PRESENTED
1 JAN 1943

TRANSACTIONS

OF THE

Norfolk and Norwich

NATURALISTS' SOCIETY

FOR THE YEAR

1942

VOL. XV PART IV.

EDITED BY MAJOR A. BUXTON

NORWICH
PRINTED BY THE SOMAN-WHERRY PRESS LTD., NORWICH.
JANUARY, 1943

PRICE 10 -

PAST PRESIDENTS

REV. JOSEPH CROMPTON, M.A.	1869—70
,, ,, ,,	1870—71
HENRY STEVENSON, F.L.S.	1871—72
MICHAEL BEVERLEY, M.D.	1872—73
FREDERIC KITTON, Hon. F.R.M.S.	1873—74
H. D. GELDART	1874—75
JOHN B. BRIDGMAN	1875—76
T. G. BAYFIELD	1876—77
F. W. HARMER, F.G.S.	1877—78
,, ,, ,,	1878—79
THOMAS SOUTHWELL, F.Z.S.	1879—80
OCTAVIUS CORDER	1880—81
J. H. GURNEY, Jun., F.Z.S.	1881—82
H. D. GELDART	1882—83
H. M. UPCHER, F.Z.S.	1883—84
FRANCIS SUTTON, F.C.S.	1884—85
MAJOR H. WE. FILDEN, C.B., F.G.S., C.M.Z.S.	1885—86
SIR PETER EADE, M.D., F.R.C.P.	1886—87
SIR EDWARD NEWTON, K.C.M.G., F.L.S., C.M.Z.S.	1887—88
J. H. GURNEY, F.L.S., F.Z.S.	1888—89
SHEPHARD T. TAYLOR, M.B.	1889—90
HENRY SEEBOHM, F.L.S., F.Z.S.	1890—91
F. D. WHEELER, M.A., LL.D.	1891—92
HORACE B. WOODWARD, F.G.S.	1892—93
THOMAS SOUTHWELL, F.Z.S.	1893—94
C. B. PLOWRIGHT, M.D.	1894—95
H. D. GELDART	1895—96
SIR F. C. M. BOILEAU, Bart., F.Z.S., F.S.A.	1896—97
E. W. PRESTON, F.R.Met.Soc.	1897—98
J. H. GURNEY, F.L.S., F.Z.S.	1898—99
JOHN T. HOTBLACK	1899—1900
SIDNEY F. HARMER, Sc.D., F.R.S.	1900—01
W. H. BIDWELL	1901—02
HENRY WOODWARD, LL.D., F.R.S., V.P.Z.S., F.G.S.	1902—03
FREDERICK LONG, L.R.C.P.	1903—04
WALTER GARSTANG, M.A.	1904—05
EUSTACE GURNEY, M.A., F.Z.S.	1905—06
C. A. HAMOND	1906—07
SYDNEY H. LONG, M.D., M.B.O.U.	1907—08
REV. M. C. H. BIRD, M.A., M.B.O.U.	1908—09
D. G. THOMSON, M.D.	1909—10
W. M. CROWFOOT, F.R.C.S.	1910—11
W. LINCOLNE SUTTON, F.I.C.	1911—12
ROBERT GURNEY, M.A., F.Z.S.	1912—13
MISS ALICE M. GELDART	1913—14
J. H. F. WALTER, F.Z.S.	1914—15
H. J. THOULESS	1915—16
CLAUDE B. TICEHURST, M.A., M.B.O.U.	1916—17
W. G. CLARKE, F.G.S.	1917—18
EDWARD BIDWELL	1918—19
J. H. GURNEY, F.L.S., F.Z.S.	1919—20
B. B. RIVIERE, F.R.C.S., M.B.O.U.	1920—21
MISS E. L. TURNER, F.L.S., F.Z.S.	1921—22
RUSSELL J. COLMAN	1922—23
SIR HUGH R. BEEVOR, Bart.	1923—24
DONALD HUTCHINSON, M.D.	1924—25
E. H. HANKIN, M.A., Sc.D.	1925—26
,, ,, ,,	1926—27
H. J. HOWARD, F.L.S.	1927—28
H. F. WITHERBY, F.Z.S., M.B.O.U.	1928—29
G. H. GURNEY, F.E.S., F.Z.S., M.B.O.U.	1929—30
MISS A. M. GELDART	1930—31
E. J. SALISBURY, D.Sc., F.L.S.	1931—32
MAJOR A. BUXTON, D.S.O., M.B.O.U.	1932—33
,, ,, ,,	1933—34
W. P. PYCRAFT, F.L.S., F.Z.S.	1934—35
COLIN McLEAN	1935—36
G. J. COOKE	1936—37
MISS J. M. FERRIER, F.Z.S., M.B.O.U.	1937—38
E. T. BOARDMAN	1938—39
HUGH WORMALD, M.B.O.U.	1939—40
J. A. STEERS, M.A.	1940—41
E. C. KEITH	1941—42
A. J. RUDD	1942—43

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JANUARY, 1943

Norfolk and Norwich Naturalists' Society

Patron

H.M. THE KING

OFFICERS FOR 1942.

President

A. J. RUDD

President-elect

MISS C. E. GAY

Vice-Presidents

SIR SIDNEY F. HARMER, K.B.E., Sc.D., F.R.S. PROF. F. W. OLIVER, D.Sc., F.R.S.
RUSSELL J. COLMAN. ROBERT GURNEY, M.A., D.Sc., F.L.S.

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549, Earlham Road, Norwich.

Hon. Secretary

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Hethersett Hall, Norwich.

Assistant Secretary & Hon. Librarian

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Castle Museum, Norwich

Hon. Secretary Junior Branch

MISS P. MEADE
Quidenham, Norwich

Hon. Editor

MAJOR A. BUXTON
Horsey Hall, Gt. Yarmouth

Hon. Auditor

C. R. A. HAMMOND
Barclay's Bank, Norwich

Committee

W. EASTER
H. J. HOWARD
P. E. RUMBLELOW
(to retire 1945)

SIR H. E. S. UPCHER
(to retire 1944)

A. P. BAGNALL-OAKLEY
G. J. COOKE
DR. S. SHEPHEARD
(to retire 1943)

Ex-officio: MISS G. V. BARNARD

NEW MEMBERS, CHANGES OF ADDRESS, etc.

NOTE.—Instead of reproducing the complete list of members, only alterations are given in this number.

NEW MEMBERS ELECTED 1942.

Bunwell, The Rector of, Norfolk.

Lisney, A. A., M.A., M.D., F.R.E.S., Red House, Narborough, Leicestershire.

Loyd, L.R.W., Tudor House, Martham (Life Member).

Turner, A. H., "Astrantia," Wendling, Dereham.

CHANGES OF ADDRESS.

Brooks, C. J., F.R.E.S., 49, Harvard Court, London, N.W.6.

Ellis, E. A., The Rookery, Hellington, Norwich.

Ferrier, Miss J. M., M.B.O.U., Seagull Bungalow, Porth, nr. Newquay, Cornwall.

Harris, Rev. G. H., Uggeshall Rectory, Beccles.

Mason, Austin, 9, Willow Lane, Norwich.

Newman, L. F., Southdown, Blakeney.

Phillipo, G. Winnowsty House, Winnowsty Lane, Lincoln.

NORFOLK & NORWICH NATURALISTS' TRUST, 1941-2.

GENERAL ACCOUNT.

1.4.41.	£ s. d.	£ s. d.
To Balance		50 12 3
,, Subscriptions		130 0 0
,, Interest on Investment £300 4% Consold. £105 6s. 10d. War Loan ...		9 13 8
,, Interest at East Anglian Trustee Bank ...		1 13 9
,, Sales Scolt Head Handbook	1 9 8	
,, East Anglian Flora	19 0	
		1 19 8
		£193 19 4

Sums from above credits were placed in Trustee Bank and withdrawn when required, leaving balance as on other side.

	£ s. d.	£ s. d.	£ s. d.
By Transactions Printing		120 14 6	
Postage		3 0 0	
		123 14 6	
Less			
Sales	3 0 0		
Publication Fund—			
W.B.P.A. ...	10 0 0		
J. A. Steers	7 0 0		
Lesser sums	2 1 0		
	19 1 0		
		22 1 0	
			101 13 6
Library Rent		... ...	6 5 0
Photo Survey		... ...	2 0 0
Expenses of Meeting		... ...	1 7 2
Assistant Secretary, Honorarium		... ...	15 0 0
Printing and Stationery		... ...	1 15 6
Postage Insurance, etc., £2 11s. 0d. less 17s. 6d. due Treasurer		... ...	1 13 6
30.3.42.			
Balance In East. Anglian Trustee Bank ...		81 13 9	
less o/d at Barclays Bank ...		17 9 1	
			64 4 8
			£193 19 4

LIFE MEMBERSHIP ACCOUNT.

1.4.41.	£ s. d.
To Balance	54 6 4
,, Interest	1 15 0
,, Interest Bank	1 7 2
	£57 8 6

31.3.42.	£ s. d.
By Balance at East Anglian Trustee Bank	57 8 6
	£57 8 6

LIBRARY ACCOUNT.

	£ s. d.
To Balance	47 10 11
,, Interest	1 3 9
	£48 14 8

	£ s. d.
By Purchase	2 7 6
Balance	46 7 2
	£48 14 8

Audited and found correct. 30.4.42.

C. R. A. HAMMOND

I

REPORT OF THE YEAR'S WORK, 1941–42

By the Hon. Secretary

During the winter of 1941-42 the Society was only able to hold two meetings. The first of these was on November 15th, when Mr. G. J. Cooke led a discussion on "Some Aspects of Norfolk Natural History in War-time," in which the President and others took part. The effects of present conditions on the countryside in general, and the policy to be followed for the safeguarding of existing nature reserves and the establishment of others within the framework of national planning, formed the chief topic of the meeting, and it was urged that the Society should take a full part in collecting information about the areas suitable for reservation in Norfolk. Among places mentioned as being of outstanding interest were Buxton Heath, Hevingham, Booton Common, Holt Lowes, Wheatfen Broad, parts of the Westwick and Stratton Strawless woods, parts of Roydon Common near King's Lynn, and most of the Broads of the Bure Valley and its tributaries. Measures taken for the preservation of parts of Breckland could not be effective until after the war; the coastal dunes and salt-marshes had not, it was believed, suffered much permanent damage as the result of defence restrictions. The President suggested that members would be doing valuable service by reporting on the exact nature of the vegetation and other life of any areas which were in danger of destruction, while they remained outside the control of the National Trust or similar protective interest.

The 73rd Annual Meeting was held at Norwich Castle Museum on May 2nd, 1942. A satisfactory report of the Society's finances was delivered by the Hon. Treasurer. The following officers were elected:—Mr. A. J. Rudd to be President in 1942-43, Miss C. E. Gay President elect; Messrs. W. Easter, H. J. Howard and P. E. Rumbelow to serve on the committee for three years in the places of members retiring by rotation. The retiring president paid tribute to the memory of Mr. H. E. Hurrell, F.R.M.S., whose death had deprived the Society of one of its keenest scientific workers and the honour of having him as its President chosen for the coming year. The Society hoped to be able to publish the draft of Mr. Hurrell's address which he had prepared only a few days before his death.

The President (Mr. E. C. Keith) then delivered an address on "The Policy of the Norfolk & Norwich Naturalists' Society in War and Peace."

Some informal excursions of members have taken place, chiefly to commons and broads within reach of Norwich. Among others several members on leave from the Forces attended.

II

THE JUNIOR BRANCH OF THE NORFOLK AND NORWICH NATURALISTS' SOCIETY

Annual Report, 1942

The Junior Branch is primarily intended for those young people who being at School or College are unable to attend the meetings of the Senior Society, but others interested are eligible.

The Annual Subscription is 2s. 6d.

The present Membership numbers 74.

Ten new members joined during the year.

Five members resigned during the year.

Thirteen members resigned for the duration of the war.

January 3rd, 1942.—Forty members and friends met at the Norwich Castle Museum at the kind invitation of Miss Barnard, and much enjoyed "Grey Owl" and other interesting films shown.

April 22nd, 1942.—Sixteen keen juniors travelled by train and bicycle to Quidenham and spent a long day exploring the woods, park, gardens and Mere. Nightingales sang during the picnic luncheon, and many wild flowers were found. A Magpie's nest was discovered in a thorn bush only about seven feet from the ground, and a Great Crested grebe's nest on the Mere, both with eggs.

September, 1942.—Owing to transport difficulties no meeting could be held, but it is hoped to arrange two meetings during the Christmas holidays.

BALANCE SHEET for Year ending 30th September, 1942.

Receipts.	£	s.	d.	Payments.	£	s.	d.
Balance from 1941 Account ...	2	6	1	Norfolk Wild Bird Protection Committee	1	1	0
39 Members' Subscriptions ...	4	17	6	Postages		12	2
				Balance in hand	5	10	5
	£7	3	7		£7	3	7

Patricia H. I. Meade,

Hon. Sec.

III

PRESIDENT'S ADDRESS

Delivered by Mr. E. C. Keith to the members of the Norfolk and Norwich Naturalists' Society at the Castle Museum, Norwich, on May 2nd, 1942

THE POLICY OF THE SOCIETY

INSTEAD of following the usual custom of reading a paper to you on any one subject, I propose this year to review, so far as I am able and very briefly, the probable effect the war may have on the interests of this Society.

I should also like to make some suggestions as to the future policy and activity of this Society in order to counteract the effects of the war upon it, and especially during the post-war period. This war is likely to cause a great change in all our lives, and to some extent in the lives of all living creatures, and life generally. I can foresee a revolution in the purpose and use of the soil due to a changed economic policy, which will have a far-reaching effect on the interests of this Society. In my opinion some of these interests may disappear entirely unless a more active programme is evolved by the governing body.

I am not quite clear as to the purpose for which this Society was originally formed. Even if it was merely for the interchange of ideas and knowledge, then surely it is necessary on occasions such as the present, to take action to preserve the subject matter of that knowledge. Each generation of naturalists should, in my opinion, view circumstances as they find them, and if necessary alter their objectives according to the need of the moment.

Looking through the list of members and Presidents during the past seventy years, and particularly during the earlier period, we find the names of many eminent men and outstanding naturalists who were by no means passive in their interest in nature. They made and recorded discoveries which are the basis of natural history to-day, and I am quite sure that were those men in control of this Society at the present time, they would take the most active steps to preserve the source of their interest and study.

A great deal of wild life depends for its existence on uncultivated and undisturbed land, and during the past century much of interest has been lost owing to the reclamation of waste land, fens and commons. At the present time we see a great drive being made to bring into cultivation many more such lands, some of which are probably part of original England, and, if the war should continue for long, I imagine that a great drainage scheme will be instituted which will eventually dry up many of the existing sanctuaries for wild life. Much of this reclamation can be only temporary, a war-time expedient, for the reason that the soil is intrinsically unsuitable for permanent cultivation—some of it has already proved the effort and enterprise to be misdirected. Much more might be achieved if the same effort were directed to the better cultivation of some of the existing arable land which in many cases is producing, even to-day, little more than half its capacity.

Before the present war, the standard of farming had fallen very low, and it will take a good many years to restore it to normal. This was due mainly to the devaluation of land and its products, and also to the breaking up of large estates, which has now been going on for some considerable time. The large land-owners of the last century were efficient guardians of the soil and of the countryside, and although certain modifications of their privileges were necessary, the alternative adopted by force of circumstances has not proved beneficial to either farming or property. Land had so depreciated in value that many who owned and farmed it had little interest in it further than for their own immediate needs, and there was no control over natural amenities. In this way our greatest national asset has become misused and neglected to an alarming extent, resulting in a low and inefficient standard of production.

