TRANSACTIONS

OF THE

Norfolk and Norwich

NATURALISTS' SOCIETY

VOL. X.—PART IV.

1917—18

EDITED BY THE HONORARY SECRETARY

NORWICH.
PRINTED BY A. E. SOMAN & CO.
February, 1919

(Issued to the Members for the year 1917-18.)

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1919

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Dear Sir,

In reply t

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our Transactions have not b

and I now make good the omi

-plete your set, namely, pts

Our next part will not be p

this year.

The Librarian
British Museum(Nat Hist)

Naturalists' Society

NG
RINCE OF WALES, K.G.

31 SURREY STREET
NORWICH

March 18th 1922

our request of Feb.13th, which
I write to say that I am sorry
sent to you with regularity,
ons that you require to com-
5 of Vol 10 and pt 1 of Vol 11.
ished until towards the end of

ours faithfully

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TRANSACTIONS

OF THE

NORFOLK & NORWICH NATURALISTS' SOCIETY.

The Committee beg to direct the attention of authors of communications to the Society to the following Regulations which have been drawn up in order to accelerate the publication of the Transactions, and to utilise as widely and as fairly as possible the funds which the Society devotes to the publication of scientific researches :—

1.—Precedence will be given to papers dealing with local Natural History.

2.—MSS. of Papers.—As soon as any paper is ready for publication, whether it has been read before the Society or not, it must be sent to the Hon. Secretary for the consideration of the Committee.

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

1. The practical study of Natural Science.

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

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

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

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

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

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The Treasurer in Account with the Norfolk and Norwich Naturalists' Soctety, Year ending April 24th, 1918.

I. GENERAL ACCOUNT.

Receipts.

	£	s.	d.
Balance at Bank, April, 1917	21	2	11
Subscriptions	106	3	6
J. H. Gurney, Esq., Donation for the Library	5	0	0
Sale of "Transactions"	0	12	6
Sale of "Flora of Norfolk"	0	8	0
Payment for Reprints	0	15	0
Transferred from Special Publication Fund	20	0	0
Interest on Deposit Account	1	7	6
	£155	9	5

Payments.

	£	s.	d.	£	s.	d.
Cost of "Transactions," Vol. X., Part iii.—						
Cost of Illustrations	11	3	6			
Cost of Printing, etc.	41	10	0			
Paid to Prof. Oliver for Blakeney Point Report	4	5	0			
Envelopes for Distribution	1	15	0			
				58	13	6
Reprints				1	5	0
Norfolk and Norwich Library—Hire of Room				3	3	0
Assistant Secretary's Salary				5	0	0
Stationery and Account Books				3	9	3
Year Book of Societies				0	6	5
Insurance—Library				0	18	0
Postages and Sundry Payments				2	18	3
Transferred to Life Membership Fund				19	12	0
Balance at Barclay's Bank—						
On Deposit	51	7	6			
On Current Account	8	16	6			
				60	4	0
				£155	9	5

II. SPECIAL PUBLICATION FUND.

	£	s.	d.
Balance, April, 1917	2	13	6
Donations—			
J. J. Paul, Esq.	0	7	6
Miss Geldart	5	0	0
Sir Eustace Gurney	1	1	0
J. H. Gurney, Esq.	5	0	0
Mrs. Marggraff	4	17	6
S. H. Long, Esq., M.D.	1	1	0
Robert Gurney, Esq.	5	0	0
	£25	0	6

	£	s.	d.
Transferred to General Account	20	0	0
Balance at Barclay's Bank	5	0	6
	£25	0	6

III. LIFE MEMBERSHIP FUND.

	£	s.	d.
Balance, April, 1917, in Norfolk and Norwich Savings Bank	26	0	0
One Life Membership Payment	6	0	0
Interest to November 20th, 1917	0	13	0
From General Fund	19	12	0
	£52	5	0

	£	s.	d.
April 4, 1918, Purchase of £64 War Savings Certificates	49	12	0
Balance in Norfolk and Norwich Savings Bank	2	13	0
	£52	5	0

Examined and found correct,

ROBERT GURNEY.

EXPLANATION OF ACCOUNTS.

THE accounts submitted for the year ending April, 1918, show an apparently very satisfactory financial position since the Society ends the year with a substantial balance at the Bank, and has at the same time nearly doubled its Life Membership Fund. I must, however, draw the attention of the members to the fact that this aspect of prosperity is somewhat illusory, the unusually large receipts for the year being due chiefly to a special effort having been made to collect arrears of subscriptions. For the future the Society must rely on its ordinary income. Now the present ordinary membership of 191, assuming every member to pay his subscription regularly, (which is not always the case), can only produce about £70, and this amount will barely suffice to pay for the cost of the Transactions, having regard to the increased cost of paper and printing. If the Society is therefore to remain solvent it is absolutely necessary, not only for members to pay their subscriptions regularly, but also to increase the membership; and I wish to appeal to members to interest their friends in the Society and to persuade them to join it.

ROBERT GURNEY.

List of Publications added to the Society's Library from May, 1917, to April, 1918.

Allis T. On the Sclerotic Ring of the Eyes of Birds and Reptiles. 8vo. York, 1855. *Presented by Mr. J. H. Gurney, F.Z.S.*

Ashmolean Natural History Society of Oxfordshire. Proceedings and Report, 1916.

Bompas G. C. Life of Frank Buckland. 8vo. London, 1886. *Presented by Mr. J. H. Gurney, F.Z.S.*

Bristol Naturalists' Society. Proceedings, Vol. III. Parts 2 and 3. Vol. IV. Parts 1 and 2.

Cambridge Philosophical Society. Proceedings. Vol. XIX. Parts 2 and 3.

Edinburgh Royal Botanic Gardens. Notes. Nos. 29, 30, 42—46.

———— Royal Physical Society. Transactions. Vol. XX. Parts 2 and 3.

———— Royal Society Proceedings. Vol. XXXVI. Parts 3 and 4. Vol. XXXVII. Parts 2—4.

Geographical Journal. May, 1917—April, 1918. *Presented by Mr. H. G. Barclay, F.R.G.S.*

Geological Society. Quarterly Journal. No. 284. *Presented by Col. H. W. Fielden, C.B.*

Glasgow Naturalist. Vol. VII. Nos. 1—4.

Hastings. St. Leonard's Natural History Society. Report, 1914—15.

———— Naturalist. Vol. II. Part 6.

Hertfordshire Natural History Society. Transactions. Vol. XVI.

Heyn V. Wanderings of Plants and Animals from their first home. 8vo. London, 1888. *Presented by Mr. J. H. Gurney, F.Z.S.*

Hinde Dr. G. J., F.R.S. The Glacial and Interglacial Strata of Scarboro' Heights, Ontario. 1877.

———— Notes on Distribution of Xanthium. 1878.

———— A new genus of Favosite Coral (*Syringolites huronensis*) from the Niagara Formation, Manitoulin Island. 1879.

———— Review of Nicholson's Tabulate Corals. 1879.

———— Annelid Jaws from the Wenlock and Ludlow Formations of the West of England. 1880.

———— Catalogue of the Fossil Sponges in the British Museum (Natural History). 4to. 1883.

———— Structure and Affinities of the Family of the Receptaculitidæ. 1884.

———— Some Fossil Calcisponges from the Well-boring at Richmond, Surrey. 1884.

———— Microscopic Structure of the so-called Malm of Firestone Rock of Merstham and Goldstone, Surrey. 1886.

———— *Hystricinus* Hinde, *versus Arthroacantha* Williams; a question of Nomenclature. 1886.

———— The Fossil Sponges. 1886—1912.

———— On the genus *Hindia*, Duncan and the name of its typical species. 1887.

———— The Chert and Siliceous Schists of the Permo-Carboniferous Strata of Spitzbergen. 1888.

———— The History and Characters of the genus *Septastræa*, D'Orbigny (1849). 1888.

———— On *Archæocyathus*, Billings, and on other genera allied to or associated with it, from the Cambrian Strata of North America, etc. 1889.

———— Fragments of Siliceous Rock from the Boulder Clay of the Roode Klif (Friesland). 1889.

———— A new genus of Siliceous Sponges from the Trenton Formation of Ottawa. 1889.

———— Palæontology of Western Australia. 2. Corals and Polyzoa. 1890.

———— Radiolaria in the Mullion Island Chert. 1893.

———— Microscopic Structure of some of the Organic Rocks from the New Hebrides. 1893.

———— A new Fossil Sponge from the Eocene of the East Slope of the Ural. 1894.

———— Additional Notes on the Radiolarian Rocks of the Lower Culm Measures of Dartmoor. 1897.

———— Radiolarian Chert from the Island of Billiton. 1897.

———— Eminent Living Geologists. Dr. G. M. Dawson. 1897.

———— Radiolaria in the Devonian Rocks of New South Wales. 1899.

———— Remarkable Calcisponges from the Eocene of Victoria, Australia. 1900.

———— Hans Bruno Geinitz (Obituary). 1900.

———— Review on Prof. V. Amalitzky's "The Permian of Russia." 1901.

———— Zone of Marsupites in the Chalk at Beddington, near Croydon, Surrey. 1904.

———— Description of some Fossils from a Croydon Garden. 1904.

———— Structure and Affinities of the genus *Porosphæra*. 1904.

———— The Bone-bed in the Upper Ludlow Formation. 1904

———— Note on Fragments of Chert from North China. 1905.

———— Review on Geological Survey of Canada, by Robert Ball. 1905.

———— Radiolaria from Triassic and other Rocks of the Dutch East Indian Archipelago. 1908.

———— Fossil Sponge-spicules in a Rock from the Deep Lead (?) at Princess Royal Township, Norseman Island, W.A. 1910.

———— Review of Prof. J. W. Gregory's Fossil Brysozoa. 1910.

———— On *Solenopora garwoodi*, sp. nov., from the Lower Carboniferous in the North-West of England. 1913.

———— and Horace B. Woodward. Excursion to Faringdon and Abingdon. 1892.

———— Howard Fox. Supplementary Notes on the Radiolarian Rocks in the Lower Culm Measures to the West of Dartmoor. 1896.

All presented by Mrs. G. J. Hinde.

Hooker W. J. Journal of a Tour in Iceland in the Summer of 1809. 8vo. Yarmouth. 1811.

Presented by Mr. J. H. Gurney, F.Z.S.

Hull Scientific Field Naturalists' Club. Vol. IV.

Janet C. L'alternation sporophyto-gamietophytique de générations chez les Algues.

———— Notes préliminaires sur l'œuf de Volvox globator.

Presented by Mr. J. H. Gurney, F.Z.S.

Linnean Society. Journal of Zoology. Nos. 209, 210, 219—223.

———— List of Members, 1914—18. Proceedings, 1913—16.

Presented by Mr. J. H. Gurney, F.Z.S.

Lloyd Library. Bibliographical Series. Vol. II. No. 12.

Manchester Literary and Philosophical Society. Memoirs. Vol. LXI. Part 1.

Marine Biological Association Journal. Vol. XI. Part 3.

Microscopical Society, Royal. Journal. Nos. 238—41.

Northampton Natural History and Field Club. Transactions. Nos. 145—148.

North Staffordshire Field Club. Transactions. Vol. LI.

Philadelphia Academy of Natural Science. Vol. LXVIII. Part 3.

Royal Institution of Great Britain. Proceedings. Vol. XXI. Parts 1 and 2.

Sladen F. W. L. The Humble Bee. 8vo. London, 1912.

Presented by W. H. Tuck, Esq.

South London Entomological Natural History Society. Proceedings. 1916—17.

U.S. Geological Survey. Bulletins Nos. 627, 630, 635, 636, 638, 640, B.D.E., 645, 648, B.E. 649.

———— Mineral Resources. Report, 1915. Part 1. Nos. 3, 5, 7. Part II. Nos. 12—14, 16, 17, 19, 20.

———— Professional Papers. Nos. 91, 98, I—N.

———— Water Supply Papers. Nos. 360, 384, 387, 395.

Wisconsin Academy of Sciences. Transactions. Vol. XVIII. No. 2.

ADDRESS

Read by the President, Lance-Corporal W. G. Clarke, *to the Members of the Norfolk and Norwich Naturalists' Society, at their Forty-ninth Annual Meeting, held at the Norwich Castle Museum, April 25th,* 1918.

Ladies and Gentlemen,

I regret to say that, owing to the continuance of the War and of the stringency of the local lighting conditions, it has been impossible to resume our ordinary monthly meetings. This is much to be regretted, and it was thought at one time that such action—or rather inaction—might reflect adversely upon the membership of the Society, but I am pleased to be able to report, and the Report of our Hon. Treasurer would seem to bear this out, that so far no such connection has been noticed.

During the year six members have resigned, five of whom live at a distance from Norwich and never attended our meetings.

Four members have died. These were the Rev. W. Becher, Mr. G. J. Hinde, F.R.S., Mr. Hamon le Strange, and Mr. W. M. Crowfoot. The last-named was one of our eight remaining original members, and it is hoped that we shall be able to publish an obituary notice of him, with portrait, in the next number of the Transactions.

As you have heard from the Report of the Special Committee, it is the intention of the Society to mark its Jubilee next year in some special and appropriate manner. I think one may safely leave it to the Committee to determine how best this can be carried out.

The total membership of the Society at the present time is 238, made up of :—189 Ordinary members,

37 Life members,

12 Honorary members.

Ten years ago we had 284 members, so that we have decreased by 46 members in this period.

My learned predecessors in office have had many varied claims to distinction, and my own must rest on the fact that I am the first—and, I hope, the last—to deliver my Presidential address in khaki. Owing to this I have had no opportunity of undertaking any special work during the year, and have been compelled to rely upon my notebooks for the subject of my address, so that I must ask your forbearance should its details or conclusions already be known to you.

The Natural History of Norfolk Commons.

In 1910, by the help of a number of correspondents in various parts of the County, I was able to publish a preliminary list of the Commons of Norfolk.* Since that time I have visited (generally in company with Mr. W. H. Burrell, F.L.S.) all the areas mentioned in that paper, as well as some hundreds of others whose status was uncertain. My own enquiries have been devoted to ascertaining the common land in Norfolk accessible (though not of legal right) to the general public, and therefore to the naturalist, and this naturally excludes a large area consisting of fuel allotments let to private persons and the proceeds divided among the poor. After a lengthy experience of seeking to elicit information, I am reluctantly compelled to conclude that the only way to obtain a perfectly accurate list of the commons of Norfolk would be to hold a judicial investigation in each village, with power to examine witnesses, and inspect manorial deeds, Inclosure Acts, award maps, and other essential documents. Residents in a village frequently do not know the location of their own commons, and there is often confusion because of a practice prevalent in Norfolk—perhaps dating from pre-Inclosure days—of calling privately-

* Trans. Norf. and Nor. Nat. Soc., Vol. IX., pp. 52—70.

owned heathland or any area with furze upon it, "common." The place-name "Common" has often persisted long after the area has been allotted and enclosed, and in many villages parishioners give the most contradictory accounts of what is, and what is not, communal property.

As a result of visits to the places mentioned, it seems probable that the following recorded as commons in the previous list should be deleted as they are now neither privately owned or inaccessible to the public :—Alby-with-Thwaite Low Common, Aylmerton Common, Billingford (Dereham) Common, Blickling White Top Common, Bradfield Hill, Costessey Common, Docking Common, Dunston Common, East Harling Fen, East Walton Lamb's Common, Felmingham Low Common, Felthorpe Common, Fulmodestone Common, Gaytonthorpe Common and Moor's Common, Grimston Mill Hill Common, Loddon Common, Narborough Common, Blackborough End, Middleton, North Elmham Turf Common, Old Buckenham Fen, Thorpe Market Common, and Worstead Common. The areas of Bradfield Common (7a.), East Beckham Common (2a.), East Walton Common (14a.), and Roydon Common (600a.) are also approximately as now given.

The following should be added to the previous list :—

Barton Turf. "Claypits." 40 S.E. Pasture and pools. About 2a. "Gravel-hole." 40 S.E. Furze and *Juncus*. About 2a.

Billingford (Diss). "Greens." 90 N.E. Pasture. About 7a.

Bodham. "Common." Furze and *Erica*. About 18a.

Brancaster. "Barrow Hill." 7 N.W. Furze and heath pasture. 18 common rights appertaining to ancient cottages. "Marsh Common." 2 S.W. 65a. Salt marsh. About 350a.

Briston. "Green." 17 S.E. Pasture. About 4½a.

Brunstead. "Common." 30 S.W. and 41 N.W. Marsh and pasture. About 12a.

Burnham Thorpe. "Green." 7 N.E. Pasture. About 2a.

Castle Rising. "Day and Night Commons." 22 S.E. Pasture. About 60a. "Ling Common." Scotch pines, bracken, and heather. 22 S.E. and 33 N.E. About 100a.

Cawston. "Heath." 38 N.E. and 39 N.W. Fuel allotment with Rifle Range. Scotch pines, *Erica* and *Calluna*. 116a.

Eaton. "Common." 75 N.W. Pasture. About 12a. In 1916 the right to graze one head of cattle let for 16s.

Great Massingham. "Green." 35 N.W. Pasture with ponds. About 6a.

Great Ryburgh. "Common." 25 N.E. Reed-swamp, marsh, pasture, and furze. About 33a.

Howe. "Green." 88 N.W. Pasture. About 5a.

Hunworth. "Green." 18 S.W. Pasture. About 3a.

Leziate. "Fen." 34 S.W. Marshy pasture, peat-workings, and reed-swamp. 104a. "Heath." 33 S.E. and 34 S.W. Heath pasture, *Calluna*, and *Carex arenaria*. About 140a.

Little Barningham. "Green." 18 S.E. Pasture. About 14a.

Newton-by-Castleacre. "Grove Common." 47 N.E. Bracken and heath pasture. About 3a. "Newton Heath." Heath and marshy pasture. About 30a.

North Wootton. "Cattle and Horse Common." 22 S.E. Pasture. 137a. "Ling Common." 22 S.E. and 33 N.E. Bracken cut by right-holders. About 100a.

Palling. "Common." 30 S.E. Pasture with gors and *Rubus*. About 7a.

Shouldham. "Green." 57 N.E. Pasture. About 2a.

Smallburgh. "Fen." 40 N.E. Mowing marsh with alders. About 18a. "Fen." 40 N.E. Mowing marsh. About 20a.

Stoke Ferry. "Common." 70 S.W. Heath pasture with large pond. About 10a.

Swanton Morley. "Burgh Common." 37 S.W. Riverside pasture. About 4a.

From the 11,163 acres of land in the county described in my previous list as accessible to the public, 1,199 acres should therefore be deducted, and 1,388 added, leaving an approximate total of 11,352 acres on which the botanist can wander unchallenged.

The Results of Inclosure.

The commons of Norfolk are the attenuated survivals of large areas, of much of which no details of the period of Inclosure are known, though up to the middle of the 18th Century Norfolk was less inclosed than Suffolk or Essex, and there was more open field in West Norfolk than East. The percentage of townships affected by subsequent Inclosure Acts was 28 for open field and 15 for common, and the percentage of land 19 for open field and 6.9 for commons. Common of shack was frequent, and this was a great obstacle to inclosure. Between 1730 and 1760 considerable inclosure took place by agreement in the sandy areas of North-West Norfolk, although the inclosure by act in the county before 1760 amounted to only .2 per cent. of the area. In Norfolk there was greater liberality than elsewhere in giving compensation for common usage illegally practised prior to the various Inclosures. Professor E. C. K. Gonner has shown* that on the sands of the north-west the percentage of inclosure by act is low, amounting in the Docking registration district to 29, Walsingham 22, Erpingham 15, and Aylsham 13. In the south-west the inclosures were in the main of land with common field, and amounted in the Thetford registration district to 26 per cent., Downham 30, and Swaffham 31. In East Norfolk the inclosures were mostly after the year 1800, and were nearly all of common field, which in such a fertile district yielded little more profit when inclosed than when open, and totalled 59

* "Common and Inclosure," 1912.

per cent. in the Fleggs and 38 per cent. in Tunstead. Commons were especially inclosed in the south-east. From the figures given, it will be seen that about 90,000 acres of common land, as distinct from common field, were inclosed in Norfolk between 1760 and 1870.

Common Rights and Customs.

Associated with existing commons are certain customs, some of immemorial antiquity, details of which have never been printed. On Oxburgh Fuel allotment the ancient signal for the beginning of mowing was the blowing of a horn, whereupon each rightowner cut round as much as he could mow. On Blo' Norton Fen, where each rightholder has a strip 14 yards wide from road to river, the signal for beginning to cut peat was the tolling of the church bell. Peat is still cut and stacked every year on Buxton Heath, Hevingham, and most of the "wet commons" show that the industry was formerly carried on. In 1889 it was resolved at a parish meeting at Brunstead that all the poor should have equal rights on the common, as previously only dwellers in certain cottages enjoyed the rights, and there were disputes concerning the turf and peastick cutting, feeding, and grass and rush mowing. Common mowing begins on July 20th, at 6 a.m., and ends on July 30th. No turf or hovers may be cut before May 1st or after July 30th; no person may cut more than 1000 for any one householder; and none may be sold out of the parish. Peasticks can be cut in April, but none may be sold out of the parish. Furze may be cut at any time. The ditches are cleaned out by parish rate at irregular intervals. No turf or hovers have been cut for fuel for the past ten years; three or four cottagers exercise feeding rights; but practically all the common is mown annually. Before 375 acres of Roughton Heath were enclosed, eight to ten men obtained their living from it, "casting" stone, cutting turf, broom-tying, and digging sand for sanded floors. Both on Marsham Heath and Buxton Heath, Hevingham, *Calluna* and *Erica* are still cut for besoms or sink brushes, which are made by the villagers. On West Lexham Common, known

as "Sidestock," I was told a widespread tradition with a local application. The common was said originally all to have been in Lexham parish, but a dead man was found on it. The Lexham people refused to bury him, and the inhabitants of Newton-by-Castleacre did, so that the latter took the main square of the Common, leaving Lexham the angles. Boughton Fen is mown by the right-owners without limitation, at an agreed date after harvest. The rights of mowing and grazing were originally attached to 18 cottages, 11 of which were pulled down by one owner, who retained the rights. At his death in 1913 these were advertised for sale, but the Charity Commissioners prevented this and held an inquiry, when it was stated that the mowing rights were worth about 2s. each, and the grazing rights about 15s. each, so that the annual value of a common of 44 acres was about £15. One man hired the eleven rights previously mentioned and four others. On Barrow Hill, Brancaster, the occupants of certain dwelling-houses have a right to keep "two cows or heifers, or a mare and a foal, or two horses; also to cut furze." There are 57 common rights on Castle Rising Day and Night Commons, attached to various houses in the village, and the 10s. paid yearly for each right goes to the Lord of the Manor. The right-owners on Holt Lowes and Spout Hills can pasture two head of cattle or horses. Parishioners of Great Bircham cut bracken as they choose on Bircham Common, but may not cross the boundary of the Bircham Tofts part, which is reserved for inhabitants of that parish. The Great Fen at South Lopham belongs to North Lopham, and is let to various occupiers, the money being divided among all the inhabitants. The Middle and Little Fens belong to South Lopham, and only the poor participate. The fens were originally staked out for various cottages. On the three greens in Long Stratton the lords of the manors are entitled to a third of the value of all timber severed. On Little Ellingham Goose Common the inhabitants turn stock and pay a certain sum per head per week for the benefit of the poor. The grazing rights on Hardwick Narrows are let annually, with a fixed charge of 2s. 6d. for pigs. Guist

Common may be mown for six weeks, from July 12th, where the parishioners choose; but on the two Smallburgh Fens cutting begins at 6 a.m. on July 6th and continues until August 6th. Thornham Common, which accommodates 100 head of cattle, was always opened on May 13th until 1911, when the date was altered to May 1st. A "full right" is two head of cattle, and in 1915 was worth about 22s. 6d., but formerly £3. The rights belong to certain ancient houses and are bought and sold. On West Winch Common the right-owners depasture animals from May 12th to December 31st. The owners meet on Easter Monday, when a Common Reeve is appointed and a voluntary rate, which approximates to 7s., is made for the repair of the banks, fences, etc. As evidence of the value of these commons, it may be mentioned that in 1913, 130 "goings" on Wacton Great Common were let at 41s. to 43s. each, and three "bull runs" at 8s. 6d. to 12s., while in 1917 the 96 "goings" averaged 69s. each. In 1912, 62 head of stock and 33 geese were depastured on the Castle-acre Commons, and in 1913, 60 head and 39 geese. Parishioners pasture cattle and farmers sheep on Great Massingham Heath and Carr Common, and in July, 1912, I saw on the Heath flocks of 10 score, 11 score, and 30 score sheep. In pre-Inclosure days, when almost all the land in the vicinity was common, stock from the neighbourhood was driven to an open space near the "Tumbledown Dick" Inn, Pott Row, Grimston, in order to be claimed by the respective owners.

