

TRANSACTIONS  
OF THE  
Norfolk and Norwich  
NATURALISTS' SOCIETY;

PRESENTED TO THE MEMBERS FOR

1895—96.

VOL. VI.—PART 2.



NORWICH:  
PRINTED BY FLETCHER AND SON.

1896.

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TRANSACTIONS  
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NATURALISTS' SOCIETY.

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.

1896

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1895—96.



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**Year ending 30th March, 1896.**

	Dr.	£ s. d.	Cr.	£ s. d.
To Balance from last year	...	...	By Fletcher and Son, for Printing <i>Transactions</i> , 1893—94	35 16 6
To Subscriptions:—			" Stationery, Printing Circulars, and Postage	7 10 9
9 for 1894—95	2 5 0		" Bookbinding	1 16 6
179 " 1895—96	44 15 0		" Advertisements	0 7 0
5 " 1896—97	1 5 0		" Insurance	0 3 0
1 " 1897—98	0 5 0		" Memoir of the late F. Kitton	0 2 0
		48 10 0	" Year Book of Scientific Societies	0 6 0
Additional payments for monthly notices	...	0 11 0	" Gratuity to Doorkeeper	1 0 0
" Sale of <i>Transactions</i>	...	1 3 6	" Rent of Room	1 1 0
" Grant from Life Membership Fund	...	10 0 0	" Assistant Secretary's Salary	5 0 0
		£66 12 6	" Balance at Messrs. Gurney	7 9 9
				£90 12 6

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	£ s. d.	£ s. d.	
To Balance from last year	93 18 6	By Transferred to General Account	10 0 0
" Interest for 1894	2 9 7	" Balance in Post Office Savings Bank	88 16 11
" " 1895	2 8 10		
	£98 16 11		£98 16 11

*Norwich, April 1st, 1896.*

Examined and found correct,

STEPHEN WM. UTTING, *Auditor.*

*List of the Publications received by the Society as Donations  
or Exchanges from March, 1895, to March, 1896.*

- 
- ASSHETON (Richard). Studies in the development of the Rabbit and the Frog. [Reprinted from the 'Quarterly Journal of Microscopical Science' for December, 1894.] 8vo. Lond., 1895.  
*From Col. Feilden, F.G.S.*
- BARROW Naturalists' Field Club and Literary and Scientific Association. Annual Reports and Proceedings; vol. v. for the years 1883 to 1890, and vol. x. for the year ending March, 1895. 2 nos. 8vo. Barrow-in-Furness, 1895. *From the Club.*
- BATH Natural History and Antiquarian Field Club. Proceedings. Vol. viii. no. 2. 8vo. Bath, 1895. *From the Club.*
- BELGIUM. Annales de la Société Belge de Microscopie. Tome 19 et 20. 8vo. Bruxelles, 1895—96. *From the Society.*
- BENNETT (Arthur, F.L.S.). Notes on British Plants. [Reprinted from the 'Journal of Botany' for December, 1894.] pp. 5. 8vo. *From the Author.*
- Records of Scottish Plants for 1894, additional to Watson's 'Topographical Botany,' second edition, 1883. [Reprinted from 'The Annals of Scottish Natural History,' April, 1895.] pp. 5. 8vo. *From the Author.*
- Carex Funca, Allioni, in Scotland. [Reprinted from 'The Annals of Scottish Natural History,' October, 1895.] pp. 3. 8vo. *From the Author.*
- Contributions towards a Flora of the Outer Hebrides. No. 2. [Reprinted from 'The Annals of Scottish Natural History,' October, 1895.] pp. 8. 8vo. *From the Author.*
- Notes on the Potamogetones of the Herbarium Boissier. [Extrait du Bulletin de l'Herbier Boissier, Juin, 1895.] pp. 12. 8vo. *From the Author.*
- BERWICKSHIRE Naturalists' Club. Proceedings. Vol. xiv. no. 2. and vol. xv. no. 1. 8vo. Alnwick, 1894—95. *From the Club.*
- BRITISH Association. Report of the sixty-fifth Meeting of the British Association for the Advancement of Science held at Ipswich in September, 1895. 8vo. Lond., 1895. *From the British Association.*
- Notes and Queries on Anthropology. Drawn up by a Committee appointed by the British Association. sm. 8vo. Lond., 1874. *From Col. Feilden, F.G.S.*

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## ADDRESS.

*Read by the President, MR. H. D. GELDART, to the Members of the Norfolk and Norwich Naturalists' Society, at their Twenty-seventh Annual Meeting, held at the Norwich Castle-Museum, March 30th, 1896.*

LADIES AND GENTLEMEN—I come before you to-night in a unique position, as being the first person you have honoured by making him your President for the third time; and I assure you that I feel a great compliment has been conferred on me by your doing so, and hope that you will place some others of our members who have already served the office twice in the same position, feeling sure that they will be able to perform its duties better than I have done.

The year now ended has not been a very eventful one to our Society; it has been marked especially by the large number of deaths among our more distinguished members, and to this cause, principally, we owe a slight diminution in our numbers. We began the year with 270, we have lost by death and other causes 19, and have now 264, having elected 13 during the year. Our finances, as you have heard from the Treasurer, are in a sound and good condition. Ten pounds have been drawn from the Life Membership Fund; but, as you see by the Balance Sheet, very little of it has been spent, and there is no occasion for any further draft from that fund for the coming year.

At the meeting in April, Mr. A. W. Preston sent us an account of the Great Storm of March 24th, which will appear in the 'Transactions'; and, on the same evening, Mr. Clement Reid was elected our representative to the meeting of the British Association at Ipswich. It turned out, however, that he was unable to represent us. Mr. H. B. Woodward was asked to take his place; but a

difficulty arising at the last moment, Mr. F. W. Harmer very kindly consented to act for us.

In May, Mr. G. H. Harris read us a capital paper, "Notes on the Flora of the Yarmouth District," which we publish. Mr. Nicholson gave us an account of the High Tide of the 18th May, and Mr. Patterson read his interesting notes for February, March, April, and May; indeed, throughout the year he has been most kind in contributing notes, a selection from which will appear in the 'Transactions.'

On June 13th, Mr. Nicholson and myself, as President and Secretary, representing our Society, attended the Opening Ceremony of the Yarmouth Museum, and afterwards were present at a very handsome and hospitable reception, held by the Mayor and Mayoress of Yarmouth, at the Town Hall.

On June 27th, the North Staffordshire Naturalists' Field Club, numbering about thirty members, who were staying at Yarmouth for a summer excursion, visited Norwich, and were received by our Committee at the Castle Museum. They spent a pleasant afternoon, and appeared much interested in the Castle Building and Museum Collections.

On July 31st we had the only Excursion of the year, to Hunstanton, where Mr. le Strange most kindly threw open his fine old moated Hall, allowing us to see the interior of this charming house, also his fine collection of Mexican birds, and afterwards to go over the quaintly arranged and most interesting gardens; from thence we went by the beach to the town, and after lunch at the Sandringham Hotel, spent the remainder of our time wandering about on the pier and under the cliffs. Everything about this excursion was most satisfactory with one exception, the attendance, for only nine went. The best thanks of the Society are due to Mr. le Strange for his kindness to us. I only regret that more of our members did not take advantage of it.

In September, Mr. F. W. Harmer read to us two papers, one on "The Derivative Shells of the Red Crag," and the other on "The Southern Character of the Molluscan Fauna of the Coralline Crag, tested by an analysis of its characteristic and abundant species."

In the latter, he showed by careful analysis and by calculation of the percentages of species, that the fauna of this Crag is southern in character, and closely resembles that of the Mediterranean and West European province, inferring therefrom that there was at some time, subsequent to the coming into existence of the present fauna, a more direct and open communication between the Mediterranean and the seas of Great Britain than exists at present.

In October, Mr. Southwell read some notes on remarkable Birds in the Castle Museum collection, confining himself on that occasion to the Megapodes or Mound-builders, and to the Apteryxes or wingless birds of New Zealand; and, in November, he continued his observations, taking the Crows, Birds of Paradise, Rille Birds, and Bower Birds; then the South American Bell Bird and the Hornbills, concluding with the Parrots, especially the Nestors and the Owl-Parrot. On this latter evening the Members of the Norwich Science Gossip Club were present by invitation, a departure from the ordinary routine of our Society which it is to be hoped may serve as a precedent, and be frequently repeated.

Dr. Emerson also, in October, sent us some notes from Lowestoft, concerning the birds which he had observed on the north hills and denes near that town.

In January, Mr. Stacy-Watson addressed us on the "Herring Fishery of 1895, Yarmouth and Lowestoft," with valuable statistics of the season's fishery which we print. Mr. J. H. Gurney read a paper on "The White-faced Owl of New Zealand," now supposed to be nearly extinct. Professor Newton sent an interesting note of the breeding of the Spoonbill in Norfolk, extracted from the Patent Rolls of King Edward I., A.D. 1300; and Mr. W. H. Tuck sent a list of additions to the Aculeate Hymenoptera from Suffolk, found in 1895. These are valuable contributions to our 'Transactions.'

In February, Colonel Feilden read us two papers: "The Flowering Plants of the Island of Kolguev," and "The Flora of part of Russian Lapland." The former contains important additions—about thirty species—to one of the least known floras of the European Arctic regions; and the latter described some of the plants of a not very frequently visited portion of the Kola peninsula. We ought to

feel grateful to him for reserving these important papers for our Society.

Mr. A. W. Preston sent his Meteorological Notes for 1895, and Mr. A. Mayfield a list of Norfolk Mollusea, with several additions to the list already published.

On March 17th, the Yarmouth Section of the Society held their Second Annual Meeting, under the presidency of the Rev. C. J. Lueas, at which several good papers were read. Many objects of interest were exhibited, and judging by the numerous attendance, this section seems in prosperous condition.

You will observe that the past year has witnessed two new departures from the usual order of our proceedings: the visit and reception of a kindred Society, the North Staffordshire from the Midland Counties; and the presence, by invitation, at one of our meetings, of another scientific club belonging to our own city. It is much to be hoped that these will not be isolated instances of intercourse between ourselves and other societies with similar objects to our own.

We lose by death this year,—

Frederic Kitton, Hon. F.R.M.S., one of our oldest members, who died on the 22nd of July, and of whom we print a short memoir, written by Mr. James Mottram.

Henry Seebohm, F.L.S., F.Z.S., who died on the 26th of November. He was President of this Society for the session of 1890—91, and Mr. Howard Saunders has kindly contributed the following notice of him.

“Henry Seebohm, who died at his residence in South Kensington, on the 26th November, 1895, was the son of a well-known member of the Society of Friends, and was descended from a family which, though associated with Germany for about two centuries, was of Swedish origin. His elder brother is Mr. Frederick Seebohm, of Hitchin, author of ‘Lives of the Oxford Reformers,’ ‘Village Communities,’ &c. Henry Seebohm, who was born at Bradford, in 1832, displayed from his boyhood a strong taste for natural history, and to this he devoted all the time that he could spare from business; but it was not until about 1872 that he was able

to make any long excursions abroad. His first ornithological expedition was to Greece and Asia Minor; while in the summer of 1874, his collecting-ground was Northern Norway, whither he was accompanied by Dr. R. Collett, of Christiania. In the latter year, Mr. J. A. Harvie-Brown, who had recently returned from Archangel and the Lower Dwina, brought back valuable information respecting the land still further east; and in the early spring of 1875, he and Seebohm made an expedition to the valley of the Lower Petchora, in North-eastern Russia, where they obtained eggs of the Grey Plover, the Little Stint, the Petchora Pipit, and other rare species. Accounts of this expedition appeared in 'The Ibis,' and in Seebohm's 'Siberia in Europe.' In 1877, Seebohm accompanied Captain Wiggins to the Yenesei, much further east, in true Siberia, and made some important collections which were described in 'The Ibis,' and 'Siberia in Asia.' Several visits were also made to Heligoland, where the migrations of birds were studied under the auspices of the veteran ornithologist, Herr Gätke. Henceforward Seebohm devoted considerable attention to the subject of migration, and even made a trip in winter to South Africa, in order to obtain information suitable for his important quarto on 'The Geographical Distribution of Plovers, Sandpipers, and Snipes.' Before this, however, he had produced vol. v. of 'The Catalogue of Birds in the British Museum,' treating of the Thrushes and Warblers (*Turdida*), on which he was an acknowledged authority; while in 1885, he completed his 'History of British Birds, with Coloured Illustrations of their Eggs.' These works were followed by 'The Birds of the Japanese Empire,' 'The Classification of Birds,' and several minor treatises, not to enumerate many interesting papers in 'The Ibis,' and elsewhere. It will be remembered that Seebohm contributed to these 'Transactions' a valuable abstract of Dr. A. Bunge's observations on the birds of the Lena Delta, and another on Mr. Murdoch's Report on the birds of Point Barrow, Alaska while in 1891, he delivered an excellent address, as President of this Society. Up to the spring of 1895 he was working with remarkable energy, but an attack of influenza, followed by congestion of the lungs, enfeebled his constitution, and although he managed

to attend to his duties at the Royal Geographical Society (of which he was one of the Secretaries) and elsewhere, it was clear that his health was broken. His illustrated 'Monograph of the Thrushes' remains unfinished. Seebohm was a constant attendant at the monthly meetings of the British Ornithologists' Club, and it was there that most of his friends saw him for the last time on October 23rd. During his life-time he was a frequent and liberal donor to the British Museum (Natural History), and to that Institution he has bequeathed the remainder of his magnificent collection of birds (about sixteen thousand specimens) and eggs. His loss is much felt."

Thomas Edward Amyot, F.R.C.S., of Diss, died on the 15th of December, aged 78 years. He was the son of Thomas Amyot, F.R.S., V.P.S.A., Treasurer of the Society of Antiquaries, Private Secretary to the Right Hon. William Windham, Prime Minister, and editor of his speeches, also one of the founders of the Shakespeare, Percy, and Camden Societies. Born in London, he was educated at Westminster School, and came to Norfolk early in life, practising first at Scole, and then for fifty years at Diss, with distinguished ability and the highest esteem. He was well-known as a Microscopist, took great interest in Astronomy, Botany, and Geology, was a great lover of Chess, and for many years was President of the Diss Chess Club.

Mr. Amyot became a member in 1871, and in 1874 he gave us a charming account of the Winfarthing Oak: this was read on the spot on the occasion of the Society's excursion on July 7th. Many of us must remember how much trouble he took that day to make the excursion a success, and to promote the pleasure of all who joined in it. A thoroughly scientific man, and the kindest of doctors, his memory will be long held in affectionate remembrance and regret by his friends and acquaintance.

The Rev. E. W. Dowell died on the 14th of February, at Dunton, near Fakenham, of which parish he had been vicar since the year 1855. Mr. Dowell had been all his life a keen sportsman and naturalist, and his practical acquaintance with the birds of the shore was very considerable. The information thus attained he carefully recorded



in his note-books, which in the most liberal manner he placed at the service of both Mr. Stevenson and Mr. Southwell, who repeatedly acknowledge their indebtedness to him in the 'Birds of Norfolk.' In later life he gave his attention to the cultivation of Roses, in which he was very successful; he was also interested in the botany of his neighbourhood, and often sent wild flowers to me for identification. Mr. Dowell had been a member of our Society since the year 1878.

When I laid before you in 1894, "Notes on some Plants collected in Spitsbergen by Colonel Feilden," I ventured on a few general remarks on the distribution of flowering plants in the Arctic regions, and expressed a hope that I might some day return to the subject from a wider base, and in greater detail, and I take this opportunity of doing so—the great interest to those who study the flora of our own country of the Arctic element (what H. C. Watson calls partly the Highland and partly the Scotch element in it) being my excuse.

The largest factor in producing the present distribution of the Arctic flora, and the greatest agent in determining its present limits, we must believe to have been the Glacial Epoch. But in considering the matter from a botanical point of view, we happily are not concerned with the vexed question of the causes of that epoch, and need not pause to attempt to arrive at any decision whether the hypothesis which is known as the astronomical or that called the physical is the more likely, or to try to understand the complicated theory lately revised and published in an English<sup>\*</sup> dress, that past changes of climate have been due to variations in the heat given off by the sun, a variable star, once white, now yellow, later on to become red, and finally dark, and we may be content to accept Professor Neumayr's criticism of this last supposition, which indeed covers the whole of them, † "for this or any other assumption there is no proof forthcoming."

Neither need we try to weigh the evidence for or against the occurrence of Interglacial Periods, for the sum of the influence

\* Eng. Dubois, 'The Climates of the Geological Past' (1895).

† M. Neumayr, "Climates of Past Ages," 'Nature,' vol. xlii. (1890) pp. 148 and 175.

exerted by the ice and cold on vegetation will be expressed by the effect produced at the climax of the Ice Age, not by that of times of lesser action which may or may not have intervened during its continuance. What we have to do is to state as shortly as possible, first, the views of some leading geologists as to this climax, its extent and effect on phænogamous vegetation, and then to advert to the alterations of land surface, which must in their opinion have taken place to produce the present distribution, and their views on the migration of plants.

The term "migration" is somewhat unfortunate as applied to plants. It is so often and so commonly used as applied to the periodic movements of individual animals in search of food, shelter, or breeding-places, and conveys with it a sense of individual volition, certainly not possessed by plants, which as individuals scarcely ever move from their original position at all, and as species travel only as they are forced by circumstances entirely beyond their own control.

And here let me say, once for all, that I do not in the least wish to put any views before you as either final or dogmatic, but as suggestions which, by contrasting different hypotheses and citing facts as at present presented to us, may induce you to think about, and better still, if it may be so; to study the great problem of Arctic distribution of flowering plants, which seems to me to admit of a simpler explanation than that proposed by some very eminent authorities both at home and on the Continent, and also to bring before you views which have been published in Denmark.

What is the extremest hypothesis of the Arctic Glacial Epoch and its effect on the distribution of flowering plants in Europe and Greenland? This will be found in Professor James Geikie's 'Prehistoric Europe,' shown by a map (plate D), which has been virtually republished so lately as 1891, by Dr. Nathorst, in 'Nature,'\* and again by Dr. Wright, in 1893, in 'Man and the Glacial Period' (p. 184). This map shows the whole of Scandinavia, Northern Russia, Denmark, a great part of Germany, Scotland, Ireland, and England, down to the valley of the Thames, as covered with con-

\* 'Nature,' vol. xlv. (1891) p. 273.

tinuous ice, and the effect of this ice-sheet is thus stated with the enormous weight in its favour (in part) of Sir J. D. Hooker's approval.\* "Even if Iceland were not entirely buried under an icy covering, yet the climatic conditions of the last glacial epoch must have sufficed to *destroy* such a flora as it now possesses. And the same must have been the case with Greenland. Indeed, I do not see how it is possible to resist the conclusion that the floras of all these high latitudes must have been introduced since the close of the Glacial Epoch. And as the plants *could only* have migrated over a land surface, we are compelled to infer that in post-glacial times the Færoe Islands, Iceland and Greenland, and Spitsbergen also, must have been united to the European Continent."

The passage quoted clearly states two things (which I have italicised), viz., that an ice-sheet *destroys* the flora, and that a land surface is *necessary* for the immigration of plants. Surely we are justified in reasoning from existing circumstances which we can study, rather than in relying on hypotheses of which we can have no proof.

There are three conditions of cold and hardship which we may suppose to be very detrimental to the flora of any country:—

An ice-sheet.

Extensive glaciation by glaciers.

Intense cold, with comparatively little shelter for plants.

Let us inquire how these conditions affect floras in Arctic regions at the present time.

First—Ice-sheet. Greenland is now covered by an ice-sheet, how thick in the centre of that country no one knows, probably some thousands of feet; but even in such severe glaciation as this, there is in many places a margin left uncovered near the sea, and there are also rocks—"Nunataks"—protruding through the ice, and in these situations a not inconsiderable flora holds its own.

Professor Warming, of Copenhagen, having visited Greenland, has gone in great detail into the question of Arctic distribution. Publishing in 1888 † tables in which he traces the flora known

\* 'Prehistoric Europe' (1881) p. 519.

† 'Tabellarisk Oversigt over Gronlands, Islands, og Færoernes Flora' (Kjøbenhavn, 1888).

up to that date to be found in Greenland, Iceland, and the Færoes, all round the Pole, he divides the west coast of Greenland into seven, and the east coast into three districts, and from these tables we learn that in District D, from  $67^{\circ}$  to  $71^{\circ}$  N. Lat., which may be regarded as the centre of the western coast, there are no less than 252 species of flowering plants and vascular Cryptogams; and even in the most northerly district of the west coast, from  $76^{\circ}$  to  $83^{\circ}$  N. Lat., there are 88 species; and even at the most northern latitude which we know to have been visited by civilised man, about  $83^{\circ}$  N., near Lockwood Island, there must be considerable vegetation, for\* “this camp proved prolific in animals, thus indicating a luxuriant vegetation near.” Ice-sheet then does not “destroy” phænogamous vegetation.

Second—Glaciation by Glaciers. Probably nowhere in the Northern Hemisphere is more severe glaciation of this kind to be met with than in Alaska. From Mount Elias descends to the Pacific Ocean the mighty group of glaciers, which at last unite in the † “Malaspina Glacier.” It covers an area of 1500 square miles, and where it reaches the sea terminates in cliffs sometimes 300 feet in height; surrounded by it is “Blossom Island,” a Nunatak. The ice here surrounds a considerable area of fertile land, which is covered with dense forest, and beautified by a brilliant assemblage of flowering plants. In other places considerable vegetation is found upon the surface of moraines, which are probably still in motion with the underlying ice.

Southward from the Malaspina, and descending from Mount Fairweather, is the “Muir Glacier,” a charming account of which is given by its discoverer in the ‘Century Magazine’ of June, 1895. A broad, gently undulating prairie contains as much ice as (probably) all the 1100 Swiss glaciers; it is fifty miles long, and just below the confluence of tributaries is twenty-five miles wide. Some of the ice remains buried for a century or more, as shown by the age of trees growing above it. The lower summits above the glacier are

\* Greely, ‘Three Years of Arctic Service,’ vol. i. p. 330.

† Bonney, ‘Ice Work’ (p. 68), and Wright, ‘Man and the Glacial Period’ (p. 30).

richly adorned and enlivened by beautiful flowers, lines and flashes of bright green appear on the lower slopes, and a fainter green tinge may be noticed on the subordinate summits at a height of 2000 or 3000 feet. The lower are made mostly by Alder bushes, and the topmost by a lavish profusion of flowering plants, Cassiope, Vaccinium, Pyrola, Erigeron, Gentiana, Campanula, Anemone, Larkspur, and Columbine, with a few grasses and ferns.

Clearly the most acute glaciation by glacier action in this Northern Hemisphere does not "destroy" the flora.

In connexion with these Alaskan glaciers there is a curious effect of glaciation on vegetation lately observed in that country which must not be overlooked. In 1883,\* Professor Thomas Meehan, while examining the glaciers in South-east Alaska, found reason for believing that plants do not merely advance in the wake of retreating glaciers, or push into growth from material brought down in their advance, but that when caught under the mass of flowing ice would remain for an indefinite period retaining vitality, and push again into growth when the ice retreated. He was led to this conclusion by finding no annual plants among those collected in the immediate wake of retreating glaciers, while the actual number of species of perennials would be as great as if much time had been given for a floral advance, . . . these and some other facts led to the hypothesis that the plants were not migratory, but had held their position through the whole icy period. In 1892, William E. Meehan (son of the above) was acting as botanist to the expedition sent to the relief of Lieutenant Peary in West Greenland. He also paid great attention to this question of suspended vitality of plants under ice, and claims to have strengthened his father's observations. As to *Salix arctica*, he writes in a paper read at Philadelphia: "In Inglefield Bay, there were found large old plants within twenty feet of a receding glacier, and in a spot which had certainly been covered by ice less than two years before. There were no lateral or medial moraines to bring the plants, and all the facts on the spot led to the conclusion that the Willows had been buried when the glacier flowed over the spot, and had been dormant until the ice

\* "Contributions to the Flora of Greenland." William E. Meehan, Proc. Acad. Nat. Sciences, Philadelphia, April, 1893, p. 205.

receded." This opens quite a new field for inquiry as to the distribution of plants in a severely glaciated country, and deserves much further investigation. If perennial woody plants can remain dormant for an indefinite time while covered by ice, that portion of the flora stands in little risk of "destruction" during a glacial period, and this may throw some light on the conclusions arrived at in a paper by Dr. Nathorst, to be alluded to presently.

Third—Extreme cold in a comparatively bare country with but little snow. This at first sight appears likely to be the most fatal form of cold and hardship to flowering plants. What are the facts? In Grinnell Land, Lat. 82° N., General Greely found large tracts of a comparatively bare country.\* In Discovery Bay, "ten Musk Oxen were feeding, the adjacent brook slopes and margins were clothed with vegetation, thick beds of *Dryas*, clusters of *Saxifrages*, varied with *Sedges*, *Grasses*, or *Buttercups*. Higher up, countless Arctic *Poppies* of luxuriant growth dotted the landscape." In September, † Greely watches two Musk Oxen feeding, their food was almost entirely *Dryas* and *Saxifraga*, the *Grasses* and *Lichens* were almost entirely lacking, and in no case did he note the Musk Ox "feeding on the latter vegetation, although in many places the ground was covered with scanty minute *Lichens* for acres in extent." This matter of the Musk Ox food is important to our subject, for it marks the fact that herbage must be plentiful, for Greely's party saw between 200 and 300 Musk Oxen, and actually killed 80 of them in one year. Again he writes:‡ "To right and left on the southern shore of Lake Hazen, low rounded hills, bare, as a rule, of snow, extended far to east and west. Numerous tracks of Hare and Ptarmigan were seen in the vicinity of our camp." Greely found no less than sixty-nine species of flowering plants in Grinnell Land, and he records the very curious fact that, in that country, "elevation above the sea makes little or no difference to the plants."§

\* Greely, 'Three Years' Arctic Service,' vol. i. p. 81.

† *Loc. cit.* p. 104.

‡ *Loc. cit.* p. 276.

§ For additional particulars of part of Grinnell Land see "Botany of the British Polar Expedition of 1875-6, by H. C. Hart, Naturalist to H.M.S. 'Discovery,'" 'Journal of Botany,' 1880.

The next point is the assertion that land communication is *necessary* for the immigration of plants. What we now know of the geology and botany of the Island of Kolgney, of which Colonel Feilden gave us an account at our last meeting, appears to disprove this assertion. This island, although shown in both Geikie's and Nathorst's maps as covered with ice in the Glacial Epoch, is now ascertained not to have been in existence then at all, but to be entirely post-glacial, and probably very recent. There is no proof that it has since its upheaval ever been connected with the mainland; yet on so small an island, very insufficiently examined, we already know of nearly 150 flowering plants. How did they get there? Probably some drifted by current, possibly on ice; others were carried by wind, and the remainder by birds, on mud attached to their beaks and feet, or as undigested seeds; at all events, there they are, without any land communication past or present to account for them.

To account for the return of the flora after expulsion from Greenland, Geikie and others suppose a bridge from Scotland to the Feroes, Feroes to Iceland, Iceland to Greenland. But is there any proof of any such bridge having ever existed? True, there are shoals which, if they were all elevated at the same time, might make such a communication, though between Iceland and Greenland the water is much deeper than in the other two cases. What says Warming to this? "In my opinion, Greenland has not been united to Europe since, nor even during, or immediately before, the glacial period; in any case not to Scotland by the hypothetical bridge between Iceland, the Feroes, and Scotland." And although he acknowledges the *possibility* of such a communication having existed between Scotland, the Feroes, and Iceland, he denies that any such thing could have taken place between Iceland and Greenland, citing the depth of water between these two latter countries, and the difference in their geological structure, as his reasons.