This Society has nothing to fear from a rejuvenated agriculture provided action is taken to preserve certain areas which are of little productive value, but there is a danger of indiscriminate attempts at cultivation followed by neglect, of areas which are quite unsuitable. All will agree that the land should be put to its best use during the war and even after, but this should be carried out by thoughtful planning, so that the interests and privileges of a future generation may be

preserved. Breckland is being progressively encroached upon for cultivation, for aerodromes and for afforestation, and I imagine that most wild life cannot or will not exist under, or among, the dense canopy of a newly-planted area. I make no complaint against the policy of afforestation, but there should be more imagination exercised in its development. A vast unbroken tract of one species of tree is quite unnecessary and destroys the attractions of a woodland area. Hard woods or even larch would relieve the monotony and add immensely to the beauty of the landscape as well as serving their purpose industrially. As a nation we appear to have little imagination and rely too much on our capacity to muddle through. The Forestry Commission will no doubt achieve its purpose, but I see no reason whatever why more consideration should not have been given to the ultimate effect of their work on the countryside and on the creatures and plants which inhabit it. It is the lack of any State policy for the preservation of rural amenities which allows these interests to be neglected. Older woodlands are being felled, Military Camps erected, and generally the depredations of war are causing great changes in the county which must inevitably affect the interests of this Society. The emergency of war must take its toll, and it would be idle and wrong to attempt any obstruction of national necessity, but there are ways and means of preservation which need conflict with no other interests.

The variety of soils in this country, and especially in this county, constitute its main natural interest, for each type of soil has its own variety of vegetation and wild life, and in this way makes its own particular contribution towards the interests we represent. It is therefore imperative, if these features are to be preserved in certain areas, that action should be taken which will retain for all time the natural characteristics of the county.

I would suggest as a first step to a more active policy that every district in the county should be represented by selected members of this Society who would act as wardens, and report on any matter affecting its interests. It may be found that voluntary representatives would not be able or competent to carry out such comprehensive work, but at least it would be a step in the right direction. Members of the Society have the

point of view and the outlook on Nature which could not fail to create an interest in others. They could obtain first-hand information more quickly regarding any threatened area or object and so enable prompt action to be taken. Or it might be found necessary to follow the example set by the Norfolk Bird Protection Committee and have one or more whole-time wardens. In this way a survey of the county might be taken and a catalogue made of all places and items of Natural interest so that a watchful eye might be kept on these by the Society through its representative.

Another matter long neglected and now of increasing importance is education, and in this respect we lag far behind some other European countries, which value highly and profit by their natural amenities. It has been proved that where a people are educated in such matters they quickly respond to the interest, and share willingly in its preservation. I imagine that the post-war period will see a great boiling over of the population of the towns into the country, and unless these people can be educated to countryside values they may well prove to be the Panzer Divisions of destruction which would make any kind of preservation extremely difficult.

In these democratic days the interests of naturalists cannot be segregated from those of the general public, nor is it right that they should be. The enjoyment derived from British wild life and the countryside generally should be as wide-spread as possible. For this purpose more freedom should be granted to all interested in the countryside and fewer restrictions imposed against the entry on to private property, and a step in this direction is provided by the "Access to Mountains" Bill. However, it is obvious that any such extension of liberties must be accompanied by education in natural values. It is only by greater knowledge and a fuller understanding that the general public can be made to realise and to appreciate the recreation which many of us find so valuable. In recent years a great yearning has developed for more knowledge of wild life and Natural History, especially among the town population, and it is here that such a Society as ours might play a more useful part by encouraging this wholesome tendency. It is probable that in the post-war period there will be a shorter working day for a large part of the population,

entailing more hours for recreation. Given a lead and some encouragement there is no doubt that many would be glad to avail themselves of the healthiest of all recreations, the study of wild life.

Education can be made very interesting to-day by means of written articles, lectures and films. The co-operation of the B.B.C. might be obtained to a greater extent, and certainly the Board of Education should recognise the importance of the subject. But naturalists should give a lead and there would then, I am sure, be many to follow. Naturalists generally are notoriously docile and frequently inarticulate. Their activities are unselfish and usually beneficial, yet there is little respect for the few laws which protect their interests. There are many crimes against nature committed under the heading of sport. For this reason a more alive policy is needed, greater activity in the open and a spreading of knowledge to make popular the values which are so little protected, for it is only with the co-operation of the general public that these can be preserved.

The question of National Parks has been freely debated on many occasions, but certainly Norfolk is not a suitable county for such an experiment. I would prefer to see the whole country—this small island—treated as one National Park, and all Societies such as our own induced to play their rightful parts in the preservation and development of its natural possessions. The work and objects of the National Trust are of the greatest importance, and I should like to see its activities so extended as to co-ordinate preservation throughout the country. Indeed, the promotion and preservation of all natural interests might be vested in its control so that there would be uniformity in every county. In this way each Society might be affiliated so as to obtain authority as well as assistance in local matters. There are many areas which might be acquired by the Trust for the benefit of the Nation, and the management of these could be carried out by local Committees responsible to the central executive.

Any form of Enclosure is to me objectionable, and of necessity it defeats its own object by ceasing to be natural. In the original state of the land there were no restrictions against either man or beast, and that same condition is essential if we

wish to retain any area in what we regard as its natural state. Although man has become much more predatory with the advance of civilisation, his destroying influence should be curbed by encouragement and education rather than by arbitrary measures. The most annoying of all countryside objects is, in my opinion, a notice board threatening trespassers with prosecution. Such a notice makes me lose all sense of right and wrong, and I am overcome with a desire to trespass to my heart's content. Many others, I am sure, feel the same way. It savours too much of Nazi Germany and is the wrong way to preserve the countryside. Education, co-operation and a sharing of interests would be a more effective policy. Let us have sanctuaries by all means, but no reserves. Let the public be encouraged to make full use of these under supervision, as is already done in our bird sanctuaries which have done so much for preservation coupled with education. The benefits of Nature should be for the masses and not for the few, but the masses need educating.

England is essentially a forest and would very quickly revert to one again if all restraining influences were removed. Even the most barren of our Brecklands would revert to scrub forest if the rabbits were eliminated. The downlands of the south and west would do likewise were it not for the sheep; and it should be remembered that the beauty of England is mainly man-made, the work of two thousand years, and no one would suggest that it was a green and pleasant land when first visited by the Romans. Since that date, successive generations of thoughtful men have created the countryside by planting trees and woods and hedges, by laying out roads and lanes and even guiding the rivers into the courses in which they now run. We have roads to-day made by the Romans, and the cultivations they began have been improved and extended by each succeeding generation. Man has controlled and restricted the forests and trees by eliminating the scrub and developing the best, while introducing new species of usefulness and great beauty. He has turned swamps and wastes into the most fertile of all land for his use, and except for his recent misuse of bricks and mortar and iron, his handiwork has in no way discredited nature. The change he has made in the fauna of this country has gone far enough, or perhaps too far, and

its control to-day should not be decided by individual taste. This applies to the whole subject with which we are dealing, and a national policy controlled by experts is urgently needed to create and develop a national interest. As a people we have too much irresponsible freedom and too few intellectual and educational privileges.

The countryside contains relics and examples of the industry and thought of each generation of man throughout our existence, and it is questionable whether the ability to create natural beauty is as great to-day as it has been in the past. But if we cannot create we can at least preserve and study the precious heritage which has been handed down to us, representing the art and ideas of the various tribes and races which have occupied this island. Meanwhile, nature has evolved a population of creatures and plants to suit the surroundings created by man, and to suit the districts which man has left in their natural state. Nature has ornamented and beautified this work to a remarkable extent so that the result is worthy of careful preservation. There is much thought being given to-day to planning a new and better England after the war, and when once the war is won, no greater problem will exist. But it will be every man's problem, and naturalists are concerned to a considerable extent in so far that they are the self-constituted guardians of many interests.

A memorandum has recently been issued by a Conference held under the Chairmanship of Lord Onslow, dealing with the preservation of rural amenities—forest areas and the natural flora and fauna—for the advancement of scientific knowledge and education. I was sorry to see that our Society was not one of the many organisations taking part in this Conference, as these are subjects in which we are keenly interested. Norfolk should have been represented for several reasons. No other county will have suffered more from the exigencies of war, and no other has done so much for the development and encouragement of natural history, nor produced so many eminent naturalists. A great deal has been done in the way of preserving interesting bird life and providing bird sanctuaries, and this was almost entirely due to the energy and initiative of one very distinguished member of this Society. Such work should in my opinion be expanded

and continued until it covers all the headings in which this Society is interested.

It is not in the interest of naturalists generally that a large number of Societies should be formed, each dealing with its own particular subject, and I would advocate amalgamation or at least close co-operation between all Societies of similar objects. The Norfolk Naturalists Trust might with advantage be brought under the direct control of this Society. The preservation of Rural England is a matter in which the Norfolk Naturalists are as interested as any other ; indeed, it is the foundation of our interests. If this Society could see its way to playing a more active part in the development and propogation of Natural knowledge, preservation would follow in due course. There would be no lack of interest or of a following, and no lack of funds, for it will certainly be work of great national importance in the difficult post-war years which lie ahead.

The beauty and interests of the countryside are priceless possessions which have been far too long at the mercy of the speculator and the destroyer. I believe the time is at hand when they will be appreciated at their true value and preserved for the enjoyment of future generations.

There is a great love of their country and the treasures it contains in the hearts of all Englishmen, but owing to the lack of knowledge, in many it lies dormant. *Now*, when we have seen the threat that all might be taken from us and destroyed, is the time for a great awakening. This Society has an opportunity and, in my opinion, a duty, to spread its knowledge and to enlarge its activities so that the study of nature may become a great national recreation.

IV

POND LIFE

By H. E. Hurrell, F.R.M.S.

(*The late Mr. Hurrell, President elect for* 1942-43. *died before this address could be delivered.*)

On looking through the list of past Presidents of this Society, I am proud to have had personal contact with Sir Sydney Harmer and with the late Sir Eustace Gurney and Dr. Robert Gurney, with both of whom I have searched for Polyzoa in the waters near Longmoor Point, Sutton Broad. I have a vivid recollection of the late Mr. Octavius Corder (President 1880-81) both as an employer and a patron. While a lad I acted as assistant in Messrs. Caley & Corder's laboratory in Bedford Street, Norwich, and Mr. Corder gave me my first taste for Natural History and an initiation into pond life. He took me one day into his private room over the London Street premises and gave me my first glimpse of the motile alga known as *Volvox globator* in good living condition. For 70 years *Volvox globator* has held its attraction for me both on account of its beauty and its life history. Its movement caused much discussion during the last century between botanists and biologists as to whether it should be classed as belonging to the animal or vegetable kingdom ; it is now established as belonging to the latter.

I am also indebted to the late Mr. Chas F. Rousselet, the world-wide authority on the rotifera, mere specks of animation as seen by the eye, but gloriously caparisoned when viewed under the microscope. This class is eloquently described and artistically delineated in Hudson & Gosse's work, to which Mr. Rousselet and some American and Continental workers have added scores of new species. There are over 800 species in the latest published lists, most of which have been found in Norfolk waters. The finding of some of them gained me entry into the Royal Microscopical Society, and the celebrated Quekett Microscopic Club with Mr. Rousselet as my sponsor.

During Sir Sydney Harmer's term as chief at the Natural History Museum, South Kensington, both he and his lieutenant

in the department of fresh-water biology (Dr. Kirkpatrick) gave me valuable information; the latter was the author of "The Biology of Water Works," which has become the popular work on the microscopic flora and fauna in the water supply to the cities and towns and latterly to the villages of our country. The book has had, without doubt, its influence in securing more scientific treatment of our water supply and in bringing drinking water from distant streams and springs right into the homes of millions of our people. In addition to Dr. Kirkpatrick's work we have a treatise on the subject by Sir Sidney F. Harmer in his contribution to the proceedings of the Zoological Society of London (1913) in the "Polyzoa of Waterworks." Harmer gives an historical account of all the known British forms which are almost identical with those of the great American lakes and rivers, as well as those on the continent as first described by Kraepelin of Leipsic, who called attention to their presence in water supply pipes serving continental cities.

There is abundant evidence that most of the waterworks on the continent and in this country suffered in the past from the choking of the mains and supply-pipes by polyzoa and an accumulation of small crustaceans, larval worms and filamentous algae. Much of the trouble has been abated by the close study of the subject by biologists both here and abroad. The workers and many of the engineers at waterworks had noticed tufts or small masses of moss-like material ejected from the mains, when filling the filter-beds, and the introduction of sand-filters in the latter part of last century and more fully at the beginning of the present quickly lessened the pipe nuisance. During the past 30 years or more the chemical treatment of water passing through Municipal waterworks has almost stopped the growth of both bacteria and polyzoa as well as infusoria and minute algae. The presence of polyzoa in waterpipes came under my personal notice some years ago when visiting the Lound water-works which supply Lowestoft. I asked the engineer to turn on the water which comes from the adjoining lake in order to test the matter; as the water gushed over the closely packed sand filter, little patches of material were shot out and floated about. The assistant present said "That's moss," but I assured him that it was

something of greater significance than moss, and placing a piece in a small tube of water I showed him with a magnifier that it was in reality a number of tubes from which living polypides were protruding their graceful heads.

Most of the fauna met with in waterpipes come from the minute eggs of water-beetles and small crustaceans which gradually get through the most perfectly packed filters and in the case of polyzoa the tiny statoblasts of the various species also find their way gradually into the pipes. These statoblasts are the reproductive bodies, resembling buds or seeds, which contain within their horn-like cases the embryos of lovely little animals forms. Waterworks flora and fauna form a sort of epitome of the fauna found in the rivers and broads.

I shall endeavour to give a short account of British microscopic plants and animal forms without minimising the importance of Norfolk's contribution. All collections of water, however small, are worth searching, for infusoria are found in abundance in roadside ponds and ditches as well as in farmyard puddles and even rainwater tubs and tanks. On several occasions I have found a magnificent rotifer in highly-coloured water running from a farmyard into the public roadway and have found the telescopic rotifer *Actinurus neptunius* in black mud from roof gutters. This rotifer has the power of withdrawing into its body its several-jointed foot in much the same way as a telescopic fishing-rod can be reduced to a single-length piece. Rotifera are also found in the axils of moss growing on gravestones and specially in the sphagnum mosses, but all of them have their origin in the freshwater of our rivers, broads, ditches and ponds.

Members should consult Pritchard's Infusoria, beautifully illustrated by Saville Kent, if they wish to learn about these families so baffling to scientists a century or more ago, when microscopic life was presumed to come spontaneously into existence.

In order to give my subject a biological sequence from the lowest form of plant and animal life up to the limit of the freshwater polyzoa, I will follow the lead of the accredited observers. The lowest form of life known is the amœba, a one-celled mass of protoplasm having the power of assimilating minute algæ and even the smaller diatomaceæ. It has

no proper mouth or organs other than a contractile vesicle and gains its livelihood by simply folding itself around suitable vegetable material or elongating portions of its body in order to reach and enfold algæ.

No paper on the freshwater flora would be complete without reference to two important Orders in the Vegetable Kingdom, the *Desmidiaceæ* and the *Diatomaceæ*. Although desmids are fairly numerous in Norfolk waters they are found in greater abundance in the West of England. Here in Norfolk they inhabit bogs where sphagnum mosses are rampant: on the Scottish Moors they are to be found in tarns and lochs. Most of the diatomaceæ are all but invisible except under high magnification. The majority of the species are undoubtedly marine but a fair number have acclimatized themselves to freshwater, and more notably to such highly brackish water as Breydon near Yarmouth. Prominent among the desmids are the *Closteria*, most of which resemble a cucumber; like many low forms they are reproduced by division. Diatoms provide an immense number of forms, many of these bearing the loveliest patterns chiselled on their siliceous valves; some are orbicular like the marine form *Arachnoidiscus*, some shaped like the freshwater forms of *Naviculæ*, the markings being frequently used as tests for the higher powers of microscope objectives.

The more familiar forms of algæ are found in almost every pond and ditch, sometimes appearing in such vast numbers as to colour the water green. The graceful threadlike alga *Spirogyra*, with its 50 and more species, is particularly plentiful in the Spring and later on the motile alga *Volvox globator*—a rolling orb of brilliant green moving through the water by the lashing of thousands of moving tags on its surface. *Volvox aureus* (the golden species) I have found more than once but *globator* scores of times and once under the ice on Xmas Day during a sharp frost, in a wayside ditch at Caister-on-Sea.