Geology.

Castle Rising and North Wootton Ling Commons, Roydon Common, Congham Common, and Leziate Heath are on the sands and gravels associated with the Lower Greensand. On Congham Common there is a hilltop boulder of consolidated white greensand, 6-ft. long, 4-ft. wide, and 3-ft. high. There are ancient chalk pits on Alderford Common, Swannington, and Melford Common, Thetford, and chalk is sufficiently near the surface to affect the vegetation on other areas detailed hereafter. Disused pits in the shelly Norwich Crag are found

on Bramerton Common and Hellington Low Common, and modern pits in the Crag gravels on Flordon Common and Alderford Common, while part of the latter and Crostwick Common are also on the Crag series. The furze-clad heathy commons are, as a rule, associated with plateau gravel, which has been worked in many instances, fine pits existing at Barrow Hill, Brancaster, Hunworth Common, Gatesend Hill, Tattersett, East Ruston Common, and Ringland Hills. A pit on Bull's Green, Toft Monks, shows 10-ft. of chalky boulder clay above sand, and chalky boulder clay is also exposed on North Tuddenham and Whitwell Commons. On some knolls at the north-east end of the latter common are strong springs, very calcareous. On Upgate Common, Swannington, Barnham Common, Southrepps Common, and many others, there are sandpits. Peat is dug on a number of the fens, though formerly to a much greater degree than at present, and I was informed that tree-trunks were often found when peat-cutting in Leziate Fen.

Ornithology.

As a rule the commons are not the haunts or nesting-places of the rarer species of birds. They are to some extent the stronghold of those that have a preference for nesting in furze, such as the Whinchat, Stonechat, Whitethroat, Goldfinch, Linnet, and Bullfinch, while the upland commons frequently provide nesting-sites for the Willow Warbler, Meadow Pipit, Yellow Bunting, and Nightjar, and the numerous pits are beloved of the Sand Martin. The low-lying commons are especially attractive to Common Snipe and Redshank, the pools to Moorhens, and the reed-beds, alder carrs, and mowing marshes to Reed Warblers, Sedge Warblers, Grasshopper Warblers, and Reed Buntings. The Stone Curlew nests on Barnham Common, Thetford, and Massingham Heath, and, with the Ringed Plover, on Roydon Common. In his excellent account of the East Ruston Commons (Nat. Trans., VIII., pp. 631–666), the Rev. M. C. H. Bird deals fully with their

ornithology, and he also tells me that Mallard, Snipe, and Lapwing nest on Brunstead Common.

Botany.

With the exception of woodland, most of the ecological types differentiated in the county occur to a greater or less degree on the Norfolk commons, and with regard to the wet heath sub-association they provide better examples than can be found on privately-owned areas. At different seasons of the year there are wonderful colour-effects, sometimes from massed blooms such as the furze on East Ruston and Ridlington Commons, Anmer Minque and Crostwight Heath, the sea lavender on Brancaster salt marshes, the rosebay willow-herb on Tottenhill Whin Common, columbine on Booton Common and Oxburgh Fuel allotment, heather on Plumstead Heath and other *Calluna* areas, bog bean on Castleacre Common, and rock-rose on Massingham Heath. Sometimes the picture is on a smaller scale, as with *Achillea Ptarmica* at East Bilney, 174 spikes of *Malaxis* in a peat-pool on Roydon Common, *Liparis* in the floating bogs at Blo' Norton, Roydon Fen, and South Lopham Fen, or the waxen blooms of *Pyrola rotundifolia* in the depths of the swamp on Roydon Common. It is not always easy to classify the commons ecologically, as so many types may be represented on a single area. On Upgate Common, Swannington, for example, there is the aquatic vegetation of the streams and the ponds, an area of neutral grassland, heath-pasture with furze, *Rubus*, and *Rosa*, *Calluna* heath with Scotch pines and birch, alder-swamp and wet heath sub-association, with transitional areas from one to the other. In the subsequent lists I have endeavoured to classify the commons according to the predominating type of vegetation.

Neutral Grassland.

The most valuable grazing commons of the county belong to the plant-formation of clays and loams, consisting of a close turf of grasses with associated herbaceous plants, the neutral grassland which is considered to be "the ultimate phase of

degeneration of damp oak wood." In a few cases, as Braconash Common, Great Ormesby Green, Gressenhall Goose Green, Old Buckenham Church Green, Little's Green, Roydon, and Crow Green, Stratton St. Mary, there are still standard trees growing, chiefly oaks. Most of this neutral grassland is on boulder clay, and where this has not been sufficiently leached of calcium carbonate, the more deeply rooted plants may have calcicole tendencies. This is especially the case on chalky boulder clay. Where neutral grassland is pure, it is comparatively poor in lime, has a tendency to become marshy, and gives an acid reaction. The commons included in the drier portion of this group have an area of about 1400 acres :—Aldborough Green, Ashill Green, Beeston Regis Back Common, Billingford (Diss) Greens, Boughton Green, Braconash Common, Braconash Marsh Green, Briston Green, Burnham Thorpe Green, Caston Green, Coltishall Common, Denver Sluice Common, Dickleburgh Langmere Green, Diss Denmark Green, Downham Market Howdale, East Bradenham Green, Eaton Common, East Dereham Etling Green, East Runton Abb's Common, East Runton Common, East Runton Green's Common, Fritton Common, Gateley Green, Great Massingham Green, Great Ormesby Green, Gressenhall Goose Green, Hales Green, Hardwick Narrows, Heydon Green, Hingham Fairland, Howe Green, Hunworth Green, Letton Green, Little Barningham Green, Loddon Stubb's Green, Martham Green, Mulbarton Common, New Buckenham Common, Newton-by-Castleacre Well's Green, North Wootton Cattle and Horse Common, Old Buckenham Church Green, Pulham St. Mary Magdalene Coles Common, Pulham St. Mary Magdalene Green, Roydon Baynard's Green, Roydon Little's Green, Salthouse Green, Shelton Common, Shotesham Common, Shouldham Green, South Creake Green, Stratton St. Mary Crow Green, Stratton St. Mary Wood Green, Swaffham Camping Land, Swanton Morley Burgh Common, Swardeston Common, Thetford Castle Meadow, Thetford Carr Common, Thetford Melford Common, Thetford School Plain, Thornham Oldfield Green, Toft Monks Bull's Green, Toft Monks Maypole Green, Trowse Common, Wacton

Common, Wacton Green, West Runton Common, West Winch Common, Wymondham Lizard Common, and Wymondham Oxford Common.

Botanically these commons are the least interesting in the county, and there is little worthy of note save the abundance of *Mœnchia erecta* on Wood Green, Stratton St. Mary, and of *Genista tinctoria* on Wacton Common, and the occurrence of *Gentiana campestris* on Green's Common, East Runton. The prevalence of *Orchis Morio*, *O. mascula*, and *O. maculata* on some of the South Norfolk commons, such as Wacton and Bull's Green, Toft Monks, is undoubtedly due to the influence of the chalky boulder clay, though in other respects the vegetation is more neutral than calcareous.

Where the ground-water approaches the surface, the neutral grassland passes into an association in which *Juncus*, usually *Juncus glauca*, is dominant. Low-lying patches on many of the commons in the preceding list are thus characterised, but in the following, *Juncus* is more generally dominant. Hillocks and thin spreads of gravel are often occupied by *Ulex*, and swampy portions develope a marsh flora. *Polygonum amphibium* is abundant on East Lexham Poor's Land; pools on Thwaite Common contain *Littorella uniflora*; and *Bidens tripartita* occurs in a pond on Roughton Common. The area of the *Juncus* pasture of neutral grassland is about 460 acres, as follows:—Barton Turf Clay pits, Billingford (Diss) Common, Bradfield Common, Brandiston Common, Castleacre Broadmeadow Common, Castleacre Emanuel's Common, Castle Rising Day and Night Common, Corpusty Common, East Lexham Poor's Land, Fakenham Recreation Ground, Gissing Common, Hapton Common, Morningthorpe Green, Newton-by-Castleacre Goose Common, Newton-by-Castleacre Heath, North Runcton School Green, Ringland Low Common, Roughton Common, Roydon Brewer's Green, Saxlingham Nethergate Green, Shelfanger Boyland Common, Stratton St. Michael Rhees Green, Sustead Common, Swannington Hingrave Common, Thornham Common, and Thwaite Common (part).

Heath Formation.

The largest area of common land in the county belongs to the heath formation, which is developed on Crag sands and gravels north of Norwich, on Lower Greensand in the north-west, and on plateau and other glacial gravels and sands in various parts of the county. In most cases it is supposed to have degenerated from the dry sandy oakwood association, but it is probable that some of the heaths were never occupied by woodland. There is a subordinate scrub association, closely resembling that of the clays and loams, largely represented on Norfolk heaths, with gorse as its most characteristic member. A similar scrub association dominated by whitethorn, blackthorn, furze, and *Rubus*, is well developed on parts of Crostwick Common, Hempstead Green, Hunworth Common, Ringland Church Hill Common, Salthouse Heath, Swannington Upgate Common, Tittleshall Common, and Weybourne Heath. In many cases it is difficult to distinguish between the relative dominancy of *Ulex*, *Pteris*, and *Calluna*.

East Beckham Common, Rushford Green, and Thetford Two-mile-bottom Common are heath pasture without furze or bracken, and have an area of 33 acres. *Teesdalia nudicaulis* is very abundant on the last-named.

The commons on which *Ulex*, or the scrub association previously mentioned, is dominant, are the following, with an area of about 2990 acres:—Anmer Minque, Ashill Common, Barton Turf Gravel-Hole, Bawdeswell Heath (part), Beeston Regis Common (part), Beetley Common (part), Bramerton Common, Brancaster Barrow Hill, Brisley Bexham Common, Brisley Green, Brisley Harper's Green, Chedgrave Common, Crostwick Common, Crostwight Heath, Denver Whin Common, East Dereham Neatherd Moor, East Ruston Dyball's Common (part), East Ruston Fox Common, East Ruston Gravelpit, East Ruston Lambert's Hill Allotment, East Ruston Little Allotment, East Walton Common, East Winch Common (part), Flordon Common (part), Foulden Common (part), Garboldisham Broomscot Common, Great Ryburgh Common (part), Hautbois

Common, Hillington Low Common, Hempstead Green, Hempton Common, Hempton Green, Holt Spout Hills, Honing Town Land (part), Hunworth Common, Kettlestone Common (part), Litcham Common, Little Ellingham Goose Common, Lyng Heath, Massingham Common, Massingham Carr Common, Massingham Heath, North Runcton Common, North Runcton Sheepscourse, North Tuddenham Common, Norwich Mousehold Heath, Palling Common, Ridlington Mill Common, Ridlington Plough Common (part), Ringland Church Hill Common, Ringland Hills, Roughton Donkey Allotment, Scarning Fen (part), Scottow Mill Common (part), Sheringham Common, Southrepps Common (part), Southrepps Mill Common (part), Sparham Common, Swannington Alderford Common, Swannington Upgate Common (part), Swanton Abbott Low Common (part), Swanton Abbott Hill Common, Tattersett Gatesend Hill, Thwaite Common (part), Tittleshall Common, Tottenhill Whin Common, Tottenhill Row, West Harling Common, West Lexham Poor's Land, West Rudham Common (1), and Weybourne Heath.

On certain heaths, bracken is the dominant. It has been found in Scotland that after heath-burning the soil has a tendency to grow bracken, and the heather may be lost for ever. Fires are not infrequent on Norfolk heaths, and the dominance of bracken may perhaps be due to this cause. On the other hand, Dr. E. P. Farrow has shown* that *Calluna* heath attacked by rabbits tends to degenerate to grass heathland. This, however, is in the Breckland area, where the factors are not the same. The bracken areas, which are 769 acres in extent, are :—Gaywood St. Helen's, Great Bircham Boiler Common, Great Bircham Common, Harpley Commons, Newton-by-Castleacre Grove Common, North Wootton Ling Common, Wellingham Heath, and West Rudham Common (2).

As a rule there is little variation in the vegetation on the dry portions of the heaths. *Cuscuta* is not uncommon on furze and heather, and *Tillæa muscosa* occurs on many heathland tracks. *Epilobium angustifolium* is abundant on the

* "Journal of Ecology," Vol. IV., No. 2.

two Tottenhill Commons ; the proximity of the sea is indicated by *Juncus maritimus* on Palling Common ; and there is a small colony of *Botrychium Lunaria* on Ringland Hills. Where the soil is more retentive of moisture, *Pedicularis sylvatica* is a characteristic plant. *Teesdalia* was noted on Chedgrave Common and Pentney Bradmoor Common ; *Rosa spinosissima* on Weybourne and Salthouse Heaths ; *Jasione montana* at Felmingham, Hunworth, and Pentney : and *Melampyrum pratense* on Ringland Hills. Ponds on the heathy areas of Hanworth, Stoke Ferry, and Thwaite Commons are bordered by fine growths of *Rumex maritimus*. An area of a few square yards in a gravel pit on East Ruston Common gave me in August, 1915, *Lepidium virginicum* (the first Norfolk record), *Rumex maritimus*, *Setaria glauca*, *Avena fatua*, and *Lolium temulentum*, probably originating from a deposit of waste after threshing.

Where the soil tends more to the formation of peat, though the layer may be extremely thin, *Calluna* becomes the dominant plant. The heath pasture with furze areas is sometimes difficult to differentiate from *Calluna* heath, for though in some cases the associations remain pure, in others there seems to be a state of transition. In at least fifteen of the heaths where *Ulex* is the dominant, *Calluna* is locally dominant, often with *Erica cinerea*, and its known intolerance of lime and nitrogenous matter helps to indicate suitable conditions for it to flourish. Areas where it appears to be dominant total about 1950 acres, and are as follows :—Bodham Common, Castleacre Common (part), Castle Rising Ling Common (part), Cawston Heath, Felmingham Bryant's Heath (part), Hanworth Common, Hevingham Buxton Heath (part), Holt Lowes (part), Ingoldisthorpe Common (part), Kelling Heath and Telegraph Hill, Litcham Heath, Marsham Heath, Pentney Common (part), Pentney Bradmoor Common (part), Plumstead Heath, Salthouse Heath, Snettisham Common, South Wootton Common, Syderstone Common, and Weasenham Heath.

A similar type, often with *Carex arenaria* as a local dominant, occurs on the Greensand at Congham Common, Leziate Heath,

and part of Roydon Common, with a total area of about 659 acres.

Pinus sylvestris has been planted on Castle Rising and North Wootton Ling Commons, Cawston Heath, and a "dole" on Upgate Common, Swannington, and seedlings and young trees of this species and birch, are common on many heaths.

Deschampsia flexuosa, which is characteristic of siliceous pasture, and is always absent from calcareous grassland, occasionally occupies large areas as a local dominant, notably on Great Bircham Common and Boiler Common, Hevingham Buxton Heath, Leziate Heath, Ringland Hills, and Syderstone Common.

The typical Breckland flora does not occur on any common in Norfolk, though Barnham Common, Thetford (area 200 acres), which is south of the Little Ouse river, is in the administrative county. Here there are flourishing colonies of six of the typical "breck" species (see Nat. Trans., Vol. X., p. 138), namely: *Silene Otites*, *Medicago falcata*, *M. minima*, *Galium anglicum*, *Artemisia campestris*, and *Scleranthus perennis*. *Veronica verna* was formerly found, but is apparently extinct. With the exception of *Galium*, these occur on the heath pasture, chiefly on banks and tracks where the competition from *Ulex* is less keen. Much of the Common is dominated by *Ulex*; there is a little *Calluna*, and patches of *Carex arenaria*, and it would seem that the area of the original steppe flora has been greatly reduced by the encroachments of furze. In addition to the ordinary plants of heath pasture, *Arabis hirsuta*, *A. glabra*, *Teesdalia nudicaulis*, *Arenaria tenuifolia*, *Trifolium scabrum*, *Astragalus danicus*, *Jasione montana*, and *Cynoglossum officinale* also occur, and in the spring there is a wonderful growth of *Erophila vulgaris*.

The Flora of Ringland Hills.

With the exception of an article on the "Flora of Mousehold Heath," compiled by Mr. A. Mayfield*, I know of no list of the plants of a Norfolk heath. The flat top of Ringland Hills

* "Norwich Mercury," Aug. 28th, 1895.

consists of a foot to 18 inches of stony humus resting on very hard plateau-gravel, though there are small patches of loam (dominated by *Deschampsia flexuosa*) and stratified sand. Three parts of the plateau are dominated by *Ulex* and *Pteris*, but at the south-eastern end *Calluna* is the dominant, and in part of this area the prevalence of *Scilla* and *Oxalis*, with *Polytrichum formosum, Campylopus fragilis, Dicranum scoparium, Mnium hornum, Eurhynchium prælongum, Plagiothecium undulatum*, and *Hypnum resupinatum*† probably indicates a survival of ancient woodland, maintained by the shade of the wooded boundary. *Tillæa muscosa* is common on a green trackway; *Melampyrum pratense* fringes a plantation on the south; and a gravel pit provides a habitat for *Spergularia rubra, Sherardia arvensis* and *Filago minima*, with *Polytrichum piliferum, P. juniperinum, Pleuridium subulatum, Ceratodon purpureus, Barbula fallax*, and *Brachythecium purum*. The most abundant grasses of the heath pasture are *Anthoxanthum odoratum, Agrostis canina, Deschampsia flexuosa, Cynosurus cristatus, Poa trivialis*, and *Festuca rubra*.

The species I have noted on the Hills are:—*Ranunculus acris, R. repens, Papaver Rhœas, Corydalis claviculata, Cardamine hirsuta, Sisymbrium officinale, Capsella Bursa-pastoris, Viola Riviniana, Polygala serpyllacea, Silene latifolia, Lychnis alba, L. dioica, Cerastium semidecandrum, C. vulgatum, Stellaria media, S. Holostea, S. graminea, Arenaria serpyllifolia, Sagina procumbens, Spergularia rubra, Hypericum humifusum, H. pulchrum, Linum catharticum, Geranium molle, Erodium cicutarium, Oxalis acetosella, Acer Pseudo-platanus* (seedlings), *A. campestre, Ulex europæus, Cytisus scoparium, Trifolium pratense, T. repens, T. procumbens, T. dubium, T. filiforme, Lotus corniculatus, Ornithopus perpusillus, Vicia sativa, Prunus spinosa, P. avium, Rubus idæus, R. fruticosus* (agg.), *R. cæsius, Fragaria vesca, Potentilla sterilis, P. procumbens, Alchemilla arvensis, Rosa Eglanteria, R. micrantha, R. canina, R. arvensis, Cratægus monogyna, Saxifraga tridactylites, S. granulata,*

† The mosses from the area were kindly identified by Mr. W. H. Burrell, F.L.S.

Tillæa muscosa, Ægopodium Podagraria, Conopodium majus, Anthriscus sylvestris, Hedera helix, Cornus sanguinea, Sambucus nigra, Lonicera Periclymenum, Galium Cruciata, G. verum, G. saxatile, G. Aparine, Sherardia arvensis, Bellis perennis, Filago minima, Achillea Millefolium, Senecio sylvaticus, S. Jacobæa, Carlina vulgaris, Cnicus lanceolatus, C. palustris, Centaurea nigra, Hieracium Pilosella, Hypochœris radicata, Leontodon hispidum, Taraxacum officinale, Sonchus oleraceus, Campanula rotundifolia, Calluna vulgaris, Primula veris, Fraxinus excelsior, Myosotis arvensis, M. collina, M. versicolor, Verbascum Thapsus, V. pulverulentum, Linaria vulgaris, Scrophularia nodosa, Veronica arvensis, V. serpyllifolia, V. officinalis, V. Chamædrys, Euphrasia officinalis (agg.), *Rhinanthus Crista-galli, Melampyrum pratense, Thymus Serpyllum, Nepeta hederacea, Prunella vulgaris, Stachys sylvatica, Teucrium Scorodonia, Plantago lanceolata, P. Coronopus, Scleranthus annuus, Rumex conglomeratus, R. Acetosa, R. Acetosella, Urtica dioica, Betula alba, Corylus avellana, Quercus pedunculata, Salix caprea, Tamus communis, Scilla non-scripta, Luzula campestris, Carex contigua, C. pilulifera, C. caryophyllea, Anthoxanthum odoratum, Phleum pratense, Agrostis canina, A. alba, Aira caryophyllea, A. præcox, Deschampsia cæspitosa, D. flexuosa, Holcus mollis, Arrhenatherum elatius, Cynosurus cristatus, Dactylis glomerata, Briza media, Poa annua, P. trivialis, Festuca rigida, F. ovina, F. rubra, Bromus arvensis, Brachypodium sylvaticum, Lolium perenne, Pteris aquilina, Botrychium Lunaria, Ceratodon purpureus, Dicranum scoparium, Brachythecium purum, Hypnum cupressiforme, H. Schreberi, Hylocomium squarrosum,* and *H. splendens.*

The number of species (omitting the mosses) noted on the 33 acres of Ringland Hills is therefore 144, while on the 169 acres of Mousehold Heath, Mr. Mayfield recorded 172.

Wet Heath Sub-Association.

Low-lying areas of many of the heaths in the county, dominated either by *Ulex* or *Calluna*, carry the characteristic flora of the wet heath sub-association, which is of the utmost interest

to the botanist. Typical plants are *Hypericum elodes, Drosera rotundifolia, D. longifolia, Erica tetralix, Pinguicula vulgaris, Salix repens, Myrica Gale* (only occurring in this association on the Greensand heaths of West Norfolk), *Juncus squarrosus, Scirpus cæspitosus, Schœnus nigricans, Eriophorum angustifolium, Rhyncospora alba, Carex pulicaris, Molinia cærulea, Nardus stricta, Sphagnum,* and *Polytrichum.* The Norfolk commons on which some or all of these plants occur are parts of the following, with an area of about 375 acres :— Bawdeswell Heath, Beeston Regis Common, Beetley Common, Castle Rising Ling Common, East Winch Common, Felmingham Bryant's Heath, Hevingham Buxton Heath, Holt Lowes, Ingoldisthorpe Common, Kettlestone Common, Pentney Bradmoor Common, Pentney Common, Ridlington Plough Common, Roydon Common, Scottow Mill Common, Stoke Ferry Common, Swanton Abbott Low Common, and Swannington Upgate Common.