Sir J. D. Hooker throws the great weight of his opinion into

\* 'Sur la Vegetation du Groenland' par M. Eug. Warming, French Summary of his Work in Danish (Kjobenhaven, 1888).

the scale in favour of the retention of European species in high Arctic latitudes during the Glacial Epoch, for in 'Appendix to the Voyage of the Isbiorn' (1831), he writes, regarding the differences between the floras of Novaya Zemlya, Spitsbergen, West Greenland, and Smith's Sound (Lat.  $71^{\circ}$  to  $82^{\circ}$  N.): "Whereas there is no difficulty in assuming that Novaya Zemlya and the American Polar Islands have been peopled with plants by immigration from the south, no such assumption will explain the European character of the Greenland, and especially of the high northern Greenland vegetation, the main features of which favour the supposition that it retains many plants which arrived from Europe by a route that crossed the Polar area itself, when that area was under geographical and climatal conditions which no longer obtain." This opinion coincides in part with that of Warming: "It is, perhaps, not only possible, but even probable, that at a very remote period, before the Glacial Epoch, there existed around the North Pole a great continent to which Europe and America were then united, and which would explain the numerous agreements which their vegetation presents." And I understand him to say elsewhere, it is not Smith's Sound which is the separation between the present floras of America and Europe, but Denmark Strait, between Greenland and Iceland. This land connexion must have been in existence, if it ever did exist, before the commencement of the Glacial Epoch, for North Greenland has never yet emerged from that epoch even up to the present time, and we can hardly suppose much immigration of a European flora under the conditions that still obtain there.

But you may think it useless to spend so much time on a flora so far removed from our own as that of Greenland. The reason for doing so is, that by consideration of what is now taking place in that country under glacial conditions, we may hope to obtain a glimpse at what probably happened to the flora of our own country under similar conditions. It will hardly be unfair to compare a space of four degrees of latitude in the centre of the coast of West Greenland, with a space of the same number of degrees in Great Britain, which may be said to contain the greater part of what



was once the most severely glaciated portion of our own islands. From  $67^{\circ}$  to  $71^{\circ}$  N. Lat. of the West Greenland Coast constitutes the Belt D, the Disko Belt of Warming's Tables, and from  $54^{\circ}$  to  $58^{\circ}$  N. Lat. the Belt of Great Britain, with which we will roughly compare it. The southern limit of this Belt,  $54^{\circ}$  N. Lat., passes approximately through Driffield, York, Harrogate, Skipton, and Lancaster; and the northern limit,  $58^{\circ}$  N. Lat., includes the whole of the mainland of Scotland, excepting a very small portion of the county of Ross, almost all Sutherland, and the whole of Caithness, and also all the Hebrides, except the northernmost third of the Long Island. One of the greatest differences between these belts is that the coast of West Greenland is swept by a cold Polar current bearing much ice, while that of Scotland is bathed by the warm water of the Gulf Stream; but both have a western coast studded with islands, and indented by deep fiords.

Surely it will hardly be contended that the west coast of Scotland was ever more severely glaciated than is the coast of the Disko Belt at the present time, especially if it be true, as Mr. Bulman thinks from the evidence of fossil shells, and the greater southern extension of ice-sheet in America than in Europe, that the Gulf Stream was in existence during the Glacial Epoch. Comparing Warming's list of the flora of the Disko Belt with that of the British Belt ( $54^{\circ}$  to  $58^{\circ}$ ) as given in *Top. Bot.*, ed. 2, we find that the former has 252 species, of which 157, more than half, are common to both, and that among these is included a very large proportion of what is commonly called the Arctic or Alpine Flora of Great Britain. Now, if these 157 species can hold their own under the present condition of the Disko Belt, why should they not have held their own in the Scotch Belt during the Glacial Epoch, and what need is there of any hypothesis of "destruction" and subsequent "re-immigration" to account for their presence?

The actual state of things at Disko is thus described in the voyage of the "Alert":—"July 7. The flowers by this date were fast bursting into bloom. The white-blossomed *Cassiope tetragona* gave quite a healthy look to the fells, *Azalea procumbens*, the

\* 'Natural Science,' vol. iii, p. 261 (Oct. 1893).

Arctic Poppy, the bright yellow *Pedicularis*, and several Saxifrages were common, and in sheltered clefts of the basalt ridges Ferns were unfolding their bright green fronds."

In 'Nature,' in 1891,\* Nathorst published an important paper on Distribution of Arctic Plants during the Glacial Epoch, showing how he and others had found remains of Arctic plants in many localities south of the supposed ice-sheet to which they were driven. It will be sufficient for us to quote as an example one of these finds by Pengelly at Bovey Tracey in Devonshire, consisting of *Betula nana*, *Salix myrtilloides*, *S. cinerea*, and another Willow undeterminable. But I would ask: Is this southern extension of Arctic forms incompatible with their also holding their own in more northern localities? Is it not exactly what we should expect, that such plants would have a much more extended range during the lower temperature of the Glacial Epoch?

Nathorst concludes his paper thus: "The theory advanced by E. Forbes so far back as 1846, that the Alpine Flora of Europe, so far as it is identical with the flora of the Arctic and sub-Arctic zones of the old world, is a fragment of a flora which was diffused from the north, and that the termination of the glacial period in Europe was marked by a recession of an Arctic fauna and flora northwards—may now be regarded as definitely proved." Forbes' views were first set out in a paper read before the British Association at Cambridge in 1845,† and those who remember what happened to them at the pen of the author‡ of 'Cybele,' the most accurate authority on British topographical botany of our day, may feel a little surprise at their resuscitation half a century afterwards, at all events, Forbes and Nathorst, as they hold irreconcilable views as to the distribution of the British flora cannot both be right. Forbes divided the British flora into five parts, which he arranged in order of age, and of which the Alpine flora of Wales, the North of England, and Scotland was the fourth. The first and oldest flora he describes thus: — 1. West Pyrenæan Flora confined to

\* 'Nature,' vol. xlv., p. 273.

† Abstract in 'Literary Gazette' said to be by Forbes himself.

‡ 'Cybele Brita,' vol. i. Appendix.

the West of Ireland, and mostly to the mountains of that district. Though an Alpine flora it is quite distinct from No. 4. Its very southern character, its limitation and its extreme isolation, are evidences of its antiquity, pointing to a period when a great mountain barrier extended across the Atlantic from Ireland to Spain."

Nathorst's paper is accompanied by a map. This map does not show the glaciation of Ireland, because Bovey Tracey being his most western point it was not necessary to go further in that direction; but as the lines of extent of ice-sheet are practically the same as those of Geikie's map, we may assume that the lines further west would be the same also, and Geikie's map shows the whole of Ireland as covered by ice-sheet. What, in that case, would become of a "West Pyrenean Flora of southern character"? What possible chance of survival would there be for such plants as *Erica mediterranea*, *Menziesia polifolia*, *Saxifraga umbrosa*, and *S. gem.*, or *Pinguicula grandiflora*, or of such a Fern as *Trichomanes radicans*, if with Forbes we grant their survival we must deny the extent of glaciation shown in Geikie's Map, or if we grant their extinction we must infer for their return by land over Forbes' Barrier between Ireland and Spain a trifling alteration in the elevation of the Atlantic sea-bed of not less than 12,000 feet (2000 fathoms) since the termination of the Glacial Epoch.

Whilst the two maps already cited do not allow of any chance of this flora remaining during the glacial period, that of Professor Carvel Lewis, embodying his views of the extension of the ice-sheet, does leave a sufficient portion of Southern Ireland uncovered to afford a possible asylum for at least a portion of it. You will find the two contrasted in a map in Professor Bonney's 'Ice-work Past and Present' just published.

The "Skandinavian" Flora—a name to which Warming strongly objects, as he regards Greenland as quite as much if not more "the mother country" of it than Europe—is the most extensively distributed at the present day of any flora in the world, and as Sir J. D. Hooker writes: "Regarded as a whole, the Arctic Flora is decidedly Skandinavian." Ought not this sentence to be reversed,

and to read "The Skandinavian Flora is decidedly Arctic"? May not the facts be something like these? Before the Glacial Epoch a flora having its origin in Polar regions, which then presented a more extensive land surface and enjoyed a milder climate than they do now, had, radiating from the pole as centre, established itself very widely over the earth. As the cold and hardship increased, many species in high latitudes perished under them; but others, possessing greater powers of resistance, such as we find growing now to the north of the Arctic circle, and in the mountains of Continental Europe, and of our own islands, held on just about where they were and never "migrated" at all. Some of them, such as the Willows alluded to by Nathorst, increased vastly, and then died away as the cold diminished again, leaving their semi-fossilised remains behind them.

There are many anomalies—such, for instance, as the absence of *Caltha* and almost entire absence of Leguminosæ as an order from Greenland to which Sir J. D. Hooker alludes, or that of *Salix polaris*, once so widely distributed, from Greenland and Iceland—which seem inexplicable; but do we know enough of the life-histories, or of the necessary life-conditions of these, or indeed of any of our present Arctic plants, to form even a doubtful "hypothesis" on any such subject?

This theory of plants holding their own in their old localities, in spite of ice and cold, may appear dull and stupid beside the attractive and showy hypothesis of migration to and fro from north to south and back again, but is it not more consistent with the facts which we know now exist? Remember, it was the slow but steady Tortoise that won the race at last, and not the brilliant but eccentric Hare, and that, in this race, the goal at which we want to arrive is fact and not hypothesis.

## I.

## FLORA OF GREAT YARMOUTH DISTRICT.

BY G. H. HARRIS.

*Read 27th May, 1895.*

IN the remarks I am about to make, I purpose giving a few observations on the changes in the flora of my own district. Seeing that these remarks will have as their basis the list of Sir James Paget, compiled in 1834, and that I have not had an opportunity of comparing my result with the flora of Kirby Trimmer, I am rather afraid you will often find me anticipated by that later list. I must therefore ask for your forbearance if my short paper is sometimes of the nature of a *crambe repetita*. I will also premise that I confine myself to the Phanerogams, as I have no acquaintance with the field botany of the Cryptogams.

It will, I think, suit the plan of the paper best, if I first run through Paget's list, taking the natural orders in his sequence, and commenting on whatever species presents points of interest by reason of its increase, decrease, or change of habits. The district that I have explored—at present quite cursorily and ineffectively—a district that Mr. Geldart was kind enough to map out for me—corresponds in the main pretty closely with that in which Paget worked. Towards the north my bounds run further, as Paget's limit in that direction seems to have been Winterton, omitting the interesting country between Winterton and Happisburgh: whilst out west he occupied country, St. Bennet's Abbey, &c., on which I do not touch; towards the south our boundaries coincide, as they necessarily do towards the east.

Amongst the Ranunculaceæ *Anemone nemorosa* is, according to Paget, very rarely, if ever found. Now this is extraordinary in

itself, and when we put together a list of the woodland plants characterised in 1834 as rare or wanting, and which are now easily found, our wonder is not likely to diminish. *Anemone nemorosa* can hardly have been overlooked, for the remark, "Mr. Turner used to find it in the plantations at Gunton Hall," shows that the district that now produces it plentifully, was known to produce it then, although in small quantities. Gunton Hall plantations I do not know, but I know plantations close by at Lound, and in certain of those the flower is abundant. Again, Oulton Broad had been botanised by Sir J. Paget, for we find a mention of it in the list. But quite close by that sheet of water is Carlton Colville, with its plantations white with this beautiful flower. Running my eyes down the numerous Buttercups, an incident which happened in the quite early days of my botanical experiences recurs to me; an incident, perhaps, worth telling, as it shows how certain flowers, though apparently allied, never permit the one to encroach on the other's preserves, or to put it in more scientific language, it shows in a rather forcible way, how one of two plants which are alike in every other particular, may have so specialised a certain organ that it becomes unable to exist outside its own environment, even though the other environment, similar in almost every particular, adjoins it. Along Breydon Water are high banks, built up out of river mud, in order to stop the encroachment of the tide. These banks or walls are, in some places, superimposed on the marsh land which runs down to the water's edge, and the soil of this marsh land, whatever it may have been in days gone by, has, by the processes of draining and farming, become just rich enough to support a fresh marsh vegetation. So here were two contiguous soils, the chemical constituents of which did not very materially differ. Nor, to a casual observer, was the vegetation supported by the soils dissimilar. Both were bright with the shining yellow of the Buttercup. Yet a closer examination revealed not only that *Ranunculus repens* and *Ranunculus bulbosus* were present, but that each confined itself in the strictest way to its own soil; *R. repens* growing on the wall and down to the foot of it, but never crossing over to the marsh, whilst *Ranunculus bulbosus* restricted itself to, and never passed beyond the confines of the marsh.

*Ranunculus arvensis* is reported by Paget, on the authority of

Mr. Turner, to have been found at Ormesby : I have not yet found it nearer than Hickling.

*Ranunculus hederaceus* is easily found in the ditches on the North Denes, of which there are more now than in Paget's time.

Amongst the Papaveraceæ the most notable thing is the disappearance of *Glaucium luteum*. I have never seen it by the south pier, nor anywhere on the coast between Hasbro' and Lowestoft. North and south respectively of these places, it grows, I believe, plentifully enough. Its extermination at the pier, is, perhaps, due to visitors, who would almost certainly carry away the pods as mementoes of their visit.

Amongst the Crucifere, *Cheiranthus cheiri* is, of course, abundant, and I should not mention it, were it not for a fact perhaps worth recording. Up to five years ago or thereabouts, Winterton Church was ablaze with this flower. It grew from the top of the tower to the foundation, rooting itself, of course, in the mortar of the crevices of the stonework. The sexton told me that as it took all the virtue, (as he expressed it), out of the mortar, it would have to be removed, and that has been done, probably at no small expense. But a few plants now remain, and the church is shorn of a dangerous glory which was its weakness, and not its strength. It is more of a Samson without its golden locks than it was with.

One may be always certain of finding *Tuesdalia nudicaulis* on the North Denes. Paget says it is uncertain. It is very local, restricting itself to certain spots, and never crossing over to the South Denes, but it is perfectly regular in its appearance.

Of the Caryophyllaceæ, I must confess to a great difficulty in determining whether a very humble little *Cerastium*, flowering in sandy places, should call itself *Semidecastrum* or *Tetrandrum*. This is the earliest flower on the Denes, flowering before and in the closest company with *Draba verna*, and being from its inconspicuousness, often confounded with *Draba*. The habitats of *Tetrandrum* and *Semidecastrum* incline me to the former name : but on the other hand, whilst recognising the variability of *Tetrandrum*, I find the flower on the Denes far more often possessing five stamens than four, and this fact inclines me to *Semidecastrum*. Paget calls it *Tetrandrum*. The fact that the plant is so very early—flowering at the latter end of March in

fine seasons—also leads me to think that *Semidecandrum* is the correct name.

We now come to *Oxalis acetosella*, another woodland plant of the same habit as *Anemone nemorosa*. Paget particularises it as now lost, having at one time been found in a small wood at Lound. I still find it growing in abundance also in a small wood, and also in Lound.

The Portulacaceæ is a natural order to which another species must be added. *Claytonia perfoliata* is now, I believe, accepted as a well naturalised plant. It was introduced into this country about 1825, by a botanist named Clayton, who brought it from Virginia. Since that time it has slowly spread and seems to have reached Gorleston, where it now grows, about 1860. If the species can boast a Cecil Rhodes amongst its numbers, it has not brought him to Gorleston, for it seems to find colonising a difficult matter. At present I have only found this Virginian exile in a hedge-bank opposite Gorleston cemetery, with scattered individuals for a length of about  $\frac{1}{4}$  mile along the road. It then turns down a lane, where it grows fairly abundantly. The lane opens out on the Beebles Road, and on this road it has its only other locality, at the cross road leading to Belton. *Montia fontana*, characterised by Paget as rather rare, is plentiful enough about the damp places on the North Denes.

Of the Crassulaceæ, *Sedum anglicum*, which grows fairly abundantly on the North Denes, has gradually disappeared from the South Denes. This will be found to be not the only example of a flower apparently unable to exist in the isolation of the South Denes.

Of the Saxifragaceæ, Paget reports that *Parnassia palustris* is common at Gorleston. I have not yet had the pleasure of recognising this elegant flower amongst our nearer neighbours. It grows quite plentifully around Barton Broad, but I know of it nowhere else. It is probable that draining operations have driven it from Gorleston. Gorleston Common in particular, seems in days gone by to have been quite a happy hunting-ground; but since then the sanitary officer has arisen, by whom no flower is allowed to blush unseen unless it can give a satisfactory account of its why and wherefore. *Tempora mutantur et flores mutantur cum illis*. *Saxifraga granulata* is plentiful at Cromer, but is rare enough in my neighbourhood to have escaped me at present. *Saxifraga*



*tridactylites*, Paget says, grows on town walls, but is becoming rare; he reports it as common at Burgh. It is easily found on the Burgh walls, but I cannot find it on those at Yarmouth.

Of the Leguminosæ, *Melilotus officinalis* has lately appeared on the South Denes. Its arrival there is due to the heaps of river mud the Port and Haven Commissioners have caused to be deposited on the river bank,—heaps that are full of seeds of flowers common to the river bank, and marshes higher up the river. I am inclined to think that some of the Trifolia are becoming scarce, both on the Denes and in the marshes.

*T. subterraneum* and *scabrum* are still abundant on the South Denes, and *fragiferum* is fairly plentiful in the marshes; but *suffocatum* and *glomeratum* must be much less abundant than they were years ago, for they are by no means easy to find. It should be remembered that since Paget's time much of the South Denes has been enclosed by the government, and the original turf, to a great extent, converted by covering it with a richer soil containing the seeds of ordinary pasturage. Even on the unenclosed space a very different turf is gradually taking the place of the older sort. This is inevitable—for the encampments, shows, and races that are now held there every summer, leave their mark in the shape of bare places of considerable extent, which during the winter, on such a loose and sandy soil, tend to increase rapidly under the powerful action of high winds. In order that the whole place may not be turned into a Sahara, it is necessary every spring to dump down a quantity of soil, and re-sow it with ordinary hay seed. I think I may say, without exaggeration, that three-quarters of the South Denes now needs to be subjected to that treatment. It will therefore easily be seen that the rare Clovers run a very poor chance of perpetuating their kind.

It may be noticed that the natural order of Onagraceæ does not contain the species *Epilobium roseum*. This species, well known about London, does not occur at all in this district as an indigenous species. I know of one case, however, where it has been introduced into a foundry yard in sand used for foundry purposes, which is brought from Erith on the Thames. As the seeds of *Epilobium* are furnished with a pappus, it is a flower that would easily multiply if the conditions were favourable, but outside the foundry yard I have been able to find no traces of it.

Of the *Violaceæ* I have not much to say, except to agree with your President that in all probability Paget made an oversight when he included *Viola lutea*. At the same time one often wonders whether the Dog Violet that grows on the Denes ought not to be elevated to the dignity of a variety. Its leaves are never cordate, but always oblong-lanceolate, a characteristic of *Viola lutea*. I think, too, its stipules will not be found to correspond closely with those of *Viola canina*, though that most important part, the fruit, shows, so far as I can see, no essential difference. The fact that it not only grows on a sandy soil, but favours it, flourishing best on those parts of the Denes which are least rich, lends countenance to the view that it is a variety.

The mention Paget gives of *Cireea lutetiana* would lead one to think that in his time the plant was uncommon. "Lanes, Browston, Mr. Turner," his notice runs, so apparently he had never seen it himself. It is of quite frequent occurrence now in the district. Amongst the rarer *Umbelliferae*, *Pencelamum officinale* is becoming distinctly uncommon, owing to the draining of the salt marshes. *Crithmum maritimum*, said to have been found by Mr. Wigg, is buried in the region of myth. It is extremely unlikely it ever occurred, as reported, amongst the Hensby marrams. Its distribution, and the fact that rocks are necessary to its growth, make the sandy soil of the warren, near Hensby, one of the most unlikely places in which to find it. *Feniculum vulgare* is still, as Paget says, not uncommon. *Bupleurum tenuissimum* I have not seen. *Smyrniolum olusatrum*, which Paget reports as rare, has spread in an extraordinary manner in the neighbourhood of Gorleston, where in many hedge-banks it is, in its season, the most prominent flower. This is, I think, the most remarkable instance of increase I can put on record. *Eryngium maritimum*, although still common about Caister, has lost a good deal of ground on the South Denes, owing to the devastations of visitors. *Sanicula europaea*, chronicled by Paget as "rather rare," is another instance of a woodland plant easy enough to find in certain woods, though evidently regarded by Paget as uncommon.

The natural order *Rubiaceæ*, to which Paget gives the name of *Stellatae*, is represented on the North Denes by *Galium verum* and *Galium saxatile*. Of these two the former is quite common on the South Denes; but the latter has become extinct within the

last ten years, affording another instance, with *Sedum anglicum*, of the gradual extirpation of typical Denes flora which is taking place there. The *Caprifoliaceæ* include a plant, *Sambucus ebulus*, of which I am rather anxious to inquire whether it is common about Norwich. I found one luxuriant specimen of this handsome shrub growing near Stalham, but that is the solitary instance. Paget cites it as occurring at Gorleston and Acle, but, apparently, it had not come under his own observation. Of the *Compositæ* I think *Solidago virgaurea* is more common than it was fifty years ago. *Cineraria palustris* has not come under my notice, though it may very likely still grow in some of the more remote marshes. *Achillea ptarmica* is common at Beccles; but decidedly rare in this district. *Helminthia echioides* is another instance with *Smyrnium olusatrum* of a plant that has pushed itself to the front since Paget's time. Quoted as rare, and growing in fields near Bradwell in his 'Flora,' it is now much more profuse, and may be found in great abundance on North Breydon Walls. Of the *Solanaceæ* it would seem that *Atropa belladonna* was too rare even in Paget's time to have been seen by him. I cannot say I have seen it; but I was told that on the excursion last year of the Yarmouth Branch of the Naturalists' Society to Ormesby, a specimen was found near the Broad. As a good deal of uncertainty seemed to exist in my informant's mind, perhaps I may be able to find a corroboration of his statement from some of those gentlemen belonging to the mother Society, who were present at that excursion, if any are here to-night. It is a great pity that *Hyoscyamus niger*, a curious and handsome, though somewhat dangerous, plant should have been smothered by the mud heaps of the Port and Haven Commissioners. Just that locality where the Commissioners pitched their mud on the South Denes was its last retreat. It used to grow, according to Paget, plentifully on the North Denes, but no trace of it is to be found there now. These rubbish heaps are being gradually cleared away, so there is just a hope that a resuscitation of *Hyoscyamus niger* may occur.

Amongst the *Labiata*, the very local distribution of *Salvia verbenaca* is, perhaps, worthy of remark. Given by Paget as growing in Gorleston churchyard and cliffs, it is now also to be found growing plentifully in St. Nicholas' churchyard. On Gorleston cliffs it is fairly abundant, but certainly does not grow with the

freedom that characterises it in Gorleston churchyard, from which it is, perhaps, an escape. If that is so, we should have a plant confined in its habitat to two churchyards. The question, of course, arises,—was *Salvia verbenaca* planted in times gone by in burying-places for any particular reason? Plants, possessing medicinal virtues, such as *Aristolochia* were, we know, grown near monastic establishments, and are, at the present day, confined almost entirely to these spots. The flower in question must, at one time, have been highly prized for certain curative properties; for its name, *Salvia*, is derived from the Latin verb *salvo*, to heal. There were large monastic foundations both at Gorleston and Yarmouth. I would suggest that the plant was grown by the monks in the monastic precincts, and also, owing to the luxuriance of vegetative life, in the churchyards. The sites of all the convents in both places being now entirely covered by houses, would leave the two churchyards as the only surviving habitats of the *Labiatae*.

But, on the other hand, if this is so, Paget should have seen it growing in St. Nicholas' churchyard, a locality it would have been more natural for him to mention than Gorleston.

*Hippophaë rhamnoides*, belonging to the natural order *Elaeagnaceæ* is, perhaps, becoming more limited in range, as I know of it only as growing immediately opposite Hemsby, on the cliffs. Paget locates it in Caister also, and calls it abundant.

The difficult family *Chenopodiaceæ* has probably finally lost *Atriplex portulacoides* and *A. laciniata*. Last summer your President wrote me, asking me to obtain for him a dozen specimens of *Atriplex pedunculata*, which, he said, were to be found in the damp, salt marshes in Cobholm and Runham in profusion. Unfortunately, in both Cobholm and Runham, the number of marshes has been considerably reduced, large spaces, originally vacant, having been covered with houses; many marshes which are left are not half so damp as they were; and of these marshes which are still in their pristine dampness, hardly one is salt, the result of the assiduous draining and river wall building of the last fifty years. So, although I hunted the river banks and inquired of marshmen the way to the most saline spot, my search was futile. I did not find a single specimen. And at Herne Hill, Lowestoft, a locality I regard as a typical survival of the salt-

marsh proper, the same lamentable deficiency was observable. Now, I do not say this plant has become extinct; on the contrary, I think it highly probable that it still perpetuates its kind in some lonely and inaccessible marsh. It must, however, have become very rare, and for this reason: I have already mentioned that the Port and Haven Commissioners some years ago took to dumping down their dredgings at the South Denes, on the east bank of the river. And, I have said that this, which was sport to them, was the death of *Hyoscyamus niger*. But, although this process buried one rare and curious flower under a heap of refuse, it, nevertheless, brought quite a new flora to the bereaved South Denes. The mud from the bed of the river contains seeds of all the plants that grow on the banks and marshes on the higher reaches. So we have had quite a crop of plants entirely alien to Denes flora. *Cochlearia anglica*, *Melilotus officinalis*, *Apium graveolens*, *Tussilago farfara*, *Aster trifolium*, the commoner *Rumex* and *Atriplex*, and many other plants common to a more or less saline and clayey soil have taken root and flourish in the rubbish. So it at once occurred to me that if *Atriplex pedunculata* were so very common, it could not fail to be represented in this colony which had come down the river. But again I spent some interesting hours in a vain search.

Now that I am on this subject of the rubbish heaps on the South Denes, it may be, perhaps, worthy of a passing comment, that although so many plants of the higher reaches are represented, *Glaux maritima*, one of the commonest, and from its proximity to the water, one of the most likely to deposit its seed in the river mud, has, up to the present, exhibited not a single specimen.

The interesting family of *Orchidæ* are poorly represented in this district. With the exception of the genus *Orchis* none are plentiful. Paget mentions as not uncommon, *Listera orata*, *Epipactis palustris*, *Gymnadenia conopsea*, and *Malaxis paludosa*. *Listera orata* is to be found at Carlton Colville, but I know of it as growing no nearer. Ormesby Common is held, by Paget, to account for *Epipactis palustris* and *Gymnadenia conopsea*. Ormesby Common must, I think, have greatly changed its nature. Paget makes frequent reference to it, but in no single instance can I follow him, and I believe I know the common fairly well. *Malaxis paludosa* may still grow, as Paget says it does, in Ashby

Warren. That is a locality with which I have no acquaintance. *Habenaria bifolia*, said, by Paget, to be extinct, is very plentiful in the copses about Carlton Colville. *Spiranthes autumnalis*, of which Paget makes no mention, grows near Lound. Of the *Asphodelaceae*, *Ornithogalum umbellatum* found in 1820 near St. Bennet's Abbey, was found in the spring of 1894 at Burgh; and *Leucojum aestivum* of the *Amaryllidaceae*, a flower not chronicled in Paget, was found about the same time at Lound. Both were probably escapes. When I have mentioned that one plant of *Armeria vulgaris*, and an occasional specimen of *Linum usitatissimum* has appeared on the South Denes, all of which were probably escapes, I think I have particularised everything worth mentioning.