With the advent of the bottle-net some 40 years ago all was made easy for the collector, time was saved, patience preserved, and success assured. The naturalist who previously carried an ugly jar and a jointed fishing-rod could now go out with a collecting rod fashioned as a walking stick, the only other

equipment being a small tube-net neatly tucked away in his breast pocket and a case of small tubes for stowing his catch.

Thanks to the work of Bolton of Manchester, Hood of Dundee and perhaps still more to the Quekett Club, pondlife has become a favourite study for Naturalists, and most Microscopists have become acquainted with the more popular forms such as amœba, melicerta, floscules, stephanoceros, hydra, and many of the rotifera and freshwater polyzoa. I would caution the beginner however against attempting to become closely acquainted with *all* the multitudinous forms, for unless he has unlimited time he cannot hope to compass the subject. Better to have a thorough knowledge of a few orders than an imperfect acquaintance with all. Anyone who has had practice in mounting microscopic objects should find little trouble in preparing good specimens, but I advocate personal collection and a critical examination of a particular polyzoon and then its preparation for permanent exhibit. It is preferable to have a dozen colonies naturally placed on their host plant than an isolated specimen in a slide mount.

Temperature, light, food supply, and salinity of the water, are all aspects of importance. There is much to substantiate the view that the higher the temperature the greater the number of forms, but I find that the *Cladocera* (or water fleas) and the *Copepoda* (*cyclops*) die in a very high temperature. To get anything like a large number of water fleas home in safety it is necessary to give them plenty of room and an extra supply of water before attempting to keep them in a tank or aquarium. The same thing applies to cyclops, canthocamptus and all the cyclopean crowd. Oxygen is the prime necessity for health amongst all pond animals and this can only be obtained in an aquarium by the admission of just the right proportion of plant-life.

Light has much to do with the position of the fauna plankton in the water. On one occasion when searching for entomostraca in a lake I found very few specimens near the surface, but a foot or more deeper a much larger number were taken and deeper still the numbers increased. On the other hand the rotifera in this lake were abundant in the shallows. Generally speaking the microfauna are found in best condition and in largest numbers where the microflora abound. In a pond

in the middle of a field containing almost every kind of aquatic plant including chara, nitella and one or more of the potomagetons I have found season after season almost all the fixed rotifers, the splendid crown animalcule (*Stephanoceros*), *Pacinularia*, *Melicartæ*, *Cladocera*, *Copopodæ*, and larvæ innumerable. In this pond *Stephanoceros* was plentiful one year when snow was lying on the field and it also provided *Plumatella repens* in the late summer.

In one or two of the Norfolk rivers, notably the Yare, Bure and Waveney, there are many brackish-water species. There are several brackish ditches where *Floscularia* are so rampant that the weed is sometimes crammed with them, the species generally found being *F. ornata* and *F. cornuta*. The salinity of these waters produces luxuriant growth of the hydroid *Cordylophora* which I have taken with all its gonophores ripe. Another form is the semi-marine polyzoon *Membranipora*, which encrusts the stems of *Myriophyllum* and other freshwater plants. This polyzoon is infested with that nimble rotifer *Anurea aculeata*. Many of the *Synchæta* may be found in brackish water, especially *S. tavina*, whilst *S. baltica* is a well-established marine species. Brackish water however is not the favourite habitat of the vast majority of forms.

Years ago when I had visited scores of ponds in search of the rotifer *Pedalion mirum*, I took a dip from a small pond in my own garden and found the very thing I was looking for in goodly numbers. Once, when out with the Quekett Club on a Saturday excursion in North London, at the very end of the day I netted from a large pond a number of those tiny statoblasts given off by *Plumatella fungosa*. This was a sure sign that the polyzoon was not far off and it only needed a short examination of the pond shore to find it in sufficient quantity for division among the members.

It is not given to every naturalist to find a new species but it is sometimes his good fortune to be in at the find and take some of the reflected honour. This has happened to me more than once in particular at the finding of a new species of Zoothamnium, a tree-like Vorticellidan. Until that moment only a single species *arbuscula* was known. The new species *Z. geniculata* was found by Mr. Ayrton of Beccles in 1899 who gave a description of it in a paper published by the R.M.S.

43 years ago. I was collecting this beautiful form at the time and later found it in quite another part of the country. In still water it can easily be detected by its snow white cluster of fairy-like zooids.

The disused pits in old brick-fields are often productive of rotifera and algæ. There is a flooded pit in a brickfield at Ipswich where *Volvox auratum* was found one summer and a few yards off in a pool of water only about a foot deep *Melicerta ringens* was crowding the ranunculus plants so densely that the sight of one or two of the threadlike leaves under dark-ground illumination reminded one of passing through the town of Sheffield at night with its myriad chimneys and furnaces in full blast. There is no more engrossing sight than 4 or 5 Melicerta standing side by side and in full working order, the only other picture of almost equal interest being a regiment of Floscules or Stephanoceros.

Every one will have had his half-hour or so with Hydra but I wonder how many have gone in for their cultivation. Having access to an unlimited supply of Daphnia I isolated three *Hydra fusca* in a large jar and fed them regularly with these crustaceans, occasionally half starving them to give them time to properly assimilate the juices from their luscious food. Some would tackle as many as 5 or 6 water fleas at a time and one by one crowd them into the sacklike cavity doing duty for a stomach. The carapaces of the Daphnia would after a time be ejected, the Hydra perceptibly growing and budding meanwhile. The buds produced other Hydra and these again owing to the abundance and suitability of the food produced further buds, until within a few weeks the triplets in the jar were multiplied 30 times. Newly-formed Hydra can be shown on the lantern screen sloughing off the parent animal and two adjacent Hydra sometimes seize voraciously the same Anopheles larva, and tear it in half.

Rotifera

I now propose to deal in particular with the rotifera. Ehrenberg seems to have been the first to issue a treatise on the subject and his "Die Infusionsthierchen" published in 1838 laid the foundation of all subsequent study and nomenclature.

The names given by Ehrenberg were maintained down to the time of Hudson & Gosse's monograph which came out in 1886 and dealt with some 400 species. Owing to the greater interest taken in the subject and the improvement in microscopes, additions came in quickly and were notified in various journals. In 1893, 1897 and 1902 lists of the new rotifera discovered were brought out by the late Mr. Chas. Rousselet. Mr. Bryce made a new classification of the generic names and added a number of species. Mr. Murray added to the knowledge of rotifera by his extensive journeys. For instance, he named the rotifera collected by the Shackleton Antarctic expedition, gave an account of the Bdelloid rotifers of South Africa and described in the Transactions of the Royal Society of Edinburgh of 1908 the rotifera of Scottish lochs.

Mr. Rousselet published numerous papers that have appeared both in the R.M.S. Journal and the Quekett Club Journal, including the results of the Third Tanganyka Expedition in 1904-1905. His paper on the genus *Synchæta* placed these rotifers in the limelight and many of the beautiful drawings by the late Mr. Dixon-Nuttal, were presented to me by that artist. Some years since a friend of mine found near his home a rotifer that caused much discussion when found at Cracow by Wierzejski in 1893—a rotifer without a ciliary crown. This was named *Atrochus tentaculatus* and provided a new genus and a new species. This rotifer turned up in this country in a pond at Yaxley in Suffolk in 1911.

Another rotifer that has always interested me is *Pedalion mirum* one of the *Scirtopoda*, which so resembles the naupilus of *Cyclops*, that it was at one time mistaken for it. It is, however, a true rotifer although its arthropodous limbs place it in a class almost by itself. This is a very powerful rotifer, its 6 limbs being so strong that it can skip in the water and it is difficult to keep it within bounds under the microscope except under the nicest adjustment. In any water that has stood for any length of time and in such places as the axils of the leaves of mosses and in holes in the boles of trees, this lively rotifer may be found.

Freshwater Polyzoa

Many microscopists are glad to get hold of living colonies of Polyzoa, but the applicants do not seem to know the time of

year when it is possible to supply living specimens. Nearly all the species are at their best from June to September with the exception of *Plumatella fungosa*. All of them are deciduous leaving behind at the end of the season the reproductive bodies known as statoblasts as well as, in some cases, larvæ. Only one species is devoid of statoblasts and bears winter buds of a special kind, called hibernaculæ.

The British Polyzoa consist of two principal Orders viz.; the Phylactolœmata and the Gymnolœmata. The former has a bilateral lophophore (the base of the tentacular crown) with the mouth protected by an epistome. In the latter the lophophore is circular and has no protective epistome. The Gymnolœmata are subdivided into the Lophopæ and the Paludicellidæ the latter containing only one species *Paludicella*. the other comprising *Lophophus crys*, *Cristatella mucedo*. all the *Plumatellas* and *Fredericella sultana*. There is great scope for further investigations in this most interesting group. The Bryozoa or moss animals as they are called by continental writers (Polyzoa or Zoophytes by British naturalists since Allman) are of surpassing beauty and fairly plentiful in these islands. They are almost sure to be found in quiet waters, but scarcely ever in quick running streams owing to the frail nature of their polypidoms. I have no means of ascertaining how widely the freshwater Polyzoa are distributed in this country but I know that they are to be found in and around the London Area. They seem to be intermittent there, and by no means so abundant as in other parts of the country. East Anglia seems to be their favourite habitat, and the Norfolk Broads especially, for the food supply is unique. The three main rivers—Yare, Bure and Waveney, feed these Broads. the rivers themselves being the depositories of all forms of infusoria from the numberless ditches draining the land. Two broads on the river Yare furnish almost every one of the British species. One of these (Rockland Broad) is the home of *Stratiotes* (water solder), and the beautiful *Cristatella mucedo*. whilst in the main dyke leading into it *Lophopus crystallinus* is sometimes prolific. Surlingham Broad with its dykes is crowded with *Lophopus*, *Cristatella*, *Plumatella* and *Fredericella*. I find that the less saline the water the more healthy the polyzoa.

In the Yare polyzoa may be picked up at almost any tide during the summer because of the large amount of river traffic, which causes constant swells that wash away portions of the river bank, carrying away the reeds and rushes thus liberating large quantities of polyzoa clinging to their roots. Thanks to the splendid food supply and abundance of aquatic plants of the right kind for aeration the Yare can be depended upon for good results with almost every one of the polyzoa with the exception perhaps of *Plumatella fungosa*. It is strange, however, to find similar water almost bare of one particular species whilst the others are rampant. For instance, in South Walsham Broad there are only two species of polyzoa, but both are abundant:—*Plumatella fungosa* and *Cristatella mucedo*. I have found *Plumatella fungosa* there in clumps of a foot or more in length and several inches in circumference, growing on and around the submerged roots of alder and willow. The long stems of white water lilies are enveloped by the exquisite hyaline colonies of *Cristatella*. The seed-like bodies of polyzoa called statoblasts greatly assist in the determination of species. This applies particularly to the *Plumatellas* and a species can often be determined by the size, shape, or markings of the statoblasts, even in the case of decayed polypidoms or imperfect tubes. In the case of *P. fungosa* there are larvæ as well as statoblasts, both of which produce the perfect polyzoon. In all cases statoblasts are liberated at the end of each season varying from late June for *P. fungosa* to September or October for all the rest. At one time it was held that *P. fungosa* persisted from season to season on account of the apparent rings of growth sometimes to be seen in a cross section of the polyp mass. This idea, however, is incorrect as I have had 30 years' proof that the mass dies down and sloughs off the roots upon which it has been growing, and does so earlier than in the case of any other fresh-water polyzoon. The so-called rings of growth are, I think, due to the same reason as the colour bands in the tubes of *Melicerta ringens*, the brown shadings being caused by the colour of the debris used by both polyzoon and rotifer in the process of tube building.

Many years ago the late Mr. Saville Kent found a new polyzoon in the Victoria Docks, London, and named it *Victorella pavida*. This was growing on the hydroid *Cordylophora*

lacustris. I have not yet heard that it has been found in any other habitat or at any other time. I have had access to waters where *Cordylophora* is invariably to be found but have never yet seen it. Another polyzoon not yet found in this country nor on the continent is *Potsiella*, a very diminutive but attractive form. This is the one species to be found in running streams,

From what I can learn both from American and continental correspondents the British freshwater polyzoa are unique for luxuriance of growth. There is no better work on polyzoa than Allmans monograph issued by the Ray Society and often obtainable at a low price: although not a modern work it is a safe guide. The marine species far outnumber those from freshwater and Hinck's great work is absolutely necessary to a proper understanding of them.

All freshwater polyzoa require some plant or other on which to obtain a foothold, although two or three forms make use of whatever stable surface presents itself. For instance *Plumatella repens* will creep over submerged stones and other firm objects in addition to one or other of the regular water-plants such as the broad leaves and the leaf stalks of the water-lily. *Cristatella mucedo*, the only light loving member of this group delights to sun itself on the water-lily and I have seen both leaves and leaf-stalks all but enveloped by this translucent creature. *Lophopus crystallinus*, however, is most prone to promiscuous attachments. I have seen it on most of the larger water-plants and one season found the long trailing growths of a Potomageton literally crowded with it and giving an impression of ropes of living pearls. It will also cover stones, shells, submerged sticks and straws, sunken posts and even the keel of a ferry-boat. Other forms such as *Fredericella sultana* and *Paludicella Ehrenbergii* are found on the water-moss *Fontinalis*, while *Plumatella fungosa* attaches itself to submerged willow and alder roots. No doubt freshwater polyzoa originally existed as marine forms and gradually adapted themselves to freshwater thereby increasing their luxuriance of form and general beauty in a process probably occupying. ages. The marine forms contain a much larger number of species but are not to be compared in beauty to the inhabitants of our ponds, rivers and streams.

An important joint article on the so-called insectivorous water plant *Utricularia* or bladderwort by the late Mr. W. H. Burrell and Mr. W. G. Clarke, appeared in Vol. IX, 1911 of the Society's Transactions pp. 263-268. The notes by these two fine botanists speak of the luxuriance and abundance of some two or three species. I once went botanising with these two gentlemen and was astonished at the facility with which they discovered and described various rare mosses and plants. We found a fine growth of bladderwort at Longmoor Point, Sutton Broad, where Sir Eustace and Mr. Robert Gurney maintained a laboratory, then open to working Naturalists. I have made special references to *Utricularia* because of the minute fauna it entraps and absorbs within its lethal chambers, such as rotifers, water-fleas and other small animals, whose horn-like carapaces are found within the bladders after the soft parts have been dissolved.

The list on the following page shows the habitats and occurrence of freshwater Polyzoa in Norfolk waters.

HABITATS AND OCCURRENCE OF FRESHWATER POLYZOA AND HYDROZOA IN NORFOLK WATERS.

Rivers, Broads, &c.	Lophopus crys.	Cristatella mucedo.	Plumatellas.	do. fungosa.	Fredericella Sultana	Paludicella.	Freshwater Hydrozoa.	Hydra.	Cordylophora.
River Yare :—									
Rockland	x	x	x	x	x	x	x		
Surlingham ...	x	x	x	x	x	x	x		
Wheatfen			x						
River Bure :—									
South Walsham ...	–	x	–	x	–	–	x		
Ranworth ...	–	x	x	x	–	–	x		
Hoveton (Lt.) ...	–	–	x	–	–	–	x		
Woodbastwick ...	–	–	x	x	–	–	x		
Salhouse	–	x	x	x	x	x	x		
Hoveton (Gt.) ...	–	–	x	x	–	–	x		
Wroxham ...	–	–	x	x	x	x	x		
Belaugh	–	–	x	x	x	x	x		
Barton ... —	–	x	x	x	x	x	x		
Stalham —	–	x	x	x	x	x	x		
River Thurne :—									
Martham	–	x	x	x	x	–			–
Horsey Mere ...	–	x	x	x	x	–			x
Do. Dyke	–	x	x	x	x	x			x
Heigham Sounds ...	–	x	x	x	x	x			x
Hickling	–	x	x	x	x	x			x
Whiteslea	–	x	x	x					x
Candle Dyke ...	–	–	x	x	–	–		x	x

N.B.—The polyzoa are chiefly found on the following water plants, viz. :—anacharis, potomagetons, water lilies, reeds and rushes, *Ceratophyllum* (hornwort), also *Fontinalis* river moss, submerged branches of willows and alders) : hydra and cordylophorea on decaying reeds and rushes, the latter on stems and leaves of potomagetons.