The sub-association is most perfectly developed at East Winch, Felmingham, Hevingham, Holt, Roydon, and Swannington. On Roydon Common in July there is a wonderful floral feast. Primitive bog is partly water-covered, and peaty pools are bordered by broad cushions of *Sphagnum ;* ridges a few inches above the water and all the bordering slope are ablaze with the orange-yellow blossoms of *Narthecium ;* for hundreds of square yards it is impossoble to walk without treading on specimens of *Drosera rotundifolia* or *D. intermedia ;* and the delicate foliage of *Oxycoccus quadripetala* is dotted with berries, either ruddy or purple-mottled. Pools are carpeted with a mosaic of intertwining stems of *Utricularia intermedia ;* and drier areas are gorgeous with the pale waxen bells of *Erica tetralix* or the deeper tinge of *Erica cinerea.* In some places the three sundews, the three bladderworts, and the butterwort pursue their insect-catching avocations in close proximity ; and where there is not much competition, *Anagallis tenella* covers tufts of *Sphagnum* or otherwise bare peat, with thousands of tiny pink blossoms. Here, in 1910, I found what appears to be the only flower of *Utricularia inter-*

media recorded for this country, as the few other flowers supposed to belong to this species have proved to be *U. ochroleuca*. This is the only common in the county on which *Narthecium* and *Oxycoccus* are found, and this appears to denote a closer affinity between the wet heath sub-association of the greensand and the moors of other parts of England than is the case with the wet heaths on later deposits. *Drosera anglica* occurs at Beeston Regis, Beetley, Castle Rising, Felmingham, Hevingham, Holt, Ingoldisthorpe, Roydon, and Swannington; *D. longifolia* at East Winch, Hevingham, Ingoldisthorpe, and Swannington; *Achillea Ptarmica* at Beetley and East Winch; *Cnicus pratensis* at East Winch, Hevingham, and Roydon; *Pyrola rotundifolia* at Roydon; *Centunculus minimus* at Stoke Ferry; *Gentiana Pneumonanthe* at East Winch and Hevingham; *Utricularia minor* at Felmingham, Holt, and Swannington, and the only Norfolk record for *f. platyloba* at Swannington; *Utricularia intermedia* at Roydon and Swannington; *Scutellaria minor* at Holt; *Malaxis paludosa* at Felmingham and Roydon; *Habenaria bifolia* at Hevingham, Holt, and Roydon; *Scirpus filiformis* at Beeston, Felmingham, and Hevingham; *Carex limosa* at Roydon; *Lastrea cristata* at Swannington: *Lastrea Thelypteris* at Hevingham and Roydon; *Osmunda regalis* at Roydon; *Equisetum sylvaticum* at Holt; *Lycopodium Selago* at Holt; and *L. inundatum* at Hevingham and Holt. *Pedicularis palustris* is said* only to occur in marshes where the water contains lime, but it is associated at Beetley, Hevingham, Holt, Ingoldisthorpe, Kettlestone, Roydon, and Swanton Abbott Low Common with such calcifuge species as the *Ericaceæ*, *Droseræ*, *Sphagna*, and many others, so that the distinction does not seem borne out by experience. Dr. A. G. Tansley also records it† as a frequent member of the damper sub-association of the upland grass moors of the Pennines, where the soil is peaty and acid, while it is less commonly found in the limestone swamps of the same region.

* A. D. Hall, "The Soils."

† "Types of British Vegetation," p. 285.

Chalk Grassland.

There is no common entirely on the chalk, though chalk grassland is developed in several areas, particularly on Massingham Heath, where many acres are covered with *Helianthemum Chamæcistus*, associated with *Spiræa Filipendula*, *Poterium sanguisorba*, *Asperula cynanchica*, *Scabiosa Columbaria*, and *Astragalus danicus*, and a particularly fine form of *Polygala vulgaris*. The chalk area is open downland, but where the depth of sand above the chalk is slightly greater, heather, bracken, and furze flourish, and antheaps in the chalk area proper are usually covered with *Calluna*. Though much less in extent, there are more chalk-loving species on part of Foulden Common, where all those previously mentioned are found, with the exception of *Astragalus*, and with the addition of *Thalictrum minus*, *Ononis spinosa*, *Hippocrepis comosa*, *Campanula glomerata*, *Gentiana amarella*, and *Spiranthes autumnalis*. *Helianthemum* and *Asperula* are found on East Walton Common, and with the addition of *Spiræa* on Harpley Common; *Spiræa* and *Ononis* on Brisley Green; *Scabiosa Columbaria* and *Hypericum montanum* on Hunworth Common; *Spiræa* on Beetley Common; *Spiræa* and *Poterium* on Ashill Common; *Thalictrum minus* a. *collinum*, *Helianthemum*, and *Poterium* on Thetford Castle Hill earthworks: and *Spiræa*, *Poterium*, *Ononis*, and *Avena pratensis* on a small patch a few inches above the fen level in Lopham Little Fen. In the ancient chalk pit on Alderford Common, *Festuca ovina* is the dominant grass, with *Reseda luteola*, *Carlina vulgaris*, *Cnicus acaulis*, and *Ophioglossum vulgatum* as calcicole plants, though not so exclusively as those previously mentioned.

Fen Formation.

Apart from the heath formation, the largest area of common land in Norfolk belongs to the fen formation. Here, again, the classification is not always easy, on account of the diversified characteristics of individual commons. Fen is rich in mineral salts and alkaline in reaction, therefore calcifuge species do not occur, and it provides a habitat quite distinct

from that of the wet heath sub-association, where calcifuge species are dominant. The Norfolk common-land areas included in this formation have an area of about 1800 acres, and are :—Barton Turf Fen, Blo' Norton Fens (2), Brunstead Common, Booton Common, Boughton Fen, Bressingham Fen, Burgh St. Margaret Common, Caldecote Oxburgh Fuel Allotment, Castleacre Common (part), Crostwight Common, East Bilney Common, East Dereham Badley Moor, East Dereham Potter's Fen, East Dereham Rush Meadow, East Ruston Dyball's Common (part), East Ruston The Holmes (one-third), East Ruston Mown Fen and New Bridge Marsh, Feltwell West Fen, Flordon Common (part), Foulden Common (part), Foulden Borough Fen, Garboldisham Old Fen, Great Ryburgh Common (part), Great Witchingham Common, Guist Common, Honing Hind Holmes' Common, Honing Simon Willows, Honing Old Corner Common, Honing Town Land, Leziate Fen, Roydon Fen, Scarning Fen (part), Smallburgh Fens (2), South Lopham Fens (3), Southrepps Common (part), Southrepps Mill Common (part), Thetford Broadwater Common, and Whitwell Common.

There is very considerable diversity in the areas under notice, the associations ranging from pure reed-swamp to grassland with calcareous ground-water. Compared with Miss Pallis's divisions of the East Norfolk fens into the Bure Valley and Yare Valley fens*, the former with *Phragmites*, *Cladium*, and *Juncus* as the dominants, and the latter with large societies of *Glyceria aquatica* and *Phalaris arundinacea*, most of the Norfolk fens are allied to the Bure Valley type, the only ones that can be compared with the Yare Valley type being Thetford Broadwater Common and Feltwell West Common in the Little Ouse Valley, Foulden Borough Fen and Boughton Fen in the Wissey Valley, and Guist Common in the Wensum Valley. Exploring these fens is by no means without its excitement. Many of them, notably Blo' Norton, and parts of East Ruston and Burgh St. Margaret, consist of a mass of vegetation floating on an unknown depth of water and mud. The floating carpet

* "Types of British Vegetation," p. 233.

yields at every step; the surface for yards round becomes tremulous; and one may be walking over the middle of a deep pool, with the knowledge that should the thin covering break it would be impossible to swim, almost impossible for a rescuer to approach, and the nearest help may be a mile distant. Unpleasant, though not dangerous, is the effect of new and old peat-workings, which occur on most of the fens. Walking carefully in nine inches of water, the depth of which is hidden by the vegetation, a sudden drop of two feet or more into an older peat-working is apt to interrupt botanical investigation for a time. Further troubles are caused by the sharp edges of the sedge and the saw-like teeth of *Cladium*, the stumps of reed cut below the water, the slipperiness of putrid mud, and the falls from the narrow ridges that intersect peat-workings. Happily, however, these drawbacks preserve *Liparis* and other Norfolk rarities from the ravages of the collector.

An excellent list of species of the fen association common to all the East Norfolk river-valleys is given by Miss Pallis on pp. 233–4 of "Types of British Vegetation." *Liparis Loeselii*, which is restricted to the Bure Valley type, is found at Honing, East Ruston, Roydon Fen, South Lopham Little Fen, Blo' Norton Fen, and in the Wissey Valley. *Lathyrus palustris* is found at Burgh St. Margaret; *Peucedanum palustre* at Burgh St. Margaret and Bressingham; *Œnanthe Lachenalii* at Blo' Norton, South Lopham, and Boughton; *Utricularia minor* at East Ruston, Honing, Barton Turf, Burgh St. Margaret, Southrepps, Guist, Roydon, Flordon, South Lopham, Blo' Norton, Caldecote, Boughton, Feltwell, and Foulden; *Utricularia intermedia* at Barton Turf Fen, Foulden, Honing, Leziate, and East Ruston; *Epipactis palustris* at Blo' Norton, Barton Turf, Bressingham, East Bilney, East Ruston, Flordon, Garboldisham, Roydon, Smallburgh, and Southrepps; *Calamagrostis lanceolata* at Bressingham; *Carex lasiocarpa* at Barton Turf and Lopham Great Fen; *Ophioglossum vulgatum* at Badley Moor, East Dereham, Flordon, Foulden, and Potter's Fen, East Dereham; and *Lastrea Thelypteris* at Booton, Burgh St. Margaret, Rush Meadow and Potter's Fen, East

Dereham, and Smallburgh. Of other plants not included in Miss Pallis's lists, *Ranunculus Lingua* was noted at Boughton, Bressingham, Burgh St. Margaret, Barton Turf, East Ruston, Flordon, Borough Fen, Foulden, Roydon, and Scarning; *Aquilegia vulgaris* at Booton and Caldecote; *Poterium officinale* at Blo' Norton; *Drosera anglica* at Badley Moor, East Dereham, Booton, East Ruston, Flordon, Foulden, Honing, Roydon, Scarning, South Lopham, and Whitwell; *Cicuta virosa* at Burgh St. Margaret; *Daphne Laureola* at Crostwight; *Stratiotes aloides* at Barton Turf; *Habenaria conopsea* at East Bilney, Caldecote, Flordon, Foulden, Garboldisham, Roydon, and South Lopham; *Eleocharis multicaulis* at East Ruston and Roydon; *Scirpus filiformis* at East Ruston and Southrepps; *Carex teretiuscula* at Rush Meadow, East Dereham, Blo' Norton, East Ruston, Roydon, and Scarning; *Carex limosa* at Smallburgh; and *Carex pallescens* at Scarning. A list of the plants of the fen association on Flordon Common is given in our Trans., Vol. IX., p. 181.

A type of common somewhat difficult to classify ecologically, but which I have included in the fen formation because the ground-water is not acid, is the swampy grassland found on Booton Common, East Dereham Badley Moor, Southrepps Common, and Whitwell Common. Here there are tufaceous deposits, consisting of calcareous matter with land and freshwater shells, mainly the product of vegetable decomposition and the action of living organisms on calcareous water. Similar deposits are found on most of the fen areas. A sample from Potter's Fen, East Dereham, examined by Mr. W. H. Burrell, F.L.S., showed that 76.25% was soluble in dilute hydrochloric acid, 3.75% was insoluble and incombustible, and 20% combustible. *Pedicularis sylvatica, Carex flacca,* and *C. panicea* are striking components of the vegetation of such areas, which do not correspond with any of the types of grass fen which Miss Pallis has described in East Norfolk.

Reed-swamp association is well developed on about 20 of the fens, the open associations at Blo' Norton, East Ruston, Caldecote, and Roydon being of special interest. Alder-

swamp is even more commonly associated with fen, and reaches fair proportions on some fifteen, though those of most interest to the botanist number only three, Booton, Crostwight, and Honing.

Bordering many of the fen areas there is a restricted wet heath association which in some cases has arisen through the growing up of the fen raising the ground level above that of the alkaline waters, and the accumulation of peat poorer in mineral salts, but in other cases bordering patches of gravel where the ground-water is acid in reaction, furnish a suitable habitat. It closely resembles the ordinary sub-association of wet heaths, and it is often difficult to make a distinction. *Calluna* and *Erica tetralix* are frequent, occasionally with *Ulex*. The fact that the lower level contains alkaline water, whereas on the wet heath the water in the lower level is acid in reaction, excludes *Hypericum elodes*, *Juncus squarrosus*, *Scirpus cæspitosus*, and *Schœnus nigricans*, but *Rhyncospora alba* and *Carex pulicaris* are also apparently absent, while *Drosera anglica* and *Cnicus pratensis* are common. *Achillea Ptarmica* is abundant on East Bilney Common. The areas in which this heather zone associated with fen swamp is developed are :— Barton Turf Fen, Blo' Norton Fen (1), Brunstead Common, Burgh St. Margaret Common, East Bilney Common, East Dereham Potter's Fen, East Ruston Dyball's Common, East Ruston New Bridge Marsh, Foulden Common, Honing Town Lands, Honing Old Corner Common, Leziate Fen, Lopham Little Fen, Roydon Fen, Scarning Fen, and Smallburgh Fens (2).

Denes and Salt Marsh.

Although the public have access to most of the sand dunes along the coast, these cannot be included among the commons of the county. The North and South Denes at Great Yarmouth, with an area of about 363 acres, differ in many respects from the sand-hills of the littoral, and their special flora has been described by Mr. G. H. Harris (Trans., Vol. VI., pp. 137–147). The only area of common salt-marsh appears to be that at

Brancaster, about 350 acres in extent, which is common to all the parishioners, and the rent paid for the golf course, which occupies part of the common, is divided among them. This is a typical salt-marsh, the species including *Frankenia lævis, Spergularia salina, S. marginata, Apium graveolens, Aster Tripolium, Artemisia maritima, Limonium vulgare* and *f. pyramidale, L. binervosum, L. bellidifolium, Statice maritima, Glaux maritima, Centaurium pulchellum, Plantago maritima, Atriplex littoralis, A. portulacoides, Salicornia ramosissima, S. procumbens, S. radicans, S. disarticulata, Suæda fruticosa, S. maritima, Juncus compressus, J. Gerardi, J. maritimus, J. acutus, Triglochin maritimum, Scirpus Tabernæmontani, S. maritimus, Glyceria maritima,* and *G. distans.*

From the foregoing it will be apparent that the commons of the county provide material for the student of folk-lore, the antiquary, geologist, and ornithologist, but particularly for the botanist. In these days, when it is found desirable to extend cultivation in all possible directions, lovers of wild life must still feel a certain satisfaction that there are limited areas where the conditions are so unsuitable that they are likely to preserve for many years to come some of the most interesting examples of our native flora.

Young Bitterns in Nest

II.

NOTES ON THE BREEDING OF THE BITTERN IN NORFOLK.

By Miss E. L. Turner, F.L.S., F.Z.S., H.M.B.O.U.

Received October 2nd, 1918.

There has been a satisfactory increase in the number of authenticated nests of the Common Bittern (*Botaurus stellaris*) since its re-discovery as a breeding species—at Sutton Broad—on July 8th, 1911. This bird is now sparingly distributed over the county in a fairly wide circle, radiating no doubt from the original centre. During 1918, four pairs bred in one locality and two in another, while three were present throughout the breeding season in other areas.

If a bittern is regularly seen on the wing during the day, it is safe to infer that she is feeding young. The booming of the male is not necessarily a criterion, yet if he remains in one locality throughout the breeding season he is, in all probability, nesting. Careful and systematic watching would soon prove this one way or the other, but it needs a considerable amount of time. Furtiveness is an innate characteristic of the species, though, like all other birds, individual bitterns vary in temperament and habits. When feeding young, bitterns are so regular and methodical in their habits that a few hours of watching should settle the locality of the nest; nevertheless, while one bird may be quite easy to watch, another will elude the most vigilant observer. To find the nest is not easy, because if the young are hatched, the old birds frequently move them to another nest, if disturbed.

Between 1911 and 1917, no nest of the bittern was actually found, but, from information received, I have no doubt that the Sutton birds nested regularly. During this year (1918), four bitterns were about in this area all day during the breeding season; these birds were "very tame." In 1917 a nest

with two half-fledged young was found in an entirely new locality some miles from Sutton. I saw this nest late in August of that year, and on several successive evenings put up three bitterns from the reed beds. These birds were frequently flushed during the winter.

In 1918, I saw four nests in and near the same locality. Two pairs of bitterns nested close to where the nest was found in 1917, and the other two pairs inhabited dense reed-beds about a mile apart. The first nest was found on March 24th. It contained four eggs, two of which were hatched by April 1st, and the other two eggs did not hatch. These two nestlings came to an untimely end on April 16th : owing to heavy rains the water rose, flooded the nest, and drowned the young.

This pair of bitterns nested again, and on April 28th a second nest containing two eggs was found not far from the first. This nest also came to grief. On May 16th I visited it with the keeper, and, to our chagrin, we found it forsaken. One egg was lying smashed in the nest and the other lay in the water ; the lining of the nest had also been pulled about. This destruction must have been caused by some natural enemy, because there was no sign of human intrusion, and the nest had not been officially visited since its discovery on April 28th. As we pushed our way through the tall reeds we put up a male bittern, whose sudden booming had startled me a few minutes previously, and it was the first time I had heard this curious sound at close quarters. His favourite nesting-place was a small rushy oasis not far into the reed-bed ; but I could never catch a glimpse of him before he rose, owing to the height of the reeds. With the loss of this second nest I almost gave up all hopes of ever seeing young bitterns.

On Sunday, May 19th, three of us began a systematic search once more through the reed-bed, for we hoped that these bitterns might have made a third attempt to nest. We put up one bird from the oasis and two more further in, and very shortly we almost walked on to a nest containing *five* incubated eggs. Here was a problem : were there two pairs of bitterns nesting in such close proximity, or were there two females and only

one male ? We had flushed only three birds. Obviously these five eggs could not be a third clutch of the first pair, and, besides, incubation was far advanced for they began to hatch a week later. It was not until May 29th that we heard two males booming in this area, and so definitely proved that there were, or had been, two pairs nesting in this half acre. From the day we found this nest until the end of the season one of the males, presumably the owner of the destroyed nest, removed himself to an almost inaccessible reed-bed farther off : here he boomed regularly, and for some time after the other bitterns had practically become silent. His mate we never saw ; perhaps she was destroyed with the nest.

I do not know what resistance a bittern can put up when attacked, but the young are powerful on the ground and will strike hard. On June 7th, I saw two bitterns fighting in the air ; they were flying in circles and swooping down at one another. It was an unusual and fascinating sight, but as far as the combatants were concerned, there seemed to be little evidence of anger, and no obvious result. One male may have been driving another from his breeding area, or, on the other hand, could the whole performance have been of the nature of an aerial " display," such as was described by Mr. Vaughan in these Transactions, Vol X., p. 118 ? The two birds finally disappeared from sight, skimming over the tops of the reeds. Later on, I saw one of these bitterns rise from near the nest and chase away a small flock of Black-headed Gulls.

On June 9th, I watched a fight between a bittern and a marsh harrier. I suppose no living ornithologist has hitherto seen such a thrilling sight in the British Isles. I was rather out of heart after long and fruitless attempts to photograph a bittern on the wing, and sat on the edge of my house-boat feeling it would be a great relief to throw either myself or my camera into the water. This attitude of extreme dejection soon gave place to one of absorbed interest. On looking up I saw a marsh harrier approaching the bittern's nesting area. Slowly and majestically the harrier swept onwards, ruthlessly disregarding the dismay his presence created amongst the

smaller birds in the neighbourhood. Suddenly a bittern shot up from the reed-bed, and the harrier only avoided disaster by a dexterous turn. It was a clear June evening, the marshes were bathed in golden light, and everything was sharp and clean cut. High in the air the two birds turned and twisted, the one so immeasurably stronger than the other. It looked a very unequal fight. There never seems anything very tangible about bitterns on the wing, usually they glide along in slow and stately flight, but this bird was transformed into a whirling mass of golden brown. Furiously he bore down upon his dusky adversary, and his valour was more than a match for the enemy, for the harrier sheered off closely pursued by the bittern, until both birds were out of sight. By and by the bittern returned and dropped down near the nest. Almost every day the marsh harrier worked up and down that reed-bed ; he was always *the* dark and sinister shadow overhanging the bitterns' home. I think he may have been the culprit that destroyed the second nest.

I only saw the nest of the third pair of bitterns (the second according to date of nesting) after the young were fledged. This nest was found on April 3rd ; it contained four eggs, two only of which hatched. The other eggs were brought away later, and were kept until one burst ; I then removed the young bird from each, and preserved them in spirit. It would seem that bitterns, like other birds that lay their eggs on alternate days, do not trouble about hatching the whole clutch. I visited this nest on June 19th after we had found the nest containing five eggs, but although we hunted for a long time for the young we failed to find them. About twelve paces on either side of the original nest there were found two secondary nests, one being merely a resting-place. This may have been a "cock's nest," as there was no little oasis near where the male could rest. The other was full of scale and well built, and it is probable that the young were moved to this after the original nest had been discovered.

The fourth pair of bitterns baffled us completely for some time, and it was not until June 20th that their nest was found ;

Plate II

Nest of Bittern in Reed-bed

it contained two nearly-fledged young. I shall have more to say about this nest later on.

For the sake of simplifying these dates, I will tabulate them :—

1st Pair of Bitterns.

Nest No. 1, found March 24th ; 4 eggs, 2 hatched by April 1st ; young drowned April 16th.

Nest No. 2, found April 28th ; 2 eggs, destroyed by May 16th.

2nd Pair of Bitterns.

Nest found April 3rd ; 4 eggs, 2 hatched.

3rd Pair of Bitterns.

Nest found May 19th ; 5 eggs, 3 hatched by May 27th.

4th Pair of Bitterns.

Nest found June 20th ; 2 nearly-fledged young ; number of eggs unknown.

Though the bittern inhabits the densest and most inaccessible reed-beds, it does not follow that its nest will be found amidst the thickest cover. For example, the 1917 nest was placed in low thin vegetation on dry ground between two reed-beds.

The nest here depicted (see accompanying photograph) was on dry ground amongst tall reeds ; it was surrounded by much denser growth and still taller reeds, through which we had to force our way to reach it. The nest found on June 20th was placed near the edge of a large reed-bed, where the water was often up to our knees. Sometimes the nest is a bulky structure ten or twelve inches above the water ; it varies in height according to its situation. All the nests I have seen were made of bits of dead reed stems* ; the cup is quite shallow and soon gets flattened out by the energetic young. The eggs closely resemble those of the pheasant in colour and vary considerably in size.

