Ormesby, Costessey, St. Faith's.
C. operculata. var. mesoleia. Grun. Flordon.
C. papillosa. (O'Meara.) Ormesby: rare.
C. punctata. (Sm.) Titchwell, Breydon (River Nene, near Wisbeach. W. Sm.).
C. (Stephanodiscus) rotula. (Sm.) Ormesby, Horning.
C. scotica. (Kg.) River Bure, near Yarmouth.

Genus Stephanodiscus Ehrenberg.

S. Hantzschiana. (Grun.) Breydon.

Genus Actinocyclus Ehrenberg.

A. crassus. (Sm.) Sand-washings, Hunstanton, Breydon: rare.
A. Ralfsii. (Sm.) Found with the above: rare.
A. Roperii. Grun. Hunstanton: rare.
A. subtilis. (Greg.) Sand-washings, Hunstanton, Breydon: rare.

Genus Coscinodiscus Ehrenberg.

C. concinnus. (Sm. nec Ehr.) Stomachs of *Noctiluca miliaris*, Yarmouth: rare.
C. excentricus. (Ehr.) Same localities as preceding species.
C. minor. (Kg. nec Sm.) Breydon, Wells, Hunstanton.
C. nitida. (Greg.) Sand-washings, Hunstanton: rare.
C. nobilis. (Grun.) Stomachs of *Noctiluca miliaris*, Yarmouth.
C. radiatus. Ehr. Sand-washings, Hunstanton, Breydon.
C. Weisflogii. (Grun.) Breydon: rare.

Genus Palmeria Greville.

P. ? lunaris. (Bréb.) Yarmouth Pier (=*Eunotia? lunaris*, Bréb.)
P. vulgare. (Kitton.) Sand-washings, Hunstanton, Wells (=*Amphora complexa*, Gregory).

XX.

ORNITHOLOGICAL NOTES FOR 1882.

By Henry Stevenson, F.L.S.

Read 25th March, 1884.

In the absence of Mr. Quinton's elaborate and valuable Meteorological Notes, I cannot help feeling personally indebted to Mr. Preston for his "Summary," to compare with my own weather records, and literally speaking, I look with blank amazement at the paucity of notes in my journal on other topics, for the exceptional year of 1882. I never remember twelve months so devoid of special occurrences in relation to Ornithology; and, failing these, I will dwell more at length on minor incidents, and the effect of abnormal seasons upon the feathered tribes both resident and migratory.

Such remarks may not prove uninteresting to many readers, and the effect of an early, but fickle spring, and a chill stormy summer, upon the *Hirundines*, in particular, is, in itself, a noteworthy subject.

A bad season for the shore-gunners means, always, brief notes for the Naturalist; and both before and after Christmas, in the winter of 1881—2, an almost total absence of "hard-weather" fowl, and a singular scarcity of Fieldfares and Redwings, are readily accounted for in Mr. Preston's notes, when he speaks of November, 1881, as "the mildest and warmest for many years." December, also, as "mild and stormy," and January, of 1882, as "free from snow, with but little frost, and rain and fog predominating with southerly and westerly winds." The same kind of weather, with the exception of a few rime frosts and heavy gales, towards the end of the month, prevailed in February and, with the wind chiefly south and west, no wonder vegetation was unusually early. The great army of winter migrants had passed down our coasts at their usual period, and no subsequent stress of weather impelled those wintering in the North of England and Scotland to feed their way southwards,

as in most seasons; and hence a general dearth of bird-life about our sea-coasts and marshes, as well as in more sheltered inland localities.

In the first week of January I heard of two or three Waxwings, seen or shot, near Holt, and one at Lammas, near Cromer, indicating, as I have before observed, that the advent of this beautiful and irregular migrant is by no means confined to severe winters.

On the 6th a Common Buzzard appeared at Northrepps, and a large Raptor, seen at the same place on the 30th, was, possibly, a Rough-legged Buzzard, of which species one had been shot at Fulmodestone on the 14th. Of wild-fowl, the only entries I find worth notice during this month are a male Gadwall, at Salthouse, on the 6th, and another at Hickling on the 14th, the latter, in all probability, bred in this county.

As early as the 11th of February, a profusion of chips on the ground drew my attention to a freshly-bored or enlarged nest-hole of the Starling, in one of the old trees in Chapel-field; but, already, Sparrows were disputing possession, and prevailed, I have no doubt, from a mass of nesting stuff protruding from the aperture when I passed some days later.

On the 22nd a Snow Bunting was shot at Cromer, which had already begun to assume its breeding-dress,—an exceedingly early date; but if at all attributable to so mild a season, it was, no doubt, a bird of some age, as my aviary experience proves that, in most species, the oldest birds assume their summer garb soonest; and I think I may also add, in healthy subjects, the assumption in such fully adults is more rapid than in second-year, or still younger birds.