V

NORFOLK SEA FLOODS.

GENERAL EFFECTS OF THE FEBRUARY 1938 FLOOD SEEN IN 1942.

By Anthony Buxton.

I was doubtful whether to continue this series of articles, but, so far as I know, no other record is available and it seems that some account should be published. Moreover certain experiments have been made this year, which seem to me of more than passing interest, and therefore worth relating: they have incidentally, a bearing on some of the remarks in the President's address.

As stated in the first paragraph of last year's account, the Ministry of Agriculture has, on the request of the Norfolk Relief Committee generously granted a further £1,800 for improving drainage in the flooded area and this money has been spent in bottomfying more dykes. The effect of this work will, it is hoped. be apparent after next winter. In addition the Internal Drainage Boards have requested all owners, whose dykes have been bottomfyed but who have not since drawn those dykes, to do so at the earliest possible moment, in order to obtain the greatest possible benefit to their land from the improved drainage.

If this work is properly kept up it must have a beneficial effect and produce better drainage than existed before. But it is no use pretending that, even with all the improvements made, the drainage is good. The pace of recovery as stated last year is at least three times as slow as the Dutch consider normal and that is no doubt because Dutch drainage is at least three times as good as ours. There has still been no real test of the defences, but everyone's hats should go off to Mr. Mobbs for the groins he erected: thanks to them the beach is much improved in the area where the groins are situated and to the North of them. To the South of the groins, however, as I understand always happens on this coast, the beach is in a bad state, and in places there the sandhills are very narrow and weak. In my opinion there is danger of a breach here.

Salinity.

The drop in salinity during the winter of 1941—42 has again been disappointing, and my theory, which may or may not be correct, is that having reached a certain point of drop in salinity we get little or no further because neither our pumps nor our dykes are deep enough. We can get the salt out from a certain depth, but there is still plenty of salt below that depth, which will not wash out owing to lack of fall from the soil to the bottom of the dykes, and this salt of course rises to the surface with evaporation in hot weather in the summer. This autumn, however, for the first time since the flood, the red colour in the water, even after hard pumping, has almost ceased.

The samples all taken at Horsey Mill intake and always at the end of a day's pumping show the following results :—

(No samples were taken in January and February owing to frost.)

Date.		Salinity.
Nov. 5th, 1941...	...	5°/oo
Nov. 24th, 1941	...	6.55°/oo
Dec. 16th, 1941	...	5.02°/oo
March 2nd, 1942	...	5.65°/oo
March 23rd, 1942	...	4.52°/oo
May 4th, 1942 ...	...	7.60°/oo
Sept. 22nd, 1942	...	4.65°/oo
Nov. 14th, 1942	...	3.45°/oo
Nov. 22nd, 1942	...	4.15°/oo
Dec. 12th, 1942	...	5°/oo

★ 7.27 inches of rain fell between Sept. 22 and Nov. 14, 1942. Of this amount 5.28 inches fell between Oct. 21 and Nov. 6. Nov. 14 was the first date, after this particularly wet spell, on which the water in the dykes could be reduced by pumping to the low level, at which all samples are taken.

Timber.

The process of re-sprouting from the stem has continued among the silver birches that show any signs of life, and a few horse chestnuts at what was high water mark of the flood have repeated their queer performance of putting out a few shoots whose leaves afterwards wither, but this year they withered much more slowly. More re-planting of white willows has been done by the County Council on the Horsey-Somerton Road. Even this summer a great many of the willows have died at the Somerton end of the road. The willows are planted on the edge of the road in what is probably the best drained portion of the whole area, for all the washings of rain water off

the road pour through the soil into the deep dykes on either side. It is probably several years too early to attempt re-planting anywhere else in the salted area. We are all indebted to the County Council for a public demonstration, that anyone can see from the road, of when it is and when it is not worth re-planting.

The order of resistance to salt of trees and shrubs (starting with the most and ending with the least resistant) seems to be roughly as follows : tamerisk (easily top) tea plant, crab apple, black sallow, turkey or bushy cupped oak, more resistant than British oak, broom, silver birch, myrobella plum, belladonna (deadly nightshade), poplar, apple, (I have no evidence about pear, but it is said to be more resistant than apple), bramble, lilac, privet, wild rose, macrocarpa, thorn, raspberry, gooseberry, black and red currant, horse chestnut, conifers, willow and osier, rhododendron, lime, alder, beech, ash. The merest smell of salt is enough for ash.

Vegetation.

The grass on the marshes made very poor growth in the spring of 1942, but I put this down to East wind rather than to salt, for the growth of grass near the coast was much less than the growth inland. Nevertheless it was disappointing to find in a few places that a very little samphire (edible seaweed) was still alive in grups in the marshes at Horsey in the summer of 1942. Round the samphire and in other low places as well there was still a certain amount of sea spurrey and orach, sure signs of salt. While on drainage work in the Parish of Waxham, where the drainage is inferior to that at Horsey and Somerton, I came across a marsh just East of Waxham Cut, on which recovery was two or three years behind that at Horsey and Somerton, in fact recovery had barely started. On it was a good healthy crop of edible seaweed and other maritime plants in the summer of 1942 (over 4 years after the flood) and the place looked more like a salting than an inland marsh.

It was a bad year for reed everywhere, and particularly so in those marshes, where the dykes have not been bottomfyed and where accordingly recovery is backward. Black sallow, bramble, yellow iris and water-lilcs have all increased. Deadly nightshade has thrived along certain dykes as it did during the last two summers. Pin rush is still rampant where it

can find enough salt, and common rush is still absent except for a very few clumps in isolated places. Marsh sowthistle has again extended its range but giant spearwort has never reappeared. The salt-loving fungus *Hebeloma mesophaeum* has almost disappeared.

Marshes are much improved, particularly where surface draining has been undertaken. Here areas which were bare or covered with orach and sea spurrey are now green with grass. One particular marsh which last summer consisted mainly of very short reed and sea spurrey is now almost entirely covered with grass, although of poor quality. Another marsh which seemed in a hopeless condition last year is at last showing signs of recovery.

Last year generally speaking it was true to say that it was worth while cropping three-quarters of the way down the slope to marsh level. In this flat country slope seems an exaggerated term for it is hardly visible to the eye, but all the same a slope exists. This year in places, but only in places, crops have been good right down to marsh level. Two fields of wheat, for instance, at Horsey looked as good at midsummer at their lower ends as at their upper, but the ears on the lower ground were smaller : these are fields which were entirely covered by the sea.

Does this mean that it would now be safe and worth while to plough up marshes that were covered by the sea and try to grow corn on them ? If our drainage were better and deeper I should say yes as regards certain marshes, provided ploughing did not go deeper than the level to which recovery of the soil has taken place. But in any case I feel that it would be unwise to attempt it anywhere without extensive and careful sampling in the spring according to what the Dutch call their A.B.C. method for discovering the amount of salt in the water in the soil. I am told that it is difficult to bury the rubbish and get a good seed bed, unless the land is ploughed to a depth of about 6 inches. Has the soil texture recovered down to that depth ? If not such ploughing might do permanent harm.

An inspection made early in October, 1942, made me think that there are some marshes where recovery has reached that depth, but for corn growing on the marshes water should be kept dead low in the dykes in summer as well as in winter, and

when that is done cattle grazing on adjoining marshes cross dykes and wander anywhere. The only answer to that is wire and strong posts, which constitutes a terrible problem.

New Experiments.

Such are the conditions as I see them under which two very bold and interesting experiments have been made.

In the summer of 1942, Mr. H. P. Neave bought the marshes lying between Waxham Cut and the Hickling Wall and bounded on the South by the wall of Brayden marshes. The area was covered by the sea flood in 1938 and except for the main dykes belonging to the Drainage Board, which were bottomfyed under the Flood Relief Committee's Scheme, no private dykes had been cleaned in the area for years before or after the flood. In fact the area had lain for years entirely derelict ; no reed or grass had ever been cut or grazed and no private dykes had ever been drawn.

Moreover, the drainage of the Waxham area is, and always has been, notoriously bad. The pumping station is near the wrong end and in my opinion on the wrong side of Waxham Cut, and most of the water has to come a great distance and through trunks under the Cut which cause obstruction to the flow of water to the pumping station. Naturally, therefore, recovery at Waxham has been slower than at Horsey and Somerton and particularly slow in the area bought by Mr. Neave.

In June 1942, Mr. Neave set fire to these marshes and the fire catching the turf, as fires lit in the summer constantly do in this type of country, burnt for months. I know a marsh at Horsey on which has been a bare space free of all vegetation ever since I have been there. This bare space is the result of a fire lit thirty years ago.

At the end of July the turf on Mr. Neave's land was still burning on both banks of the main dyke which carries all the water of Waxham parish to the pump ; much of the burnt earth had fallen into the dyke and its banks had practically ceased to exist for they had become heaps of cinders. Worse still, the fire had burnt the turf on the surrounding walls, for a comparatively small area on the wall of Waxham Cut and the wall of Brayden Marshes, but for a long distance on the Hick-

ling wall, some of which was still burning in September. In fact, owing to the fire the Hickling wall has ceased to exist. These walls protect this low lying area from the water in the high level system of Waxham Cut and Brayden Marshes and from the water in the low level system in the Hickling area to the West. Until therefore, the damage caused by the fire to these walls is repaired by digging out the burnt earth and replacing it with sound soil, the walls will leak like a sieve and the whole area be flooded at every high tide. Also, unless the main dyke is thoroughly repaired, water will not get to the pump. This work is now being done but floods may come before it is completed.

Immediately after the lighting of the fires, ploughing to a minimum depth of 12 inches which in places brought sand to the surface was, with the approval of the Minister of Agriculture, started on the area. Mr. J. C. Mann, an official of the Norfolk Agricultural Committee, Mr. Bassett Hornor and I were specially warned during our trip to Holland by the Dutch against ploughing below the level at which the soil had recovered from the effect of the salt and a farmer who had ploughed a plot of land in 1917 in the Anna Paulowna polder, flooded in 1916, told us that recovery on that plot had not begun for 5 years and was not complete 23 years after he had ploughed, although the rest of his land, thanks to good drainage, had recovered quickly. Mr. Neave's ploughing seems to me roughly parallel with this Dutch farmer's ploughing, for although Mr. Neave's work has not been done until the fourth summer after the flood, the drainage of the land in question is so inferior to that of the Anna Paulowna polder, that our fourth year seems to me to almost correspond with their first year after sea flood.

Mr. Neave's experiment is a direct flaunting of Dutch advice, and we are, I think, all indebted to him for giving a public demonstration, which will allow everyone to see whether or not the Dutch are right. The Catchment Board is setting to work on the dykes and is certainly making a good job of them, but the ploughing has been done *before* the dykes have been tackled, in fact *before* the drainage has been improved, whereas the Dutch would say that the drainage must be tackled first and then that ploughing must only be undertaken to a depth

at which recovery has already occurred. In any case it is most important that the experiment should have a fair chance, and it will not have a fair chance unless the damage to the walls and to the main dyke caused by the fire lit by Mr. Neave is repaired before the first high tide which may occur at any time.

In July I got into conversation with one of the men who was ploughing this land with a tractor. My last question was "Have you seen a worm?" "Well" he said, "that's a rum thing you askin' that question. I remarked to my mate only yesterday, with all this hair ploughin' I *h'ent* seen a *one*." That gives the salt situation with some clarity and in my opinion the worms are right and the Minister of Agriculture and Mr. Neave are wrong.

After ploughing, some of these marshes were sown with grass and some also with linseed. The weather was very wet and cold in July and the grass was growing fairly well, while the linseed looked short but healthy except in the lower parts of the marshes where it was yellow, if it had come up at all. Neither of them had then had to contend with a hot spell bringing the salt to the surface. The linseed subsequently failed and was reaped, but the grass appears to have got a hold, although there is a great deal of silver weed which is a lover of salt. There is also much marsh pennywort (Hydrocotyle vulgaris) an acid lover, and no doubt able to exist because of the peat. Of course the war makes immediate results important, but the real point of interest, will be the state of the land 5, 10, 20, 30, etc. years hence—after that ploughing.

The other experiment is Mr. W. A. Alston's at Martham Holmes, a farm which he acquired in February, 1940, two years after the sea flood. As the name Holmes implies, the farm buildings are on a low mound and the ground slopes away in every direction from the mound down to marsh level. About 35 acres of the mound, including the buildings, were left high and dry as an island by the flood. The artificial drainage of this area as a whole has been distinctly bad, but there is good natural drainage from the mound in the centre down to marsh level. Thanks mainly to Mr. Alston a new electric drainage plant is now being installed. Mr. Alston's objective, as he told me himself, is good grass—grass that will fatten stock and

not merely keep them alive—and he is not worrying about the catch crops he obtains in cleaning the land for grass. In the spring of 1940 he ploughed, to a depth of 6 inches, 64 acres above and just below high water mark of the flood, i.e. on the central mound. He sowed barley and obtained quite good crops on the higher land. When I saw this land in 1942 there were good crops of oats and hay with plenty of clover in it. In the spring of 1941 he widened his operations in every direction and ploughed 42 more acres on rather lower land, all of which had lain under the sea flood. He sowed barley and linseed on this land, and told me that the barley crop that year was poor and that he only got 4 cwt. of linseed per acre, whereas he reckoned 14 cwt. per acre a good crop. There was so much rubbish and the crop was so poor on much of this land that he ploughed the crop in.

In April 1942 he ploughed again and sowed with linseed. and oats. The crops on this lower land in July, 1942 looked extremely bad. In the lows there was practically nothing and where linseed had come up at all it looked yellow and unhealthy. I found some samphire on an adjoining marsh and the cropped area was full of orach and silver weed, both of which plants like salt. Some of the lows had the appearance and consistency of a hard tennis court lying under water; the soil was cracked in every direction so that it looked like a tesselated pavement. This is typical of soil that has been injured by salt. The weather had been wet and cold at this time so that salt was not visible on the surface, but the plant life showed that it was there in abundance.

In July 1942 he was ploughing to a depth of 6 inches still further out from the centre on the very lowest land, and we examined the soil. Down to a depth of 3 inches, except in the lowest portions, the soil had broken up fairly well and felt powdery, but at a depth of from 3 to 6 inches it was in solid putty-like lumps, and where these had dried they were so caked that they were hard to break. Here there was no give in the soil and it was tiring to walk on it. I told Mr. Alston that I was afraid he had gone too deep too soon and had ploughed below the level to which recovery had reached. He replied "Well you get kind of impatient and can't wait." Everyone who has had any experience of land affected by salt

will sympathise with this feeling, but I think it pays to wait and am nervous about the lasting effect of this ploughing before the improvements in drainage have been instituted and had a chance to take effect after winter rain.

I walked over Mr. Alston's land again in the first week of October, 1942, when most but not all of the crops on the lowest marshes had been cut. There was rather a poor crop of oats and linseed with a large admixture of thistles. In the lows there was practically no crop and they were full of orach and sea spurrey. The marshes ploughed for the first time in the summer of 1942 showed a heavy growth of thistles with orach and sea spurrey in the lows.

My past records show that the state of these marshes in 1942 corresponds exactly with the state of the Horsey and Somerton marshes in 1940. They are therefore two years behind in recovery, due of course to their inferior drainage, which should now be improved by the electric engine just installed. Mr. Alston intends to put on a heavy dressing of chalk or lime, but the Dutch informed us that it will not have its full effect until the salt is washed out.

In what had been a carr which the sea just covered in 1938, killing both trees and bushes, Mr. Alston planted in 1940, poplars, rhododendrons and other shrubs. The poplars had grown well in practically every case, but the rhododendrons and other shrubs had either died or were still very dwarfed and unhappy in July, 1942.