These notes on the bittern are largely the result of observations made between May 16th and June 28th, 1918. I was alone during these seven weeks, in order to insure perfect quiet. When not punting round with the keeper trying to

* *Arundo pragmites.*

photograph the bittern in flight, I was constantly on the watch from the roof of my house-boat. My vantage-ground was midway between the nest found on May 19th and the feeding-ground of the female bird. After the young were hatched on May 27th, I spent some part of nearly every day following up the old bird and lying in wait for her return. I had unique opportunities for photographing her on the wing, but I failed owing to a technical flaw in my camera, which could not be corrected in war-time.

There is a halo of romance and mystery surrounding the bittern in its wild state; once counted extinct as a native breeding species, its sudden re-appearance startled all bird lovers. It still remains an elusive and mysterious bird; one knows so little of its domestic life. There is something primeval about the dense, untrodden reed-beds surrounding its sanctuary, which are always difficult of access and sometimes knee-deep in water. You fight your way slowly through the tangle, feeling carefully with each step for your next foot-hold, while with both hands you part and thrust aside the tall reeds, much as a swimmer cleaves his way through the water; at the same time you must keep a sharp look-out down in the depths of the reeds. Meanwhile, the bitterns, whether young or old, are probably walking stealthily away, or they are standing with bills pointing upwards as rigid as sentinels. Nature and inherited instinct have taught them how to hide, and the nestlings, when only a few days old, will conceal themselves perfectly; they are, as I shall show presently, even more camouflaged than the adults.

Except when feeding the young, bitterns are not seen flying by day; they may, of course, be suddenly flushed from their hiding-places, but if so they immediately drop into cover elsewhere. During this period the bird is seen on the wing from dawn till dusk; she has regular feeding-grounds at some distance from the nest, and she will sometimes visit one area for days together, returning hour after hour to the same spot. For example, one bittern dropped down near my house-boat day after day, and took no notice of two marshmen who were mowing there.

Another favourite feeding-ground was an old "delfway" opposite me. This partially silted up ditch was edged with reeds, which formed a screen along its whole length. The weather was superb at that time, but both these feeding-grounds were fairly sloppy, and I could hear the bittern splashing around though she was always hidden from view. When rain came and the tide pushed up, the water rose four or five inches; this little rise seemed to spoil the bird's hunting, and she went further afield where the water was shallower.

This bittern, for a bittern, was easy to watch, being less furtive than some, and nothing like as shy as a heron. A heron will swerve from its line of flight if it spies you half a mile off, but this bittern always made a bee-line for home. If I happened to be in her line of flight she passed over my head, merely squawking at me several times. When leaving or returning to her nest she always talked to herself as she went along; and I could always hear her first call-note when she left her nest, even though my house-boat was distant from the latter by about a quarter of a mile. She usually took from half to one hour to collect food, so that I was fairly well able to time her return.

This call-note of the bittern is a raucous "aark, aark," repeated at intervals. Twice I heard a bittern utter a hoarse cry like that of a raven, and I wondered if this was a male calling.

It was not until I had marked her down at her feeding-ground that I cared to try to photograph the bittern; the keeper and I would then punt to some sheltered corner on one of her lines of flight and hope that she might return that way Once only did I hide near the nest, and when she saw me she circled round my head several times and made a great noise. She would not drop down to her young, and eventually she seemed to swallow the food that should have been theirs, and then went off to her feeding-ground and did not return for another hour. Meanwhile I left the vicinity of the nest and did not try again for her there. Hitherto, I have always referred to the female because, as far as my experience went,

it was the female only that fed the young by day; up to the second week in June the males were booming almost continuously whilst she was thus engaged.

Before the young bitterns in the illustration were hatched, I saw an adult drop down near the nest one evening at dusk; I could only see this once because darkness falls soon after bitterns are on the move. Whether it was the male bringing food to the female, or whether she herself was away on the feed, I could not say. Wind made a great difference to the results of my daily observations, though in this respect I was fortunate in the bittern that I watched most, for besides being less shy than some others she generally flew at a fair height. However, in rough weather I seldom caught sight of her; she then either sought food nearer home or skimmed along low down over the reeds and along the sheltered dykes.

The following notes from my diary show the regularity with which my bittern fed her young, the hours given being those of solar time:—

May 26th. First saw the bittern searching for food; she left the nest at 10 a.m. and returned at 10.30 a.m. Though on the watch all day I did not see her again, and throughout this day I did not hear her mate boom. From these facts, we gathered that the young were hatching, and this proved to be the case, because on

May 27th, three nestlings were out.

May 28th. 5.30 a.m., alighted in gladden* near house-boat; left for nest at 6 a.m. Cold and windy; did not see her again.

May 29th. Watched from 5 to 6.30 a.m. Bird left nest 6 a.m. and returned at 7.5 a.m. In evening, left nest 7.10, returning 7.40. Left nest again 8.10.

May 30th. 6.45 a.m., left nest, flying very high, and dropped down near boat; returned to nest 7 a.m. Left 2.30 p.m., returned 3.30 p.m.

June 2nd. On watch all day; bittern feeding very regularly every 1½ to 2 hours.

* *Typha latifolia*, the flower of which is the "poker," locally always known as "gladden."

Curiosity

June 10th. Not seen from 4 p.m. on 9th till 5 p.m. to-day, then saw her going south of nest.

June 15th. Left nest 1.15, 2.15, 3.40 p.m. Heavy thunderstorm till 6 p.m. Feeding again 6.15 and 7.10 p.m.

June 16th. Left nest 9.45 a.m. returned 10.30 p.m.
,, 10.45 a.m. ,, 12.30 p.m.
,, 2.30 p.m. ,, 3.15 p.m.
,, 3.20 p.m. ,, 4.0 p.m.
,, 4.20 p.m. ,, 5.15 p.m.

June 17th. Not seen all day.

June 22nd—23rd. Raging gale ; did not see bittern either day.

June 24th. Less wind ; feeding as usual.

Sunday, June 2nd, was one of the days on which I saw most of the bittern ; she flew to and fro regularly. It was so hot that I felt too lazy even to jot down the times, but I watched all day and listened to the booming far into the night. It was an evening of weird effects, with a thick mist enveloping the marshes. First little puffs of vapour crept along the dykes ; then a thin mist rose from the marshes and grew in density until only the bushes were visible as ghostly wrecks stranded in a white sea. Now and again long winding sheets of vapour trailed across the expanse, and a curious silence fell. If a long-eared owl whimpered or a lapwing called, the sounds were muffled. The hoarse cry of the bittern, heard under such conditions, sounds unearthly, partly because it is still an unfamiliar sound. After a while all the surrounding bitterns started booming, as if challenging each other across the great silence. One felt "Alone on a wide, wide sea," where ghostly fog-horns called to the spirits of the departed.

After we had watched the bittern feeding regularly for some hours, the keeper and I went to look at the young : this was on May 27th. Only three of the five eggs were hatched ; one nestling was scarcely dry ; one was unable (or unwilling) to sit up ; the eldest shewed vivacity enough for all three ! He must have been four or five days old and stood six inches high.

Though I was worked up to a high pitch of enthusiasm at the thought of fulfilling one dream of a lifetime, yet my first

impulse on beholding this "dream" was to collapse into the reeds and laugh. This young bittern was the quaintest little ornithological oddity I had ever seen; he looked more like a small animated golliwog than anything else. Light tan-coloured down stuck out all round his head, and his big greenish-blue eyes glared defiance. He stood up, straddled across his brethren and made vigorous thrusts at us with his bill. He practised all the arts of self-defence peculiar to his kind; he would crouch down and then suddenly shoot up to his full height, or, throwing himself on his back, would kick at us with his splay feet, which seemed several sizes too large for him. The long silky down enveloping him in parts seemed to tremble with defiance. The whole of the skin showing through the down, as well as the bare patches, was bluish in colour. The gape and legs were a deeper blue. The blue colour on the body was even more striking later on. In some lights the eyes appeared intensely blue, but for the most part they shone with a blue-green light. I had only two plates with me and these were exposed very hastily. The reeds surrounding the nest were too tall to be bent back satisfactorily, and besides, I was anxious not to disturb the young in any way.

I did not visit this nest again until June 5th, when I found that the young bitterns had grown very considerably, but neither of the remaining eggs had hatched. The nestlings had become so lively that we had the greatest difficulty in collecting them and keeping them in the nest; they had scattered and hidden themselves as we approached, and it took some time to find them. They looked queer, ungainly, attenuated objects—all skin and bone and wide gape. The colour of the down had changed to a marabou brown, and their bodies bristled with sprouting quills. They were all three pugnacious and made a loud clamour, the sound produced being something between a quack and a croak. The eyes were hazel; the inside of the gape and big pouch slatey-grey. The bill, legs, and large bare patches of skin on the body were uniform in colour—a beautiful pale blue-green. No ordinary photograph can possibly do justice to the colour of the young bittern;

Plate IV

Expectation

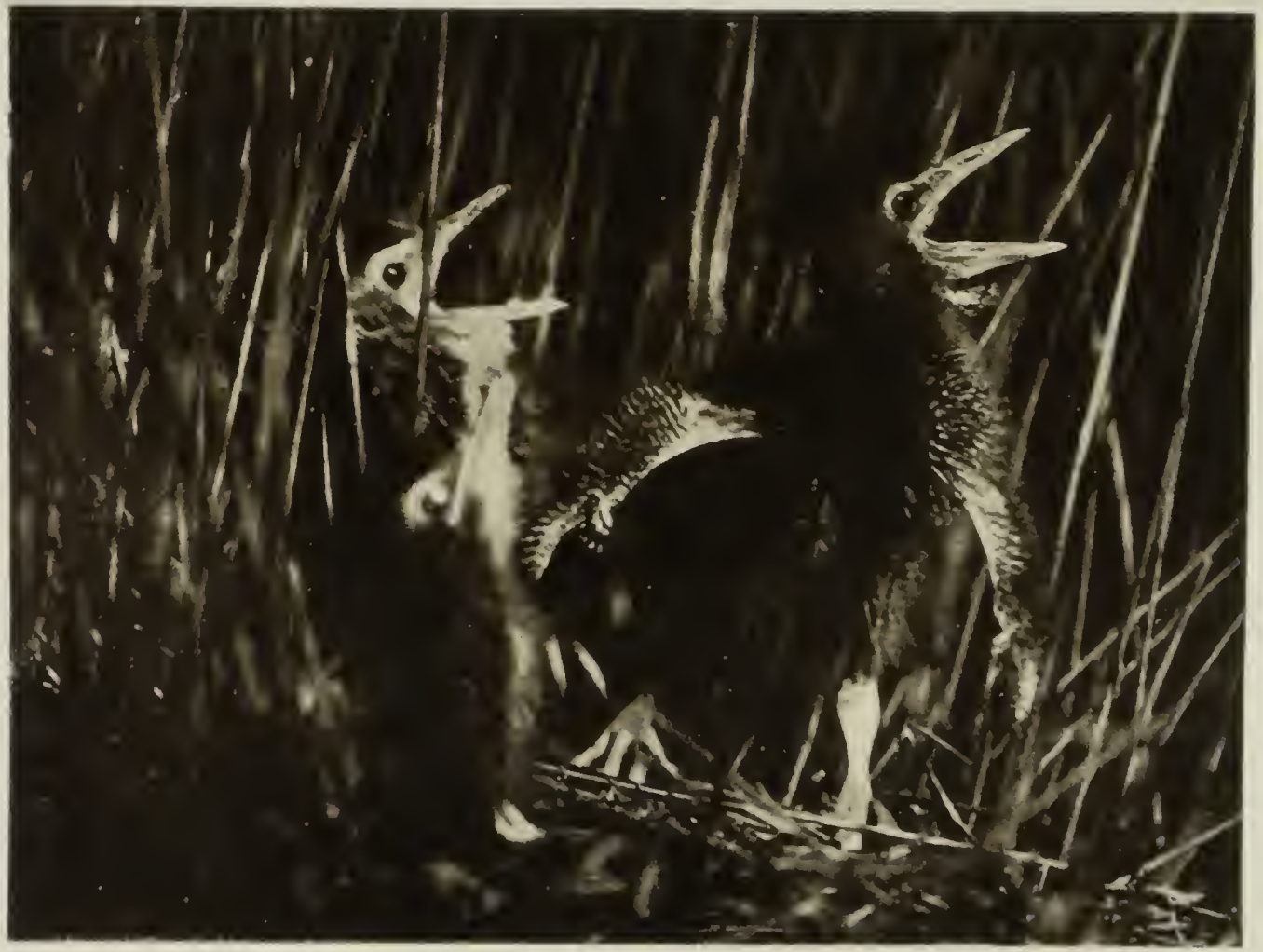
punted in and out of waterways, and I spent whole evenings gazing over those marshes, but all in vain. However, on the afternoon of June 20th, the keeper chanced to see a bittern flying low over the reeds, and she dropped down near the edge of the great reed-bed ; he at once made for the spot and found the nest only twenty feet from the rand.

Two young birds were standing in the nest waiting to be fed, but they immediately plunged into cover. He managed to catch one of them which was nearly feathered, though the wing quills were not quite perfect. We again visited this nest on the 21st and 25th, but failed to find the young bitterns ; the nest was full of scale and there was no second nest to be found.

There were, however, many "runs" leading to the nest and several flattened-out places where the birds had rested. Some of these were like woven mats, about six inches square, so thoroughly had the reeds been flattened out. The "runs" are not trampled paths such as a duck or a wader makes to her nest, but rather are they ill-defined tracks radiating from the nest in all directions. Here and there, in more or less regular lines, you are able to trace a bittern's steps by means of bent or broken reeds. Whether more than two nestlings were hatched at this nest we were never able to discover.

On June 25th, we hid up in a water-way near the nest, and waited for the old bird to return with food. After some time, as she did not appear, we waded to the nest, but the young eluded us. I struggled through the water to rest on a piece of open rand, and had just thrown myself down on the ground when I heard the now familiar call-note ; the old bittern was close to me, flying low over the reeds. The young birds must also have been near, because she was just going to drop down when she saw me. Up she rose with a loud cry and circled round me, croaking lustily. If only my camera had not been lying in the punt on the other side of the reed-bed I could have secured a photograph. Her gullet was distended with food, which she soon swallowed, and then flew off.

This bird must have been unusually wary, even for a



Anger

bittern, but having once located her home we now knew where to look for her. During the few remaining days at my disposal I occasionally saw her flying to and fro for food. Twice she flew to the feeding-ground that was used by the other, less shy, bittern ; but she generally skulked. Long before she reached her nesting area, she would drop to the level of the reeds, and just skim over them.

The last time I saw her was after some hours of fruitless watching. The day had been windy and cold. We emerged from a water-way on to a great grey expanse of open water and sky. The young reed-bed had almost attained its full height. The light was behind the reed-beds, turning their pale green to pearl-grey. Big clumps of bulrushes* stood out black against the leaden sky. The grey water was strewn with golden waterlilies. the banks fringed with stately yellow iris. A narrow belt of golden-brown divided the sky from the water. Over all hung the iridescent haze of a June evening so that the great marshland lay like a giant opal in the shade. I stood up for a last look. The bittern was slowly flying towards us merely skimming along the tops of the reeds. Her plumage exactly toned with the golden belt of dead reed flowers. In all probability she had been to and fro all the afternoon, but in such a light she would easily escape detection.

Young bitterns are not seen on the wing during the day, but seem to keep together in family parties for some months ; eventually they disperse and wander from the old area. During last winter a man caught a young bittern in a field at some distance from the marshes, and not knowing what to do with the strange bird he shut it up in a hen-coop for the night. It seems to have escaped ; at any rate, it was not there in the morning.

After the breeding season bitterns are rarely seen ; they are then more elusive than ever. When I am sailing home in the dusk of an autumn evening, suddenly, a shadow may float out of the twilight, hover for an instant over the boat and then disappear with a hoarse cry into the darkness and silence.

Scirpus lacustris.

The males begin to boom near their nesting areas early in January, and they continue booming till the end of June. Heard at close quarters it is the weirdest of sounds; no wonder that our superstitious forefathers regarded it with awe! Having frequently, since 1912, heard the Sutton bittern boom at a distance of three miles, I was astonished at the comparatively small volume of sound produced when the bird is only a few feet away. It is an intensely resonant sound, and at a little distance one only hears this resonant "boom"; one has to be fairly close to the bird to hear him "draw" before each "boom." He often begins with two or three grunts, as if he had a bad pleurisy pain; then comes a long-drawn inspiration, immediately followed by the deep "boom." These sounds, the inspiration and the "boom," are repeated three times as a rule, but frequently five or six times. When in full vigour two of the bitterns in my neighbourhood nearly always boomed six times, two others seldom boomed more than three times, a fifth varied considerably in his vocal powers.

Booming was always most vigorous just after sunset and before dawn, but the birds do not seem to obey any hard and fast rule. Sometimes one would start booming at mid-day or in the early afternoon and keep it up for an hour or more, at intervals of a few minutes. After thunderstorms they all seemed to vie with each other in making as much noise as possible; and in 1915 the Sutton bittern was long and loud in his protests at bombs being dropped in his vicinity during the early hours of the morning. In windy weather they are comparatively silent, but individual birds vary. For example, I have a note in my diary for May 26th: "Cold and windy; number one bittern booming but little, number two very noisy, the others silent."

When the young are two or three weeks old the males boom less during the day; but whether this is due to the increasing needs of the brood, or because the male is then approaching the end of the song period, I do not know. From June 7th onwards, two of the males became less vociferous; these had

Self Defence—The crouch and the spring

successfully reared young. The male belonging to the nest I photographed seldom boomed after the young were hatched.

On the other hand, the male that removed himself from the ground where two nests came to grief, boomed day and night regularly and lustily till June 17th, when his voice broke. On the 18th the voice of one of the other males began to break. This break in the bittern's boom is akin to the break in the cuckoo's voice; there is as much difference between the true resonant boom and the broken sound as there is between the ring of a sound and of a cracked glass. Nevertheless, on June 26th, one of these out-of-tune bitterns boomed magnificently, and in the evening all the bitterns tuned up, but it was a final spurt before they lapsed into silence.

There is always one night during the breeding season when all birds seem to reach the acme of their vocal powers; that is the night of the full moon in May or early June. It is the gala night of grand opera, and this year it fell upon the night of May 30th. There is an almost unearthly brilliance about the Broadland moonlight; the great expanse of water reflects the light as in a huge mirror: no wonder the birds are awake and excited.

I stood outside my boat at midnight and listened; redshanks were yodelling, snipe bleating, lapwings calling, reed- and sedge-warblers singing as if their hearts would break with the effort, and they sang until 5.30 a.m.—scores of them. The grand chorus consisted chiefly of these warblers, but running through it was a thin, intermittent thread of sound rising and falling at intervals: it was the long-drawn "reel" of the grasshopper warbler. All this I have heard on many occasions; it is an age-long chorus, coming down from the time when "all the morning stars sang together, and all the sons of God shouted for joy." But on that 30th of May there was, for me, a new thrill in it all. Beneath this riot of song, and accompanying it like a deep bassoon, was the booming of six bitterns, some near, others far away. Alone in that wide expanse, it seemed as if the whole orchestra had tuned up for my benefit; it was a thrill I would like to have shared with every bird lover.

I know that it is orthodox to say, that the bittern disappeared as a breeding species from these islands owing to the drainage of the Fens ; and this may be true of places like Whittlesea Mere, but it does not apply to many of the remaining Fen-lands. You have only to read the works of the older ornithologists to realise how wantonly bitterns were destroyed ; then, when they became scarce, the collector stepped in and finished them off with his craze for British-killed specimens. There are acres and acres of suitable breeding-grounds still left, not only in Norfolk, but elsewhere in the British Isles. Nevertheless, it is the duty of the men of Norfolk to protect their own rare birds, and to see that this little colony of bitterns does not meet the fate of its ancestors.

Mr. Riviere has collected evidence of fifteen bitterns having been shot in Norfolk between Midsummer, 1917, and Midsummer, 1918. Some of these may have been migrants, others may have been shot by mistake during duck flighting ; but, allowing for all possible valid excuses, the number is too large.

During the exceptionally hard winter of 1916–17 the whole Broadland area was ice-bound for weeks. A marshman, named Gray, deserves the thanks of all ornithologists for the care he took (and successfully) in keeping alive the Sutton bitterns. Between his cottage on the edge of the uplands and the marshes whereon he was at work was a dyke, over which he had to pass several times a-day. Each time he crossed he broke the fresh ice that had formed and so kept the dyke open. For a period of three weeks whenever he came up to the dyke he found two, and often three, bitterns feeding, and by taking advantage of cover afforded by a turn in the dyke he was able to get within a few yards of the birds and watch them fishing. Gray did this entirely on his own initiative and because of his love for the bitterns. I know of another marshman-keeper who, I am sure, would have acted likewise had bitterns bred in his district. This is the kind of spirit one wishes to encourage in those who live near the bitterns' haunts.

III.

MODERN ZOOLOGICAL NOMENCLATURE.

By Robert Gurney, M.A., F.Z.S.

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A note in Mr. W. Rowan's paper on the Birds of Blakeney Point in the last Part of our Transactions (Vol. X., p. 257) to the effect that the nomenclature there employed is that of the B.O.U. List of British Birds draws attention to a step in the direction of uniformity of nomenclature, the significance of which may not have been generally appreciated, and I think it would be of interest to offer here some observations on the present position of Zoological Nomenclature for the consideration of those who may not be familiar with the subject.

The system of binominal nomenclature introduced by Linnæus was immediately accepted, and proved itself of immense benefit in simplicity of designation, but it lent itself, unless controlled, to much misuse, and many efforts were made to lay down rules which should govern the application of Latin names. The Stricklandian Code, for instance, was drawn up in 1842 and took for the starting-point of binary nomenclature the 12th, and most complete, edition of Linnæus' *Systema Naturæ*, published in 1766. Therein was laid down the fundamental principle of Priority, namely that the first valid name given for a species by Linnæus or any subsequent author must be retained for that species. The Stricklandian Code was generally adopted by British ornithologists, but not by others, and other codes were drawn up and adopted in France, America and Germany. The resulting unsatisfactory position made it necessary to draw up rules which should be accepted by Zoologists universally, and such a Code was submitted to the Zoological Congress of 1889; but it was not till 1905 that the final Code of Rules, which is now in force, was accepted by the

Congress. This Code of Rules was designed to cover all difficulties and complexities of nomenclature, and a permanent Committee was set up to whom difficult questions might be submitted, and without whose unanimous sanction no alteration of the Rules might even be proposed to the Congress.

It is important to note these three points—firstly that the starting-point of zoological nomenclature was taken to be the 10th edition of Linnæus' *Systema Naturæ* of 1758, some eight years earlier than the date English zoologists were working from ; secondly that this Code provided for the strict application of the Rule of Priority without any exception whatever ; and thirdly that the zoologists of the world surrendered their judgment to a small Committee, the adverse vote of a single member of this Committee being sufficient to block any proposed amendment to the Code.

Theoretically, of course, the general adoption of a perfect system of laws would ensure that absolute uniformity of nomenclature throughout the world which is so much desired by all, but in practice the problem has proved, as human problems generally do, to be one of great difficulty.

It has been found that the adoption of the 10th edition of Linnæus' System, and the strict application of the International Rules, have made so many changes of names necessary that those who are not able to make a special study of the literature are apt to find that the names now in use are quite meaningless to them. The obvious and reiterated reply is that the present generation must put up with a merely temporary inconvenience in view of the surety of a future international uniformity ; but some are inclined to doubt firstly whether the price to be paid is not too heavy for the result, and secondly whether the result aimed at can ever really be attained.