March followed suit as to mildness of temperature, and the first three weeks were altogether foreign to its usual character. With some rain to begin with, from the 5th to the 20th, Mr. Preston describes it as "summer-like;" but the 21st brought an unlooked-for change, and a keen north wind, with sleet, and even snowstorms, at times, quite changed the scene till the 25th, when the former state of things prevailed to the end of the month. With but a few rime frosts, however, the brief interval of cold had no effect on the forward state of vegetation, some three weeks in advance of ordinary seasons.

On the 1st, at Gunton, near Cromer, a solitary Brambling Finch was seen consorting with a flock of other small birds; and on the 4th and 6th, Hooded Crows, in some numbers, were observed passing southwards, near the coast at Northrepps. By the 12th, some thirty Rooks' nests were completed in Brundall Wood, and about twenty more by the 16th; and young Herons were hatched at Taverham prior to the 25th. Of the earliest summer migrants, the Wryneck was heard in Cossey Park on the 20th, and the Willow Wren and Chiffchaff at Northrepps, about the same date.

Snow Buntings, in small numbers, remained along the coast at Yarmouth till late in the month. Redshanks were clamorous in the marshes quite early in March, and Lapwings' eggs were in Yarmouth market by the last week of the month.

April was not a pleasant month, the weather variable, and mostly cold and wet, with a prevalence of north and north-east winds; and, although, as Mr. Preston notes, the Oaks were leafing as early as the 5th, and the Hawthorns in blossom by the 28th,—for the first time so early since 1840,—yet vegetation, on the whole, received a check, and the keen air and chilling showers were in strange contrast to the luxuriant greenery of the trees and hedges. The terrible gale on the night of the 29th, from the south-west, with sheets of driving rain, caused sad havoc amongst the trees in plantations, to Scotch and Spruce Firs especially, and to shrubs and plants in our gardens, those in the direct line of the blasts having their leaves shrivelled and discoloured, as if by frosts; and in the South of England the effect of frost and wind combined, after much wet, was most disastrous to the fruit crop generally. Some young Robins in my garden the next morning, partly fledged, had probably been blown from their nests, which faced the storm. Young Rooks, in localities exposed to the force of the gale, had a rough time of it on that memorable night, and nests and young birds were alike blown out of the trees. At Beeston, near Cromer, Mr. Cremer informed me that nearly all the old trees in his rookery having been blown down by the previous October gale, some fifty nests had been built this spring in smaller ones, which swayed about so much in the gale of the 29th, that numbers of young birds were thrown out and killed.

Two or three Magpies were seen at Forncett on the first of

the month; and one or more of that species were observed at Northrepps, on the coast, throughout the winter. Of the dates of arrival of summer migrants, I may further quote the following from various correspondents:—Cuckoo, 14th, at Northrepps; Nightingale, 16th, on the Ipswich and Unthank's Roads, Norwich, and Reepham a few days earlier, Thorpe 20th, Keswick and Yarmouth 22nd; Blackcap, 10th, Woodbastwick; Swallow, 18th, Keswick, 19th, Thorpe River; Sand Martin, 19th, Thorpe River; Redstart, 16th, Eaton. On the 21st, at Eaton, a bright spring day, with a south-west wind, I heard and saw, in the sheltered copse of "Blue-bell Hole," Nightingales, Redstarts, Willow Wrens, Blackcaps, and Chiffchaffs, and three Red-back Shrikes on a neighbouring fence. Neither in the village nor on the river did I see a single Swallow or Martin of either species.

There is nothing, to my mind, more unsatisfactory than the general records of so-called first arrivals of our summer warblers, as, so far as my experience goes, there is little or nothing to be learnt by them. There is an average time for the arrival of all such birds, and be the season early or late, it seems to make but little difference. An early Cuckoo or Nightingale, like the Swallow, does not make a summer; and stragglers in advance of the migratory host may occur in a cold as well as a warm spring. Such "early bird," if he finds a warm, genial, air on arrival, will burst at once into song, and be recognized; but, however warm previously, if the "early bird" is met by a sudden change to cold, on arrival, he keeps silent and sheltered till the first bright morning, when his cheery notes will certainly not register "the time of his coming." I cannot see, also, as fondly believed by many, how a forward spring in this country should necessarily lead to an early arrival of migrants from the far south; but, when these, impelled by sexual influences, have reached our southern shores on their northward passage, I can imagine a warm spring would then hurry them on to their accustomed nesting-places, whilst adverse and cutting winds would, probably, delay them for days in our most southern counties. Surely the temperature in the localities whence they take their departure, combined with and influencing the instinct of propagation, must guide their movements, rather than the sunny days with us that have advanced vegetation; or why, otherwise, should we find, in many a backward spring, or in one

where, as so often happens in April, abnormal heat is suddenly succeeded by frost and snow—Swallows and Martins, on their first arrival (species most susceptible of atmospheric influences), dying by dozens in the more exposed parts of this county from the combined effects of cold and starvation; the paucity of insect food by day rendering them still more sensitive to the frosts at night. Till our resident birds, then, open up telegraphic communication with their migratory cousins in the far south, to hasten or retard their movements in accordance with our climatal variations, I shall probably hold my present views on this subject; but the abnormally early Cuckoo or Nightingale, as recorded in the 'Times' or local journals, will never cease till the desire of some to see their names in print shall cease also. Such an announcement is rare indeed under an anonymous signature; whilst I am wicked enough to believe, whether the statement be reliable or not, that, in a large majority of cases, the chronicler himself attaches infinitely more importance to the fact that he heard it, than that the bird was there to be heard.