Mr. Alston's land, with its very simple configuration of a low mound and gentle slopes in every direction down to the lowest levels, is an absolute museum for the student of sea flood and its effects. On it are demonstrated the quick recovery of the land with a good slope and natural drainage and the exact reverse on the low land with no fall and a very inferior artificial drainage. I am much indebted to Mr. Alston for the information he so freely gave and for the most instructive inspection which he and I made together.

The results on Mr. Alston's land and on marshes owned by the County Council on the Somerton-Horsey Road, which were given very shallow cultivation and re-seeded in 1940, lead me to the conclusion that the course here followed is the safest and best. Further, that it is not advisable to do

even this, where drainage has not first been improved, and where maritime plants are still growing. In any event these two experiments are of great interest to all scientists, whether agricultural or not.

MAMMALS, BIRDS, REPTILES, FISH, INSECTS.

There is nothing that seems worth recording about mammals which can be set down to salt conditions. In regard to birds, cuckoos have completely re-established themselves in the marshes. There were rather less yellow wagtails in 1942 than in previous years since the flood, but still many more than before the flood. I consider that this increase has been due to some insect that likes salt plants and that this year's slight decrease is due to recovery and consequent diminution of maritime plants and the insects that thrive on them. Sedge warblers and grasshopper warblers have increased slightly, but water rails are still almost entirely absent in the summer.

The weed which diving ducks like had still not returned in sufficient quantity to attract them in the winter of 1941-42, but it was evident then and in the summer of 1942 that there is plenty of the weed that attracts swans both wild and tame and also wigeon. No mute swans, however, bred on Horsey Mere although they fed there, which presumably means that the weed required by young cygnets has not returned. Weed of many kinds is now rampant in the Mere, but it remains to be seen whether the kinds beloved of diving duck are present.*

Frogs and toads certainly succeeded in breeding in some parts of the salted area. Worms are making very slow progress outwards from high water mark. Adders seem mainly confined to the warren which was not covered by salt water, but a number were seen on Mr. Neave's marshes.

As regards fish, there has certainly been an increase in rudd and probably in all fish. More pike have been seen but they all seem to be small. I have not yet heard of the capture of a tench since the flood.

The most remarkable recovery of the year has been made by swallowtail butterflies. Last summer if there was any increase it was very slight; this summer with one bound the swallowtails are back in full force, and literally swarmed throughout June, and plenty of their caterpillars were found at the end of July.

*At the end of November, 1942, for the first time since the flood, pochard and other divers found the weed they required at the point where Waxham cut enters the mere.

VI

WILD BIRD PROTECTION IN NORFOLK IN 1942

Report of the Committee

The Council has pleasure in presenting its Report on this branch of the Norfolk Naturalists Trust's work—the fourth under war-time conditions.

It is grateful to the many subscribers who continue to support it so generously, and to those who have felt unable to do so as the pace of the war has quickened, it extends a hope that they will reconsider the needs of the Trust when happier days return.

Norfolk by reason of its geographical position has suffered from the physical effects of the war as much as any county, and for this reason it is particularly cheering to be able to report the acquisition by the Trust of two new properties in Breckland, one mainly through the generosity of one of its life members, and the other as a gift from the late Mrs. Rich of Wretham Hall. These brecks will form oases of natural heath in the great conifer forests fast growing up in the district, and both will eventually be established as sanctuaries for the birds which make them their breeding haunts.

The beautiful photographs of barn owls and marsh harriers illustrating this report were taken by Mr. Hosking at Hickling. The Council is grateful to him for lending them to the Trust for this purpose.

The following notes on Scolt Head and Cley are taken from the watcher's diary. They are incomplete because owing to Bishop's absence in H.M. Navy, Charles Chestney has for the past two years divided his time between the two places.

Few people in Norfolk now have time for systematic bird watching and it has always been the practice in this report only to give information from sources known to be completely reliable.

SCOLT HEAD ISLAND

Bitterly cold weather with persistent wind from the north and frequent snow storms was experienced from the end of the first week in January until the end of the first week in March. Waders had a bad time owing to the freezing of the mud in the creeks as soon as the tide left it uncovered. Mallard and

Copyright E. J. Hosking

wigeon all left and only a few diving ducks remained in the harbour.

During this time rats infested the shore feeding on the mussels and dead seals washed up on the tide-line, and Chestney was kept busy trapping them, and many stoats as well.

On January 6th the strong north-westerly wind forced up a very high tide which completed the breach in the western end of the island, and subsequent erosion has washed away all of the old ternery.

Chestney was not able to spend much time at Scolt Head during the early part of the year, for reed-cutting at Cley made it necessary for him to be there during the greater part of January, February and March.

The following birds were noted in his diary on the few days which he spent on the island during the winter months.

Long-tailed duck.—Several of these were seen in the harbour during January and the beginning of February. One was a full-plumaged drake.

Brent goose.—Large numbers collected in the creek during January, most of which stayed until the beginning of April. A few remained until the end of May and two were noted on June 6th—probably "pricked" birds.

Shore-lark.—Small parties were noted between January 6th and March 2nd when twenty-seven were counted.

Snow-bunting.—Large flocks of these stayed on the island until the middle of March. On one occasion a party of them was seen feeding on a stubble field behind the village.

Smew.—Two red-headed birds were in the creek on February 2nd.

Merlin.—During January three were seen on two occasions on the island. Two were also noted on May 10th.

Hen-harrier.—Two were seen several times between the end of January and the end of March. One was a particularly noticeable grey bird.

Short-eared owl.—Five of these were flushed on the island on January 10th, a very cold snowy day.

Magpie.—A single bird was in the plantation in House Hills on February 7th. This is a rare visitor to the island and has been noted there only once before.

Velvet Scoter.—Two of these were seen in the creek by the writer on March 15th.

The overlapping of winter with summer birds, usually so noticeable in April, was later in Norfolk this year. On May 2nd the first ringed-plover's nest was found and there were bar-tailed godwits on the shore in full breeding plumage while Brent geese and goldeneyes were still in the creek in some numbers.

The nesting season was a good one for most of the birds which breed on the island and particularly for the Sandwich terns. These have increased very much during the last two seasons, and this summer they formed five colonies on the outskirts of the dune-area occupied by the common terns. Fortunately they were settled there before the artillery range practice began in earnest, and although they rose screaming into the air every time a shell whistled over, they returned to their nests again very quickly and the successful hatching of the eggs later on proved that no harm had been done. Other birds which nest in the dunes and on the marshes east of the Hut, were not so fortunate. There were no breeding lapwings on the island this season and it is thought that the gunfire was responsible. It also affected the black-headed gulls and there were very few nests compared with former years. Mallard and sheld-ducks were also much disturbed by the frequent small fires in the dunes which result from bursting shells, and, in consequence, there were fewer nests than usual.

The following list of the number of nests of terns and waders was made by the Watcher who gives an estimate of those which he had no time to count :—

Common tern	about the usual number estimated
Sandwich tern	1042 nests
Little tern	114 ,,
Oyster-catcher	43 ,,
Ringed plover	47 and as many more uncounted
Redshank	about the usual number estimated.

The roseate tern does not appear to have nested in Norfolk this year.

CLEY AND SALTHOUSE

During the period of intense cold in January and February there was very little bird life on the marsh. The only open water was a single pool in which there is a strong spring, and a few duck visited this from time to time, including four goldeneyes. Two bitterns were frequently flushed by the reed-cutters and apparently found sufficient food to keep themselves alive, for there were at least three breeding pairs later on. A few reed-buntings frequented the reed-beds where the cutters were at work and found food there although it was not possible to see what they were eating.

On March 8th the wind changed to the south-west and the thaw began in earnest and on the day following there was a noticeable return of mallard and wigeon. Ten days later the bitterns were heard grunting but it was not until the 26th that they were booming well.

Although the marshes are spoiled in appearance for the time being by Coastal Defence works there is no range practice here other than that at a target towed by an aeroplane along the coast line. The birds seem to have become accustomed to this, although it may have been one of the factors which caused the Sandwich terns to abandon their usual nesting sites on Salthouse Broad. The first of these appeared at Salthouse on April 4th and they gradually increased until, by the end of the month, they were present in their usual numbers. However, after one or two fitful attempts to colonise the small islands of the Broad they all left at the end of the first week in May.

Owing to the bad weather early in the year the reed cutting went on later than usual and Chestney was fully employed with the carting and stacking well into May. This prevented him from looking for nests on the marsh but judging by the number of broods of both mallard and shovelers seen at the beginning of June, it was a good average season. On June 15th a pair of garganey teal were seen in the big pool.

There were again three pairs of bitterns on the marsh throughout the breeding season. On May 28th the Watcher saw one fly up to attack a marsh harrier and concluded that it had young nearby.

In the late summer it is a common sight to see black-headed gulls hawking over the dune-areas of the Norfolk coast for winged ants, particularly at Scolt Head. This year winged ants were seen over the wheat field behind the Cley marshes—the gulls flocked to it from all directions until the sky above the field seemed full of them.

Signs of the return migration were first noted in the middle of July when the first green sandpipers arrived. On August 6th a flock of thirty knot, some of them in summer plumage, were feeding in the shallows of Salthouse Broad in company with two black-breasted grey plovers. Ruffs and reeves were present on the marsh during August. Among the duck which returned to the marshes in the autumn was an unusual number of pintails.

BLAKENEY POINT

For obvious reasons there has been no resident keeper on the Point since almost the beginning of the war, and the result of the removal of all control of nature is now becoming very apparent. Black-headed gulls have become far too numerous, and the fact that their eggs have been picked up by the Coast Watchers in the immediate vicinity of the Point House seems to have resulted in a bigger concentration of them on the ternery. The number of common terns nesting this year was judged to be not more than half that of recent years and a great number of these were not successful in rearing young. During a visit on July 16th the writer found the ternery strewn with dead chicks of all ages and indeed saw very few live ones at all. Admittedly there is often a high mortality among the young of the common terns in the first forty-eight hours after hatching, but many of these birds were well-grown chicks. Black-headed gulls by nesting a full week earlier than the average tern tend to crowd them out of their usual sites, and later on when they are feeding their own young will peck to death any tern chicks within reach. Sandwich terns by reason of their larger size and earlier nesting seem better able to defend themselves and their

Hoopoe about to feed young

Photo by A. Buxton

young from the pugnacious gulls. A small colony consisting of twenty-five nests appears to have hatched successfully on the western edge of the ternery, while another colony of about the same size took up new quarters in the Big Low beyond the Laboratory—the site usually occupied by little terns.

BIRD NOTES FROM HORSEY

By Major A. Buxton.

After the prolonged frost the ice on Horsey Mere on March 15th was rapidly disappearing. Swans were coming and going all day and in the evening I counted ninety-four, all whoopers with the exception of four mutes. Sixteen more whoopers flew over from Hickling calling loudly, the birds on the mere answering them. Nearly all the new arrivals carried on in an easterly direction out to sea followed by about half the swans on the mere. Those left behind kept climbing on to the islands of ice.

On April 17th I saw a great grey shrike at Horsey. This seems rather a late date for this bird to be travelling, for on the plain of Geneva where they are common, they generally begin to build in the middle of April. Another glided across the road a yard or two in front of my car near Clippesby on October 13th.

A hoopoe was feeding on the east bank of Waxham Cut on May 2nd, the first I have ever seen in England. Together with Captain Rampton of the Berkshire Regiment I saw the bird near the same place twice on the following day. My chief experience of hoopoes has been at Geneva where they pass through in considerable numbers in the middle of April, and where a few stay to breed. The call of the cock is a bored "hoo-hoo-hoo" not unlike that of a cuckoo in tone. On arrival at the nest both birds give an attractive little laugh. The accompanying photograph was taken at Geneva where I had much entertainment watching the birds at their nest in a hole previously made by a woodpecker.

A wryneck—presumably a hen, for it was silent—visited my garden early in May. Two orioles also passed through the Hall garden, one in the last week of May and the other in the

first week of June. This year the garden was for some reason without a single warbler in June. Normally there are two or three pairs of willow-wrens, four to six pairs of garden warblers, two pairs of blackcaps, a pair or two of common whitethroats and a pair of lesser whitethroats in a fence just outside. I cannot account for their absence this summer and did not notice any lack of warblers in other parts of the county.

We are still short of the usual number of sedge-warblers at Horsey, but reed-warblers and reed-buntings have never seemed to mind the salt conditions. For the last two years I have, unfortunately, not been able to hear grasshopper warblers so that it is difficult for me to be sure of their numbers, but I think there are once again plenty of them.

There were a few water-rails and bearded tits present in the winter, but none have bred at Horsey this summer unless a water-rail heard in June had a nest, which I think unlikely. Spotted crakes passed through in October in numbers—for instance five birds were audible on October 29th on a 300 yard length of mere shore, and the previous day two others were heard calling to each other on Waxham Cut.

Bitterns have undoubtedly been greatly reduced in numbers by the hard winter and two were found dead at Waxham. On a particularly favourable night, when they were fairly on the boom and the wind was in the right direction, I could hear only five booming in an area where up to this year I should have been able to hear at least a dozen.

A great deal of marshland was ploughed up at Waxham in the summer and this attracted large numbers of rooks and different members of the pigeon tribe. Mr. G. Crees in early June counted a flock of sixty-two turtle doves feeding on newly-sown land, and this at a time when probably half the turtle dove population were sitting on their nests. The nightly visitation of Norfolk plover to the Horsey marshes noticeable in July, 1941 was not repeated in 1942, but in October they came nightly to the newly-ploughed land at Waxham.

When asked, as I often am, to describe the appearance of a marsh-harrier in flight, my answer is that it looks like an aeroplane. That is not quite true of a Montagu's harrier which is better looking than any aeroplane. After a long interval since the attack made upon them in 1935 when practically

all the breeding stock was destroyed, two Montagu's harriers' nests were found on my property in June. One pair chose the marsh in which there was already a marsh harrier's nest and this led to a good deal of squabbling and manœuvring over territory, but they eventually agreed to keep to their own particular end of the marsh. A Montagu is so much more active in the air than a marsh that despite its smaller size it always scores. It is doubtful whether there was more than one cock Montagu present this year, but each nest contained three eggs, all of which hatched. Out of the six young only one died in the nest and the remaining five all flew. One of the nests was so situated that it was easy to erect a hide in a position suitable for seeing the " pass " without in any way disturbing the bird—in fact the hide was put up while the hen was sitting.

There is nothing more enjoyable than a close and uninterrupted view of Montagu's harriers revelling in their skill at trick flying. Just for the " pass " they lose their air of graceful indolence, light up and show their excitement and pleasure in the manœuvre. The sitting hen does not in the opinion of the cock need much food, and the watcher in his hide must expect long waits while the cock is hunting or, more probably, spending his time asleep on his favourite post. These waits make his eventual arrival all the more exciting. Suddenly there is a soft kissing cluck, the grey form glides into view with one leg dropped to show the prey ; the hen rises with an excited scream from the nest to join the cock in the air and take the " pass." She drifts away from him with the prey that she has caught in one hand and drops to the marsh to eat her meal, and then floats airily back to poise for a moment and drop like a fairy on to her eggs. She is hidden in the tall sedge and the cock is away again either on the hunt or just as likely fast asleep on his favourite post.

NOTES FROM YARMOUTH

By Dr. R. Leonard Ley

An unusual feature of the winter of 1942 was the presence of enormous flocks of duck in the Yarmouth Roads looking like islands in the sea and amounting to many thousands. These arrived early in January and were still there on March 10th. Unfortunately field-glasses are not permitted in Yarmouth at the present time, but in bright sunlight the majority of these duck were seen to be black and white and were apparently tufted and scaup and not scoters as might have been expected.

With the beginning of the cold snap all the birds on the marshes left except the grey geese, partridges and an occasional flock of snow buntings. Pipits, larks and fieldfares all vanished and green plovers completely disappeared until March 8th when a single bird was again seen there. On the same day a heron was noted—the first for many weeks.

The large heron population of the district was almost destroyed in the first of the recent cold winters—that of 1939-40—and although it showed some signs of recovery last season the stock has again been much diminished.

Throughout the season the geese appeared to be in good condition and remained normally wary and unapproachable. In former cold winters they have lost weight and become less wary and I believe that inability to find fresh water may be responsible for this. This time there were several short but sharp thaws.