I dare say it will not have escaped the notice of my hearers that the general trend of my remarks leads up to the fact that in the flora of Yarmouth, as in both the fauna and flora of many other places, the tendency is towards a dead level of uniformity. There is very little doubt that under the new influences that engineering and scientific agriculture bring to bear on waste places, such specialized and peculiar flora as the salt marshes and the Denes support must give way to the ordinary flora of the pasturage and corn-land. New flowers, such as *Claytonia perfoliata* are not often introduced, and so the botanist that undertakes the duty of chronicler, must content himself with the melancholy task of recording the gradual disappearance of an interesting flora.

It is rather a strange thing that the South and North Denes, although so similar in soil and originally connected as one continuous strip of land should be gradually diverging from each other in the matter of flora. It is an undoubted fact that within the last ten years *Sedum anglicum* and *Galium saxatile* have both disappeared entirely from the South Denes. Other changes I have mentioned. It is to be remembered that the South Denes is now entirely isolated from any kindred soil, bounded as it is by the town, and surrounded by the river and high lands of Gorleston.

The disappearance of woodland plants in Paget's time, and their re-appearance since, is another feature characterising the interval of fifty years. *Anemone nemorosa*, *Oxalis acetosella*, and *Sanicula europaea* have already been mentioned. The *Moschatel*, another

flower of exclusively woodland habit, finds no place at all in the old lists, although it grows plentifully enough in the Lound woods. Some sentences in Paget's introduction, alluding to the scantiness of timber in his time, lead me to think that some of the copses which are now fairly frequent about Lound and the neighbourhood have been planted since. Hoping that I have not encroached too much on the valuable time of this Society, with these few bare facts, and thanking you for accordng me so patient a hearing, I will bring my paper to a conclusion.

## II.

### NOTES ON THE HERRING FISHERY OF 1895.

By C. STACY-WATSON.

*Read 27th January, 1896.*

In presenting these notes, I purpose deviating slightly from the limits hitherto observed, and to touch upon some contingent occupations in order to indicate the wide-spreading nature of the interests involved in this important industry.

We will begin with the boats, and fishing implements, and gear. The original value of a Herring Fishing-boat fully equipped for sea is from £800 to £1000, and her nets and gear £300; now, estimating the 338 local boats, old and new, at an average value of £500, and their nets, &c. at £200, we have a total of £700 each boat, or a capital sum of £236,600; to this add value of the 200 Scotch boats and their fishing gear at £500 each, a total of £100,000, we have then a total capital of £336,600 employed in catching the Herrings landed at Yarmouth and Lowestoft from the North Sea and Home fishing this year, to which must be added the wages of some 5000 fishermen who are mostly paid on the share system,

based upon the earnings of the boat. There is the manufacture of the nets and ropes, which alone gives employment to thousands of men, women, and children in the large steam factories of distant towns, as well as the humbler rope-walks and beating chambers at home, entailing an outlay of large capital.

In addition to this there are a multitude of men and women, boys and girls, engaged locally in various branches connected with the fishing, to whom it is a veritable harvest when the provident lay up for the proverbial "rainy day." For instance, the amount paid out for labour in transferring the catches from the boats to the buyers' premises this year amounted to over £8000, apart from incidentals too numerous and complex to apportion and describe.

There is also the value of materials, packages, and labour used in curing, which involved an outlay of £50,000 to £60,000 on the year's catch, to which must be added the value of the fishing premises and utensils, estimated at £76,000.

Thus it will be seen that this industry is of great importance to the inhabitants of Yarmouth and Lowestoft, and should be carefully fostered by their respective Corporations.

The Spring catch, which began from Yarmouth in March, and Lowestoft in April, shows an increase upon 1894 of 131 lasts, although fewer boats were employed, only 16 against 19 last year; 4 of these sailing from Yarmouth and 12 from Lowestoft. The Yarmouth men captured 54 lasts, whilst the Lowestoft men secured 818, an average of  $13\frac{1}{2}$  lasts for Yarmouth, and 68 lasts per boat for Lowestoft. The greatest catches were made in April and May; Yarmouth 50 lasts, Lowestoft 793 lasts. Why there should be this difference in the quantities caught by the Yarmouth and Lowestoft men I cannot at present understand, inasmuch as they fish over the same grounds.

The Midsummer fishing was less productive this year than last, but the quality was about the same, and, the demand being good, prices were well sustained. From Yarmouth there sailed 70 local and 18 Scotch, and from Lowestoft 190 local and 22 Scotch boats, in search of these fat, plump, delicate morsels. There were landed at Yarmouth 1063 lasts; and at Lowestoft 1113 lasts; a total of 2176, showing a deficiency of 601 lasts; Lowestoft being responsible for 580 lasts, Yarmouth 21 lasts.

The destination of these fish was chiefly confined to home



markets, the experimental speculation of last year proving too disastrous to tempt curers to repeat their ventures in the Mediterranean markets again.

The North Sea and Home fishings are so intimately connected that it is not possible accurately to define them separately, I shall therefore not divide them in the text.

The Midsummer fishing was scarcely completed before a few venturesome spirits launched their craft and bled away to the far-off Scotch fishing-grounds, intent upon the capture of the silvery tribes of those clearer waters, where tides are strong and waters deep, producing a large fish, sound in flesh, fat, full-roed, the longed-for palate-tickler of the Germans and Russians. Other boats quickly followed, but shot their nets at less distant grounds; thus this fishing, favoured by fine weather and favourable breezes, was in full activity at an early date, and Herrings were landed at Yarmouth in the middle of July, the quality, however, was not equal to the previous year. Nevertheless, the demand for the Continental market being good, sales were easily effected at good prices; many of the boats sailing from Yarmouth, however, ran into Scarborough, Grimsby, &c., and disposed of their catches whilst in a fresh state, bringing only their sea-salted Herrings to Yarmouth, as circumstances favoured them.

The Scotch boats, of which 142 made Yarmouth their rendezvous, began to put in an appearance early in September; during their stay they landed 3900 lasts of good medium, bright, well-scaled fish, which realised, on days of heavy delivery, as low as £5, but average deliveries from £8 to £12. These boats made good catches during their short stay, some of them capturing as many as 8 and 13 lasts a night; their best catches were made between the 10th of October and the 8th of November, the heaviest delivery being on October 29th, when 117 boats landed 502 lasts. The prices obtained were from £5 to £11 per last; but, reckoning the average at £8, our Scotch friends earned about £4000 that night—a very fair night's work. On the whole these boats did very well, and returned home well satisfied with the result of their southern venture. They did not, however, escape unscathed, many of them losing nets, and in one case the lives of the crew were in great jeopardy. On the 11th of October, a sight of desperate effort to regain the sheltering waters of Yarmouth Roads and

Harbour was witnessed. On the previous day, the weather being fine and apparently propitious, nearly the whole Scotch fleet put to sea, but, during the night, one of these sudden storms of wind and blinding rain, for which the North Sea has such an unenviable reputation, sprang up; nets were hauled, and the boats headed for the shore; on they came, wildly careering towards the harbour, which they entered in such quick succession as to endanger their new gained safety; not all, however, returned, for one, the "Star of Bethlehem," a Banffshire boat, making for the coast, struck the Cross-sands, the furious waters of which, dashing with relentless fury over the frail craft, soon overwhelmed her and she went to pieces; the brave fellows on board, with great presence of mind, in the few minutes left to them, constructed a fragile raft composed of small spars, oars and hatches, to which they lashed the bladder net-buoys; trusting themselves to this, were tossed about in the sea for several hours with their heads only just above water. The accident had been witnessed from the lightships, whose signal-guns drew the attention of tug and lifeboat-men, who promptly responded to the call, and sailed in the direction of the Sands in search of survivors, whom they eventually discovered and rescued almost dead with long immersion and fight for life.

The loss of nets and gear amongst these boats was heavy; the nets of some, getting too full of Herrings, sunk; others were destroyed by bad weather; early in November they began to return homeward, all having disappeared by the 20th of that month. Their catch was 1327 lasts in excess of the previous year.

The 147 local Yarmouth boats, of which four are steamers, were not so successful, and their deliveries show a considerable decrease upon the previous year, viz., 2263 lasts, from which deduct the increase Scotch boats thus:

Yarmouth, decrease	.	.	Boats	2263
Scotch, increase	.	.		1327
Net deficiency remaining of				936

Lowestoft comes well to the front with an increase of 2379 lasts, thus:

	YARMOUTH.	LOWESTOFT.
	Local and Scotch Boats	Scotch Boats
1894 .	17,407	3,515
1895 .	16,471	5,894
Net deficiency	936	Increase 2,379

The total catch of the North Sea and Home fishings was as follows: 22,364, against 20,921, showing a net increase of 1443 lasts.

There were 538 boats engaged in these fishings, viz.:

Out of Yarmouth	.	Boats	Local	Boats	Scotch
		117		142	
„ Lowestoft	.	191	„	58	„
		<hr/>		<hr/>	
		338		200	

employing about 5000 men and boys.

The highest catch by a local boat was just over 18 lasts, and its arrival created quite a flutter of excitement for awhile.

November, in spite of the stormy weather, was productive of the largest catches:

For the week ending November 1st,	2297 lasts
„ „ „ 8th,	2295 „
	<hr/>
	4592 „

*i.e.*, 4592 lasts were landed from local boats at Yarmouth, equal to 60,614,400 fish, or about 8,000 tons; allowing five tons to a railway wagon, this fortnight's catch would occupy 1607 wagons or fifty-three trains of thirty wagons each.

The prices realised during this season varied much in the month of September, but became firm in October and continued so to the end; during November they had advanced, until fresh Herrings reached £25 per last; Bloater "stuff," £15; Salt £10; and one day over-day Fresh realised £27 10s.

The earnings of the boats have been fairly good throughout, the highest reaching £1300, and several £800 to £1000. The average for local boats is estimated to be £650, this is somewhat less than last year. The Scotch fishermen also returned home with well-lined purses, the exceptionally fortunate ones having earned over £300.

For the first part of the season the weather was very fine, but from the date of the storm on the 10th of October, it continued fickle, sometimes very fine, and then developing sudden energy, so that the loss of property was great.

Yarmouth has this year seen a revival of the old Dutch practice of sending their vessels and buyers here for Herrings. It was a quaint sight to see these fishermen in their long bright-coloured hose worn outside of their trousers, and white wooden shoes, the

costume of their own country ; comments were freely made upon their singular appearance.

The Dutch fleet had missed the fish, consequently their buyers were compelled to come to Yarmouth and Lowestoft to supply their needs. They bought large quantities during the months of November and December, from catchers and curers, thus giving a special firm tone to this market.

Thinking it might be of interest to you to know somewhat of their craft, and fishing, I will very briefly allude to them. I am able to do so through the kindness of my friends, Messrs. Betz and Van Heyst of Vlaardingen. The Dutch Herring fishing vessels are comprised of luggers similar to ours but larger, and boms, which are flat bottom boats for hauling up on the beach in winter. The luggers carry fourteen to fifteen, and the boms eight to nine men each. This year there were fishing from the various ports of Holland, 557 luggers and boms. Their catch is reckoned by the barrel, and at the close of the season it was discovered that there was a deficiency of 65,957 barrels as compared with the previous year's catch ; this was such a serious decrease that their merchants were compelled to buy on this side to supply their requirements.

The total deliveries at Yarmouth and Lowestoft of the four fishings for the year are :

Yarmouth	.	.	.	Lasts	17,588
Lowestoft	.	.	.		7,826
					<hr/> 25,414

Covering the same period in 1894, they were :

Yarmouth	.	.	.	Lasts	16,184
Lowestoft	.	.	.		8,158
					<hr/> 24,342

An increase for the year of 1072 lasts.

It is not possible to accurately ascertain the actual average price which the fish have realised throughout the season ; but estimating it at £9, which I believe to be under the mark, the value of the North Sea and Home fishing would be over £200,000.

Again I have pleasure in acknowledging the kindness of Mr. W. J. Nutman, the Borough Accountant of Great Yarmouth, and the Harbour Master of Lowestoft, for supplying me with the following statistical table of the catches for the year.

## RETURN OF HERRINGS LANDED AT YARMOUTH AND LOWESTOFT FISH-WHARVES IN 1895.

	YARMOUTH.			LOWESTOFT.		
	Lasts (1,200)	Thousands (100)	Hundreds (10)	Lasts (1,200)	Thousands (100)	Hundreds (10)
Spring Fishing	January . . . . .	—	—	—	—	—
	February . . . . .	—	—	—	—	—
	March . . . . .	—	—	—	25	6
	April . . . . .	3	4	0	417	4
	May . . . . .	50	4	4	345	7
Mid- Summer Fishing	June . . . . .	565	6	1	778	2
	July . . . . .	497	6	3	335	4
North Sea Fishing	August . . . . .	1259	2	1	52	2
	September . . . . .	2479	3	2	51	9
Home Fishing	October . . . . .	3281	0	7	1992	0
	November . . . . .	1189	1	4	1000	5
	December . . . . .	1354	3	4	737	3
Yarmouth . . . . .	13,682	4	3	7826	7	8
*Scotch Boats . . . . .	3905	9	0	—	—	—
Lowestoft . . . . .	17,588	0	3	7826	7	8
Total . . . . .	25,414	8	4	—	—	—

## Abstract of Herrings landed at Yarmouth and Lowestoft Fish-Wharves in 1895:

	YARMOUTH.			LOWESTOFT.		
	Lasts	Thousands	Hundreds	Lasts	Thousands	Hundreds
Spring Herrings	53	8	4	818	8	9
Midsummer „	1063	2	4	1113	7	5
North Sea „	3738	5	3	104	1	6
Home Fishing	12,732	4	2	5789	9	8
	17,588	0	3	7826	7	8
Add Lowestoft	7826	7	8	—	—	—
Total Landed	25,414	8	4	—	—	—

## Number of boats engaged:

	LOWESTOFT. Boats	YARMOUTH. Boats
In Spring Herring Fishing . . . . .	4	12
„ Midsummer „ . . . . .	88	212
„ North Sea and Home Fishing . . . . .	289	271

Estimated value of catch for North Sea and Home Fishings, £200,000.

## III.

THE NEW ZEALAND OWL  
(*SCELOGLAUX ALBIFACIES*, GRAY)  
IN CAPTIVITY.

By J. H. GURNEY, F.L.S.

*Read 27th January, 1896.*

IN March, 1895, Sir Francis Boileau, who was visiting New Zealand, obtained from Mr. H. B. Coles, a taxidermist at Christchurch, through the intervention of Dr. Moorhouse, a living example (which afterwards proved to be a male) of the White-faced or Laughing Owl (*Sceloglaux*\* *albifacies*, Gray) of that country, now said to be, for lack of its natural food, nearly extinct, together with a well-preserved skin and an egg of the same.

This food was, in the opinion of Sir Walter Buller ('Birds of New Zealand,' vol. i. p. 199) and Mr. R. J. Kingsley (Proc. New Zealand Institute, 1890, p. 190) the "kiori maori," or native Rat; but Hutton thinks there is no proof that an indigenous Rat ever existed (Proc. New Zealand Institute, vol. v. p. 230), and so, for the present, the matter remains undecided between these authorities. Meanwhile, the bird is admitted on all hands to be extremely rare and local. It probably became extinct long ago in the little Chatham Islands (Forbes, 'Ibis,' 1893, p. 544) and, if it quite dies out in New Zealand, there will be only the common 'Morepork' left there. The chance, therefore, of studying a living *Sceloglaux*, in England and enabling some competent anatomist to examine its internal structure afterwards, was one which might never happen again.

\* *Sceloglaux*, which my father puts at the commencement of the *Strigidae* and next to *Scelostrix*, was named *Athene albifacies* by G. R. Gray in 1844, and afterwards transferred by Dr. Kaup to his genus *Ieroglaux* (written at first *Hierocoglaux*) and subgenus *Sceloglaux*, where it remains, admitted on all hands to be a strongly differentiated, insular form,—a relic, perhaps, of a far-distant time when a giant bird of prey, *Harpagornis*, half as large again as the Golden Eagle, also inhabited New Zealand.

Sir Francis' Owls had been procured near Timaru in the south island, a previously known locality for them, and he was informed by Mr. Coles that the live one had already been about four months in captivity. Rare as *Sceloglaux* is, this is, nevertheless, the third time that it has been brought to England alive, Mr. D. Rowley having had two, and Mr. W. Rothschild one in confinement at Cambridge, now, with six others, preserved in the rich museum at Tring.

Having lately had an opportunity of examining this series at Tring, all of them apparently adult birds, I notice considerable differences in plumage, which Mr. E. Hartert, of the Tring Museum, had also observed. These consist, not only in the general tint of the Owls which may fade, but in the shape of the brown spots and blotches, particularly on the under-surface, which may mean age and sex, or may mean something more. These brown spots, which form the centre of the feather, are in some examples of *Sceloglaux*, short, broad, and rounded, suggesting the probability that *Sceloglaux* moults its body feathers, not by shedding them, but by attrition, and the dropping off of the "barbiceps." There is also another respect in which Sir Francis Boileau's pair differ from our old Museum specimen, given as long ago as 1854 (and thought a great prize by my father even then),—on the scapular feathers the white spots are longer and narrower. The under-parts are also more tawny, but, no doubt, our bird has faded. One of the examples in the museum at Tring has three or four white feathers (albinistic) on the top of the head; and the bird which Mr. Rothschild had in confinement is less rufous than the others, and altogether darker and smaller, the result, no doubt, of confinement.

The *Sceloglaux* in captivity at Ketteringham was tame, but not tame enough to eat comfortably when any one was by; but he had an appetite almost too good for a captive, and ejected the feathered portions of his meals in the customary pellets. With two toes on either side of the perch he sat contented enough in the darkest corner, where his flat-crowned and rather square-shaped head, and prominent dark eyes, watched with Minerva's wisdom for what was coming; viewing visitors with apathy, but the approach of a dog with some perturbation. The accompanying sketch, taken from a small photograph, shows him in his usual position, though not quite enough puffed out. The pectoral feathers are extremely thick and downy at

the roots, slate-coloured at the base, and for two-thirds of their length, and, perhaps, it was one result of prison life, that I observed they slightly over-lapped and crossed. It was also noticeable that the dark facial bristles did not lie flat against the white feathers which form the disk, but stood out a little. This Owl had a penchant for small birds which, it was found, he preferred to Mice or Rats, dainties he was not accustomed to get in New Zealand. He was



in good health when he arrived in Norfolk, but felt the cold of an English November very much,—though, in its own country, said to brave the icy blasts of snowstorms,—crouching in a corner, although the cage was in a conservatory, and, on November 9th, died, but not from want of food, as he was, if anything, too fat. Like Mr. Dawson Rowley's, he had always been provokingly mite; but, in New Zealand, Sir Walter Buller had one which barked in the night like a dog, and Mr. Potts writes of their "doleful yells." The carcase was sent to Mr. W. P. Pyecraft, of the Oxford Museum, to investigate its anatomy, which has never been described, and may possibly prove of great interest, but as it was divested of its skin the feather tracts could not be described.

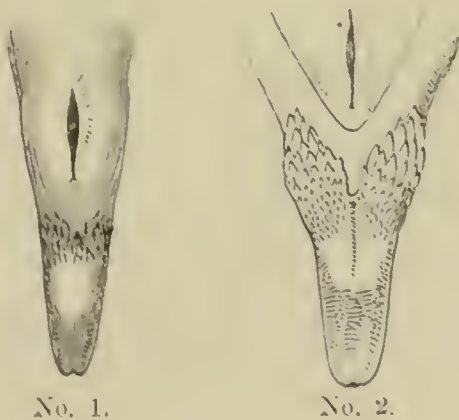
I should call the eyes of *Sceloglaux* very dark brown, large and rather prominent; beak and nostrils, which are a good deal raised, or, as Gould says, swollen, as gray horn colour; claws, which are not in the least pectinated, the same, with dark tips. Its toes have



long bristly hairs on the upper surface, and the outer toe is easily reversible half-way, as I observed when the Owl was both dead and alive. The eyelid is gray, and the toes and soles of the feet are reddish-brown, the latter covered with numerous small spicules as in *Pandion haliaetus* and *Bubo iguazu*. The ears are very low in the head, in fact, placed beneath the eyes, and appear, from external examination, to be quite symmetrical; but after the bird was skinned, I could see, by looking at the skull from the back, that the hind angle of the inferior mandible was lower on one side than the other. This, however, may not affect the actual ear, the external orifice of which measures about  $\frac{3}{12}$  inch, and is of an elongated shape. Mr. F. Beddard, who has examined the skull of *Sceloglaux*, considers that it comes nearer to that of *Strix* in its relative proportions than do the skulls of many other genera, confirming the position assigned to it in our Museum by my father, but he does not say anything about the ear.

I could not measure the dead bird exactly, as it had lost its tail; but from the beak to the toes was fourteen inches, and from tip to tip of the two wings about twenty-eight, which is not a small spread for an Owl. Mr. Gould speaks of its small Accipitrine head, but the head is as large in proportion to its body as in *Syrnium aluco*, and the eye cavity is rather exceptionally large. The oil gland (*Glandula uropygialis*) is single and pointed, with no tuft of feathers at its extremity, as in other Owls.

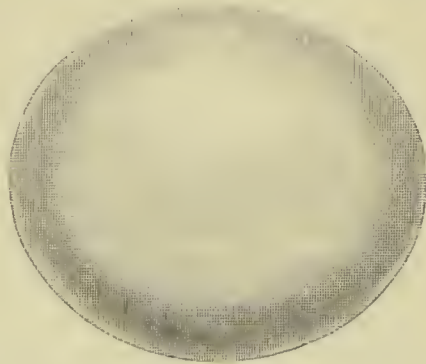
The tongue is the size and shape of the annexed drawing, No. 1, taken the day after the death of the bird; and, for the sake of comparison, No. 2, the tongue of the American Eagle Owl (*Bubo virginianus*, Gmel.), has been added by Mr. R. Holding, to whose handiwork I owe the cuts.



No. 1.

No. 2.

The egg which Sir F. Boileau brought home, and presented to the Norwich Museum, measures  $1.45 \times 1.23$ , and is here figured to



show the size and exact shape. There is no need to colour the cut, as, like all Owls' eggs, it is pure white, and is about the size one might expect from such a bird as *Sceloglaux*.

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IV.

EARLY NOTICE OF SPOONBILL BREEDING  
IN NORFOLK.

BY PROFESSOR ALFRED NEWTON, F.R.S.

*Read 27th January, 1896.*

A FEW weeks since, my friend Mr. John E. Foster, of Trinity College, kindly drew my attention to a passage in the lately published Patent Rolls of King Edward I.\* (p. 546) as follows:—

\* Calendar of Patent Rolls preserved in the Public Record Office. Prepared under the superintendence of the Deputy Keeper of the Records. Edward I. A.D. 1292—1301. London: 1895.

"1300.

MEMBRANE 24 d.

March 22. Commission of oyer and terminer to William Haward, Westminster. William de Hanyngfeld and William de Sutton, touching the persons who entered the park of Hugh de Bardolf in Whynebergh and his free warren there and in Wyrmegeye, Westbrigg, Rungeton, Stowe Bardolf, Fynchham, Cauntele, Strumpshagh, Castre by Jerneuth, and Scrouteby, hunted therein and carried away deer, hares and rabbits; carried away his eyries of sparrow-hawks, herons, spoonbills (*poplorum*) and bitterns in his several woods in Whynebergh, Cauntele and Wyrmegeye, his swans at Wyrmegeye, and his goods there and at Shuddham and Castre by Jerneuth, and assaulted his men at Shuddham, Whynebergh and Castre, co. Norfolk."

This additional evidence of the Spoonbill's breeding in Norfolk is perhaps the oldest on record, and therefore it is not surprising to find the bird mentioned by its ancient and often over-looked name "Popeler"\*; Latinized of course to suit the language of the document. The word is evidently cognate with or corrupted from the Dutch *Lepelaar*, and I have often thought it may survive in the name of Poppylot, part of Feltwell Fen, which was still undrained in 1852, and would perhaps even then have afforded suitable harbour for a company of Spoonbills had any been left in the country.

I would venture to suggest that any member of this Society who might have the opportunity of consulting the original document summarized in the passage I have extracted, would do well to use it, as some other matter of interest to a naturalist may occur in it.

ALFRED NEWTON.

Magdalene College, Cambridge,

14th January, 1896.

[Acting on the suggestion of Professor Newton, and with the kind assistance of the Rev. William Hudson, F.S.A., I obtained a literal copy of the document referred to, and the latter gentleman added still more to our indebtedness by making an extended copy of the cramped and abbreviated original in fair Latin, which he accompanied by a translation. The passage referred to by Professor Newton is here printed *literatim*, also the translation of the whole document, which, although it does not add any new fact, is still interesting as a record of the lawless proceedings of the times, and of the mode of obtaining redress.

\* See 'Promptorium Parvulorum,' ed. Albert Way, part 2, p. 408, and part 3, p. 448 (Camden Society).

't feras in pco ꝑdco 't lepores 't cuniculos in Warennā ꝑdca 't aeries spuaricoꝝ heyronum poploꝝ 't bittoꝝ in boscis suis sepabit in Whynebergh Cauntele 't Wyrmegeye 't eignos suos apud Wyrmegeye 't bona 't catalla sna ibidem apud Shuldā 't Castre iuxta Jernemuth inventa ad valenciā Centū libraz ceperunt 't apportaūūt.

## PATENT ROLLS.

28 Edward I—Membrane 24 dorse [at the back].

Concerning Oyer and The King to his beloved and faithful William Terminer of Trespases Haward and William de Hanyngfeld and William de Sutton greeting

Know that we have assigned you as our Justices to enquire by the oath of good and lawful men of the County of Norfolk through whom the truth of the matter may the better be known what evil doers and disturbers of our peace into the park of our beloved and faithful Hugh Bardolf in Whynebergh and his free warren there and in Wyrmegeye Westbrigg Rungeton Stowe Bardolf Fyncham Cauntele Strumpshagh Castre by Yarmouth and Scrouthy by force and arms entered and in them without his license and will chased the wild animals in the aforesaid park and the hares and rabbits in the aforesaid warren and the cyries of sparrow-hawks herons spoonbills and bitterns in his several woods in Whinebergh Cauntele and Wyrmegeye and his swans at Wyrmegeye and his goods and chattels found there at Shuldā and Castre by Yarmouth to the value of £100 took and carried off and upon his men at Shuldā, Whynebergh and Castre by Yarmouth made assault and beat wounded and evil entreated them and inflicted other enormities upon them to the heavy damage of the said Hugh and contrary to our peace and to hear and determine these trespasses according to law, &c. And further we command you that if you cannot all conveniently be present at the fixed days and places which you shall have thereto provided then you the aforesaid William Haward and William de Sutton without waiting for the presence of the aforesaid William de Hanyngfeld do make that enquiry and do hear and determine the aforesaid trespasses in form aforesaid with a view of making &c.—saving &c. We have also commanded our Sheriff of the County aforesaid that he cause to come before you at the fixed &c. of which you all or you the aforesaid William Haward and William de Sutton shall inform him so many and such &c. from his bailiwick through whom &c. in the premises [the truth] may the better be known and enquired into. In (testimony) whereof &c. Witness the King at Westminster the 22d. day of March—ED.]

## V.

A CONTRIBUTION TO THE FLORA OF  
RUSSIAN LAPLAND.

BY COLONEL H. W. FEILDEN AND MR. HERBERT D. GELDART.