By the publication, within three years of each other, of the " Handlist of British Birds " and the B.O.U. List, both drawn up by a committee of experts and both conforming to the International Rules, we are put in a good position to judge of the value of these rules in introducing uniformity and clearness.

It may be said at once that the agreement between the two lists

is remarkably close, but the differences that remain bring out forcibly certain points of fundamental weakness in the Rules. I do not propose to compare the lists in detail, but to point out the main causes of disagreement, and to go on to discuss the general grounds which lead me to the conclusion that the Rules have failed and will fail to attain their object.

The differences which are found between the two lists may be reduced to the following general headings :—

1. Differences of opinion regarding method of naming, and validity, of sub-species.

It is somewhat difficult to determine the opinion of the B.O.U. Committee in many cases, since they have adopted the practice of using the binominal specific name even in many cases where they actually recognise a subspecies ; but there are instances of two birds being cited as distinct species which are, in the "Handlist," regarded as subspecies of a third. In the B.O.U. List, when two races of a species occur in this country, the Continental variety is cited under the binominal name and the British form under its subspecific name—e.g., *Parus ater* and *P. ater britannicus* (p. 55–56). In such cases the meaning is obvious, though it would have been far better to have adopted the method of the "Handlist" and to have cited the specific name as a heading—giving (as the "Handlist" does not) the authority for the name—followed by the subspecies. Where only a British form occurs and not the Continental one, as is the case with the Marsh Tit (p. 57) the B.O.U. List agrees with the "Handlist." But, in cases where only one form, and that a form also found on the Continent, occurs in the British Isles, the species name only is given in the B.O.U. list, so that it is impossible to discover whether the Committee do or do not recognise subspecies within it. For example, *Turdus aurea* is, in the "Handlist," *T. dauma aurea*, and it would be of some interest to know if the B.O.U. Committee wish it to be understood that they do not regard White's Thrush as a subspecies of *T. dauma*.

As an example of difference of opinion with regard to the validity of subspecies I may mention *Phylloscopus tristis*. This

bird is apparently regarded by the B.O.U. list (p. 83) as an independent species, but by the "Handlist" as a subspecies of *P. collybita* (p. 57). A further instance is that of the Stonechat. In the "Handlist" the British Stonechat is regarded as distinct from the Continental form, and it is treated as a subspecies of the South African *Saxicola torquata;* but the B.O.U. Committee do not consider the British and the Continental races to be distinct and do not accept the view that either is a subspecies of *S. torquata.* The result is that it is named *S. rubicola* in the B.O.U. list and *S. torquata hibernans* in the "Handlist," a difference in names which no Rules could remove. Other similar examples could be given, but these will suffice.

Differences such as I have mentioned above are not concerned with the adoption of one Latin name rather than another, but are due to differences of opinion concerning the birds themselves, which are not amenable to any rules.

A case of divergence of opinion of a different character with regard to the status of species and varieties is that of the Gyrfalcon and the Greenland and Iceland Falcons. All these are, by the "Handlist," regarded as subspecies of *Falco rusticolus* Linn., whereas the B.O.U. Committee regard the Gyrfalcon as one species, *F. gyrfalco*, and the Greenland and Iceland Falcons as subspecies of the Iceland Falcon, *F. islandus.* In this case the difference in the names of the Gyrfalcon is attributable, as a note in the B.O.U. list shows, to a disagreement as to whether Linnæus' description of *F. rusticolus* is recognizable. Here the Rules are obviously ineffective, since, without authoritative ruling on each such point, no finality can ever be attained. It is to be noted that the B.O.U. list recognises the genus *Hierofalco* as distinct from *Falco* and gives as the type *H. candicans* (Gmelin). It is one of the freakish results of the Rule of Priority that, although the Greenland Falcon is the type of the genus *Hierofalco*, yet, if it is regarded as a subspecies of *F. islandus*, its name cannot be used as that of a species.

2. Differences in Specific Nomenclature due to different interpretations of authors' descriptions.

The authors of these two lists have both, generally, applied the Rules strictly and have, where the question was one of rule and not of opinion, arrived at agreement. Where the B.O.U. Committee have adopted names different from those used in the "Handlist," Dr Hartert has, for the most part, accepted their amendments, but there are a few names upon which the authors of the two lists remain disagreed. Some of these, such as *Falco rusticolus* for the Gyrfalcon, are due to disagreement on the identity of the species indicated in an ancient description and, as I have said, the Rules do not, and cannot ever, enforce uniformity in such cases. But there is a group of names which Dr. Hartert has introduced, and which the B.O.U. Committee do not accept, upon which agreement is not reached for another reason: these are names attributed to Pallas in Vroeg's Catalogue. Now this part of Vroeg's catalogue is anonymous, though there appears to be good evidence that it was written by Pallas, and the B.O.U. Committee refuse to recognise an anonymous publication. On this point the Rules sre silent, so that here again they do not help towards uniformity. To my mind the B.O.U. position is obviously the correct one, since it seems a very reckless thing deliberately to change a number of old-established names on the authority of an anonymous publication of which only three copies are known to exist.

As further instances of differences arising from disagreement as to the validity of the names of old authors and the interpretation of their descriptions may be cited *Oenanthe leucomela* (B.O.U. List, p. 370) and *Sylvia simplex* (B.O.U. List, p. 363). In the former case the "Handlist" has adopted Lepechin's name *O. pleschanka*, but the B.O.U. Committee reject Lepechin's names on the ground that he did not consistently use binominal nomenclature.

The Garden Warbler is called in the B.O.U. List *S. simplex*, but in the "Handlist" the name is *S. borin* (Daubenton). In this case the B.O.U. Committee consider that Daubenton's figure is not recognizable, and in this, as in the case of *O. leucomela*, the Rules are incapable of ensuring agreement.

3. Differences due to the retention of names by the B.O.U. Committee as "Nomina conservanda."

There are certain names, of which a list is given on p. 355 of the B.O.U. List, which, although admittedly wrong according to the strict interpretation of the Rules, should be retained by reason of the confusion which their alteration would cause.

There can be little doubt that the retention of these names is in the best interests of Zoology, but obviously the action of the B.O.U. Committee is not binding on anyone and it is open to the objection that no individual or Committee has any right to suspend the application of the Rules for any reason whatever, since the selection of Nomina conservanda must, if they are to be generally accepted, be reserved to the International Commission. On the other hand the majority of ornithologists will, I feel sure, approve the lawless action of the Committee, since in several of the cases at all events the authoritative fixing of these names must eventually be sanctioned, and any changes made in the meantime can only lead to disastrous confusion.

4. Differences of Generic Names due to disagreement as to the types and authority of Genera.

The determination of the types of genera is a matter of some complication and is governed, under the Code as amended at the Monaco Conference, by a number of rules. These rules were probably available to the authors of both lists, but they have not proved capable of disposing of differences of opinion. As examples may be given the names of the Swallow and the Martins and of the Grebes and Divers, but the subject is too complicated to go into in detail, and it is sufficient to point out that here again uniformity does not necessarily follow the adoption of a code of rules.

I have summarised the main causes of divergence between the two Lists of British Birds and have shown that these are due partly to differences of opinion on points not affected by the Rules, and partly to differences of opinion as to the application of the Rules themselves. I will proceed to deal more at length

with certain defects in these Rules which are, in my opinion, the causes of their failure.

Can Unifomity of Nomenclature be Attained?

A comparison of these two Lists of British Birds seems to show that absolute uniformity of nomenclature is, and is likely to remain, unattainable, in spite of a rigid system of rules. A general agreement has, it is true, been reached, and may rapidly become more close, but there will always be a certain residuum of specific names which, under the existing system, will remain subjects of controversy, and, for this reason, useless. The main sources of such disagreement are two :—

1. Difference of opinion as to the admissibility of the names proposed by certain authors.

As an instance I would cite Dr. Hartert's introduction of names from Vroeg's Catalogue which is not admitted by the B.O.U. Committee. Herein agreement can only be reached by a definite ruling by an authority in whom all will have confidence. An authority constituted for such a purpose exists and has expressed a number of opinions on disputed points in the interpretation of the Rules, but I question whether it possesses the general confidence which alone can give effect to its findings. If the findings of such a body could be enforced it would be only a matter of time before all doubtful ancient writings could come under its notice and be finally accepted or rejected, and this souce of disagreement would be excluded.

2. Differences of opinion as to the identity of the species indicated in the descriptions of ancient authors.

Authors of the eighteenth century naturally did not strive after or attain to the precision and detail of modern description, and they had also an unfortunate habit of copying from one another. It is therefore difficult, and often impossible, to discover to what species some of their descriptions refer. Sometimes it is possible to attain to a reasonable certainty from their references to other authors or from other evidence ; but herein we enter a region of opinion and speculation, and it is possible for anyone to upset the nomenclature which has been

in use for generations by forming an opinion different from that which has been commonly accepted. For instance, Dr. Hartert has recently discovered that Linnæus described the female of the common Mallard separately from the drake under the name of *Anas platyrhynchos* and that, as this name has page-priority over *A. boscas*, therefore the current name must lapse in favour of *A. platyrhynchos*. In this case examination of Linnæus' references shows that he, as well as Ray and Willughby, were simply quoting from Aldrovandus, and Aldrovandus himself to some extent from Conrad Gesner, and describing a bird they did not recognize personally. Ray distinctly says "*Avis est fœmina, nobis nondum observata,*" and I do not think even Dr. Hartert could seriously maintain that Ray did not know the common Wild Duck! It is perfectly obvious that "*Anas platyrhynchos* Linn." is a mistake which should be decently forgotton. If it is objected that Linnæus' diagonsis is a recognizable description of the Mallard duck, and that therefore, no matter what Linnæus meant and no matter what inconvenience may be caused, the name must stand, one can only deplore the existence of Rules which allow such things to be done.

No doubt there are many more of such doubtful descriptions of species which await discovery and novel interpretation, and from changes due to such "researches" the International Rules afford no defence. Herein is a source of mutability of names the effect of which may be limited, but which must remain a possible, and in these days an actual, obstacle to uniformity.

The Price of Uniformity.

All who are or have been at any time concerned with the nomenclature of animals agree outwardly that uniformity is the object which all seek to attain, but it seems to me that another and perhaps greater object has been commonly lost to view. Whatever benefits may be derived from exact uniformity in future, I think the present generation will stand condemned if that end is attained by loss of continuity with the past.

It would, logically, be possible to achieve exact uniformity at a stroke by abolishing all existing names and substituting new ones with the sanction of an International Commission. But even were such a course practically possible, it would obviously be undesirable to do so simply for the reason that there would be a complete loss of continuity with the past. But the effect of the rigid application of the Rules of Nomenclature is much the same, for it has made it necessary to change so many names which have had general currency for generations that there is in fact a wide breach between the old and the new, so that those who are not specialists must find it very difficult to recognise many species in their new guise. Such name changes are, it must be granted, a necessity in some cases, but it should be understood that any change, when a name is a familiar one, is a distinct loss, only to be tolerated in the belief that the gain will, in the future, repay the loss. This does not appear to be the general view. Some writers seem to take pleasure in such changes and take pride in effecting them even when the necessity is a matter of opinion or dispute.

Science is international and perennial and still in its youth, though one is tempted sometimes to consider that some branches of it may be in their dotage—and it is no matter if this uniformity for which we strive be delayed a few years. Nothing is to be gained by heedless haste and very much may be lost. It would be far better to retain an old name which is admittedly wrong than to substitute a new one which itself proves in the end to be founded on error.

Already quite a number of names which Dr. Hartert considered, when publishing the "Handlist," to be the earliest and only available ones are admitted by him to be incorrect; for example:—*Falco aesalon* rejected for *F. regulus* and now reinstated; *Milvus migrans* rejected for *M. korschun* of Gmelin, which proves not to be a Kite at all; and there are others the validity of which is strongly disputed by ornithologists equally well qualified to judge.

The B.O.U. plan of reserving certain names as "*Nomina con-*

servanda" is, in my opinion, the correct one. There is the obvious objection that a Committee of the B.O.U. has no right to determine what names should be preserved and which should be changed, but at least the names it has selected to retain are universally understood, which is all that is required of a name, and they may be changed later on if it is proved absolutely necessary to do so. The Committee have at all events avoided the transposition of names from one species or genus to another. The substitution of a long-forgotton name for one established by long usage is a matter for regret, but it is a change to which one can become accustomed in the end; but the transposition of names from one species or genus to another causes a confusion which must endure for all time, and it is hardly credible that any scientific man should even have contemplated such an act.

This transference of names is by no means confined to Ornithology, and, where it is a question of genera and not of species, the effect may be disastrous and far-reaching. For example, if the International Rules are to be strictly followed the name *Actinia* universally used for a Sea-Anemone must be transferred to a Holothurian, while *Manatus* becomes *Trichecus* and the Lobster has to assume the name *Astacus*, hitherto used for the Crayfish. Similarly the Swifts, generally recognizable under the name of *Cypselus*, have to take the name of *Apus*, which has been in use throughout the world for generations as the name of a Phyllopod Crustacean.

Some of these transpositions are the inevitable result of the strict application of the Code, but some have been made even when the legal justification is open to dispute. The name of the Song Thrush may be given as an instance.

The name *Turdus musicus* has always been applied to the Song Thrush, and, so far as I know, to no other bird, so that until October 1st, 1910 (See "British Birds" Vol. IV.), the name has meant to ornithologists all the world over the Song Thrush and nothing else. On that date Dr. Hartert stated that Linnæus really described the Redwing under that name and that therefore the Redwing should be called *Turdus musicus*

and the Song Thrush should have the next available name of *Turdus philomelos*. Now as to the changing of the name of the Song Thrush to *T. philomelos*, one cannot raise any valid objection if Dr. Hartert's premises are correct, though one may regret the alteration, but so long as the original name remains in use there will remain uncertainty as to its meaning. Henceforth and for ever no man may write "*Turdus musicus* Linn." simply and expect to be understood. The only way of explaining his meaning will be the addition of the English (or other vernacular) name, or, and this would be more correct, by writing "*T. musicus* Linn., Hartert, 1910"

If the application of the name *T. musicus* to the Redwing and of *Sylvia hortensis* to the Orphean Warbler are in accordance with the Rules, all one can say is that the sooner the Rules are changed the better. It would be far better to drop these names altogether than to allow them to stand as monuments of the mental breadth of the present generation of ornithologists.

But the question of the naming of the Song Thrush and the Redwing is of such importance that it is worth while stating the facts in full.

Linnæus' description of them is as follows (Syst. Nat., X. ed., pp. 168–169) :—

168 *Turdus iliacus.—T. alis subtus flavescentibus, rectricibus tribus lateralibus apice utrinque albis.*

Turdus iliacus.—Raj. av. 64 n. 4. Klein. av. 66 Aldr. orn. 1. 16 c. 4

Turdus viscivorus maurus.—Alb. av. 1., p. 31. t. 33 *Habitat in Europa. Linea nulla superciliorum alba. Caro ob amaritiem minus accepta.*

169 *Turdus musicus.—T. alis subtus ferrugineis, linea superciliorum albicante.* Fn., Suec. 189

Turdus simpliciter dictus viscivorus minor.—Will. Orn., 138. t. 37, Raj. Av. 64 n. 4.

Turdus musicus.—Frisch. av., t. 27. f. 1. 2. Alb. av. 1. p. 32. 33. t. 35. 34. *Habitat in Europae sylvis. Nido ex luto. E summitate arboris vere*

Lusciniam cantilena imitatur Disseminator cum præcedentibus Juniperi.

Now Linnæus' diagnosis of *T. musicus* does certainly refer to the Redwing rather than to the Song Thrush, though his notes on the habits leave some doubt; but it seems to me that, having regard to the ambiguity and incompleteness of many of his diagnoses, we are entitled to make use of other evidence to ascertain to what birds he did really intend to attach these names.

In his Fauna Suecica of 1746, No. 189, both birds are confused together under one diagnosis, but in the edition of 1761, p. 79, they are quite clearly distinguished thus :—

217 *T. musicus. remigibus basi introrsi ferrugineis. Turdus simpliciter dictus viscivorus minor.* Will. Orn., 138. p. 37.

218 *T. iliacus. alis subtus ferrugineis. Superciliis albicantibus.*
Fauna Suec., 1746. 189.

So that it is clear that his final intention, at all events, was to name the Song Thrush *T. musicus*, and the Redwing *T. iliacus*.

Now in the 10th edition he gives certain references to other authors; let us see what birds are referred to under these references.

1 *T. iliacus*. Ray. Synopsis avium. 1713., 64 n. 4
Aldrov. I. XVI. Cap. 4., p. 597
In both these cases the Redwing is referred to.

2 *T. musicus*. Ray. Syn. Av., 64. n. 2.
Turdus viscivorus minor seu simpliciter dictus. The Mavis, Throstle or Song Thrush. "*Vere egregie cantat arboribus insidens.*"
Willughby. Orn. 138 and 137.
Turdus simpliciter dictus sive viscivorus minor
A Mavis, Thrush or Throstle: a Song Thrush.

So that, although in his description he transposed the species, it is perfectly certain that his intention was to follow the older authors.

In view of these facts I maintain that Dr. Hartert, in transposing these two names, has infringed the spirit, if not the letter, of the Rules, and that by his action he has done more than any critic or opponent of the Code to bring the Code itself into disrepute.

Subspecies in Ornithology.

In Zoology men's minds seem to bend in unison to the solution of the same problem, and the problem and study of one decade is not that of the next. There is something in this of fashion, something of evolution and necessity, and the effect is as that of Mutation—of progress "*per saltum.*" In the minor branch of Ornithology the outstanding feature of the work of late years has been the critical study of species and the discrimination and naming of an infinite number of subspecies, with the result that we have a very accurate knowledge of the distribution of most European birds.

But this splitting of species, which is a work of a certain obvious value in the hands of some, may be, and I think has proved, something of a pitfall for others whose ideas on species are perhaps less clear than usual. It is true that even in these days few Zoologists would agree in a definition of a species, and a true and correct answer to the question of "what is a species?" is as much to be desired as it was ten years or more ago. Generally speaking, I suppose it will be conceded that, as a matter of practical convenience, no group of animals whose variation curve shows a complete continuity in respect to all measurable characters can be treated as consisting of more than one distinct species. Such a series could only be split up if intermediate gradations were suppressed, in such a way that the uniform curve of the continuous series showed two or more distinct maxima of frequency. But within the range of a group covering a wide extent of country we generally expect to find a considerable diversity of characters, and specimens from widely separated districts will commonly be so distinct that they may be, and often have been, described as separate species or subspecies. But a more complete knowledge of the

forms inhabiting intermediate districts will generally show less and less marked distinction between the subspecies till the two or more extremes may be found to grade imperceptibly one into the other. Complete knowledge of the biology of such a form, namely, the constancy of the variation and the power of interbreeding and resulting fertility, will alone solve with certainty the question whether we are here dealing with one species or more, or with one species and two or more "subspecies."

The progress of our knowledge of species may be stated somewhat in this way :—The first stage is the description of genera containing forms generally characterised by a few well-marked and briefly-summarised structural features. Progress of knowledge will bring to light new species, and will also in many cases show that the primary species can be subdivided again into others quite well marked, but separable only by enumeration of more characters and those less conspicuous. With further and more critical study perhaps these too will be again separated, with the result that more and more species are described, but for their discrimination a more and more detailed analysis will be needed. But complete knowledge of all forms of these species will lead again to the fusion of many of the new species, since discovery of intermediate forms will make discrimination impossible. It seems to me that, with regard to the birds of Europe, knowledge is in the second stage that I have postulated, with a multiplication of named groups which are called subspecies, and it is questionable whether, with complete knowledge, any of these groups will prove to be practically separable. It may be a matter of convenience that the extremes of variation, where they can be shown to be definitely limited in space, should be named because, by such naming, facts of migration may be brought to light which would otherwise escape notice, but their limitations and slender foundations should be borne in mind.

There is, to my mind, no logic or convenience in referring to these "subspecies" at all except in such, comparatively rare, cases in which they illustrate some problem of Zoology. To

many ornithologists the House Sparrow of Britain is *Passer domesticus domesticus* always and exclusively, which is, I maintain, altogether wrong. The House Sparrow of Britain may be different from certain other House Sparrows, but, that being once established, needs no repetition—it is, and remains, Passer domesticus. If this form were found outside its own range and within the range of another form, it would be correct and proper to mention the fact, but any other use of the name in current literature (I exclude Monographs) only raises a suspicion of ignorance.

It should be remembered that the subspecific third name is merely a device or a symbol embodying the statement " the representatives of the species found in a certain area differ from those occurring in certain other areas in a definable degree." In current writings on local ornithology it is therefore somewhat absurd to use this terminology—in fact one is rather reminded of the classic platitude " Queen Anne is dead." I am informed that it is not necessary for contributors to " British Birds " to insert the Latin names of birds observed by them, since the Editor supplies the correct subspecific names in all cases! I find it difficult to understand the point of view, but am led to believe that those who use these names so freely consider that the species-name ceases to exist except as a " chapter-heading " as soon as subspecies have been discovered within it.

There is another point in the current mode of reference to subspecies to which I should like to draw attention. Where a species has been separated into geographical races these are named as subspecies under the specific name first assigned, with the inference that these races are derived from the first described, and therefore typical, race. But though such a procedure naturally follows from the application of the rule of priority, the inference may be entirely contrary to fact. For instance, the Black Rat is called *Mus rattus*, and any subspecies must therefore be called *M. rattus rattus*, *M. rattus alexandrinus*, and so on. But it is believed that the parent form is not *Mus rattus* at all, but *M. alexandrinus*. This is not a great matter, but it is a point which is not, I think, always understood and may lead to erroneous conclusions.

Conclusion.

Purely destructive criticism is generally easy and rarely very helpful, but the results of the application of the International Rules have been so unfortunate and have so far failed in their object that it is difficult to suggest any improvement other than their complete suppression. The bed of Procrustes was more effective than the Rules have been in attaining to uniformity, and its results were equally satisfactory to the victims. I do not think the world is ever likely to endorse the Prussian view that the destruction of the ancient memorials of the past and the blasting of a country by fire and axe are but trivial and transient misfortunes scarcely weighing in the scale against the blessings of the spread of German Kultur, and it seems to me that the Procrustean uniformity which alone can be attained by these rules may fairly be likened to the Prussianisation of Belgium and—the World.

The authors of these Rules honestly set themselves to remedy evils which admittedly existed, but their Code suffered from two fundamental weaknesses—firstly the adoption of the 10th instead of the 12th edition of Linnæus' System, and secondly the rigid adherence to the rule of Priority. The decision of questions of nomenclature according to these rules is so intricate that it is impossible for zoologists in general to deal with them, with the result that the matter has become a separate and special study divorced from zoological science. Dr. Hartert has stated that questions of nomenclature should be left to systematists and that, if they are willing to put up with temporary inconvenience, no one else has any right to protest. This seems to me an inversion of the facts. The systematist, dealing constantly with these names, is far better able to keep track of name changes, and in fact they cause him but little inconvenience; but it is the biologist, occupied with the wider problems of morphology and biology, to whom the first consideration is due, and the systematist should remember that he is but a hewer of wood and drawer of water for others. Each in his own degree shares in the age-long labour of erecting the edifice of

acquired knowledge, and on each is a responsibility that the work he contributes shall be sound and enduring. Systematists of this generation seem to be hastily building a tower of Babel.