Some notes on the goose population may prove of interest since I have lived in Yarmouth for thirty-four years. Before the war of 1914-18 geese were rarities here and the reason for their coming to the district has been a much disputed one. Personally I believe that the resurgence of the Scroby Bank, which had disappeared since the reign of Charles II, may have had a lot to do with it, for a safe sand-bank where they can foregather to rest, preen and fill their crops is necessary for anserine economy. Moreover the bank acts as a breakwater and provides smooth water in its lee for roosting at sea.

The majority of these geese are white-fronted and pink-foots. A few bean geese occur, but among some two hundred

which I have handled less than half a dozen were beans. The pink-foots begin to arrive in the last week of September but the white-fronted do not appear in numbers until Christmas and from then until the end of the season far outnumber the pink-footed. Most have left by mid-February in normal seasons, but this year there was still a flock of about 700 on the Caister marshes on March 8th.

The flighting habits of these geese vary very much. They appear to be afraid of being caught on their feeding grounds after dark, and seem equally afraid of being on the sea in bright moonlight. This may be due to the presence of Arctic foxes and of killer whales in their northern habitat, and it is probable that seals and sea-lions are not averse to a meal of goose either. On dark moonless nights one can be sure that they will flight in to feed at dawn however adverse the wind; also sudden changes in the weather, and specially snow or the threat of it, will bring them in from the sea. Another interesting fact is that skein after skein will frequently fly in from the same direction—not always from the Scroby Bank—and over a period of some hours will follow the same line without more than a few yards deviation. It is probable that these are directed by the calls of those already feeding; the human ear can hear geese from almost as far off as the eye can see them.

NOTES FROM HICKLING

By Jim Vincent

An influx of wildfowl occurred early in the New Year and ducks, coots, lapwings and woodpigeons came in by hundreds. On January 7th eight guns killed a thousand coots in just over three hours—a useful addition to the local larders. Then followed a very severe spell which took a big toll of bird life. I have never known a greater dearth of song and missel thrushes than this spring and summer.

Whooper and Bewick Swans.—These are now spending the winter at Hickling in ever-increasing numbers, many of them

staying until March. This spring there were well over 200 on the Broad and their wild chorus was a joy to hear.

Bittern.—The severe winter took a heavy toll of these, and their numbers are reduced by half. This seems to be general throughout the district.

Bearded Tit.—These were fewer than in the previous year, but at the end of the season they could be seen and heard all round the Broad.

Water-Rail.—This species is almost down to vanishing point. There were only three pairs at Hickling, fewer than I ever remember before.

Garganey Teal.—Two pairs bred and reared their young.

Shoveler.—A number of these bred. Nine nests were found in two days.

Redshank.—These were fewer, but breeding snipe more plentiful.

Lapwing.—The breaking-up of marshland for cultivation will result in a big increase of this species. On one six acre marsh this year fourteen nests were found.

Marsh-Harrier.—One bird wintered here. In the nesting season there were two females, but only one male bird. Each built a nest and hatched young, but a party of fishermen kept both birds off their young all night when they were very small and only one survived. This was ringed by Mr. Eric Hosking who took the best series of photographs ever seen of this difficult bird.

Montagu's Harrier.—Two females of this species also shared one male, and each reared a brood.

One of the features of the year has been a succession of rare visitors which are given in the following list in the order in which they occurred.

Sea Eagle.—An immature bird turned up again on February 11th and stayed for a long time feeding on wounded wildfowl, coots and rabbits. It spent a lot of its time resting in the wood near Whiteslea Lodge.

Rough-legged Buzzard.—One bird seen on January 17th.

Kite.—Mr. E. Piggin reports seeing a kite soaring overhead on March 31st. Its forked tail was very noticeable, but whether it was a red or a black kite he could not determine.

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Cock Marsh-Harrier with prey in bill

E. J. Hosking

Osprey.—One turned up at Hickling Broad on April 21st and stayed until the 26th.

Water-Pipit.—On April 29th a bird of this species was seen on a freshly cut reed ground.

Whiskered Tern.—On May 3rd—a very early date—I saw a fine adult male hawking for flies over the water not far from the Lodge, and another on Rush Hills on June 30th. Both of these birds passed within fifteen yards of me.

Temminck's Stint.—One seen on May 3rd and another on June 30th.

Spotted Redshank.—I saw a fine adult on May 2nd and a pair of adults on June 19th.

White Stork.—On the morning of June 14th a bird of this species was circling round over the Broad going east.

Little Gull.—An adult was over Hickling Broad on June 27th.

Black Terns.—A few more of this species were seen than of late years.

Squacco Heron.—This bird was first seen on July 22nd and remained until the 27th. It was an adult, golden-fawn in colour with a noticeably black tip to its bluish-grey bill and crest plumes extending well on to the mantle. It was feeding on insects, making quick thrusts with its bill to catch them in the same way as a bittern does.

I have seen a squacco heron at Hickling once before, in the summer of 1912.

Little Bittern.—On August 2nd my Labrador flushed and nearly caught a little bittern within ten yards of me. As it flew across the water to a clump of thick reeds it looked grey and black and appeared to be an adult.

Solitary Sandpiper.—On August 1st I saw this bird fly up from Rush Hills and alight on a heap of rushes in the water a short distance away. It looked rather smaller and not so dark as a green sandpiper and there was no white on the rump, but it was darker than a wood sandpiper. It was near the same spot on the following day when I watched it with glasses and its size, appearance and habits answered to the description of

the Solitary Sandpiper given in the Handbook of British Birds. This is the first time this bird has been recorded in Norfolk.

The last three species have been reported in British Birds, Vol. xxxvi, *No.* 5.

Waxwing.—A party of sixteen flew past within thirty yards of me on September 27th. They were flying fast in a westerly direction chattering as they went.

Richard's Pipit.—I flushed a bird of this species from a marsh on which cattle had been fed, when shooting there on October 2nd. It settled about sixty yards ahead, but by the time I arrived there it had run on at least thirty yards before I flushed it a second time. This pipit is almost the size of a skylark, and its size and nimbleness on the ground are its main characteristics.

MISCELLANEOUS NOTES

Sea Eagle.—An immature sea eagle was again at Narford at the end of January, but it did not make a long stay there. It is possible that this was the bird which arrived at Hickling on February 11th and which remained there for a considerable time.

On March 8th Dr. Sumpter of Brancaster Staithe saw one coming in from the sea. His first impression was of a circling aeroplane until it came inland and, passing over the village, disappeared in the direction of Docking.

Waxwing.—Small parties were seen in Norfolk and on the outskirts of Norwich at the end of January and beginning of February. On February 5th five were feeding on rose hips at the side of Boundary road and were so tame that they were approached within a few yards. Others were seen at Old Lakenham, in the gravel pit at Eaton, and at Hingham.

Glaucous Gull.—Several were seen during the winter at Sheringham by Mr. Marsham, the last occasion being on February 17th. Two were seen by Chestney on Scolt Head on October 27th.

Iceland Gull.—One at Beach Gap, Horsey, seen by Captain Rampton.

Woodchat Shrike.—Mr. Marsham reports that he had an excellent view of a bird of this species perched on the top of a bush on Sheringham Common on May 16th.

Fulmar Petrel.—These returned to the cliffs at Sheringham again this summer. Mr. Marsham first saw one on May 24th and two days afterwards there were four flying round the same part of the cliffs as in 1940. These birds were seen to be still there in the middle of June, but the coastal defence works on the top of the cliff made it impossible to see whether they were nesting.

Osprey.—An osprey frequented Hoveton during the latter half of August and was seen to catch a fish on the big broad on August 23rd (B. B. Riviere).

Breckland

Wheatear.—A single male was seen by the writer at the side of Lakenheath Warren on March 14th, a very early arrival in Norfolk this year.

Goosander.—Three adult males and three red-headed birds were on Stanford Water on March 14th. Two males were also seen on Thompson Water on April 16th.

Whooper Swan.—Ten of these were standing on the ice of Thompson Water on January 11th. All the meres were frozen and remained so until well into March. On the 12th of that month there was still a lot of ice on all of them.

Shag.—One was picked up in an exhausted condition in a street in the centre of Norwich on February 3rd.

Breydon Water

A pair of oyster-catchers again nested on the marsh adjoining the north wall of Breydon, and appear to have been successful in rearing young. (R. Harrison).

Avocet.—A single bird was seen feeding at the Burgh end of Breydon on July 20th. (R. Harrison.)

Goshawk.—Mr. Jim Vincent reports seeing a goshawk at Hickling on the evening of November 25th. He first saw its reflection in the water of a large dyke as he was crossing the

plank bridge, and looking up saw the bird about twenty-five yards above his head. It was broad-winged, long-tailed, and at first sight seemed almost as big as a common buzzard.

Mr. Hugh Wormald also saw a goshawk on December 7th. It was perched on a three-foot post in a field near Elmham when he first caught sight of it, but it flew off as he got through the the hedge for a closer view, and sailed past at a distance of about forty yards. Thinking the bird might be an 'escape' he looked for jesses on its legs but could see none.

Little Auk.—Two were picked up on November 19th. One by a keeper at Hickling and the other at Horsey.

Grey Wagtails.—A pair of Grey Wagtails were seen in the garden of Cogham Lodge by Miss Meade on October 27th.

Signed (on behalf of the Norfolk W.B.P. Committee).

CONSTANCE E. GAY, *Secretary*.

VII

THE GENUS CAREX IN WEST NORFOLK

By E. L. Swann.

In 1914, under the auspices of the Norfolk & Norwich Naturalists' Society, the Flora of Norfolk was published. It represented, in the main, the labours of the late W. A. Nicholson. The records of Carices from West Norfolk were noticeably meagre, due largely to the lack of botanists in this division of the county as compared with those in the Eastern, North Central and South Central. In this paper it is proposed to give the results of four years' field-work and study of this interesting genus in the local fens and marshland.

Description of Organs

Carices, of the Family Cyperaceæ, are characterised by their more or less triangular stems which are usually neither swollen at the nodes nor hollow and by their closed leaf-sheaths. The leaves are grass-like, chiefly radical or on the lower part of the stem.

The inflorescence varies from spicate to paniculate. The spikes are in the axils of bracts, which may be leaf-like in appearance, very fine, or reduced to scales. Some of these bracts form sheaths. The flowers are for the most part unisexual and monoecious with one sole British exception. The male flower consists of three or rarely two stamens subtended by a "scale." Here it is proposed to use the term "scale" in preference to the usual "glume" which, it is held, should apply only to the Gramineæ. These scales are imbricated all round the axis. The female flower consists of an ovary enclosed in a sac or utricle, often more or less inflated, bearing a single style with two or three stigmas. It is likewise subtended by a scale which does not always correspond with the male scales. The utricle is a distinctive feature of Carex and its immediate allies.

British Carices may be divided into three groups. No. 1, by far the largest, consists of those species with one or more terminal spikes wholly or partly male and the others female. No. 2 group has spikelets, continuous or interrupted, male at

Wood Sedge. *Carex sylvatica Huds.*

the other is suddenly narrowed giving the resemblances to a bladder and a bottle respectively. C. rostrata is quite common and grows in many bogs and marshes but C. vesicaria is comparatively rare. This year, owing to increase of grazing, it was not found at its usual station of Derby Fen near Leziate.

Carex lasiocarpa Ehrh. (C. filiformis auct. angl.) Slender-leaved Sedge

This species is rather rare in West Norfolk. It is chiefly a plant of North England and Scotland. With us it probably reaches its south-eastern boundary. On Derby Fen there is an almost pure colony adjacent to the reed-swamp zone. Easily distinguished by its long, slender leaves, and fruit covered with a stiff grey pubescence.

Carex hirta L. Hairy Sedge

This is extremely common along grassy banks, roadsides and other places wherever the soil is moist. It is easily known by its flat, hairy leaves, hairy utricle and bright green colour. Typical specimens bear soft hairs on the sheaths but the degree of pubescence varies.

Carex pendula Huds. Pendulous Sedge

This beautiful sedge is strikingly distinct from all other species. A lover of damp woods, it grows in large tufts and luxuriant specimens may reach six feet in height. The spikes, both male and female, are often six inches long, very long stalked, and gracefully pendulous. Specimens have been gathered from Holt Lowes, but so far search in West Norfolk has been unsuccessful, although Nicholson gives it for Dersingham, West Acre, and Houghton-juxta-Harpley.

Carex sylvatica Huds. Wood Sedge

One small, damp copse at Leziate Fen is carpeted each year with this sedge. It is not very common. Not exceeding two feet in height and with gracefully nodding green spikes, this plant growing in hundreds in one small copse is a very pleasing sight.

Carex binervis Sm. Green-ribbed Sedge.

Again not a common species but found growing at Derby Fen, where the fen proper gives way to dry heath. It may be confused with C. distans. The distinguishing points are its

purplish female scales with a green midrib, its greater height, and the two prominent ribs on the bright green fruit.

Carex distans L. Distant-spiked Sedge

Not very common but grows near the coast and inland. The typical plant is about two feet high and bears small spikelets, the lowest always some distance from the one above, hence its name. From C. binervis it differs in its brownish female scales, its narrower and flaccid leaves and dull green fruits. Whereas C. binervis favours acid soils, C. distans is found in neutral and alkaline ones.

In common with certain other species, C. distans is the subject of taxonomic difficulties. Some workers regard as the true " distans " the seaside plant which C. B. Clarke named C. vikingensis. Mr. E. Nelmes of Kew, the British authority on the Carices, who has had this genus assigned to him in the projected New Students' Flora of the British Isles, has come to the conclusion after examining Linnaeus's herbarium that the inland plant is the true C. distans.

Carex flava L. Yellow Sedge

Very common in marshy places and distinguished by its almost globular female spikelets, usually three in number, and its yellowish-green colour. The male spikelet, about one-inch above the uppermost female, is narrow and spindle-shaped. Here again many aberrant forms and varieties occur.

Carex extensa Good. Long-bracted Sedge

A plant of salt-marshes and wet dunes. It is no longer to be found at North Wootton owing to the extensive reclamation work. Found still at Old Hunstanton.

Carex caryophyllea Latour. Vernal Sedge

One of the earliest sedges to flower and found on dry chalky pastures and commons. Plentiful on East Winch Common. Differs from C. pilulifera in its creeping rootstock and clasping bracts.

Carex pilulifera L. Pill-headed Sedge

A heath-loving species. The female spikelets are round compared with the ovate spikelets of C. caryophyllea. This species has a fibrous rootstock. Found also on East Winch Common following the last in flowering.

Carex flacca Schreb. (*C. glauca Scop.*) *Glaucous Sedge*

A very common sedge of grassy places with considerable variation in height. In rich, damp soil it will be found growing as tall as eighteen inches whilst in dry places it may be only six inches high and bearing short, recurved leaves. The foliage is decidedly glaucous and the female spikelets are more or less drooping in mature specimens.

Carex panicea L. Carnation Sedge

So called from the shape and colour of the leaves. One of the commonest of sedges in West Norfolk and found in all marshy places. Easily recognised by its glaucous foliage, erect and loose spikelets, solitary male spikelets, and the tumescence of its fruits which are comparatively few in number.

Carex Goodenowii Gay. (*C. vulgaris Fr.*) *Tufted Sedge*

Extremely common throughout West Norfolk. In rich marshes it may attain a height of three or four feet but in dry soils only as many inches. Like the next species, its fruits are considerably flattened and its flowers have two stigmas. The stems are often densely tufted.

Carex gracilis Curt. (*C. acuta auct.*)

Nicholson's record of its station at Wormegay still holds good. It is not common. It has been confused with the last but is a more luxuriant species with narrow and acute scales and narrower fruits.

SPECIES OF GROUP 2

Carex ovalis Good. (*C. leporina auct.*) *Oval Sedge*

Found on heaths and pastures at East Winch, Bawsey, Leziate, etc. Its mature spikelets are a pleasing shade of dusky brown, oval in shape, and about half an inch in length. They are made up of chiefly female flowers with a few males at the base of each.