A few Hooded Crows still remained at Northrepps into the second week of April; and a Woodcock was flushed there on the 10th. A large number of Pied Wagtails appeared at Yarmouth about the latter date; and early in the month a Water Rail was caught alive on board a smack, just off the coast. During the first week also, the puzzling occurrence of French Partridges, seen to come in from the sea with a strong easterly wind, and, as usual, in an exhausted state on arrival, was observed on the beach at Yarmouth; and I have notes of a single bird, seen to fly in from the sea, at Lowestoft in March, and, in the same month, a small covey of this species arrived on the sands at Cromer, in like manner, and crept into any holes they could find for shelter. Being birds of rapid but not sustained powers of flight, as is well known to sportsmen, it is not easy to conjecture, if continental immigrants, from whence they come; and, as we have no record whatever of this Partridge being found in the Eastern Counties till eggs were imported at the close of the last century, and Sir Thomas Browne wrote just two hundred years ago, it was not seen in Norfolk, I still incline to the theory advanced in the 'Birds of Norfolk' that these apparent visitants are but residents, after all, seized with a restless migratory impulse in spring, and

daunted by the vast expanse of water, as they pass out to sea, swerve round again toward the land, and alight in the exhausted state in which they are usually found. Some of such immigrants, possibly, cross the Wash from the Lincolnshire coast, or arrive from still more northern counties.

May, though wet at times, and with some cool days from easterly winds, made up for it in many more of a really warm and cheery nature. I have notes of the House Martin, first seen at Keswick on the 1st, and Unthank's Road on the 2nd; but, strangely enough, I saw none at Cromer till after the 15th, though Sand Martins were numerous about the cliffs. On the 6th, Nightingales were unusually noisy round the city, after much rain, so much so, as to draw general attention to their song, and no doubt the moisture facilitating their search for worms, had stimulated their vocal powers even more than the sunshine. I first heard and saw Swifts at Cromer on the 13th, and Mr. Purdy observed and heard some in Norwich on the same day. On the 16th, at Cromer, a House Martin's nest was commenced under the eaves of a house, where, if a nuisance, they were evidently welcomed, for a board had been fixed the whole length of the building, below the remains of former nests; but, quite unconscious of its meaning, these birds were hard at work under the boarding, and, in a few days, several more nests occupied the same position.

The Turtle Dove was first heard at Northrepps on the 6th, and several were seen in that neighbourhood on the 13th; and a Nightjar and Spotted Flycatcher appeared there by the 20th. A Hobby was also observed at Northrepps on the 16th of May.

Of spring migrants amongst the Waders on Breydon "muds" the Wimbrel was seen on the 3rd, Turnstones on the 10th, and both Common and Green Sandpipers on the 13th; and on the 16th and 17th a Greenshank and some Bar-tailed Godwits, all these putting in an appearance about their accustomed time, as the 12th of May is known as "Godwit day" to the shore-gunners. Somewhat later, Grey Plovers and Pigmy Curlew were also seen at Yarmouth in summer dress; and three Avocets were said to have been seen, and one Spoonbill shot, the Bird Protection Act notwithstanding. A flock of Black Terns were observed on the 22nd, hovering over the river between Brandon and Lakenheath;

and on the 28th a large flock of Common Curlew were seen passing at Northrepps.

On the 29th, Mr. J. H. Gurney, Junr., found the larder of a pair of Red-backed Shrikes, at Northrepps, their prey spiked, as usual, on the thorns of a fence; and this, within a few yards of the spot where he had noticed the same occurrence, in the previous summer,—a tall fence, on the road near the Cromer Station.

A stay at Cromer, from the 12th of May to the 9th of June, afforded daily observation of bird-life in that neighbourhood; and renewing acquaintance with that well-known and genial old fisherman, Billy Mayes, I learnt from him, when at sea in his crab-boat, many interesting facts, both as to sea-fowl and sea-fish; some of which, as to the latter, may prove acceptable to this Society at a future time.