Those who unreservedly support the application of the rules should remember that the President and Secretary of the International Commission were themselves strongly opposed to a rigid use of the law of Priority (see Zool. Anz. XLII. 1913. p. 473) and that protests have been made against it by many of the most distinguished Zoologists. On the other hand the International Code has been adopted by the International Congress and has had currency now for several years, so that the problem is an exceedingly difficult one. Although I believe the Code to have proved itself a failure, the authors of it and the International Commission deserve the gratitude of Zoologists for their labours, which have earned them much abuse and no reward.

To my mind the only solution of the difficulty that has arisen would be the amendment of the Code in the following respects :–

1. The insertion of a preamble to the effect that uniformity of nomenclature is for the present less a desideratum than intelligibility and continuity.

2. A relaxation of the Rule of Priority in the sense that it is permissive to neglect the earliest name when there is any doubt or ambiguity attaching to it or where a newer name is generally used and more commonly understood.

3. The definite refusal to permit the interchange of names between two genera or species.

4. The suppression of Rule 27b relating to Larval Forms.

In the meantime small Committees of specialists in each group should go through the names known before a certain date (say 1890) and determine once for all the appropriate name for each species, having regard solely to the question as to which name available would be best understood as denoting that particular species, and entirely disregarding any question of priority. There is an obvious objection that, in the first place, the findings of such Committees would not be binding— but neither are the solemn leagues and covenants of nations

held binding in these days, and the International Rules themselves have no higher authority. Their findings would be judged and accepted or rejected by Zoologists in general just in so far as they proved themselves to have exercised a broad common-sense. Secondly there is the practical objection that it is difficult to get men of all nations together in one spot for personal discussion. But this difficulty has already been largely overcome by the International Commission, and need not prove insuperable.

The principle of the compilation of a list of *Nomina Conservanda* irrespective of priority has been accepted even by some members of the International Commission, and a proposition was submitted by Mr. Hoyle to the Monaco Conference for the adoption of certain Mammalian names in this sense. But the Commission has to some extent barred the way to such a solution by the compilation of lists of generic names which are, in their judgment, correct according to the strict meaning of the Rules, and it is hardly to be expected that they will agree to the complete abandonment of these names, upon the verification of which an infinite amount of labour has been spent. But, in my opinion, such lists as have been published are valueless, for Biologists, apart from Systematic specialists, require names to be authoritatively fixed, not according to the rule of priority at all, but simply with regard to Intelligibility, Continuity, and Uniformity, in descending scale of importance.

RED-BACKED SHRIKE *(juvenile plumage)*

IV.

NOTE ON SOME HAND-REARED RED-BACKED SHRIKES.

By B. B. Riviere, F.R.C.S., M.B.O.U.

The two Red-backed Shrikes (*Lanius collurio*) to which the following notes refer were taken from a nest on June 12th, 1918, at the age, I should say, of a week to ten days. The nest contained five young birds, three of which, including the two taken, were much larger and altogether further developed than the other two. There was no down whatever upon them, and the feathers were just showing through the quills on the head, back, and wings. The inside of the mouth was orange-yellow, the iris dark brown, and the legs and feet bluish flesh-colour.

Thanks to my wife, to whose lot fell the very arduous task of feeding them and to whom the credit for their successful up-bringing is entirely due, they throve well from the very first day, their diet consisting of blue-bottles, wood-lice, raw meat, and hard-boiled egg, supplemented by the two patent soft-billed bird foods "Cecto" and "Life."

They were fully feathered in less than a week, and it was then to be seen that one bird was a good deal lighter and greyer on the head than the other, and whether or not this is a sexual difference remains to be seen until they have attained their adult plumage. For reasons which will appear later, I am fairly certain that the darker and browner-headed bird is a cock, but am doubtful as to the sex of the other.

They roosted on a perch out of the nest for the first time on June 20th, and on the 22nd could fly quite well, though the quill feathers of the wings, and the tail feathers, were then not much more than half-grown, and did not attain their full length until the end of the first week of July.

After this, the only change observable has been a gradual but very marked increase in the size of the head and beak, which gives them now a very much more shrike-like appear-

ance than is depicted in my drawing.

I did not notice them using the oil gland in dressing their plumage until July 10th, but since they began to do so their feathers have lost the loose, fluffy appearance characteristic of the young bird, and lie much closer to the body.

They first had a bath on June 30th, since when they have shown themselves to be extraordinarily fond of water, bathing always once, and very often twice or three times a day.

At about the end of June they began to attempt to fix flies and other food in the bars of their cage. Though a branch of a thorn tree has been threaded through the wires of the cage, they have never yet succeeded in fastening anything to it, though they almost always try, especially with meat of any kind, as soon as their immediate appetites are satisfied. At first all food was bolted whole, even including cockroaches and bees, but on June 30th they began to hold things in their feet, and now anything larger than a fly is usually held in the foot and eaten piecemeal.

Their method of using their feet is entirely different from that of a hawk, which simply stands upon its prey and holds it down. The shrike holds its food in its foot like a parrot, resting the tibio-tarsal joint upon the perch or ground to keep its balance.

In flying, food is carried either in the beak or foot.

Their favourite food is certainly raw meat, but flies, cockroaches, bees, ants, and ants' eggs are all eaten with avidity; and, curiously enough, considering their otherwise carnivorous tastes, they are very fond of lettuce. Bees are sometimes pulled to pieces, and sometimes swallowed whole, no notice apparently being taken of the sting.

For the size of the bird, the swallowing capacity is enormous. When feeding on a dead mouse, and there is nothing edible remaining which can be torn off by the beak, the head and limbs are swallowed whole.

As nestlings, pellets were cast every second or third day, but since their diet has contained more indigestible material, they cast them more often—certainly every day, and some-

times twice or three times. These pellets consist of the indigestible portion of whatever food has been eaten, such as the wings and casings of flies and beetles, and the bones and fur of mice.

The nestling cry for food is a harsh note, not unlike that of a young starling, and though our birds have now (July 31st) been out of the nest for more than a month, they still make use of it, and "shiver" their wings, whenever they are hungry. The note of alarm or anger is the well-known shrike chatter, always accompanied by the curious "lashing" or swinging movements of the tail. This note the darker-headed bird first made while still in the nest, but the lighter-headed one not till much later. Another note, which I take to be the ordinary call-note, and which we have only noticed during the last few weeks, is a short, harsh note of two syllables.

On the last day of June, when only ten days out of the nest, the darker-headed bird, rather to my surprise, began to sing, and has since done so almost daily. This song is a very pleasant, though rather harsh and disjointed little warble, and is accompanied by a good deal of swaying and jerking of the head and body. Latterly the greyer-headed bird has also occasionally sung, but only very rarely, and not with the same freedom as the other bird.

When let out of their cage, these birds are most amusing. They love to play with any small object such as a match or leaf, carrying it about in their bills, and chasing each other round the room for the possession of it. The browner-headed bird, when chasing the other, occasionally goes through a regular "display," swaying his head from side to side, and alternately crouching and standing bolt-upright, the feathers all the time being laid very smooth and close to the body.

Whether we shall succeed in keeping them through the winter remains to be seen—the lack of sunshine, which they appear positively to revel in, will, I think, be the greatest difficulty—but I sincerely hope we may do so, as more interesting or amusing birds it would be difficult to find.

They are now (July 31st) beginning to moult the feathers

of the head and body, and so far as I can see will assume an intermediate, and not the adult, plumage.

Since the above notes were written, the darker-plumaged bird has, I regret to say, killed his companion. The victim, on dissection, proved to be a male, and as I am convinced that the remaining bird is also a male, the difference in plumage above alluded to would seem to be merely an individual variation.—B.B.R.

THE HAILSTORM OF JULY 14, 1917.

By The Rev. M. C. H. Bird, M.A., M.B.O.U.

Many a dull morning turns out a fine day, but fortunately few bright, hot days end in such cold and devastating storms as that of the evening of July 14th, 1917. Broadland is not recognised by the Insurance Societies as a hailstorm area, but never, in living memory at any rate, has any part of England been visited by such a catastrophe to the produce of farm and garden as suddenly and unexpectedly occurred that day in the parishes of Ludham, Potter Heigham, Hickling, Catfield, Sutton, Stalham, Brunstead, East Ruston, and Happisburgh. With an E.S.E. wind and the sun shining brightly (thermometer stood at 96° in my daughter's shelter at noon), a sudden thunderstorm came on about 7.30 p.m., accompanied by a gale which brought with it hailstones of huge dimensions, the largest as big as walnuts, though not so symmetrically formed, many being irregularly-shaped pieces of ice, which in falling chipped wooden gates and palings as as if they had been hacked with a shut-knife. As was graphically stated in the "Eastern Daily Press" report of the damage, "for a stretch of some 2½ miles, by a width of half a mile the country, a few days after the storm, looked as if it had been subjected to a creeping barage, the corn being

levelled, and the hedges, denuded of foliage, presented an almost burnt appearance." Smaller stones perforated apples at Stalham, and a zinc chimney cowl was pierced as if peppered by a shot-gun. Windows were smashed in hundreds of houses, glass next day being at a premium, plumbers and glaziers alone reaping the proverbial good of this ill wind. On the following morning, at the base of the wall of one of Mr. Read's goodly range of greenhouses at Stalham, a mass of hailstones had collected and consolidated into a solid block of ice some 18 inches deep, into which a pitchfork would not penetrate; and yet, curiously enough, comparatively little glass was broken, whereas in an old, small-paned greenhouse at Sutton nearly every pane was smashed, the different quality of the glass and the different angle at which the falling stones struck it at either place probably accounting for the disparity of damage done.

The local fruit-growers suffered severely; a few black-currants had been previously gathered, but none remained on the bushes after the storm had passed—twenty women were gathering berries off the ground in a small holder's garden next day. As most growers had already signed contracts for the supply of their crop (a fairly good one in the locality), not only was the loss the more disappointing, but the producers were also faced with the prospect of prosecution for breach of contract! Nor did the anxiety of the fruit-growers end here; the question still remained as to the amount of damage done to their trees and bushes, the old as well as the young wood being in many cases so shattered that the owner of an allotment at Sutton was subsequently advised to cut his black-currants down to ground level, the result being that he has now (October, 1918) got a good growth of strong basal-shoots, though a two years' crop has been sacrificed. Between Ingham and Stalham, much damage was done to timber, many oak trees on Mr. Herbert Wenn's land having huge branches, heavy with foliage at this season of the year, twisted off by the violence of the wind, the debris taking several days to clear up. The storm itself lasted only about twenty minutes,

but for hours after the roads and lanes presented a mid-winter appearance, the hedgerows being white with drifts of hailstones, and road traffic was stopped in several places by fallen trees. At Hickling and Catfield birds were killed. On the boundary of Sutton and Stalham I saw a field of late-sown swedes on which the plants had been cut up by their roots and hurled or washed out of the ringes by hundreds. Mangold, being forwarder and therefore more securely rooted, did not suffer so much, but on some fields the leaves were shredded to the midrib, and the reclining plants looked as if a roller had passed over them. A Catfield farmer subsequently told me that where some of his early mangold bulbs had been wounded and afterwards healed, they had no colour within at haling time, and he thought that the feeding value was consequently depreciated.

The greatest loss of course fell upon the wide acres of the local corn-growers, thousands of coombs of wheat, barley, and oats being spoilt, and the straw so damaged as to be useless for thatching and much depreciated in value for litter, a valuable commodity in this bullock-grazing district. At the time, it was impossible even approximately to assess the amount of destruction, and all estimates fell short of the actual loss which the threshing-machine revealed. One farmer was 1400 coomb short of his previous ten years' average. Mr. F. Worts, at Sutton, threshed 18 coomb of oats from 14½ acres, on which he had drilled 17¼ coomb of seed. Mr. J. Bygrave, in the same parish, had 37 coomb of wheat from 25 acres, 45 of barley from 17 acres, 21 of oats from 6 acres, and he cut 18 acres of oats directly after the storm to make into hay, the resulting stack affording an interesting instance of the vegetating of prematurely ripened seed, for although the oats were quite green and soft on July 14th, when a piece of the stack was cut some months later the corn scattered around in the process germinated freely. Mr. Henry Cooke, of the Church Farm, Stalham, suffered severely. Three days after the storm I met a friend near his house, who had come from a distance to view the affected area, and he asked me

where most damage had been done. I told him that he had just passed one of the worst fields: because cattle were grazing on it, he had taken it for an olland, though but a few days before it had been carrying a promising crop of oats! Another of Mr. Cooke's fields, near by, he had pointed out to his wife, shortly before the storm, as the best piece of wheat he had ever grown since he had been in business—some forty years—and in twenty minutes the passage of the hurricane had rendered the corn unfit for human food.

These are only a few typical instances, larger occupiers suffering even more severely, as for example the Gladden family at Ingham, Catfield, Hickling, and Brunstead, and Messrs. H. Barber, of Catfield, and H. Wenn, of Ingham. To mitigate the loss incurred, Government aid was sought in vain; the proprietors of the "Eastern Daily Press," however, at once consented to open its columns for the purpose of a public subscription, and in spite of the many other objects appealing in wartime to public sympathy, over £900 was eventually collected and distributed amongst the most needy applicants by a Committee over which Mr. C. Waters presided. Of course only the smaller occupiers could be considered, for to recoup the larger farmers would have required far more than the £30,000 at which the damage had been estimated previous to threshing time. Several landlords besides contributing to the public subscription allowed rebatement in rent to their victimised tenants. A curious application for relief came from a well-known rush horse-collar maker at Stalham; the storm had completely spoilt the crop of collar-gladden (*Scirpus lacustris*, the true Bulrush), and so robbed him of material for a year's employment. He had anticipated using from 400-500 bundles, worth, in the water, about six shillings per long hundred, out of the manufacture of which he had expected to earn some £20. Black-weed or Black-star (*S. nigricans*) was formerly used for stitching these collars, but this rush has apparently decreased in the district as much as *Cladium mariscus*, beloved of Reed Pheasants for nesting purposes, has increased.

Comparison has been made between the hailstorm of July, 1917, and that which occurred in the Norwich district on August 9th, 1843, towards the relief of the destruction done by which a public subscription was also organised, and surveyors appointed to assess the damage. In the following September, losses to the amount of £30,770 2s. 3d. were reported. In some parishes a voluntary rate of 3d. in the £ was paid. The total contributions finally amounted to £10,013. From these particulars, gathered from the local Press, it will be seen that there was a striking similarity between the estimated damage on the two occasions, but, whereas in 1917 we had only one short hailstorm unaccompanied by rain, in 1843 much rain fell, and consequently much flooding resulted ; moreover, there was a similar storm on the following day, a further storm on the 15th, and a waterspout was observed on the 18th at Rushall and Dickleburgh.

VI.

THE HERRING FISHERY OF 1917.

By Arthur H. Patterson.

The East Coast Herring Fishery of 1917 created a record for prices realised, for never before in the history of this great industry had catches, and even individual herrings, exchanged ownership at such abnormal figures. The results of a comparative scarcity, due to a vastly diminished catching power and a great demand for this fish for purposes of home consumption, had been seriously to debar the poorer classes from freely enjoying what has been for long centuries a wholesome staple dietary. Fresh herrings were almost unknown to many humbler townsfolk, and fell only to the share of the better classes, and in a smaller degree to those whose menkind were toilers of the sea. Even these have had greatly restricted "doles," whereas, in the pre-war days of plenty, some careful souls might be seen staggering home under full bags, which they either smoked or salted for winter use.

On the other hand, fishing boat owners, who had drifters still free of Government and Naval uses, made a wonderful fishing, catches realising a quick sale and unprecedented prices. It was a catchers' harvest.

Throughout the centuries, right down to 1913, the local fishery had been steadily growing and rising in importance, with only occasional setbacks, due mostly to stormy weather of longer or shorter periods. In 1913, its highest point was reached, to be temporarily thwarted and reduced by war. After that year's fishing a great number of drifters were converted to naval uses; restrictions were necessarily imposed with regard to the areas fished in, and precautions were taken to keep as quiet as possible the extent of the fishing operations, for purposes of policy and safety. The 1915 and '16 voyages were kept largely out of the public ken by non-publication; although, perhaps, at the present juncture, a short review of

the progress of the fishing may be pardoned. The following are the figures for 1913, as compared with the three succeeding years :—

Drifters Fishing out of Yarmouth		Crans Landed		Lasts
		1913.		
999 boats	...	824,213	...	82,421
		1914.		
370 ,,	...	177,459	...	17,745
		1915.		
185 ,,	...	120,122	...	12,012
		1916.		
59 ,,	...	12,289	...	1,228
		1917		
Scotch 200 Yarmouth 30	230	76,056	...	7,605
Catches, etc., at Lowestoft for the 1917 fishery :				
Approximately 160 boats		48,989	...	4,898

Miscellaneous Remarks.

The 1917 voyage was somewhat curtailed at either end of it, the finishing being curiously abrupt, although the Scotchmen were desired to continue the fishing for a spell longer, or at least while catching was remunerative, but they, having done exceptionally well, preferred to get away home, on the principle of " letting well alone." The voyage was wonderfully free of mishap from the mischances of war.

The prices realised for the herrings were abnormal, although no foreign competition or export was allowed, and the fish were only salted for home consumption : and the natives were harder hit than folk in other counties. An interesting light was brought to bear upon this point by Mr. Walter Rye rather indignantly complaining in the " Eastern Daily Press " of the price asked in Norwich in January (1917) for white (uncured) herrings, viz., 3½d. each, as against obtaining a couple " in old days " for 1½d. I do not know what he would have said " in old days," of even 25 years ago, had a herring-stealing

urchin met him, offering a big bunch on a cord at " Fourpence for 30 " (!) fresh from the boat.

On the date Mr. Rye wrote, it appears that only half-a-dozen boxes of herrings, from Brixham, arrived at the Fish Wharf : these realised 28s. the hundred (" long tale " of 132 to the hundred) ; thus making first hand 2½d. each. When the cost of labour, from the catcher to the consumer, that of rail, etc., are considered, it will be seen that some of the middle-men could boast of but very small gains ; yet boatowners insist it was these who got the greater bulk of gains, and not themselves !

On February 20th we had consignments by rail from Mallaig (West of Scotland) of medium-sized fish, in excellent condition, full of roe, making tasty bloaters.

From the East Suffolk stow-nets " yawlers " (half-grown herrings) were being hawked about the streets on February 21st at 4d. per lb., insipid, undeveloped fish, which it was a pity to net.

Excellently plump " 'Longshores " were being netted off the beach on May 1st. Nothing further of interest obtained until September : on the 27th, 2000 herrings were landed on the Wharf by Winterton off-shore boats, which realised from 38s. 6d. to 40s. per hundred. Bloaters at the time were selling in London at 6d. each. A small lot of herrings sold at Lowestoft for 48s. the hundred. During the month the Palling and Winterton boats did well.

Government interference in the controlling of herring prices did not find favour with the fishing fraternity generally ; and fixing the price at 10d. a pound was not only a hardship upon the curers and little fishmongers, who found the sale of them hang fire, but was a far greater one upon the poorer classes, to whom a herring means the " backbone " of a meal. I went into a little shop and asked the price of some bloaters—great, coarse, wire-boned old Norwegian stagers. The shopkeeper placed one upon the scales which lumped it at a half-pound. Fivepence for such a veteran was an atrocity—and I was not disposed to conclude a bargain.

The highest price ever paid for herrings was at the beginning of December, when £14 was the cost per cran, or £140 per last; a decided contrast to periods of glut, in pre-war days, when £2 per last (of 10 crans) was nothing uncommon.

I have been furnished by a leading fish-merchant with two or three items of exceptional interest with regard to remarkable catches: "The five best catches for *one* night's fishing averaged £1,000 each; record landing in one week by one boat, £1,745 (Scotch motor drifter); record total for the season (top boat), £6,707. One Lowestoft steam drifter was missing with all hands, due in all probability to a stray mine; the explosion was heard, but night very dark. One sailing Scotch boat was lost with all hands in bad weather; and one motor boat, but the crew was saved. Thanks to the Navy's vigilance, the fishing was prosecuted undisturbed."

Herring Stealers.

Some small satisfaction may be mine in the conviction that certain steps taken by me helped towards the suppression of a centuries-old immoral institution, that of herring stealing by small boys and youths. When I undertook the duties of truant extermination, in October, 1892, my campaign began almost immediately. I found boys from all three local districts swarming daily to the Fish Wharf, their quest being herrings; their main object, ill-gotten pence; their condition deplorable. A swarm of boys habitually truanted all the fishing season: some stayed from home for days and nights together, their offices, diggings, and sleeping quarters being in the interior of those huge piles of empty swills that back-ground the Fish Wharf. Herring-barrels were appropriated, and drawn into the heaps for sleeping berths; the boys' clothes, wet and dry alternately with herring-drip and rain, stank worse than Dickens' "ancient and fish-like smell." By day the urchins distributed their "scouts" and "pinchers," defying fishermen and owners and policemen, all of whom they deftly outwitted, taking back to their quarters herrings of the primest condition, successfully plucked out of the swills. In the swill-heap interior

the catches swelled, and were strung, to be taken out at even-tide and sold to sundry small chandlers and fish shops for pickling (potting in vinegar) or smoked in small back-yard fish houses, as the case might be. Some of these purchasers got their fish 200 per cent. cheaper than by honest purchase.

After selling their catches provisions were purchased at shops—*e.g.* cheese, bread, and choicer fare, as well as candles; and the urchins went home to their lairs to feast and sleep. I attacked these fortifications armed with a long cane, and many a race around swill heaps enlivened my day's duties; I even pursued them among the full swills on the busy wharf. Onlookers, highly delighted, laid their money on the boys: I also "laid on Macduff," with my cane, *slowly winning*. Often would boys drop strings of "selected," fine herrings, to be thrown by me into the river or in the docks. Occasionally a tempting string of herrings went—but this is another story.

On Saturdays the country market-people proved ready buyers, and sharp bargainers; occasionally, on a glut, they beat the boys to a minimum price, which the cunning young rebels made up somewhat for by a choice of unpaid-for apples, etc. Incorrigibles I brought before the magistrates, *asking for a fine against their parents*: a far better and cheaper method than sending them to the local industrial school, where they did not repent!* Gradually my care and court work broke the system, as far as in school-time hours went, but after-hours and half-holidays still saw troops of scores going wharf-wards, to the chagrin of the heavy forces (policemen), who were not nimble enough for active reformation. From 76% average attendances mine gradually went up to 93%, and on occasion even higher.

In 1917 an absolute epidemic of herring stealing again broke out—mostly out of school-time, but there being so restricted a market, and so many policemen, only extra-alert urchins got a hand in at the wharf; the favourite method was for two boys to follow laden carts, one clambering on behind to

* This institution has been abolished for several years owing to truant scarcity.

throw out the fish, the other to run behind picking up the dropped fish. I made enquiries, and found that with the enhanced prices of fish the boys were earning big sums. One lad preferred to steal herrings—to make as much as *seven shillings and ninepence in a day*—to less doubtful working for a master.

I gave the Clerk to the Commissioners some statistics and a number of glaring facts : he asked me to "*put it in writing*" to the Commissioners, which I did. My effort, helped by the awakened "alarm" of the fish fraternity, I believe had the desired effect. A meeting of influential Herring-folk was called together ; a number of them were sworn on as special constables ; and immediately the urchins found "their occupation gone." By pursuing this restrictive measure there never need be a recrudescence of this vile pilfering, which, up till 1915, undoubtedly had accounted for a loss of herrings that amounted to *hundreds of pounds annually*.