Carex echinata Murr. (*C. stellulata Good.*) *Star-headed Sedge*

Found in many bogs and marshes to the east of King's Lynn. A slender plant and bearing three or four small spikelets about one quarter of an inch long. At maturity, the ripe fruits, with their long beaks, spread out in every direction and give the plant its "star-headed" appearance.

Carex remota L. Distant-spiked Sedge

Another common species. Found in damp, shady places such as woods and the sides of dykes bordering woods. The stem is extremely weak and fails to maintain erect the several small, pale spikelets spaced at considerable distances from each other. It is also remarkable for the very long leaf-like bracts of the lowest spikelets.

Carex curta Good. (C. canescens auct.) Whitish or Grey Sedge

Found growing fairly plentifully on the boggy and shaded parts of Shouldham Warren but far from being generally common. The few spikelets, about six in number, are pale and elliptical and the scales are whitish. Here the stems are stiff and hold the spikes erect.

Carex Otrubæ Podp. (C. nemorosa Rebent ; C. vulpina auct. occid.)

Another common and variable species. Numerous crowded spikelets of a shining green or pale brown colour on a sharply triangular stem sufficiently mark this species which is found growing in plenty by ditch and stream-sides especially near the coast. Those interested in the relationship between this species and C. vulpina may be referred to the Journal of Botany, September, 1939, where Mr. Nelmes states the differences. The common British Carex which has been known as C. vulpina is not the true vulpina of Linnæus which is mainly a north and east European plant. True vulpina L. has so far been found only in Kent, Sussex, and Gloucestershire. It may eventually be found in Norfolk but the common plant, which is so well known, is C. Otrubæ Podp.

Carex spicata Huds. (C. contigua Hoppe ; C. muricata auct.) ; Carex Pairaei F. Schultz (C. muricata auct.) ; C. divulsa Stokes

Many copses, ditches, and hedge-banks, both dry and damp, have plants of this puzzling group. In large, grass-like tufts they resemble miniature "vulpina." At present, the name of C. Pairaei F. Schultz is probably correct for most West Norfolk records of Nicholson's C. contigua Hoppe. The latter is certainly far less common. The two are to be distinguished only in mature specimens by the relative lengths of the utricle beak, and size and shape of ligule. C. divulsa Stokes, found

Divided Sedge. *Carex divisa Huds.*

on dry hedge-banks, is fairly common. It has a long, interrupted and sometimes compound inflorescence. A critical examination again calls for observation of fruit and ligule.

Carex paniculata L. Tussock Sedge

Fairly common at Wormegay Fen. Growing in large tussocks, sometimes five feet in height, it is well known by its very rough-edged stems and leaves, and its numerous long, branching, brownish spikelets.

Carex disticha Huds. (*C. intermedia Good.*) *Soft brown Sedge*

Common on the water-logged parts of East Winch Common and elsewhere. It resembles the next species but is taller, more leafy and slender.

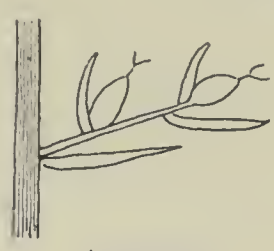
Carex arenaria L. Sand Sedge

Common not only on the sea-sand but also on heaths and road-margins inland. Known by its long creeping rootstock, sometimes several feet in length.

Carex divisa Huds. Divided Sedge

The damp meadows adjacent to the east bank of the river Nar at Saddlebow have many hundreds of this well-defined species growing in them. It has small, dark spikelets and very slender leaves. It is remarkable for its extremely long and woody rootstock. On Wolferton Marshes in 1940, among many normal plants, one was gathered exhibiting a monstrosity in the form of proliferous utricles. Normally, in any species the female spikes bear in the axil of each bract a secondary shoot ; the axis of this is included in the utricle together with the pistil which is borne in the axil of the bract. In the abnormal form, the secondary axis was found to be elongated and bore another but smaller utricle and nut.

(Diagrammatic and Enlarged)



Abnormal

Normal
(After Eichler)

Such aberrations are not uncommon ; indeed, it is the normal feature of C. microglochin Wahl. a very rare sedge of

Scotland, where the secondary axis develops into a long bristle protruding from the utricle. Instances of this monstrosity, however, in C. divisa so far as can be ascertained, have not been noticed before.

SPECIES OF GROUP 3

Carex pulicaria L. Flea Sedge

Quite common in many of our local bogs especially where competition from tall-growing plants is at a minimum. It grows in small tufts and is without a creeping rootstock. It may have few or many stems and the flowering spikes have from four to a dozen female flowers with a few males at the apex. Chiefly remarkable at maturity for its shining brown fruits which spread out horizontally from the stem and bear a striking resemblance to fleas.

Carex dioica L. Dioecious Sedge

The sole British species bearing male and female spiklets on different plants. Not common anywhere in Britain it is somewhat rare with us but Derby Fen has still a few plants to show each year. This plant has a creeping rootstock, slender stems and very narrow leaves. The female spikelets are much shorter than the males, ovoid in shape, and the fruits are spreading when ripe.

The title of this paper may imply a wider knowledge of distribution than is actually the case. Four years is the actual length of time spent by the author on field-work but the time and opportunities for visiting all likely stations in West Norfolk have been strictly limited. Several species have undoubtedly been overlooked and such omissions will one day be remedied. In the meantime, we look forward to the time when a Flora of Norfolk will be published comparable with that excellent recent work, the Flora of Devon.

Finally, I wish to acknowledge my great indebtedness to Mr. E. Nelmes for his assistance in determination of critical species and his help in many ways, so often asked for and so generously given.

VIII

THE MYCETOZOA OF SUFFOLK

By Arthur Mayfield, F.L.S.

In his Presidential Address, 1928, Mr. H. J. Howard gave a comparative table of the Mycetozoa of Norfolk, Essex and other counties of Britain. At that time no serious attempt had been made to survey the distribution of the group in the sister county of Suffolk. Some early collections by Mr. Edmund Skepper, made chiefly in the neighbourhood of Bury St. Edmund's, with a few additions by the Rev. M. J. Berkeley, amounting in all to about thirty species, were included in the list of fungi published by Prof. Henslow and Mr. Skepper in their "Flora of Suffolk," 1860. Still regarded as fungi, these were republished under the heading "Myxogastres" by the Rev. E. N. Bloomfield in his paper on Suffolk Fungi contributed to the Transactions of the Norfolk and Norwich Naturalists' Society, VIII, 261. In the present account I have quoted from the foregoing source wherever definite localities were assigned, adding the initials "H. & S." I am indebted also to Mr. H. J. Howard and Mr. E. A. Ellis for a good number of recent records from the north-eastern corner of the county.

My own researches have been made chiefly in Mendlesham and the neighbouring parishes; a district which is almost entirely agricultural, with moderately heavy soil overlying the boulder clay. Here is very little woodland to provide suitable hunting grounds, but through the kindness of the present and former vicars of Mendlesham, I have been permitted to carry out a thorough search through a period of several years in the Vicarage plantation, which has resulted in the finding of over fifty species in that spot. The plantation is a quadrangular belt of trees consisting chiefly of limes, beeches and hollies, with a smaller number of firs, yews, Turkey and evergreen oaks, sycamores, maples and hornbeams, and with an undergrowth of bramble, dog rose, snowberry and ivy. Apart from the boulder-clay area, I have made occasional search at Fritton in the north-east; at Foxhall, Barham, Butley and Freston in the neighbourhood of Ipswich; at Ampton and Icklingham on the border of Breckland, and at

Redgrave in the fen-belt on the northern border of the county, so that the survey has been fairly comprehensive.

The most interesting finds have been *Physarum ovisporum*, *Cribraria violacea*, *Perichæna pedata* (recently accorded specific rank) and *Dianema Harveyi*—all new records for East Anglia.

My sincere thanks are due to Messrs. Howard and Ellis for allowing me to include their Suffolk notes, and I am particularly indebted to Miss Lister for her kindness in examining many of my gatherings. The following list records 100 species; no doubt several others might be added by further research in the wooded areas.

Ceratiomyxa fruticulosa (Muell.) Macbr. Common on rotten coniferous wood, but found once on elm at Mendlesham.

Badhamia capsulifera (Bull.) Berk. On rotten wood, Bury St. Edmund's (H. & S.).

B. *utricularis* (Bull.) Berk. Common on dead wood and leathery fungi. An almost limeless form on an ash log at Mendlesham.

B. nitens Berk. East Bergholt (M. J. Berkley in *Annals of Natural History*).

B. panicea (Fr.) Rost. On dead ivy stems, Lothingland (H. J. Howard) and Mendlesham Vicarage plantation.

B. foliicola Lister. On a yew stump and among dead leaves at Mendlesham, on a garden lawn at Ipswich and plentiful on pine needles at Foxhall. Lothingland (H.J.H.)

B. lilacina (Fr.) Rost. At Belton fen, 1933-6 (E. A. Ellis).

Physarum leucopus Link. A large colony on dead grass and hawthorn leaves by the roadside, Brockford, December, 1933.

P. psittacinum Ditm. On a pine stump, Belton (E.A.E.).

P. viride Pers. Great Glemham (E. N. Bloomfield), Lothingland (H.J.H.) and on pine stumps at Mendlesham.

P. straminipes Lister. Plentiful on a leaf heap in a Mendlesham garden.

P. pusillum (B. & Br.) Lister. On dead twigs in Mendlesham Vicarage plantation.

P. didermoides (Ach.) Rost. A large colony on lawn cuttings at Mendlesham Vicarage, August, 1932.

P. nutans Pers. Common. The variety *leucophæum* Lister is frequent, and var. *robustum* Lister was found at Fritton (E.A.E.).

P. compressum Alb. & Schw. On dead leaves of ivy and willow at Mendlesham; on dead herbaceous stems, Creeting.

P. cinereum Pers. Common on dead leaves. In July 1933 specimens were found on living stems and leaves of *Galium cruciatum*.

P. vernum Somm. The var. *iridescens* G. Lister on dead bracken at Freston; Lothingland (H.J.H.).

P. ovisporum G. Lister. A single colony was found on a twig in Mendlesham Vicarage plantation, December, 1934 and was identified by Miss Lister.

P. sinuosum (Bull.) Wein. On dead leaves at Creeting ; on fir twigs at Redgrave ; Hardwick near Bury (H. & S.) ; Lothingland (H.J.H.).

P. bitectum Lister. Not uncommon in several parts of the county.

P. contextum Pers. Fritton, November, 1933 (E.A.E.). A small colony on a dead culm of *Dactylis* in a meadow at Mendlesham, November, 1938.

P. lateritium Morg. On moss (*Dicranum scoparium*) under birches in Blythburgh Wood, August, 1936 (E.A.E.).

Fuligo septica (L.) Gmel. Common on tree stumps and occasionally on pine needles. The variety *candida* Lister has occurred several times at Mendlesham.

Craterium minutum (Leers) Fr. Common on dead leaves, grass and twigs.

C. leucocephalum Ditm. Common on dead leaves ; on pine needles, Redgrave.

C. aureum (Schum.) Rost. On dead leaves, twigs and bracken at Freston. Lothingland (H.J.H.).

Leocarpus fragilis (Dicks.) Rost. Common on larch twigs and brambles at Foxhall, Freston and Icklingham. Lothingland (H.J.H.). It appears to be absent from the boulder-clay district.

Diderma montanum Meyl. A single gathering on a dead leaf at Creeting, January, 1925.

D. hemisphericum (Bull.) Horn. On dead ivy and willow leaves in a Mendlesham garden. Bury (H. & S.), Lothingland (H.J.H.).

D. effusum (Schw.) Morg. On dead leaves and twigs at Foxhall ; on dead wood near Fritton Lake, May, 1937.

D. spumarioides Fr. On decaying vegetable matter, Mendlesham ; Hardwick near Bury (H. & S.) ; Lothingland (H.J.H.).

D. globosum Pers. On fallen oak leaves, Bury (H. & S.).

D. deplanatum Fr. A single gathering on a dead leaf in Mendlesham Vicarage plantation.

D. floriforme Pers. At Hopton and Fritton (E.A.E.) ; on dead bracken at Freston.

D. radiatum (L.) Rost. The variety *umbilicatum* Meyl. on pine bark in the Mendlesham Vicarage plantation.

Diachæa leucopoda Rost. On fallen oak and chestnut leaves at Freston. In an alder carr at Fritton (H.J.H.).

Didymium difforme (Pers.) Duby. Very common everywhere on vegetable refuse.

D. complanatum Rost. On dead willow leaves in a Mendlesham garden. Lothingland (H.J.H.).

D. Clavus (Alb. & Schw.) Rost. On dead leaves, widespread.

D. melanospermum (Pers.) Macbr. On dead wood, Mendlesham and Creeting ; on pine needles, Foxhall and Redgrave.

D. nigripes Fr. On dead leaves and twigs, Mendlesham, Great Glemham (E. N. Bloomfield), Lothingland (H.J.H.). Var. *xanthopus* Lister on dead grass at Mendlesham.

D. squamulosum (Alb. & Schw.) Fr. Common in most parts of the county. Iridescent sporangia without lime crystals were found at Freston.

D. anellus Morg. On fallen willow leaves and twigs in a Mendlesham garden, March, 1937.

Mucilago spongiosa (Leyss.) Morg. Occurs by roadsides at Mendlesham and Brockford. It was very abundant on a roadside bank at Foxhall, October, 1938. Reported also from Nowton, Ickworth Park, Great Glemham (H. & S.), Browston (E.A.E.) and Thorpe Morieux (R. Burn).

Stemonitis fusca Roth. Common on rotten wood. The variety *confluens* Lister has been found at Mendlesham and Redgrave ; var. *flaccida* Lister in Lothingland (H.J.H.).

S. hyperopta Meyl. On pine needles and twigs at Foxhall.

S. splendens Rost. var. *flaccida* Lister. Two large colonies on a felled pine at Foxhall. At Mendlesham one colony matured on an A.A. signpost, May, 1932, another on a pine stump and a third on the upper rail of a boarded fence which had been in position many years, July, 1942.

S. herbatica Peck. On dead willow-herb stem at Mendlesham, July, 1934.

S. flavogenita Jahn. On dead wood in the Mendlesham Vicarage plantation, August, 1932.

S. ferruginea Ehr. On rotten wood in an old chalk-pit at Barham, also near Fritton Lake, August, 1936.

Comatricha nigra (Pers.) Schrœt. Common everywhere on dead wood. A form with persistent grey sporangium walls occurred on rotten beechwood at Mendlesham.

C. laxa Rost. On a pine stump at Mendlesham ; on larch twigs, Foxhall ; Lothingland (H.J.H.).

C. elegans (Rac.) Lister. This has been taken several times at Mendlesham and once in Brookhill Wood near Ipswich.

C. lurida Lister. A single gathering in the Vicarage plantation, Mendlesham, October, 1934.

C. typhoides (Bull.) Rost. Occasionally on rotten tree stumps, Mendlesham ; Lothingland (H.J.H.).

C. pulchella (Bab.) Rost. On dead bramble and bracken at Creeting and Freston ; Lothingland (H.J.H.).

C. tenerrima Lister. Not infrequent on hogweed and nettle stems at Mendlesham ; Lothingland (H.J.H.).

C. rubens Lister. Plentiful on a heap of dead willow leaves in a Mendlesham garden, 1934-5.

Enerthenema papillatum (Pers.) Rost. Several gatherings at Mendlesham and Brookhill Wood near Ipswich.

Lamproderma scintillans (B. & Br.) Morg. Common and well distributed on dead leaves, especially beech and willow.

L. columbinum Rost. On alder wood, Fritton, April, 1934 (E.A.E.).

L. violaceum (Fr.) Rost). Two small gatherings were made at Mendlesham, 1932-33.

Brefeldia maxima (Fr.) Rost. Three large æthalia, two on a stump, the other on leaves, in the Mendlesham Vicarage plantation, December, 1934. Another very large æthalium (20 x 12 inches) was found in the same spot in November, 1936. Also recorded from Dalham (E. Skepper).

Cribraria argillacea Pers. On coniferous stumps at Mendlesham, Ampton, and Icklingham ; Lothingland (H.J.H.).

