TRANSACTIONS

OF THE

Norfolk and Norwich

NATURALISTS' SOCIETY

VOL. X.—PART V

1918—19

EDITED BY THE HONORARY SECRETARY

NORWICH

PRINTED BY A. E. SOMAN & CO.

JANUARY, 1920

(Issued to the Members for the year 1918-19).

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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.

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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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To Balance, April, 1918—On Deposit	51 7 6		By Fire Insurance Premium		0 13 6
On Current Account ...	8 16 6		,, A. W. Goose, Printing		0 18 0
		60 4 0	,, Cost of "Transactions," Vol. X., Part 4—		
,, Subscriptions		74 1 8	A. E Soman, Printing, etc.	70 7 6	
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II. SPECIAL PUBLICATION FUND.

	£ s. d.		£ s. d.
To Balance, April, 1918	5 0 6	By Transferred to General Account	27 16 6
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III. LIFE MEMBERSHIP FUND.

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,, Balance, April, 1918, at Norfolk and Norwich		War Savings Certificates	49 12 0
Savings Bank	2 13 0	At Norfolk and Norwich Savings Bank ...	2 19 0
. Interest on Bank Account	0 6 0		52 11 0
	£52 11 0		£52 11 0

Examined and found correct.
W. A. NICHOLSON
May 9th, 1919

ROBERT GURNEY.

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

Belfast Naturalists' Field Club. Proceedings, Scc. II. Vol. VII. Part 5.

Bristol Naturalists' Society. Proceedings. Vol. IV. Part 3.

California, University of. Publications in Botany. Vol. V., Nos. 9—11. Vol. VII., Nos. 1—4. Publications in Zoology. Vol. XII., No. 17. Vol. XIII., No. 13. Vol. XV., Nos. 2 and 3. Vol. XVI., Nos. 16—24. Vol. XVII., Nos. 1—11. Vol. XVIII., Nos. 1—6, 9.

Cambridge Philosophical Society. Proceedings. Vol. XIX. Part 4.

Croydon Natural History Philosophical Society. Proceedings. Vol. VIII. Part 3.

Edinburgh Botanical Society. Transactions. Vol. XXVII. Nos. 2 and 3.

——— Royal Society. Proceedings. Vol. XXXVIII. Parts 1 and 2.

Essex Naturalist. Vol. XVIII. Parts 6—12.

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

Geological Society. Quarterly Journal. Nos. 285—292.
Presented by Col. H. W. Feilden, C.B.

Harvard Museum of Comparative Zoology. Bulletins. Vol. LV., No. 4. Vol. LVI., Nos. 3 and 4. Vol. LVII., No. 4. Vol. LXIX., Nos. 4—8. Vol. LX., Nos. 1—9, 11—12. Vol. LXI., Nos. 1—9. Reports, 1914-15, 1915-16.

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

Marine Biological Association. Journal Vol. XI. Part 4.

Microscopical Society, Royal. Journal. Nos. 242—244.

New Zealand Institute. Transactions and Proceedings. Vols. XLIX. and L.

Northampton Natural History and Field Club. Transactions. Nos. 149—152.

Northumberland, Durham, and Newcastle-on-Tyne Natural History Society. Transactions. Vol. V. Part 1.

Philadelphia Academy of Natural Science. Proceedings. Vol. LXIX., Parts 2 and 3. Vol. LXX., Parts 1 and 2.

Plymouth Institute. Transactions. Vol. XVI. Part 1.

Royal Institution of Great Britain. Proceedings. Vol. XXI. Part 3.

Smithsonian Institute. Report, 1916.

South London. Entomological and Natural History Society. Proceedings. 1917-18.

Upsala Geological Institute. Proceedings Vol. XIII., Part 2. Vol. XIV.

ADDRESS

Read by the President, Mr. Edward Bidwell, *to the Members of the Norfolk and Norwich Naturalists' Society, at their Fiftieth Annual Meeting, held at the Norwich Castle Museum, April 29th,* 1919.

Ladies and Gentlemen,

It has been a source of great regret to me that during my year of office as President of this Society I have not been able to attend a single meeting. This, in part, has been caused by illness, which prevented my being present when Mr. Pycraft's and Mr. Robert Gurney's papers were read. Had I been here, it was my wish to bring several matters before your notice. Now my only opportunity before relinquishing the Chair is the present time, and I trust you will therefore pardon a somewhat unusual course.

A point I should like the Council to consider is :—Would it not be possible to found a Junior Branch of our Society, to attract the young of both sexes to take a greater interest in Natural History, and, more important still, to learn the habit of observation, a habit sadly deficient in our nation? There is nothing like an interest in Natural History to teach and develop this habit.

Mr. Edward Thomas Connold, whom we might almost claim as a Norfolk man, at the beginning of 1904, with the help of a few friends, started a Junior Branch in connection with the Hastings and St. Leonard's Natural History Society, and it numbered 90 members when he died in January, 1910.

As many of our Members, including our President-Elect, belong to the Hastings Society, might we not obtain information as to the steps they took to establish their Junior Branch, and endeavour to emulate them?

Another question I want to ask is :—" What has the Natural History Society done for the City ?" We are allowed the use of the City's Museum for our meetings, but I cannot see that we do anything for the City in return for this privilege.

I should like the Society to do one thing, and that is to give the City a number of rare and interesting trees to be planted in the public gardens, all properly named, and bearing a notification that the Society presented them. We might easily open a special fund for this purpose, and plant the trees in this our Jubilee Year.

On the eve of his departure for America a month ago, I showed Mr. H. J. Elwes a list of trees that I thought would be of interest to plant, and asked him for suggestions as to additions to the list. He said he had a number of rare and interesting conifers in his nursery garden which he would gladly give to the Society for presentation, if it would guarantee that they should be properly looked after. If my suggestion is adopted, might we not elect a special committee to do this ?

Norfolk has long been noted for its trees, but I fear they have been sadly neglected of late years by our Society, and such a step as I now advocate might revive our interest in this fascinating and useful subject. Now would be a good time to make a list of the rare and interesting trees of the County, to be printed in our *Transactions*.

In a lecture on " Celebrated Trees past and present in Great Britain," given in February before the Gilbert White Fellowship, Mr. Elwes said that when he began to work with Mr. Henry on their " Trees of Great Britain and Ireland," he was astonished at the want of knowledge of the trees in the various counties. He could obtain wonderful county lists of the mammals, the birds, the fishes, the reptiles, the insects, the flowers, the fungi, but no one seemed to know anything of the interesting, the rare, or the finest specimens of the trees of their own county.

To quote the words of one of my predecessors in this Chair :—

> " By the laws of our Society the President is invited, and I fear expected, to supplement the business portion of his address by some more or less original remarks of his own.

Now, though I have been a member of this Society for many years, and have in the past contributed several papers on ornithological subjects, two or three of which you did me the honour to print, I must confess that for the last twenty years I have done little work in Natural History, and the only two subjects connected with it upon which I should have cared to address you have been treated by two Presidents during the period of the late War.

In the Natural History Museums of the United States of America, I believe it is the rule to place man in his true zoological position. In the Central Park Museum at New York, one of the finest Natural History Museums in the world, the Greenlander, the North American Indian, and the Mexican, I am told, are exhibited as native races of mammals, and their life-history is shown just as other groups of this family, and if this is permissible in a Natural History Museum, it is surely permissible in a Natural History Society, and I claim the privilege of speaking to-day on some points in the life-history of man, as coming within the scope of this Society, especially as you have printed papers on "Prehistoric Man in Thetford," "The Neolithic Age in Thetford," and "The Distribution of Flint and Bronze Implements in Norfolk," and if prehistoric man is a fit subject, why not recent man? The subject that has interested me most during the last twenty years has been the history and evolution of primæval man's greatest discovery—

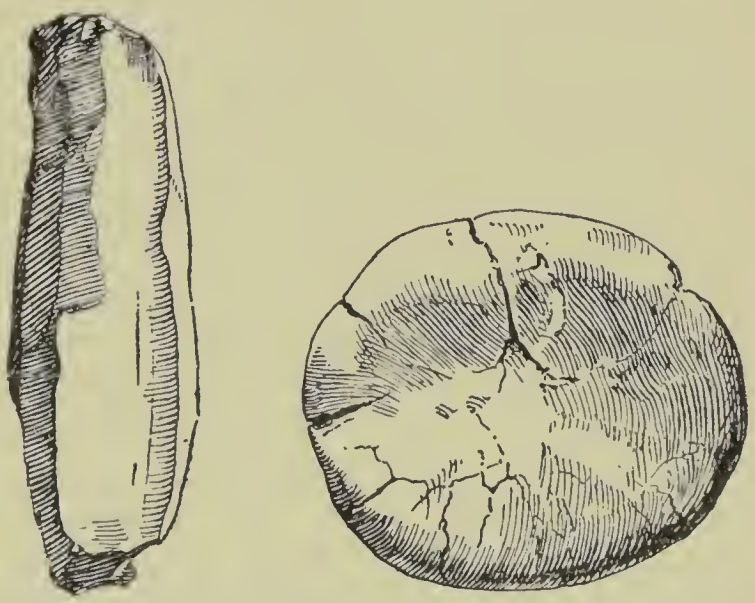
The Production of Fire.

In a letter on this subject one of our Vice-Presidents writes to me :—

> "It seems difficult to draw any distinct line of cleavage between Natural History and Anthropology. The elucidation of how human beings first discovered the artificial production of fire, and its subsequent development, is surely as much Natural History as the study of how Palæolithic and Neolithic man worked their stone implements."

For a few minutes I propose to draw your attention to some of the least-known methods of fire-making.

Up to the present time there is no book published that gives an adequate or true history of this subject. Our late President, in the Sixth Volume of our *Transactions*, draws a picture of A Neolithic Man at Thetford with the fire obtained by striking a nodule of iron pyrites with a piece of flint, and this, I believe, is really the earliest known method of obtaining fire by percussion.



Iron Pyrites Nodule and Flint Flake found by Canon Greenwell in a British barrow at Rudston, Yorks.

Canon Greenwell, and other well-known antiquaries, have repeatedly found a flint flake and a nodule of iron pyrites in Neolithic graves. It is practised even in the present day by the Eskimos of Smith's Sound, North Latitude 79°, as proved by the Peary Expedition of 1899-1901, and was used quite recently by other North American tribes.

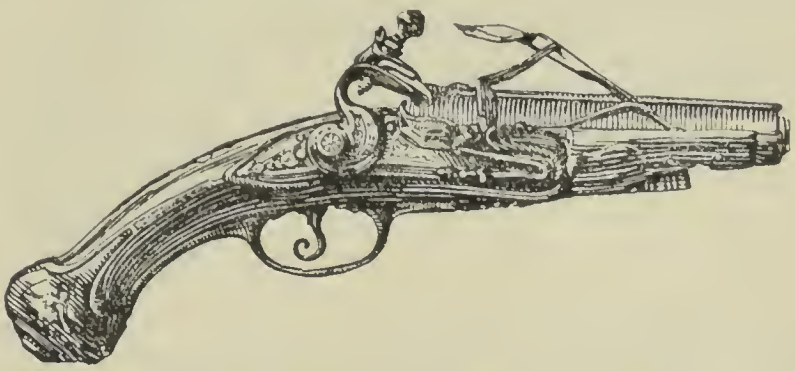
I may mention that two nodules of iron pyrites were in daily use in a tinder-box in Suffolk so late as 1827, and I have obtained fire with these identical nodules.

With the invention of gunpowder and the use of fire-arms, the only way for ignition was by the concussion of flint and

steel—the slow match had to be ignited by a spark, and brought down to the gunpowder in the priming-pan of the gun by a lever worked by a trigger. Each improvement in firing the gun has been followed by adapting the same action to the mechanical tinder-box.

The wheel-lock, which succeeded the match-lock in the 16th century, was applied to pistol-action tinder-boxes. One was sold at Messrs. Christie's Auction Rooms early in this century—the only one I have ever heard of—but, unfortunately, I have not been able to trace its whereabouts.

The snap-haunce lock had such a short reign that it is doubtful if such a thing as a snap-haunce tinder-box was ever made, but with its successor—the ordinary flint and steel action—which in England lasted from 1626 until the invention of the percussion gun cap in 1820, some interesting points may be referred to briefly.



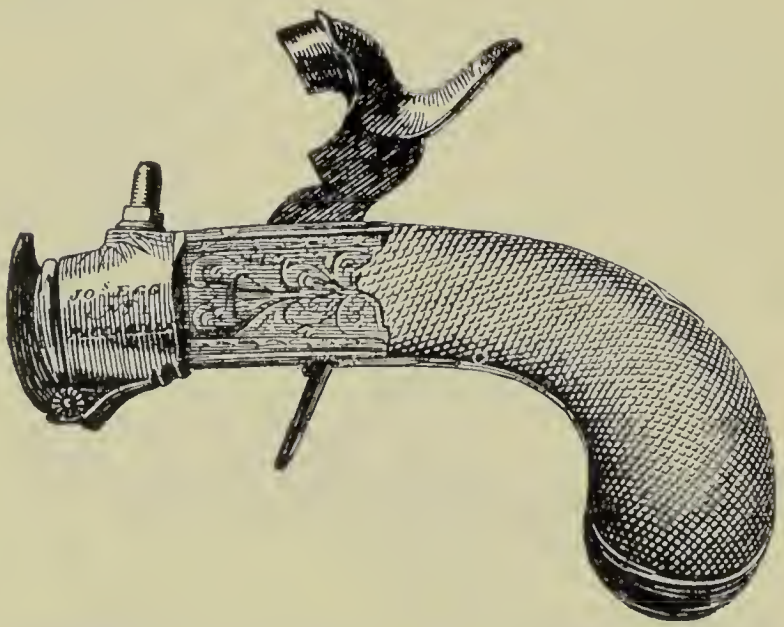
A Split-barrel Pistol-action Tinder-box. The tinder is held in a clip lying in the barrel, which springs up directly the pistol is fired. (Italy.)

At the end of the 17th and early in the 18th century, the Holy Roman Empire produced some exceedingly fine examples of table clocks with alarums. When the alarum went off it fired a pistol-action tinder-box, and lit a candle. So far as I have been able to examine specimens, these were all fired with a priming of gunpowder, and not by a spark falling direct upon the tinder. A priming of gunpowder was used by both the Italians and the Germans in what are called "split barrel" tinder-boxes, a form peculiar to these two nations. This use of a priming of gunpowder seems to have been seldom used in England for tinder-boxes, judging from the rareness of

specimens, for I have only seen two or three examples, and these all of a late type, that is, with the works enclosed.

It is interesting to note that the Japanese were making flint-lock tinder-boxes thirty years before the Battle of the Boyne, where our soldiers were using ordinary "flints and steels" to ignite the slow match for firing their match-lock muskets.

When flint locks were superseded, pistol-action tinder-boxes fired by percussion gun caps were made by Joseph Egg of Piccadilly.



Pocket Pistol-action Tinder-box, with nipple for percussion cap. Engraved "Jos. Egg, No. 1, Piccadilly, London."

I have only one other form to refer to— the wheel tinder-box, where the spark is obtained by friction instead of percussion. This was probably evolved from the steel mill, the invention of a coal miner employed in the mines in Cumberland owned by the Lowther family. It was for making a continuous stream of sparks by holding a flint against a disc of iron revolving rapidly when driven by a crank handle and multiplying gear. Its light enabled the miner to pick coal in dangerous places, and after being in use for a century was superseded in 1815 by Sir Humphrey Davy's Safety Lamp.

This wheel tinder-box is a japanned tin box about four and a-half inches long, one and a-half inches wide, and one inch deep, provided with a sliding lid, and having a revolving wheel or

disc of iron one and a-half inches in diameter and a twelfth of an inch thick, held in position by two curved arms projecting from one end of the box, which internally is divided into three compartments; that nearest the wheel holds the tinder, and the others a flint and some small sulphur-tipped matches. A piece of string is wound round the axle of the steel wheel, and when the string is pulled sharply it causes the wheel to revolve rapidly. The sliding lid is pulled back to expose the tinder, and the flint is held firmly on to the end of the lid by the thumb of the left hand, so that the sharp edge of the flint is placed in contact with the periphery of the wheel, with the result that a small shower of sparks falls on the tinder. With the exception of Mr. Miller Christy, who in his article "Concerning Tinder Boxes" in the *Burlington Magazine* for 1903, no English writer on Fire-making refers to this interesting

Wheel-tinder-box of tin (japanned), with three compartments and a steel wheel.

development, although there are specimens in the Museum at Lewes and the Blackmore Museum at Salisbury, besides some eight specimens in private collections in this country. None of the specimens have a name on them, so we are not able to trace by whom or where they were made. There are at least three references to this form in American literature. In Mr. W. Hough's paper on "Fire-making Apparatus in the United States National Museum" (1888), in Mrs. Earles' "Home Life in Colonial Days" (1898), and in Mr. N. H. Moore's paper on "Old Time Lights," in the *Delineator* (1906). Thus three specimens of the wheel tinder-box are described, all of which are in America.

Of the frictional methods of Fire-making, the earliest known specimen is a bow-drill complete with its hearth, found by Professor W. M. Flinders Petrie, F.R.S., during his excavations at Kahun, and described by him in his "Civilization of the

XII Dynasty," 1890, p. 29. I am happy to say this interesting specimen, in use about 3400 B.C., is in the Owen's College Museum at Manchester. The Bow-drill was in use for Fire-making by the North American Indians until a very few years ago, and is still used by the Eskimo, so we have knowledge of its use for over 5000 years.

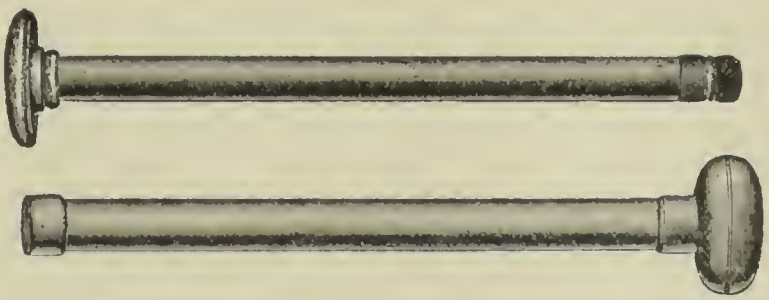
Miss M. E. Durham, a lady well known by her books of travel in the Balkan Peninsula, kindly informed me that when travelling in Montenegro in 1906-7, her guide, Kresto Pejovich, of Njegush, in Montenegro, told her that when a young man (*c.* 1870), he had seen a man suffering from fever cured by using a fire-drill. They brought the patient two pieces of wood, one hard and the other soft wood, and they made the hard wood to turn round on the soft wood with a string which the patient, holding an end in each hand, pulled backwards and forwards. The fire came out of the patient. It set the wood on fire, and the patient was cured!

The next method I have to bring to your notice has been aptly described as "the most extraordinary contrivance ever devised for getting fire," namely, the fire piston, by which fire is obtained by the sudden compression of the air. A patent was taken out for this in 1807 by Richard Lorentz. After Mr. Henry Balfour's exhaustive paper on this subject (in which he traces its distribution), one of the Anthropological Essays presented to Edward Burnett Taylor, of Oxford, in 1907, there is little for me to say, except to demur to this statement made by Dr. E. B. Taylor in his "Researches into the Early History of Mankind":—"There is a well-known scientific toy made to show that heat is generated by compression of air," and this "scientific toy" theory has been adopted by every writer on the subject.

Before John Walker's invention of the friction match in 1827, and for some years after, until matches became more easily obtainable and less dangerous, smokers especially were eager to find some safe and sure method of lighting their pipes and cigars. The late Mr. W. B. Tegetmeier kindly gave me for my collection a compression tube which he had carried in his

pocket for thirty years, and another friend, the late Mr. Henry Rosling, who was only four years junior to Mr. Tegetmeier, told me that he too used one daily for many years, and if since my first taking an interest in this subject in 1886 I have found two friends who constantly used them before I was born, I think I may fairly argue that they were in much more general use as practical means of fire making than as "scientific toys."

In the literature of a century ago many references are made to the then recent chemical means of producing fire, and as few of these means were clearly described by their inventors or by contemporary writers, they have been a great source of confusion to students and writers of the present day. To a member of this Society, Mr. Miller Christy, is due the credit



Compression Tube, 6-in. long, formerly used by W. B Tegetmeier.

for having elucidated some of these puzzles. Unfortunately, the book on which he has been at work for many years has not yet been published, but through his research we have now a true description of the "phosphoric taper," the first in order of practical chemical methods of fire making; it was produced in 1780. I had better quote Mr. Christy's own words:—

"The phosphoric taper consisted of a small glass tube, about four inches long, closed at one end. Into the closed end a tiny piece of phosphorus was introduced. Next a small piece of wax taper, rather shorter than the glass tube, was inserted, and its forward end (the cotton threads of which were slightly frayed out) was thrust up against the piece of phosphorus. Then the open end of the tube was sealed hermetically by means of a blow-pipe, enclosing the taper; the other end (that containing the phosphorus, was placed for a second or two in warm

water, causing the phosphorus to melt and adhere to both the glass and the cotton threads of the taper, and finally, by means of a glazier's diamond, a circle was drawn round the glass tube, about one-third of its length from its hinder end. To obtain fire from one of these tapers one took it and warmed it slightly, either in the closed hand or the mouth ; broke the glass tube in two with the fingers at the point where the circle has been cut or scratched round it ; grasped the taper between the finger and thumb ; drew it slowly out of the tube, and held it for a time with the phosphorus-end downwards. Very soon the phosphorus ignited spontaneously, incited by the warmth, by the friction due to drawing the taper out of the tube, and by contact with the air. As soon as it had set fire to the wax taper and a candle had been lighted, the operation was complete."

The immediate successor to the Phosphoric Taper was the Phosphorus Box. It was first brought out in Paris in 1786, and was introduced into England in the following year, where it was known as the "Portable Fire Box." Fortunately there is a specimen in the Museum at Saffron Walden, so that an accurate description can be given. A small, painted tin box, containing some small sulphur-tipped matches, a tiny well-stoppered glass bottle containing phosphoric composition, a small candle, and a strip of cork. In order to get fire, one of the matches was inserted, rubbed against the phosphorus which adhered to the side of the bottle, so that a minute portion adhered to the sulphur tip. The match was held in the air for a moment, when, if the composition was in good condition it burst into flame, igniting first the sulphur and then the wooden match.

In 1810 another great advance was made by the introduction of the "Instantaneous Light Box," where fire was produced by the contact of chlorate of potash with sulphuric acid. These boxes, though in common use for some thirty years, had so completely disappeared that the late Professor Tidy (after an exhaustive search), when lecturing in 1889, said "he

did not believe there was a specimen in existence," an opinion also held by the late Dr. E. B. Taylor.

From information obtained from a study of the specifications of patents—a mine not worked by any writer previous to Mr. Miller Christy—and from the good fortune of a few diligent collectors, we have now a fairly good history of the various forms of these boxes, with the dates of their production. They contained a small bottle of sulphuric acid with a little asbestos to prevent the acid spilling, and a supply of small wooden matches, the heads of which were formed of a composition of chlorate of potash, sugar and gum ; these being dipped into the acid immediately burst into flame.

Many of the writers on this subject during the latter half of the last century trusted to memory for their descriptions of these and other inventions, with the usual result—what they wrote could not be depended upon, and I fear that even in the present day their successors are equally at fault, for many of them speak of the " Lucifers " and " Congreves " of John Walker, who always referred to his productions as " Friction Matches," and it was more than five years after this that R. Bell (who opened his match factory in London in 1832) first made use of the word " lucifer " as applied to a friction match.

The German match makers, who began to manufacture in 1832, were the first to call their matches " Congreves "—not because Sir William Congreve invented a friction match (for he died in 1828), nor because when struck matches made a noise like a Congreve rocket, as has been so frequently asserted. In 1824 Sir William Congreve became the General Manager of the English Association for Gas Lighting on the Continent, a gigantic business which undertook to produce gas for most of the great cities of Central Europe, including Berlin. Therefore the name " Congreve " was thought to be a good " trade mark."

II.

SOME NEGLECTED ASPECTS IN THE STUDY OF YOUNG BIRDS.

By W. P. Pycraft.

British Museum (Natural History).

If the ornithological pundits of to-day are right, then the only aspects of Ornithology which really matter are such as concern the niceties of nomenclature, and the creation of sub-species. Birds to them, in short, become interesting only when they have become reduced to that commonly misshapen bundle of feathers known as a "skin," to be described in terms of millimetres and the Rigway Code of colours, in the hope that after these operations have been duly performed it will be possible to create yet one more new name! Of the intimate structure of feathers, and the structures underlying them, they know nothing, and care less. Nor are they interested in living birds, save as potential skins.

But there are, happily, many who take a wider outlook, realising that the study of birds is really one of immense complexity, demanding for its successful pursuit a division of labour, whereby every conceivable channel of information may be thoroughly explored.