VII.

SOME YARMOUTH BIRD-NOTES FOR 1917.

By Arthur H. Patterson.

The Great War, begun in August, 1914, would appear to have had most serious effects upon the periodical movements of European birds; so much disturbance over the vast and once-solitary nesting haunts of some, and the altered conditions affecting others, have been by no means conducive to the comfort and well-being of either bird or man.

Take the extinction of the lights upon the lightships as only one disturbing element. Prior to the war many opportunities for bird-observation obtained, as these lights, lying in the line of migration, baffled thousands of migrants on misty nights, lowering their elevation from the normal, and sorely bewildering them. Since then practically none have dropped upon the vessels for a rest; and the want of the fatal gleams made victims to disablement *nil*, whereas under the ordinary conditions it was a common thing for such dead birds as floated to drift ashore with the tide, and having escaped the keen-eyed gulls, to be seen strewn upon the tide-mark. Migrations, too, have been inconspicuous generally, the majority of those birds travelling having evidently flown at a greater elevation.

My own rambles have been exceedingly restricted, so many areas being forbidden for military and other reasons; whilst a permit, signed by a captain in command, giving me permission to visit some of my old haunts, became so often a dangerous possession, that for fear of arrest, or even some worse mishap, at length compelled me to forego its *privileges*. One episode, indeed, wherein high words passed between myself and an ignorant sentry, who could not read, led to a scene not over-dignified. My binoculars, in every case, have had to be worn under my coat.

Movements of Geese, which included White-fronts, were in evidence early in January, a presage of bad weather in

store. On January 8th a large flock went over ; and the wind veered to the E., and then N.N.E. on the night of the 9th. It blew hard ; and blizzards were reported directly after in the North of England.

Wood Pigeons were selling at tenpence each, "as they ran," on January 20th.

Frost set in during the middle of the month ; when (on the 24th) I observed Golden-eyes on Breydon, ducks that only put in there in hard weather. Swans and Wigeon in some numbers there on the 26th.

January 26th.—A number of Knots on Breydon. Several Waxwings about the country villages, same date.

On the 27th I observed a Moorhen, evidently in a bad way. I had, I suspect, overtaken it at a disadvantage. The bird seemed actually to collapse when I reached over some ice with my stick to draw it in ; the moment it touched it, the bird was all alert and flew off into the reeds. A very clever instance of a bird shamming death.

February 1st.—Observed an abject-looking Kingfisher on the edge of Breydon, dying of starvation : I have not seen one since : it would seem possible that the local race had been extirpated. Redwings were dying wholesale, although few, if any, had been seen in the autumn migration period.

Saw a Green Sandpiper (*Totanus ochropus*) on Feb. 2nd moping around the Southtown marshes, without an attempt to fly. The same afternoon a gunner killed it. It is an exceedingly rare visitor in winter.

Breydon alive with Coots from the Broads ; and many Great Crested Grebes. One gunner shot five—a senseless slaughter ; I saw the corpses lying in a row ; the man was at a loss as to what to do with them.

Various Gulls starving. Black Heads swarmed the busiest thoroughfares in the town ; haunted the neighbourhood of butchers' and fishmongers' shops, squabbling and fighting over refuse thrown to them. Common Gulls, of more marine and shyer disposition, died in numbers. The only show of fowl was in the Saturday's market (Feb. 3rd), when a number

of Tufted Ducks, Pochards, and Wigeon, with several Mallard, were on sale. Some Golden-eyes, two female Smews, and a great gaunt Curlew, many Waders, and several bunches of rough small Wood-pigeons (evidently immigrants) made up the sum total.

A number of Coots, many Grey Plovers, Curlews, Dunlins, Knots, and Redshanks, with scattered bunches of Ducks on Breydon, altogether un-get-at-able, on account of the ice, on February 4th.

Gulls have learnt to understand that undersea explosions often kill many fishes; and they now habitually resort to such localities. Some Trinity men were blowing up wreckage. Just before the explosion not a bird was within sight; within a few minutes, from all directions, from 200 to 300 Gulls were on the spot seeking for broken fishes.

April 22nd.—I observed quite 1000 Starlings in a marsh, grub-hunting in the moist soil.

May 12th ("Godwit day").—During a sail among the Breydon mudflats saw some 150 Godwits, 12 Golden Plovers, several Whimbrel, and two Little Terns.

May 13th.—Plenty of Whimbrel and Greenshanks; and a flock of Lesser Black-backed Gulls (*Larus fuscus*); among them were richly-plumaged adults, and several blotched birds of the third year.

About 100 Wood-pigeons flew overhread on May 14th, going due E., seawards.

Swallows and House Martins rather more plentiful than in some years; an astonishing number of young birds using the telegraph wires at Haddiscoe (July 26th) just before sunset.

A very richly-coloured Flamingo frequented the Breydon flats in July; it was an undoubted "escape" from Woburn that had overcome the restraints of a clipped wing and was unpinioned.

August 14th.—A Sandwich Tern was brought me from sea; on the leg was a ring marked "Museum Leeden, 6872." Mr. J. H. Gurney records this in "British Birds."

August 22nd.—"Twice to-day saw a Sparrow Hawk

at Fritton." It was evidently benefiting from the absence of a keeper, then in khaki.

Saw a Sandwich Tern flying leisurely along the Waveney at St. Olaves, September 15th.

Same date.—Swallows most industriously whipping up floating insects drifting on the tide.

Lapwings were coming in on migration in some numbers, October 7th. Many Curlews on Breydon on the 14th.

During the middle of October, migration of land birds set in in some numbers. Larks in swarms; Rooks trooping in daily; Chaffinches abounding everywhere.

November 4th.—Sail round Breydon flats; saw many Dunlins; three Scoters, some way off, apparently velvet Scoters; a score Wigeon; numerous Hooded Crows; a large flock of Snow Buntings on the wall-slopes.

From November 16th, flocks of Geese were continually crossing the town and the marshlands, up to 200 in a flock; it was interesting to watch them, when about to lower in their flight, breaking into apparent family parties; and when on a continued flight, to observe the leaders fall out and join on behind, the other birds wedging up to an acute angle.

Early in November a lady friend observed four Purple Sandpipers at Gorleston Pier.

November 8th.—Two Woodcocks picked up dead below telegraph wires by the same man, two miles apart from each other.

A curious drab or stone-coloured Pheasant on sale, November 19th.

Observed no less than 12 Redshanks on "Rotten Eye" (Breydon). This species would seem to be a more frequent winter visitor to Breydon than in years gone by.

On Christmas afternoon I put up some Snipe on the Breydon marshes.

VIII.

SOME FISH-NOTES FROM GREAT YARMOUTH AND NEIGHBOURHOOD FOR 1917.

By Arthur H. Patterson

(*Associate Member of the Marine Biological Association of Great Britain*).

The year 1917 provided me with very little of especial interest in the matter of either Bird or Fish observation: it was distinguished locally by its complete demoralisation of the Gull family; by a great scarcity of edible fishes; and by enormously inflated prices. A particularly noticeable feature has been a revival of Flounder netting on Breydon; and another, the longer continuance of dredging by shrimpers, very few of the shrimp-boats having been laid up as in the erstwhile busy days of the herring fishing, when small boats could not with safety use the crowded river. Local prejudices, to a great extent, gave way in regard to certain fishes against which, in the pre-war days of plenty, much antipathy had been shown; dog-fishes of various species are to-day taken to the fish shops and skinned on the premises, an act that a dozen years ago, if observed, would have made a fishmonger an exceedingly unpopular individual. A ready sale now obtains of the ugly Wolf-fish (*Anarrhichas lupus*); and the Flounder has become quite popular, the larger examples being eagerly purchased by the better classes, whilst absurdly small ones never want for buyers among the poorest. "Horse Mackerel" (Scads) readily sell, as does the smallest of the "round" fishes that at one time were sold only for crab-bait.

Two species new to the County have come into my hands, which stop a long unfilled gap in the Norfolk list, viz., the Variegated Sole (*Solea variegatus*) and the Solonette (*Solea lutea*). These bring up the local catalogue in round numbers

to the very creditable total of 160 species; as against 148 for Yorkshire, 118 for Lincolnshire, 120 for Suffolk, and 113 for Essex; these figures are from the most recently available sources.

It became noticeable to certain of the shrimpers, late in December, 1916, that quite an inrush of spawning Flounders had set in, and two or three shrimp trawls were soon at work. These fish resorted to the deeper channel, and the neighbourhood of the shoals at the confluence of the Bure, Yare, and the extreme northerly point of Breydon, known as the Knowle. Another or two, helped by a certain Government scheme, fitted their craft with motors—these, scraping the bottom most persistently, obtained unusual quantities of fish, which made record prices on the Fish Wharf: three men working a boat one night netted sufficient Flounders to realise the sum of £10 next morning. At the end of 1917, and early into the next year (1918), motor-drawn trawls were most assiduously worked. From the middle of December to the middle of January, the fish ran large; but a wasteful pursuit of a very meagre and small type of fish, scarcely fit for cooking, went on. An average-sized example was no longer than a child's hand, whereas the usual run of the earlier captures weighed a pound a-piece, or thereabouts.

I question if the old-time method of staking nets on the edges of the flats, which enmeshed the fish as they came off with the ebb-tide, will ever again obtain; although good Flounders, fat and luscious eating, and once known as the "grass-fed butts," are generally plentiful in August. These fish in the warmer months pursue the shrimps in the "drains," devour many small crabs, and the small mollusca that abound in the *Zostera*.

In the "old days" a considerable number, at two shillings or half-a-crown a hamper, went to Cromer to be used as crab-bait.

There was a revival in the winter of 1917 of "butt-pricking," or "darting"; it was a favourite winter pursuit of the old-time Breydoners, practically every one of whom owned and

used a "dart." The shaft ran to about 20 feet in length; one under 25 feet, even at low tide, cannot to-day be used in some parts of the channel. To the "business end" of the shaft is attached a rake-like apparatus, the barbed tines running vertically with the pole. The fisherman, who drifts in his punt or boat, is steadied by a short length of chain attached to a rope, which is thrown over; as he drifts the dart is jobbed up and down. If a spawning fish, half buried in the sand or ooze, happens to come directly under the cruel tines it is at once impaled. Unfortunately some are struck near the ventral, dorsal, or caudal fin, and easily break away; one pierced through the head, or the thick of the back, comes up—hopelessly struggling; or, hollowing itself, shews a remarkable resistance to the water. I made a few expeditions for "a bit of fish," obtaining excellent specimens, some with roes as large as medium-sized bananas. After spawning both sexes become remarkably thin and soft. Speared fish, killed at once by a blow on the head, and cleaned immediately on arriving home, then hung for two or three hours in the air to dry, are far better for cooking than those left to die miserably and then put in the pan *immediately* after cleaning. Undoubtedly the increase of up-streaming spawners is due to the "War-close season," enforced compulsorily.

A Cuckoo Wrass (*Labrus mixtus*), 10 inches in length, was brought in by a local boat on January 16th. It has been preserved for the Tolhouse Museum. The Norfolk Wrasses now number four, viz., Ballan Wrasse, Comber Wrasse, Cuckoo Wrasse, and Jago's Gold Sinny. The so-called Green Wrasse, in Dr. Lowe's Norfolk List (Victorian History), is not to my mind a satisfactory record; I think it more likely a variety of the Ballan Wrasse.

Variegated Sole.—On January 20th I observed a number of small soles, in pairs, back to back, on a fish hawker's barrow. Their uniformity in size and greater proportionate thickness at once arrested my attention. On separating them I discovered them to be the Variegated Sole (*Solea variegatus*), and was informed that they came from Brixham. Many

were full of ova. This put me on the alert, and I was pleased shortly after to record an undoubtedly local occurrence of the species.

A Pike was captured in January on Barton Broad, weighing 14½lb. It had just previously swallowed a Coot, before being victimised by a live bait.

During the latter part of January, Cods of various sizes visited the neighbourhood, when sea-anglers trooped to the piers and foreshore in pursuit thereof. Various success attended them, and by the way these amateurs "stuck it" they deserved all they hooked. A railway guard appears to have taken the heaviest fish—one of 34 lbs., worth wholesale as many shillings.

An easterly frost set in late in January, the most cruel from any quarter. Birds suffered fearfully, both land and water-birds. Most of the fish kept to deeper waters, the Conger, as is usual at such times, faring worse than any other species. These fish appear peculiarly susceptible to its effects; probably they are benumbed when overtaken in the shallows; their bladders so distend that they come helplessly to the surface, when they are entirely at the mercy of the tides, which speedily topple them on shore. Numbers were picked up on our eastern shores by beachmen and others, who gladly took them home for food, or sold them to fishmongers, some even upon the fish wharf. The largest I heard of weighed, at a guess, 70 lbs.; it was being followed and attacked by a number of Gulls.

Mr. Richard Funnel wrote me early in March that "an unusual number of Conger have been found on the beach at Sheringham" during the protracted frost. On one morning fifteen Congers were sold on Yarmouth Fish Wharf, the largest being a 30 lb. example, which realised sixteen shillings. A lightship-man reported to me that quite a long procession of Congers floated past his vessel, on one occasion, on the tide. Many were found as far south as the coast of Kent.

For many years I had suspected that the Solonette, or Little Sole (*Solea lutea*), was entitled to a place on the Norfolk

list ; and when Mr. J. T. Cunningham, M.A., compiled his list of Suffolk fishes in the Victorian History,* giving this fish as common on the Browm Ridge, off Suffolk, I at once offered rewards among the local shrimpers for a specimen. On April 14th, a shrimper brought me one, 4 inches long, taken off Gorleston, *eight years after*. A second came ashore in a draw-net on Gorleston beach ; since which I am in a position to believe it not uncommon.

Among the distinguishing features of this little chap is its more tapering tail-end ; its stone-grey colour on the upper side, minutely dotted with brown ; and the colourless dorsal and anal fins, which have, at intervals, a very noticeable black fin-ray. The under pectoral is either very small or wholly wanting. Dr. Day (British Fishes) objects to Couch's plate (CLXXIX.), but it is, to my mind, a most satisfactory one ; whilst Yarrell's (Vol. I., p. 666) is even more truthful.

Salmon-trout fairly plentiful off our coast in April and May. On May 1st, about 100 lb. were netted at Gorleston, running from 1 lb. upwards per fish. From some I obtained a parasite answering to the description of *Lepeophtherus stromii*. A Bass was netted, weighing 8 lb. 2 oz. ; by no means a small fish in this locality, although at times shoals of smaller ones even come up Breydon.

A Three-bearded Rockling (*Motella triciortata*), to be named, locality unknown, was brought me by a friend on May 5th, just as I was off for a night on the houseboat ; and was then left for my eating. I boiled half for supper and fried the rest for Sunday breakfast. It was a rather uncanny joint, tasting of a mixture between Skate and Weaver, and was rather fibrously-woollen in texture, like out-of-season crab !

May 13th.—A number of Greater Spotted Dogfish (*Scyllium*

* It may seem curious that Mr. Cunningham and myself were simultaneously compiling a list of Suffolk species, *entirely unknown to each other* ;he named two or three which I had not fallen in with ; I had done so also, and was able to confirm several of his " doubtful " ones. My list (since reprinted) appeared in the *Zoologist*, 1909, pp 361, 414, and 447.

stellare), known as "nurse-hounds," running up to 34 inches in length, had been taken off Palling.

During the earlier half of May a number of edible Crabs (*Cancer pagurus*) were taken on sea-anglers' lines off the piers and jetty, a not very common-place catch.

When fishing on Fritton lake in August, in company with Mr. C. G. Doughty, we caught several hybrid Bream-Roach, a cross that earns for these freaks the name of Pomeranian Bream, and the uglier one of *Abramis buggenhagii*. I was extremely successful in hauling out the charming silvery little chap, which in size was not quite so large as my hand; he fought well and pluckily, possessing the characteristics of both parents, being proportionately sturdier than the Roach, more agile and shapely than the Bream. He did not give in when out of the water so tamely as the latter. Yarrell (Vol. I., p. 407) gives a very fair plate of this hybrid. It is hardly surprising that in the crowded lagoons of Norfolk (including Fritton lake) various hybrids should occur; and it is to be regretted that for want of attention so few are recognised by anglers. When a suspicion of hybridism occurs, examination should take place while the fish is yet in a fresh state. Hybrids are known to have been recognised as follows:—Bream-Roach, Bream-Rudd, Common Carp-Crucian Carp, Chub-Bleak. Of hybrid sea-fishes, I have a number of interesting records. Mr. Herbert Goodchild, of Norwich, has taken hybrids of Bream-Roach at Trowse.

September 4th.—A Sting Ray (*Trygon pastinaca*), weighing 30 lb., and with a double tail-sting, was taken by a wolder off Yarmouth. It was in excellent condition, and very thick. I tried my best to persuade the fishmonger's man to crimp it, and test the local opinion of it, but he could not disabuse his mind of its unfitness for food.

October 15th.—The surface of the river and Breydon swarming with very small Whitings.

Hybrid Plaice-Turbot.—Considering the common accessibility of the spawning grounds of the flat-fishes it is hardly to be wondered at that confusion of milt and ova

should frequently obtain. Hence it is, that from time to time curious blendings are seen in these products of hybridisation. On November 9th I examined an interesting cross between the Plaice and Flounder, which weighed 3 lb, and was remarkable for its thickness throughout, which did not narrow gradually towards the dorsal and aural fins. The upper surface was of the smooth texture of the Flounder, and was *minus* the tubercles, which feel to the touch like grit, distinguishing that species. The head, too, more resembled that of the Flounder. Orange-red spots adorned the skin. It was netted off Yarmouth.

November was noted for an inrush of Codfish, many a goodly specimen coming to grief on piers and beach. Several sea-anglers made their sport profitable by taking their catches to the fish wharf, scooping in excellent returns for their trouble. On several dates, beachmen who went long-lining made remarkable catches.

It may be of some little interest to give the retail prices which generally obtained in the latter end of 1917, shewing, as they do, the figures still ascending ; until in the early part of January, in the succeeding year (1918), Government prices were fixed :—

Species.	1916.	1917.
Salmon	4/- per lb. ...	3/3 per lb.
Sprats	7d. ,, ...	7d. ,,
Fresh Herrings	1d. & 2d. each ...	1d. & 2d. each
Skate	9d. per lb. ...	1/3 per lb.
Plaice	1/4 ,, ...	2/6 ,,
Soles	3/6 ,, ...	3/- to 4/- ,,
Flounders ...	1/- ,, ...	1/2 to 1/6 ,,
Codfish	1/4 ,, ...	1/6 to 1/9 ,,
Whitings ...	10d. ,, ...	1/2 ,,
Eels	1/- ,, ...	1/6 ,,
Smelts	3/6 ,, ...	3/- to 4/- ,,
Dabs	1/- ,, ...	1/- ,,
Dogfish	6d. ,, ...	1/- ,,
Codlings ...	9d. to 1/2 lb. ...	1/3 ,,
Haddocks ...	10d. per lb. ...	1/2 ,,
Mackerel ...	5d. & 6d. each ...	5d. & 6d. each
Turbot	—— ...	2/6 per lb.

When the Government price for Herrings was, later on, fixed at 10d. per lb., I was asked for a gaunt, bony Norwegian example no less than *fivepence*; it weighed a half-pound!

On December 8th, when butt-darting on Breydon, I secured a Flounder with a curious kink in its tail, as if a V-shaped notch has been cut near its posterior end and the tail pushed back to join it. A labourer at the Fish Wharf captured in a small hoop or purse-net, during one night's fishing, enough Flounders to bring in thirty shillings next morning.

The Bi-Annual Fishery Reports issued by Captain Donnison, dealing as they do with a part of Norfolk of exceptional interest, again merit some notice, mingled with a personal regret that such a fertile field of observation should lack enthusiastic ichthyologists who might, with patient industry, enlarge our knowledge of the fishes of the Wash and of the North Norfolk seaboard. We are informed that "the larger herring (s)" do not largely visit the Wash—an instinctive dislike to the shallows rather than from a paucity of alluring prey. It would seem that the capture of Eels might with profit be more largely pursued, seeing that there is an abundance of Eels, Smelts, and Flounders. "In October (1916) a single catch in the Nene by one man included 10 stones of Eels." In the December, Eels were abundant, "one man making £22 in two nights' fishing."

Owing to "wild and cold" weather, early in the Spring of 1917, the Inspector informs us that many small Edible Crabs were washed ashore; "later on a number of Soles and Brill came ashore in the same locality (Mablethorpe and neighbourhood)." Lobsters also suffered, and "in the neighbourhood of Cromer a number of Conger Eels came ashore. Seven, averaging a stone each, were picked up in a day by one man." The devastation by the inclement weather killed many sea-birds, "chiefly sea-mews." [Common Gulls?]

Garfish, evidently in pursuit of Sprats and young Herrings, visited North Norfolk; and in October [*vide* note on "Saury Pike": Transactions, Vol. X., pp. 225-28] "The sea," says Mr. Donnison, "was made quite alive by the pursuing and

the pursued fish. . . . . Many of the Garfish became stranded, and this allowed the musselers to fill their hand-nets with them. . . . . When cooked the fish taste like Mackerel." I am extremely sorry that I did not see an example, as I have a strong suspicion that they were identical with the wandering Sauries which invaded local waters at about the same period, and turned up in such quantities on Yarmouth Fish Wharf.

The September Report was made interesting by references to Dogfish catching. "In the Wash, where an abundance of food attracted the fish, there were more Soles, Plaice, Dabs, Flounders, Thornbacks, Whiting, and Horse-mackerel than usual." These conditions would naturally appeal to the smaller sharks. In May, 30 Sheringham boats landed 1,106 cwts. of Dog-fish. In September, some of the men, fishing with long-lines, were "obtaining 15 cwts. of Dog-fish per boat a day." Other species referred to were also hooked in fair quantities.

The following statistics are of some value, as showing the catches of Crabs and Lobsters made off North Norfolk :—

Year.	Boats.*	Crabs.	Lobsters.
1914	101 ...	973,200 ...	38,000
1915	86 ...	916,800 ...	30,500
1916	77 ...	989,100 ...	23,850
1917 (to Sept. 30)	58 ...	928,500 ...	29,400

The excellent work of the Inspector and his subordinates in nursing the Mussel industry deserves commendation. That Mussel culture might yet more largely be extended, is shewn by the fact that an enormous quantity of Mussel brood settled in Yarmouth Roads, our local shrimpers complaining loudly of the nuisance caused by large takes in their nets, as much as "half a ton at one haul." The spat undoubtedly drifted on the tides southwards, and when the free-swimming larvæ reached this neighbourhood, settled there. Breydon is to-day almost denuded of these molluscs, their only patron

* The decrease in catchers was partly due, as the Inspector remarks, to "more fishermen having been called up, chiefly for the Naval Service." He also hints that the profitable catching of Dog-fish attracted others.

being the Hooded Crows, which haunt the tide-emptied drains at low water in search of them ; these they fly with to the concreted walls, and break by letting them fall from a height, when they descend and devour them.

Common Seals still abound in the Wash, and might, but for their tendency to sink, when killed by rifle-shot, be turned to good account as food, and for obtaining an excellent oil.