His most startling announcement was, that about the second week in May, as he and others were sheltering one morning from a bitter wind, under the lee of the Boarding-house on the Cliff, they saw a large grey bird coming in from the sea, which rose as it landed, and flew over their heads in the direction of Cromer Hall Woods. It was not too high for them all to recognize it as a big Owl of some kind,—"as large as a Cockerel," was his description; and one of them exclaimed: "'Tis an Owl, plain enough, and he can see in the day-time." He remembered Barn Owls that used to frequent the church-steeple, and knew well the difference in size of this visitant, which I can scarcely doubt, from the particular description of its plumage, was an immature Snowy Owl; but I could not ascertain, afterwards, that any such bird had been either seen or shot inland.

There were the usual small flocks of Grey Gulls, large and small; non-breeding rovers, in second-year plumage; but whilst some of these might be seen at all times of the day fishing off shore, others, chiefly in the morning, might be seen pursuing, low over the waves, a steady easterly course, bound, apparently, for Yarmouth Roads, and, perhaps, the mud-banks of Breydon. On one occasion I saw a few adult Greater Black-back Gulls, pursuing their routes, with an evident purpose in view; and I believe, from many former observations, that with an instinctive knowledge of the ebb and flow of the tides, these Gulls come for miles to exposed feeding-

grounds near Yarmouth, and work back again, late in the day, to roost on the extensive sand-hills about Blakeney and Cley.

Mayes tells me that about the month of October, the fishermen see Gulls by hundreds, day after day, flying in the direction of Blakeney, late in the afternoon, where he has seen them congregated in great numbers; but, as at that season they never see them going in the other direction in the morning, he supposes they must pass along the coast earlier than even the fishermen are about at that time of the year. Early in May he had seen Guillemots out at sea, off the Cromer lighthouse, passing northwards, no doubt to their breeding station at Flamborough, from whence, in the breeding season, as the fishermen assert, they pass regularly for food down to Yarmouth Roads. At different times, when fishing out at sea, he has seen various species of birds, coming over the sea, and making direct for land, more or less exhausted; amongst which he mentioned Starlings, Rooks, Sparrows (Tree Sparrows, probably), Chaffinches, Swallows, and Martins, and the tiny Gold-crested Wren. Rooks he had seen settle on the waves, as if to refresh themselves, as is frequently the case with the Swallows, dropping their feet into the water, and raising their wings at the same time. He has seen French Partridges making for land, but never knew an English Partridge in flight over the water.

One morning a small flock of the Common Gull, and on another, of Black-headed Gulls, all birds of the previous year, were hovering over and settling on the waves, within gun-shot of the beach, attracted, no doubt, by the fish-offal thrown overboard by the fishermen before coming ashore; and I noticed, also, that a few old Rooks on the Runton beach came regularly to feed on the same diet, when washed up by the tide. This is a common habit with them in the autumn and winter, in company with the Grey-back Crows; but I had never noticed it before in the nesting season.

The cold wind off the sea, for a few days after the arrival of Swifts on the 13th, delayed nesting operations; and, by day, scarcely a bird was seen over the sands, or about the Church; but by 6 p.m. some six or eight pairs were clamorous round the tower, screaming and chasing each other in their flight, before roosting. These, I imagine, had been seeking their insect-food for hours in more sheltered spots inland, or in flights over the sand-hills and salt-marshes to the north of Cromer.

The same cause had, to some extent, a like effect on the Swallows and House Martins, which, missed from the town itself, were found, during rural walks, hawking for flies over the luxuriant hay crops, and always under the lea of a tall fence or a covert side.

The predominance of Swallows over House Martins here, as in many other localities, was remarkable. The diminution of late years in the number of House Martins, is also a matter of some speculation, variously accounted for by naturalists, and my observations of some years past, have led me to consider that modern architecture, and allied causes, have much to do with it. Drainage in and around our cities and towns, and the deficiency thereby close at hand, of the minute forms of insect life that form the sustenance of themselves and their nestlings, has had, no doubt, a considerable effect upon them, together with the persecution of Sparrows, who usurp their nests; but this must have existed long ago, though it has told more perceptibly on diminished numbers through other circumstances.

As to modern street architecture, then, I would point out that the prevalence of iron gutters and the invariable flat painted board beneath, are a snare to the House Martin, which may be seen for days vainly attempting to fix its clay structure to the smooth surface, beginning again and again till the wood-work is, from end to end, dotted with little lumps of clay; and if here and there, successful, the nest falls later through much heat, or wet. People are also more particular now than formerly as to their house-fronts, and the birds are often driven off as a nuisance, and more frequent outside painting brings the inevitable third year of disturbance just as the nesting time commences, and with all their old nests destroyed, the birds are unsettled and, probably, only late fix on some other site. How rare it is now, even in the country, to see a Martin's nest in the upper corner of a bedroom window. The old-fashioned gable is disappearing fast from our streets, and those over-hanging and often drooping eaves, under which Martins' nests were protected from wind and wet. The poorer localities in our cities and towns are unquestionably the chief resorts in these days of both Martins and Swallows, though exceptions may be met with, here and there; and what the paint-pot does for the House Martin, the chimney-pot effects for the Swallow, closing up the old chimney shafts in which it once built its nest.