Of late years wonderful things have been done by means of the camera, in regard to that branch we call Ecology— the study of the living bird in relation to its environment, animate and inanimate. And the surprising insight which this intensive study of birds in the field has revealed, has induced one or two more philosophical spirits to adopt "bird watching" as a means of collecting data bearing upon the problems of Natural Selection and Behaviour, and the bearing of these on the problems of evolution.

This term "behaviour" is used in regard to all that concerns the observation of the activities of animals, in the hope of discovering data from which to infer the existence of that special mode of the working of consciousness termed "instinct." The psychological inferences to be drawn from these facts require very subtle powers of analysis to avoid the otherwise inevitable anthropomorphism which so commonly colours, and vitiates, the work of those who have essayed to interpret these evasive phenomena.

Among our own countrymen we have in Prof. Lloyd Morgan one of the greatest living exponents of the study of "behaviour," and those who may be tempted to take up this study would do well to read his "Habit and Instinct," and "Animal Behaviour." Among his disciples is, at least, one ornithologist who has achieved distinction. This much will be apparent to all who have read that quite remarkable book "A History of the British Warblers," by H. Eliot Howard. As a study in the "behaviour" of birds, pure and simple, Macpherson's "Home Life of a Golden Eagle" may be cited as a model of what such books should be. Mr. Macpherson and Miss E. L. Turner (who has done such admirable work, on similar lines, in regard to Broadland Birds) have added materially to the charm and value of their work by combining exceptional powers of observation and the skilful use of the camera. This combination in so high a degree of perfection is rare, and it demands yet a third element to achieve success, that is, endurance under extremely trying conditions. Edmund Selous' "Bird Watching" contains a mine of information, but is marred by a persistent effort to interpret the behaviour of birds in terms of human conduct. What Eliot Howard has done for us in regard to the British Warblers, Prof. F. H. Herrick has done in his "Home Life of Wild Birds" for American ornithologists. It is a book which must be read by all who propose to take up this line of research, which is to be regarded as an almost unworked field.

In discussing the "behaviour" of birds we must walk warily. Only too commonly their activities as living creatures are

loosely described as "instinctive," and left at that; as if the term "instinctive" carried an obvious, and self-sufficient meaning. This is far from true, for there are indeed activities which lie on the border-land between "instinctive" and such as are of a purely physiological or "reflex" nature. But, in a general sense, we designate by the term "instinctive" those activities which are associated with consciousness, and are not born of experience.

There are some who, while they talk glibly of "instinct," show, at the same time, that they have not even a glimmering of a notion of what that term means. As a case in point, I may cite a story which I read recently in a Magazine purporting to popularise science for the edification of children, of a pheasant chick which was placed in an aviary of small finches, and, as a consequence, as it grew up it forsook the gait characteristic of the game-birds and hopped like a finch! This was cited to show how the power of imitation in animals could, and did, overcome natural instincts.

Perhaps the best possible insight into the instincts of birds is that afforded by their behaviour during the reproductive period. At this time we can pass in successive review the great phenomena of "mate-hunger," the unfolding of the parental instincts, and the development of the nascent consciousness of the young.

The inferences drawn from the complete cycle of events should then be further tested by experiments with the young birds, both while under the protection of their parents, and after removal from their guardianship.

Even men who have enjoyed great reputations, like Alfred Russell Wallace, have shown themselves hopelessly inept in interpreting this matter of instinctive behaviour. According to Wallace, birds build their nests, not "instinctively," but by the dual aids of imitation and memory. He assumes that the older birds pair first, and that the younger, about to assume the rôle of parents, watch the older birds at work, their appreciation of what is being done being assisted by the memory of the character and details of the nest in which they themselves

were reared. There is something incredibly stupid in this theory, and it becomes the more so when the reputation of its author is remembered. The preliminaries to pupation among the Lepidoptera include the construction of "nests" as cunningly wrought as any fashioned by birds, yet they perform the task in solitude, and but once in their lives. No caterpillar needs a pattern to work by; they weave their cocoons "instinctively."

Those who have reared young birds taken from the nest before their eyes have opened know well that, as they grow up, so they develop all the characteristics of their species in the matter of "behaviour," and on this matter I can speak from experience.

Some years ago, to save a young magpie from a worse fate, I adopted it. At the time it came into my possession its eyes were still unopened. It had therefore never seen either its parents or the nest in which it was hatched. In due course it grew up, as fine a specimen of its race as could be desired, and it was the most delightful and endearing pet I have ever had. As soon as its wings had grown it flew, without any instruction on my part. How, indeed, could I have imparted it? And in all his habits he was a typical magpie. I well remember his first bath. We stood him in the middle of a large, shallow dish of water, and waited to see what would happen. He was clearly puzzled at the sensation of the cold water round his feet, and presently stooped down and tested the water with his tongue, then immediately hopped out on to the kitchen floor, where the experiment was made. A moment later he rushed back, jumped into the middle of the dish, and, flopping down, proceeded to send the water in a shower all over and around him, by means of his wings. Then he hopped out, and presently returned to repeat the process. When he was soaked through and through he came out, a draggled, dripping bundle of feathers. Then he began to preen himself until he was dry. He bathed, in short, after the fashion of his tribe, instinctively. At this time we also had a small South American parrot, of the species known as the "Quaker

Parrot" (Myopsittacus monacus). She used her cage as a sleeping apartment, and as a refuge when in disgrace. The greater part of the day was spent on its roof. On that memorable morning, after "Piggles" had had his first bath, my wife suggested putting "Jummy," as we called her, in. It was her first bath, with us at any rate. She behaved in an entirely different manner. She walked round and round in the water, and by dint of lying down first on one side, then on the other, contrived to get herself thoroughly wet without any splashing with her wings. After this the bath was a daily institution, and though both often occupied it at the same time, neither ever attempted to copy the methods of the other. They bathed "instinctively," after the manner of their tribe.

"Piggles," true to the traditions of his race, was a born thief, and he thoroughly enjoyed a game: his favourite was stealing. We would lay some small article on the table, and affect not to see him edging gradually nearer and nearer, till at last he would make a dash for the coveted object. To snatch it away at the moment his beak was on it heightened his joy immensely. But presently he would be too quick for us, and away he would fly with his prize to the top of the dresser. We tried him once in my study, but the experiment was too costly to repeat!

He certainly displayed a remarkable degree of affection for my wife. During one of our holidays we were persuaded to leave him with a friend. He was most unhappy. I brought him home one evening. No sooner had he entered the hall and heard his mistress's voice than he commenced a most amazing performance. Standing bolt upright on his perch, with his beak pointed skywards, and his eyes rolling, he began to utter a series of the weirdest notes I have heard. His whole performance, indeed, was, I take it, what in normal circumstances would have been his "love-display," such as would mark his amorous moods when "courting." His alarm notes were absolutely indistinguishable from those of the wild birds, though he had never heard them uttered by any member of

his kind. His experience of the world was strictly limited, for when away from us he never left his cage, and when at home he lived in the kitchen, where he was allowed an hour or two to exercise his wings and roguery. Yet as he grew up he developed all the peculiarities of flight, and methods of feeding, which are common to magpies. He instinctively held food down with his feet while he picked it to pieces, whenever occasion demanded. He displayed, in fact, a perfect equipment of inherited habits. Imitation in his case displayed no part.

Just before he died, of a chill caught on one of his visits to a friend while we were out of Town, we were contemplating moving, and had arranged to provide him with really sumptuous quarters, as an alternative to taking him into the country and giving him his liberty. But this we were loth to do, lest he should presently fall a victim to some prowling gamekeeper on the look-out for "vermin." Personally I would rather apply that term to the gamekeeper, or, at least, to some of his kind. "Piggles" afforded me an insight into avian mentality and behaviour which I shall bear in grateful remembrance to the end of my days, and I would suggest that all who are interested in this aspect of ornithology should repeat my experiment.

That the response to alarm notes is intinctive is shown by the fact that chicks, on the point of hatching, will stop cheeping at once in response to the alarm notes of the parents which, as yet, they have not seen. But I need not labour this point. Many of those who will read these lines will have had far more experience of the behaviour of nestling birds in their surroundings than I have, and they will know well that their actions are instinctive, and not the result of imitation.

What is needed now is more intensive study of nestling birds in their wild state, and when possible, of others kept at the same time in captivity. These last should, of course, whenever possible be taken from the nest as soon as hatched, or better still, hatched in incubators. These will furnish valuable control experiments and serve to check the observations on wild birds.

So great is the uniformity of instinctive behaviour among any given number of the same species that we are apt to overlook the fact that congenital variations occur there as often as in matters of size, colouration, or in the qualities of the five senses. But very special pains should be taken to obtain evidence on these aspects, for they furnish new stepping-stones to evolution. A whole host of difficulties surrounds the task of collecting material of this kind, for it is so easy to misinterpret. And where advanced nestlings or adult birds are concerned, the possiblities of imitation are very real. But the greater the difficulties of a problem, the more fascinating it becomes.

There are certain aspects of the colouration of nestling birds which sorely need investigation on a more serious scale than has yet been attempted. The grebe, the dabchick, the coot, the waterhen, afford most excellent material for this purpose, and these are birds with which all Norfolk ornithologists are familiar.

The nestling great crested grebe and the dabchick are both striped, but the stripes differ conspicuously in their intensity in the two species. Is this difference associated with any peculiarity of habitat? What is the significance of the curious vermilion red patch of bare skin on the crown of the nestling great crested grebe? It would seem, as I tried to show in my "Infancy of Animals," that the striped livery is an ancestral dress worn by all birds as an adult dress in the remote past. Is its survival, in a few species of nestlings to-day, in any way related to the struggle for existence? A ghostly relic of such striped colouration can be seen in the downy nestlings of many Rallidæ, when seen in certain lights, though the down, casually inspected, seems to be uniformly black. The downy nestling of the osprey alone, among the Accipitres, is striped. Young coots, and waterhens, afford some striking features in the matter of the colouration of the head, and they further differ very conspicuously from their respective adults in this particular. The white frontal shield and beak of the adult coot contrasts strongly with the red, fleshy tubercles

of the head of the nestling. The nestling waterhen has a red beak, the immature bird a green one, the adult, once again, a red one. Has this colouration in the nestling any relation either to habit or habitat? Is it associated with any peculiarities of behaviour, or is it to be regarded as a survival of an ancestral adult colouration? At the present time no satisfactory answer to any of these questions is possible. But, shadowy as the prospect may seem, much may result from careful and patient observation of living birds in their natural environment.

No less in need of investigation in the field is the problem presented by the remarkable colouration of the open mouths of many nidicolous birds, as in the case of young larks, and bearded-tits, for instance. Norfolk naturalists are again favoured, for there are few places now-a-days where the young of the last-named species can be studied in a living state. Are the curious white "denticles" of the mouth of the nestling merely ornaments, or survivals of some ancestral stage, or do they serve some useful purpose? I have suggested that, like the black spots on a bright yellow ground found in so many species, they serve as guide-marks to the parents when feeding. Others hold that they are "terrifying" factors, repelling would-be enemies when they approach too near the nest. Theorising on the matter will never furnish us with an answer to this problem, but it may be forthcoming as a result of careful field work.

Play and its significance in young birds is another subject which has received but little attention. Groos has shown us what a rich field of research this offers, and Eliot Howard and Macpherson have given some interesting examples drawn from the warblers and the golden eagle, respectively.

Where survival depends on the successful capture of swiftly-moving prey, the young seem to require some sort of education in the art of hunting, by their parents. I have given instances of this in the case of young grebes; Macpherson has given some striking facts in regard to the golden eagle, and there are many records of similar training in the case of young swallows.

But as yet no more than the outermost fringe of this latter aspect of bird-life has been touched. Workers are badly needed. From the appalling amount of time that is now being spent upon the stupidities of nomenclature one might suppose that the subject of field work had been exhausted. On the contrary, it has scarcely begun, and the harvest to be gleaned is likely to be far more important than most people seem to suspect.

One might go on extending almost indefinitely this list of problems, and the several side-issues they suggest for investigation. But the aim of this brief review is rather to suggest some of the more urgent themes awaiting investigation more especially in relation to "behaviour" and its translation into terms of psychology. Norfolk is justly famed for the number of naturalists it has produced. As a native of Norfolk I am anxious to see that number further increased. Hence these suggestions, made in response to a request from my old friend, Mr. Edward Bidwell, who has himself done so much for our beloved study.

III.

BREEDING STATIONS OF THE BLACK-HEADED GULL IN THE BRITISH ISLES

By Robert Gurney, M.A., F.Z.S., M.B.O.U.

The Black-headed Gull (*Larus ridibundus*) is not only one of our most beautiful and conspicuous water birds, but it has also come to possess a certain economic importance. So far the results of the investigations carried out to ascertain the nature of its food have been wholly in its favour,* so that no check

* "Report on the food of the Black-headed Gull," E. L. Thorpe and E. Hope, 1907. "The food of some British Birds," Newstead. Suppl. to Journ. of the Board of Agriculture., Dec., 1908. See also "British Birds," vols. I., p. 191, and VI., p. 21.

Breeding Stations of the Black-headed Gull in the County of Norfolk.
Existing Gulleries are underlined.

PLATE I

has to be imposed upon its increase for economic reasons. That this gull has increased of recent years seems to be certain, since Mr. J. E. Harting, when giving a summary of the breeding colonies known to him, in 1884, was of opinion that the bird was on the road to extinction as a breeding species. Some of the colonies then enumerated are now deserted, but many new ones have been founded, and there is now no likelihood of a fulfilment of Mr. Harting's prophecy. In some cases the protection afforded to these gulls has led to such an increase in numbers that other birds have been driven away (*see* account of the gullery near Bala, p. 434). At Loch Stormont, in Perthshire, the protection of the gulls has been followed by the unfortunate result of the disappearance of many of the ducks which used also to breed there. In many parts of the country its increase may be viewed with satisfaction, since it is certainly a "farmers' friend," but in Scotland and Northern England, where it is so abundant, its increase should be kept within bounds for the sake of other birds.

I have endeavoured to collect information as to the existing colonies of this gull in the British Isles, and think the subject is of sufficient interest to place the results on record for comparison at a future time. It is, of course, impossible, without personally visiting the sites, or without correspondence with local ornithologists, to ensure that the information is up-to-date, and, for the most part, I have been obliged to be content with consulting the most recently-published County Ornithologies, and the scattered references in various periodicals. I am, however, indebted to a number of gentlemen for information supplied in reply to my enquiries, and to them I wish to express my thanks. I am specially obliged to Dr. S. H. Long and Mr. J. H. Gurney for valuable advice and suggestions.

A great difficulty in compiling such a list as the following is that some authors are content to state that the bird breeds within the district without specifying the number or localities of the breeding-places, and it is also often exceedingly difficult, and sometimes impossible, to identify the localities when they are given. In some cases the same colony has been described at

different times under different names, so that there is uncertainty as to whether one colony or more is meant. I have not attempted to make a complete list of deserted sites or to quote descriptions of existing colonies, and I am well aware that such a list as is here given is only a rough approximation to the truth. Colonies wax and wane greatly from year to year and the birds frequently desert a site altogether, only perhaps to return after a few years. The list may be regarded as an incomplete framework, and I shall be very grateful if ornithologists will send me any information which may fill in the gaps and correct errors.

Northumberland*

The following list of breeding stations in Northumberland is derived partly from Mr. George Bolam's "Birds of Northumberland" (1912), and partly from information kindly supplied to me by Mr. Abel Chapman. The list is probably not complete, as Mr. Chapman tells me that there are many small and fluctuating colonies on the moorland tarns.

(1) Pallinsburn. This is a very ancient gullery, said by Selby (1856) to have been founded by gulls from Kelso. (See Harting, "The Field," 1884, p. 204).

(2) Weetwood (or Coldmartin), near Wooler.

(3) Cateran Hill
(4) Harehope Lough
(5) Kimmer Lough

These three lie close together N.W. of Alnwick.

(6) Black Lough in Aydon Forest, near Alnwick.

(7) Barrow, or Linshiels, Lough, on the Coquet, near Alwinton.

(8) Harbottle Tarn, near Barrow.

(9) Darden Lough, about 7 miles S.W. of Rothbury.

(10) Blackaburn (or Cairnglassenhope), on Houxty Burn (North Tyne Valley).

(11) Halleypike Lough
(12) Greenlee ,,
(13) Bromlee ,,
(14) Grindon ,,

* *See* postscript, p. 447.

Four Loughs close together in the South Tyne Valley, W.N.W. of Hexham.

(15) Hallington Reservoir, near Thockrington.

(16) Holy Island Lough.

Gulls formerly bred at Fallowlees, near Rothbury, Prestwick Carr, Sweethope Lough, and Colt Crag Reservoir, near Hallington Reservoir.

Cumberland

Mr. Harting, in his paper of 1884, stated that there were no gulleries in Cumberland, but colonies certainly existed at that time at Jenkins Cross, and at Cumberland Marsh, near Ravenglass ("Field," 1884, pp. 276 and 564).

Macpherson and Duckworth ("Birds of Cumberland," 1886) mention nine breeding sites, and in 1892 Macpherson and Ferguson ("Vertebrate Fauna of Lakeland") gave a list of eleven, so that the Gull is apparently increasing its range in the county.

The following is a list of the gulleries :—

(1) Ravenglass. A large colony among sandhills, 6 miles N.W. of Bootle. This colony is notable for the number of young gulls ringed by Messrs. Robinson and Smalley.

(2) Denton Fell. N.E. Cumberland, about 16 miles N.E. of Brampton. A colony of some hundreds of birds.

(3) Bowness Moss. On the Solway, N.W. of Carlisle.

(4) Solway Flow. In 1889 the birds from Solway Flow nested on the salt marsh at Rockcliffe, but their eggs were washed away. Attempts were made to nest here in 1890 and 1891.

(5) Moorthwaite, 7 miles S.W. of Brampton. This colony was founded in 1878, and had increased to 1,000 pairs in 1889.

(6) Greystoke. 5 miles W. of Penrith. 250 pairs in 1886. Mr. H. W. Robinson informs me in a letter that an offshoot of this gullery has established itself at Blencaw, near Penrith.

Small colonies are also recorded from :—

(7) Monkhill Lough. 4 miles N.W. of Carlisle.

(8) Crofton Hall. 3 miles N.E. of Wigton.

(9) Devoke Water. 5 miles N.E. of Ravenglass.

(10) Seathwaite Tarn. W. of Coniston.

(11) Drigg. 2 miles N.W. of Ravenglass.

Thompson (*Trans. Northd. and Durham Nat. Hist. Soc.* XI., 1893, p. 360) describes a visit to this colony, which then consisted of hundreds of nests.

Colonies are also mentioned by Macpherson and Duckworth (*Loc. cit.* 1886) at Salta Moss and Wedholme, localities which I have been unable to identify. Those mentioned in the "Field" of 1884, at Jenkins Cross and Cumberland Marsh, seem to be identical with those of Moorthwaite and Ravenglass respectively.

The neighbourhood of Solway Firth seems to be one of the most favoured parts of the Kingdom, since there are six gulleries in this region in Cumberland, and several over the border in Dumfriesshire.

Durham

Mr. Joseph Gill, who has been kind enough to make enquiries as to the nesting of the Black-headed Gull in the county of Durham, informs me that no regular gulleries are known. Nests have been found at Hurworth Reservoir, but the gulls have not been permitted to establish themselves. Mr. Isaac Clarke considers that the gulls would nest regularly at Axwell Park, Blaydon, if permitted to do so.

Westmoreland

Macpherson & Ferguson ("Vertebrate Fauna of Lakeland," 1892) mention only three colonies in this County :—

(1) Sunbiggin Tarn. 9 miles S.W. of Appleby.

(2) Clibburn Moss. 6 miles S.E. of Penrith.

(3) Bolton Fell. 3 miles S.E. of Clibburn.

Yorkshire

An excellent summary of the gulleries in Yorkshire is given by Mr. Nelson ("Birds of Yorkshire," 1907), who mentions the following seven as still existing :—

(1) Riccal and Skipwith Common. 10 miles S. of York. About 25 pairs in 1902.

(2) Locker Tarn, in Wensleydale, founded in 1888. 40-50 pairs in 1902.

(3) On moors between Whitby and Scarborough, founded about 1893. 20 pairs.

(4) Browsholm Tarn, near Bashall Hall.

(5) Skipton

(6) Grassington, near Hebden Bridge.

(7) Oxenhope, about 8 miles S.E. of Keighley.

Nests have also been recorded of recent years at :—

(8) Egton-on-Eske. 7 miles S.W. of Whitby.

(9) Hebden Bridge.

(10) Stanedge Moor. 5 miles N.E. of Castleton.

Mr. Coward informs me that there are four colonies in the Pennines just on the border between Lancashire and Yorkshire (see Lancashire), and that there are also colonies at :—

(11) Withens Reservoir.

(12) Black Moss, Diggle. About 150 pairs.

The Yorkshire gulleries appear for the most part to be small and not very firmly established, and several have disappeared. Mr. Harting ("The Field," 1884) stated that there were then only two—at Thorne Waste and Strensall Common, both of them now deserted. Other deserted sites are Thornton Bridge, Hornsea Mere, Newton Fell, Keighley Moor Dam, Summer Lodge Tarn, Punchard Head, and Semer in Yoredale.

In 1906 a colony consisting of about 40 nests existed near Scarborough ("The Naturalist," vol. XXXII., p. 196), but all the eggs were taken.

Lancashire

I am indebted, through Mr. R. J. Howard, to Mr. T. A. Coward and Mr. H. W. Robinson for information with regard to Lancashire.

There appear to be about seven existing colonies :—

(1) A large gullery formerly existed on the site now occupied by the town of Fleetwood. About 1830 the gulls migrated to Pilling Moss, where they were still breeding in 1884

(Harting), although the moss had been reduced by drainage.* The cultivation of the moss finally drove the gulls to a new site at Winmarleigh, near Garstang. A description is given (Jackson, "The Naturalist," XII., p. 129, 1887) of a large colony at a place near Cockerham, by which, no doubt, Winmarleigh is meant. The number of gulls was then estimated at 20,000. I am informed by Mr. M. Wigley, of Lancaster, that during the War the moss was taken over by a company for digging peat, and that, as a result, the gulls have left. Mr. Coward says that the colony is now on the saltings between Pilling and Fluke Hall, where the nests are liable to be flooded by spring tides.

(2) On Walney Island were formerly several small colonies, but a large part of the island is now occupied by Messrs. Vickers' works, and the birds may have been driven away. In 1915 there was a large colony on the South end of the island, with many hundreds of nests (Mr. T. A. Coward).

(3—5) On the Lancashire and Yorkshire border there were, in 1918, three colonies on Blackstone Edge. The largest of these, on Soyland Moor, consisted of about 150 pairs, while the second, at Whiteholme Reservoir, had about 120 nests. In 1918 there was also a fourth small colony of about 20 pairs at another spot on the Yorkshire side (Mr. T. A. Coward).

(6—7) Mr. H. W. Robinson informs me of two more colonies, one at Wyresdale Park, near Garstang, and the other at Burnemoor, near Bentham, on the Yorkshire and Lancashire boundary. The first may perhaps be an offshoot of the Winmarleigh Gullery.

A colony is mentioned by Mitchell ("Birds of Lancashire," 1885) at Bleasdale Fell, but this was probably an offshoot of Winmarleigh, and is now deserted.

Attempts have been made to found colonies at Longton Marsh, on the South side of the Ribble, and at Ainsdale, near Freshfield, but in the former case the birds were flooded out, and in the latter they have been systematically robbed (Mr.

* See also "Naturalust," 1851, p. 194, and "Zoologist," 1844, p. 577 and 1867, p. 832.

T. A. Coward). Mr. Jackson ("Naturalist," XII) alludes to a colony on a tarn in the hills above Scorton (near Garstang), but states that it was deserted by all but a single pair in 1886.

Cheshire

Only one gullery is known in Cheshire—that of Delamere Forest. Mr. Coward writes that this colony, consisting of about 200 pairs, moved to Oakmere, about 3 miles from its previous site, in 1918.

Bruton ("British Birds," XII, 1917-18, p. 68) refers to the abandonment of the old site, attributing it to the burning of gorse round the pool. He states that the number of gulls rose from 15 pairs in 1899 to 500 pairs.

Lincolnshire

Mr. Cordeaux ("Birds of the Humber District," 1899) mentions breeding stations at Twigmoor and Scotton, but the most recent account is that of the Rev. F. L. Blathwayt ("Lincolnshire Gulleries," "Zoologist," 1909, p. 139), who gives an excellent account of the gulleries then existing.

(1) Twigmoor. (About 4 miles W. of Brigg). This colony was founded about 1843 by gulls from Manton Common, which was deserted shortly after. At Twigmoor a number of small pools were converted into a large lake, which seems to have attracted the Manton gulls, which were then much persecuted. The birds nest on projecting spits of peat, or among rushes, and some nests are built on fir-trees overhanging the water. The number of gulls was estimated at 5000 pairs.

(2) Crosby. 5 miles N. of Twigmoor, and probably an offshoot from it.

The gulls first bred there about 1865, but, about 1894, they left it for some years, having been disturbed. In 1905 there were great numbers of nests, but Mr. Blathwayt informs me that the site is now almost deserted, owing to mining operations having tapped the springs.