C. rufa (Roth.) Rost. On pine stumps at Mendlesham and Ampton.

C. vulgaris Schrad. On pine wood at Foxhall and Ampton. The var. *aurantiaca* Pers. occurred with the type at Foxhall ; Mr. Ellis found it on pine twigs at Belton.

C. violacea Rex. Two colonies of this beautiful little species were found in Mendlesham, on a beech twig, October, 1933, and on a willow twig, February, 1934.

Dictydium cancellatum (Batsch) Macbr. On rotten coniferous wood at Mendlesham, Butley and Foxhall ; Lothingland (H.J.H.).

Licea flexuosa Pers. On larch wood at Foxhall, October, 1935.

Tubifera ferruginosa Gmel. On a pine stump at Icklingham ; more than fifty æthalia on a pine log at Fritton, August, 1936 ; also found on rotten elm wood at Mendlesham.

Dictydiæthalium plumbeum (Schum.) Rost. One æthalium on dead wood at Church Farm, Mendlesham and several on a dead stick in the Vicarage plantation.

Enteridium olivaceum Ehrenb. Several æthalia on pine and beech wood at Mendlesham, 1933-6. Fritton (E.A.E.).

Reticularia Lycoperdon Bull. Common. Some very large æthalia on the crown on a pollard willow, Mendlesham, May, 1932.

Liceopsis lobata (Lister) Torr. On yew wood in Mendlesham churchyard. On a pine log, Belton, April, 1934 (E.A.E.).

Lycogala epidendrum Fr. Frequent on rotten wood.

Trichia affinis de Bary. On rotten wood : Mendlesham, Barking and Butley. Fritton (E.A.E.).

T. persimilis Karst. Common in all districts.

T. scabra Rost. On fallen tree trunk in Holywells Park, Ipswich. Lothingland (H.J.H.).

T. varia Pers. Common in all districts.

T. contorta Rost. In company with its variety *inconspicua* frequent on lime wood in Mendlesham Vicarage plantation. Lothingland (H.J.H.).

T. decipiens (Pers.) Macbr. Frequent in most parts of the county during the winter months.

T. Botrytis Pers. Frequent on dead wood. The var. *munda* Lister on birch bark at Butley and var. *flavicoma* Lister on a holly twig at Mendlesham.

Hemitrichia Vesparium (Batsch) Macbr. Inside a hollow log at Barham, March, 1933.

H. clavata (Pers.) Rost. On dead wood, Mendlesham, Brockford, Barham, Freston and Martlesham ; also recorded from Bury (H. & S.).

H. Karstenii Rost. On rotten lime and beech wood, Mendlesham.

Arcyria ferruginea Saut. On dead wood, Mendlesham. Lothingland (H.J.H.).

A. cinerea (Bull.) Pers. On dead wood, leaves and bracken ; Mendlesham, Creeting, Freston, Foxhall, Ampton and Fritton.

A. pomiformis (Leers) Rost. On pine and oak wood, Mendlesham. Lothingland (H.J.H.).

A. denudata Wetts. Frequent on rotten wood. A colony was found at Mendlesham maturing on bare earth by a ditch side, December, 1936.

A. incarnata Pers. Frequent in all districts.

A. nutans (Bull.) Grev. On dead wood : Bury (H. & S.), Mendlesham, Barham, Foxhall and Ampton ; Lothingland (H.J.H.).

Lachnobolus congestus (Somm.) Lister. Two colonies on a dead stick in a ditch ; several on a rotten log, October, 1935, reappearing on the same log in September, 1936 ; all at Mendlesham.

Perichæna depressa Lib. On a hazel stick in a Mendlesham garden ; on a dead briar stem, Creeting ; Lothingland (H.J.H.).

P. corticalis (Batsch) Fr. On fallen poplars, Bury (H. & S.). Found many times in Mendlesham on dead wood, bark and old ivy stems ; Lothingland (H.J.H.).

P. vermicularis (Schw.) Rost. Very common on vegetable refuse, dead grass and leaves at Mendlesham, Brockford and Wickham Skeith. Very abundant on old nettles in a disused chalkpit at Creeting, January, 1935.

P. pedata G. Lister. On dead leaves and twigs on ivy-covered ground under a willow in my garden at Mendlesham during the years 1934-36. Mr. Ellis found it on a twig at Flixton, February, 1935. All the gatherings were submitted to Miss Lister for examination (see Journal of Botany, November, 1937).

Margarita metallica (B. & Br.) Lister. On dead twigs and leaves at Mendlesham, Creeting and Freston. Var. *plasmodiocarpa* (Blytt) R. E. Fries at Mendlesham.

Dianema Harveyi Rex. Flixton, February, 1935 (E.A.E.).

D. depressum Lister. Several gatherings on dead wood at Mendlesham and Barham.

Prototrichia metallica (Berk.) Mass. On rotten briar stems in the Mendlesham Vicarage plantation during winter months.

IX

MISCELLANEOUS OBSERVATIONS.

PLANTS

UREDINALES—*Puccinia behenis* (DC.) Otth. : uredo– and teleutospores on bladder campion at West Runton, 9.ix.1940 and on white campion at Wheatfen. *P. arenariæ* (Schum.) Wint. on lesser stitchwort, Swannington Upgate Common, x.41. *P. valantiæ* Pers. on bog bedstraw, Alderfen Broad. *P. ambigua* (Alb. & Schw.) Lagh. on goose-grass, Brumstead, Salhouse, Surlingham, Fir Hills at Tharston and bank of river Yare at Harford. *P. millefolii* Fckl. on yarrow, Neatishead and Roydon Fen. *P. bardanæ* Corda : teleutospores abundant on several plants of burdock in a gravel pit by the coast road at East Runton, 16.ix.40. *P. gentianæ* (Strauss) Mart. : W. G. Clarke's record of this rust attacking and dwarfing gentians " probably *campestris* " on ancient heathland north of Weeting in 1908 was overlooked when the list of Norfolk Uredinales was published : see Transactions, VIII, 680. *P. veronicæ* Schröt. : on mountain speedwell growing in a moist clayey hollow at the edge of woodland at Hanworth, 27.iii.41. *P. maydis* Bereng : teleutospores on maize in the garden at Wheatfen, 23.xi.41. The maize had been grown from seed saved from the same garden the previous year. There appears to be no published record of this rust occurring in Britain, but Prof. W. Brown of the Royal College of Science tells me that the fungus occurred on plants grown for class purposes at the Chelsea Physic Garden in two consecutive years round about 1925 ; the maize was grown by the late Curator, Mr. W. Hales, who each year used a handful of seed from his chicken-feed. As this rust is known to produce æcidia on species of *Oxalis*, and clumps of *O. floribunda* and *O. acetosella* were growing near the infected maize at Wheatfen, I made inoculation experiments with overwintered teleutospores, but no æcidia were produced on these plants in the spring or summer of 1942. *P. anthoxanthi* Fckl. : uredospores on sweet vernal grass at Upton Broad, 8.viii.40 and Wheatfen, 29.vi.41. *Uromyces geranii* (DC.) Otth. & Wartm. : æcidio– and uredo-spores on round-leaved geranium, Old Lakenham, 5.vi.41, teleutospores in September ; also present on *Geranium pusillum* at Lakenham, vii.42. *U. genistæ-tinctoriæ* (Pers.) Wint. on needle-whin, Swanington Upgate Common, x.41. *U. fabæ* (Pers.) de Bary : many æcidia and a few uredo-sori on marsh pea at Upton Broad, 20.vii.42. *U. salicorniæ* (DC.) de Bary ; on erect annual glasswort growing on a rond along the north shore of Breydon Water, together with *U. chenopodii* (DC.) Schrot. on annual sea-blite. *U. scillarum* (Grev.) Wint. : an interesting record of longevity in a rust is afforded by this species which has persisted on a colony of cultivated bluebells (*Scilla campanulata*) in Norwich Castle Gardens

for 20 years; Mr. H. J. Howard noticed it annually from 1922 onward, while I have observed it also from 1933 to 1942; it does not prevent the plants from flowering. *U. junci* (Desm.) Tul. In marshes of the Tas at Tharston, July, 1942, thousands of plants of fleabane bore æcidia of this rust; in the clayey area where they were growing I could not find a single clump of obtuse-flowered rush, which is the alternate host for the fungus; the associated rush was instead *Juncus inflexus*. Farther up the valley, however, on sub-acid peat, *J. subnodulosus* occurred in plenty, bearing the rust, but no fleabane was present on that soil. The circumstances showed how effective wind dispersal of spores can be; at the same time it is puzzling why the rust should need to jump to a species of rush belonging to a distinct ecological zone when another rush is the natural associate of its æcidial host plant.

Hyalopsora polypodii (Pers.) Magn. found attacking a bladder-fern (*Cystopteris fragilis*) in Mr. Hinde's garden on Earlham Road, Norwich, 8.vi.42; the fern was growing out-of-doors. *Coleosporium petasitis* (DC.) Ed. Fisch. on common butter-bur (*Petasites ovatus*) and white butterbur (*P. albus*) in Saxlingham rectory garden, 22.x.42.

E. A. Ellis.

Angiospermæ—The lizard orchis growing in a spinney at Cringleford, as recorded in these Transactions several years ago, was still thriving in July, 1942, when it had a stem 10 inches and flower spike 3½ inches in length. No seedlings have appeared round the parent plant.—E. Limmer.

Impatiens fulva: quantities of this beautiful balsam have colonised the edge of the river at Horstead; still flowering in October, 1942.—Miss Whittingham.

ANIMALS

Amphipoda—*Talitrus alluaudi* Chevreux: fern house at Daniels Bros.' nurseries, Norwich, 1942 (det. D. M. Reid). Previously recorded in the British Isles only from Royal Botanic Gardens, Glasgow.—A. E. Ellis.

Oniscoida (woodlice)—The following species were observed in the nursery gardens and greenhouses of Messrs. Daniels Bros.', Norwich, in 1942: *Trichoniscus pusillus* (Brandt), *T. pygmæus* Sars, *Androniscus dentiger* Verhœff (=*Trichoniscus roseus* Sars), *Haplophthalmus danicus* Budde-Lund, *Oniscus asellus* L., *Porcellio scaber* Latreille, *P. spinicornis* Say (=*P. pictus* Brandt), *P. dilatatus* Brandt, *P. lævis* Latreille, *Porcellionides pruinosus* (Brandt), *Platyarthrus hoffmannseggii* Brandt (in nest of black ant, *Acanthomyops niger*), *Armadillidium vulgare* (Latreille), *A. speyeri* Jackson (confirmed by Dr. W. E. Collinge). The following species were seen at Earlham Park: *T. pygmæus*,

A. dentiger, O. asellus, P. scaber, P. dilatatus, P. spinicornis, A. vulgare and *A. speyeri* (confirmed by Dr. Collinge). *Ligidium hypnorum* (Cuvier) : this species, first recorded for Norfolk in these Transactions, vol. 15, p. 292, is probably common and generally distributed in the marshes of east Norfolk. It has been collected in the following localities : Dunston ; Smotton Common near Saxlingham Thorpe ; Upton Broad ; South Walsham Broad ; Panxworth ; Alderfen Broad and Bradeston Marsh. *Haplophthalmus danicus* B.-L. : Whitlingham ; Postwick ; Dunston ; Panxworth ; Shotesham Park ; Flordon. *Platyarthrus hoffmannseggii* Brandt. : West Tofts, 2nd/Lieut. T. Warwick ; Thorpe St. Andrew.—A. E. Ellis.

Chelonethi (false-scorpions) *Chernes cimicoides* (Fabr.) : Dunston, under bark of dead oak and beech ; Stoke Holy Cross Mill, under oak bark ; Ringland Hills, under oak bark ; Tuck's Plantation, Wheatfen, Surlingham, under elm bark. West Tofts, 2nd/Lieut. T. Warwick. *Chthonius ischnochelus* (Herm.) : Thorpe St. Andrew ; Surlingham Wood and Tuck's Plantation, Wheatfen ; Dunston ; Upton ; Earlham ; Daniels Bros.' nurseries, Norwich ; Framingham Pigot ; Arminghall ; Shotesham Park ; Flordon ; Old Lakenham. *Chthonius tetrachelatus* (Preyssler) : Earlham Park ; Daniels Bros.' nurseries, Norwich ; Old Lakenham Hall. A.E.E.

Opiliones (harvestmen)—*Nemastoma chrysomelas* (Herm.) : Dunston ; Thorpe St. Andrew ; Ringland ; Ashwellthorpe. *Lacinius ephippiatus* (C. L. Koch) : Dunston, Framingham Pigot. A.E.E.

Orthoptera—*Meconema thalassinum* (De Geer) : Smotton Common, Saxlingham Thorpe, amongst rushes in marsh ; Thorpe St. Andrew ; Old Lakenham. *Conocephalus dorsalis* (Latr.) : Upton, Alderfen, Rockland and South Walsham Broads ; Irstead. *Tetrix subulatus* (L.) : Horning. *Tetrix vittatus* Zett. : Smotton Common ; Ringland Hills. *Tetrix ceperoi* I. Bolivar : Wheatfen Broad, Surlingham (det. Dr. B. P. Uvarov). Occurs at Wheatfen in association with *T. subulatus* and *T. vittatus*. Many of the Wheatfen specimens have a remarkably short pronotum. For the differences between *T. ceperoi* and *T. subulatus* see B. P. Uvarov, " *Tetrix ceperoi* I. Bolivar, new to British fauna (Orthoptera, Tetrigidæ), " J. Soc. Brit. Entomol. 2,1940, 72-75, fig 11. *Myrmeleotettix maculatus* (Thunb.) : Thorpe St. Andrew ; Mousehold Heath ; Ringland Hills. *Chorthippus albomarginatus* (De Geer) : Irstead. *Chorthippus parallelus* (Zett.) : Thorpe St. Andrew ; Dunston ; Smotton Common ; Ringland.—A. E. Ellis.

Odonata (Dragonflies)—*Aeschna mixta* Latreille : frequent in the broads district during the latter part of August and in September ; first seen Aug. 15th ; Irstead, Horning, Woodbastwick, Panxworth, and at Wheatfen, Rockland, Alderfen, Upton and South Walsham

Broads. *Aeschna isosceles* (Mull.) : Fleet Dyke, South Walsham, 1.viii. 1942 ; Alderfen Broad, 7.viii. 1942. *Orthetrum cancellatum* (L.) : males only, Alderfen Broad, 7.viii.1942. *Libellula fulva* Muller : males only, river Bure near South Walsham, 1.viii.1942. A.E.E.

COLEOPTERA—*Aulonium trisulcum* Geof. : Two specimens of this rare beetle emerged from elm bark collected at Catton Grove, Norwich, 26.v.1942 ; another on 28.v.42 and others in early July. The elm had been dead for more than a year and the bark was riddled with holes made by *Scolytus destructor* and not *S. multistriatus* with which the *Aulonium* had been found associated previously in Middlesex. Five specimens of *Hypophloœus bicolor* L. were taken from under the same bark on 21.v.42 and others from an elm on Hall Road, Norwich, 2.vi.42. *Hylesinus fraxini* Panz. : several specimens of this bark beetle, normally occurring in ash, were found dead in their larval tunnels in a sycamore log at Whitlingham, 13.vi.42. *Pediacus dermestoides* F. : one found under bark of alder, Tuck's Ride, Wheatfen, 28.vi.42. *Aspidiphorus orbiculatus* Gyll. : found in association with a mycetozoon (*Comatricha nigra*) on a dead log in Tuck's Plantation, Wheatfen, 21.vi.42. *Tetropium gabrieli* Weise : five under bark of pine, Easton near Norwich, 30.v.42 (usually in larch). *Alphitobius piceus* Ol. (*diaperinus* Brit. Cat.) : under bark at the edge of a scar on a living elm, Hall Road, Norwich, 7.vi.42. *Thanasimus formicarius* L. : under birch bark on Felthorpe Heath, 29.iii.42 (usually associated with fir trees).—R. M. S. BROWN.

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10 MAR 1943

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BRITISH MUSEUM
NATURAL HISTORY

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