The latter species, however, still find ample accommodation on the cross-rafters of barns and boat-houses, in the roofs and chambers of corn and water mills, or similar erections, both in town and country, and especially near the streams they love to frequent. In support, however, of my architectural theory as regards the House Martin, I may remark that I have particularly noticed of late that where new houses have been erected after the olden style, whether large or small, there the House Martins congregate as soon as completed; in support of which I may instance the highly ornamental houses on the high road at Brundall, overlooking the river, and some ornamental cottages at Northrepps, where, as Mr. Gurney tells me, these birds located themselves from the first, and with many "coigns of vantage" for their nests in gables and projecting brickwork, built on all sides, apparently indifferent to aspect. Nothing suits them better than a fancy cornice, with the nest recessed between two projecting bricks, giving a firm hold on either side; whilst, on a flat surface, we often see three nests clinging, as it were, to each other, and the loosening of one, when the young are hatched, is probably the downfall of a colony.

Mr. Cremer, of Beeston, near Cromer, informed me that, this year and last, he had two pairs of Nightingales in his grounds, for the first time, to his knowledge; and on the evening of the 20th of May, I heard one in full song in Mr. Birkbeck's shrubbery, next the lighthouse hill, at Cromer, indifferent to the most cutting north-east wind that made one shiver in listening to him. There they are not uncommon.

June and July were equally disagreeable months, through an exceedingly low temperature. Cold winds and much rain, and a minimum of sunshine, made fires a necessity; and if we had no snow, as was the case in Scotland, in June, we had heavy hail-storms about the same date. In each month, however, the weather became finer and warmer about the last week.

The effect of such an inclement season, upon the *Hirundines* generally, was very marked, in June, especially, when nesting operations appeared to cease, for a time, altogether; and the birds, quitting their usual haunts, spent their days over the rivers and meadows for the little insect food to be found even in such

localities. Several House Martins were picked up dead in exposed parts of the country, arising from hunger as well as cold.

On the 4th of June, an adult Night Heron was seen by Mr. Cremer, at his pond at Beeston—as notable an event as the Snowy Owl. At Palgrave, near Diss, my friend, Mr. Ringer, had his attention drawn to the note of the Wryneck, and on tracing the sound to an old Scotch Fir in the churchyard, he saw two of these birds, sitting one above the other, each on a short, broken, branch projecting from *the trunk*, and as they uttered their notes with a curious elongation and twisting of the neck, they seemed to lean hard against the bole of the tree; and this they continued to do till he was tired of watching them.

A pair of Snow Buntings and a pair of Bramblings both nested and had eggs in my aviary in June, but unfortunately no young were hatched. In each case the male bird assumed the most perfect summer plumage. I also noticed for the first time in my experience, that a male Twite re-assumed the flame colour on the upper tail-coverts and a Lesser Redpole the red on its forehead, which had been lost for a time, and is hardly ever re-assumed by such birds in confinement.

On the 18th of June, this year, I heard the Cuckoo's note seven or eight times repeated, when sitting in my garden, on the Unthank's Road, within a few minutes' walk of the Market Place; and a few days after I saw one on a fence, as close to the city as Mount Pleasant Lane.

Lesser Redpoles and Goldfinches had nests and eggs in my aviary by the first week in July. House Martins did not appear, daily, in the streets, or on the roads outside the city, till about the 15th, indicating a backward state of nesting operations. This summer I noticed that the face of a perfectly fresh jamb of gravelly soil, where a cutting had extended the Thorpe Station ground, near the Cromer line of rails, was already thickly perforated with Sand Martins' holes, and these not very high up; and at Bramerton Woods End, this summer, I saw Sand Martins busy at their nest-holes, in a narrow gravelly slope, near the river, all of which were within three and four feet of the ground. In a fresh cutting, near Wroxham Station, also, these birds nest very low down.

An adult Magpie, found dead on the 15th, and a young one

trapped a few days later, at Northrepps, proved the nesting of that species in the vicinity, in spite of all precautions in the interest of game preservers.

On the 24th, I spent an hour or two on Surlingham Broad, but though a bright, sunny, day and still, with a south-west wind, both Reed and Sedge Warblers were strangely silent; the former, I was told, being very scarce. But I learnt, afterwards, from Mr. Robert Pratt who is constantly on the water, that he had scarcely ever known the Broad so void of melody in marsh-birds' notes; and the same might be said of the cries of Coots and Water-hens, so terribly had these birds been thinned down in the hard winters of 1879—80 and 1880—81. They had not, in fact, recovered their losses, especially in the former winter, when, with the Broad frozen over, the half-starved birds were knocked down with sticks or killed by dogs, and Hooded Crows; and the remnant of the Water-hens took to the stackyards and upland fences. The Coots, after a time, left for the salt-marshes on the coast, where the gunners killed large numbers, and very few returned in the spring. Migratory birds were heard whistling over the city, one night, near the end of this month.