*Read 24th February, 1896.*

THE small collection of plants from the Kola peninsula, exhibited this evening, was made last June, by Feilden, in the vicinity of the Ukanskoe river, which empties into the Bay of Sviatonoskaia on the west side of Sviatoi Nos, that prominent headland of Russian Lapland which marks the entrance to the White Sea, when approaching it from the westward.

The beacon on Sviatoi Nos is in Lat.  $68^{\circ} 9' 50''$  N., and Long.  $39^{\circ} 47' 40''$  east of Greenwich. The Ukanskoe river flows from a lake of the same name into the south-west angle of Sviatonoskaia Bay, between the high, steep, dark bluff Tolstoi, and the small islet of Ust Vokanski, where it is about half a mile in width. There are five fathoms depth at the entrance, and not less than two and a half fathoms are found for two miles up the river, which affords safe navigation for vessels drawing fifteen feet. At three and a half miles up, the rapids commence, and it is no further navigable, even for small boats. From the mouth of the river to the rapids, it is more correctly speaking a fiord, flanked on either side by the granite and gneissoid granite rock formations, which are the prevailing ones in this area. The proper right bank of the river is the steeper, the granite slope rising to a height of 210 to 300 feet, before it attains to the level of the tundra land. This slope is

clad with coppice wood rising to a height of twelve to fifteen feet, and is chiefly composed of Birch, *Betula intermedia*, and Willows, *Salix lanata* with *S. phylicifolia*. *Betula nana* is very plentiful, but nowhere larger than a shrub; *Pyrus aucuparia* and *Juniperus communis* are intermixed; but the predominant feature of the woods is Birch. The undergrowth is chiefly *Empetrum nigrum*, *Vaccinium*, Mosses, Lichens, and plants of various kinds which generally hide the rock surface. As we look up the Ukanskoe to the south, it appears beyond the rapids, as a brawling river not unlike one of our Scottish Highland streams. The banks are edged with high accumulations of immense boulders, which are also spread broadcast over the shallow river-course, the clear water rushing and foaming between them. There are brown Trout, Salmon Trout, and Salmon in the stream. Nowhere is the vegetation very profuse along the river course, but several species of *Viola* showed, with *Gnaphalium dioicum* and *Pedicularis sudetica*, here and there *Taraxacum dens-leonis*, *Sedum rhodiola*, *Lychnis alpina* and *Phyllodoce cærulea*. Looking closely, we meet with *Trientalis europæa*, and *Bartsia alpina* is not uncommon. In the dells leading from the river to the upland, vegetation is richer, gurgling rills trickle down most of them, and the Birch woods screen the flowers from the bitter winds, which come on so suddenly that in a few minutes there may be a change from what seemed tropical heat, with myriads of mosquitoes in attendance, to a temperature at the freezing-point, and the disappearance of one's tormentors. In these sheltered gullies and on the slopes *Anthriscus sylvestris* grows abundantly, but from the water's edge to an elevation of 150 feet *Veratrum lobelianum* is the representative plant. Yellow-blossomed *Trollius europæus* waved all around; this last flower proved a valuable aid in collecting insects. When a sudden change took place in the temperature, the Globe-flower closed its petals into a tight ball, but not before the flies, diptera, beetles, and many other species of insects had fled for refuge to these sheltering bowers. With a camel's hair brush and deft fingering, many minute insects were transferred from these retreats to the collecting tubes. *Myosotis sylvatica* and *M. palustris* grew by the edges of the rills, with *Nardosmia frigida*, *Saussurea alpina*, *Archangelica officinalis*, *Cornus suecica*, and *Adoxa moschatellina*.

*Geranium sylvaticum* was common enough, but was hardly in flower, and the same with *Cardamine pratensis*, at the time of our visit, whilst *Caltha palustris* brightened the rivulets with a border of yellow, as did *Ranunculus acris* on the drier knolls.

On ascending to the uplands from the valley of the Ukanskoe river, a height of 300 feet or so, we see stretching around us not an absolutely flat country, but a sombre, grey, monotonous, dreary expanse of ice-worn land. There are undulations and swellings, the former in many places occupied by lakes and tarns, and by broad surfaces of Lichen-covered peat, with patches of *Eriophorum*. We find in some places still deeper hollows concealing lakes or fair-sized sheets of water, and around these are grouped Birch woods, and the same may be seen in a few sheltered dells; but as the eye travels far and wide over this sad-looking land, these favoured localities are generally hidden from view, and the grey slopes and ice-abraded surfaces predominate. The entire country is covered with erratic boulders, all clad in shaggy coats of Lichen-growth.

These boulders are spread far and wide in countless thousands, scattered over the tops of the rounded eminences, which do not rise higher than 500 to 600 feet. They accumulate in far greater numbers in the hollows and undulations of the rock surface. It is difficult to walk over them, as progression is a series of leaps and bounds, with the danger of falling into the yawning gaps between the boulders. Some of them are of great size, and in places they take most singular positions. One can easily conjure up the impression that you see around, altars and monoliths, and the work of some departed race of Titans, and this adds to the weird feeling of a solitary ramble in that dreary land.

The result, however, is that one learns from these surroundings a most important lesson in glacial geology. We are standing on a surface that has once been covered with an ice-sheet, and as the area of Russian Lapland has been planed down to a very general level, on the melting and recession of the superincumbent ice, its contained erratics have sunk to the level of the land on which it rested. The greater accumulation of the boulders in the undulations would probably arise from the retreating and melting ice-sheet drifting them into the depressions and troughs of

the rock surface. Except by the borders of lakes, or in some of the undulations of the land where there are accumulations of peat, little or no humus rests on the surface of this glaciated country. The flora, however, is richer than one might expect from the surroundings. The lovely little *Diapensia lapponica* with its bosses of white bloom grows everywhere on the bleakest and most exposed situations, where apparently only a few grains of earth and triturated rock hold its roots together. *Ledum palustre*, growing as a small bush in damp spots and on peaty soil, is one of the most striking plants of the tundra. *Arctostaphylos alpina*, *Vaccinium vitis-idaea*, *V. myrtillus*, *Calluna vulgaris*, this last rarely, with *Phyllodoce carulea*, *Andromeda polifolia*, conspicuous by its pink waxen blossoms; *Loiseleuria procumbens*, and *Empetrum nigrum* are a representative group of the tundra plants.

In one or two of the dells on the tundra where we met with a thick layer of peaty soil, *Pinguicula alpina* was found, but it is not widespread. The Saxifrages are represented by few species. *S. caespitosa* was growing on the small gneissoid islands at the mouth of the Ukanskoe, and *S. nivalis* in the ravines of the tributary streams of the main river. Four species of *Papilionaceæ* are common on the barer parts of the tundra, their hard, strong, tap-roots work into cracks and crannies of the rock. These are *Astragalus alpinus*, *Phaca frigida*, *Oxytropus sordida*, and *Hedysarum obscurum*. Of the Rosaceæ, very beautiful is *Rubus arcticus*, *Rubus chamaemorus* is dotted over all the damp peat lands; *Rubus saxatilis* is not uncommon in the Birch woods amongst boulders. *Geum rivale* and *Comarum palustre* are scarce, whilst *Alchemilla vulgaris* var. *alpestris*, is abundant amongst the boulders of the river side. The only *Draba* met with was *D. incana*. The flora of this part of Russian Lapland is of interest, as Sviatoi Nos has been accepted as the meeting-ground of two botanical provinces.\*

The plants collected in Russian Lapland on the Kola Peninsula in the vicinity of the Ukanskoe river at Sviatoi Nos present no

\* Note by Mr. Arthur Bennett:—Sviatoi Nos is the meeting-point of the botanical provinces of *Lapponia ponoiensis* and *Lapponia murmanica*, the latter extending to the westward along the coast to the eastern edge of an island to the right of Cape Teriberskoi where the province of *Lapponia inarensis* commences.



particular features; they are ninety-six in number; and were all determined, with his usual great kindness, by Mr. Arthur Bennett.

- RANUNCULUS ACRIS var. PUMILUS, Willd.  
 TROLLIUS EUROPEUS, L.  
 CALTHA PALUSTRIS, L.  
 DRABA INCANA, L.  
 CARDAMINE PRATENSIS, L.  
 VIOLA CANINA var. MONTANA, L.  
   „ SYLVATICA, Fr.  
   „ STAGNINA, Kit.  
   „ EPIPSILA, Ledeb.  
   „ BIFLORA, L.  
 LICHNIS ALPINA, L.  
 CERASTIUM ALPINUM, L.  
 GERANIUM SYLVATICUM, L.  
 PHACA FRIGIDA, Rich.  
 ASTRAGALUS ALPINUS, L.  
 OXYTROPIS SORDIDA, Willd.  
 HEDYSARUM OBSCURUM, L.  
 ALCHEMILLA VULGARIS var. ALPESTRIS, Schmidt.  
 POTENTILLA COMARUM, Nestl.  
 GEM RIVALE, L.  
 RUBUS SAXATILIS, L.  
   „ CHAMLEMORUS, L.  
   „ ARCTICUS, L.  
 PYRUS ACUPARIA, Goertn.  
 SAXIFRAGA CESPITOSA, L.  
   „ NIVALIS, L.  
 SEDUM RHODIOLA, D. C.  
 MYRIOPHYLLUM ALTERNIFLORUM, D. C.  
 ANTHRISCUS SYLVESTRIS, L.  
 ARCHANGELICA OFFICINALIS, Hoppe.  
 CORNUS SUECICA, L.  
 ADOXA MOSCHATELLINA, L.  
 GALIUM sp. possibly G. TRIFIDUM, L.  
 ARTEMISIA sp.  
 COMPOSITE (Incognit).  
 SAUSSUREA ALPINA, D. C.

- GNAPHALIUM DIOICUM, L.  
 TARAXACUM DEN-LEONIS, Des.  
 NARDOSMIA FRIGIDA, Hook.  
 LEDUM PALUSTRE, L.  
 ARCTOSTAPHYLOS ALPINA, Spr.  
 ANDROMEDA POLIFOLIA, L.  
 CALLUNA VULGARIS, Salis.  
 PHYLLODOCE CÆRULEA, Bab.  
 LOISELEURIA PROCUMBENS, Desv.  
 PYROLA MINOR, Sw.  
 VACCINIUM VITIS-IDEA, L.  
     ,, MYRTILLUS, L.  
 DIAPENSIA LAPPONICA, L.  
 TRIENTALIS EUROPEA, L.  
 MYOSOTIS PALUSTRIS, Rel.  
     ,, SYLVATICA, Hoffm.  
 VERONICA sp. SINE FLORE.  
 BARTSIA ALPINA, L.  
 PEDICULARIS SUDETICA, L.  
     ,, LAPPONICA, L.  
 PINGUICULA ALPINA, L.  
 POLYGONUM VIVIPARUM, L.  
 OXYRIA DIGYNA, Hill.  
 BETULA INTERMEDIA, Thomas.  
     ,, NANA, L.  
 SALIX PHYLICIFOLIA, L.  
     ,, LANATA, L.  
     ,, LAPPONUM, L.  
     ,, SERPYLLACEA, Willd.  
 EMPETRUM NIGRUM, L.  
 JUNIPERUS COMMUNIS, L.  
 ALLIUM SCHIENOPRASUM, L.  
 VERATRUM LOBELIANUM.  
 LUZULA MULTIFLORA, Lej.  
     ,, CONFUSA (HYPERBOREA).  
     ,, WAHLENBERGII, Rup.  
 SCIRPUS CÆSPITOSUS, L.  
 ERIOPHORUM ANGUSTIFOLIUM, Roth.

- ERIOPHORUM VAGINATUM, L.  
 „ SCHEUCHZERI, Hoppe, CAPITATUM, Host.  
 CAREX HALOPHILA, F. Nyl.  
 „ AQUATILIS, Whlb.  
 „ VAGINATA, Tausch.  
 „ GLAREOSA, Ley.  
 „ RARIFLORA, Sm.  
 „ AMPULLACEA, F. PLANIFOLIA, Norman.  
 „ SALINA VAR. FLAVESCENS, F. Nyl.  
 „ RIGIDA, Good.  
 ANTHOXANTHUM ODORATUM, L.  
 Hierochloë borealis (odorata, Vahl).  
 „ ALPINA, L.  
 POA PRATENSIS, L.  
 LYCOPodium annotinum, L.  
 „ ALPINUM, L.  
 „ SELAGO, L.  
 Equisetum arvense, L.  
 „ PRATENSE, Ehrh.  
 „ SYLVATICUM, L.  
 LASTREA SPINULOSA, Presl.  
 POLYPODIUM DRYOPTERIS, L.
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## VI.

## A CONTRIBUTION TO THE FLORA OF KOLGUEV.

BY COLONEL H. W. FEILDEN AND MR. HERBERT D. GELDART.

*Read 24th February, 1896.*

AN expedition, organised by Mr. H. J. Pearson, left England in the end of May, 1895, with the intention of visiting Novaya Zemlya. The members of the party were Mr. H. J. Pearson, Mr. C. E. Pearson, the Rev. H. H. Slater, and Colonel H. W. Feilden. Leaving Vardö in the Steam Yacht "Saxon," June 14th, a course was laid for Novaya Zemlya. The ice conditions in Barents Sea were found to be extremely unfavourable. Impenetrable pack-ice was met with about eighty miles from the west coast of Novaya Zemlya, trending towards the north-west, and several days were spent in cruising along the edge of that ice to the south-east. Every likely bight in the pack was entered, and in some cases these indentations were followed up for twenty to thirty miles, but invariably heavy compact ice barred further progress, and the yacht had to return to open water. Recalling Milton's lines :

"Mountains of ice that stop the imagined way,  
Beyond Petsora easterly, to the rich  
Cathaian coast."

Coal running short, the little vessel bore up for Vardö to refill. The members of the expedition were landed on the Murman Coast of Russian Lapland, near Sviatoi Nos, where they went into camp. A week was profitably spent there in ornithological, botanical, and geological investigations. On the return of the yacht from Vardö, a second attempt was made to reach Novaya Zemlya. The ice-pack was again met with in about the same meridian as before, but a lead showing, the vessel ran some forty miles through the ice-fields, and reached within eight or ten miles of that part of Novaya Zemlya known as Goose Land. There again, an impenetrable pack, eight to ten miles in width, was wedged against the shore. Every attempt to find a way through this failed, and after running many risks another retreat had to be attempted. This was very fortunately

effected, and after passing through some forty miles of ice, open water was reached. The yacht then ran down to the island of Kolguev, with the ice in sight all the way, on the port side. As the "Saxon" had to return to Vardö for a fresh supply of coal, Mr. H. J. Pearson determined, if the weather permitted, to land on Kolguev. This was effected July 5th, and the members of the expedition went into camp near the mouth of the Gobista river, on the south-west side of Kolguev. The yacht returned from Vardö and took the party off on July 16th. A third attempt was then made to reach Novaya Zemlya which proved successful.

The island of Kolguev lies between 68° 43' and 69° 30' N. Lat., and Long. 48° 15' to 49° 55' east of Greenwich. It is about fifty geographical miles in length, and some forty in width. It possesses no harbour for a sea-going craft drawing any depth of water, and none of its rivers are navigable. It is surrounded by shoals and sand-banks, and often during summer by ice. In winter it is completely ice-bound, and indeed during the whole year, the ice-fields seem to remain on its eastern shore. Its western coast during the short summer is freer, but even in the month of July, 1895, when Colonel Feikden passed ten days on that side of the island, the ice-pack came down from the northward, and for three days enveloped the coast. The climatic conditions of Kolguev are very severe. Professor Saweljew, who with Dr. Ruprecht (conservator of the Botanical Museum of the Imperial Academy of Science, Russia) visited Kolguev, in 1841, makes the following remarks about the climate: "During the sixteen days which we spent at various spots on (or off) the island in July and August, the thermometer never rose above 9° R., and even this but once, at mid-day. Usually it stood at 4° or 5°, and fell at times to 2°, or even to 1° R.; while before this, on Kanin (*i.e.* on the mainland), a warmth of 10° to 12° prevailed, which, immediately after our departure from Kanin, mounted (there) to 15° R. It is to be remarked that the soil of this island . . . does not thaw in the course of the year more than two feet deep. Further down all remains in a frozen state—a thing which we have not found to occur either on the Kanin peninsula or on the coast of Timan."\*

Mr. A. Trevor-Battye, who paid an adventurous visit to Kolguev in 1894, has told his experiences in a delightful volume, 'Ice-bound

\* Archiv für Wissenschaftliche Kunde von Russland, 1852. A. Erman, x. 313—316.

on Kolguev,'\* to which we shall frequently have to refer in this paper, especially to his excellent appendix on the Botany of the island. He tells us, "that the Russians have a great dread of being compelled to pass the winter on Kolguev. They told him that only one Russian to their knowledge had ever done so. He described the winter as terribly severe; and the Samoyeds all agreed in saying that it was far worse than on the mainland." Mr. Trevor-Battye gives the following as the result of his meteorological observations: "The average shade temperatures for the twenty-four hours during June were, max. 40° F., min. 33° F., the thermometer twice falling to 31° F., and twice rising to 50° F. On June 24th it registered in the sun at mid-day 62° F. The average for July was decidedly higher, though more than once it fell to freezing-point. On August 28th, my thermometer was broken during a gale, but up to that date it varied from 42° F. at noon to 76° F. This, the highest reading, was on August 16th, and on that day it was 86° F. in the sun. The thermometer never fell below 42° F. during August up to the 28th. After this the weather got rapidly colder, and by September 16th, the ground was covered with snow, and the lakes were beginning to freeze. Kolguev is exceedingly subject to fogs and gales of great duration. The prevailing wind is northerly, either N., N.E., or N.W." †

The experiences of Mr. Pearson's party were quite as unfavourable. July 5th, the day on which they landed near the mouth of the Gobista river, was warm and oppressive, with heavy rain showers; the wind from the south and south-west, and accompanied by thunder and lightning. The next day the wind shifted to the north and north-west, with fog, and intermittent snow showers, remaining bitterly cold till the 16th July, when the party left the island.

During the whole of their stay, the temperature seldom rose above 35° F., whilst at times it fell to 32° F. Several experiments were made by Feilden to test the heat of the earth at the root of plants in flower. At a depth of five to six inches below the surface, it was found that the temperature varied but little. Several readings of the thermometer taken on different days, worked out to 40° F., the observations on no occasion showing a difference of more than one degree. Though these observations on earth

\* 'Ice-bound on Kolguev' (London, 1895).

† Trevor-Battye, *op. cit.* pp. 445—46.

temperature in Kolguev are of a somewhat perfunctory nature, yet they may be compared with those of our own country. At the Royal Botanic Society Gardens in London for 1895, we find that the mean temperature of the earth at six inches below the surface, during the months of March and November, approximate very closely with the earth temperature of Kolguev at the same depth in July.

We have referred to the subject of earth temperature at the roots of flowering plants more as a suggestion, that fuller experiments be made on this interesting subject in frozen regions. It is evident that some species of plants can survive intense cold. For instance, at Floeberg Beach in Grinnell Land, where 70° below zero of Fahr. was recorded, and 40° to 50° below zero was a common winter temperature, some twenty nine or thirty flowering plants exist. A covering mantle of snow as a protection does not seem to be necessary, for it is mentioned by Feilden that the pink mountain Saxifrage, *S. oppositifolia*, growing on bare spots, entirely denuded of snow throughout the winter, blossomed luxuriantly on the return of summer. We cannot doubt that under such circumstances the roots as well as the leaves of these plants must be completely frozen during the winter; it would therefore be interesting to learn at what temperature the revivifying process takes effect. We all know how rapidly a dark surface absorbs the heat rays, and judging by the crude observations recorded from Kolguev, it is probable that in the Polar regions, the earth exposed to the sun's heat may for some inches retain a temperature sufficiently high to enable the plant to fulfil its function of flowering, though the atmospheric temperature be much below freezing.

The geological structure of Kolguev is of special interest, when taken into consideration with the flora. The island is composed entirely of sedimentary beds of glacio-marine origin, without any bottom or basement rock, of an older series, showing throughout its entire extent. Its geology has been described by Mr. Trevor-Battye,\* and also by one of the writers,† and their determinations of its structure coincide with the map of the Russian Geological Survey, on which Kolguev is laid down as consisting of "marine boreal beds." Though the distance of the island from the nearest part of the mainland of Russia is only fifty miles, and the soundings

\* *Op. cit.*, pp. 392, 395.

† Feilden, Q. J. G. S. Lond. 1896, pp. 52—65.

between are under thirty fathoms, yet the evidence is entirely opposed to Kolguev having been connected with the Continent since its elevation above the sea. The present Kolguev is doubtless a part of what has lately been the bottom of Barents Sea, and probably fairly represents the floor of the ocean for a considerable area around. The recent emergence of Kolguev gives to its flora an interest which otherwise it might not possess. As there is no evidence throughout the entire length and breadth of the island, of any older rock formation showing through its glacio-marine beds, which might have been the mother-earth of some of the plants now growing there, we are entitled to assume that its present flora is derived entirely from immigration, and that within a comparatively recent period. That the transport of plants or their seeds may readily be effected by floating ice, cannot be doubted by those who have noticed the large quantities of earth and debris resting on the ice-floes which float in summer from the White Sea, and the estuary of the Petchora river, into Barents Sea. This ice-pack drifts around, and is at the present day pushed up on the shores of Kolguev, and a similar process must have been going on since the period when the island first commenced to emerge as a sand-bank from the sea.

It is, therefore, only what we might expect to find, that the flora shows closer affinity with that of the mainland than with Novaya Zemlya. Probably birds have contributed as well to the transportation of seeds, and it may not be out of place to mention that three species of freshwater Mollusca were found in the swamps of the Gobista valley—

*Planorbis borealis*, Loven.

*Limnæa palustris*, Muller, var. *terebra*

„ *ovata*, Draparnaud, var. *kolguevensis*, E. A. Smith.

This fog-environed, wind-tormented island of Kolguev is exceptionally dreary and desolate-looking. There is not one redeeming feature in its scenery. No mountains, no brawling streams, no woods, no rocky cliffs to enoble the view. The entire western side of Kolguev, from the mouth of the Gusina river to that of the Gobista, is a long straight line of bluff running nearly due north and south. At intervals, ravines and gullies made by streams issuing from the interior break the coast-line. These bluffs rise to a height of about a hundred feet at the north-west end of the island, but sink by an almost imperceptible dip from north to south,



until at the mouth of the Gobista they are not more than forty feet above sea-level ; and this dip continues in the same direction, for at the mouth of the Kriva river the land almost merges with the sea, the coast-line being only a few feet above the sea-level.

The aspect of the interior of the island is not more inviting, the brown, sad-looking tundra, patched here and there with snow and dotted over with shallow meres and lakes, stretches a dreary flat, mile upon mile, embracing the south end, or about one-third of the area of the island. The northern part of the island is more elevated ; and from the west coast the land is to be seen rising to the north and north-east, and culminating in rounded hills, which reach an altitude of 200 to 250 feet. An interesting description of this elevated part of the island is given by Mr. Trevor Battye.\*

Walking over the tundra in Kolguev is weary work. When the sun comes out, and there is a definite rise in the temperature, the traveller is assailed by myriads of mosquitoes. The constant stepping from one Lichen-covered peat-mound to the next, in order to clear the *sphagnum*-covered swamps, is exhausting. There is no change in the view ; the horizon, bounded by the level tundra, is always the same. The flora is uninteresting. One gets tired of seeing the swamps covered with the white blossoms of the Cloud-berry with fluffy headed *Nardosmia frigida* interspersed. Now and again one passes a red or yellow Louse-wort (*Pedicularis*), and, looking more closely, *Saxifraga stellaris* is to be seen. Frequently one stumbles through a growth of downy Willow (*Salix lanata*) not higher than the knee, from which, at times, a Willow Grouse rises, wild as any hawk. The flora of the tundra proper is not rich in species nor in colouring. The typical plants are :

- Rubus chamaemorus*
- Empetrum nigrum*
- Salix lanata*
- Betula nana*
- Nardosmia frigida*
- Sedum rhodiola*
- Pedicularis hirsuta*
- "      *lapponica*
- Saxifraga stellaris*
- Polemonium pulchellum*

\* 'Ice-bound on Kolguev.'

Whilst around the pools and wet spots are found

*Ranunculus pallasii*

*Hippuris vulgaris*

*Eriophorum angustifolium*

„ *scheuchzeri*

Sedges and a few *Luzulæ*

Each peat hag and mound is Lichen-covered, and probably the Lichen flora is the richest of all, it is quite the distinguishing feature of the tundra.

The Gobista river, which rises at the base of Mount Siekherher in the interior and elevated part of the island, then flows west as a shallow, muddy stream, but when it reaches the tundra, or flat portion of the island, it has excavated through the soft clay and mud-beds a valley quite out of proportion to the river as it now runs. This valley is, in parts, as much as a mile and a half wide, decreasing in places to half a mile across. On either side it is bounded by bluffs, forty to ninety feet in height. At angles where the present river abuts, and erosion is in process, the mud walls are perpendicular; but as the stream has shifted its course from one side of the valley to the other, miles of bluff have been left to moulder, and these now descend with more or less abrupt slopes. The bottom lands through which the Gobista river winds is dotted over with meres and pools of water, around which *Ranunculus pallasii* and *Hippuris vulgaris* are two of the commonest plants. It is in these localities that the wild Swan, *Cygnus bewickii*, makes its nest on a mound of moss, built up by the birds for that purpose, whilst on the drier slopes, the Little Stint, *Tringa minuta*, was found depositing its four eggs in an artless nest. On the slopes of this valley and facing south, the greatest abundance of flowering plants was met with. Many kinds that dare not face the bleak tundra with its cutting winds, there nestle in warm corners, or on sheltered banks. The beauty of the flowers in some of these favoured nooks is difficult to describe, without laying one's self open to the suspicion of exaggeration. Be it remembered that the traveller sees them under exceptional circumstances. For days before, he may have been sailing through fog, and surrounded by ice; or he lands on some bleak and inhospitable shore, where only a few dwarfed and struggling plants are to be met with; or, driven from the monotonous tundra by

sharp wind or snow showers, he seeks shelter in the valley. Turning some corner his eyes are greeted with a floral display, quite unexpected, and in marked contrast with the scenes lately passed through, which cannot fail to make a lasting impression. The following is a record of such a bank, noted on the spot. Here are masses of blue Gentian (*Gentiana verna*), of superb colour, with a wealth of Forget-me-nots (*Myosotis alpestris*), intermingled with *Polemonium caeruleum*. Contrasting with these lovely shades of blue, are yellow twin-flowered Violets (*Viola biflora*), in dense beds, patches of Buttercups (*Ranunculus acris*), with Potentilla, Marsh-marigold, and Globe-flower (*Trollius europaeus*), waving highest of all, *Silene acaulis* in clumps, with its pink mass of bloom, *Sedum rhodiola* scattered broadcast, with Alpine Milk-vetch, *Oxytropis sordida*, *Hedysarum obscurum*, Wood Geranium, Valerian, and Veronica, Willow bushes, a carpeting of grasses, and large beds of our common Lady's-mantle.

It is apparent from these observations by Feilden that the flora of the western side of Kolguev is richer than that of the east coast where the ice clings to the shore throughout the year. This is shown by a comparison of the list of plants obtained chiefly in the valley of the Gobista, with that made by such a competent botanist as Mr. Trevor-Battye on the eastern side of the island and the elevated interior. The much earlier date on which flowers blossom on the western side is also noticeable. This difference in favour of the western side may be accounted for by the shelter afforded in its valleys, and the tempering influence of the Gulf Stream which extends as far eastward as the Sea of Barents.