(3) Scotton, 6 miles S.W. of Twigmoor, on pools on a swampy heath near the Trent. Probably 1,000 pairs in all. The gulls first came here in 1870 from Twigmoor.

In addition to these three stations, I am indebted to Mr. Blathwayt for information of a fourth colony at Peacock's Hole on Laughton Common, near Scotton. There were at one time about 100 pairs here, but they had much decreased in 1915.

Mr. Blathwayt also tells me that a large gullery formerly existed near the coast at North Cotes, but that it ceased to exist before 1855.

Essex

Mr. Miller Christy ("Birds of Essex," 1890) mentions two gulleries as still in existence—namely at St. Osyth (Colne Estuary) and Tollesbury (Blackwater Estuary), but several large colonies had become extinct.

In 1888 there were two colonies on the Tollesbury marshes—at Joyce's Head Fleet, of 12 nests, and at Pennyhole Bottom, of 25 nests" ("Essex Naturalist," II., 1888). In 1899 Mr. P. Clark ("Essex Naturalist," XI., 1900, p. 184) gave an account of all the gulleries known to him. These were :—

(1) Brightlingsea (St. Osyth), 40—60 nests.

(2) Tollesbury. A scattered colony of about 50 nests.

(3) Hamford Water. 20 nests on an island near Peewit Island.

In 1901 there were only two colonies, the Tollesbury site having been deserted, but there were then about 30 nests at Hamford Water, and 30—40 at St. Osyth. All these gulleries are situated upon the saltings near the estuary.

I am informed by Mr. Robinson that there is another colony of about 25 nests at Fingringhoe, near Colchester, so that there may be now three or four in all.

Norfolk

An excellent account of the history and then existing status of the Black-headed Gull in Norfolk is given by Mr. Southwell in Stevenson's "Birds of Norfolk" (vol. III., p. 322, 1890), and a good deal has been written elsewhere at different times about the Norfolk Gulleries. In Mr. Southwell's account are enumerated 12 sites, either deserted or still occupied, but the permanent Norfolk Gulleries may, I think, be reduced

to two, namely, those of Scoulton and of the Norfolk Broads. From Scoulton have probably originated the small colonies which, from time to time, have nested on several of the Meres of the Western parts of the County, while the gulls breeding in the east have migrated from one Broad to another, and have waxed and waned in numbers. The original nesting station seems to have been at Horsey, where immense numbers bred in Sir Thomas Browne's time. That site has long since been deserted and the Broadland Gulls are now very much reduced in numbers.

The name "Mow Creek" at Brancaster and at Wells seems to indicate that gulls bred on this coast in conspicuous numbers at one time, but both sites were deserted for a very long time, and it is only in recent years that a small colony has re-established itself at Wells.

The following is a list of the stations now, or recently, occupied in the County:—

1. Scoulton Mere

Much has been written about the Scoulton Gullery, which is famous both for the number of its gulls and also for its antiquity,* and I will not therefore enter into a description of it, but I think it will be of interest to attempt an estimate of the number of the gulls breeding there. As visitors are not now allowed to land upon the island on which the birds breed, it is not possible to count the nests, but the following list of the eggs taken will give some idea of the size of the colony. For the years 1860-1902 I am indebted to Mr. J. H. Gurney, the figures for 1917-19 having been kindly given me by Messrs. Bidwell and Sons, agents for Major Weyland, the owner of the Mere.

* For the best descriptions of Scoulton see:—(1) Sheppard & Whitear, "Trans. Linn. Soc.",, XV., 1825. (2) Stevenson, "Trans. Norf. and Nor. Nat. Soc.", 1872, p. 22, (3) Stevenson, "Birds of N9rfolk," III., p. 327, (4) J. H. Gurney, "Zoologist," 1903, p. 128, (5) Rowley's "Ornith. Miscell.", 1876, p. 407.

Year,	Eggs taken.	Year.	Eggs taken.
1860	15,000	1897	13,000
1864	50	1898	5,736
1872	4,000	1899	6,618
1876	6,000	1900	7,474
1889	9,000	1901	7,654
1892	4,000	1902	1,000
1893	4,000	1917	4,700
1894	7,200	1918	6,888
1895	2,000	1919	6,640

Average (excluding 1864)—6,524.

From this list it appears that the numbers of gulls have remained approximately constant for many years, the few years of very large collections being preceded and followed by gatherings below the average, indicating that the large numbers of eggs do not show great increases in numbers of nests. In 1903 Mr. J. H. Gurney estimated the number of gulls at 1,000, but any such estimate made as the birds rise in whirling masses from the " Hearth " must be purely a matter of guesswork. In order to obtain what I believe to be a more accurate figure, I have counted the numbers of gulls shown in a photograph taken on May 23rd, 1918, at a moment when the largest number of birds seemed to be in the air, and have arrived at the conclusion that not less than 2,000 gulls were at that moment visible. This is probably considerably below the actual number frequenting the colony, since to it must be added gulls still on their nests, others away feeding, and others again which were outside the field of the camera. Further, the difficulty of counting is very great, as the gulls are so thick in the air that it is often impossible to distinguish individuals in the picture. I think, therefore, that an estimate of 2,500 gulls as the total strength of the colony in 1918 would not overstate the number. The gulls nest on an island of about 40 acres, occupying only a small portion, about one acre, in its North-West corner. If the numbers given are correct, there would, on an average, be about one nest in each four square yards. The area occupied by the gulls was probably more

Scoulton Mere. A view of the "Hearth."

PLATE II

extensive in former years, but has been encroached upon by bushes.

2. Langmere

Langmere lies in the centre of the Breckland district between Wretham and Thetford, and from time to time gulls have bred by the Mere, or in its neighbourhood, but no permanent colony has been founded. There were nests there in 1853, and in June, 1883, Mr. Frank Norgate found about 50 nests in the heather at the S.W. corner of the Mere, but there were none there in 1884. Mr. F. Russell informed Mr. W. G. Clarke that there were five nests at Langmere in 1898, and that a few had nested there for several years previously. Mr. Clarke himself found 25-30 nests in 1898 round the pond between Ringmere and Langmere, but saw no more there until 1904 and 1905, when there were about twelve. In 1913 there were about six nests. In 1917 a single nest was found by Dr. Long and myself among thistles on the island at Langmere, but the following year a target was placed on the island for machine-gun practice from aeroplanes, so that no nesting was possible. This year (1919), owing to a wet winter, the Mere has flooded a large part of the surrounding heath, and the island, to which it was formerly possible to wade, is now unapproachable. On June 12th gulls were seen on the Mere, but no evidence was found of their having nested.

3. Hoveton Broad

The gullery at Hoveton is said to have started in 1854 with 30 nests on the Sedge Fen, the birds being supposed to have come from Rollesby Broad, which was deserted in the following year. At first the nests were built on ridges left by turf cutters, but the birds soon moved to Hoveton Great Broad, and, after a few years, to the Little, or Black Horse, Broad. The colony was carefully protected and its numbers rapidly increased, 700 eggs being taken in 1858, and 2,000 in 1864, a number which was maintained for several years. At Hoveton, as also at Alderfen and Somerton (see below), the gulls nest on small islands locally known as "Hovers." These hovers are formed by the horizontally-interlaced roots of the Reed (*Phragmites*)

often intermixed with those of the Reed-Mace or "Bolder" (*Typha*)—which gather mud until a platform is built up above the water, upon which other plants, such as *Apium*, *Oenanthe*, and *Carex* take root. These platforms break loose from the reed-bed and take root again in the open Broad if the depth of the water is not too great.

For the following information as to recent years I am indebted to Capt. J. C. Blofeld, the owner of Hoveton Broad.

	Eggs gathered.	
1894	1,569.	
1895	571.	A bad year.
1896	2,095.	
1897	1,930.	
1898	632.	
1899	1,278.	
1900	626.	
1901	188.	
1902	1,371	
1903	959	
1904	853	

1905 106. "A bad season, there being no hovers for the birds to nest on. The absence of hovers had been noted for some years. It seemed that the water level was rising each year, and, as it did, so the hovers broke loose, drifted across the Broad, and broke up." (J. C. Blofeld).

1906 No eggs taken, a bad year.

1907-1909 No records.

1910. No gulls at all. They came and looked at the Little Broad, but, finding no nesting places, left it, apparently going to Alderfen.

1911 A few nests on the Great Broad.

1912 About 20 nests on Pound End Broad (part of the Little Broad).

1913 A great number of nests on Pound End Broad.

1914 A good number of nests.

1915 95 eggs gathered mostly from Pound End Broad, but a good number of nests on the Little Broad.

1916 "A nice number of nests on Pound End."

1917 Several nests both on Pound End and on the Little Broad. (Dr. Wright).

1918 Thousands of gulls came, but left in about a week. About six nests were built. (Dr. Wright).

1919 On May 29th I visited the Little Broad in company with Dr. Long and found no fixed hovers in the open water. There are several clumps of Reed-mace and "Bolder" (*Scirpus*) growing from the bottom, and round the edges of these there are, here and there, collections of drifted reed roots which provide precarious nesting places. On that day there were five pairs of gulls only, three of which were nesting on these roots, and two on a substantial hover close to the shore. On or about June 1st, Dr. Wright, whose house overlooks the Broad, observed the arrival of a large number of fresh gulls, which at once began nesting, fetching grass from the field in front of his house for the purpose. On June 25th Dr. Wright was kind enough to show me the nests, and we counted 39 of them, built on every available spot on the open Broad where the least support could be found. This very late appearance of the birds at their breeding station is remarkable, and seems to indicate disturbance at some other colony.

Captain Blofeld tells me that his father employed a night watchman during the breeding season, and that when large numbers of eggs were taken, some were sold (at 2s. a score) to meet the cost of the watching. Captain Blofeld is of opinion that the break up of the hovers was due primarily to the dredging operations in the River Bure. The dredging of the river has caused a much greater flow of the tide, and consequently the fresh water is backed up to a higher level.

4. Alderfen Broad

When the bulk of the gulls left Hoveton, about 1905, they found a new station on the little Broad of Alderfen, near Barton, where the many small islands of hover provide suitable nesting sites. There are no records of the numbers which have nested there, but in 1918 I estimated the number of nests at about 100, and this year, on May 26th, I counted

98 nests, and suppose the total to have been about 120. The majority of nests then contained three eggs or young birds, but several dead and half-eaten gulls were found, some dead actually on the nest, the destruction being attributed to otters.

5. Sutton and Barton Broads

Though gulls do not nest on these Broads now, they appear to have done so in the past. Mr. E. Southgate, of Sutton, informs me that his father remembered them breeding on Sutton Fen about 70 years ago. They were driven away intentionally. About 1870 a small colony of 7 or 8 pairs nested at Barton, but were driven away. Sir E. Preston tells me that a few pairs nested for two or three years (about 1907-09) at the South end of the Broad.

6. Somerton (or Martham) Broad

Mr. J. H. Gurney ("Zoologist," 1886, p. 110) alludes to a new colony at Somerton where, in 1885, about 60 nests were seen. The Rev. M. C. H. Bird tells me that he saw nests there in 1884 and 1885, but in 1886 the number had decreased, and in 1887 he noted that "the gulls were not allowed to hatch off." Apparently they deserted the Broad for a few years, but in 1899 Mr. Bird recorded that there were about 200 nests. When the Broad was re-colonised there was a single pair only in the first year, but the numbers increased very rapidly. In 1903 I saw one nest and a number of gulls, but did not visit the main colony. About 10 years ago the gulls were driven away, intentionally it is said, and have not returned.

7. Horsey.

Black-headed gulls formerly bred in enormous numbers at Horsey, but this site was deserted many years ago (Stevenson's "Birds of Norfolk," III., p. 329). They continued to breed either near the mere or on Horsey Warren, near the coast, until at least the year 1819, as is since proved by the following extracts from the diary of the Rev. W. Whitear:—"May 26, 1818. Went into the marshes at Winterton. Saw Common Wild Ducks and Shovellers; Common, Lesser, and Black Tern; Ruffs, Lapwings, Redshanks, Brown-headed Gulls, and Wheat-

PLATE III

Fig. 1. Alderfen Broad. A large "Hover" with nests along the margin.

Fig. 2. Mow Creek at Wells. Showing one nest built on a bed of *Obione*.

ears." "July 2, 1816. Went shooting with Mr. Brown in the marshes between Winterton and Horsey. We killed five Gulls, agreeing with Montagu's description of the Black-headed Gull, except that the heads of all were of an uniform Chestnut-brown colour. We found their young." (See Trans. Norf. and Norwich Nat. Soc., III., pp. 247, 243). At that time Horsey was a wonderful place for birds, for Black Terns, Avocets, and Ruffs bred there, the Avocets maintaining themselves till 1824. I have been informed by Mr. Pegg (a waterman at Horsey) that he can remember Gulls nesting by a pool on Horsey Warren about 50 years ago, and I imagine that it was here that Mr. Whitear met with them. The pool no longer exists, having been filled up with sand by an incursion of the sea through the sandhills in January, 1918.

8. Wells

Gulls are said to have nested at Mow Creek at Wells many years ago, but Mr. Southwell (Stevenson's "Birds of Norfolk," III., p. 331) concluded that they had not done so for at least 50 years, though gulls returned there every spring for a time. About 1904, as I am informed by the keeper, Mr. T. Cringle, a single pair nested on the north side of Mow Creek. The next year there were two pairs, and the number steadily increased, thanks, no doubt, to the protection afforded them by the watcher appointed to look after the Terns. In 1917 Dr. S. H. Long and I counted about 30 nests by the south side of Mow Creek, and we estimated the number of gulls at about 100. The nests were substantial structures of sticks and sea lavender (*Statice limonium*), widely scattered over a large extent of salt marshes, and often resting on the top of a thick growth of *Atriplex*. This year (1919) Mr. Cringle estimates that there are 150 pairs in three colonies, one at Stiffkey Creek, and the other two on the north and south sides of Mow Creek. Dr. Long and I visited one of these sites on June 1, and counted 15 nests, but there had been a very high tide the previous night, and the eggs had been washed out of a number of the nests. We were told by Mr. Cringle that this was the second time the nests had been flooded this season, but he expected the birds

to breed again. The nests were this year built at a considerable distance from the Creek, and were generally raised only an inch or two above the level of the marsh. Among them we found three Common Terns' nests, the eggs of which had not been disturbed, although actually on the ground. That the gulls' eggs had floated away while those of the Terns did not was due, no doubt, as Mr. Cringle suggested, to the former being incubated.

Hampshire and Isle of Wight

In 1905 (Kelsall and Munn, "Birds of Hampshire and the Isle of Wight) there was only one small gullery close to the Avon between Matchams and Hurn, and this station appears to be still occupied, though it is said to have been much harried. ("British Birds," IV., p. 223).

Kelsall ("British Birds," IV., 1910, p. 182) records the first breeding of the Black-headed Gull in the Isle of Wight, and, in a footnote, Mr. Witherby mentions a two-year-old colony of 16 nests on the Hampshire mainland.

Dorsetshire

I am indebted to the Rev. F. L. Blathwayt for the following information regarding the Dorsetshire Gulleries.

Gulls have bred on the south side of Poole Harbour since about 1877, and there are now about 1,000 pairs divided up into communities, which frequently shift their quarters.

This year (1919) there have been four such colonies, as follows :—

(1) At Little Sea, near Studland.

(2) On Rempstone Heath.

(3) On the N.E. and S.E. sides of the Arne Peninsula.

(4) By the Decoy pond on Norden Heath.

In addition to these groups there are scattered pairs nesting by various pools and swamps on the heath.

At present the majority of the gulls nest on the Arne Peninsula, but a few years ago the largest colony was on Rempstone Heath. D'Urban and Matthew (Supplement to "Birds of Devon," p. 29, 1895) give an account of a visit to a gullery

of at least 2,000 birds on the S.W. shore of Poole Harbour, and I imagine that the Arne Peninsula was the spot visited.

Kent

There are two colonies—at Dungeness and Romney Marsh (Ticehurst, "Birds of Kent," 1909).

The Dungeness colony at Hoppens Pit numbered in 1908 about 300 pairs, having increased somewhat, owing to protection. The Romney Marsh gullery consisted of 20-60 pairs.

There appear to be no breeding colonies in any of the central counties south of Yorkshire. The only counties in which this gull has formerly bred are Staffordshire and Shropshire. Mr. Harting ("The Field," 1884, p. 165) gives a very full account of the gullery which once existed at Norbury and was described by Willughby (1678). Here the young gulls were at one time taken and fattened for eating. (See "British Birds," II, 1908, p. 220, where Plot's account is fully quoted and his plate reproduced). This colony migrated at one time to Aqualate, in Shropshire.

WALES

Information regarding the breeding of the Black-headed Gull in Wales is scanty, and I have little doubt that the following list is far from being complete.

Flintshire

No modern colony. Formerly one at Point of Ayr.

Denbighshire

Four colonies :—

(1) Llyn-y-foel-frech at head of Aled valley, at altitude of 1250 feet. About 400 pairs. The nests here are built in *Equisetum*, with a foundation of Ling stems.

(2) Small tarn near Denbigh. 60 pairs in 1904.

(3) Brodidris, E. Denbigh, 8 miles S.E. of Ruthin. About 150 pairs.

(4) Nant-y-ffrith, on border of Denbigh and Flint.

Carnarvon

No modern colony, but deserted sites at Llyn Conway, Llyn Llydaw, and Beddgelert.

Anglesey

One large colony. (Rolfe, 1905).

Merionethshire

I am indebted to Mrs. Thomas for an excellent account of a large gullery on a pool called Mynuchllwyd, in the parish of Llandrillo, near Bala. Mrs. Thomas writes as follows :— "There was a natural pool of about 4 acres in the midst of a grouse moor, containing poor trout under ½lb. in weight. In the summer of 1887 an embankment was made at the outlet which increased the water area ; the result being that the boggy land at the head of the pool became flooded. The following spring, 1888, a pair of Black-headed Gulls made their nest at the head of the pool on one of the tussocky islands formed by the raising of the level of the pool. The greatest care was taken of the birds, and they hatched off their young. In 1889 three pairs nested there. In 1890 a flock of geese drove the gulls away from the pool, but in 1891 about 7 pairs came, since when the gullery has gradually increased till in 1917 there were 1000 nests or more. This year (1918) the numbers are considerably reduced, due, most likely, to the eggs being gathered for four or five years, and heavily gathered in 1917 (they were pickled and used for cooking). The pool is in the middle of a grouse moor, and the first five or six years the grouse increased in numbers. Subsequently, as the gulls increased, the grouse left the moor, till now there are hardly any left. The gulls have also driven the wild duck from the pool."

Dobie (1898) mentions a colony at Palé, near Llanderfel, which was established in 1888, but I think this must be the same as that described above.

Montgomeryshire

Mr. Forrest ("British Birds," IV., 1910, p. 124) records the first colony known in this county—at Llanluggan, "a remote spot among the hills."

Pembrokeshire

Matthews ("Birds of Pembrokeshire," 1894) states that he was not aware of any breeding place in this or any adjoining county. Formerly a large colony existed on Caldey Island (Memorials of J. Ray, 1846, p. 175). "Itinerary," No. 3, 1662.

Radnorshire

In "Country Life," June 7th, 1919, a new colony at Painscastle is recorded.

In "British Birds," VIII. and IX., references are found to gulls marked or recovered at colonies at Bresaddfed Lake and at Llanfairpwll, but I cannot locate these places, or discover records of any existing Welsh colonies other than those mentioned above.

The following table shows the numbers of existing colonies of the Black-headed Gull in England and Wales according to the information available to me:—

	Totals.	
Northern Counties.		
Northumberland	16	
Cumberland	11	
Durham	0	
Westmoreland	3	
Yorkshire	12	
Lancashire	7	49
East Central Counties.		
Lincolnshire	3	
Norfolk	4	
Essex	4	11
West Central Counties and Wales		
Cheshire	1	
Denbighshire	4	
Anglesey	1	
Merionethshire	1	
Montgomeryshire	1	
Radnorshire	1	9
South Counties		
Kent	2	
Hampshire	2	
Isle of Wight	1	
Dorsetshire	3	8
		77

IRELAND

Mr. Ussher "(Birds of Ireland," 1903) states that this gull breeds extensively through Ireland, excepting in the East and South, and Mr. Ernest Phelps writes: "Speaking generally, one may safely say that the Black-headed Gull breeds on almost every large lake, and on a great number of the bogs throughout Ireland, and that the colonies are on the increase. This gull has enormously increased since the Wild Birds Protection Act, and no one takes the eggs save fishermen, who destroy them."

The following are all the breeding stations which I have found mentioned; for several of these I am indebted to Mr. Phelps.

King's County

E. Williams ("Zoologist," 1889, p. 396) gives a description of "the largest colony in Ireland" at Killeemore Bog, two miles from Tullamore. He estimated 8,000 gulls to be in sight, the birds breeding on floating islands in a bog of 200 acres, making their nests of heather and stems of bog bean. This colony appears to have shifted in 1898 to Monettia Bog, near Clonaslie, in N.W. Queen's County (Ussher). Mr. Ussher says that the majority of colonies are in King's and Queen's Counties, and mentions another site at Raheenlough.

Donegal

Thompson ("Natural History of Ireland," 1851) describes a gullery at Portlough, near Dunfanaghy, on the shores of a lake. The gulls are said to have deserted the lake when a boat was put on it, but to have returned when the boat was removed. There are several stations in Donegal, e.g. Lough Derg, Kenny Lough, and Garton Lake ("Irish Naturalist," IV., p.192).

Antrim

A good account is given by Thompson (1851) of a colony on Lough Neagh, on a shingle spit running out from Ram's Island The same gullery is mentioned by Rolfe (1905).

Fermanagh

Breeding stations on Upper and Lower Lough Erne.

Cavan

A colony on an island in a lake near Shercock. (Thompson, 1851).

Galway and Mayo

Large numbers breed on Lough Corrib, Loch Conn, Loch Carra, Lough Mask, and Lough Derg.

Sligo

Lough Gara (Ussher); also Loughs Arrow and Gill.

Roscommon

Lough Key (Ussher). Lough Ree (Phelps).

Leitrim

Lough Allen (Ussher).

Down

Ussher says this gull breeds on "some lakes in Down," but does not give the localities.

Kerry

Beginish in Blasket Islands; Castleisland district and East of Tralee.

Limerick

Lough Gurr, S.S.E. of Limerick (Ussher).

Mr. Ussher states that none breed in the maritime counties from Kerry to Down, or in Carlow, Meath, S. Munster, or E. Leinster.

Clare

Cullaun Lake—a large colony. Also a small one of three or four years' standing, on Tullymachen. (Phelps).

Tiperary

A large colony on the bog of Kilsheelan.

West Meath

Large colonies on Lakes of Ennel, Owel, and Dereveragh (Phelps).

SCOTLAND

The following list of gulleries in Scotland contains, probably, but a very small proportion of those actually existing. In some parts the bird is so abundant that it would be a matter of some difficulty to make a complete census of the colonies. Such a census has been made for Dumfriesshire by Mr. H. S. Gladstone, and it would be of much interest if other counties could be dealt with in the same way.

Orkney Islands

Colonies at North Ronaldshay, Damsay, Eynhallow, and Pomona (Buckley and Harvie Brown, "A Vertebrate Fauna of the Orkney Islands," 1891).

Shetlands and Faroes

Not breeding in the Shetlands (Saxby, 1874), but said to have formerly bred in the Faroes (Dresser, "Birds of Europe").

Outer Hebrides

Gray (1871) speaks of "breeding haunts numerous" throughout the West of Scotland and the Outer Hebrides, but Buckley and Harvie Brown (1888) give no list of stations. They mention one colony on Loch an Dune in North Uist as being the only one in that island. This is a tidal loch, and the gulls breed here in company with Arctic Terns and Common Gulls, eggs of the latter being found sometimes in the same nest with those of the Black-headed Gull. An excellent account, with photographs, of a gullery on an island in a "Hebridean Loch" is given by P. H. Bahr in "The Home Life of Marsh Birds," 1907. In this place also Common Gulls nested among the others, and Mr. Bahr notes that one of them frequently settled on the nest of a Black-headed Gull. Mr. Beveridge ("Scottish Naturalist," 1919, p. 22) states that the bird is increasing in North Uist, colonies of 80-100 nests being scattered throughout the island.

Inner Hebrides

This gull apparently does not breed anywhere in Skye, but nests here and there on the other islands. (Harvie-Brown and

Buckley "A Vertebrate Fauna of Argyll and the Inner Hebrides," 1892). (Harvie-Brown and Macpherson, "A Fauna of the North-West Highlands and Skye," 1904). Graham (1890) states that it does not nest on Iona or Mull.