In the course of the summer I had ocular demonstration of the abundant breeding of wild-fowl on a Norfolk estate, where the strict preservation of game proves a sure safeguard. Here, on extensive waters, were seen many pairs, with their young, not only of the Common Wild Duck and Teal, but of Shovellers, Garganey, Pochards, Tufted Ducks, and Gadwalls, as well as Great Crested and Little Grebes. Further details as to locality, site of nests found, &c., are carefully preserved in my journal and, in the interest of our rarer indigenous species of fowl and, not to gratify the curiosity of roving birdstuffers, whole "clutch" egg-collectors, or the ubiquitous excursionist (beguiled by the flashy articles of popular writers on local natural history), will remain further unused till time may render it safe to do so.

August did its best to make up for previous cold and wet, till within the last ten days, and a warm sun tempered the east and north-easterly winds. On the 6th, Mr. Preston records the hottest day of the year—eighty-three degrees.

A Hobby was seen on the 1st at Northrepps. By the 12th and 15th I find the usual notes of migratory Waders appearing on Breydon, and along the coast at Cley and Blakeney. Common Curlew and Green Sandpipers were very plentiful at the former place, where two immature Spotted Redshanks were shot on the 15th and 26th, and a few Pigmy Curlew and Knots. Four Cormorants appeared on Breydon on the 29th, and one Kentish Plover was obtained on the 21st; and a Black-tailed Godwit at Cley.

Of summer Warblers, prior to their southward movements, I may note that, in my own garden, though so near the city, I saw a Wryneck on the 3rd. Spotted Flycatchers were still there on the 16th, and, quite as late as that date, young Whitethroats, Chiffchaffs, Willow Wrens, and Redstarts frequented my Silver Birch trees, as usual in autumn. One morning I saw and heard a Robin and a Willow Wren, both birds of the year, practising their notes against next spring. I have no record of Swifts seen after the 15th, and I find, after an entry in my journal of House Martins seen feeding young in the nest on the 31st, I describe the summer of 1882 as the worst I had ever known for that species. A Nuthatch visited my garden on the 7th, and was very busy about the trunk and branches of a Cherry-tree. This species nests, regularly, in some spot on the Unthank's Road, between my house and Mount Pleasant Lane, as I frequently hear its peculiar cry during the summer months.

I may here mention that Mr. H. M. Upcher of Feltwell informed me that he had reason to believe that the Short-eared Owl nested, once again, this summer in the fens of that neighbourhood. A single bird of this species was seen at Northrepps on the 30th, coming in from the sea.

My own records of the weather in September and October tally, only too closely, with those of Mr. Preston. The former was, on the whole, wet and squally; the latter, as he describes it, was "the wettest October for seventeen years past; in fact, with but two or three exceptions, the wettest October ever known." We had, also, that month, on the 27th, a most destructive gale from the east, with a deluge of rain.

A Red-necked Phalarope was sent me in the flesh from Yarmouth

shot on Breydon on the 4th, and another was seen at the same time and on the same date exactly on which a specimen was killed there in 1881. There was somewhat a paucity of migratory Waders at Yarmouth early in the month, though, including Knots, Pigmy Curlews, and Golden Plovers (still with much black on the breast), several Greenshanks and more than usual of that species. Terns, both Common and Lesser, were leaving about this time. Redstarts were still seen on the coast about Yarmouth late in the month, as well as many Golden-crested Wrens; and Siskins had arrived at Overstrand on the 18th, and Caistor Denes on the 20th. Numbers of Titmice, Great, Blue, Marsh, and Long-tailed, in plantations near the sea; also a good many Kingfishers about Breydon water, of which, I regret to say, ten or twelve were shot, whether migrant or resident.

Close to the city I saw two Spotted Flycatchers on the 25th; and, on the same date, several young House Martins were still being fed in their nests; but on no occasion this autumn did I witness, as in previous years, the congregating of these birds, old and young, in large numbers, on the lofty roof of the chapel opposite my house.

On the 21st a Hoopoe was killed near Barton, and another specimen, some time this month, at Sheringham.

Towards the end of September there seems to have been a very mixed assortment of Waders at Yarmouth; and, in a list sent me by Mr. G. Smith of birds shot on Breydon and on the beach between the 16th and the 25th, I find Little Stint, Reeve, Oyster-catcher, Greenshank, Dunlin, Sanderling, Bar and Black-tailed Godwit, Green Sandpiper, Purple Sandpiper, Turnstone, Curlew, and Golden Plover.

A single Snow Bunting was seen on the beach as early as September 16th.

Some Honey Buzzards appear to have arrived on the coast in the last week of September, as one was trapped at Northrepps on the 30th, and another, I understand, occurred at Flegg-Burgh near the same time, and at Lound, near Lowestoft, a third (all immature) about the 26th.