Smelts abounded in Breydon in 1917, and catches made such handsome returns from the London markets, after all expenses were deducted, that a slight addition was made to the number of boats draw-netting. When Smelts will realise from six to eight shillings a score, with little extra outlay for catching save a certain extra cost for the nets, it may be supposed that these men did extremely well. It is somewhat curious that, after the heavy snowfall in the first half of January (1918), with its melting, the fish appear to have fled before the snow-water.

IX.

METEOROLOGICAL NOTES, 1917.

(From Observations taken at Norwich.)

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

January.

The month entered with very mild weather, the temperature on New Year's Day (54°.2) having been nearly as high as on the previous "record" one. From the 7th day till the end of the month winterly conditions prevailed continuously. The days were relatively colder than the nights, the mean day temperature having been 4°.5 below the average, but, owing to the great prevalence of cloud, the mean night temperature was only 0°.2 deficient. A strong, freezing east wind for many days in succession without a gleam of sunshine during the second half of the month caused the cold to appear greater than that recorded by the thermometer. Snow fell frequently (on 13 days), but to no great depth in this part of the country. The month's rainfall, part of which was in the form of snow, was half an inch above the normal quantity.

February.

This was the coldest February since 1895. Mean temperature was 5° below the average. The coldest period was the second week, when on five successive nights the exposed thermometer sank below 20°, and on three successive nights below 10°. On the night of the 6th—7th the screen minimum was 8°.7, and that on the grass 3°.3. At Cringleford, Mr. F. W. Harmer recorded a temperature of 1° below zero. On the 5th, snow was 7 inches deep on the level, but not much snow fell during the remainder of the month, the total

rainfall of which was a quarter of an inch deficient. The sun shone brilliantly on the four days 6th to 9th inclusive, but the remainder of the month was generally cloudy, the total month's sunshine having been only 39 hours. The first flowering of the earliest spring flowers was the latest for a great many years, the first winter aconite flowering on Feb. 18th (against Dec. 31st, 1915), snowdrop Feb. 17th (against Jan. 13th, 1916), and crocus Feb. 26th (against Jan. 19th, 1916).

March.

The rigorous season which set in early in January continued throughout March, in which month the thermometer reached or exceeded 50° on only five days. Mean temperature was 4°.4 below the average, and was lower than in any March since 1892. Snow fell at frequent intervals throughout the month, and lay on the ground on ten days. Sunshine was, for the fourth month in succession, below the normal, and vegetation had no chance of making a start. The month closed with the whole countryside wrapped in a white mantle of snow, lying to a depth hardly surpassed throughout the whole of the winter.

April.

So abnormal an April as that of 1917 has not occurred within living memory. On the 1st very heavy snow fell, lying to a considerable depth, and on the following morning the thermometer dropped to 17° in the screen and to 12° on the grass, and in more exposed places to near zero. Such low temperatures in April in this vicinity appear to be without precedent. Frost and snow continued with but little intermission until well into the third week, after which the weather became drier, though many days contiuned cold and the nights frosty. Snow fell on eleven out of the first seventeen days; frost occurred in the screen on 13 nights, and on the grass on 22 nights. The mean temperature of the month (41°.2) was the lowest recorded here for April since these observations were commenced, in 1883, and there does not appear to have

been any April which gave a mean temperature at all comparable since 1837. At the end of the month the landscape was almost as barren as at the depth of winter. The first hawthorn leaf was seen on April 22nd (as against Jan. 28th, 1916) and the trees were quite leafless at the month's close. Sunshine was 31 hours deficient, and the rainfall, considerably more than half of which was in the form of snow, was about ¾ of an inch above the average, although no rain or snow whatever fell after the 19th day,.

May.

With the advent of May an extraordinary change occurred. The month was fine, warm, and sunny throughout. The drought which set in on April 19th continued until May 15th, and there were accordingly 25 consecutive days without rain. This rainless period was four days longer than that of July, 1911, and we have to go back to June, 1889, for an absolute drought of greater length. On the afternoon of May 17th a welcome supply of .59 ins. fell, but after that date the falls were trifling. The number of days on which rain fell during the month was only five. The mean temperature of the month was 4°.2 above the average, being higher than in any May since 1868, but only exceeding the warm May of 1908 by about half a degree. Sunshine was 64 hours in excess of the normal, and vegetation exhibited an extraordinarily rapid growth. One observer in the county reported hawthorn in flower 19 days after showing first leaf. The first blossom and foliage were of unsurpassed beauty.

June.

This was the warmest June since 1868, mean temperature having been as much as 4.5 degrees above the average. The thermometer exceeded 80° on six days, and on the 17th reached 90°.4, a higher reading than has been recorded in June in this neighbourhood since 1858. The drought continued until the latter day, and the land was much parched and the grass burnt brown. On the evening of the 17th a severe thunderstorm occurred, which was remarkable for the brilliancy of

the lightning and frequency of the flashes. The accompanying rainfall here, however, was only .09 ins., and it was not until the 28th and 29th that a substantial supply of rain fell. The sun shone for 246 hours, which was 40 hours above the average.

July.

During the first week the weather was fine but cool. On the night of the 8th–9th there was heavy rain, yielding 1.17 ins. at 9 a.m. on the morning of the 9th. From the 12th to the 29th considerable heat prevailed, but the mean temperature of the month did not much exceed the average. A great and sudden change set in on the 30th, with chilly winds, clouds, and rain, and a great reduction in temperature. The most remarkable incident of the month was a great but very partial storm of thunder and hail, which occurred on the evening of the 14th. This station was visited by the fringe only of the storm, the accompanying rainfall having been but .07 ins., but on the Ipswich Road, Norwich, .47 ins. of rain and hail was measured by Mr. Willis in $2\frac{1}{2}$ minutes by his Casella automatic recording gauge, and the hailstones were over an inch in diameter. This storm in the places it struck was of a devastating character, and the chief damage took place in the Stalham district.

August.

The rainy weather which set in at the close of the previous month continued until August 4th, during which time no less than 3.20 ins. of rain fell. After the 4th an improvement set in, with showers and thunderstorms at times. From the 22nd to the end of the month strong winds, of a character foreign to this period of the year, prevailed, culminating with an exceptionally severe gale on the 28th, when the barometer fell to 28.69 ins. The month's rainfall, 4.61 ins., was more than double the average, and the sunshine of the month was 23 hours deficient.

September.

Thunderstorms occurred on the 1st and 6th, accompanied by heavy rain. The latter storm, which came early in the day, was the "tail end" of a remarkable storm which had taken place in London late on the previous evening. Heavy rains also occurred on the 17th and 19th, amounting to 56 ins. and 58 ins. respectively. With these exceptions the month was generally very fine, sunny, and warm. The fine weather following such a wet August caused a fresh outburst of verdure, the pastures looking as green as in spring, and there was much brilliancy of colour in the flower gardens.

October.

The month opened with some very warm days for the time of year, a maximum of 70° being reached on the 2nd. This warmth gave place to a period of cold unusual so early in the season. On the morning of the 7th a sharp frost occurred, the ground being quite white and with ice in places. During the remainder of the month the day temperature kept at a remarkably low level, the thermometer reaching 55° on only two days. On the 28th the sharpest frost recorded here in October for 22 years occurred, and on the mean the temperature of the month was as much as 4 deg. below the average, or only about one degree warmer than that of the abnormally cold October of 1905; in fact, the month has only been colder three times in the last 35 years. The first half was very wet, and the second half dry. There were many bright days, the total sunshine having shown an excess over the average of as much as 58 hours. There was much wind at times, and a heavy gale on the night of the 24th.

November.

The weather of November was, generally, exceedingly fine and pleasant. There were 66 hours of sunshine, and mean temperature was 2°.3 above the average. Rainfall was about half an inch deficient, and some snow fell on the 25th and 26th. On the latter day, following a nocturnal

gale of considerable violence, great and unusual changes of temperature occurred. At 9 a.m. the thermometer stood at 34°, and in the evening a snowstorm ensued. In a few hours the temperature sprang up to over 50°, and next morning the air was quite balmy and the snow had completely disappeared.

December.

This month was colder than usual, and gave only five days which could be called mild. Frosts were registered in the screen on 19 nights and on the grass on 26 nights. Snow fell on nine days, and we had the unusual spectacle of a "White Christmas." Not since 1890 had Norwich presented so winterly an appearance on Christmas Day, although in 1906 a very heavy fall of snow occurred early on the morning of December 26th. It is stated that there was some thunder on the afternoon of the 25th during a snow squall. The rainfall of the month was about two-thirds of the average, and on only four days did the amount exceed a tenth of an inch. Sunshine was 15 hours in excess of the normal, and was more than double the amount recorded in the previous December.

The Seasons.

Tables of mean temperature and rainfall of the four seasons of 1917, together with those of the five previous years, and compared with average.

Temperature.

Seasons.	1912.	1913.	1914.	1915.	1916.	1917.	Average	Departure of 1917 from average.
	degrees	degrees	degrees	degrees	degrees	degrees	degrees	degrees
Winter -	40·8	41·2	40·3	39·7	41·7	35·4	38·4	— 3·0
Spring -	49·4	48·6	48·5	46·4	47·6	44·9	46·3	— 1·4
Summer -	60·0	58·4	61·8	60·2	58·8	62·2	60·2	+ 2·0
Autumn -	47·6	52·3	51·0	48·6	50·6	50·0	50·1	— 0·1
Year - - (Jan. to Dec.)	49·6	49·8	50·5	48·8	49·3	48·0	48·8	— 0·8

RAINFALL.

Seasons.	1912.	1913.	1914.	1915.	1916.	1917.	Average	Departure of 1917 from average
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Winter -	8·00	6·34	4·66	13·35	10·41	6·55	5·37	+ 1·18
Spring -	3·60	5·84	5·45	5·18	8·20	6·27	5·13	+ 1·14
Summer -	17·25	4·88	5·25	7·47	7·63	8·61	6·87	+ 1·74
Autumn -	7·58	9·15	6·38	6·58	7·39	8·03	8·38	− 0·35
Year - - (Jan. to Dec.)	35·03	24·42	27·62	29·97	32·68	27·82	25·75	+ 2·07

The Winter was the most severe since 1895, and the Spring the coldest since 1892. The Summer was the warmest since 1911, and the mean temperature of the Autumn was in close agreement with the average. The rainfall of the three Winter months, while much less than in 1915 and 1916, again exceeded the normal amount, as did that of both the Spring and Summer, the latter having been the wettest Summer since 1912. The rainfall of the Autumn was very slightly deficient.

THE YEAR.

The mean temperature of the year was about a degree under the average, the warmth of May and the Summer months failing to neutralise the extraordinary falling off of temperature in February, March, April, and October. Rainfall was two inches in excess of the normal, but was considerably less than in the two preceding years. August was the wettest month, with 4.61 ins., and there was also an excess in January, March, April, and October. The other months were drier than usual, May yielding less than three-quarters of an inch. Bright sunshine was about 79 hours above the average, and was as much as 400 hours in excess of that of the previous year. May was the brightest month, with 270 hours of sunshine, and June, July, September, October, November, and December all gave more than usual.

The greatest falling off was in the first three months of the year, when there was a combined deficiency of 110 hours. Mr. J. H. Willis has again very kindly furnished me with the sunshine readings. Owing to the fine, warm May there was an abundant supply of fruit and garden produce, although some damage was done by the drought. Harvest commenced about August 7th and was much impeded by the rains, but the fine weather of September caused an earlier termination than had at one time been anticipated.

MR. PRESTON'S METEOROLOGICAL RECORDS FOR 1917.

Month.	Barometer.					Thermometer.					Hygrometer.	Sunshine.	Rainfall.		Wind.								
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Mean Relative Humidity 9 a.m.	Hours.	Inches.	No. of Days.	Direction and Days.								Mean estimat'd force
															N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	
	in.		in.		in.	°		°		°	%												
Jan.	30.37	22	28.79	8	29.860	55.0	3	24.7	30	35.2	91	24.7	2.20	23	5	1	14	1	1	2	4	3	3.2
Feb.	30.49	8	29.75	20	30.123	49.0	24	8.7	7	33.7	89	39.0	1.24	13	2	5	6	3	5	2	3	2	1.4
March	30.60	16	29.22	30	29.810	58.0	17	20.4	9	37.1	86	81.7	3.18	21	8	5	4	3	1	6	4	0	3.7
April	30.54	25	29.21	2	29.860	60.2	30	17.0	2	41.2	79	128.8	2.37	15	8	1	1	3	3	5	3	6	3.0
May	30.37	3	29.66	18	29.994	78.0	11, 13	33.0	7	56.4	69	270.2	0.72	5	2	5	10	6	2	3	1	2	3.2
June	30.26	3	29·59	20	30.019	90.4	17	44.3	23	62.6	65	246.8	1.54	14	3	3	4	5	4	7	1	3	3.2
July	30.30	5	29.71	19	30.044	82.3	27	44.0	22	62.3	74	242.8	2.46	13	5	7	3	1	4	7	4	0	3.2
Aug.	29.99	20	28.69	28	29.692	76.2	7	49 0	20	61.8	80	161.5	4.61	23	5	0	1	0	6	9	8	2	4.0
Sept.	30.36	29	29.69	1	30.028	73.5	6	42.2	15	58.4	83	178.6	2.34	9	3	3	1	1	1	12	6	3	3.2
Oct.	30.33	20	28.87	12	29.707	70.1	2	26.8	28	45.9	86	163.2	3·52	20	0	0	0	0	6	7	10	8	3.5
Nov.	30.52	18	29.15	9	30.025	56.4	24	31.7	5	45.7	87	65.9	2.17	16	1	1	0	1	2	4	14	7	3.4
Dec.	30.44	4	29.68	9	30.157	51.0	7	18.0	19	35.5	88	58·4	1.47	23	2	8	4	1	3	5	3	5	2.6
Means					29.943					48·0	81												3.1
Extreme & Totals	30.60	Mar. 16	28.69	Aug. 28		90.4	June 17	8.7	Feb. 7			1661.6	27.82	195	44	39	48	25	38	69	61	41	

X.

THE LANTERN MAN.*

By Frank Norgate.

William Bailey, a Norfolk labourer's son of my own age, walked with me one moonlight night down Sparham Hill to the river Wensum, as I wanted to shoot a Heron or, as Billy called it, a "Harnsey."

When we were nearly down the hill dense strata of white mist hung low over the river and the big meadow-drains, and corresponded to them in size and position, the atmosphere being clear above and below the strata, under which we could see the lower parts of trees, etc., beyond the river. It was a weird scene, and scared Billy.

After crossing the Common we came to a gate near the river and within shot of the spot where I expected to find Herons. Fortunately for them, they rose behind a clump of trees and bushes, close enough to us to add to Billy's scare by their loud, harsh cry of "Frrrank." I went through the gateway, but Billy said, "I'm afeared, sir." With difficulty I induced him to come a few paces into the meadow, till he again lagged behind and said, "I dassent go no fudder." On asking why and what it was he feared, he said, "You'll only laugh at me, sir, I'm afeared we'll see a lantern man what hev bin seed over yonder acrost the river." Asking him what a lantern man was, he replied, "I don't know nothin' only as how they tell onto me tha's the fowls of the eyer" (meaning foul gas of the air), "an I du beg and pray yu, sir, if we du see a lantern man, whatever yu du, don't yu wissle, du tha's sure to come for ye."

* This tale has, possibly, reference to an Owl exhibiting luminosity of plumage at night, such as was described in these *Transactions* some years ago (Vol. VIII., p. 547). It is of interest as showing the influence of such phenomena on the rustic mind, and those familiar with the Norfolk dialect will appreciate the vernacular in which it is written.—Ed.

"Well, Billy," said I, "I never saw a lantern man and I hope we may see one to-night; if so, I shall certainly whistle." He begged, "Now don't yu du it, but if yu will be so wentersome, mind, sure as ever that come for ye, hull yerself on ter ground an' shove yer nose inter mud, don't that'll draw yer breath, sure's ye're alive." He refused to go another step. On my telling him to stay there or go home, he said, "I dassent go home alone and I dassent stop here alone." On my asking him what he had heard of the lantern man which had been seen, he told me the following account :—

"When my gran'father (they called him Bunnett) wuz shupperd to Johnny Beeson* (Johnny Bees'on wuz the man wot shot the flyin' sarpent†) he wuz agoin' acrost them medders at Blackwater one night, an' sune as ever he come agin' the brig, afore he could put his fut on the fust plank, up jumped a lantern man a t'other side. When he fust set eyes on t'ut that wuz about the bigness o' the sneast o' a canle, an' that 'peared ter grow and grow till that got all as big as a cort pot. Gran'father, he wuz rarely frighted. He wissled his dorgs an' took an' run for Johnny Bees'on's house, and the lantern man, sune as ever that see my gran'father an' heard him wissle, that want arter 'im, an' gran'father, he called out and he say to Johnny Bees'on, he say, sez he, 'Ther's a lantern man arter me,' an' he took an' whipped inter Johnny Bees'on's house an' shet the door arterim, 'cause arter he wissled his dorgs the lantern man want forim. Now Johnny Bees'on he see the lantern man trow the winder, 'cause Johnny Bees'on he set a writin' in the parlour. An' Johnny Bees'on he say to my gran'father, he say, sez he, 'Set yu still, bor,' he say, sez he, 'an' we'll hev a spree wi' it.' An' Johnny Bees'on, he took an' shet the winder and want and fetched a lantern an' a pole (what they prop the linen line with), an' he took an' lit the canle inside on't an' tied the lantern onter the end o'

* Johnny Bees'on was, I believe, John Beeston, probably tenant of the Blackwater Farm at that time.

† A Goosander. The writer shot one within a few yards of the same spot some years after.

the pole, an' took an' oped the winder an' huled the lantern on the pole outer the winder; and sune as the lantern man see the light, that came for't. Johnny Bees'on he took an' dodged it, so's whereby that want over it. Lawk! that come back agin a rum un, and Johnny Bees'on he took an' dodged it tew or tree times, an' at last Johnny Bees'on he says, sez he, 'We'll see what that 'ill du to't,' he say. An' he took an' huled it right staady like this here*, an' lawk! that came for't agin an' that basted it in a moment! That bant the horn part all up to a crisp, so's the horn all scringed up."

The above has been written from memory of the account as given by Billy Bailey. He and his father being both illiterate, what he told me was probably a fairly true tradition, firmly believed by him and his ancestors.

* Holding his fist at arm's length, but shaking it (in terror ?)

XI.

UTRICULARIA OCHROLEUCA HARTM., IN NORFOLK.

By Arthur Bennett, A.L.S.

This species, only lately satisfactorily decided as a British species, I have expected to find as a Norfolk plant, but until last year, all the specimens were *U. intermedia* Hayne, and one had to be very careful, having regard to the notes* of Messrs. Burrell and Clarke. But I have compared the specimens with others from Inverness, and the Black Forest, Germany, named by Dr. Glück. They were gathered by Mr. Newton in Sept., 1914, W. Norfolk, Co. 28. Writing to Mr. Newton respecting them, he replied, "I am almost certain those you name were gathered on Foulden Common."

Like *U. intermedia*, Hayne, it differs in size; those I am now speaking of are small compared to those from Inverness and Shetland; the latter are larger than any *U. intermedia* I have seen. I mounted the specimens last year in the hopes they could be shown at a meeting of the Society, along with some excellent magnified drawings of both species made by my late friend, Mr. Martindale, of Kendal. So far as Great Britain is concerned, *U. ochroleuca* is mainly a northern species, taking the place of *U. intermedia*, from Shetlands, south to Wigton, Kirkcudbright, and Dumfries. South of this it occurs in Cumberland !, S.E. York !, S. Hants !, Dorset !, Westmorland !, Lake Lancashire ! I have seen it, or possess specimens from 28 counties and vice-counties, and it is recorded for two others; while *U. intermedia* is certain for only 8 counties, and requires confirmation for 14 others in which it has been reported. In Ireland, *U. intermedia* is more common, but the relative distribution of the two requires working out. The first report of *U. ochroleuca* as a probable British plant will be found in the *Ann. Scot. Nat. History* (1903), pp. 123

* Trans. Norf. and Nor. N. Soc., IX., 625, 1913.

and 250. A note will also be found in the *Trans. Bot. Soc., Edinburgh,* XXVI., Part 2, p. 140 (1913), by the writer, where I give the original description of Hartman. In Europe its range has yet to be determined, being as yet reported only for Denmark, Germany, Scandinavia, Iceland, and W. Greenland, in America.

In the *Annals of Botany,* XXVII., No. 108, 1913, Dr. Glück has given a very full account of the two species, with plates to illustrate their structure, etc., and many text-figures.

U. intermedia also occurs on Foulden Common.

Camberwell Beauty (*Vanessa antiopa*) in Norfolk.—Not since 1872 does there appear to be any record in our *Transactions* of the occurrence of this rare and beautiful butterfly in the County. In that year (Vol. I., 1872-3, p. 24) the late C. G. Barrett recorded a number of instances of its having been seen and obtained in Norfolk; chiefly in the months of August and September. It is therefore interesting to note that on April 2nd, 1918, a (hybernated) butterfly of this species was seen by Miss Susan Lascelles in the orchard at Thelveton Grange. Not being able to identify it, she called her mother to see it, and from the latter's description there is no doubt that the identification was made correctly. Mrs. Lascelles writes, "It was so sleepy that I could easily have caught it if I had had a net; instead, we followed it from tree to tree and hedge to hedge, till it fluttered out of sight." —Ed.

Large Tortoiseshell (*Vanessa palychloros*) in Norfolk. —On the afternoon of March 24th, 1918, which was unusually warm and sunny for the time of year, I saw a very fine hybernated specimen of *Vanessa polychloros* in Northrepps Wood. I watched it for some time, and it kept flying round and then returning and settling on some mole-hills. It was a very fresh-looking and quite perfect insect. This species, I believe, has become very scarce, and I had not seen one for many year .

F. H. Barclay.

Rose-coloured Pastor (*Pastor roseus*) at Marlingford.—A Rose-coloured Pastor frequented some fields at Marlingford, near Norwich, in October, 1918, where it was seen with a flock of about forty starlings by Mr. Parker, from whose description the bird was evidently an adult. This species has become curiously rare in Norfolk of late, and in the last forty years only one, or at the most two, have been recorded for the County. J. H. Gurney.

Little Owl (*Carine noctua*) in Norfolk.—At the end of November, 1917, a Little Owl was caught in a rabbit trap at Swanington, and in the same month of 1918 another was obtained in the same district (Innes Watson). From accounts received, it would appear that this species has now become widely distributed over the County. We have heard of other cases of this bird having been caught in a rabbit trap. —Ed.

Hoopoe (*Upupa epops*) in Norfolk.—On September 3rd, 1917, I twice flushed a Hoopoe late in the afternoon in a belt of young trees within a few yards of the salt marsh at Thornham. The flight was undulating, similar to that of *Picus viridis*. There was no cry. The brown back and distinct black and white markings on the rump were very clear. I have seen the bird in Egypt, but certainly never during the last forty years in Norfolk.—Victor Ames.

Common Sun-Fish (*Orthagoriscus mola*) on Norfolk Coast.—The late Mr. Hamon le Strange, of Hunstanton, in a letter dated November 29th, 1917, says :—"An unusually large specimen of the Short Sun-Fish, *Orthagoriscus mola*, was washed up on the beach at Titchwell on November 12th. It measured eight feet in length and five feet in depth (without the fins). The fins were each one foot six inches deep. It had all over it a quantity of white fat to a depth of four or five inches."—Ed.

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