Sutherland and Caithness

Harvie-Brown and Buckley ("A Vertebrate Fauna of Sutherland, Caithness, and West Cromarty," 1887) state that the Black-headed Gull is common and resident on the East coast, but much rarer on the West. There is a large colony near Durness, on an island in Loch Borrolaigh, and another near Bettyhill in N.E. Sutherland. In Caithness there are several breeding places, including a large colony on Loch Stemster (or Scarmclate) where the eggs are regularly taken. Colonies are recorded at Sule Skerry ("Scottish Naturalist," No. 67, 68), and at Golspie, in S.E. Sutherland ("Scottish Naturalist," VIII., p. 53.)

Ross and Cromarty

There are colonies on Gruinard Island and at Tain Hill, near Fearn. Nested in 1888 on small islands in Gairloch, but apparently do not do so now or anywhere in Applecross. (Harvie-Brown and Macpherson, *Loc. cit.*, 1904). There are several colonies in Strathglass, but the bird is generally rare in West Ross.

Argyllshire

Breeds sparingly on Loch Gorm, on Islay ("Glasgow Naturalist," VI., p. 29).

Inverness

Colonies at Loch Kinellan near Strathpeffer, Abernethy Forest, Loch a Choire near Laggan, Lynwilg near Kingussie, and Craig a Bheinne near Carr Bridge. (Harvie-Brown and Buckley, "A Fauna of the Moray Basin," 1895).

Nairn and Elgin

At Darnaway Woods, near Forres, there is a large colony, and there are others at Loch Annoir, near Forres, along the Findhorn at Loch of Belivat and Loch of Boath, Loch Spynie,

Altyre Woods, Dulsie Forest, and near Grantown. (Harvie-Brown and Bucklye, *Loc. cit.* 1895).

Perthshire and Forfarshire

Colonies at Loch Stormont, Haremyre, White Mire of Methven, Loch Tay, Gull Loch on Sidlaw Hills, Rossie Moor, Forfar. Mr. Harvie-Brown ("A Fauna of the Tay Basin and Strathmore," 1906) states that the gull is increasing, and there are, in fact, too many colonies in the N.E. of the Tay Basin.

Aberdeenshire

Sim ("Vertebrate Fauna of Dee," 1903) states that the Black-headed Gull breeds "in many of our inland lochs." Colonies are mentioned at Uppermill, near Kintore, on a muddy island in a mill dam of 10 acres, and on the Loch of Braeroddach. There are deserted breeding places at Pottertown and Loch of Auchlossan.

Prof. Thomson informs me that small colonies exist throughout the county, and mentions stations at Sands of Forvie, Corbie Loch, near Park Hill, and the Moor of Dinnet (Loch Davan).

Selkirk

Several breeding places between Selkirk and Melrose (A. H. Evans, "A Fauna of the Tweed Area," 1911). Colonies are mentioned at The Haining Loch, close to Selkirk, and at Kingside Loch.

Peebles

The only colony mentioned is on White Moss, near West Linton.

Roxburgh

Colonies at Hoselaw Loch, in the parish of Linton, and at Yetholm, eight miles S. of Kelso.

Renfrewshire

In "British Birds," IV., 1910, p. 223, a new colony of about 1,000 birds is mentioned, but the locality is not given.

Berwickshire and Midlothian

The following list is taken from Muirhead's "Birds of Berwickshire" (1895) and Evans' "Fauna of the Tweed Area" (1911).

(1) Everett Moss, near Legerwood.

(2) Bemersyde Loch, near St. Boswell's.

(3) Kirknewton. Eleven miles S.W. of Edinburgh. (Scottish "Naturalist," 1916, p. 298).

(4) Coldingham Moor, near St. Abbs' Head.

(5) Ancrum Moss, near St. Boswell's (Mr. Abel Chapman).

Former colonies now deserted :—

Billie Mire, Dogden Moss, Corsbie Bog, Redpath Bog, "Hen Poo," near Duns.

Dumfriesshire

Mr. Gladstone ("Birds of Dumfriesshire," 1910) has given a most complete account of the gulleries in this county. The list includes 16 breeding stations with an estimated total number of 5,300 nests, and it is much to be regretted that Mr. Gladstone's example has not been followed in other parts of Scotland, since there are no doubt great numbers of stations in adjoining counties of which there is no record. In 1914 ("Scottish Naturalist," 1914, p. 203), Mr. Gladstone revisited most of the gulleries and made a comparison between the numbers in 1909-1910 and 1914. The result is as follows :—

	1909-1910.		1914.	
Cærlaverock Parish				
Eastbanke foreshore	400	nests	4	nests
Closeburn				
Townfoot Loch	300–400	,,	600–800	,,
Dumfries				
Racks	800	,,	800	,,
Durisdeer				
Cleughhead	160–180	,,	3	,,
Maryhill Loch	40–60	,,	0	,,
Eskdalemuir				
Langsawburn Loch	200	,,	100	,,
Tanlawhill	200	,,	30	,,
Foulbog	20	,,	6-8	,,

	1909-10.	1914.
Glencairn		
Loch Urr	1,300 nests	1,200 nests
Stranshalloch Loch	25–40 ,,	80–100 ,,
Kirkmahoe		
Black Loch	500 ,,	0 ,,
Kirkpatrick Fleming		
Raeburn Moss	Hundreds	Decreased
Penpont		
Dhu Loch	800	Loch drained
Ruthwell		
Langbridgemuir	An offshoot of Backs Moss	Deserted
Sanquhar		
Black Loch	200 nests	200 nests
Torthorwald		
Racks Moss	200 ,,	600 ,,

Mr. Gladstone estimates that the total number of nests in 1914 was about 3,600—a considerable decrease.

This summary shows very clearly how the status of this gull changes from year to year, so that a compilation such as I have made from so many sources of such different dates must necessarily contain omissions and errors.

Fifeshire

Tentsmuir. (See "Scottish Naturalist," 1916, p. 298.)

Stirlingshire

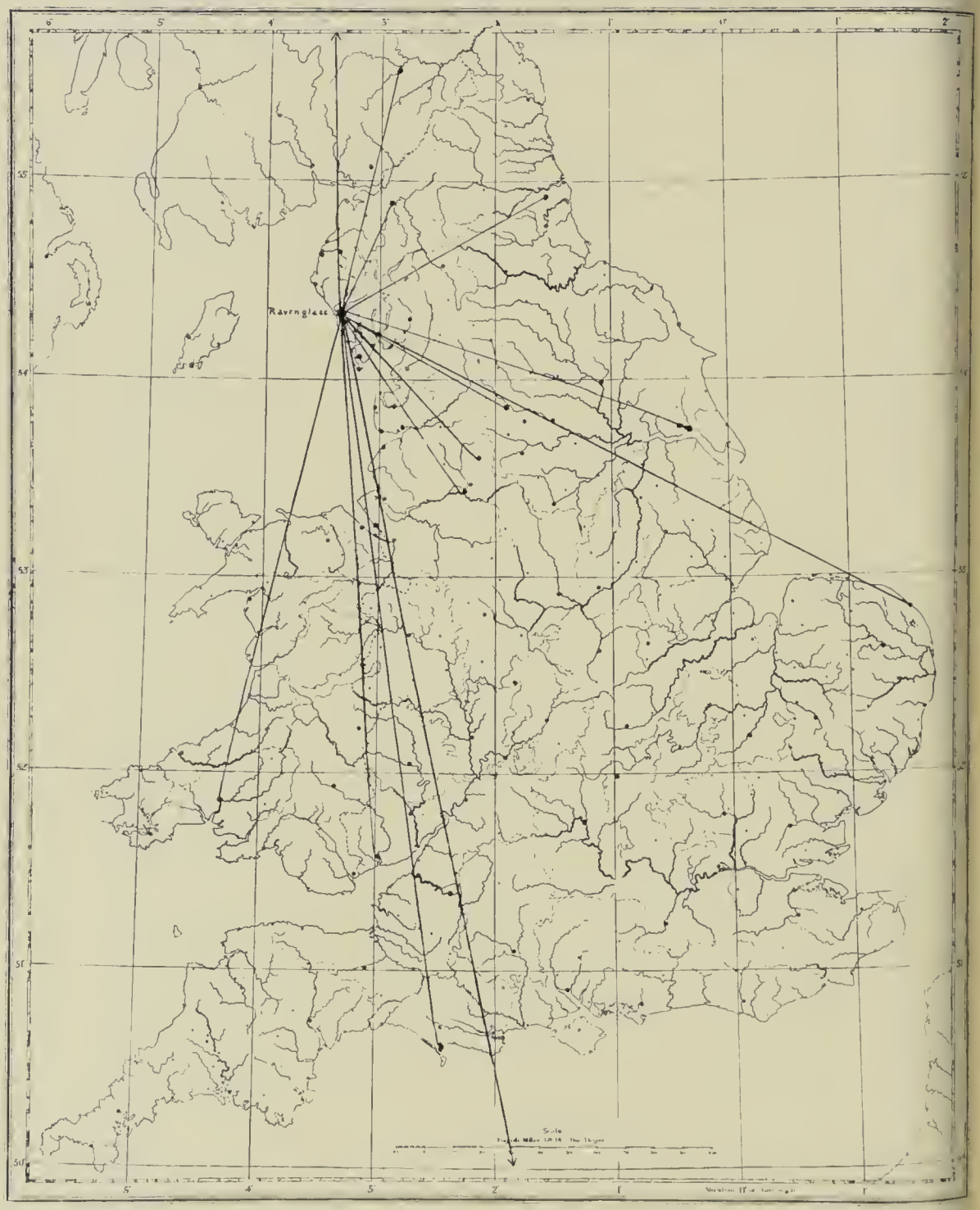
Loch Lomond. Gray ("Birds of the West of Scotland," 1871, p. 476) mentions a large colony on Inchmoin Island which was apparently still in existence in 1898.

Ayrshire

Gray and Anderson ("Birds of Ayrshire," 1869) state that there were then many stations, but mention only Loch Doon.

Colonies are noted at Loch Moan and Loch Wayoch ("Glasgow Naturalist," IV., 1911, p. 2). Once nested at Loudoun Hill, near Darvel ("Ann. of Kilmarnock Glenfield

PLATE IV



Map showing chief lines of movement of Gulls marked at Ravenglass and recovered during July and August of the same year.

Ramblers' Society," 1898-9, p. 46). Rose (*ibid*, 1914-17, p. 76) says that it breeds on many inland lochs, but gives no localities.

Wigtownshire

Castle Loch (Lauder, "Scot. Nat.," 1914, p. 203, and "Glasgow Naturalist," V.)

MIGRATORY MOVEMENTS

Very large numbers of Black-headed Gulls have been marked as nestlings under the scheme inaugurated by the Editor of "British Birds," and of these 515 or 4.3% have been recovered ("British Birds," XI., p. 273). The majority of the birds have been ringed at Ravenglass by Messrs. Robinson and Smalley, and a summary of the results to date was given by the former in 1915 (B.B. VIII., p. 209). Mr. Robinson concludes that the movements of the young gulls may "be described as a scattering—a scattering with a decided southward tendency, along both the West and East Coasts." I have tabulated the history of 162 birds marked at Ravenglass, but find it very difficult to draw any conclusions from the facts. It may reasonably be assumed that birds recovered within two or three months of leaving the nest have moved more or less in direct lines, but as the interval between marking and recovery increases, so the movements of the birds become less certain. So far, therefore, as direct movements are concerned, only those recoveries made within three months can be usefully considered.

The majority of the birds leave the colony about the end of June or beginning of July, and recoveries in July and August are naturally made generally within no great distance from the breeding centre. Of 39 birds recovered in July and August, the majority (23) had moved in a southerly direction, those that were found north of Ravenglass being mostly within the County of Cumberland. Only three crossed the border into Scotland, one of these reaching as far as Milnathort, in Kin-

rosshire. Most of the southerly moving birds took an easterly direction, none of them apparently following the coast of Wales, and a few reached very distant points. For example, one was taken at Landemer, Cherbourg, another at Weymouth., and a third at Eccles, in Norfolk. If the places of recovery are joined on the map to the site of Ravenglass, the lines radiate evenly in all directions, but the longest lines are those to the S.S.E. and S.E., and several records also fall approximately on the same line, indicating that these are the true directions of movement.

The recoveries in September agree very closely with those of July and August, the general direction being again S. to S.E. No birds were recovered in Scotland, but two had struck across to Ireland (Co. Down).

The October records are few (17), and none of these were taken on the south coast, but again the S.E. line is marked by ringed birds being taken on the Wash. This route was also taken by two birds killed in November at Wisbech, and in December in Lincolnshire (Skegness and Sutton Bridge). But the December records are remarkable for the fact that three (out of 13) were captured in France (Finistere, Morbihan, and Cotes du Nord), while one had reached Vigo Bay in Spain.

So far as conclusions can be drawn from such records, it seems that there is a distinct movement in winter to the south, to France, Spain, and probably to the Mediterranean, but that the majority of the birds do not leave this country, but spread themselves over England, mainly in the direction of the east coast.

The records do not give much information as to the position of birds at the breeding season following their marking, but, such as they are, they show a tendency to return to the home colony. Two Ravenglass birds have been retaken in June, at Ravenglass, after two and three years respectively, while two others were found in Cumberland in June, two and four years later. One Ravenglass bird taken at S. Milford in Yorkshire may have joined one of the Yorkshire colonies.

Two birds marked at Delamere Forest have been recovered

at the same colony in later years, but another was found in a colony at Fly Flats, Yorkshire—a very remarkable migration.

A table is appended giving records of recoveries during the spring.

Extensive marking experiments have been carried out at the Rossitten Station (East Prussia), and the results so far as concerns Black-headed Gulls have been described by Thienemann.* He has marked out certain lines of migration, one of which follows along the Baltic and Belgian coasts to the Rhine, and beyond it to Western France, with a branch to England. A number of German birds have been recovered in England, nearly all of which have been taken on the east coast during the winter, but a few have reached England in August and September. It seems probable that these birds do not indicate an intention of wintering in England, but would have continued their migration south to Spain and the Mediterranean.

RECOVERY OF MARKED BIRDS DURING THE BREEDING SEASON

Where marked.	Date.	Where recovered.	Date.
Ravenglass ...	11.6.10	Ravenglass	5.6.12
,, ...	17.6.12	S. Milford, Yorkshire	4.13
,, ...	6.13	Cumberland	5.15
,, ...	,,	Lancashire	4.15
,, ...	,,	Denbigh	5.16
,, ...	8.6.12	Maryport, Cumberland	23.6.16
,, ...	11.6.10	Askam in Furness, Lancs.	4.4.11
,, ...	1.6.12	Newport, Mon. ...	15.3.13
,, ...	1.6.12	Burton Haven, Lincs.	12.3.13
,, ...	19.6.12	Wyke Regis, Dorset	21.3.13
,, ...	5.6.12	Carlisle	4.10
,, ...	19.6.12	Fleetwood, Lancs. ...	3.16
,, ...	7.6.12	Milford Haven, Pemb.	3.16
,, ...	7.6.13	Ravenglass (among nests)	2.5.16
Llyn Mynyddlod	12.6.09	Hebden Bridge Gullery	1.6.12
Denton Fell ...	22.5.10	Annan Harbour ...	19.3.13
Penpont ...	28.6.12	Cockermouth ...	3.13
Delamere Forest	17.6.12	Delamere	16.5.15
Delamere Forest	9.6.13	Fly Flats Colony, Yorks.	5.6.15
Delamere Forest	21.6.14	Lisbon	3.16
Cleughhead, Dumfries ...	2.7.12	Penpont, Dumf. ...	13.6.16
Forvie ...	26.6.10	Scotston Moor, Aberdeen	18.6.12

* Journ. f. Ornith. 1909. Zool. Jahrb. Suppl. II., 1910, p. 665. Journ. f. Ornith. LX., 1912, and LXI., 1913.

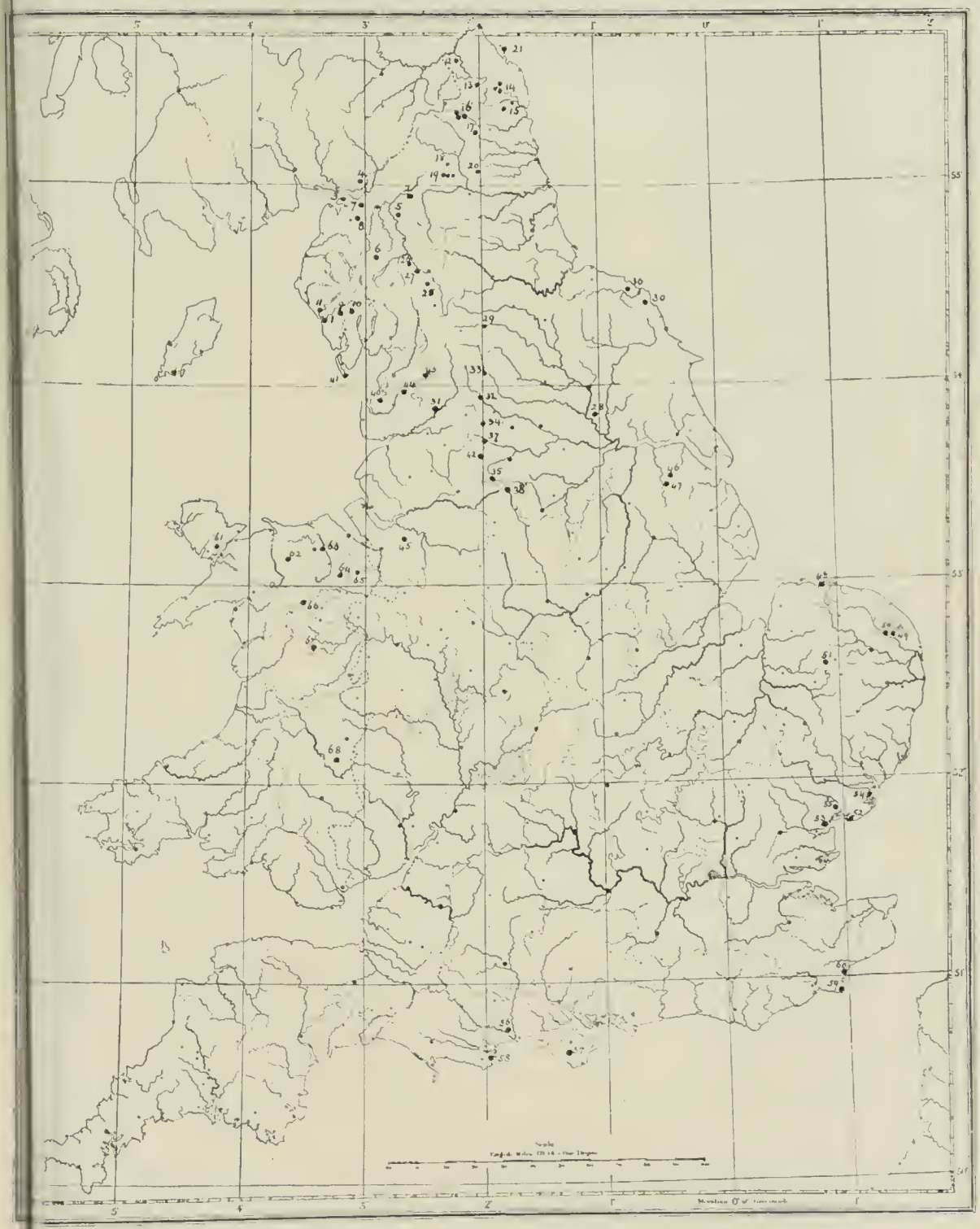
Recovery in England of Gulls marked Abroad

Where marked.	Date.	Where recovered	Date.
Rossitten ...	5.7.06	R. Medina, Isle of Wight	3.10
,, ...	16.7.08	Lowestoft	29.11.10
,, ...	4.7.12	Terrington, Norfolk	10.12
,, ...	,,	Long Sutton, Lincoln	26.11.12
Lübeck, Schleswig	21.6.13	Crassington, Yorkshire	18.8.13
,, ...	,,	Hornsey, nr. London	27.8.13
Fehmarn, Schleswig	11.7.13	Cefn-Mably, Monmouth	26.9.13
Pomerania ...	8.7.13	Sandwich	20.9.13
,, ...	29.6.13	Gravesend, Kent ...	2.11.13
Fehmarn ...	11.7.13	King's Lynn... ...	26.12.13
Rossitten ...	18.7.13	Maidstone	3.1.14
Lübeck ...	25.6.13	Sittingbourne, Kent	27.1.14
Pomerania ...	29.6.13	Breydon, Norfolk ...	14.2.14
Lübeck ...	21.6.13	Portsmouth ...	1.2.14
Texel ...	22.6.13	Chingford, Essex ...	31.1.14
Schleswig ...	7.7.13	Woodton, Norfolk ...	14.1.14

Index of Localities marked on Map

1 Ravenglass
2 Denton Fell
3 Bowness Moss
4 Solway Flow
5 Moorthwaite
6 Greystoke
7 Monkhill Lough
8 Crofton Hall
9 Devoke Water
10 Seathwaite Tarn
11 Drigg
12 Pallinsburn
13 Weetwood
14 Cateran Hill, Kimmer Lough, and Harehope Lough
15 Black Lough
16 Linshiels and Harbottle Tarn
17 Darden Lough
18 Blackaburn
19 Halleypike, Greenlee, Bromlee, and Grinden Loughs
20 Hallington Reservoir
21 Holy Island Lough
25 Sunbiggin
26 Clibburn
27 Bolton Fell
28 Riccal and Skipwith
29 Locker Tarn
30 Whitby
31 Browsholm Tarn
32 Skipton
33 Grassington
34 Oxenhope
35 Diggle
36 Egton
37 Hebden Bridge
38 Stanedge Moor
40 " Winmarleigh " (present site)
41 Walney Island
42 Blackstone Edge
43 Burnemoor
44 Wyresdale
45 Delamere
46 Twigmoor and Scawby
47 Scotton
48 Wells
49 Alderfen
50 Hoveton
51 Scoulton
52 Brightlingsea (St. Osyth)
53 Tollesbury
54 Hamford Waters
55 Fingringhoe
56 Hurn
57 Isle of Wight (locality uncertain)
58 Swanage
59 Dungeness
60 Romney Marsh
61 Anglesey
62 Llyn y Foel Frech
63 Denbigh
64 Brodidris
65 Nanty Frith
66 Bala
67 Llanllugan
68 Painscastle

PLATE V



Existing breeding stations of the Black-headed Gull in England.
For reference list see p. 446.

POSTSCRIPT.

The following additional information regarding gulleries in Northumberland was received, after this paper was in print, from Mr. George Bolam, to whom my thanks are due.

1.—Pallinsburn. There is a tradition that this colony was founded by gulls which were driven from Morebattle, near Kelso, "when the loch there burst" and the water drained away. Mr. Bolam has been unable to trace the date of this event.

2.—There is a small gullery on a pond near Blanchland, 9 miles S.E. of Hexham, which was founded about 20 years ago.

3.—At Coanwood (or Whitfield) Lough, 4 miles from Tyne Bridge, about 50 pairs used to breed some 30 years ago. This year (1919) Mr. Bolam found about a dozen nests, all of which had been robbed.

4.—In 1915 about 50 pairs of gulls nested on Langley Castle Fells on an artificial lake which is used in connection with the lead mines. Despite much plundering of eggs during the war they have continued to nest there.

5.—There used to be an old and strong colony at Wylie Syke, a few miles west of Haltwhistle, but the site has been almost drained by colliery workings, and now very few gulls are left.

IV.

THE FAUNA AND FLORA OF AN ESSEX COMMON.

By W. G. Clarke, F.G.S.

In previous communications to this Society, Mr. W. H. Burrell and I dealt with "The Fauna and Flora of Flordon Common" (Vol. IX., p. 170 *et seq.*), and "A Contribution to a Vegetation Survey of Norfolk" (Vol. IX., p. 743 *et seq.*), and I have also given details of "The Flora of Ringland Hills" (Vol. X., p. 308, *et seq.*). When, therefore, brief intervals of leisure after military duties enabled me in 1918 to study an Essex common, and observe similarities and contrasts to Norfolk commons, I gladly embraced the opportunity. The common is two miles south of Brentwood, in the parish of Little Warley, and is known as Scrub Hill. Most of it consists of the slopes of a valley, but on the south-east there is a plateau. On the east, where it is bordered by Thorndon Park, it has a length of 1,100 yards, and of half a mile on the W. and S.W., where it is bordered by the highway from Brentwood to Little Warley. At its widest part, Scrub Hill is less than a quarter-mile in width, and tapers to a point at each end. The plateau is 297 feet above O.D., and the edges slope fairly steeply to the stream, which is from 100 to 120 ft. below the plateau. This brooklet rises a few hundred yards from the N.W. end of the common, is a somewhat turbulent stream in winter, owing to its rapid fall, but was quite dry during the summer drought of 1918. It leaves the common on the S.E. to join two other streams from Thorndon Park, and thence into the Mar Dyke, a small tributary of the Thames which debouches at Purfleet. The plateau and the tops of the valley slopes are capped by about six feet of Bagshot Gravel, which rests on London Clay, the subsoil of most of the common, and springs emerge at the junction of the beds and trickle down among the herbage to the stream. The plateau and a portion of the eastern slope are covered by a thick scrub of oak and birch 10 to 15 feet in

height, while *Ulex* is dominant on the top of the western slope. Nearer the stream, on the east, there are numerous hornbeam trees of the same height as the oaks and birch, and slightly below them, dense thickets of blackthorn, *Rubus* and *Rosa*, with many clusters of hawthorn, and occasional holly-trees. The ground-water and the stream are not calcareous, and the courses of some of the springs that trickle down the sides of the valley are marked by dense tufts of *Sphagna*. The scrub association provides sufficient shelter for such typical woodland species as *Anemone nemorosa*, *Viola Riviniana*, *Oxalis Acetosella*, *Circæa lutetiana*, *Primula vulgaris*, *Convallaria majalis*, and *Scilla non-scripta*. In summer the bed of the stream is filled with a dense matted growth of *Lychnis Flos-cuculi*, *Lotus uliginosus*, *Apium nodiflorum*, *Mentha aquatica*, *Lycopus europæus*, and *Juncus conglomeratus*, with patches of *Peplis Portula* and *Hypericum elodes*.