On the 3rd of October Snow Buntings appeared in considerable numbers on the Denes at Yarmouth, where about a score were

netted, and I received three pairs for my aviary. Bramblings were plentiful in the same neighbourhood on the 13th. On the 5th an immature Little Gull was shot on Breydon. A Hoopoe was killed at Horsey on the 9th. On the morning of the 12th a Woodcock was shot on Yarmouth Denes, from a fresh flight, and about a dozen in that neighbourhood by the 15th. Short-eared Owls also appeared there about the same date. On the 12th, at Blakeney, Mr. J. H. Gurney, Jun., found numbers of Song Thrushes on the sand-hills, apparently just arrived. Grey Crows, first seen at Northrepps on the 9th, arrived in large numbers at Yarmouth on the 22nd, and some Fieldfares. On the 20th, also, at Northrepps a considerable flight of Jackdaws was seen passing inland. There seems to have been an arrival also of Magpies about Weybourne and Sheringham on the 10th; and, on the 17th at Northrepps, an apparent immigration of Robins, as observed by Mr. J. H. Gurney, Jun. A good many Ring Ouzels appeared at Yarmouth and its vicinity between the 6th and 15th of the month (and several at Weybourne in September). Mr. Smith told me he had seven or eight specimens brought to him. And, of other birds in that locality, seen or shot, I may mention a Peregrine at Caistor on the 14th, an immature Richardson's Skua on Breydon, same date, a Great Snipe at Bradwell on the 18th, and one at Lopham on the 28th, weighing 8½ ounces; also a Great Grey Shrike on the North Denes on the 26th; and a young male Merlin at Barton on the 23rd.

Of late summer birds, in such a season, may be noted a Swallow at Stoke, near Norwich, and a Nightjar at Northrepps on the 14th.

A good many Spotted Rails were met with in the Yarmouth neighbourhood this month. The chief ornithological event, however, of the month was the arrival, in unusual numbers all along the coast, of the tiny Golden-crested Wren, their flights occurring at intervals of some days, commencing in the previous month, and noticeable up to about the 20th of October.

A single bird, which flew, exhausted, into a room in Dr. Beverley's cottage at Overstrand, close to the sea, on the morning of the 5th, marks the date, no doubt, of one flight; and on the 8th they were abundant in a plantation on the Caistor road, near Yarmouth, and Mr. Smith described them in the same locality, and in like shelter, at Gorleston, as "very thick," on the 15th. In the neighbourhood

of Cromer, Mr. J. H. Gurney, Jun., noticed a very large arrival on the 13th, and they were numerous in the garden of Colney House, Cromer, on the 18th and 19th; and just at this date, twelve were picked up dead against the Hunstanton Lighthouse.

Amongst the Starlings, Skylarks, and other migrants killed at the Cromer light, this month, was a specimen of the Knot Sandpiper, a very exceptional circumstance.

Another special feature of this month was the great influx of Shore-larks on the beach and denes at Yarmouth. They were first seen, Mr. G. Smith informed me, on the 15th, and from that date to the 29th, about fifty were shot, of which thirty passed through his hands; and of these he believed only six were females. Two were shot at Cley, out of a considerable flock, on the 30th. Twenty years ago I gave a long price for a Yarmouth specimen, as one of our Norfolk rarities.

The wild-fowl killed on Breydon this month consisted only of a few Pintail Ducks, Wigeon, Mallard, and Teal, a few Grey Geese, of which species not known, a large flock was observed, flying, at Northrepps on the 25th, and a lot of seven Sheldrakes on the 23rd. The fearful gale, however, from the east on the 27th, drove hundreds of Gulls, large and small, in shore, which sought Breydon waters for shelter.

November, mild, wet, and stormy, and with but slight frosts, afforded little sport to the gunners. The only winter fowl at Yarmouth were represented by a few immature Scaups, Golden-eyes, Red-breasted Mergansers, and Goosanders, on Breydon, and considerable flocks of Scoters out at sea. Several young birds of the Sclavonian Grebe were also met with, and about sixteen Whooper Swans appeared, but passed on in safety.

The paucity of Tringæ, both on the beach and Breydon muds, this month, was remarkable; but Snipe were at times very plentiful in the marshes, with hundreds of Lapwings.

A few Shore-larks still frequented the Denes, and five more were shot in the first week, and two on the 25th, and one caught alive, which came to my aviary. A pair were seen at Hunstanton on the 2nd (when Skylarks and Hooded Crows were arriving off the sea all day), and three were shot at Blakeney the same week. Large flocks of Wood Pigeons were observed coming inland at Northrepps

on the 5th, and Lapwings, in successive flocks, high up, on the 23rd.