Our previous knowledge of the flora of Kolguev is confined to two authorities, the first being the celebrated botanist Ruprecht, who, as already mentioned, made his memorable visit to Kolguev in 1841. The list of flowering plants collected by him on the island is given in his work entitled *Flores Samoyedorum Cisurallensium*. The other is Mr. Trevor-Battye, who in 1894 found ninety-six flowering plants on Kolguev, and in his work\* gives a list of twenty-one others recorded by Ruprecht, and which Mr. Trevor-Battye did not meet with himself, bringing up the total number of flowering plants then known from Kolguev to one hundred and seventeen.

\* 'Ice-bound on Kolguev,' pp. 396-415.

Feilden's botanical investigations on Kolguev were greatly aided by the Rev. H. H. Slater, himself an accomplished botanist, and by Mr. C. E. Pearson. Both of these gentlemen devoted themselves more particularly to the ornithology of the island, during the short visit; but Feilden's thanks are especially due to Mr. Slater, not only for adding to his herbarium, but also for critical identification of plants, and drawing attention to several obscure species, which might otherwise have been overlooked. Mr. C. E. Pearson also contributed to the collection, and his assistance, at all times generously accorded, is gratefully remembered.

It is somewhat remarkable that Kolguev which has not been visited by scientific men since 1841, when Dr. Ruprecht landed there, should have been botanised over by two Englishmen in two successive years, 1894 and 1895, the result being that Mr. Trevor-Battye brought the number of species of flowering plants and vascular cryptogams known to grow there up to one hundred and seventeen, and Feilden adds thirty more, making a total of one hundred and forty-seven. But it is not at all likely that the flora of the island has been exhaustively worked out, for Feilden's collection was entirely made in a semi-circular area (with the sea for its base) of about seven miles radius from his camp on the Gobista, that distance being as much as he could travel on foot out and home again in one day over so difficult a country, and in such an unfavourable climate.

The flora of the island appears to be merely an extension of that of the nearest mainland about fifty miles distant, with, as has been pointed out by Mr. Trevor-Battye, a few curious additions and omissions. Of the additions, *Stellaria longipes*, Goldie, and *S. humifusa*, Rottb., seem the most important. These two species, though both are found in Skandinavia, are specially at home in Greenland, where the latter grows in every one of the ten zones into which Professor Warming has divided that land, and the former in eight out of the ten, being absent only from the middle and southern zones of the east coast. By far the most notable of the omissions, as at present known, is *Saxifraga oppositifolia*, L., which has been found in Arctic regions of both hemispheres, being present even in the restricted floras of Jan Mayen and Bear Island. Its absence is all the more strange, because we know that it is a favourite food of birds, and therefore the more likely to be

carried to the island by them. *Mertensia maritima*, Don., also noticed by Mr. Trevor-Battye as an absentee, is not nearly so widely distributed as the *Saxifraga*, being absent from East Greenland altogether, and from both the extreme north and extreme south of West Greenland, and from both Novaya Zemlya and Bear Island (Th. Fries), but it grows in both Jan Mayen and Spitsbergen. *Ledum palustre*, L., as Mr. Trevor-Battye observes, does not grow on Kolguev, but it is also absent from Novaya Zemlya, indeed it appears from Professor Warming's and Th. Holm's tables ('Voyage of the *Dijmphna*') that no plant of the order *Ericaceae* has been found on that island. It is also noticeable that *Phaca frigida*, L., is absent from Kolguev, considering its presence in the Kola Peninsula, and its remarkable abundance in Novaya Zemlya.

There is no doubt that had Feilden's collection been made a month later in the year, more additions would have been made to the list of species. There are several *Cruciferae* and *Cyperaceae* among his plants, which being only in flower, and not in seed, are undeterminable. In the case of *Carex limosa*, L., that name is used as an aggregate, it being very probable that had the specimens been in fruit some might have been separable as *C. irrigua*, Hoppe, and others as *C. rariflora*, Sm.

Warm thanks are due to Mr. Arthur Bennett, to whom the whole of Colonel Feilden's plants collected on this voyage were submitted, for his kindness and the great trouble that he took in naming them. A few which remained doubtful were compared with the herbarium of the British Museum at South Kensington, where Messrs. Jas. Britten, E. G. Baker, and A. B. Rendle showed great kindness and gave most valuable help, for which we beg to thank them one and all.

**RANUNCULUS PYGMEUS**, Wahl. Common on clayey banks, and on the sides of runnels in the tundra. Fully in flower during July on the west side of the island.

**RANUNCULUS ACRIS**, L. Very common in the Gobista valley on slopes and banks. Grows in clumps and clusters of blossom. Flowering fully in July.

**RANUNCULUS PALLASII**, Schlecht. Abundant around the pools and meres on the tundra, likewise in similar places in the valley of the Gobista. Its long roots grow in the water, and the white flowers

float on the surface. They have a delicate and pleasant scent, somewhat akin to that of an almond.

*RANUNCULUS HYPERBOREUS*, Ruprecht. Rare, only observed in a few mossy pools, on the tundra and in the valley of the Gobista. Its aquatic mode of growth at once attracts attention.

*RANUNCULUS SAMOYEDORUM*, Ruprecht. This diminutive plant was detected by seeing its bloom like minute yellow seeds, scattered over the wet moss of small pools on the tundra. It is of aquatic habit like the preceding species, and its comparatively long roots pass between the moss into the water below.

*TROLLIUS EUROPEUS*, L. Common in some parts of the Gobista valley, generally on banks facing south. We found it well in flower during July. This plant was so abundant at one spot in the Gobista valley, some five miles from the sea, that we named it Trollius Point.

*DELPHINIUM?* A Larkspur in bud, not in blossom, was met with in the Gobista valley. Probably *D. elatum*, L.

*CARDAMINE PRATENSIS*, L. Quite common, and spread over the bottom lands of the Gobista. Lilac-coloured blossoms were met with as well as white ones, though Mr. Trevor-Battye's experience is the reverse.

*ARABIS ALPINA*, L. Rather uncommon. Grows on the barest banks which slope down from the tundra to the Gobista valley.

*VIOLA BIFLORA*, L. One of the most abundant flowers on the banks of the Gobista valley. Fully in flower during July, and equalling in strength and size of blossom the finest Norwegian specimens.

*VIOLA EPIPSILA*, Ledeb. Not at all uncommon on the banks of the Gobista valley. Out of hundreds of plants looked at, all had well-developed leaves, which is quite the opposite to Ruprecht's experience.

*SILENE ACAULIS*, L. Very common in the vicinity of the Gobista. The clumps of blossom varied from deep pink to a pure white colour.

*ARENARIA PEPLOIDES*, L. Common enough on the great sand and gravel terraces which bar the estuaries of the Kriva and Gobista rivers.

*GERANIUM SYLVATICUM*, L. Common enough in the Gobista valley, just opening into flower the middle of July.

*HEDYSARUM OBSCURUM*, L. Common in the Gobista valley, only coming into flower the middle of July.

*RUBUS ARCTICUS*, L. This lovely flower was not uncommon either in the Gobista valley, or in gullies along the coast. We did not meet with two forms as recorded by Mr. Trevor-Battye.

*RUBUS CHAMEMORUS*, L. Perhaps the most widely distributed and abundant plant of the tundra land.

*POTENTILLA COMARUM*, Nestl. Not at all common. Growing by the side of pools on the tundra.

*ALCHEMILLA VULGARIS*, L. Very abundant. Just commencing to flower the middle of July.

*SAXIFRAGA CESPITOSA*, L. Common everywhere.

*SAXIFRAGA DECIPiens*, Ehr. Uncommon. Only a few plants found which grew in clumps.

*SAXIFRAGA CERNUA*, L. Common everywhere, and of remarkably fine growth.

*SAXIFRAGA RIVULARIS*, L. Common in damp spots, both on the tundra and in valleys.

*SAXIFRAGA STELLARIS*, var. *COMOSA*, Poir. Common; especially on the tundra.

*SAXIFRAGA HIRCOLUS*, L. Common; when growing on dry and exposed situations of a stunted character, but in damp places attaining its normal size as we meet with it in Britain.

*SAXIFRAGA HERACIFOLIA*, W. & K. A striking plant when seen growing on the tundra, as it is usually isolated, and attains a height of six or seven inches.

*PARNASSIA PALUSTRIS*, L. Common in the swamps of the Gobista valley.

*SEDUM RHODIOLA*, D. C. Very common, especially on the bluffs overhanging the sea.

*HIPPURIS VULGARIS*, L. Abundant in the pools and meres, both on the tundra and in the valleys.

*PACHYPLEURUM ALPINUM*, Ledeb. Common on the slopes of the Gobista valley.

*ARCHANGELICA OFFICINALIS*, Hoffm. Very common by the seaside around the estuary of the Gobista.

*ERIGERON UNIFLORUS*, L. Common.

*GNAPHALIUM SUPINUM*, L. Common; not in flower up to the middle of July.

*MATRICARIA INODORA*, var. *PHENOCEPHALA*, Rup. Very common along the west coast, in some sheltered spots it grew abundantly, with blossoms the size of a penny-piece.

SAUSSUREA ALPINA, D. C. Common ; but not fully in flower by the middle of July.

VACCINIUM ULIGINOSUM, var. MICROPHYLLUM, Lange. Common on the peaty lands of the tundra.

VACCINIUM VITIS-IDEA, L., var. PUMILUM, Horn. Common on the peaty lands of the tundra.

ARCTOSTAPHYLOS ALPINA, Spreng. Common ; flowering in July.

PYROLA MINOR, Sw. Not common, but found flowering in some of the side ravines of the Gobista valley, and more abundantly in a ravine five miles to the northward.

GENTIANA VERNA, L. One of the most lovely plants we met with, growing in beds on the slopes of the Gobista valley. The masses of deep blue blossom were very striking.

GENTIANA TENELLA, Fries. This small Gentian was found in only one locality, a ravine some five miles north of our camp.

ARMERIA VULGARIS, var. ARCTICA, Cham. Extremely abundant on the weather-beaten summits of the sea-bluffs.

PRIMULA STRICTA, Horn. Common on the slopes leading down from the tundra, in ravines, and likewise in the valleys.

PRIMULA SIBIRICA, L., var. FINMARKICA, Jacq. We first met with this beautiful Primrose on the banks of the Gobista, some five miles from the sea. It was in full flower during July. We came across a bed of this plant near the mouth of the Kriva, not less than a quarter of an acre in extent, and a mass of bloom.

TRIENTALIS EUROPEA, L. Only met with in one locality, a ravine five miles north of our camp.

PINGUICULA ALPINA, L. This plant, with its delicate waxen flower, was found growing in some abundance on bogs and damp places in the Gobista valley, some five miles inland.

CASTILLEIA SEPTENTRIONALIS, L. Growing as a plant six to ten inches high, on the banks of the Gobista river.

MYOSOTIS ALPESTRIS, Schmidt. Very common in the valley of the Gobista. We did not meet with *M. arvensis*, nor with *Eritrichium villosum*, which are common plants on the eastern side of the island (*vide* Trevor-Battye).

ADOXA MOSCHATELLINA, L. Only found in one locality, some four miles south of our Gobista camp.

BARTSIA ALPINA, L. Common on the slopes of the Gobista valley, but not fully in flower by the middle of July.

PLANTAGO MARITIMA, L. With *Sedum rhodiola*, the commonest



plant, along the wind-swept heights of the shore-bluffs, on the west side of the island.

*ALLIUM SIBIRICUM*, L. Very common; on sandy banks near the mouth of the Gobista, on slopes further inland, and near the mouth of the Kriva river.

*KÖENIGIA ISLANDICA*, L. Not uncommon in damp spots on the tundra, and the lowlands of the valley, where it was discovered by the Rev. H. H. Slater.

The following list includes all flowering plants and vascular cryptogams found by Dr. Ruprecht and Mr. Trevor-Battye as shown in that published in 'Ice-bound on Kolguev.' Those which Colonel Feilden did *not* find are in italics, and those which he adds to the list are distinguished by an asterisk.

- RANUNCULUS* *ACRIS*, L., var. *PUMILUS*.  
 „ *LAPPONICUS*, L.  
 \* „ *HYPERBOREUS*, Rup.  
 „ *SAMOYEDORUM*, Rup.  
 „ *PYGMEUS*, L.  
 „ *PALLASHI*, Schlecht. (var. *MINOR*, Rup.)  
*CALTHA* *PALUSTRIS*, L.  
*TROLLIUS* *EUROPEUS*, L.  
*DELPHINIUM* *ELATUM*, L.  
*Aconitum septentrionale*, Willd.  
 \* *ARABIS* *ALPINA*, L.  
*CARDAMINE* *PRATENSIS*, L.  
 \**COCHLEARIA* *ARCTICA*, D. C.  
 „ *DANICA*, L.  
*DRABA* *ALPINA*, L.  
 „ *HIRTA*, L.  
 „ *RUPESTRIS*, R. Br.  
 „ *MURICELLA*, Wahl.  
 \* „ *INCANA*, L.  
*EUTREMA* *EDWARDSII*, R. Br.  
*VIOLA* *BIFLORA*, L.  
 „ *EPIPSILA*, Led.  
*DIANTHUS* *SUPERBUS*, L.  
 \**ALSINE* *BIFLORA*, Wahl.  
*CERASTIUM* *ARVENSE*, L., var. *INCANUM*.  
 „ *ALPIMUM*, L.  
*ARENARIA* *PEPLOIDES*, L.

- \*MELANDRIUM AFFINE, Wahlb.  
*Wahlbergella angustiflora*, Rup.  
*Sagina intermedia*, Rup.
- \*SILENE ACAULIS, L.  
 STELLARIA LONGIPES, Goldie (S. EDWARDSII, R. Br.)  
 „ HUMIFUSA, Rottb.
- \*MONTIA FONTANA, L. (1 spec. only).  
 GERANIUM SYLVATICUM, L.  
 OXYTROPIS SORDIDA, Willd.  
 ASTRAGALUS ALPINUS, L.
- \*HEDYSARUM OBSCURUM, L.  
*Dryas octopetala*, L.  
*Geum rivale*, L.
- POTENTILLA SALISBURGENSIS, Haencke.  
 „ COMARUM, Nestl.
- SIBBALDIA PROCUMBENS, L.  
 ALCHEMILLA VULGARIS, L.  
 RUBUS CHAMLEMORUS, L.  
 „ ARCTICUS, L.
- \*EPILOBIUM ANGUSTIFOLIUM (sine fl.)  
 „ *lineare*, L.
- SAXIFRAGA CERNUA, L.  
 „ CAESPITOSA, L.
- \* „ DECIPIENS, Ehrh.  
 „ HERACIFOLIA, W. & K.  
 „ HIRCULUS, L.  
 „ *nivalis*, L.  
 „ RIVULARIS, L.  
 „ STELLARIS var. COMOSA, Poir.
- CHRYSOSPLENIUM ALTERNIFOLIUM, L.  
 PARNASSIA PALUSTRIS, L.  
 „ *obtusiflora*, Rup.
- SEDUM RHODIOLA, D. C.  
 HIPPURIS VULGARIS, L.  
 ADOXA MOSCHATPELLINA, L.  
 PACHYPLEURUM ALPINUM, Led.  
 ARCHANGELICA OFFICINALIS, Hoffm.  
 VALERIANA CAPITATA, Willd.  
 ARTEMISIA VULGARIS f. TILESII, Ledeb.  
*Antennaria carpathica*, R. Br.  
 „ *alpina*, R. Br.

- GNAPHALIUM SUPINUM, L.  
 ERIGERON UNIFLORUS, L.  
 MATRICARIA INODORA (PHICEOPHALA, Rup.)  
*Pyrethrum bipinnatum*, Willd.  
*Achillea millefolium*, L.  
 SAUSSUREA ALPINA, D. C.  
 NARDOSMIA FRIGIDA, Hook.  
 SENECIO CAMPESTRIS, D. C.  
   „ *palustris*, L.  
 TARAXACUM OFFICINALE, Schrank, var. ALPINUM.  
*Hieracium alpinum*, L.  
*Campanula rotundifolia*, L.  
 VACCINIUM ULIGINOSUM var. MICROPHYLLUM, Lange.  
   „ VITIS-IDEA, L., var. PUMILUM, Hoff.  
   „ *myrtillus*, L.  
 ARCTOSTAPHYLOS ALPINA, Spe.  
 PYROLA MINOR, Sw.  
   „ *uniflora*, L.  
 GENTIANA VERNA, L.  
 \* „ TENELLA, Fries.  
 ARMERIA MARITIMA, Willd.  
 PRIMULA STRICTA, Hoff.  
 \* „ SIBIRICA var. FINMARCKICA, Jacq.  
*Androsace septentrionalis*, L. (*f. citiata*, Traut).  
 \*TRIENTALIS EUROPEA, L.  
 \*PINGUICULA ALPINA, L.  
 POLEMONIUM HUMILE, Willd. (PULCHELLUM, Bunge.)  
   „ CERULEUM *f.* ACUTIFOLIUM, Willd.  
 MYOSOTIS ALPESTRIS, Schmidt.  
   „ *arvensis*, Hoff.  
*Eritrichium villosum*, Bunge.  
 VERONICA alpina, L.  
   „ LONGIFOLIA, L.  
 BARTSIA ALPINA, L.  
 CASTILLEIA SEPTENTRIONALIS, L.  
 PEDICULARIS LAPONICA, L.  
   „ HIRSUTA, L.  
 \*PLANTAGO MARITIMA, L.  
 \*KENIGIA ISLANDICA, L.  
 OXYRIA RENIFORMIS, Hook.

- POLYGONUM VIVIPARUM, L.  
 RUMEX ACETOSA, L.  
     ,, DOMESTICUS *f.* NANUS.  
 BETULA NANA, L.  
 SALIX HERBACEA, L.  
     ,, MYRSINITES, L.  
     ,, RETICULATA, L.  
     ,, LANATA, L.  
     ,, LAPPONUM, L.  
     ,, POLARIS, Wahlbg.  
 EMPETRUM NIGRUM, L.  
*Juniperus communis*, L. (or *nanus*).  
 \*ALLIUM SIBIRICUM, L.  
 \*JUNCUS ARCTICUS.  
 LUZULA HYPERBOREA, R. Br.  
     ,, WAHLENBERGII, Rup.  
 \*    ,, MULTIFLORA, Lej.  
 \*CAREX AQUATILIS, Wahlb.  
 \*    ,, DIOICA, L.  
 \*    ,, LIMOSA, L.  
 \*    ,, GLAREOSA, Wg.  
     ,, *rigida*, Good.  
     ,, *stricta*, Good.  
 \*    ,, SALINA, Wg.  
 \*    ,, VAGINATA, Tausch.  
 \*ERIOPHORUM ANGUSTIFOLIUM, Roth.  
     ,, *vaginatam*, L.  
 \*    ,, SCHEUCHZERI, Hoppe.  
 AIRA *flexuosa*, L.  
 \*    ,, CÆSPITOSA var.  
 ALOPECURUS ALPINUS, Sm.  
*Festuca ovina* et vars.  
 \*POA ALPINA, L.  
     ,, FLEXUOSA et var. ARCTICA.  
     ,, *prolifera arctica*.  
*Trisetum subspicatum*, P. de B.  
 LYCOPODIUM SELAGO, L.  
 \*EQUISETUM ARVENSE var. ARCTICUM, Led.  
     ,, *palustre*, L.

## VII.

## THE MOLLUSCA OF NORFOLK.

BY ARTHUR MAYFIELD, M.C.S.

*Read 24th February, 1896.*

The following list of species and varieties of Norfolk Mollusks is intended to supplement the papers on the subject written by Messrs. J. B. Bridgman and F. W. Harmer, and published in the first volume of the Society's 'Transactions.'

With a few exceptions, which are marked with an asterisk, the land and freshwater varieties have already been recorded by Rev. S. Spencer Pearce and myself in 'The Journal of Conchology,' vol. vii. pp. 391—404. A few shells which have not come under my own notice, but which are given on the authority of the Rev. S. S. Pearce, are marked (S. S. P.). The additions I am able to make to the marine list are the result of researches made in the spring of 1893, when I was residing at Great Yarmouth, and in July, 1890, while making a holiday-tour along the coast from Yarmouth to Hunstanton.

\*ARION MINIMUS, Simroth. Under dead leaves. Caistor St. Edmund's, Dunston, Buckenham.

A. HORTENSIS, Fér. var. GRISEA. Heigham.

AMALIA SOWERBYI (Fér.) Plentiful at Catton; Kirby Bedon.

\*A. GAGATES (Drap.). In gardens. Heigham.

AGRIOLIMAX LEVIS, Müll. Plentiful on marshes and ditch-banks, Bramerton, Postwick, Colney, Costessey.

HYALINIA NITIDULA (Drap.) var. HELMII (Alder). Old Lakenham.

\*H. PURA (Alder). var. MARGARITACEA (Jeff.). Under dead leaves. Dunston.

- H. CRYSTALLINA (Müll.) var. CONTRACTA. Westl. Whitlingham Woods (S.S.P.).
- HELIX LAPICIDA, L., var. NIGRESCENS, Taylor. Framingham Earl.
- H. ASPERSA (Müll.), var. MINOR, Moq. With usual form. Upper Hellesdon.
- „ var. CONOIDEA, Picard. A single specimen. Hellesdon.
- „ var. GRISEA, Moq. Hellesdon, Thorpe.
- \* „ var. ALBO-FASCIATA, Jeff. Drayton.
- \* „ var. TENUIOR, Shuttl. Yelverton.
- \* „ var. FLAMMEA, Picard. Very common. Earlham, Colney, Hellesdon, Drayton.
- \* „ var. ZONATA, Moq. Upper Hellesdon.
- H. NEMORALIS, L., var. MINOR, Moq. Occasionally with type at Earlham and St. Faith's; plentiful upon a hedge-bank at Hethersett.
- „ var. ROSEOLABIATA, Taylor. Rare, Earlham.
- „ var. LIBELLULA, Risso. Very common everywhere.
- „ var. RUBELLA, Moq. Frequent, Earlham, Hellesdon, Hethersett, Catton.
- „ var. CASTANEA, Moq. Plentiful at Horsham St. Faith's, Earlham.
- „ var. OLIVACEA (Risso). One specimen at Horsham St. Faith's.
- „ var. CARNEA. Very common.
- „ var. DIAPHANA. A single specimen at Yelverton (S.S.P.).
- „ var. HYALOZONATA, Taylor. A single specimen, Earlham. (This shell had also a pale pink aperture.)
- H. HORTENSIS, Müll., var. FUSCOLABIATA, Taylor. Brooke.
- „ var. ALBINA, Moq. Very common, Brundall, Lakenham, Catton, etc.
- „ var. LUTEA, Moq. Common. This and the preceding are the most abundant forms.
- „ var. INCARNATA, Moq. Catton and Sprowston.
- „ var. ARENICOLA, Maegill. Catton, Kirby Bedon, Bramerton.
- „ var. TENUIS, Baudon. Yelverton (S.S.P.).

- H. ARBUSTORUM* L., var. *CINCTA*, Taylor. With type and var. *FLAVESCENS* at Thorpe.
- H. RUFESCENS*, Penn., var. *RUBENS*, Moq. Plentiful at Earlham.
- „ var. *ALBA*, Moq. Earlham.
- „ var. *DEPRESSA*, Taylor. Catton.
- „ mon. *SUBSCALARE*, Williams. A single specimen at Eaton.
- H. HISPIDA*, L., var. *NANA*, Jeff. Banks of the Yare at Whitlingham.
- „ var. *DEPILATA*, Alder. Under dead willow leaves, Costessey Common.
- H. GRANULATA*, Alder (= *H. SERICEA*, Jeff.), var. *CORNEA*. Costessey Common.
- A. ITALA*, L. (= *H. ERICETOCUM*, Müll.), var. *GRISESCENS*, Colbeau. The common form about Norwich.
- „ var. *MINOR*, Moq. Earlham, Bowthorpe.
- H. CAPERATA*, Mont., var. *MAJOR*, Jeff. Eaton and Framingham Earl.
- „ var. *GIGAXII*, Jeff. Common. With type at Eaton, Thorpe.
- „ var. *SUBSCALARIS*, Jeff. Eaton.
- „ var. *ORNATA*, Picard. A single specimen on road-side near Stoke Holy Cross (S.S.P.)
- „ var. *BIZONALIS*, Moq. Yelverton (S.S.P.).
- „ var. *LUTESCENS*, Pasc. A very common form; Eaton, Framingham Earl, Thorpe, Hellesdon.
- „ var. *OBLITERATA*, Picard. Near the Asylum, Hellesdon.
- „ var. *ALBA*, Picard. With preceding, and at Drayton.
- H. VIRGATA*, Da Costa, var. *SUBALBIDA*, Poiret. Heigham, Upper Hellesdon, Thorpe.
- „ var. *ALBICANS*, Grat. Hellesdon, Thorpe.
- „ var. *SUBDELETA*, Ckll. Hellesdon, Thorpe, Postwick.
- „ var. *CARINATA*, Jeff. Thorpe.
- \* „ var. *LINEATA*, Olivi. Mundesley and Sheringham.
- \* „ var. *ALBA*, Taylor. Roadside at Upper Hellesdon, Trowse.
- \**VERTIGO SUBSTRIATA* (Jeff.). Among dead leaves. Diss.
- V. PUSILLA*, Müll. Among dead leaves on hedge-banks at Earlham and Bowthorpe. A single specimen at Bramerton.

- CLAUSILIA RUGOSA, Drap., var. EVERETTI, Miller. Earlham.  
 ,, var. TUMIDULA, Jeff. Whitlingham Woods (S.S.P.)  
 ,, var. ALBINA, Moq. Yelverton (S.S.P.).
- COCHILICOPA LUBRICA, Müll., var. LUBRICOIDES, Fér. Whitlingham  
 Marsh (S.S.P.).
- SUCCINEA ELEGANS, Risso, var. PFEIFFERI, Rossm. With type at  
 Heigham.
- PLANORBIS NAUTILEUS (L.), var. LÆVIGATA, Adami. With the  
 usual form in the pond near Mousehold Heath.
- P. CARINATUS, Müll., var. DISCIFORMIS, Jeff. Colney.
- P. UMBILICATUS, Müll. (=P. COMPLANATUS, Jeff.). var. RHOMBEA  
 (Turt.). In ditches near Great Yarmouth.
- BULLINUS (=PHYSA) HYPNORUM (L.) In a ditch at Thorpe, with  
 PLAN. SPIRORBIS and PISIDIUM FONTINALE.  
 ,, mons. DECOLLATUM (Nelson). With above.
- AMPHIPEPLEA GLUTINOSA (Müll.), var. ALBIDA, Williams. Shell  
 milk-white. A single specimen at Colney.
- LIMNÆA PEREGRINA (Müll.), var. LACUSTRIS, Leach. Ranworth  
 Broad, and near Brundall (S.S.P.).  
 ,, var. INFLATA, Kob. Ranworth Broad, ditch near  
 Aele (S.S.P.).  
 ,, var. MARGARITACEA, Esm. Heigham.  
 ,, var. CANDIDA, Porto. Ditch by side of New Cut  
 near Reedham (S.S.P.).
- L. PALUSTRIS (Müll.), var. TINCTA, Jeff. Brundall, Reedham  
 (S.S.P.).  
 ,, var. CARINATA, Pearee. In a ditch by the side of the  
 New Cut, Reedham (S.S.P.).
- VELLETIA LACUSTRIS (L.), var. COMPRESSA, Jeff. In the Yare at  
 Brundall (S.S.P.).
- NERITINA FLUVIATILIS (L.), var. PALLIDA, Pascal. In the Wensum  
 near Norwich Waterworks.  
 ,, var. TRIFASCIATA, Colb. With above.
- BYTHINIA LEACHII (Shepp.), var. ELONGATA, Jeff. Surlingham  
 Ferry (S.S.P.).
- SPILÆRIUM CORNEUM (L.), var. FLAVESCENS (Macgill). Colney.  
 ,, var. NUCLEUS (Stud.). Near Bramerton and  
 Whitlingham (S.S.P.).  
 ,, var. PISIDIODES, Gray. Colney.