In his "Little Guide to Essex" Dr. C. J. Cox says that the London Clay "is remarkable for the limited nature of its flora, owing to the extraordinary dryness and hardness of the surface in the heat of summer." To this is due the fact that almost all the species noted on Scrub Hill are able to endure extremes of moisture and drought, and are therefore among those widely distributed in the British Isles. Of the 259 species detailed hereafter, 188 have been recorded for over 100 vice-counties, 66 for over 50 vice-counties, and only five for less than 50 vice-counties. These are *Cratægus Oxyacantha* (30), *Euphrasia Rostkoviana* (36), *Carpinus Betulus* (37), *Ruscus aculeatus* (29), and *Carex Œderi* (38). Probably only one of these, the Butcher's Broom, is of any real rarity, and of this there is one good patch and several isolated plants on the common. *Calluna* is abundant, *Erica tetralix* is sparsely distributed, but *Erica cinerea* does not occur. *Ulex europæus* is dominant over considerable areas, but *Ulex Gallii*, which is not uncommon on Warley and Upminster Commons, is represented by a very few plants, probably having been almost exterminated by the growth of scrub on the gravel.

Swampy patches near the stream, and occupying the bottoms of shallow valleys leading to the top of the plateau, are occupied by *Sphagna, Juncus, Carex, Deschampsia cæspitosa,* and *Molinia. Achillea Ptarmica* is common on the wetter portions of the London Clay ; *Lathyrus montanus* (the presence of which in Norfolk has never been definitely established) is widespread on the more open portions of the Common ; *Melampyrum pratense* borders footpaths and trackways ; a few small patches of *Moenchia erecta* occur by the roadside ; and *Stachys officinalis* is abundant. Of the 259 species recorded, 135 are found on London Clay only, 90 on both London Clay and Bagshot Gravel, and 34 on Bagshot Gravel only.

The only mammals I saw on the common were the Water Vole (*Arvicola amphibius*), Rabbit (*Oryctolagus cuniculus*), Mole (*Talpa europæa*), and Common Shrew (*Sorex araneus*).

The nesting birds (and in this connection I have to acknowledge the valuable help of Mr. C. J. Derisley, of Stratton Strawless) were the Turtledove (*Turtur Turtur*), Nightjar (*Caprimulgus europæus*), Song-Thrush (*Turdus musicus*), Blackbird (*Turdus merula*), Hedge-Sparrow (*Accentor modularis*), Nightingale (*Philomela luscinia*), Whitethroat (*Sylvia cinerea*), Lesser Whitethroat (*Sylvia curruca*), Willow Warbler (*Phylloscopus trochilus*), Wood Warbler (*P. sibilatrix*), Red-backed Shrike (*Lanius collurio*), Meadow-Pipit (*Anthus pratensis*), Goldfinch (*Carduelis carduelis*), Chaffinch (*Fringilla cælebs*), Linnet (*Linota cannabina*), Bullfinch (*Pyrrhula europæa*), Yellow Bunting (*Emberiza citrinella*), and the Starling (*Sturnus vulgaris*). Many other species were noted. The Turtledoves nested in hawthorn bushes. At least a score pairs of Nightingales frequented the common, and two were greatly superior to the rest in the richness and variety of their song. On April 30th the scrub was alive with Willow and Wood Warblers on migration, and on September 22nd there was an inrush of titmice, marsh, cole, blue, great and long-tailed, all being represented. There was a flock of several thousand starlings on the common on June 12th.

The most abundant butterflies were the Wood Ringlet,

Least Meadow Brown, Small Pearl-bordered Fritillary, Grizzled Skipper, Large Skipper, and Small Copper, while among the moths the Oak Tortrix and Brown Silver-line appeared in swarms.

The following is the list of plants noted by me on Scrub Hill during the summer of 1918 :—

Anemone nemorosa Linn.
Ranuneulus Drouetii F. Schultz
R. hederaceus Linn.
R. Flammula Linn.
R. acris Linn.
R. repens Linn.
R. bulbosus Linn.
R. Ficaria Linn.
Radieula Nasturtium-aquaticum Rendle and Britten
Cardamine pratensis Linn.
C. hirsuta Linn.
Diplotaxis muralis D C.
Reseda Luteola Linn.
Viola Riviniana Reichb.
Polygala serpyllacea Weihe.
Lychnis dioica Linn.
L. Flos-cuculi Linn.
Cerastium viscosum Linn.
C. semidecandrum Linn.
C. vulgatum Linn.
Moenchia erecta Gaertn.
Stellaria media Vill.
S. Holostea Linn.
S. palustris Retz.
S. uliginosa Murr.
Arenaria trinervia Linn.
Sagina procumbens Linn.
Spergularia rubra Pers.
Montia fontana Linn.
Hypericum perforatum Linn.
H. quadrangulum Linn.
H. humifusum Linn.
H. pulchrum Linn.
H. elodes Linn.
Linum catharticum Linn.
Geranium Robertianum Linn.
Oxalis Acetosella Linn.
Ilex Aquifolium Linn.
Euonymus europæus Linn.
Rhamnus Frangula Linn.
Aeer Pseudo-platanus Linn.
Genista anglica Linn.
Ulex europæus Linn.
U. Gallii Planch.
Cytisus scoparius Link
Ononis spinosa Linn.
Trifolium pratense Linn.
T. repens Linn.
T. procumbens Linn.
T. filiforme Linn.
Lotus corniculatus Linn.
L. uliginosus Schkuhr
Ornithopus perpusillus Linn.
Vicia tetrasperma Mœnch.
V. Cracea Linn.
Lathyrus pratensis Linn.
L. montanus Bernh.
Prunus spinosa Linn.
P. avium Linn.

Spiræa Ulmaria Linn.
Rubus idæus Linn.
R. fruticosus Linn.
R. cæsius Linn.
Fragaria vesca Linn.
Potentilla sterilis Garcke
P. procumbens Sibth.
P. reptans Linn.
P. anserina Linn.
Agrimonia Eupatoria Linn.
Rosa tomentosa, Sm.
R. canina Linn.
R. arvensis, Huds.
Pyrus Aucuparia Ehrh.
P. Malus Linn.
Cratægus Oxyacantha Linn.
C. monogyna Jacq.
Peplis Portula Linn.
Epilobium angustifolium Linn.
E. hirsutum Linn.
E. montanum Linn.
E. palustre Linn.
Circæa lutetiana Linn.
Bryonia dioica Jacq.
Hydrocotyle vulgaris Linn.
Apium nodiflorum, Reichb. fil.
Ægopodium Podagraria Linn.
Pimpinella saxifraga Linn.
Conopodium majus Loret.
Anthriscus sylvestris Bernh.
Œnanthe fistulosa Linn.
Silaus flavescens Bernh.
Angelica sylvestris Linn.
Heracleum Sphondylium Linn.
Daucus Carota Linn.
Hedera Helix Linn.
Sambucus nigra Linn.
Lonicera Periclymenum Linn.
Galium Mollugo Linn.
G. saxatile Linn.
G. palustre Linn.
G. Aparine Linn.
Scabiosa Succisa Linn.
S. arvensis Linn.
Eupatorium cannabinum Linn.
Solidago Virgaurea Linn.
Bellis perennis Linn.
Gnaphalium uliginosum Linn.
Pulicaria dysenterica Gray
Achillea Millefolium Linn.
A. Ptarmica Linn.
Chrysanthemum Leucanthemum Linn.
Matricaria inodora Linn.
Tussilago Farfara Linn.
Senecio vulgaris Linn.
S. sylvaticus Linn.
S. erucifolius Linn.
S. Jacobæa Linn.
S. aquaticus Hill
Arctium minus Bernh.
Cnicus lanceolatus Willd.
C. palustris Willd.
C. arvensis Hoffm.
Centaurea nigra Linn.
Lapsana communis Linn.
Crepis capillaris Wallr.
Hieracium Pilosella Linn.
H. sabaudum b. *boreale* (Fr.).
H. umbellatum Linn.
Hypochœris radicata Linn.
Leontodon hispidum Linn.
L. autumnale Linn
Taraxacum officinale Weber

Campanula rotundifolia Linn.
Calluna vulgaris Hull
Erica Tetralix Linn.
Primula vulgaris Huds.
Anagallis arvensis Linn.
A. tenella Murr.
Fraxinus excelsior Linn.
Ligustrum vulgare Linn.
Centaurium umbellatum, Gilib.
Myosotis scorpioides Linn.
M. arvensis Hill
Solanum Dulcamara Linn.
Linaria vulgaris Mill.
Scrophularia nodosa Linn.
Digitalis purpurea Linn.
Veronica agrestis Linn.
V. Chamædrys Linn.
V. officinalis Linn.
V. Beccabunga Linn.
Euphrasia Rostkoviana Hayne
Bartsia Odontites Huds.
Pedicularis sylvatica Linn.
Melampyrum pratense Linn.
Mentha aquatica Linn.
M. arvensis Linn.
Lycopus europæus Linn.
Thymus Serpyllum Linn.
Nepeta hederacea Trev.
Prunella vulgaris Linn.
Stachys officinalis Trev.
S. sylvatica Linn.
Teucrium Scorodonia Linn.
Ajuga reptans Linn.
Plantago major Linn.
P. media Linn.
P. lanceolata Linn.
P. Coronopus Linn.
Chenopodium album Linn.
Polygonum aviculare Linn.
P. Hydropiper Linn.
P. minus Huds.
P. Persicaria Linn.
P. lapathifolium Linn.
Rumex conglomeratus Murr.
R. obtusifolius Linn.
R. crispus Linn.
R. Hydrolapathum Huds.
R. Acetosa Linn.
R. Acetosella Linn.
Urtica dioica Linn.
Betula alba Linn.
B. tomentosa Reith and Abel
Carpinus Betulus Linn.
Corylus Avellana Linn.
Quercus Robur Linn.
(a) *pedunculata* (Ehrh.)
Castanea sativa Mill
Fagus sylvatica Linn.
Salix caprea Linn.
S. aurita Linn.
S. repens Linn.
Populus alba Linn.
P. tremula Linn.
Orchis maculata Linn.
Tamus communis Linn.
Ruscus aculeatus Linn.
Convallaria majalis Linn.
Scilla non-scripta Hoffmgg and Link.
Juncus bufonius Linn.
J. squarrosus Linn.
J. inflexus Linn.
J. conglomeratus Linn.

J. articulatus Linn.
Luzula pilosa Willd.
L. sylvatica Gaud.
L. campestris D C.
Sparganium erectum Linn.
Lemna minor Linn.
Alisma plantago-aquatica Linn.
Eleocharis palustris Roem. and Schult.
Scirpus setaceus Linn.
S. lacustris Linn.
Carex pulicaris Linn.
C. leporina Linn.
C. Goodenowii Gay
C. flacca Schreb.
C. pilulifera Linn.
C. caryophyllea Latourr.
C. pallescens Linn.
C. panicea Linn.
C. flava Linn.
C. Œderi Retz.
C. hirta Linn.
Anthoxanthum odoratum Linn.
Alopecurus pratensis Linn.
Phleum pratense Linn.
Agrostis canina Linn.
A. alba Linn.
A. tenuis Sibth.
Aira præcox Linn.
Deschampsia cæspitosa Beauv.
D. flexuosa Trin.
Holcus mollis Linn.
Arrhenatherum elatius Mert. and Koch
Sieglingia decumbens Bernh.
Cynosurus cristatus Linn.
Molinia cœrulea Mœnch.
Dactylis glomerata Linn.
Briza media Linn.
Poa annua Linn.
P. pratensis Linn.
Glyceria fluitans Br.
G. aquatica Wahlb.
Festuca Myuros Linn.
F. ovina Linn.
F. rubra Linn.
F. elatior Linn.
Bromus sterilis Linn.
B. hordeaceus Linn.
Brachypodium sylvaticum Roem. and Schult.
Lolium perenne Linn.
Nardus stricta Linn.
Pteris aquilina Linn.
Lastrea Filix-mas Presl.
L. spinulosa Presl.
Ophioglossum vulgatum Linn.
Equisetum maximum Linn.
E. arvense Linn.
E. palustre Linn.
E. limosum Linn.

The mosses and liverworts, gathered in March, were kindly identified by Mr. W. H. Burrell, F.L.S., as follows :—

Sphagnum cymbifolium, Warnst.
S. papillosum, Lindb.
S. subnitens, Russ and Warnst.
S. recurvum var. mucronatum, Warnst.
S. rufescens, Warnst.

S. acutifolium, Russ and Warnst.
Tetraphis pellucida
Polytrichum juniperinum
P. formosum
Dicranella heteromalla
Dicranum scoparium
Aulacomnium palustre
A. androgynum
Webera nutans
W. proligera
Mnium hornum
Thuidium tamariscinum
Eurhryncium prælongum
Plagiothecum denticulatum
Hypnum cupressiforme
H. cuspidatum
Pellia epiphylla
Lophocolia heterophylla
Cephalozia bicuspidata

Most of these indicate a peaty soil, mild humus such as is found on woodland floors and sandy heaths.

V.

METEOROLOGICAL NOTES, 1918.

(From observations taken at Norwich).

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

January.

The first half of the month was very winterly, with frequent snow. On the 16th snow was 9 inches deep on the level. On the night of the 8th the thermometer fell to 16.3 deg. in the screen and to 12.2 deg. on the grass, and there were several other very cold nights. The highest day reading on 8th was 25.2 deg., the lowest recorded by day since the 4th January, 1894. The second half of the month was abnormally mild, bringing aconites and snowdrops into flower a month earlier than in the previous year. Sunshine was 11.1 hours above

the average. Mean temperature was in exact agreement with the average, and rainfall 1.24 ins. in excess.

February.

With the exception of some sharp frosts in the third week, this month exhibited but few winterly traits. For eight days in succession (5th to 12th) the thermometer exceeded 50 deg. by day, and failed to fall below 40 deg. by night. On the 23rd it reached 58 deg. Sunshine was 3.2 hours above the average, mean temperature 4.2 deg. above, and rainfall .29 ins. deficient.

March.

This month was exceedingly dry, having been the driest March since 1910. There was much variation of temperature. While some days were exceedingly cold, there were many warm, summerlike days, particularly in the week ending March 24th, when on each of the last three days the thermometer exceeded 66 deg., and on the 23rd nearly touched 70 deg. Sunshine was 18.4 hours in excess of the normal, mean temperature 1.4 deg. above, and rainfall .82 ins. below the average.

April.

April was a very unkindly month, and although the mean temperature was nearly 3 deg. in excess of that of the previous April, there was hardly a day which could be called really warm. 1.68 ins. of rain fell on the 15th, being the greatest one-day fall recorded here since the " Norwich Flood " of August, 1912, and considerable snow fell on the 18th, 19th, and 20th. The dull, cold, uncongenial weather which prevailed during the greater part of the month had a disatrous effect on the fruit blossom, which had come on very early after the mild February and March, and resulted in a very poor crop of apples, pears, and plums. Sunshine was 11.0 hours less than the average, mean temperature 2.3 deg. deficient, and rainfall 1.76 ins. in excess.

May.

As in the previous May, the weather conditions sprang with one bound from winter to summer, and the month was very warm throughout. It was the third May in succession with the mean temperature considerably above the average. The third week was the warmest, with readings of 80 deg. and upwards on three days. There was no frost either in the screen or on the grass. It was a very dry month, rain falling on five days only, and the surface of the soil was much parched. Sunshine was as much as 52.7 hours above the average, mean temperature 3.3 deg. above, and rainfall .97 ins. deficient.

June.

The drought of May continued during June, and although there were local storms in places, round the 17th, which yielded considerable rains, there was no day here with more than a tenth-of-an-inch until the 25th. On the evening of that day there was a heavy rainstorm, accompanied by thunder and lightning, yielding .58 ins., which was a welcome supply, and at once refreshed the thirsty soil. It was generally a cold month, and several days and nights were exceptionally cool for the season, and there was ground frost in exposed places. The mean minimum temperature of the month was the lowest in June since 1886. Sunshine was, however, 26.3 hours above the average, mean temperature 1.9 deg. below average, and rainfall .83 ins. deficient.

July.

To the 10th the weather was fine and dry, with moderate heat. Much thunder and rain ensued until the 26th, and some of the storms were very severe, that on the evening of the 17th being accompanied by most brilliant lightning and the most deafening crashes of thunder. Sunshine was 5.0 hours above the normal, mean temperature in fair agreement with the average, and rainfall .74 ins. in excess.

August.

This was a very fine and hot month, and, with the exception of the first and last weeks, in which some showers fell, was practically rainless. The 20th, 21st, and 22nd were very hot, the maxima having been 81, 84.2, and 90.8 deg. respectively. The last-named day was the warmest since the 9th August, 1911. A great drop of temperature occurred on the 23rd, and some of the days in the last week were also cool. Thunderstorms on the 3rd and 26th. Sunshine was 2.9 hours deficient, mean temperature 1.5 deg. above, and rainfall 0.75 ins. below their respective averages.

September.

Much rough and rainy weather prevailed during this month, and it was the wettest September in Norwich since 1876. Many days were exceedingly windy, and on the night of the 9th-10th there was a strong gale, with violent gusts. The temperature was generally fairly seasonable, with no excess of heat, and no very cold nights. Fortunately the bulk of the harvest in Norfolk was gathered in before the heavy rains commenced, but in late districts the ingathering was much impeded. Bright sunshine was astonishingly large for so rainy a period, and was 17.7 hours above the average. Mean temperature was 1.9 deg. below the normal, and the rainfall (4.65 ins.) 2.04 ins. in excess.

October.

This month was generally gloomy and damp, with but few warm days, and frequent rain. Although the days were for the most part cold for the season, there was no frost registered in the screen, and the ground frosts were slight. Sunshine was very deficient, and the contrast in the amount recorded in this and in the previous October was remarkable, the total in 1917 have been 163.2 hours, and in 1918 only 57.3 hours, the total of the latter month showing a deficiency of 47.7 hours. Mean temperature was 1.2 deg. below the average, and the rainfall 0.16 ins. deficient.

November.

The month entered with mild weather, and there was a heavy fall of rain, amounting to 0.86 ins. on the 3rd. From the 12th day to the 23rd there was no rain, and the weather was very fine, bright, and dry. During this period morning frosts were of daily occurrence, but in the last week mildness again prevailed, with frequent fog and light rain. There was a great absence of wind during the entire month. Sunshine was unusually excessive, and was 14.8 hours above the average. Mean temperature 1.5 deg. below the normal, and rainfall 0.64 ins. under the mean.

December.

Mildness and wet were the predominant features of this month, the high maximum temperature of 57.8 deg. having been recorded on the 3rd. Sunshine was slightly under the average, and 15 days were sunless. There was but little frost, and snow was conspicuous by its almost entire absence. Mean temperature was as much as 5.0 deg. above the average, and rainfall 1.81 ins. above.

The Seasons.

Tables of Mean Temperature and Rainfall of the four seasons of 1918, together with those of the five previous years, and compared with the average.

Temperature.

Seasons.	1913.	1914.	1915.	1916.	1917.	1918.	Average	Departure of 1918 from average.
	degrees	degrees	degrees	degrees	degrees	degrees	degrees	degrees
Winter -	41·2	40·3	39·7	41·7	35·4	38·7	38·4	+ 0·3
Spring -	48·6	48·5	46·4	47·6	44·9	47·5	46·3	+ 1·2
Summer -	58·4	61·8	60·2	58·8	62·2	60·0	60·2	— 0·2
Autumn -	52·3	51·0	48·6	50·6	50·0	48·6	50·1	— 1·5
Year - - (Jan. to Dec.)	49·8	50·5	48·8	49·3	48·0	49·4	48·8	+ 0·6

RAINFALL.

Seasons.	1913.	1914.	1915.	1916.	1917.	1918.	Average	Departure of 1918 from average
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Winter -	6·34	4·66	13·35	10·41	6·55	5·63	5·37	+ 0·26
Spring -	5·84	5·45	5·18	8·20	6·27	5·10	5·13	— 1·17
Summer -	4·88	5·25	7·47	7·63	8·61	6·03	6·87	— 0·84
Autumn -	9·15	6·38	6·58	7·39	8·03	9·62	8·38	+ 1·24
Year - - (Jan. to Dec.)	24·42	27·62	29·97	32·68	27·82	28·88	25·75	+ 3·13

The Winter, while subject to the fluctuations above alluded to, did not give results, on the mean, much departing from the average, either in temperature or rainfall. Owing to the warm May, the Spring quarter gave an excess of temperature, but the rainfall was less than that of any Spring quarter since 1912. Summer yielded an equable temperature and a slight excess of rain, but the Autumn was both cold and wet.

THE YEAR.

The mean temperature of the year was half a degree above the normal, and the rainfall (28.88 ins.) was 3.13 ins. in excess. Of the last ten years only one (1913) gave less than the average amount of rain. The total amount of sunshine, as registered by Mr. J. H. Willis, was 46 hours excessive, but was 33 hours less than in the previous year. The brightest month was May, with 258.7 hours of sunshine. Harvest commenced in Norfolk generally about August 9th, and proceeded very rapidly during the magnificent weather with which it was favoured in the earlier days. The wet September, however, was very unfavourable for the later crops, and in many places harvest was not completed until October.

MR. PRESTON'S METEOROLOGICAL RECORDS FOR 1918.

Month. 1918.	BAROMETER. Highest.	Date.	Lowest.	Date.	Mean.	THERMOMETER. Highest.	Date.	Lowest.	Date.	Mean.	HYGROMETER. Mean Relative Humidity 9 a.m.	SUNSHINE. Hours.	RAINFALL. Inches.	No. of Days.	WIND. Direction and Days. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Mean estimat'd force
	in.		in.		in.	°		°		°	%												
Jan.	30.45	3	29.22	7	29.927	55.0	24	16.3	9	37.6	91	63.1	2.94	21	3	0	1	1	10	6	6	4	3.0
Feb.	30.73	25	29.42	28	30.128	58.0	23	23.2	18	42.9	86	82.1	1.22	14	1	1	1	5	5	6	8	1	3.7
March	30.44	21, 22	29.19	31	30.033	69.5	23	24.0	9	42.9	80	142.5	0.85	11	2	3	8	2	4	5	2	5	3.0
April	30.18	30	29.33	1	29.899	59.2	26	30.9	21	44.0	84	114.8	3.46	17	10	9	2	1	1	2	3	2	2.9
May	30.44	31	29.55	13	30.028	81.0	17	40.6	3	55.5	70	258.7	0.79	5	7	6	5	5	3	3	1	1	2.9
June	30.45	1	29·67	19	30.041	77.2	2	38.4	6	56.2	67	232.4	1.08	11	5	3	1	2	2	2	10	5	3.4
July	30.41	4	29.56	23	29.906	80.0	16	45.7	10	61.4	74	215.4	3.48	17	3	2	1	5	4	10	4	2	3.4
Aug.	30.28	10	29.57	6	29.962	90.8	22	47.0	30	62.5	74	181.6	1.47	10	2	0	2	1	1	9	7	9	3.3
Sept.	30.04	25	29.20	23	29.696	72.2	16	36.4	29	55.2	82	167.2	4.65	26	1	0	2	3	8	7	9	0	3.9
Oct.	30.30	29	29.60	16	29.964	62.0	6	33.8	1	48.7	86	57.3	2·86	19	4	2	0	2	7	9	1	6	2.5
Nov.	30.55	13	29.44	2	30.047	59.0	1	26.0	20	41.9	91	78.0	2.11	17	4	2	3	5	9	2	2	3	1.9
Dec.	30.30	14	29.07	18	29.778	57.8	3	30.0	26	43.9	91	35·6	3.97	29	1	0	0	1	6	8	12	3	3.0
Means					29.951					49·4	81												3.1
Extremes & Totals	30.73	Feb. 25	29.07	Dec. 18		90.8	Aug. 22	16.3	Jan. 9			1628.7	28.88	197	43	28	26	33	60	69	65	41	

APPENDIX.

Annexed is a summary of the results obtained from meteorological and phenological observations during the ten years 1908-1917, being a continuation of the tables given in Vol. VI. of "Transactions," pp. 342-347, and Vol. VIII., pp. 739-746.