Of other occurrences may be noted a fully adult male Shoveller, in brilliant plumage, shot near Yarmouth on the 3rd. A Norfolk Plover, from Swaffham, as late as the 8th of this month, which was very fat, and weighed 1 lb. 6 oz. A Fork-tailed Petrel was said to have been for sale in Yarmouth market. A Crossbill, shot from a flock at Caister, near Norwich, and a beautiful adult male Merlin at Caistor, by Yarmouth. Two or three great Spotted Woodpeckers, seen this month in unusual localities near the sea, had, no doubt, arrived on this coast. The last House Martins seen this year, were two young birds of a very late hatch, flying feebly about Bracondale Hill on the 8th of November.

Several rime frosts and one severe night when eight degrees of frost was registered, in December, did not avail to bring wild-fowl, or other winter visitants to our shores in any numbers; and the list of occurrences on any part of the coast is but a meagre one.

When going up to London by rail on the 4th, I saw a prodigious quantity of Lapwings rise from the meadows near the Lakenham Viaduct. I should say between three and four hundred. I never before saw so many in one flock; and with the sun on them, as they rose and spread out, it was a beautiful, as well as a remarkable sight.

The scarcity of Waders on Breydon was the same this month as last; and a few Knots and a Bar-tailed Godwit, shot on the 19th, was an event amongst the gunners. Golden and Green Plovers were plentiful, and a good many Widgeon appeared on the 3rd, and a Whooper Swan was shot on the 11th. About the 16th, seven Goosanders were sent into Yarmouth, one an adult male, shot in the neighbourhood; and three other young birds had been killed on Breydon with one or two immature Red-breasted Mergansers. Immature Golden-eyes were the only "hard-weather" fowl, and one or two Grey "Lag" Geese were shot on the coast—eight seen in one flock;—and three Bean Geese in the marshes near Yarmouth. Two more Sclavonian and one Red-necked Grebe were also obtained on Breydon. On the 8th another Little Gull was shot on the beach, and an immature Hen Harrier, male, on the 15th. Two Bitterns, from Hickling, were for sale in

Yarmouth market; and a Peregrine Falcon was shot on Breydon on the 13th.

Early in the month, three Great Grey Shrikes were killed in the county, at Loddon, Aylsham, and Fakenham.

Waxwings were seen, and two or three shot at Palling, Sheringham, and Hunstanton; at Yarmouth, one was killed in the "Apollo Gardens" on the 14th, and two were reported from Gorleston on the 17th. Woodcocks were numerous about the 15th, when thirty were shot in the coverts at Hempstead.

In bringing my notes for this year to a close, it is something to be thankful for, that, in its last month, Norfolk escaped the severe snowstorms that blocked locomotion, by road and rail, in some parts of Scotland, and in the North of England; as well as the terrible fogs which, from personal experience, I can say, rendered life in London almost unbearable for a time. Still, a modified form of similar wretchedness was ours in a prevalence of, rain, sleet, fog, and cold winds, with a combination of such atmospheric pleasantries on Christmas-day. Slightly varying then the form of a familiar epitaph I would say, of 1882: "Take it for all in all, may we never look upon its like again!"

XXI.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Chitons from Cromer. In July, 1883, Mr. A. C. Savin and myself collected a number of Chitons, between tide-marks, at Cromer. All the specimens, except one, belong to *Chiton marginatus*, Pet., species already recorded by the Rev. G. Munford from Hunstanton. One large specimen is referable to *Chiton lævis*, Pen., a species apparently new to the county.—Clement Reid.

Further notes on the Springs and Spas of Norfolk (see *ante* pp. 318, 525). I was informed by Mr. S. F. Sainty (of the Ordnance Survey) that people have walked miles to drink of the Stibbard Spoy, a spring that runs into the stream about three furlongs due north of Stibbard Church, and to the east of the road between Stibbard and Fulmodeston. It is a chalybeate spring, that issues from the Glacial sands.

Mention is made in 'The Norfolk Antiquarian Miscellany' (vol. ii. part ii. p. 391), edited by Walter Rye, of a mineral spring that was situated at or near Cromer. No particulars of the water are given; and on referring the matter to Mr. Clement Reid, he informs me (by letter): "I expect it was an iron spring such as we constantly find, but the cliffs have gone too much since 1631 for us to find it now." I am indebted to Mr. Southwell for the reference to Mr. Rye's book.—H. B. Woodward.

ERRATA.

Page 150. In measurements of *Delphinus albirostris*, fourth and fifth measurements, for "caudal," *read* "dorsal."

Page 193. Last line, for "from one point of view," *read* "our," &c.

Page 487. Second line, for "two hundred," *read* "two thousand."

Page 624. Seventh line from top, for "penman," *read* "penmen."

" Tenth line, for "Kynme," *read* "Kyme."

" Seventeenth line, for "change," *read* "charge."

Page 673. Third line from bottom, and again, page 674, eight lines from top, for "Kenick," *read* "Kerrich."

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