PISIDIUM FONTINALE (Drap.), var. PULCHELLA, Jenyns. In a ditch at Colney.

\*P. NITIDUM, Jen. In a ditch near Thetford.

MARINE.

MODIOLARIA DISCORS (L.). Common in sea-weed; Yarmouth, Cromer, Palling.

DENTALIUM ENTALIS, L. In drift, Wells.

CHITON CINEREUS, L. Wells Harbour.

C. MARGINATUS, L. Sheringham and Cromer.

HELICION PELLUCIDUM (L.) In drift, Wells.

TROCHUS MAGUS, L. Wells, Heacham.

„ var. CONICA, Marshall. A single specimen of this rare variety (now in the possession of Mr. Marshall of Torquay) was picked up from drift at Heacham.

T. UMBILICATUS (Mont.). Yarmouth, Cromer, Hunstanton, Wells.

T. STRIATUS, L. Wells.

LAGUNA DIVARICATA, Fabr. In drift, Yarmouth.

„ var. GRACILIOR, Metc. One specimen, Yarmouth.

L. FALLIDULA (Da C.). Yarmouth.

LITTORINA NERITOIDES (L.). Breydon Water.

RISSEA PARVA (Da C.). A few specimens of the typical form in drift at Yarmouth.

HYDROBIA VENTROSA, Mont. Plentiful in a ditch near Breydon.

„ var. PELLUCIDA, Jeff. Breydon.

ODOSTOMIA UNIDENTATA (Mont.). In drift, Wells.

SKENEIA PLANORBIS, Fabr. Breydon.

APORRHAIUS PES-PELECANI (L.). One water-worn shell in drift, Wells.

CERITHIUM RETICULATUM, Da C. Wells.

## VIII.

## METEOROLOGICAL NOTES, 1895.

(From observations taken at Bradestone House, Brundall, Norfolk.)

BY ARTHUR W. PRESTON, F. R. MET. Soc.

*Read 24th February, 1896.*

## JANUARY.

THIS was a very winterly month throughout. Snow was deep on the ground when the month came in, and continued, with fresh supplies, till the 16th, when there was a slight thaw. Frost and snow returned on the 21st, and the earth remained covered with a white mantle until the end of the month. The number of days on which snow was registered (18) was the largest in any month since March, 1883. The mean temperature of the month was nearly 5 degrees below the average.

## FEBRUARY.

With the exception of 1855 this was the coldest February for over 100 years past. Snow lay on the ground almost throughout the month, and frosts occurred on twenty-seven nights. The thermometer fell below 20 degrees on nine nights, and below 10 degrees on three nights, the lowest being 4 degrees on the 7th. On the grass it fell below zero on three nights, and nearly to that point on other nights. On the 7th it fell to *minus* 3.5 degrees at Brundall, and to *minus* 12 degrees at Cringleford. As a more detailed description of the weather of this and the previous month has already been given (vol. vi. part i. p. 95) it is not necessary here to go into further particulars.

## MARCH.

The severe winter weather broke up on the 6th, and the remainder of the month was much milder. The great meteorological event

of the month was the terrific gale of the 24th, full particulars of which have already been noted in a special paper on the subject (vol. vi. part i. p. 99).

#### APRIL.

This was a fine, warm, "growing" month with considerably less east wind than usual at this season. There were showers at intervals, but the rainfall was below the average. The mean temperature was about a degree above the normal, thereby constituting the third warm April in succession, and a pleasing contrast to the six cold Aprils of 1887—92.

#### MAY.

May entered with fine, bright weather, with cold north-easterly winds, changing to warmer currents on the 6th, with magnificent summer-like days of high temperature for so early in the season. An extraordinary change occurred on the 16th, when the temperature dropped 28 degrees, accompanied by a chilling northerly wind and showers of hail and sleet. The young foliage on the north sides of trees was torn to shreds and blackened, and, in many instances, never recovered throughout the summer. The weather became warm again at the end, the thermometer touching 80 degrees on the 30th.

#### JUNE.

This was an exceedingly dry month, although local showers occurred in places. The total fall at Brundall was 0.85 in., and at Heigham, Norwich, 0.58 in. At the former station 0.40 in. was registered in less than half an hour during a thunderstorm on the 27th, whilst at the latter place no rain whatever fell on that date. It was a fine, sunny month, and the mean temperature quite up to the average.

#### JULY.

The first seventeen days were exceedingly fine, very warm, and attended by much sunshine. There was but little rain, and the ground was greatly parched. The last fortnight, while still warm, was very showery, 2 $\frac{1}{4}$  inches of rain falling in eleven days. Thunder occurred on the 19th, 21st, and 22nd, but the storms were few and

slight when compared with those of the previous July. The mean temperature was in close agreement with the average, and, by a singular coincidence, precisely the same as in the two previous years.

#### AUGUST.

To the 14th the weather was rainy, close, and thundery. The remainder of the month was remarkable for its warmth and fineness, interrupted only by a severe thunderstorm on the morning of the 22nd, and some squally showers on the 27th. The mean temperature was about  $2\frac{1}{2}$  degrees warmer than the previous August, and about one degree above the average for the month.

#### SEPTEMBER.

This was a remarkable month, and will long be remembered. Entering with a continuance of the fine, warm weather with which August closed, the thermometer reached 70 degrees and upwards on each of the first ten days, and on the 2nd a maximum of 81 degrees was attained. Thunderstorms occurred on the 3rd and 6th, the latter yielding 0.41 in. of rain, which was within 0.05 of the total month's fall. The third week was fine, and warm, but the heat was not excessive. The chief feature of the month was the last week, which was, probably, the warmest week so late in the year upon record. The thermometer considerably exceeded 70 degrees on each day, and on the 25th rose to 79 degrees, on the 26th to 80 degrees, and on the 28th to 77 degrees. During this time the sky was nearly cloudless, and the heat, particularly indoors, was almost overpowering, as, from the low declination of the sun, its rays penetrated into dwellings in the hottest part of the day to a far greater extent than during June and July when the sun is nearly overhead. The results of the measurements of the amount of sunshine at the various stations showed that the excess was greater during this month than any previously recorded. Rain fell on three days only. The mean temperature of the month was about 4 degrees above the average, but was less than in 1865, which gave more warm days, and no rain whatever, although the last week was not then so warm as the three previous weeks. The only other instance during the present century of a reading

of 80 degrees in East Anglia in the last week in September was in 1832, when the thermometer touched that value on the 25th and 26th.

#### OCTOBER.

This month also presented features of unusual meteorological interest, having had the warmest day and coldest night observed in any October for a great number of years. On the 1st the thermometer reached 75 degrees in the shade, which was an altitude probably not recorded in the tenth month in East Anglia since 1859, although in 1886 there was one reading which nearly equalled it. On the morning of the 2nd a decided change set in, with a considerable fall in temperature, and the reading of the thermometer at 9 a.m. on the 3rd was 31 degrees lower than on the afternoon of the 1st. This sudden and abrupt change was the more noticeable by reason of the temperature of the previous fortnight having been of unusual uniformity. Cool, rainy weather ensued till the middle of the month, when it became drier, though cold for the season. Winterly conditions, of a severity most unusual before the end of November or beginning of December, set in on the 22nd and continued until the 31st. During this cold period the thermometer never once exceeded 47 degrees by day, and by night it fell below the freezing-point in the screen on six nights successively. The lowest readings recorded were, in the screen, 25.4 degrees on the 28th, and 25 degrees on the 29th; and on the grass 17 degrees on the 28th, or 15 degrees of frost. Much cold rain and sleet fell at times, accompanied by lightning on several evenings, and on the 29th there were falls of snow both in large flakes and of the granular type. The injury to vegetation was most marked; trees in full leaf on the morning of the 28th were completely stripped by the evening of the following day, and dahlias and other tender garden flowers which were in full bloom on the former day were speedily transformed into blackened masses.

#### NOVEMBER.

The mean temperature was about 4 degrees above the average, and 9.6 higher than the previous November. The month was the mildest November since 1881. On the 16th the thermometer rose to 62.8, which appears to have been the warmest day in any

November since 1857 when it rose to 64 degrees on the 3rd, and 63 degrees on the 5th. The rainfall was about the average, and nearly the same as last year. There were several destructive gales, and from the 23rd to the 25th it blew at gale force almost continuously. The last three days were very gloomy, damp, and unpleasant.

#### DECEMBER.

This was a very stormy, unsettled month, with slight frost at times, but of no great intensity. There were many gales of a violent character, that on the 5th from the W.S.W. being the most severe, although those of the 12th from the S., and the 24th from the E. were also very destructive. The rainfall accompanying them was by no means excessive, and the month's total was half an inch below the average, but on many days the air was excessively humid, particularly at the close of the month, when fog and mist prevailed day after day. The mean temperature of the month was slightly above the average, but it was generally a colder month than the previous December. There was but little snow. Much lightning was seen in the north-east on the evening of the 6th. A driving blast from the east on Christmas Day made the weather exceedingly uncomfortable, and after the 23rd the sun was almost invisible to the end of the month.

#### THE SEASONS.

The following Tables show the mean temperature and rainfall for the four seasons, together with those of the five previous years, and of a twenty-year approximate average. Winter comprises the three months, December to February inclusive; Spring, March to May; Summer, June to August; and Autumn, September to November.

TEMPERATURE.								
Seasons.	1890.	1891.	1892.	1893.	1894.	1895.	20-year average.	Departure of 1895 from average.
	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.
Winter ...	38.9	33.9	37.0	36.5	39.2	34.7	37.8	- 3.1
Spring ..	46.8	44.0	44.9	49.1	47.7	47.6	46.2	+ 1.4
Summer	58.6	58.9	58.3	61.2	59.3	60.4	60.2	+ 0.2
Autumn ...	50.2	50.9	48.8	50.0	50.1	51.4	49.5	+ 1.9
Year ...	48.0	47.7	46.9	49.6	49.2	48.4	48.4	0.0

RAINFALL.								
Seasons.	1890.	1891.	1892.	1893.	1894.	1895.	20-year average	Departure of 1895 from average.
	in.	in.	in.	in.	in.	in.	in.	in.
Winter ...	4.80	3.10	6.36	5.80	4.81	7.35	6.02	+ 1.33
Spring ...	5.14	6.61	5.10	1.61	5.62	4.15	5.21	- 1.06
Summer ...	9.61	9.39	10.20	5.37	8.74	7.51	7.17	+ 0.34
Autumn ...	6.87	7.00	11.15	6.10	7.12	7.13	8.50	- 1.37
Year ...	25.96	28.35	31.05	19.66	27.32	24.91	26.90	- 1.99

From the above it will be seen that the winter was much colder than the average, although not quite so cold (owing to the mild December) as 1891. The other seasons were somewhat warmer than the mean. The rainfall of the winter and summer was slightly excessive in each case, but the dry periods in the spring and autumn made the total for the year decidedly deficient.

#### YEAR.

The mean temperature of the year was about the average, notwithstanding the intense cold of the first two months. The warm weather of March, April, May, September, and November, counteracted the previous severity, with the result that the excesses of cold and heat equally balanced. The rainfall was about two inches deficient, and although September was the driest month, the long-continued want of rain in April, May, and June, was the most severely felt, and affected vegetation to an extent from which it never recovered. There were, however, so many meteorological features during the year of an abnormal character that it will not be easily forgotten. The frost in the early months, though on the mean not quite so severe as in the winter of 1890-1 was greater on some nights in its intensity, and in the damage it created. It was certainly one of the most severe winters of the present century. Next came the great hurricane of March 24th, when the wind blew with greater fury than within living memory, and will leave its mark for some years to come. The summer was one of the finest, longest, and warmest for many years, with much bright sunshine and warm, pleasant days, without any such exceptional heat as occurred in August, 1893. The warm weather at the end of September was by no means the least remarkable meteorological feature of the year, and the great cold at the end of October, the warmth in the middle of November, and the violent gales in that and the following month should also be noted in a summary of a year presenting so many exceptional features.

1895.

MONTH.	BAROMETER.				THERMOMETER.				HYGRO-METER.	CLOUD.	RAINFALL.		WIND.												
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.			Date.	Mean.	Relative Humidity, 9 a.m.	Estimated proportion	Inches.	No. of days.	N	N E	E	S E	S	S W	W	N W	Mean esti- mated force.
JAN. .	30.51	30	28.98	24	29.664	45.0	16	9.5	27	32.8	93	7.0	3.44	27	5	5	3	4	2	4	2	2	6	2	2.8
FEB. .	30.51	16	29.60	26	30.089	45.8	23	4.0	7	30.3	91	6.5	0.88	18	6	5	10	1	0	1	1	4	4	2.6	
MARCH	30.37	15, 16	28.83	28	29.710	60.2	23	23.0	3	42.1	88	6.3	1.86	19	4	0	1	4	4	7	6	5	3	3.8	
APRIL	30.38	12	29.23	6	29.904	65.8	20	29.0	5	47.3	82	6.4	1.20	11	3	4	3	1	3	8	4	4	4	3.0	
MAY .	30.59	2	29.52	18	30.081	80.0	30	36.2	17	53.3	77	4.2	1.09	9	5	2	6	5	2	1	4	6	6	3.1	
JUNE .	30.46	24	29.63	29	30.067	79.0	23	37.7	15	58.1	80	5.8	0.85	10	6	9	0	4	1	5	2	3	2	2.6	
JULY .	30.25	6	29.50	12	29.853	81.0	8	46.0	6	61.4	84	6.1	3.21	16	3	1	0	2	6	9	4	6	6	3.4	
AUG. .	30.25	17	29.28	4	29.895	80.4	22	44.2	25	61.9	85	5.9	3.45	16	0	1	0	4	2	14	8	2	2	2.9	
SEPT. .	30.45	21	29.72	11	30.147	81.0	2	38.2	21	60.8	81	3.0	0.46	3	1	2	3	10	3	5	2	4	2	2.5	
OCT. .	30.55	18	29.10	8	29.816	75.0	1	25.0	29	46.8	87	6.9	4.00	23	2	7	0	2	1	3	9	7	2	2.6	
NOV. .	30.52	1	29.15	12	29.900	62.8	16	28.0	3	46.7	93	7.1	2.67	21	1	2	4	7	6	8	1	1	1	3.6	
DEC. .	30.51	28	29.05	12	29.770	56.4	5	26.4	22	39.1	93	7.6	1.80	20	0	2	6	4	3	6	8	2	2	3.7	
MEANS					29.908					48.4	86	6.1												3.0	
EXTREMES & TOTALS	30.59	May 2nd	28.83	Mar. 28th		81.0	July 8 and Sept. 2	4.0	Feb. 7th				24.91	193	36	40	35	48	33	71	51	50			



## IX.

SOME ADDITIONS TO  
THE NORWICH CASTLE-MUSEUM IN 1895.

BY THOMAS SOUTHWELL, F.Z.S.

*Read 30th March, 1896.*

THE Report for the year 1895, recently issued by the Committee of the Castle-Museum, is the first which has emanated from that body in which the work of a complete year is reviewed, and it must be regarded as a most satisfactory one; the additions made during that period to the various collections are numerous and valuable, and the progress in their arrangement has been considerable. It was not until the 7th of April that thrustiles were fixed to record the numbers of visitors, and the attendance thus indicated proves the great amount of interest taken by the public in the really fine institution which has arisen in their midst. Between the 7th of April and the 31st of December, the Museum was open on 267 days, on 163 of which the admission was free, on 65 by payment, and 39 were Sundays; during that time 146,893 persons visited the Museum, and thus far in the current year there has been no falling off in the attendance.

Amongst the more important additions to the collections, commencing with the Mammalia, may be mentioned a fine pair of Himalayan Bears (*Ursus tibetanus*), presented by Mrs. Petre, of Westwick House. These, when sent to England were very young, and lived at Westwick about four years; circumstances rendered it necessary to terminate their career as living specimens, and their stuffed skins were transferred to Museum collection. A fine male Mouflon (*Ovis musimon*), killed in Cyprus by Sir Henry Bulwer, and presented by him, has also been added. For many years the

Museum has been indebted to the Wombwells, and their successors, the proprietors of the celebrated travelling manageries, for gifts of animals which have died in their collections, and Mr. E. H. Bostock, the present proprietor, has been most liberal in this respect. To him we are indebted for a very handsome Leopard (*Felis pardus*), an Ocelot (*Felis pardalis*), a Raccoon (*Procyon lotor*), and a Coypu (*Myopotamus coypus*), all of which were very acceptable additions. To the Trustees of the National Museum, Melbourne, Australia, through Sir Francis G. M. Boileau, the Museum is indebted for the present of specimens of the Australian Duckbill (*Ornithorhynchus anatinus*), the Echidna (*Echidna hystrix*), the Wombat (*Phascolomys platyrhinus*), and the Bandicoot (*Perameles gunnii*); and to Mr. A. G. Hudson for two specimens of the Norwegian Lemming.

The general collection of Birds has also received some interesting additions from Sir Francis Boileau, amongst which may be mentioned a pair of Huia Birds (*Heteralocha acutirostris*), a species new to the collection, two specimens of the Parson Bird (*Prothemadera nove-zelandiæ*), the Styeh Bird (*Pogonornis cineta*), the New Zealand Bell-bird (*Anthornis melanura*), and others from New Zealand, and male and female specimens of the Victorian Lyre-bird (*Menura victoriæ*), from the Trustees of the National Museum, Melbourne, through Sir Francis Boileau. Two specimens of the Pelican (*Pelicanus onocrotalus*), killed in Egypt, and presented by Mr. S. Gurney Buxton; examples of Brunnich's Guillemot, and a female King Eider (*Somateria spectabilis*) from Novaya Zemlya; a White-billed Diver (*Colymbus alamsi*) from Norway; and a Mediterranean Black-headed Gull (*Larus melanocephalus*) from Malta, with other species from Colonel Feilden, and to the Rev. C. J. Lucas the Museum is indebted for a very interesting variety of the Long-eared Owl, with white wings, which was shot at Filby.

Peculiar interest attaches just now to the White-billed Diver, in this county, for as recently pointed out by Mr. A. F. Griffith ('Zoologist,' 1896, p. 14), there can be no doubt that a specimen of this Arctic species was killed by the late Mr. Booth, on Hickling Broad, on the 14th of December, 1872, after a "fearful gale from the S.W." The bird in question is now in the Booth collection in the Brighton Museum, and its identification is beyond question; it is thus entitled to a place in the list of birds killed in Norfolk. Only two other British-killed specimens of this bird are known;

one of these, now in the possession of Mr. Gurney, at Keswick, was killed at Pakefield, in the spring of 1852, and the other on the Northumberland coast.

Mr. Gurney has favoured me with the following notes of the additions to the Birds of Prey, to the enriching and extension of which he gives his unremitting attention.

“During 1895, one Hawk—new to the collection—has been added to the yearly increasing series of Raptorial Birds. This bird, *Accipiter rufotibialis*, Sharpe, was collected by Mr. A. Everett (a constant frequenter of the Old Museum when he used to live in Norwich) in Borneo, and is certainly not so adult as the bird of the same species figured in ‘The Ibis,’ 1889, p. 68. There are several broken bars of white on the under parts, and the thighs are not such a bright red as in the plate. My father seems to have had a share in discriminating *A. rufotibialis*, and his remarks, as they are unpublished, are worth giving. Alluding to the one figured, he says:—

““On comparing this specimen [of *A. rufotibialis*] with the two oldest males of *A. virgatus* in the Norwich Museum (one from Java, and one from Ceylon), I find that it differs in the chin and throat being buffy white instead of pure white, and in the central dark longitudinal streaks on that part being narrower and not continued on to the upper breast. Also by there being no white on the central portion of the upper breast, and by the white transverse bars on the middle and lower breast being much hidden by the rufous portions of the plumage. Also in the tibial feathers being a uniform rufous, without either white or brown transverse bars; also in the underside of most of the remiges being tinged slightly with rufous” (J. H. G., ms.).

“Another example of the handsome and conspicuous Madagascar Bay Owl, *Heliophilus soumagnei*, Gr., has come to hand from our good friend Mr. James Wills, and the valuable donation from Sir Francis Boileau I need not dilate upon, as *Sceloglaux albifacies* is to have an article to itself.

“A large box of skins collected in Borneo by Mr. A. Everett, and Mr. C. Hose, consigned to the Museum by their agent in London, yielded another specimen of *Heteroscops luciae* (Sharpe), of which we had only one before; also a good *Poliouëtus plumbeus* (Hodg.), *Limnætus albonyx*, and a few other rather noteworthy birds, but

nothing new. The only other thing which calls for remark is, that our already grand series of Lämmergeyers (*Gypaëtus barbatus*) is further enriched by an adult shot at Ladak in India, by Captain F. Adair, who killed it with a 0·300 rifle, as it was drinking at a stream at an elevation of about 17,000 feet.”

Mr. Gurney has likewise contributed a considerable number of eggs of Birds of Prey; and Lord Walsingham has sent a nest and eggs of the Gadwall Duck, taken at Merton, which it is hoped, with a pair of old birds, will soon form a prominent object in the Museum.

Conspicuous in the Fish Room is a fine specimen of the Tarpon (*Megalops thrissoides*), the gift of the Earl of Orford, by whom it was taken in a river in Florida, in 1894. Lord Orford has also placed with the ease the rod and line with which he captured this monster fish which weighed 140 lbs.

A very important addition to the Entomological Collection has been made through the generosity of Mr. J. B. Bridgman, who has presented the whole of his fine series of Hymenopterous Insects, perhaps unequalled in extent. It is contained in two cabinets, with twenty-six drawers and six boxes; many of the specimens are exceedingly rare, and the whole are beautifully set and arranged. Mr. Bridgman has also given a Collection of Works relating to Hymenoptera, consisting of thirty-two volumes of printed matter, seven volumes of manuscript, and other papers. A collection of upwards of 250 specimens of Lepidoptera, from Lake Nyasa, has been given by Mr. A. F. Gurney; and five cases of Lepidopterous and other Insects, from Ceylon, by Mr. J. Saneroff Holmes.

An important addition to the Geological department has been made by the presentation by the widow of Mr. S. V. Wood, Jun., of a collection of Tertiary Mollusea, made by the late Mr. S. V. Wood, F.G.S., and his son, Mr. S. V. Wood, Jun., of Martelsham, near Woodbridge. This important collection, which is contained in two large cabinets, is now in course of arrangement.

There are many other donations which, although of considerable interest, it is impossible to mention here, nor does it fall within our province to particularise the additions to the Library and Picture Gallery, Ethnology, Antiquities, &c., which have been both numerous and valuable.

## X.

FREDERIC KITTON,

24TH APRIL, 1827—22ND JULY, 1895.

BY JAMES MOTTRAM.

*Read 30th March, 1896.*

ON the formation of your Society in 1869, Frederic Kitton was one of the two Vice-Presidents then appointed, and he served the office of President for the term 1873—74. It will, therefore, be agreeable to many that some notice of him should appear in your 'Transactions.'

An interesting memoir of him has been prepared and published by his son, a copy of which is placed in your library, but whilst making use of some of the matter therein contained, it will be suitable in these pages to recall him, as he was known to us here in Norwich.

Born in Cambridge, he removed to this city in 1844, at the age of 17, and then commenced to assist in the tobacco business carried on by Mr. Robert Wigham, in the Haymarket.

Mr. Wigham was a botanist of some repute, and his young friend soon began to join in his rambles and studies.

Mr. Thomas Brightwell was at that time carrying on his microscopic enquiries into the Diatomacea, in which subject Wigham also was interested, and it thus came to pass that Kitton assisted the first named in many ways, and through him, in the course of a few years, was in correspondence with many of the best authorities on the subject. There is no record of the exact date from which he was considered a member of the Norwich Microscopical Society, but he became the friend of all connected therewith, and all had to thank him for the unfailing accuracy of his knowledge, for his ready assistance in all technical matters, either with the microscope, or the preparation of objects, and for his liberality in the supply of any material which had come into his hands.

It was at this time that I made his acquaintance, and his valued friendship remained to me to the end. I had the pleasure of spending a morning with him some two months before his death, and though finding him sadly altered, I did not anticipate that I should see him no more.

In the thirty years between 1855 and 1885, he was associated, more or less, with all the Societies in Norwich which had for their object the increase of knowledge, and in all he was valued; but I fear that as his own special study was one that could not be generally appreciated, scarcely any one realised that we had in our midst one whom the learned in other parts of the kingdom and in far distant countries "delighted to honour," for he was an honorary member of both the Royal Microscopical and Quekett Societies in London, and a corresponding member of the New York, Belgian, and Dublin Societies. An illustration of how easy such ignorance is, I may mention that he once told me with what surprise he learnt himself that the eminent Swedish Diatomist, P. T. Cleve, of Upsala, with whom he had long corresponded, had come to England, not on the subject of their mutual interest, but to receive the honour of the honorary membership of the Chemical Society.

About 1881, he published sets of 100 slides each, to illustrate the Diatomaceæ of the County of Norfolk; these were neatly packed in four-rack cases, bound as 8vo. books. His lists of the order for the county will be found in your 'Transactions,' vol. ii. p. 336; and vol. iii. p. 754.

He was able to read and translate any scientific papers which were published in French, German, or Danish, and he had also some acquaintance with the Anglo-Saxon language and literature. It is only necessary to read his Presidential Address to yourselves, or some others of his papers read in Norwich, to learn how much he knew of English literature.

He was of most retiring and simple manners, but with any one with whom he was well acquainted, of a most genial disposition. Such of his friends were always welcome at the shop in the Haymarket, and many a pleasant and instructive evening hour have I spent there with him.

First and last he must have mounted many thousands of slides, and he left in his own cabinets about 5000, though many of these were presents or exchanges. About 4000 slides referred to the

Diatomaceæ, and I think it must be a satisfaction to all his friends that these have passed *en bloc* into the possession of Mr. Wynne E. Baxter, F.R.M.S., the Coroner for East London, a gentleman who is qualified to appreciate them, and who proposes shortly to publish a work on the order.

The remainder consists principally of Foraminifera, sections of Rocks and Shells and Sponge Spicules. About 400 of these slides are now in my own cabinet, and amongst them are some of considerable local interest, including sections of Flints procured in Norfolk; and also the original slides which furnished the illustrations to the paper on that subject in your 'Transactions,' vol. i. part 2, page 59, and read 27th February, 1872; and I need scarcely add that these objects will now be available to any one studying the subject. The slide showing the borings in a *Haliotis* Shell from New Zealand, of which two illustrations were given in the Journal of the Quekett Club, vol. vi. series 1, in reference to papers by Mr. B. W. Priest and Mr. J. G. Waller, is now with the former.

In the part which Frederic Kitton took in editing the Diatomaceæ, in the last edition (1861) of Pritchard's Infusoria, he had perforce to work on the classification therein adopted, but otherwise he had then and for the future himself used that of Professor H. L. Smith, of Geneva, N.Y. He was in full agreement with the Rev. William Smith, the author of 'The Synopsis, British Diatomaceæ,' as to the great care necessary in establishing new species, and of the injury resulting to science from the careless introduction of synonyms. But with all due care he discovered and named many new forms, and a list of more than a dozen of these is given in his son's memoir.