TABLE I.

Absolute highest monthly and annual shade temperature during the ten years 1908-1917.

Year.	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1908	54.6	52.0	61.4	59.6	77.2	79.0	80.5	81.0	76.6	78.4	56.8	49.0	81.0
1909	49.0	53.2	59.6	70.0	80.4	71.4	74.8	83.2	74.0	66.6	54.0	52.6	83.2
1910	53.2	55.0	58.6	61.1	80.0	79.0	73.0	73.5	71.5	71.2	51.0	52.8	80.0
1911	53.0	56.2	57.0	68.5	75.0	78.2	91.1	93.5	90.5	62.3	58.4	52.2	93.5
1912	49.7	60.0	62.5	69.5	82.0	80.0	86.5	71.0	64.0	62.8	58.0	57.2	86.5
1913	51.8	54.8	55.8	67.5	81.2	83.1	74.0	81.1	73.0	65.1	58.0	53.8	83.1
1914	53.2	56.5	65.6	70.8	80.0	86.7	87.3	82.0	81.2	65.2	59.0	54.0	87.3
1915	52.0	50.2	60.0	70.0	73.8	89.5	82.3	76.0	74.8	64.8	52.8	55.8	89.5
1916	56.2	53.6	61.0	75.4	83.0	71.5	82.0	80.2	71.0	67.7	60.0	55.0	83.0
1917	55.0	49.0	58.0	60.2	78.0	90.4	82.3	76.2	73.5	70.1	56.4	51.0	90.4
Extremes 1908-17	56.2	60.0	65.6	75.4	83.0	90.4	91.1	93.5	90.5	78.4	60.0	57.2	93.5
Extremes 1888-1917	56.2	64.0	70.0	75.4	83.0	90.4	91.1	93.5	93.0	78.4	62.8	57.2	93.5

TABLE II.

Absolute lowest monthly and annual shade temperature during the ten years 1908-1917.

Year.	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1908	17.0	29.0	26.0	28.2	39.8	39.8	45.0	43.0	37.0	30.6	23.4	22.6	17.0
1909	20.8	22.6	20.4	27.2	29.2	36.4	46.7	44.8	40.0	28.8	25.8	23.0	20.4
1910	20.8	28.2	28.4	27.4	31.4	40.7	46.2	48.2	41.6	40.8	25.4	27.2	20.8
1911	26.5	20.2	30.0	26.5	34.8	39.0	44.0	46.2	37.0	30.8	28.0	29.5	20.2
1912	21.5	18.0	31.9	28.8	31.8	44.8	47.5	43.0	38.4	30.2	28.6	25.2	18.0
1913	23.7	26.5	28.3	29.0	37.0	42.0	42.7	41.5	39.5	31.7	27.0	24.8	23.7
1914	23.3	29.8	29.6	30.5	32.4	38.4	46.0	44.7	37.2	33.8	28.1	25.8	23.3
1915	28.0	28.8	22.8	30.3	32.0	37.2	47.5	42.8	37.0	31.8	23.0	29.0	22.8
1916	30.0	27.4	25.5	30.0	37.0	40.7	47.1	43.2	39.2	29.7	26.2	26.4	25.5
1917	24.7	8.7	20.4	17.0	33.0	44.3	44.0	49.0	42.2	26.8	31.7	18.0	8.7
Extremes 1908-17	17.0	8.7	20.4	17.0	29.2	36.4	42.7	41.5	37.0	26.8	23.0	18.0	8.7
Extremes 1888-1917	7.2	4.0	12.0	17.0	29.2	34.8	36.6	38.5	32.0	25.0	14.0	13.0	4.0

TABLE III.

Mean monthly and annual temperature during the ten years 1908-1917.

Year.	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
1908	35.9	40.6	39.9	42.9	56.0	58.9	61.5	59.0	56.7	53.5	44.7	38.7	49.0
1909	37.1	36.7	39.6	48.6	51.8	54.2	59.7	61.2	54.8	52.2	41.8	38.9	48.1
1910	37.8	40.7	42.7	46.6	53.0	59.2	58.3	61.1	55.8	52.8	38.5	42.9	49.1
1911	37.7	3919	41.4	46.6	55.5	58.6	65.3	66.8	59.3	50.1	43.2	41.9	50.5
1912	38.5	41.9	45.8	47.6	54.8	59.1	63.5	57.4	52.7	47.2	43.0	43.3	49.6
1913	39.3	40.9	44.0	46.7	55.1	58.5	57.6	59.2	58.5	51.9	46.6	39.9	49.8
1914	37.1	44.0	43.4	49.6	52.5	58.9	63.6	63.0	57.4	51.1	44.4	40.7	50.5
1915	38.9	39.5	41.4	46.1	51.7	58.6	61.1	60.8	57.3	49.1	39.5	41 9	48.8
1916	44.5	38.7	39.5	48.0	55.3	53.9	60.2	62.2	56.0	51.4	44.4	37.3	49.3
1917	35.2	33.7	37.1	41.2	56.4	62.6	62.3	61.8	58.4	45.9	45.7	35.5	48.0
Mean 1908-17	38.2	39.7	41.5	46.4	54.2	58.3	61.3	61.2	56.7	50.5	43.2	40.1	49.3
Mean 1888-1917	37.9	38.7	41.7	46.2	52.6	58.2	61.3	60.9	57.2	50.0	43.8	39.2	49.0

TABLE IV.

Monthly and annual rainfall during the ten years 1908-1917.

Year.	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
1908	1.13	2.17	2.51	2.67	1.79	1.20	3.49	2.61	2.91	1.40	1.63	1.65	25.16
1909	1.02	.74	2.98	1.36	1.34	3.26	3.02	1.87	1.80	4.04	1.48	4.91	27.82
1910	2.76	2.29	.87	2.37	3.86	1.88	4.08	1.66	1.58	1.67	4.33	4.49	31.84
1911	2.17	1.89	2.82	1.51	1.78	3.02	.74	.74	2.10	2.78	3.14	3.98	26.67
1912	2.65	1.37	2.34	.39	.87	2.13	3.85	11.27	2.62	1.89	3.07	2.58	35.03
1913	2.92	.84	2.32	2.36	1.16	.72	2.63	1.53	3.05	3.83	2.27	.79	24.42
1914	2.14	1.73	3.62	.80	1.03	1.57	3.04	.64	1.13	2.31	2.94	6.67	27.62
1915	3.24	3.44	1.94	.80	2.44	.93	3.73	2.81	1.53	2.01	3.04	4.06	29.97
1916	1.83	4.52	3.69	1.93	2.58	3.23	1.05	3.35	1.57	2.92	2.90	3.11	32.68
1917	2.20	1.24	3.18	2.37	.72	1.54	2.46	4.61	2.34	3.52	2.17	1.47	27.82
Means 1908-17	2.21	2.02	2.63	1.66	1.76	1.95	2.81	3.11	2.06	2.64	2.70	3.35	28.90
Means 1888-17	1.98	1.72	2.07	1.67	1.92	2.04	2.65	2.62	1.91	2.82	2.51	2.54	26.45

TABLE V.

Prevailing direction of wind in each month during the ten years 1908-1917.

Year.	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1908	S.	W.	W.	N.E.	W.	N.E.	N.	W.	W.	S.E.	S.E.	S.
1909	W.	N.W.	S.	S.	E.	N.	W.	W.	E.	S.	N.W.	W.
1910	W.	S.	N.	W.	N.E.	N.E.	N.	W.	N.	E.	N.W.	S.
1911	S.W.	N.W.	E.	W.	E.	W.	W.	W.	N.W.	N.E.	S .	S.
1912	W.	S.	S.	N.E.	N.W.	S.W.	E.	S.W.	E.	W.	W.	S.W.
1913	S.	S.	W.	S.	S.	N.W.	N.W.	N.	S.E.	S.	W.	W.
1914	W.	S.	W.	E.	N.E.	N.W.	W.	S.	N.W.	E.	W.	S.
1915	W.	S.	N.W.	W.	N.E.	N.E.	W.	N.W.	N.W.	S.E.	N.W.	S.
1916	S.W.	W.	N.E.	N.W.	S.E.	W.	N.E.	N.	N.	S.	S.	W.
1917	E.	E.	N.	N.	E.	S.W.	N.E.	S.W.	S.W.	W.	W.	N.E.
Prevailing monthly direction.	W.	S.	W.	W.	N.E.	N.E.	W.	W.	N.W.	S.	W.	S.

TABLE VI.

Number of days on which the wind blew from the eight points each month from 1908-1917.

Month.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
January	23	19	38	17	51	47	74	41
February	18	15	25	24	66	45	49	41
March	43	32	34	23	39	44	63	32
April	45	40	40	21	34	34	48	38
May	32	57	47	39	31	31	44	29
June	46	44	35	19	36	42	40	38
July	48	38	24	16	34	47	66	37
August	50	16	25	22	42	50	71	34
September	50	25	45	27	25	34	39	55
October	20	25	40	47	59	41	44	33
November	23	13	25	24	42	49	78	46
December	19	15	25	21	73	57	59	41

TABLE VII.

Number of days on which the wind blew from the eight points in each year from 1908-1917.

Year.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
1908	40	35	36	38	59	43	76	39
1909	45	35	41	27	45	53	66	53
1910	47	41	28	27	52	50	70	50
1911	45	42	39	28	49	50	73	39
1912	35	18	45	21	59	61	75	52
1913	37	28	44	39	64	46	64	43
1914	28	30	52	29	59	54	69	44
1915	49	42	37	28	52	43	58	56
1916	47	29	33	38	55	52	63	48
1917	44	39	48	25	38	69	61	41
Average days 1908-1917	42	34	40	30	53	52	68	46
Average days 1888-1917	35	38	37	30	45	61	65	54

Table VIII.

Dates of first leafing of Deciduous Trees, etc., during the ten years 1908-1917.

Trees, etc. Leafing.	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Averages. 1908-17	Averages. 1888–1917
Hawthorn	Mch. 13	Apl. 3	Mch. 9	Mch. 2	Feb. 28	Jan. 26	Feb. 24	Mch. 10	Jan. 28	Apl 22	Mch. 5	Mch. 15
Sycamore	Apl. 13	Apl. 17	Apl. 13	Apl. 18	Mch. 27	Mch. 21	Apl. 3	Apl. 15	Apl. 15	May 1	Apl. 11	Apl. 8
Horse Chestnut	Apl. 13	Apl. 12	Apl. 5	Apl. 11	Mch. 23	Mch. 14	Apl. 2	Apl. 7	Apl. 7	Apl. 30	Apl. 6	Apl. 6
Lime	Apl 30	Apl. 18	Apl. 20	Apl. 17	Mch. 27	Apl. 1	Apl. 3	Apl. 14	Apl. 15	May 3	Apl. 15	Apl. 16
Birch	May 1	Apl. 17	Apl. 20	Apl. 19	Mch. 23	Apl. 3	Apl. 6	Apl. 16	Apl. 18	May 3	Apl. 15	Apl. 20
Beech	May 4	Apl. 23	Apl. 20	Apl. 20	Apl. 8	Apl. 16	Apl. 11	Apl. 25	Apl. 21	May 2	Apl. 21	Apl. 24
Elm	May 3	Apl. 27	Apl. 20	Apl. 16	Mch. 28	Mch. 6	Apl. 5	Apl. 15	Apl. 17	May 9	Apl. 14	Apl. 23
Maple	May 10	May 6	Apl. 28	May 7	Apl. 11	Apl. 3	Apl. 12	May 2	Apl. 25	May 13	Apl. 27	Apl. 29
Oak	May 11	May 6	May 5	May 6	Apl. 16	Apl. 19	Apl. 14	May 5	May 3	May 13	May 1	May 3
Ash	May 15	May 22	May 13	May 13	May 5	May 7	May 3	May 5	May 5	May 19	May 11	May 13
Foliage generally complete	June 3	June 13	June 3	May 31	May 19	May 30	June 3	June 6	May 27	June 2	June 1	June 3

Table IX.

Date of first flowering of Indigenous Plants and other natural phenomena during the ten years 1908-1917.

Plants, etc. flowering.	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Averages. 1908-17	Averages. 1888-1917
Anemone nemorosa ... (Wood anemone)	Apl. 7	Apl. 6	Mch. 20	Mch. 23	Mch 21	Mch 2	Mch. 26	Mch. 27	Mch. 19	Apl. 25	Mch. 27	Mch. 29
Ranunculus ficaria ... (Lesser celandine) ...	Apl. 2	Jan. 14	Mch. 6	Mch. 19	Feb. 26	Feb. 6	Mch. 15	——	Mch. 24	——	Mch. 3	Mch. 3
Caltha palustris ... ... (Marsh marigold) ...	Apl. 12	Apl. 19	Mch. 11	Mch. 6	Mch. 1	Mch. 22	——	Feb. 11	Apl. 3	May 4	Mch. 24	Mch. 21
Cardamine pratensis ... (Cuckoo flower) ...	May 10	May 4	Apl. 28	May 11	Apl. 11	——	——	May 2	Apl. 22	May 16	May 3	Apl. 30
Sisymbrium alliaria ... (Hedge mustard) ...	May 7	May 3	Apl. 20	May 2	Apl. 11	Apl. 19	Apl. 21	Apl. 28	Apl. 30	May 13	Apl. 27	Apl. 24
Lychnis diocia ... ... (Red campion)	May 24	May 6	May 8	——	May 3	May 12	May 28	May 29	May 29	June 7	May 19	May 7
Stellaria holostea... ... (Great stitchwort)	May 7	Apl. 29	Apl. 24	Apl 21	Apl. 4	Mch. 21	Apl. 12	Apl. 15	Apl. 25	May 10	Apl. 20	Apl. 14
Æsculus hippocastanum ... (Horse chestnut) ...	May 12	May 4	May 5	May 6	Apl. 22	Apl. 28	Apl. 28	May 9	May 3	May 19	May 5	May 7
Trifolium repens ... ... (White clover)	June 2	May 30	May 29	May 21	May 23	June 4	May 17	May 27	May 27	June 1	May 27	May 28
Prunus spinosa ... ... (Blackthorn)	May 8	Apl. 18	Apl. 20	Apl. 18	Mch. 26	Mch. 30	Apl. 5	Apl. 4	Apl. 9	May 10	Apl. 14	Apl. 14
Rosa canina ... ... (Dog Rose) ...	June 11	June 15	June 7	June 4	May 19	June 2	May 29	June 7	June 6	June 12	June 5	June 10
Cratægus oxyacantha ... (Hawthorn)	May 20	May 18	May 16	May 9	Apl. 27	May 7	Apl. 27	May 15	May 12	May 24	May 11	May 13

TABLE IX. *Continued.*

Date of first flowering of Indigenous Plants and other natural phenomena during the ten years 1908-1917.

Plants, etc. flowering.	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Averages. 1908-17	Averages. 1888-1917
Anthriscus sylvestris ... (Wild parsley) ...	May 10	May 5	Apl. 21	May 5	Apl. 8	——	Mch. 29	May 2	Apl 24	May 13	Apl. 26	Apl. 23
Chærophyllum tem. ... (Rough chervil)	June 7	May 30	May 29	May 21	May 16	May 22	May 24	June 3	May 28	June 8	May 28	June 1
Chrysanthemum leuc. ... (Ox-eye daisy) ...	June 1	May 25	May 23	——	May 9	May 22	May 25	May 20	May 18	May 27	May 22	May 21
Veronica chamædrys ... (Germander speedwell)	May 10	May 6	Apl. 25	May 9	Apl. 25	——	——	May 2	May 5	——	May 3	Apl. 28
Nepeta glechoma ... (Ground ivy)	——	Apl. 27	Mch. 25	——	Apl. 8	——	Apl. 5	Apl 5	Apl. 22	May 4	Apl. 13	Apl. 12
Lamium purpureum ... (Red dead nettle)	Apl. 2	Mch. 21	Feb. 13	Feb. 9	Mch. 7	——	Nov. 13	Feb. 4	Jan. 13	Apl. 6	Feb. 16	Feb. 8
Iris pseud'acorus ... (Yellow iris)	June 5	June 17	June 7	June 5	May 26	June 2	May 29	June 2	May 29	June 8	June 6	June 7
Scilla nutans ... ... (Bluebell)	May 12	May 2	May 3	Apl. 30	Apl. 10	Apl. 6	——	May 6	Apl. 24	May 18	Apl. 26	Apl. 29
Hay cut	June 7	——	June 13	June 10	June 9	June 2	June 7	June 3	June 19	June 22	June 9	Jun 12
Wheat ear	June 14	June 26	June 19	June 11	May 31	June 15	June 15	June 20	June 24	June 16	June 16	June 16
Wheat cut	Aug. 10	Aug. 18	Aug. 18	July 28	Aug. 2	Aug. 12	Aug 6	Aug. 12	Aug. 24	Aug. 7	Aug. 11	Aug 9
Harvest finished	Sept. 15	Oct. 9	Sept. 24	Aug. 19	Sept. 21	Sept. 30	Aug. 28	Sept 15	Sept. 30	Sept. 15	Sept. 17	Sept. 10
Cuckoo heard	May 3	Apl. 18	May 1	Apl. 29	Apl 28	——	——	Apl. 30	——	——	Apl. 28	Apl 24
Nightingale heard ...	——	——	——	——	——	——	——	——	——	——	——	Apl. 24

TABLE X.

Dates of first flowering of Garden Plants, Shrubs, etc., during the ten years, 1908-1917.

Plants flowering.	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Averages. 1908-17	Averages. 1888-1917
Winter aconite	Jan. 19	Dec. 20	Jan. 8	Dec. 18	Dec. 26	Dec. 8	Jan. 9	Jan. 4	Dec. 31	Feb. 18	Jan. 4	Jan. 4
Snowdrop	Feb. 9	Jan. 18	Feb. 6	Jan. 24	Jan. 21	Dec. 27	Dec. 27	Jan. 13	Jan. 13	Feb. 17	Jan. 21	Jan. 18
Crocus	Feb. 14	Feb. 4	Feb. 10	Feb. 13	Jan. 30	Jan. 2	Jan. 30	Jan. 14	Jan. 19	Feb. 26	Feb. 1	Feb. 4
Daffodil	Mch. 31	Apl. 1	Mch. 13	Mch. 17	Mch. 1	Feb. 7	Mch. 10	Mch 16	Mch. 6	Apl. 23	Mch. 16	Mch. 19
Ribes sanguineus... ...	Apl. 2	Apl. 8	Mch. 12	Feb. 26	Mch. 9	Jan. 5	Mch. 5	Mch. 22	Feb. 5	Apl 18	Mch. 9	Mch. 20
Lilac	May 17	May 8	May 9	May 9	Apl. 25	May 1	Apl. 26	May 7	Apl 30	May 22	May 7	May 10
Laburnum	May 19	May 17	May 16	May 11	Apl. 29	May 7	Apl. 29	May 15	May 15	May 24	May 12	May 14
White pink	June 12	June 14	June 14	June 5	May 22	May 30	June 2	——	June 6	June 11	June 7	June 5
Lilium candidum... ...	July 6	July 16	July 2	June 26	June 21	June 24	June 27	July 7	July 11	June 30	July 2	July 6
Colchicum autumnale	Aug. 26	Sept 15	Aug. 25	Aug. 13	Aug. 12	Aug. 15	Aug. 16	Aug. 17	Aug. 21	Aug. 14	Aug. 20	Aug. 23

VI.

A RARE ROTIFER, *PEDALION MIRUM*, IN NORFOLK: WITH A NOTE ON ITS NOMENCLATURE.

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

A comprehensive list of the Rotifera of Norfolk has not hitherto been published, but the fact that the Rev. R. Freeman was able during six days' work at Sutton Broad Laboratory, in November, 1904, to collect about 120 species, shows that the Rotiferan fauna of the Broads must be very rich. But neither he nor Mr. Hurrell, who has given much attention to this group, has succeeded in finding the very remarkable species *Pedalion mirum* in the Broads district. That it does in fact occur I am able to state with certainty, for on August 27th, 1906, I found a single specimen in the River Ant, by Ludham Bridge. This specimen was discovered in a townet collection which was exceptionally rich in Rotifers, including *Polyarthra platyptera*, *Asplanchna*, and *Triarthra*. As the Cladoceran *Daphnia cucullata* was present, I think the water in which it was taken had flowed up from the Bure, since this species of Daphnia is not usually found in the Ant or its Broads, though it is abundant in the Bure.

Since that time I have not met with *Pedalion mirum* in my collections in the Broads district, but in August, 1912, several specimens were hatched out from dried mud from the neighbourhood of Vienna, received from Dr. Przibram in 1904. This mud has been a source of annual interest to me. Although kept dry for all these years, yet when a portion of it is put in water it can be relied upon to produce living Crustacea and Rotifers, and I have obtained from it *Apus*, *Estheria*, *Chirocephalus*, and various Ostracods in considerable numbers. The Pedalion multiplied in a small tumbler and lived for some weeks, but I did not discover any males or observe the formation of resting eggs.

I am now able to add two new localities in which *Pedalion mirum* occurs–namely, a pond in Windsor Park and Langmere

and Ringmere in Norfolk. In these Meres it was found to be abundant in September in this year (1919), and a re-examination of collections made in June showed that it was also present then, though in small numbers. It is worth noting that, in these Meres and also in the Windsor pond, the Dinoflagellate, *Ceratium hirundinella*, was abundant. This is a widely distributed plankton species, but is entirely absent, so far as my experience goes, from the Broads district.

Unlike all other Rotifers, the species has six moveable appendages armed with strong setæ, and by the aid of these appendages it is able to make rapid jerks through the water, just like the *Nauplius* larva of a Copepod. The resemblance of these limbs in number and structure to those of the *Nauplius* is so striking that it has been suggested that *Pedalion* provides a link between the Rotifers and Crustacea ; but the resemblance extends no further than the limbs, for the internal structure does not differ from the ordinary Rotifer type, and the arrangement of the limbs in a ring round the body is quite unlike that found in the Crustacea. These appendages of *Pedalion* are, in fact, merely a remarkable instance of the acquisition of similar organs independently in unrelated groups of the animal kingdom.

The distribution of the genus *Pedalion* is almost world-wide. The species *P. mirum* was first found by Mr. Hudson at Clifton in 1871, and has since then been found in Ireland and in various parts of England. It is not uncommon in Holstein and Silesia from June to October, and is recorded from Baden, Wurttemberg, Russia, Hungary, Switzerland, and Italy. In Switzerland it has been found at a height of 2370 metres. It appears to be common in East Africa, and has been taken also in South Africa (Matoppo Hills), in the Azores, and on a rocky island in Torres Straits. Two other species are known : *P. fennicum* was originally described by Levander from Finland, and has since been found in Queensland, and in the Solomon Islands, while *P. oxyure* was discovered in a salt lagoon by the sea of Aral, and has

also been described under the name of *P. mucronatum*, from Issyk Kul in Central Asia.

P. mirum is an inhabitant of clear, shallow waters, and is said not to occur in water more than eight metres deep. It is common in the carp ponds of North Germany, and should be found in the Norfolk Broads. Its very wide distribution and sporadic occurrence show that it is easily dispersed, but it is probably rather exacting in its requirements.

It is unfortunate that the name *Pedalion*, which has been so generally and so long applied to this Rotifer, should, according to the rules of nomenclature, be dropped, since it was used in 1839 for a fish and again in 1847 for a mollusc. The name *Pedalia* Barrois, 1878, has been adopted in the place of it by Harring,† but Mr. Rousselet* has pointed out that the Rotifer described by Barrois is quite a different animal from that named by Hudson, so that the name Pedalia is also not admissible. It has been suggested that the Rotifer described by Schmarda in 1854 as *Hexarthra polyptera* is really identical with *Pedalion mirum*, in which case *Hexarthra* would replace *Pedalion*, but the differences between the two are so profound that their identity cannot be conceded unless the rediscovery of Schmarda's species should prove his figures to be fundamentally wrong. Hudson's famous Rotifer has, therefore, no generic name sanctioned by the rules of nomenclature, and it is open to anyone to achieve distinction by providing a new name! Here is one of the many cases in which it is in the interest of Zoology to retain a name which, although condemned by the Rules, has had currency for so long that it is universally understood to refer to this Rotifer. Let us hope that, even if specialists reject the name Pedalion, it will continue to be used in all text books of Zoology.

† Synopsis of the Rotatoria. Bull. U.S. Nat. Mus. No. 81, 1913.
* Journ. Quekett, Mic. Club XII., 1914, p. 397.

VII.

STATUS AND BREEDING HABITS OF THE SHOVELLER DUCK (*SPATULA CLYPEATA*).

By J. H. GURNEY, F.Z.S., F.L.S., M.B.O.U.