There is also a list of a dozen other new species, to which various friends, to do him honour, attached his name, and in 1886, Messrs. Grove and Sturt, from the wonderful deposit found at Oamaru in New Zealand, created a new genus *Kittonia*.

So with *Brightwellia superba* and *Kittonia elaborata* (both disc forms) the two friends, who so long worked together will, for many a year, be associated in the minds of those who shall succeed them in their favourite study.

May I, in conclusion, using the idea of one of Frederic Kitton's favourite authors (Dickens), say to such students, "Keep his memory green," as a simple-minded, earnest, hard-working man, who strove for "the truth, the whole truth, nothing but the truth."

## XI.

ON AN EARLY RECORD OF THE OCCURRENCE OF  
THE NARWHAL (*MONODON MONOCEROS*)  
ON THE COAST OF NORFOLK.

BY MILLER CHRISTY, F.L.S.

*Read 30th March, 1896.*

THERE have, I believe, hitherto been only three known instances of the occurrence of the Narwhal on the coasts of Britain— one near the Isle of May, in the Firth of Forth, in June, 1648; one near Boston, Lincolnshire, in February, 1800; and one in the Sound of Weesdale, Shetland, in September, 1808. It is with pleasure, therefore, that I call attention to an apparently genuine and reliable record which seems hitherto to have been overlooked.

The Rev. Samuel Purchas, in recounting Frobisher's second voyage in search of a North-west Passage in 1577, says\* that Frobisher and his companions met with "a great dead Fish, round like a Porepis,† twelve foot long, having a Horne of two yards (laeking two ynehes) growing out of the Snout, wreathed and streight like a Waxe Taper, and might be thought to be a Sea-Unicorn. It was broken in the toppe, wherein some of the Saylers said they put Spiders, which presently dyed. It was reserued as a Jewell by the Queene's Commaundment in her Wardrobe of Robes."

The animal thus described was, of course, a Narwhal or Sea-Unicorn, and its "horn" was long preserved at Windsor. Several later writers mention having seen it there. Purchas, in the second and third editions of his 'Pilgrimage,' adds that it is "still at Windsore to be seene."

That the horn in question should have been so long and so carefully preserved in the Queen's "wardrobe" at Windsor was in

\* "Purchas his Pilgrimage" (Lond., fo., 1613), p. 621; 2nd Ed. (Lond., fo., 1614), p. 739; 3rd Ed. (Lond., fo., 1617), p. 917; and 4th Ed. (Lond., fo., 1626), p. 811.

† An old form of the word we now generally write "Porpoise," and derived from the latin *porcis piscis* (the hog-fish).



no way remarkable ; for, at the time, the tusks of the Narwhal were accounted of enormous value. The Unicorn of Fable was supposed to be an animal of immense strength and vital power, these virtues being especially concentrated in its single frontal "horn." To this horn, therefore, marvellous virtue was ascribed, and it was in consequence much sought after ; but, as the animal did not exist, no such thing as its horn was really obtainable. The beautiful twisted tusks of the Narwhal were, however, often supposed to be the real article : hence it came about that, in mediæval times, the Unicorn of Heraldry (which figures as one of the "supporters" of the Royal Arms of England) was represented as having a Narwhal's tusk in the centre of its forehead. Though the Narwhal (now often called the "Sea-Unicorn") must have been known to the mariners of the extreme north from very early times, it was only at the time when Purchas wrote (the beginning of the seventeenth century) that the animal and its tusk became known to the world at large through the narratives of the Arctic explorers and whale-fishers. The so-called "Unicorn's Horn" was, therefore, practically a new discovery, and a prodigious value was set upon it. There are instances on record at the period in which a tusk was valued at £6000 or £7000, while small fragments were sold for large sums. Although Purchas does not mention the amount obtained for the one he says was sold to Constantinople (see *post*), it was probably very large indeed. Among the marvellous properties attributed to the horn were the protection it was supposed to afford against all poisons and noxious creatures, which is probably what is meant by the mention of Spiders having died when put into the horn Frobisher found. It was long before it came to be generally known that the so-called "Unicorn's Horn" was in reality nothing more than the tusk of the Narwhal.

To his description of the finding of the dead Narwhal, as quoted above, Purchas adds a side-note, which contains the information with which we are here more especially concerned. It reads as follows :—

"Such a horne was brought home two yeres since, found on Shore in a desolate Island ; and such an one was taken up A. 1588 in the coast of Norfolk, and sold by an ignorant woman for 18 pence, which proved effectually against poisons, as I was told by *Mr. Rob. Salmon*, of Leegh, who had a peece of it."

In the second edition, although the indication of the date of discovery stands unaltered\*, some additional information is given as follows :—

“Such a horn was brought home two yeres since, found on Shore in *Greenland* by the carpenter of *Jonas Poole's* ship, seven foot and a half long, and sold since at Constantinople, proued good against poisons ; and such a one was taken up *A. 1588* in the coast of *Norfolke*, and sould by an ignorant woman for 18 pence ; which proued effectuall against poisons, as I was told by *Mr. Rob. Salmon*, of *Leegh*, who had a peece of it.”

In the third and fourth editions, the information stands exactly the same, except that, in the two places where the horn is said to have been “proved” effectual against poisons, an alteration has been made to “reported” in the first case, and to “said to be” in the second, as though Purchas had in the interval seen some reason to doubt its efficacy.

Now, before accepting unreservedly such a record as the foregoing, we are bound to ask ourselves : Is it a genuine and satisfactory record ?

It must, in the first place, be admitted that there is nothing inherently improbable in the statement that a Narwhal was met with on the coast of Norfolk in the year 1588. Although the animal habitually frequents very high latitudes, and is certainly very seldom met with on the British coasts, it cannot be denied that, if a specimen was met with on the coast of Lincolnshire one hundred years ago, it is equally likely that one was met with on the adjacent coast of Norfolk three hundred years ago.

In the second place, Purchas is a serious writer and an historian of acknowledged position, whose veracity no one is likely to call in question. It appears, however, that Purchas derived his information from some one else—a certain Mr. Robert Salmon. We are, therefore, under the necessity of inquiring also who this man was. Here, again, we can find no reason to call in question the *bonâ fides* of the record under consideration ; for Robert Salmon was a man of some eminence in his day, and not at all the kind of

\* The “horn” was found (as what follows will show) on Jonas Poole's voyage to “Greenland” (as Spitzbergen was then called) in 1611, of which voyage Purchas gives an account (“Purchas his Pilgrimes,” Lond., 1625, vol. iii., p. 711).

person whose veracity one would doubt without good reason. He was a wealthy merchant and mariner, and, at the time when Purchas wrote, he held a prominent position in connection with the Trinity House, of which, at a later date, he became Master. He seems to have resided at Leigh, in Essex, where he was probably well known to Purchas, who from 1604 to 1614 was vicar of the adjacent parish of Eastwood, a position which enabled him to make the acquaintance of the many ships'-captains who then inhabited the little sea-port town, and which undoubtedly led in the end to his becoming such a well-known geographical historian. There is in Leigh Church a fine monument in commemoration of this Robert Salmon (who died 18th June, 1641), as well as brasses to some earlier members of his family.

I can therefore see no reason why we should not accept as genuine and veracious the record to which I have called attention.

## XII.

### THE WILD BIRDS PROTECTION ACTS OF 1880 AND 1894,

#### AS APPLIED TO THE COUNTY OF NORFOLK.

IT will be remembered that in the summer of 1893 when a Bill sent up from the Commons was awaiting its second reading in the House of Lords, the Norfolk and Norwich Naturalists' Society took an active part in advocating the principle of protection by specified areas rather than by named species, and that a resolution embodying these views was sent to the Earl of Kimberley, then Lord President of the Council and one of our Vice-Presidents, asking him to use his influence to secure their reception, which he most kindly did. It was probably owing to this action that the Bill as finally passed rendered it optional either to prohibit the taking the eggs of any wild birds in specified areas, or to prohibit the taking of the eggs of certain named species, thus embodying both principles.

The Act thus having been obtained, a proposal for its application was discussed in the Norfolk County Council, when our Society again urged its views, and following in the wake of the Lincolnshire Naturalists' Union, presented the following resolution to the County Council, on the 2nd February, 1895 :

“The members of the Norfolk and Norwich Naturalists' Society learn with pleasure that the Lincolnshire Naturalists' Union having laid before the County Council of the parts of Lindsey their views with regard to the enforcement of the provisions of the Wild Birds Protection Act of 1880 as amended in 1894, that body has decided to apply to the Home Secretary to put in force the powers of the Act conferred by Section 2, thereby prohibiting the taking of the eggs of any wild birds within a well-defined area along the coast of Lincolnshire, between the 1st day of May and the 1st day of August. The Norfolk and Norwich Naturalists' Society, as represented by this meeting, would respectfully suggest to the County Council of Norfolk that a similar protection should be extended to certain breeding haunts under their jurisdiction, hereafter to be decided upon of easy definition, and frequented by a number of birds which are in great danger of extermination. They also wish to record their opinion that any attempt to protect named species would prove abortive, owing to the great difficulty of obtaining a conviction, chiefly in consequence of the impossibility of distinguishing the eggs of some species of birds which require protection from those of other species which need not be included in the schedule.”

The result was that the Wild Birds Protection Committee of the County Council requested our Society to furnish them more fully with their views upon the subject, and the following report was drawn up by a sub-committee appointed for the purpose and duly presented :—

TO THE CHAIRMAN OF THE WILD BIRDS PROTECTION  
COMMITTEE, NORFOLK COUNTY COUNCIL.

CASTLE MUSEUM, NORWICH,

19th February, 1895.

SIR,

The Committee of the Norfolk and Norwich Naturalists' Society having considered the resolution passed by your Committee at the meeting held on the 2nd February, 1895, and submitted to them, they having also had the advantage of the advice of the following members of the Society, not present at these consultations, viz., The Earl of Leicester, Mr. Cresswell (Lynn), Mr. le Strange (Hunstanton), Colonel Feilden (Wells), Sir Edward Newton (Lowestoft), and others—beg to report as follows :—

The Committee are strongly of opinion that the most advantageous mode of applying the Act in the County of Norfolk would be that provided for

by paragraph (1) Section 2, which empowers the prohibition of the taking or destroying the eggs of all wild birds in certain specified areas, this they would like to see applied to the whole of the foreshore of the County from Wolferton Creek to Gorleston North Pier, and in this opinion they are strengthened by correspondence which they have had with some of the largest landowners on the coast, but they have not yet had the opportunity of making the necessary advances to all those whose rights would have to be considered, and must therefore, for the present, be content with advocating a less ambitious scheme. They beg to recommend, with the full consent and approval of the owners of the soil, or those possessing rights over the same, that the following specified areas be suggested to the County Council for application to be made to the Secretary of State to put in force Section 2 (1) of the Act, thereby rendering illegal "the taking or destroying of wild birds' eggs, in any year or years, in any of the areas specified, viz. :

[Then follow the particulars as to the areas recommended, which will be found set forth as finally adopted in paragraph ii. of the Secretary of State's order, printed at the end of this article.]

The Committee believe that within these boundaries the principal breeding places of the shore birds on the Norfolk coast will be included. They do not think it desirable for a public body to make any suggestion with regard to inland sites, which should be left to the owners or occupiers to deal with in their discretion; but they would cordially support a memorial which will in due time be presented to the County Council, asking for protection to be extended to a specified area in the district of the Broads.

The above recommendations, if adopted, will, it is believed, to a great extent protect the shore-breeding birds, which congregate in numbers in very small areas at the nesting period, but there are a few species, named below, which this Committee think, from their being scattered at the breeding season over a large extent of country, their great rarity, or other causes, might with advantage be protected throughout the whole of the county under the jurisdiction of the Norfolk County Council, and this they think could best be done through the medium of Section 2 (2) of the Act, prohibiting the taking or destroying the eggs of certain named species—the species alluded to are as follows :

[See paragraph iii. of the Secretary of State's order.]

The Committee further approve the suggested placing of the Bearded Titmouse or Reed Pheasant on the Schedule of the principal Act (1880), and would recommend that the name of the Crossbill be also added.

The Committee also recommend that the close time for the eggs of all the birds which it is deemed desirable to protect, and of the protected areas, should be from the 1st day of May to the 1st day of August, both inclusive.

Were it possible to enlist the services of the men of the Coastguard, they would be of the greatest use in carrying the Act into effect.

I am, Sir, your obedient Servant,

(Signed) THOMAS SOUTHWELL,  
Ex-President Norfolk and Norwich Naturalists' Society.

The writer of these notes having been invited to attend the meeting of the County Council Committee, further to explain the views of our Society, but being prevented by illness from being present, addressed a letter to the Chairman, setting forth more fully the reasons which led them to advocate the measures embodied in the above report, and from which the following is extracted :—

“First as to areas. Admitting the principle of ‘specified areas’ to be adopted—the only one, I am convinced, which can be successfully carried out—personally, I should advocate the protecting the whole of the foreshore of the tidal coast from, say, Wolferton Creek to Gorleston North Pier, including the shingles, cliffs, sand hills, warrens, and salt marshes, between the sea and any embankment or other artificial boundary separating the same from the cultivated land. This would have the advantage of simplifying boundaries, and render unnecessary the precise indication of the spots to which the birds resort for the purpose of nesting, which might be attended with prejudicial results, and with regard to which I have always considered it prudent to be very reticent. The inner marshes, such as those at Holme, Holkham, etc., not affected by the salt tides, are generally cared for by their owners or occupiers, or could if considered needful be made the subjects of special application as in the case of the ‘Broad District,’ with regard to which a special memorial will be presented. By this plan the shore-breeding birds which stand in such sore need of protection would be effectually taken care of without hardship to anybody, or the interference with any private rights or vested interests, and the few small birds which would share in the protection are almost without exception insect feeders.

“As to the date on which the close time should commence, there will doubtless be difference of opinion. In order to protect Ducks and Snipe, this should be fixed rather early. I have known Ducks with eggs in the middle of March, and have heard of them late in February. Snipe pair very early, and may have eggs on 1st of April, but with both these species I think it much depends on the early or lateness of the season. The Great Crested Grebe sometimes has eggs as early as the first or second week in April. The shore-breeding birds, Terns, etc., do not lay as a rule much before the end of May. I think the 15th April a good all-round date to commence the close time.

“Those interested would probably not object, by means of a small subscription, to employ a watcher for a few summer weeks, as is already done on the Wells Marshes, but if interest could be made with the Admiralty (or other proper authorities) to allow the Coastguard to watch the shore, it would be a most effectual help, and might be done without in any way interfering with their proper duties. It may be mentioned, if a precedent be required, that the authorities (Trinity Brethren?) gave permission to the various light keepers, afloat and on shore, to keep records and make reports to the Migration Committee of the British Association, which were found to be of great interest.

"A difficulty seems to present itself with regard to a few inland species, such as the Stone Curlew and the Ring Dotterels, which breed in certain open districts and heath lands in central Norfolk. These are too scattered for their breeding places to be prescribed, and, I fear, must be left to the protection of those who have an interest in their chosen sites.

"The only serious objections which I have heard advanced against the 'specified areas' proposal are (1) That *all* the birds breeding in such areas would have to be protected. This appears to me to be a very minor objection, as the areas mentioned would hardly be those in which obnoxious birds breed, these species almost entirely frequenting woodland districts strictly protected for game, or the immediate neighbourhood of the abode of man (Sparrow), neither of which localities would be likely to be suggested for protection, and could be treated on their individual merits if such were the case. (2) Predacious Birds. The only birds which could be considered to come under this head in the districts to which I have referred are three species of Harrier and the Short-eared Owl (the Kestrel and White Owl are altogether blessings). All these species formerly bred in Norfolk, but have, except in rare instances, ceased to do so. Two species of Harrier and the Short-eared Owl almost entirely subsist on small rodents, thereby conferring undoubted benefit on man, and the third species of Harrier (the Marsh Harrier) although it certainly will, when driven by hunger, attack domestic poultry and ducks, is so rare as scarcely to be worthy of being taken into account, and probably, were the young of the wild breeding birds, which it is hoped will become more numerous by protection, less difficult to obtain, it would not be driven to commit depredations on the domesticated birds to meet its wants.

"I have little more to say than that if the Act is to be successfully carried out, the goodwill of all should be enlisted, friction should be avoided, and care be taken that even prejudice, as far as possible, should be gently dealt with, trusting to experience and time to reconcile those who may be doubters as to the expediency of a measure, the benefits of which they may not at present be able to appreciate."

The following memorial was also presented by the landowners and others resident in Yarmouth and the "Broad District":

TO THE CHAIRMAN, ALDERMEN, AND COUNCILLORS  
OF THE COUNTY COUNCIL FOR THE ADMINISTRATIVE  
COUNTY OF NORFOLK.

THE MEMORIAL of the undersigned Landowners and others interested  
in the protection of Wild Birds.

Sheweth that by a recent Act of Parliament intituled "The Wild Birds Protection Act, 1894," being an Act to amend "The Wild Birds Protection Act, 1880," it is enacted that a Secretary of State may, upon application by the County Council of any Administrative County, by order prohibit—

(1) The taking or destroying of Wild Birds' Eggs, in any year or years, in any place or places within that County, or

(2) The taking or destroying the eggs of any specified kind of Wild Birds within that County, or part or parts thereof.

Your Memorialists, whilst fully recognising that the eggs of certain birds should never be taken or destroyed, are strongly of opinion that the objects of the above mentioned Acts of Parliament can better be effected by entirely prohibiting the taking or destroying of Wild Birds' Eggs in certain districts, than by prohibiting the taking and destroying the eggs of certain specified Wild Birds; in other words, that protection by districts is better than protection by species.

Your Memorialists would indicate the following as districts which are specially deserving of protection, and in which the taking or destroying of Wild Birds' Eggs should be totally prohibited after the 30th day of April in every year; that is to say:

[Here follow the specifications as set out in paragraph No. 1 of the Secretary of State's order.]

Your Memorialists therefore pray that you will be pleased to take the matter into your consideration, and thereupon make application to a Secretary of State for an Order prohibiting the taking or destroying of Eggs of any Species of Wild Bird in or upon any of the before mentioned Districts, after the 30th day of April in any and every year.

Dated this 2nd day of February, 1895.

The final result was that the following order was issued by the Home Secretary, to come into force on the 1st of May, 1895, and to continue for one year:

In pursuance of the powers conferred on me by the Wild Birds Protection Act, 1894, and upon application by the County Council of the Administrative County of Norfolk, I hereby make the following Orders:—

I. The taking or destroying of the Eggs of any species of Wild Birds is prohibited for a period of one year from the 1st day of May, 1895, within the following areas:—

Hickling Broad, Whitesley and Heigham Sounds, Blackfleet Broad, Horsey Mere, Martham and Somerton Broads, and the Rands, Skirts, and Walls thereof, and Fens and Reed Grounds appertaining thereto respectively, and the Islands therein, and the Dykes communicating therewith, including the Hundred Stream or Thurne River, and ancient bed, and the Rands and Walls thereof from Heigham Bridge to the Sea at Winterton, and all the Marshes and low-lying and uncultivated Lands, Fens, Reed Grounds, Warrens, Marram or Sand Hills and Sea Shore, to the line of high water mark, in the several parishes of Waxham, Horsey, Potter Heigham, and Hickling, and such part of the Parish of Catfield as lies to the East of the Midland and Great Northern Joint Railway.



The Warrens, Marram, or Sand Hills and Sea Shore, to the line of high water mark in the Parish of Winterton.

And the series of Broads known as Ormesby, Rollesby, Hemsby, Filby, and Burgh Broads, and the Rands, Skirts, and Walls thereof, and the Dykes communicating therewith, and the Fens, Reed Grounds, and low-lying Lands, Marshes, and Pastures adjacent thereto, including Lady Broad or Hard Fen Water in the Parish of Filby, Brandyke Broad in the Parish of Burgh St. Margaret, and Muckfleet Dyke, and the Marshes and low-lying Lands, Marshes, and Pastures near or adjacent thereto respectively.

II. The taking or destroying of the Eggs of any species of Wild Birds is prohibited for a period of one year from the 1st day of May, 1895 within the following areas, viz. :—

The whole of the Foreshore, including the Shingle, Sand Hills, Salt Marshes, Creeks and other unenclosed Lands extending from High Water Mark to the first boundary of enclosed or cultivated land separating the Foreshore from them, from the Estuary Sluice at North Wootton to the Eastern Boundary of the Parish of Cley-next-the-Sea.

III. The taking or destroying of the Eggs of the following species of Wild Birds is prohibited throughout the entire County of Norfolk, viz. :—

1. The Bearded Titmouse or Reed Pheasant. (*Panurus biarmicus*.)
2. The Crossbill. (*Loxia curvirostris*.)
3. The White or Barn Owl. (*Strix flammea*.)
4. Wild Ducks and Teal of all species.
5. The Norfolk Plover, Stone Curlew, or Thickknee. (*Edicnemus scolopax*.)
6. Ruff or Reeve. (*Machetes pugnae*.)
7. The Ring Dotterel, Ring Plover or Stone Rummer. (*Egialitis hiaticula*.)
8. Oyster Catcher or Sea Pie. (*Hæmatopus ostralegus*.)
9. The Terns, Sea Swallows, Pearls, or Dip-ears. (*Sterna*.) All species.
10. The Great Crested Grebe or Loon. (*Podiceps cristatus*.)

IV. The Wild Birds Protection Act, 1890, shall apply within the County of Norfolk to the Bearded Titmouse, or Reed Pheasant, and the Crossbill, as if these two species of Wild Birds had been included in the Schedule to the said Act.

*The foregoing Orders shall come into force on the  
1st day of May, 1895.*

Given under my hand at Whitehall, this 5th day of April, 1895.

(Signed) H. H. ASQUITH.

The Order was renewed for a further period of one year from the 1st of May, 1896. The means are thus obtained of offering a very considerable amount of protection to the rarer birds nesting in the County of Norfolk, but it must be remembered that Acts of Parliament, however excellent, will not enforce themselves, and that to be of any service some means must be devised of making them effectual. The examples set by the Breydon Protection Society, and the similar Society at Wells, which are both doing excellent work at very little cost, should stimulate other districts to similar action, but it must still remain very much a "landlord's question," and if those who have had provided for them such a simple means of protecting the rare and interesting birds which visit their estates will not avail themselves of its advantages, the Act will, I fear, remain to a great extent a dead letter.

T. S.

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### XIII.

#### THE NORFOLK AND NORWICH MICROSCOPICAL SOCIETY, 1852—1884.

BY JAMES MOTTRAM.

*Read March 30th, 1896.*

IT has been suggested as desirable that some record should be made in our Transactions of the Microscopical Society and of some of its members. I gladly therefore endeavour to recall the pleasant memories which remain to me of its meetings.

As I write, I have before me its minute book kept by its first secretary, W. K. Bridgman, who relates that on 19th December, 1852, there met at the house of the Rev. Joseph Crompton, besides himself, Thomas Brightwell, F.L.S., Rev. James Landy Brown, M.A., Arthur Morgan, and William Kencely Bridgman, with the object of forming a Microscopical Society, and at an adjourned

meeting at Mr. Bridgman's house, at which Donald Dalrymple, afterwards M.D., and William Brooke were also present, it was determined to carry this into effect; and let me here remind you that the host of the first evening was also your own first President, who in 1869 spoke to you of "rocking your cradle," as he had, in fact, rocked that of the earlier body in 1852. During the next few months the following became members: William Hareourt Ranking, M.D., Edward Copeman, M.D., William Cadge, James Newbegin, Jun., Elijah Bleakley. I shall not allude further to Messrs. Morgan, Ranking, Copeman, and Cadge—they were all medical men in busy practice, and they appear very shortly to have found it difficult or impossible to attend the Society's meetings: but as to the other names mentioned more must be said.

THOMAS BRIGHTWELL (b. 1787, d. 1868) was a Suffolk man, who early in the century settled in Norwich to practise as a solicitor. He had from his youth been led to take an interest in Natural History, and as the achromatic microscope became improved, he adopted it in his studies, and devoted his attention to "Pond life." He published a History of Norfolk Infusoria, making some very valuable observations in various branches of that subject, but eventually applied himself more especially to the order of the Diatomaceæ.

Between 1853 and 1858 he published several papers, chiefly on the Genera *Chaetoceros*, *Rhizosolenia*, and *Triceratium*, which at the time were the acknowledged authority on those forms. The genus *Brightwellia* was established by his friend, J. Ralfs, in his honour, and the specific names of *Triceratium Brightwellii*, *Sarirella Brightwellii*, and of other forms, commemorate him, as does *Chaetoceros Wighamii*, his friend, Robert Wigham (d. 1857), who supplied him with the gathering in which that diatom was first identified.

The disciple of these two men was Frederic Kitton,\* as to whom a separate record appears at p. 201, of this vol.

Kitton assisted Mr. Brightwell in the above investigations, and though his name does not appear in the papers, the latter, in his own circle, never omitted to mention the help he had received, and testified his friendship for Kitton in many ways.

\* Frederic Kitton was President 1874--79, and on the Council 1864--67 1869--72, and 1879--82.

Shortly after 1858 symptoms of cataract warned Mr. Brightwell that his labours must cease, and, practically, blindness ensued. He was a man of deep religious feeling, and bore his trial with all fortitude. In 1862 he intimated his wish to give his instrument and collection of objects to the Society, and further details of what was done follow at page 221. He was requested to be President of the Society for life, and for his satisfaction the monthly meetings were held at his house, at least two or three times a year, to his great enjoyment. His zest for his old studies was equally manifested at the scientific lectures which, in the winters of several of the ensuing years, were given in Norwich by Owen, Pengelly, Waterhouse Hawkins, Rolleston, and others. In a year or two a successful operation restored his sight for ordinary purposes, for which he was deeply thankful, and he was able to attend some of the meetings of the British Association in Norwich in 1868.

The Society's September meeting of that year was held at his house, when he discussed with his friends all the recent interests; but old age had come, a change ensued, and he passed away, without suffering, 17th November, 1868. His response, on hearing of inquiries from some of his old friends a few days before, being: "Give my love to everybody."\*

REV. JAMES LANDY BROWN, M.A. [Counsell, 1862—65, 1868—71, 1872—75, 1876—79, 1880], son of the Rev. James Brown, who was for forty-eight years the respected incumbent of St. Andrew's and Chaplain of the Prison at the Castle, is the sole survivor of the original members of the Society. He held curacies in Norfolk and London, but in 1852 returned to his native city, and succeeded his father in the chaplaincy. (I notice, by the way, that the senior gentleman is recorded as a visitor at the first meeting of the Society held at his son's house.)

He was an expert in metal work, and also an entomologist, and became very successful in his preparation of objects for the microscope, connected with that study and in other branches. Some weakness in sight induced him, about twenty years ago, to relinquish his favourite pursuit, but he retains his cabinet of some

\* He was from the first the senior member of the Society, and from 1862 till his death its first formally recognised President. See Memoir, with likeness, by his daughter, C. Lucy Brightwell. Fletcher, Norwich, 1860.

2000 objects principally prepared by himself, and many of great beauty. His attention in recent years has been devoted with much success to photography.

WILLIAM KENCELY BRIDGMAN, L.D.S. ENG. (b. 1812, d. 1883), [President, 1869—74; Council, 1862—64, 1874—77, 1878—81; Secretary, 1852—59], was born at Walpole St. Peter, and was educated as a chemist with Mr. H. R. Priest, of St. Giles' Street, Norwich. After living for a few years at Lowestoft, he turned his attention to Dental Surgery, and settled in Norwich in that profession, one which accorded with his inborn facility of invention and adaptation. When he became a student of the microscope, his experience with the lathe enabled him to provide several accessories which at the time were highly esteemed. Dr. L. Beale, in 'How to work with the Microscope,'\* gives an illustration of his "finder," with a diamond point arranged to draw a circle on the cover glass of a slide, and also refers with great approval to his plan by which a sliding point attached to the tube of the instrument made an inked dot on a label on a slide. The Maltwood finder has perhaps superseded these, but at the time they supplied a great want. As before mentioned, he was the first Secretary of the Society, and held that office from 1852 to 1859.

DONALD DALRYMPLE, M.D. (b. 1815, d. 1873), was the son of an eminent Norwich surgeon, whom he succeeded in his profession, afterwards adopting that of a physician. His elder brother, John, was eminent in London as an oculist, and was also an F.R.S. After his early death, his very fine Ross instrument and collection of pathological slides came to his brother in Norwich.

In 1860 Mr. Dalrymple visited the Holy Land, and brought home for his friend, Mr. Brightwell, several gatherings of diatoms, but he was not a regular attendant at the Society's meetings.

WILLIAM BROOKE (b. 1795, d. 1867), [Council, 1863—66], was for many years a schoolmaster of great repute in the city. He was a good general naturalist, and one of his pupils tells me that the window in his schoolroom near his desk always contained an array of micro-slides in course of preparation. He was a careful observer of minute aquatic life, and a most regular attendant at the meetings of the Society.

\* Edit. 1880, p. 48, pl. xvii., fig. 11.

*Ibid.*, p. 49.

Some notes by him of the development of the eggs of *Limnæus perifer* are entered in the minute book.

One of his pupils, whom he introduced to the Society, was JAMES NEWBEGIN (b. 1820, d. 1871), [Council, 1865—68, 1870— ], who with his father of the same name was a tobacco manufacturer in Norwich. Like Mr. Brown and Mr. Bridgman, he was an expert lathe worker, originally making his own stand (on the Ross model), and afterwards altering it to binocular form. He was a most careful manipulator, and perhaps the chief exhibitor at the meetings of then difficult test objects. In his later years he had but little time to give to his favourite studies, as he threw all his energy, as Vice-Chairman of the Board of Guardians, into the working of the Poor Laws in the City, and he died, at a comparatively early age, deeply regretted by those who knew him.

ELIJAH BLEAKLEY (b. 1818, d. 1857), was educated as a surgeon, but suffering from ill health, and having independent means in the later years of his life, he only practised to assist his professional brethren. He was an expert anatomist, and his connection with the Society, coupled with ample leisure, supplied the stimulus for him to devote his power to the preparation of objects, in which he was eminently successful. He also made one gathering of diatoms at Felixstowe, which had almost world-wide repute—one practically pure, of that beautiful form, *Pleurosigma formosum*. More than once was the search repeated there, but the chance did not recur. Very retiring, but of most kindly manners, he was ever ready to assist his brother members in their studies, and his death, at the age of thirty-nine, was a great regret to them. He also had other earnest interests, as by his will, on the recent death of his widow, his property passed to the Norwich City Mission; but so many years have passed away, that his personality is remembered but by few.

But more should now be said of JOSEPH CROMPTON, M.A. (b. 1813, d. 1878), [Council, 1862, 1871—74], to whom, I believe, the inception of the Society was due. The son of a Birmingham surgeon, and educated at Glasgow University, in 1839 he settled in Norwich as the minister of the Octagon Chapel. Well educated, and endued with all that is most estimable in a man, he had a most happy facility of picking out the salient points in a new book or the most recent discovery in science, and then of com.

municating his acquired knowledge to others, especially the young. As a microscopist he devoted some attention to the lower forms of aquatic life, but he never prepared many objects, or kept any large collection of slides. His instrument was a small one, but passers-by might see it standing near the window of his rooms on Bank Plain, ready to interest any caller in a dip of water from his aquarium.

A warning of trouble in one of his eyes, somewhere before 1860, precluded his further use of the microscope; but he continued a most faithful and interested attendant at the monthly meetings.

Having seen in his native town the benefit and interest excited by the meetings of the British Association, he strenuously advocated that one should be held in the city of his adoption, and in 1868 he acted here in conjunction with Canon Hinds Howell and Dr. Dalrymple as local secretary, so that two of the members of the Microscopical Society filled that office.

In later life he took orders in the Church of England, and died Rector of St. Lawrence parish. All who knew him during his long residence here had for him deep respect and esteem, and he inspired his parishioners, most of whom were of the humbler orders, with the same feelings. He died from a chill, brought on during a hurried visit to his parish to arrange for an Easter tea-party, and those who attended the funeral service in his church can never forget the sight of his little choir boys, whose bitter tears rendered them inaudible, or the long stream of women who reverently walked behind the mourning carriages to the cemetery.

Remember, he was the first President of your Society, and an appreciative mention of him appears in the opening of the presidential address in 1879, but the writer of that notice had not known him for forty years as I had been permitted to, and I venture therefore to hope that this tribute may not be inappropriate.

He had known JAMES MOTTRAM [Council 1873—76; Secretary, 1859—73], from his childhood, and when in 1856 the latter consulted him as to the purchase of a microscope, he readily assisted him in the selection of a Smith and Beck "Student" stand. But this was not all, for without consulting him he proposed his young friend as a member of the Society. The new instrument, which was fitted to play the part of David to the

Goliath of some of the other members, excited much attention for its compactness and portability; and a most kindly welcome was extended to the young man, who had thus the benefit, not only of the microscopical experience of his elders, but also of their cultured knowledge on many subjects.

He deeply valued the friendships he formed, and could only hope in after years that during the fourteen years he was their secretary and official, he was able in some way to repay their kindness; and it was with great regret that in 1870 he found that, from circumstances chiefly beyond his own control, he could not continue satisfactorily to fill that office.

After October, 1853, no notes of the monthly meetings were made, but I can say that the following were at various times elected members: Hampden G. Glasspoole, of Ormesby, James Mottram, Jeremiah James Colman, Dr. now Sir Peter Eade, M.D., Dr. Webbe, M.D., then living at Lowestoft, but who moved from the district in 1857.

HAMPDEN GLEDSTANES GLASSPOOLE (b. 1825, d. 1887), the son of an East India Captain, lived for many years at Ormesby, near Yarmouth, where he had every opportunity, on the broads and the sea-shore, of pursuing his studies in Natural History, and especially as a botanist. In later life he lived in London, and was a frequent exhibitor to the Quekett Club; but his kindly smile and manner, and his constant supply to his friends of choice material for examination and mounting is not forgotten by them.

In the spring of 1857 a desire was expressed that the Society should be photographed in a group. The first attempt, at a meeting at Mr. Colman's, by Mr. J. R. Sawyer, who was then an optician and photographer in London Street, was a failure; but at Mr. Crompton's, on the 30th of June, another trial was more successful, E. Bleakley and J. Mottram being the only two absentees.

In the autumn of that year the Society sustained a great loss in the decease of Mr. Bleakley, but shortly after received important recruits, Frederic Kitton and Francis Suttou, and also Colonel Baddeley, R.A., who was then residing at Gorleston, and who rendered yeoman service to science by using his opportunities there to secure Noctilucae in whose frail bodies many diatoms were found not previously observed, being of pelagic habit.



The next change was in May, 1859, when W. K. Bridgman, who had till then made all the arrangements for the Society, desired to resign the Secretaryship, and J. Mottram was appointed in his stead.

FRANCIS SUTTON, F.I.C. [Council, 1867], well known by the work on Volumetric Analysis which bears his name, and for his practice as a chemist and analyst, added greatly to the interest of the meetings by his practical knowledge as applied to the subject matter of the Society.

About this time Rev. William Cufaude Davie, M.A., of Cringleford, and Charles Mends Gibson, M.R.C.S. (d. 1874), [Council, 1866—69], joined the Society.

In 1862 the presentation by Mr. Brightwell to the Society of his instrument and cabinet of objects necessitated its reconstruction under more definite rules, and with a small share capital of £2 per share, and an annual subscription.

On the 26th September in that year, at a meeting at Mr. Brightwell's, he made some remarks on the nature of his collection of slides, and then formally handed them and the microscope to the Society. On the 3rd October the Secretary superintended their removal to the rooms of the Literary Institution in St. Andrew's, where, by permission of that body, a large eupboard cabinet had been placed for their reception, and, from this time forth, the host of each monthly meeting arranged for the appearance of the microscope on his table, and for its return. In after years, at various dates, two micro-slide cabinets holding 1000 each, a micro-spectroscope, and a micro-lamp were purchased.

For some years (1869—1876) the 'Monthly Microscopical Journal' was taken and circulated amongst the members, and these volumes are now in your own library. In 1872 a 1-10th immersion object glass was obtained, and in 1873 the instrument was converted to a binocular.

In the spring of the year 1863 a microscopical evening was held by invitation, in the rooms of the Literary Institution, courteously granted by the Committee of that body for the occasion. More than one hundred of the friends of the members were present, and twenty-one instruments were placed on the table, with the result that a most enjoyable evening was spent.

The same course was pursued in 1864 and 1866 with a like

result ; and it may be here noted that as most of the microscopists were members of the library, a strong bond of union always existed between the two bodies. It was somewhere about 1866 that it became definitely fixed that the meeting of the British Association for 1868 should be held in Norwich, and it was not surprising that during the intervening time the approach of so important an event was continually referred to at the monthly meetings of the Society, and it gave the members great pleasure to offer to assist at the evening *soirée* in St. Andrew's Hall.

Ten instruments were then used for the display of a miscellaneous selection of objects, and were crowded with visitors during the evening.

No further *soirées* were given by the Society, but in 1871 and 1875 very pleasant evenings, were by his invitation, spent at Mr. Brown's, at which each member had the opportunity of introducing a friend.

At the dates given, the following were elected into the Society :—  
 1864, August. Rev. D. S. Govett. Left Norwich 1865.  
 1865, December. Michael Beverley, M.D.  
 1866, March. Shephard Thomas Taylor, M.D.  
 1866, April. Josiah Fletcher. Died 1873.  
 1869, May. Thomas Richmond Pinder, LL.B. [Council 1871—73, 1877—80, 1881].  
 1871, October. Walter Overbury.  
 1871, December. J. W. Whelan. Died 1874.  
 1872, June. Thomas Slaek. Left Norwich shortly after.  
 1872, September. John Brooks Bridgman, F.L.S.  
 1872, December. Haynes Sparrow Robinson.  
 1873, April. Octavius Corder. [Council, 1882].  
 1873, November. Rev. Charles Howes. Resigned 1880.  
 1874, March. Herbert Decimus Geldart. [President 1879, Council, 1875—78. President of your Society, 1874, 1882, 1895], whose contributions to the records of our district need no further reference.

1876, December. Benjamin Edgington Fletcher.

1877, August. Charles Firth.

1878, February. Frederic Wm. Harmer.

1878, September. Herbert King.

At the annual meeting in May, 1873, J. B. Bridgman was elected

secretary in the place of Mr. Mottram, who resigned, and he discharged the duties of that office till 1884.

JOHN BROOKS BRIDGMAN, eldest son of W. K. Bridgman, was your President, 1875—1876. He has contributed to your lists of Norfolk Fauna, and furnished you with many papers and notes. He has recently given his collection of Hymenoptera and of the literature of the subject to the Norwich Museum.

The monthly meetings continued to be held with regularity, but death was busy amongst the original members, and by the year 1879 most of them had passed away.

In 1881 the removal of Mr. Kitton from Norwich was greatly felt, as he had, in conjunction with Mr. Geldart, been constantly in receipt of various objects of interest from his numerous correspondents, which he never failed to bring to the notice of the meetings.

The Naturalists' and Geological Societies and the Science Gossip Club and various other interests had claims on the time of the members, and thus it came to pass that in April, 1884, it was finally determined to wind up the Society. The slides were distributed amongst the existing members, and the instrument was for some years in the care of Mr. Kitton, but at the present time it, with its accessories and the spectroscope are in the hands of Messrs. Mottram, Geldart, and Bridgman, and would be available for any new society which might, phoenix-like, arise.

That such a time may in some way come seems not improbable, and to no one would it be more welcome than to the writer.

As the Society did not publish, it leaves no printed record, but the papers of its members to other bodies show much useful work, and in the general life of our city the names of those connected with the Norfolk and Norwich Microscopical Society will remain with untarnished lustre.

## XIV.

*MISCELLANEOUS NOTES AND OBSERVATIONS.*

HIGH TIDE ON THE EAST COAST.—On the 16th of May, 1895, a very high tide occurred on this coast, and the sea-water came up the rivers of Norfolk and Suffolk to such an extent that thousands of fish were killed. The river Thurne, from Potter Heigham to Kendle Dyke and Heigham Sounds, contained countless numbers of dead fish. Pike, some of considerable weight, Bream, Bream-flats, also Roach, Perch, Tench, and Gudgeon, and numerous fresh-water Mussels were seen floating on the surface, victims to the salt-tide. At Potter Heigham, several barrel-loads of fish were taken out of the river a day or two after the high tide, and used as food for the pigs. G. Applegate, Jun., a Potter Heigham boatman, states that he remembers several cases of high tide, but not one so disastrous to fish-life as that of the 16th May, 1895. At Oulton Broad the water rose above the Staithe, and I am informed that fish were destroyed in the New Cut, and as high up the Yare as Coldham Hall; the vegetation on the banks also being affected by the sea-water. Captain Day, Pier Master at Gorleston, in a letter to Mr. F. Danby Palmer, states as follows:—“That the high tide of the 16th of May last was quite an exceptional tide for the season. The early morning’s tide, on the day named, registered 7 feet 3 inches above zero, or local datum, or say about 15 inches higher than an ordinary high-water spring-tide. This, however, of itself was not at all an excessive flow. But what may in a great measure account for the prolonged presence of salt-water in the upper rivers, and which as you state, destroyed so many fish, was that the low water following this 7 feet 3 inches tide, only ebbed down one foot; there being therefore at low water 6 feet 3 inches above zero, or, in other words, to an ordinary high-water spring-tide. This great volume of water having been pent up by a strong northerly gale during the whole of the ebb, and further backed up by the ensuing flood in the afternoon which rose to 8 feet 10 inches above zero, thereby further assisting the salt water to force its way still higher up the

rivers than would otherwise have been the case had the ebb-tide fallen to its normal depth, which may roughly be taken at 12—15 inches above zero, although it frequently happens that it falls to 1—2 ft. below zero. Therefore, in the case alluded to there would be, over and above an ordinary ebb, a head of salt water quite 5 feet high, pressing, and mixing itself up with the fresh water in the upper rivers, with an additional head of 3 feet 10 inches on the high water. We have, as you are aware, had much higher tides, but not at the same season of the year. I am therefore inclined to think with you that this is the secret of the salt water killing so many fish." The increased amount of dredging now done in the Bure may account for the salt water coming up higher than formerly. It seems to be the opinion of anglers that more fish are killed now by salt tides than was formerly the case.—W. A. NICHOLSON, *Hon. Sec.*

FISH NOTES FROM YARMOUTH.—The past year has not been one of exceptional interest with regard to the occurrence of rare fishes. One new species only has been added to the county list, viz., the Streaked Gurnard (*Trigla lineata*). Beyond this there is very little to report upon.

POLE OR CRAIG-FLUKE (*Pleuronectes cynoglossus*).—From a pile of Dabs I drew out a fair-sized example of this species on April 3rd, 1895. It is now in Cambridge Museum of Zoology. Another occurred on January 20th, 1896.

LUMP FISH (*Cyclopterus lumpus*).—In April, 1895, a number of these were met with.

SHADS. TWAIT SHAD (*Clupea pinta*) and ALLIS SHAD (*C. alosa*).—Rather unusual catches were made during May, 1895, in the draw-nets. One specimen of the Twait Shad had fifteen spots on either side. The usual number being nine.

BASS (*Labrax lupus*).—A fine specimen, weighing 8 lbs. 10 ozs., length 30½ inches, taken in a draw-net May 28th, 1895.

PILCHARD (*Clupea pilchardus*).—One taken in drift-net May 29th, 1895. Others shortly afterwards.

ALBINO EEL.—A fifteen-inch creamy-white Eel taken on a "bab" in the river Bure on June 6th, 1895. The "lips" were pink; a faint tinge of same colour adorning the dorsal and anal fins.

SCRIBBLED MACKEREL (*Scomber scomber*) var. (*scriptus*).—A twelve-inch example came into my hands on June 25th, 1895.

This is the first Yarmouth record ; and second for the county. (*vide* Trans. Norfolk and Norwich Nat. Soc. vol. v. p. 116). It is now in Glasgow Museum. On December 7th, 1895, another was landed on Fish-Wharf.

**STREAKED GURNARD** (*Trigla lineata*).—The Rev. C. J. Lucas met with a specimen at a fish shop. It was forwarded to me for identification, and to Mr. Lowne for preservation ; its locality of capture was uncertain. Length  $9\frac{1}{2}$  inches. I met with a second on November 22nd, 1895, length  $12\frac{1}{2}$  inches. A bright, fresh, well-authenticated example, 12 inches long, was taken off Lowestoft on March 10th, 1896, and came into my hands a few hours later. It is now in the possession of Mr. E. M. Connop, Rollesby Hall.

**BUBALIS** (*Cottus bubalis*).—On August 17th, 1895, a  $4\frac{1}{2}$ -inch specimen was taken in a draw-net.

**RAY'S BREAM** (*Brama raii*).—Very fine example taken with Herrings by a local drifter on October 29th, 1895. Length  $23\frac{1}{2}$  inches, weight  $5\frac{3}{4}$  lbs. A pen and ink reproduction of this fish appeared in 'Daily Graphic,' October 31st, 1895.

**SPRAT** (*Clupea sprattus*).—On December 5th, 1895, I examined some Sprats with roes beginning to form definitely ; the ova could be detected by aid of a microscope. An unusual and out-of-season catch was made during the third week in February, when roes and milts were found well developed. The ova differed very little in relative size from those of a Herring. I consider that the Sprat regularly spawns in March, and at no great distance from the land.

**ROSE PERCH** (*Scorpena dactyloptera*).—An 8-inch example was brought me on December 11th, 1895. It was taken off Lowestoft.

**NORWAY HERRINGS** (*Clupea harengus*).—Amongst a large consignment of these coarse-grained, hard-boned fish, on December 17th, 1895, I found several that measured 15 inches in length, girth 7 inches, weight  $14\frac{1}{2}$  ounces. A long-shore is only 10 inches. I believe the Norwegian "variety" are simply very aged herrings.

**GREENLAND BULLHEAD** variety (*Cottus groenlandicus*).—A  $5\frac{1}{2}$ -inch specimen captured with Shrimps December 19th, 1895.

**BULL-DOG COD-FISH**.—A well defined specimen of this extremely ugly variety of *Gadus morhua* was hooked off Britannia Pier on December 21st, 1895. Length 21 inches.

LARGE TURBOTS.—Two on Wharf, February 1st, 1896. Respectively 29 lbs. and 30 lbs., after being gutted.

SOLE, variety.—A curiously rounded Sole was brought me on February 25th, 1896. Length  $7\frac{1}{2}$  inches; extreme width  $4\frac{3}{4}$  inches. Was at least three inches less in length than a fish that width should be.—A. PATTERSON, Hon. Sec. Great Yarmouth Section.

MIGRATION NOTES FROM LOWESTOFT.—As circumstances obliged me to spend the spring and summer in the North Cliff, Lowestoft, I spent my spare time in observing the birds frequenting the North Hills and Denes, and offer the following brief notes.

The birds that I noticed migrating were Redstarts, Cuckoos (I counted a flock of fifteen), Yellow Wagtails, Ring Ousels, Turtle Doves, Wheatears.

On October 15th and 16th a strong wind from N.N.W. was blowing, and I observed migrants coming in all day. I could, with my telescope, see them far out at sea, and watched them making for the land. They all seemed to come ashore at the same point, (between the lighthouse and the yacht pond). I observed Rooks, Royston Crows, Starlings, and Peewits. The Rooks, Royston Crows, and Starlings came over in small flocks (twenty to thirty): they flew a few yards above the sea, rising higher as they approached the shore, and some giving voice when the land was reached. A few alighted on the Denes, but the majority flew on inland. The Peewits formed one large bunch, and came flying across the sea, about a hundred yards above it: they went inland without stopping. One of the Rooks was nearly drowned within a hundred yards of the shore, and had the greatest difficulty in reaching the land.—P. H. EMERSON, B.A., M.B. (CANTAB.).

ACULEATE HYMENOPTERA AT TOSTOCK, NEAR BURY ST. EDMUND'S.—The past summer and autumn—the most beautiful I ever remember—gave me abundance of field-work. Strange enough, without looking for them, I obtained four additions to my list of Aculeate Hymenoptera (vol. vi. pp. 36—46) which I may as well record. *Leptothorax Nylanderi*, Foerst. Under dead bark of Black Poplar, three specimens, September 5th. *Stenamma Westwoodi*, West. One in nest of *Bombus terrestris*, September 11th. *Crabro Pubescens*, Shuck. Bred from stump, August 1st. *Crabro Kollari*, Dhlb [*tituratus*]. On a dead stump, September 1st.

From wasps' and bees' nests I obtained a large number of

Inquiline Beetles, and several new to me, viz. : *Choleva Watsoni* (*Vespa sylvestris*), *Ocypus brunnipes* (*Myrmica scabrinodis*), *Ceuthorrynehus sulcicollis* (*Formica fuliginosa*). Although I examined fifteen nests of *V. vulgaris* I only obtained a single "Wasp Beetle" (*Metæcus paradoxus*) on September 14th. Of the general things the pretty *Anthocomus faseiatus* abounded in June, and the following local species :—*Endomichus coccineus*, *Corynetes cœruleus*, *Apoderus coryli*, *Callidium violaceum*, *Lagria hirta*, *Thyamis longitarsus*; and from the breck district near Brandon, Mr. Frank Norgate sent me two coast species, *Oteniopus sulphuralis* and *Anomala Frischii*.

The Fungi in October yielded *Daene bi-pustulata*, *D. rufifrons*, *Mycetophagus atomarius*, *M. multipunctatus*, *M. 4-pustulatus*, *M. 4-guttatus*, *Rhizophagus bi-pustulatus*, *Nitidula bi-pustulata*, *Triphyllus suturalis*, *Homalium rufipes*, *H. iopterum*, *Epurœa limbata*, *Orchestes alni*, *Triplax russica*, *Pœadius ferrugineus*, *Xylophilus boleti*. Judging by the number of applications I receive, I wonder that coleopterists do not work at Fungi. October is the best month; and the large species growing upon dead trees such as Poplar, Ash, Beech, Birch, and Elm are the most productive, in the order named. Those growing upon ivy-infested trees are not worth trying. The Fungi should be brought carefully home and immersed in a vessel containing rain-water, which quickly brings the mature Beetles to the surface. The Fungi should be then drained and placed in any decayed trees or stumps, when, at the end of March, they will afford a fresh supply.—W. H. TUCK.

*P.S.*—The brilliant weather in June of the present year (1896), gave me four additions to the Aculeate-hymenoptera, which I take the opportunity of recording as this passes through the press: *Agenia hircana*, Fab.; *Pemphredon morio*, V.D., Lind; *Prosopis signata*, Panz.; *Sphecodes rubicundus*, Sladen; which brings my list to Ants, 9; Fossores, 49; Wasps, 13; Bees, 105; Total 176.

BLACK-WINGED STILT.—My friend, Mr. T. Peteh and I, saw two Stilts on Wolferton Marsh, on October 8th, 1895. Mr. Hudson, Jun., of Castleacre, shot a Stilt, close to the river at Castleacre, on October 12th, 1895, which appeared to him to be alone.—C. T. M. PLOWRIGHT.

FULMAR PETREL.—While walking from Thornham to Hunstanton we found two recently killed Fulmars on Holme Beach. One



of these birds was an adult in full plumage; but the other seemed to be immature.—C. T. M. PLOWRIGHT.

*MUS RATTUS* AT YARMOUTH.—At the last Monthly Meeting it will be remembered, Mr. Patterson, in his Yarmouth Notes, referred to the existence of the old English Black Rat at Yarmouth. I think several of the members expected, as I certainly did, that it was some recent importation of the Mediterranean species (or, as some say, variety), *Mus alexandrinus*, that Mr. Patterson has found; but he stuck to his guns that it was *rattus*, and through Mr. Southwell, who has taken much trouble to thresh out the matter, specimens were sent to Mr. Eagle Clarke at Edinburgh and Mr. Barrett-Hamilton of London. The former wrote at once, 5th March, 1896: "The Rats you send are most undoubtedly the old English species, *Mus rattus*, and their occurrence in abundance in Yarmouth is an interesting fact. *Mus rattus* and *Mus alexandrinus* are considered to be *races* of the same species; the black *rattus*, being the form found in temperate regions, and the brown *alexandrinus* the tropical one. Yours truly, W. EAGLE CLARKE."

Mr. Barrett-Hamilton's reply was almost precisely to the same effect, and equally positive that the specimens sent were *rattus* and not *alexandrinus*. Before two such authorities I suppose we must all submit, and though we have some of us been taught to consider *rattus* and *alexandrinus* good distinct species, though closely allied, it does not, I think, very much matter which we call them, well-marked varieties or closely allied species. But, admitting the Yarmouth Rats to be *rattus* (and I must confess that though unconvinced by some immature specimens shown by Mr. Patterson, a full-grown female he has since sent me, and which Mr. Roberts is preserving for me, is most typical of what I have thought *rattus* to be) this is far from making them of the old English race, those which though apparently not here in the time of the Romans, had still been settled several centuries in the county, when they were driven out by the present universal Brown Rat, *Mus decumanus*, about the time we lost the old line of kings, and the Royal House of Hanover succeeded that of Stuart. The Brown Rat has consequently been very generally known as the Hanoverian Rat. I have myself generally called it by that name. It is supposed to have been originally a denizen of the far East,

some have said China, and like almost everything else gradually spread West till, at last, soon after 1700 it reached these islands, to exterminate quite, or nearly so, the Black Rat, and has since spread with the Anglo-Saxon race to every quarter of the Globe.

To return to *M. rattus*, Mr. Patterson says they are at Yarmouth principally confined to one very plainly marked locality, that section of old "rowed" Yarmouth, lying between the river and King Street in width, and between Friar's Lane and Regent Road in length. Any one who knows Yarmouth will, I think, easily appreciate the significance of their confinement to this district. As Mr. Patterson has said, it is against their recent importation in grain vessels, as all these unload the other side of the river where *rattus* seem to be quite unknown: but it is, to my thinking, equally against their being a survival of the old stock, else why are they not equally to be found in that portion of old "rowed" Yarmouth to the north of Regent Road? It looks to me as though they had been re-introduced (probably from some Continental port) since Regent Road was made, which I expect is something less than a century since, and that this wide street has proved a barrier not easy for them to cross. Mr. Patterson tells me only of one occurrence to the north of Regent Road, and that but just over; while to the south they are fairly common, and, as he says, have been for the last twenty years or more, though they seem to have increased of late. Mr. Patterson has given much time to their observation, and tells me that he knew of them when quite a lad. He says they seem most partial to malt-houses, and that the old houses in that portion of the town where they abound, many of them wainscotted, seem most admirably adapted to their use. He says that Cats both catch and eat them, but their holes are, as a rule, too small for Ferrets to enter, so they cannot be killed in that way.

At the recent meeting of the Yarmouth section of our Society, of which Mr. Patterson is such an admirable secretary, he exhibited what looked very much like a cross between the Black and Brown Rat, but it was only half-grown, and I have a great mistrust of immature specimens for purposes of comparison.

I feel that our thanks are very greatly due to Mr. Patterson for the way in which he has brought another most interesting question before our Society and the public at large.—J. T. HOTBLACK.



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