In 1846 we learn from Gurney and Fisher's "Birds found in Norfolk" that the Shoveller Duck "occasionally remains to breed," but in the lapse of seventy-four years this description has ceased to be applicable, for this duck has become common. Again, Stevenson, writing about 1870, remarks that the Shoveller is far outnumbered on the Broads by the Garganey ("Birds of Norfolk," III., p. 145), which would not be at all true of it now. On May 24th, 1919, there were more Shovellers on Hoveton Broad than I ever remember, although this has always been a favourite place for them, but there was not a single Garganey Teal to be seen that day. The Shoveller generally chooses for its nesting site some fairly dry marsh, but although in April the sedge is low, its domicile is by no means easy to find. Moreover, the eggs are so deftly concealed with thick down, which keeps them warm in the absence of the female, as to be almost invisible, unless the old duck be sitting, when they are exposed on her rising.

A Shoveller's nest examined on April 19th, 1919, contained eleven eggs, while another inspected on April 26th contained twelve, which is a complete clutch. This last was in a small tuft of rushes, not very high, but forming a sort of canopy over the sitting bird, while the path by which she slipped in and out could be seen on the side. After four-and-twenty days of incubation, the eggs are commonly hatched, but the old duck Shoveller's labours are not yet over, for the nestlings learn to use their legs almost immediately, and require to be looked after, or they may go astray.

A nestling Shoveller can be known by its being distinctly larger than a nestling Teal or Garganey, and less yellow than a Mallard in the general tint of its down; it is also distinguishable by the shape of its beak, which begins to broaden about the

fourteenth day, and at the age of three weeks is perceptibly wider than the beak of a young Mallard. According to Seebohm, who seems to have had experience of them, the drake Shoveller takes no part in the selection of a site for its nest, nor in the building of it, nor in the subsequent care of the young.

The anxiety of an old Shoveller over her newly-hatched brood is very pretty to witness, the faithful mother trying every artifice to make the human enemy leave the young and go after her instead. It is astonishing how closely she will feign helplessness, while the power of flight seems gone, as with droopi g wing and gaping bill she alternately runs and flutters along the ground. When satisfied that her ducklings are safely concealed, the useless wings resume their function, and the old mother flies away. All this time the nestlings assist in the general deception by compressing themselves into the smallest space, and not moving from their nooks unless actually touched.

The following dates of Norfolk nests in different years give pretty plainly the normal time of the Shovellers' laying.

April	—	Some eggs	
,,	4th	Eleven ,,	(F. C. R. Jourdain)
,,	13th	Some ,,	
,,	19th	Eleven ,,	
,,	23rd	,, ,,	
,,	26th	Twelve ,,	
May		Some ,,	
,,	9th	Twelve ,,	(F. C. R. Jourdain)
,,	,,	Eleven ,,	,,
,,	10th	Eight ,,	
,,	14th	Eleven ,,	
,,	,,	Some ,,	(Eggs sucked)
,,	16th	Some ,,	
,,	,,	,, ,,	
,,	18th	One egg	
,,	20th	Some ,,	"Ootheca Wolleyana"
,,	29th	Eleven ,,	,, ,,

Seebohm says that eggs are seldom found before the middle of May ("British Birds," III., p. 556), but that is very late, Mr. Jourdain would put the average date at about April 25th, which agrees better with Norfolk experience.

VIII.

NOTES ON NORFOLK PLANTS.

By A. Bennett, A.L.S.

The original edition of English Botany, generally known as Sowerby's English Botany, published between the years 1790 and 1814 in thirty-six volumes, and four volumes of a Supplement, and part of a fifth, between 1831 and 1865, contains many descriptions made from Norfolk specimens. In the original work all the descriptions with three exceptions were made by Sir J. E. Smith (as Dr. Smith).

This being so, it seemed, both from the historical and botanical point of view, it would be well that these should be recorded in the Transactions. One has been able to do this by the publication of a series of most interesting "Notes on the Drawings for Sowerby's English Botany," by Mr. F. N. A. Garry, in the Journal of Botany for 1903-04, and republished in book form in 1905.

I give the number of plate, date it was published, where it was gathered, and who gathered it.

Aquilegia vulgaris L.

Eng. Bot. t. 297. Jan. 1, 1796. Specimen from St. Faith's Newton. L. Wagstaff, June 9, 1793.

Brassica tenuifolia Bois.

Eng. Bot. t. 525 (as *Sisymbrium tenuifolium*). Dec. 1, 1798. Walls of Yarmouth. Mr. Woodward. June 14, 1793.

Viola palustris L.

Eng. Bot. t. 444. Jan. 1, 1798. From Norfolk. Dawson Turner, Esq. May, 1797.

Hypericum elatum Ait.

Eng. Bot. t. 1225. Oct. 1, 1803. N. Walsham, Wood Dalling, Costessey, Norfolk.

Trifolium striatum L.

Eng. Bot. t. 1843. Feb. 1, 1808. Yarmouth Denes. D. Turner. June 10, 1807.

VICIA LATHYROIDES L.

Eng. Bot. t. 30. Sept. 1, 1796. Sent from Norwich by Mr. Pitchford.

LATHYRUS SYLVESTRIS L.

Eng. Bot. t. 805. Nov. 1, 1800. It grows at Brundle (Brundall) on the south side of the church , on the brow of a hill, near a spring, plentifully. Found by Mr. Humphrey, of Norwich.

SEDUM ANGLICIUM L.

Eng. Bot. t. 171. April 1, 1794. Yarmouth Denes. Dawson Turner, Esq. 1793.

SIUM LATIFOLIUM L.

Eng. Bot. t. 204. Sept. 1, 1794. From Norfolk. Mr. Woodward.

PEUCEDANUM PALUSTRE Moench.

Eng. Bot. t. 229 (*Selinum palustre*). Feb. 1, 1795. Gathered by Dr. Smith in the ditches of a wet, reedy meadow between Norwich and Heigham. July 28, 1794.

ADOXA MOSCHATELLINA L.

Eng. Bot. t, 453. March 1, 1798. Gathered at Newton, near Swaffham, by Mr. Forby.

ARTEMISIA MARITIMA L. (*genuina Syme*).

Eng. Bot. t. 1706. Feb. 1, 1807. Yarmouth. Dr. Smith. Sept., 1806.

SENECIO ERUCIFOLIUS L.

Eng. Bot. t. 574 (*L. tenuifolius*). April 1, 1799. At Holm (Holme). Mr. Sutton. Aug. 21, 1798.

CREPIS FOETIDA L.

Eng. Bot. t. 406. July, 1, 1797. Barton, Norfolk, Hemsted (Barton Bendish ?). A new plate was drawn for the 3rd edition.

HIERACIUM UMBELLATUM L.

Eng. Bot. t. 1771. April 1, 1807. Gathered on the beautiful wooded hills at the back of Thorpe, nr. Norwich, where it flowers in August. Dr. Smith.

LACTUCA VIROSA L.

Eng. Bot. t. 1957. Dec. 1, 1808. Mackeral's Tower, Norwich. Dr. Smith.

MONOTROPA HYPOPITYS L.

Eng. Bot. t. 69. Sept. 1, 1792. Mr. Wagstaff communicated our present specimen, gathered by Mrs. Hannah Kett in a pine grove at Stoke, nr. Norwich, in which the Monotropa was discovered in 1782, and never before in that county.

STATICE BELLIDIFOLIA D.C. – S. RETICULATA Huds.

Limonium minus flagellis tortuosis. Found on the coast of Norfolk by Mr. Henry Scott. Blackstone. "Specimen Botanicum, etc." J. Blackstone, p. 47, 1746. The specimens figured in English Botany, t. 328. June 1, 1795. Were sent by the Rev. Mr. Jno. Hemsted, of Newmarket, brought from Wisbech.

I can find no mention elsewhere of this Mr. H. Scott, and can only suppose he was a Norfolk man.

VINCA MAJOR L.

The first, which Mr. Curtis has sent, has not been mentioned and which few botanists have seen, is produced every year in Mr. Kett's grounds at Seething, Norfolk. Nov. 1, 1798.

GENTIANA PNEUMONANTHE L.

Eng. Bot. t. 20. June 1, 1791. Wild specimen here figured from the Rev. Dr. Charles Sutton, D.D., of Norwich, who gathered it at Stratton Strawless Heath, a few miles from that city, the very place in which it was found by the amiable Stillingfleet many years ago.

MYOSOTIS SYLVATICA L.

Eng. Bot. t. 2680. March 1, 1810. Holt, Norfolk. Rev. R. B. Francis, in a grove amongst Scilla mutans, and remote from water. Sir W. J. Hooker.

VERBASCUM PULVERULENTUM.

Eng. Bot. t. 487. Sept. 1, 1798. Mr. J. Wagstaff, Norwich. "I send you this sketch for Eng. Bot. for inspection; it was sent from Norwich as the true Norfolk Mullein, but it is by no means peculiar to Norfolk." Gathered as above.

VERBASCUM BLATTARIA.

We have been favoured by the Hon. Mrs. F. Howard with a specimen gathered in Norfolk, near Lynn, which is either a variation of this plant, with a large purplish flower, or the *V. phœniceum* of L. Sketch of this (not published) dated Oct. 13, 1796.

MELAMPYRUM ARVENSE L.

Eng. Bot. t. 53. May 1, 1792. Our specimen came from Costessey, near Norwich, and was obligingly sent by Mr. Pitchford.

OROBANCHE PURPUREA Jacq.

Eng. Bot. t. 423. Sept. 1, 1797. Beeston, near Cromer. Rev. Mr. C. Sutton. July 10, 1797.

O. MINOR L.

Eng. Bot. t. 422. Sept. 1, 1797. Rev. Mr. Sutton, from near Sheringham, Norfolk.

MENTHA ROTUNDIFOLIA L.

Eng. Bot. t. 446. Jan. 1, 1797. Sheringham. Rev. Robt. Forby. Sept. 5, 1796.

CALAMINTHA NEPETA L. (THYMUS NEPETA).

Eng. Bot. t. 1414. Feb. 1, 1805. Gathered at Saham Church, Norfolk.

TEUCRIUM CHAMAEDRYS L.

Eng. Bot. t. 680. Jan. 1, 1800. I can engrave from Norwich wall specimen. It grows in plenty on the inside of the city wall, between Magdalen and St. Austin's Gates, Norwich, from whence our specimen came.

MENTHA RUBRA Sm.

Eng. Bot. t. 1413. Feb. 1, 1805. Saham. Dr. Smith. Sept., 1804.

MENTHA GENTILIS L.

Eng. Bot. t. 1218. Feb. 1, 1810. Edgefield, near Holt. Boun and Hosken. Sept. 19, 1809.

ARISTOLOCHIA CLEMATITIS L.

Eng. Bot. t. 398. Dec. 1, 1795. Vicinity of Carrow Abbey (near Norwich). Rev. Mr. Sutton. June 19, 1793.

ULMUS GLABRA Huds.

Eng. Bot. t. 1887. May 1, 1808. Tuck's Wood Pond. Mr. Crowe.

MYRICA GALE L.

Eng. Bot. t. 562. March 1, 1799. Dersingham Moor. Rev. C. Sutton.

SALIX PHYLICIFOLIA v. CROWEANA Syme.

Eng. Bot. t. 1146 (S. Croweana). Mar. 1, 1803. Aug. 31, 1797. Jas. Crowe, Esq. "Observed in several parts of Norfolk." Probably planted. A.B.

POPULUS ALBA L

Eng. Bot. t. 1618. Mar. 1, 1790. Lakenham Common. Dr. Smith. Mar. 20.

POPULUS CANESCENS Sm.

Eng. Bot. t. 1619. July 1, 1806. Wells Heath. Mr. Crowe.

POPULUS TREMULA L.

Eng. Bot. t. 1909. July 1, 1808. Hill near Harford Bridge. Dr. Smith.

ALLIUM OLERACEUM L.

Eng. Bot. t. 488. Sept. 1, 1798. Fincham. Re-. Mr. Forby. Sent for *A. carinatum.*

JUNCUS OBTUSIFLORUS Ehrh.

Eng. Bot. t. 2144. Apl. 1, 1810. Marshes at Limpenhoe. Rev. G. R. Leathes. Aug., 1809.

CAREX AXILLARIS Good.

Eng. Bot. t. 993. Mar. 1, 1802. Earsham. Wet ditch bank in a clayey soil. T. J. Woodward. June 13, 1801.

CAREX SYLVATICA L.

Eng. Bot. t. 995. Mar. 1, 1802. Earsham. Banks of ditches in a strong clay, shaded by trees or bushes. Dr. Smith. June 15, 1801.

ALOPECURUS FULVUS Sm.

Eng. Bot. 1467. June 1, 1805. Swainsthorpe, one mile south of Norwich. Mr. Stone.

POA BULBOSA L.

Eng. Bot. t. 1071. Sept. 1, 1802. Figured from Yarmouth specimen.

Sclerochloa loliacea Woods (Triticum loliaceum).

Eng. Bot. t. 221. Nov. or Dec., 1794. North coast of Norfolk. Rev. Mr. Bryant

Bromus giganteus L v. triflorus Syme.

(*Festuca Triflora*). Eng. Bot. t., 1918. Aug 1, 1808. Found by Mr. Crowe on his estate at Saham in the autumn of 1804 when it was in flower.

Bromus commutatus Schrad.

(*B. arvensis*). Eng. Bot. t. 920. Sept. 1, 1801. Earsham, Norfolk. Thos. J. Woodward.

Botrychium Lunaria Sm.

Eng. Bot. t. 318 (*Osmunda Lunaria*). April 1, 1796. Mrs. Kett of Seething (Norfolk) favoured us with this specimen from a meadow near her house.

There are also many plates made from Yarmouth specimens but not giving the county, though many are supplied by Mr. Dawson Turner, and thus may be presumed to be Norfolk plants, but I have left these out, as not giving a definite county record.

I now record a few additions in the way of localities, and a few added species or varieties to the Flora.

*Silene dichotoma Ehrh. (alien). Edge of field between Stalham and Ingham. Aug. 1, 1900. Salmon and Bennett.

*Arenaria peploides L. sub-var. laxior.

Williams in Trans. Liverpool. Bot. Soc. June (1909), p. 17.

Yarmouth, Norfolk. A. Bennett in Herb., Kew.

*Viola canina L. var. pusilla Bab.

E. and W. Norfolk. Mrs. Gregory in Secretary's Rep. Bot. Ex. Club (1917), p. 148f.

Geranium rotundifolium L.

Side of wood, East Harling. 7th Aug., 1918. A. J. Cusfield.

Rosa tomentosa Sm. var. Subglobosa Sm.

Swainsthorpe to Swardeston. A. Bennett.

Callitriche intermedia Hoffm.

Stow Bedon. 1917. F. Robinson sp.

Filago spathulata Presl.

W. Runton. Dr. F. Long sp. 1916.

Pyrola minor L.

Peddam, near Acle. Geldart. Trans., ii. (1877), 335. Poringland to Upper Stoke. Trans. vii. (1904), 587.

Pyrola rotundifolia L.

Hoveton. Miss Geldart sp. (1916). Reepham, among reeds. I cannot remember where I took this from.

Cuscuta Trifolii Bab.

Earsham. D. Stock, 1820. In Herb. York Phil. Society.

Microcala filiformis H. and L.

Roydon. This was recorded by Mr. Bray in the Record Club Rep. for 1881 (1883).

" Known to him for 10 years."

*Centaurium vulgare Rafn. (littoralis) var. intermedia Wheldon.

Hollows of the sandhills between Wells and Holkham. July 22, 1900. J. and A. Bennett.

Limosella aquatica. L.

Scoulton Mere. F. Robinson sp. 1914.

Veronica spicata L.

Sandy heathland, Garboldisham, V.C. 28. F. Robinson sp. (1817).

In Mr. Clarke's most interesting accounts of the Norfolk Commons in the Trans. IX., part 1, 52 (1910), under Garboldisham, he gives, " Broomscot Common " or " Camping Close." A game recalling the old fights between Norfolk and Suffolk in that rough old game of Camping.

Salvia pratensis L.

Meadow land, Griston, Norfolk. 21st June, 1915. Mrs. H. Andrews and F. Robinson. Bot. Ex. Club Rep. 1915. 265 (1916). No note as to nativity.

*Myosotis repens Don.

Among the reeds and rushes bordering Filby Broad, near Flegg Burgh. July, 1879. A. Bennett.

*Utricularia Ochroleuca Hart.

Foulden Common. Sept, 1914. F. C. Newton sp.

Utricularia major (neglecta).

Pool at Stow Bedon. 14th Sept., 1917. F. Robinson sp.

Herniaria glabra L.

Horstead. V.C. 27. J. F. Buxton. Secretary's Rep. Bot. Ex. Club. 123. 1918.

Polygonum mite Schrank.

Ashill. F. Robinson sp. 1914. A locality for v.c. 28.

Urtica dioica L. var. angustifolia Wimm. and Grab.

Sheringham in waste places. Oct., 1916. Dr. F. Long sp.

Salix Hoffmanniana Sm.

Fakenham. 1847. W. L. Notcutt in Herb. York Phil. Soc.

Salix Russelliana Sm.

Fakenham. 1847. W. L. Notcutt.

Malaxis paludosa L.

Felmingham. 1915. W. G. Clarke in litt.

*Orchis praetermissa Druce.

Abundant in the marshy meadows of Norfolk. Druce. Secretary's Rep. Bot. Ex. Club. V., 1, 153. 1918.

Crocus officinalis Huds.

Harleston, Norfolk. 1810. D. Turner in Herb. York. Phil. Soc.

*Crocus sativus L.

Harleston. 1820. Rev. J. Dalton in Herb. York. Phil. Soc.

Fritillaria Meleagris L.

Ovington. v.c. 28. F. Robinson in Rep. Bot. Ex. Club. 163. 1914.

Sparganium neglectum Beeby.

Scoulton Mere. Sept., 1817. F. Robinson.

POTAMOGETON ANGUSTIFOLIUS Bercht and Presl.

Lingmere. 1897. Canon Bullock-Webster.

POTAMOGETON HETEROPHYLLUS Schreb.

Stow Bedon. July, 1917. F. Robinson sp.

* P. PUSILLIFORMIS Hagstrom. P. FRIESII × PUSILLUS.

Horning. 1887. H. T. Mennell sp.

SCIRPUS FILIFORMIS Savi.

Scarning Fen. 1915. F. Robinson sp.

CAREX DIVISA Huds.

Yarmouth, Norfolk. 1843. G. Fitt in Herb. York. Phil. Soc.

C. DIANDRA Schranck.

The first printed record is "Prope Norwich. Crowe. Goodenough in Trans. Linn. Soc. II., 163. 1792."

CAREX ELONGATA L. var. UMBROSA Kneucher.

East Norfolk. Mr. Howard sp.

This was found in E. Suffolk by Mr. Howard, and specimens sent to me.

Starred plants are additional to the county Flora. The names given as contributing specimens for the English Botany Drawings are mostly well known, but I can find no reference to Mr. Wagstaff of Norwich. The Biographical Index of British and Irish Botanists, by Messrs. Britten and Boulger, does not give his name.

IX.

THE HERRING FISHERY OF 1918.

By Arthur H. Patterson.

The Herring Fishery of 1918, I must confess, interested me in no very great measure; the prices of herrings in all their stages of fresh, bloater, kipper, "red"-herring, and as stuff in pickle, were so exorbitant, that neither the fish-wharf nor the fish-shop saw much of me. Yarmouth people, who have for years been accustomed to purchase herrings at three and four a penny from itinerant vendors, and often from urchins with strings of filched fish at their back doors, at a still cheaper rate, grumbled freely at being asked sixpence for a pound of fresh herrings scaling two and three to that weight; nor paid without demur from twopence to threepence for a bloater, and fivepence for a pair of kippers. They did not blame the fishermen, accounting their catches as "the lives o' men," but the fish-shop keepers, who, like many other tradesfolk, would rather see edibles rot than lower prices to clear them out.

The drifters were a little in excess of the numbers fishing in 1917; there was not, I believe, a solitary craft, not even a Scotchman, that was sail-propelled, even the old-fashioned wooden boats of the Scottish type had motor engines. I have it from the fishing reporter of the *Eastern Daily Press* that "of the fleet of 340 boats engaged, of which 310 were Scottish, no fewer than 210 had oil engines as their source of motive power." Whether oil will oust steam as steam ousted the sail, is hard to say, for the steam drifters are remarkably powerful craft. The forces of steam and oil have relegated to the limbo of the past the picturesque and once necessary asset of the fishing—the paddle-wheel tugs.

The fishing grounds were as yet entramelled by many restrictions; but for all the dangers of floating mines and other engines of warfare, no casualties to the drifters were reported.

During the latter part of September the fishing commenced, and some fine fishes were landed : on the 22nd a boat made nearly £300 for its catch.

In October considerable quantities were landed, many being packed in ice, in barrels and boxes, and dispatched to the Metropolis.

During December the drifters fished uncommonly well, the controlled price of six guineas per cran, as against thirty shillings per cran in pre-war times, warranting a greater return, notwithstanding the increased price of coal, oil, food, wages, etc. One drifter made the voyage to the netting of £10,240 ; another £9,800 ; and several averaging £8,000. The fishermen did proportionately well for their three months' work, taking from £350 to £400 per man ; and it was quite a common thing for a lad to receive £100 as his share. It leaked out in a County Court case that one skipper had made £1,000 this fishing. I knew one youth, who in his school-days had given me much trouble in breaking his bad habits, who took for his three months' work over £30 more than I had to give the Gt. Yarmouth Education Authority a receipt for for a twelve months' " screw " (!) Were I sure of adding to my knowledge of North Sea cetaceans, I should be willing to change places with this illiterate youth. Such a thing as bringing the crews in debt on " making up " at the close of the fishing, has not obtained in war-time as in fishings gone by.

Late in the year 1918, too late for commissioning them for the fishing, the Government disposed of a number of war-requisitioned drifters. An excerpt or two from a record of their sale may be of interest :—

" Steam Drifters no longer wanted by the Navy as patrol boats :—

" ' Snowdrop.' Y.H. 647, official number 111094, on Admiralty Service, at £22 17s. 7d. per month.

" ' Herring-Gull.' Y.H. 273, official number 137587, on Admiralty Service at £59 15s. 8d. per month."

The Yarmouth Steam Drifter "Mon Ami" was put up for sale, December 18th, by auction. Built of steel in 1901, 76 tons gross. Bought in at £1,830.

On December 12th, dealing with the high price of herrings, the *Daily Express* remarked, "Complaint was made at a meeting of the Yarmouth Food Control Committee, that while herrings had been sold during the late season for as little as 11s. per cran (the fixed maximum price is £6 6s. 0d.), the consumer was not given the benefit of the reduced price.

"A Cran weighs about 250-lbs., so that if the fish is retailed at the price of 6d. a pound, as at Yarmouth, a return of £6 6s.0d. has been secured at an outlay of 11s."

There can be no doubt that had the fishing fleet of 1918 been restored, in time, to its pre-war number of vessels (barring lost ships), the catches of 1918 generally would have exceeded all expectations, for fish were exceptionally abundant.

The following figures, starting from 1913, will be found useful for comparison :

Drifters Fishing out of Yarmouth.	Crans Landed.	Equal to Lasts.
	1913.	
999 boats	824,213 ...	82,421
	1914.	17,745
370 ,, ...	177,459 ...	17,745
	1915.	
185 ,, ...	120,122 ...	12,012
	1916.	
59 ,, ...	12,289 ...	1,228
	1917.	
230 ,, ...	76,056 ...	7,603
	1918.	
340 ,, ...	202,447 ...	20,244

In 1917 there were 230 boats fishing out of Yarmouth; of these 200 were Scotch, the Yarmouth boats numbering but 30. The Lowestoft catches for 1917 were 48,989 crans, to approximately 160 boats.

Mr. T. C. Rising, of Lowestoft, kindly forwarded the figures for the War Catches from that port, his total 1917 catch of 49,771 crans being due to, I have reason to belivee, the fishing figures brought down to a slightly later date than before furnished me :—

Lowestoft Fishing, 1914—18 (inclusive).

	Crans Landed.	Equal to Lasts.
1914 ...	148,424 ...	14,842
1915 ...	83,647 ...	8,364
1916 ...	13,683 ...	1,368
1917 ...	49,771 ...	4,977
1918 ...	105,144 ...	10,514

The number of boats fishing from Lowestoft may be put down as about two-thirds of the number fishing from Yarmouth.

X.

SOME FISH NOTES FOR 1918, FROM GREAT YARMOUTH AND NEIGHBOURHOOD.

By Arthur H. Patterson

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

Beyond a scarcity of sea fish, and a wickedly tall price for such as were landed, no great interest attaches to the records of 1918. Breydon was trawled by small boats most industriously, for Flounders, more especially in the last weeks of the year, when a number might be expected haunting certain sandy stretches in the Main Channel for purposes of spawning. In the first week of the year, Flounders of any size were sold in the leading fish shops at eighteen-pence per pound

(including a big bony head, almost a fourth of the fish's weight), whilst very small examples were sold from smaller shops to the poor, at from a shilling to fourteen-pence the pound.

Two or three shrimpers, who had motors in their boats, occasionally trawled up as many Flounders, which were sold by auction on the Fish Wharf, as brought them in several pounds for an afternoon and night's fishing. By the end of January, the size fell off from two-pound fish to miserable things no larger, if a little thicker, than playing cards.

Among the maximum prices for January, Bream were marked at one shilling per pound; Roach at nine-pence; Flounders at fifteen-pence; Perch at a shilling; whilst Eels were two shillings, a price also demanded.

Sand Dabs inshored early in February, when sea-anglers obtained a number; and a catch of netted fish, in one day, amounted to twenty stone, priced at twelve shillings the stone. Smelts were also freely caught in January, when Breydoners were getting six shillings a score for them, an unprecedented figure. Their numbers fell off suddenly in February, when the heavy snows melted, and icy-cold waters came down the rivers.

Pike were giving remarkable sport on the Broads early in this month, the fish being "madly on the feed." At Oulton Broad, fifty Pike, up to 20 lbs. in weight, were taken in one day. One man with a score live bait secured a fish with nearly every bait; whilst another with three dead bait, hooked three Pike. The fish of the season appears to have been taken in a private water, near Norwich: it weighed 27½ lbs., was 42½ inches long, and 23 inches in girth.

Melanistic Smeared Dab.—A fish of this species appeared to-day (Feb. 19th) on a slab; its under-side was of a rich orange colour, save for a florin-sized patch of white on the "left" cheek.

A Correspondent writing to the *Eastern Daily Press* in February, stated that, ten years before, a pond, or pit, 25 by 20 yards, roughly, was stocked with Roach, Perch, Carp,

and Rudd. The pit is evidently fed by a spring, but is in no sense a running water; is eight feet deep, and very clear.

In five years it became so over-stocked, that a male and female Pike were turned in, viz., in August, 1912, which weighed respectively 1¼ lb. and 1½ lb. Early in (this) February a male Pike was taken which weighed 5 lb.; a female scaled 10 lb.—the latter had put on 8½ lb., an average of 1.54 lb. per year. The fish had not been marked, hence it was difficult to prove exact ages, although in all probability these were the original specimens, as no more could be induced to sample a bait. The fish were in excellent condition. Other interesting experiments of this sort are recorded by Frank Buckland, T. Southwell, and others. At Southport Aquarium, some Turbot, three inches broad, had increased in two years to 10 lb. each, and in four years had doubled this weight!

April. An unusual appearance of Viviparous Blennies (*Zoarces viviparus*) in local waters, after some years of increasing scarcity.

A 12-inch Sole shewn me to-day (May 16th), the upper surface of which had the normal basal colour, but had regularly-placed spots all over it. It had the thickness of a Variegated Sole, and the surrounding fins were of a milky white. It may have been a hybrid between the Common and the Variegated Soles.

May 25th. Saw a "double" Plaice, a foot in length, dark on both sides, the red spots below being as numerous and as vivid in colour as on the upper surface.

The Season's "big" fish tabulated in the *Anglers' News* for June, include a number taken in Norfolk and Suffolk:—

				lb.	oz.
Pike	Feb.	Norfolk Broads	weight	27	0
,,	Apl.	Mere (near Peterboro') ...	,,	27	0
,,	Oct.	Hickling Broad	,,	22	0
,,	Jan.	Potter Heigham Sds. ...	,,	21	8
,,	Feb.	,, ,, ,, ...	,,	20	8
,,	Jan.	Barton Broad	,,	20	6

			lb.	oz.
Roach	Aug.	Lark (Suffolk) ... ... ,,	2	1
,,	July	,, ,, ... ,,	1	14
Bream	Aug.	Coltishall (Bure) ... ... ,,	5	15
Eel	June	Hickling ... ... ,,	5	4

I had a record capture of Eels mentioned to me (without date), when a rush of Eels against a big salt tide yielded a catch in the Eel-set of 100 stone. The net was set for the ebb, *i.e.*, in the opposite direction, so that the Eels were working against a heavy flood tide.

Plaice in September were being freely caught very near the shore; the species would seem to have bred most freely during the war, and, like the recuperated Haddock, has come well south in the North Sea; whilst in October the Whitings appeared to have deserted local waters, although off the Kentish and Sussex Coasts they were most abundant.

A rather remarkable catch of Bream was made on Ormesby Broad late in the year, when few anglers ever think of fishing local fresh waters. The *Anglers' News* of Dec. 14th records a 52½ catch during a match, none of which were under 2 lb. a fish.

XI.

SOME BIRD NOTES FOR 1918 FROM GREAT YARMOUTH

By Arthur H. Patterson.

The year 1918 has not been very fruitful of Nature incidents worthy of remark in my locality. It may be interesting, however, to make mention of a noticeable alteration from their normal habits of two or three species of birds, more conspicuously displayed by the larger Gulls, mature and immature, in flocking during periods of herring scarcity to the neighbourhood of the South Denes to perch on the apex of the hugh pyramids of herring barrels, and upon the ridges of the fish wharf and other fish premises. Here they sit and watch for spilled herrings and entrails, and for any broken herrings and small whitings found intermingled with them in the "cranning," and much entertainment is afforded to spectators and idlers by the birds as they pull and tug for possession, or flutter and slide down the slated roofs endeavouring to seize a tumbling fish that some less acrobatic Gull has missed.

It is also worthy of remark, the constant passing over, by day, of one or more long lines or wedges of Wild Geese, as these birds fly, presumably, towards North Norfolk after a night's feeding upon certain grazing marshes south of "Berney Arms" and of North Suffolk. They pass over, also, almost regularly at night, uttering cries incessantly, to the wonderment of those who are unaware of the species that is responsible for them.

I would here like to make a sort of apology for recording many nature "instances" in the correspondence column of the *Eastern Daily Press*, which I do, chiefly, for the purpose of interesting observers (outside our ranks) who have opportunities of seeing natural phenomena, and of tempting them to make use of so convenient a medium for making them public. I mention this fact because from time to time a list of such outside observations appears among my notes.

January 1st, 1918, brought a touch of winter with it. On the 4th, Breydon was bleak enough, the day being grey, raw, cold. Coots were in numbers, floating about or wandering upon the *Zostera marina*, as the tide rose or fell, to which they are curiously partial. When upon the wing, a widely-spread and scattered flock shews against a grey sky like a "black" snowstorm, slowly descending.

Lapwings, against which every man's hand seemed raised, were being sold freely in Yarmouth Market at tenpence each; and, save for a few Coots and Moorhens, these are the chiefest game found there to-day, for with the disappearance of Durrant's game-stall, wildfowl ceased to be collected and exhibited for sale, the country-folk disposing of their own small lots. Local wildfowling is a lost art, and, indeed, a vanished industry.

Jan. 8th. A correspondent complained to me about the destruction caused by Moorhens in his watercress beds.

Attracted by the noisy demonstrations of a Chinese Goose, living on a marsh at the rear of my houseboat, at St. Olaves, a Wild Goose from a passing skein flew down and joined it. The farmer observing this, shot at the stranger from too great a distance, when it flew away; but suspecting a possible return of it, the gunner waited, and not in vain, and this time succeeded in breaking its wing. It weighed 6½-lb., and was probably a Pink-footed, although described to me as a Bean-goose.

On February 23rd Lapwings were swarming the marshlands between Yarmouth and Norwich in their thousands: a little frost set in at the end of the month, when they vanished; but I later observed quantities of them on the uplands freshly ploughed.

Three or four crow-picked Guillemots lay at the tidemark on March 9th. One was in full spring plumage. A weakly bird, drifting shorewards, was set upon by several grey Gulls (immature Greater Black-backs), which followed it to the beach, when they sat upon it and tore it in pieces, devouring its flesh.

Powder and shot were so exceedingly scarce and expensive, that very few gunners were afoot in the winter of 1917—18, for what little there was to be shot would not have covered the cost of it. Snipes even were unsought, and, if killed, there was no demand for them.

The number of nests in our Yarmouth rookery, on April 1st, was forty-nine, forty-two of which were located immediately behind the Parish Church.

Whilst listening for the drone of Zeppelins at midnight on April 12th, I was delighted to hear the musical "wick-wick!" of a Godwit, as it muddled around bewildered in the night-mist.

In a note from a correspondent, I was informed of a Moorhen selecting for the site of its nest a piece of board floating in a reedy corner.

When lying hidden in the grass on a Breydon Wall slope, two fowl, of striking colours, alighted beside a small puddle of water in the mud, within a dozen yards or so of me. I had an excellent and unexpected opportunity of watching them feeding on *Hydrobia ulvæ* that were attached to the young green fronds. The birds, rich chestnut, or foxy red, black primaries and tails, and conspicuously white bedaubed faces, were without doubt those of a pair of ruddy Sheld-ducks, a surmise substantiated by the subsequent examination at the hands of a taxidermist. They were remarkably beautiful when on the wing.

April 25th. Five Spoonbills on Breydon, and later six.

May 18th. An apparent increase of Redshanks on the Waveney marshes. During a row to St. Olaves in my dinghy, I had clamorous birds constantly on the wing around me; seldom were there less than a half-dozen pairs in view at a time, successive parties mobbing me with vigour, uttering their "Tig-Tig-Tig! Clu-clu-clu! Cle-u-cle-u-cle-u! Clip-clip-clip-clip!"

Same date. Observed five Cormorants flying about Breydon. My old friends, a pair of Carrion Crows (*Corvus corone*), evidently the same pair haunting the St. Olaves marshes for three or four years past, have been irritating my neighbour, Farmer

Meen, by making inroads upon the nests of outlaying hens in his orchard. He has laid a loss of thirteen eggs, so far, to their charge. In vain does he lie in wait for the cunning birds, which I note, early in the morning, patrolling the reed-beds in search of Moorhens' nests.

When out rowing on May 19th, there were many flies floating on the river, and these the Swallows were capturing; in as many yards one would snap up seven struggling insects.

When sitting in the stern of the Breydon Watcher's house-boat, on June 19th, a Rook with pure white primaries came and gleaned up food at the edge of a mudflat a few yards away.

The Cormorants remained some days on Breydon: they seemed to have specially hunted for Eels. On one occasion a bird came up with a pound eel, which entwined itself around the bird's neck, to the great delight of several watching gulls, that at once mobbed it, and endeavoured to make it drop its prey. It, however, ended the fray by diving with the fish, to come up presently with the eel either swallowed (which is doubtful) or lost to it.

In August a most interesting note came to me from Major E. Evans-Lombe, and is worthy of preservation. He writes:—"My tenant————at Marlingford had several Snipe nesting in his meadows, not far from his house; towards the end of the drought the meadows became hard and dry; early on Sunday morning, the 8th June, his yardman was crossing the farm-yard to commence milking, when he saw a Snipe fly round with two young ones she was holding in her bill: then the old bird placed the young ones near some tubs which are used to put the waste milk in for the pigs, and where the ground is wet. After the young Snipe were on the ground, Barber called Mrs. L—'s companion (a Miss S—), who saw them on the ground."

Two or three of my favourite bird-authors speak of Woodcocks carrying their young by their feet, helped, it may be, by pressing the bill below, to assist in a safe removal, but my friend's observers say nothing about this supplementary

assistance. I have not any personal records of seeing Snipe carrying their young.

Major-Gen. Upcher, of Fritton, wrote me soon after that in a certain position he saw a Snipe two or three days old, that "could not have got there of itself!" adding, "I have seen the Woodcock carrying its young, one at a time, of course. The old birds carry them between their thighs."

When fishing at Fritton Decoy in August, I had never before seen so many Great Crested Grebes upon the lake.

August 12th. A warm, still day: near my house, some 150 yards abovehead, a number of Black-headed Gulls were sailing around aloft, somewhat after the fashion of Swallows, but in more circular flight. With my glasses I could distinctly see them jerking their heads to right or left, as a winged creature—possibly an ant—came within range of the bill.

A pair of Herons nested in a little fir wood at Belton, on the edge of a bit of fen, but the eggs were stolen by a boy. Jays nested freely hard by, and were rather attentive to the peas growing in a friend's garden there. Seven were hatched in one nest.

The early days of September were notable for a visitation of Turnstones upon the beach, and an Avocet at Breydon, which was shot. The 19th saw an early immigration of Rooks; I also noted some Continental Redbreasts, and a Black Redstart, in my little wood of five small trees at the rear of the house. Up till mid-September Breydon had been frequented by Terns in rather noticeable numbers.

October 26th. Many Lapwings over: a flock of them prowling around a mudflat, a rather unusual haunt. Hundreds on the marshes. On the 31st I saw quite a hundred on the flats, evidently gleaning up *Hydrobidæ*. A Brent Goose was feeding in the midst of them.

During November skeins of Wild Geese passing to and fro, as many as 200 in a flock.

December furnished me with incidents of only minor interest.

XII.

FAUNA AND FLORA OF NORFOLK.

Additions to Part XI., Birds (Seventh List) * 1914—1918.

By S. H. Long, M.D., F.Z.S., M.B.O.U., and B. B. Riviere, F.R.C.S., M.B.O.U.

The following are the chief records of interest since our last list was published five years ago.

Jay, Continental (*Garrulus glandarius glandarius*). Three birds of this race were shot in the county in January and February, 1918 ("British Birds," Vol. XI., p. 259).

Crossbill (*Loxia curvirostra*). Four nests were found at Middleton by Mr. N. Tracy, and several more birds were seen building in March, 1915. ("British Birds," Vol. VIII., p. 289). Nests were also found near King's Lynn by Mr. Tracy on April 8th, 1917. ("British Birds," Vol. XII., p. 139). There is no doubt that these birds now breed in fair numbers in the Castle Rising and Middleton districts, and there is evidence that they still breed in the Thetford district.

Crossbill, Parrot (*Loxia pityopsittacus*). In September, 1907, a gamekeeper, John Forsdick, shot a bird at Langham, which was taken to Mr. Pashley, of Cley, but the skin was lost sight of. Recently, however, the head was found, and was carefully examined both by Mr. Witherby and by Dr. Hartert, who both pronounced it to be an undoubted specimen of *L. pityopsittacus*. ("British Birds," Vol. X., p. 20).

* For previous Lists see Vols. IV., 259 and 397; V., 642; VI., 501; VII., 733; VIII., 847; IX., 784.

BUNTING, LAPLAND (*Calcarius lapponicus*). A male and female were shot at Cley on November 2nd, 1914. (B. B. R.).

WAGTAIL, GREY-HEADED (*Motacilla flava thunbergi*). The bird killed at Sheringham on May 1st, 1842, and recorded by J. H. Gurney, Senr., in "The Annals and Magazine of Natural History" for that year (p. 353) as *M. neglecta*, and subsequently, in the "N. and N. Nat. Soc. Transactions" as *M. f. cinereocapilla* Savi, has since been re-examined by Messrs. C. B. Ticehurst and H. F. Witherby, who have decided that it is a typical adult male of *M. f. thunbergi*.

FIRE-CREST (*Regulus ignicapillus*). On August 4th, 1915, a Fire-crest was seen by Mr. R. C. Sykes in some fir-woods near West Runton. ("British Birds." Vol. IX., p. 249).

TITMOUSE, BEARDED (*Panurus biarmicus*). There is no doubt that the very severe winter of 1916—17 caused a great diminution in the number of these birds in the Broads district; but whether they were killed by the prolonged frost, which is the more probable, or migrated elsewhere, it is impossible to say with certainty. Since that date observation shows that their numbers have been gradually getting up again.

SHRIKE, RED-BACKED (*Laricus collurio*). In contrast with such species as the Corncrake, Wryneck, and Redstart, which of late years have been rare visitors to the County, the Red-backed Shrike has certainly been increasing in numbers, and in the Eastern part of the County there are many haunts which are annually visited by these birds for nesting purposes.

FIELDFARE (*Turdus pilaris*). As in many other parts of England, there was a complete absence of Fieldfares in Norfolk during the abnormally cold winter of

1917-18, though during the Spring migration of 1918 several flocks were recorded as passing migrants. During the late Autumn of 1918 there were by no means the usual numbers of Fieldfares to be seen in the County.

Redstart (*Phœnicurus phœnicurus*). Although once a common summer visitor, this has, of late years, become a vary rare bird in the County. A pair nested, and successfully hatched off, in the garden of Mrs. H. D. Geldart, at Thorpe, in June, 1918. We have not heard of others being seen.

Bluethroat (*Cyanosylvia suecica*). This species has been but rarely observed in the British Isles on its vernal migration, so that it is interesting to record the fact that a Bluethroat was captured on a ship ten miles north-west of Cromer on May 11th, 1916. ("British Birds," Vol. X., p. 41).

Wheatear, Greenland (*Œnanthe œnanthe leucorrhoa*). There would no longer appear to be any reason why this well-recognised geographical race should not be added to our County list. In 1909, C. B. Ticehurst ("British Birds," Vol. II., p. 271) recorded specimens from Norfolk, and one of us (B. B. R.) possesses the skins of five birds, all shot at Cley in the Autumn. According to our observation this sub-species is common on the Norfolk coast during the Autumn migration.

Owl, Long-eared (*Asio otus*). In the Broads district of the county this species would seem to have acquired terrestrial breeding habits, and during the past few years several nests containing either eggs or young have been seen by us and by other observers. ("British Birds," Vol. IX., p. 58).

Owl, Short-eared (*Asio accipitrinus*). It is somewhat strange that this species does not nest more commonly in the County than would seem to be the case. A pair nested at Horsey in 1918, and had

eight eggs, of which one hatched out. The empty nest and one of the old birds was seen on July 7th. (B. B. R.).

Owl, Little (*Athene noctua*). From reports received, this species must be now fairly well distributed throughout the County. A nest with one young, fully fledged, was seen on June 10th, 1918, at Melton Park, and a bird was seen at Caistor, near Norwich, on September 5th, 1918. (B. B. R.).

Harrier, Marsh (*Circus æruginosus*). This species is occasionally reported, by competent observers, from the Broads District during the early Summer months, but during the period under review there is only evidence of one pair having nested, and that in 1915. This pair hatched off. ("British Birds," Vol. X., p. 237).

Harrier, Montagu's (*Circus pygargus*). A few pairs nest yearly in the County, though the nests are not always reported. Two nests, each containing four young, were seen at Horsey on July 7th, 1918. (B. B. R.).

Osprey (*Pandion haliaetus*). One seen on Scoulton Mere on May 23rd, 1918. ("British Birds," Vol. XII., p. 47).

Cormorant (*Phalacrocorax carbo*). A pair nested in an old heron's nest in a large alder tree on an island on the lake in Melton Constable Park in 1914. They were strictly protected by Lord Hastings, and at the end of June four young were hatched, and these eventually got away safely. The nest was photographed by Miss E. L. Turner. ("Zoologist," April, 1915).

A pair also nested on a low spruce tree in a covert at Feltwell in 1916, and had four young nearly ready to fly at the beginning of September. ("British Birds," Vol. X., p. 120).

Pochard, White-eyed (*Nyroca nyroca*). On April 15th, 1915, a drake of this species was seen by one of us (S. H. L.) in company with Mr. J. H. Gurney, on Hickling Broad. The bird remained on the Broad for several days.

Heron, Buffbacked (*Ardeola ibis*). A male was shot on the Breydon Marshes, on the Norfolk side of the river, on October 23rd, 1917, and the bird was figured and recorded by Mr. F. W. Smalley in "British Birds," Vol. XI., p. 146. This would appear to be the second authentic record of the occurrence of this species in the British Isles.

Bittern (*Botaurus stellaris*). As the result of careful protection this species has firmly re-established itself as a breeding species in the County, and, moreover, is gradually extending its range. It is unnecessary to record individual nesting sites, but it may safely be asserted that at least half-a-dozen pairs of Bitterns are now breeding in the County.

Sandpiper, Common (*Totanus hypoleucus*). In Vol. IX., p. 793, evidence was given of this species nesting at Coltishall. It is not uncommon to see these birds on the rivers of the Broads district during the breeding season, and it is very probable that a few pairs nest. A pair were seen on Heigham Sounds, May 13th, 1917. (B. B. R.).

Godwit, Black-tailed (*Limosa limosa*). On July 16th, 1917, Mr. Pashley, of Cley, received a bird of this species, for preservation, which had been shot out of a flock of six or seven others on the Salthouse marshes,

Fulmar (*Fulmarus glacialis*). A dead Fulmar was picked up on the beach at Mundesley on December 22nd, 1917. (B. B. R.).

XIII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

The Reedham Heronry.—This well-known Heronry, mentioned by Sir Thomas Browne, has been visited during the breeding season on several occasions during the past eighteen years by different members of the Society, and it is interesting to note how little has the number of nests varied during this period, as the following records show.

Year.		
1901	About 85 nests	J. H. Gurney
1902	do.	"Field," Aug. 9, 1902
1903	About 83 nests	J. H. Gurney
1905	,, 90 ,,	J. H. Gurney
1910	,, 86 ,,	S. H. Long
1918	,, 84 ,,	J. H. Gurney
1919	,, 87 ,,	R. Gurney & S. H. Long

The greatest number of nests on any one tree, an ash, in May, 1919, was ten.

Some Additions to the Flora of Norfolk.

Since the publication of Nicholson's "Flora of Norfolk," 1914, I have found the following plants in the localities indicated. *Ambrosia trifida, L.*, found at North Walsham in 1915, and *Lepidium virginicum*, L., found at East Ruston the same year, are new to the county. *Aquilegia vulgaris*, Whinburgh ; *Arabis glabra*, Bodham, West Bradenham, Holme Hale ; *Lepidium latifolium*, Thorpe St. Andrew ; *L. virginicum*, East Ruston ; *L. heterophyllum*, b. *canescens*, Dilham, East Dereham, Felthorpe, Kimberley, Yaxham ; *Saponaria Vaccaria*, Keswick ; *Hypericum hirsutum*, Alburgh, Hethel ; *Geranium pratense*, Swanton Abbott ; *Medicago falcata*, Northwold, Ringland, Swanington, Weeting ; *M. arabica*, Surlingham ; *Trifolium*

ochroleucon, Alburgh, East Carleton, Flordon, Hethel; *T. glomeratum*, Hellesdon; *Tillæa muscosa*, Litcham; *Sedum reflexum*, b. *albescens* (all the Norfolk plants are this variety), Costessey, Sparham; *S. rupestre*, Coltishall, Southrepps; *Valerianella dentata*, b. *mixta*, Weeting; *Inula squarrosa*, Corpusty; *Ambrosia trifida*, North Walsham; *Matricaria suaveolens*, Flordon, Ludham, Potter Heigham, Ridlington, Strumpshaw, Surlingham, Wortwell; *Artemisia campestris*, Northwold (distinct from the Cranwich station); *Centaurea Cyanus*, Gressenhall; *Hieracium umbellatum*, Whinburgh; *Hyoscyamus niger*, Cranwich; *Verbascum pulverulentum*, Easton, Keswick, Whitlingham; *V. nigrum* × *pulverulentum*, Bowthorpe; *Linaria minor*, Little Barningham, Corpusty, Cranwich; *Mentha rotundifolia*, Ridlington; *M. alopecuroides*, Mundford; *Rumex maritimus*, East Ruston; *Malaxis paludosa*, Felmingham (August, 1915); *Neottia Nidus-avis*, Hethel; *Goodyera repens*, Westwick (August, 1915, several hundred plants); *Habenaria viridis*, Hethel; *Ornithogalum umbellatum*, Cranwich; *Scirpus fluitans*, Booton, Briston; *S. pauciflorus*, Stalham; *S. filiformis*, Felmingham; *Rynchospora alba*, Felmingham; *Carex paradoxa*, Great Plumstead, Woodbastwick; *C. sylvatica*, East Carleton, Horningtoft; *Calamagrostis epigeios*, Horningtoft; *C. canescens*, Ickburgh, Weeting, Woodbastwick; *Avena pratensis*, Brettenham; *A. fatua*, East Ruston; *Melica nutans*, Rockland All Saints; *Botrychium Lunaria*, Ringland.

Among recent Suffolk records, Mr. W. H. Burrell and I found *Veronica triphyllos* among young rye, and *V. verna* on ancient heathland, at Icklingham in May, 1913, and in April, 1916, I found *Carex ericetorum* at two stations in Eriswell.—W. G. Clarke.

Common Rorqual off the East Coast.—On April 15th (1918) I received a telegram from the South Kensington Authorities, requesting me to make enquiries with regard to a 70 foot Rorqual, stranded at Shingle Street, Allerton, which was undoubtedly the same as that reported as having

gone ashore at Aldeburgh. Two days later I received information from the Town Clerk of Ipswich (Henry C. Casley, Esq.) that he "understood from the Mayor of Aldeburgh that the Whale came ashore some distance off, and was in a state of advanced decomposition, and has now been washed away again. He had not been able to go near it, as no one was allowed to."

I heard again from Dr. Harmer, on April 23rd, who was not quite satisfied about the specimen, but an official communication to me, written by the Coastguard authorities at Aldeburgh, on May 6th, stated that all information had been sent to Dr. S. F. Harmer—the date of stranding being April 10th—"with two blades (plates of baleen), one white and the other slate colour. It was about 70 ft. in length, flippers 8 ft. 6 in." I have to thank Mr. G. T. Rope for kindly helping in the matter. The Whale had evidently been on a visit to the East Coast after what may have been an affray with a torpedo destroyer (!)—A. H. Patterson.

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