

TRANSACTIONS  
OF THE  
Norfolk and Norwich  
NATURALISTS' SOCIETY;

PRESENTED TO THE MEMBERS FOR

1902—1903.

VOL. VII.—PART 4.



NORWICH:  
PRINTED BY FLETCHER AND SON, LTD.  
1903.

*Price 3s. 6d.*

# Norfolk and Norwich Naturalists' Society.

## OFFICERS FOR 1903—1904.

President.

MR. F. LONG.

Ex-President.

HENRY WOODWARD, LL.D., F.R.S., F.G.S., F.Z.S.

Vice-Presidents.

THE RIGHT HON. THE EARL OF LEICESTER, K.G.

THE RIGHT HON. THE LORD WALSHINGHAM, F.R.S.

THE RIGHT HON. THE LORD AMHERST OF HACKNEY.

MICHAEL BEVERLEY, M.D.

T. SOUTHWELL, F.Z.S.

COL. FEILDEN, C.B., C.M.Z.S.

H. M. UPCHER, F.Z.S.

JOHN HENRY GURNEY, F.L.S., F.Z.S.

PROFESSOR NEWTON, F.R.S.

F. W. HARMER, F.G.S.

EUSTACE GURNEY.

COLONEL IRBY, F.L.S., F.Z.S.

Treasurer.

MR. F. C. HINDE.

Hon. Secretary.

MR. W. A. NICHOLSON,

St. Helen's Square, Norwich.

Committee.

REV. J. A. LAURENCE. MR. J. T. HOTBLACK, F.G.S. MR. E. J. H. ELDRED.

MR. F. LENEY.

REV. A. MILES MOSS.

MR. W. H. BIDWELL.

DR. S. H. LONG.

MR. J. MOTTRAM.

DR. H. A. BALLANCE

Journal Committee.

MR. W. H. BIDWELL.

MR. J. T. HOTBLACK, F.G.S.

MR. J. REEVE, F.G.S.

DR. S. H. LONG.

MR. A. W. PRESTON, F. R. Met. Soc.

Excursion Committee.

MR. C. BUSSEY.

MR. J. T. HOTBLACK.

MR. E. CORDER.

MR. A. PATTERSON.

MR. H. J. THOULESS.

MR. A. W. PRESTON, F. R. Met. Soc.

Auditor.

MR. S. W. UTTING.

## Yarmouth Section.

*Ex-officio Members of the General Committee.*

DR. J. RYLEY, *Chairman.*

MR. J. BURTON, *Treasurer.*

MR. T. J. WIGG, *Hon. Sec.*

TRANSACTIONS  
OF THE  
NORFOLK & NORWICH  
NATURALISTS' SOCIETY.

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

1. The Practical Study of Natural Science.
2. The protection, by its influence with landowners and others, of indigenous species requiring protection, and the circulation of information which may dispel prejudices leading to their destruction.
3. The discouragement of the practice of destroying the rarer species of birds that occasionally visit the County, and of exterminating rare plants in their native localities.
4. The record of facts and traditions connected with the habits, distribution, and former abundance or otherwise of animals and plants which have become extinct in the County; and the use of all legitimate means to prevent the extermination of existing species, more especially those known to be diminishing in numbers.
5. The publication of Papers on Natural History, contributed to the Society, especially such as relate to the County of Norfolk.
6. The facilitating a friendly intercourse between local Naturalists, by means of Meetings for the reading and discussion of papers and for the exhibition of specimens, supplemented by Field-meetings and Excursions, with a view to extend the study of Natural Science on a sound and systematic basis.

TRANSACTIONS  
OF THE  
Norfolk and Norwich  
NATURALISTS' SOCIETY;

*Presented to the Members for*

1902—1903.



VOL. VII.—PART IV.

Norwich :  
PRINTED BY FLETCHER AND SON, LTD.  
1903.



# Norfolk and Norwich Naturalists' Society.

## OFFICERS FOR 1902—1903.

### President.

HENRY WOODWARD, LL.D., F.R.S., F.G.S., F.Z.S.

### Ex-President.

MR. W. H. BIDWELL.

### Vice-Presidents.

THE RIGHT HON. THE EARL OF LEICESTER, K.G.

THE RIGHT HON. THE EARL OF KIMBERLEY, K.G.

THE RIGHT HON. THE LORD WALSHINGHAM, F.R.S.

THE RIGHT HON. THE LORD AMHERST OF HACKNEY.

MICHAEL BEVERLEY, M.D.

COL. FEILDEN, C.B., C.M.Z.S.

HERBERT D. GELDART.

JOHN HENRY GURNEY, F.L.S., F.Z.S.

H. M. UPCHER, F.Z.S.

F. W. HARMER, F.G.S.

T. SOUTHWELL, F.Z.S.

PROFESSOR NEWTON, F.R.S.

### Treasurer.

MR. E. J. H. ELDRED.

### Hon. Secretary.

MR. W. A. NICHOLSON,

St. Helen's Square, Norwich.

### Committee.

MR. E. CORDER.      REV. J. A. LAURENCE.      MR. J. T. HOTBLACK, F.G.S.

MR. H. J. THOULESS.      MR. F. LENEY.      MR. EUSTACE GURNEY.

MR. W. L. SUTTON.      DR. S. H. LONG.      REV. A. MILES MOSS.

### Journal Committee.

MR. W. H. BIDWELL.

MR. J. T. HOTBLACK, F.G.S.

MR. J. REEVE, F.G.S.

MR. F. C. HINDE.

MR. A. W. PRESTON, F. R. Met. Soc.

### Excursion Committee.

MR. C. BUSSEY.

MR. J. T. HOTBLACK.

MR. E. CORDER.

MR. A. PATTERSON.

MR. H. J. THOULESS.

MR. A. W. PRESTON, F. R. Met. Soc.

### Auditor.

MR. S. W. UTTING.

### Yarmouth Section.

*Ex-officio Members of the General Committee.*

DR. J. RYLEY, *Chairman.*

MR. J. BURTON, *Treasurer.*

MR. T. J. WIGG, *Hon. Sec.*



## LIST OF MEMBERS, 1902—1903.

\* Members who have compounded for their subscriptions are marked with an asterisk.

## A

\*Ames Victor  
Thornham Cottage, King's Lynn  
Amherst of Hackney Right Hon. Lord.  
F.Z.S., V.P. Didlington Hall  
Andrew W. H. M. Colney  
Aplin Oliver V. Bloxham, Oxon  
Atmore E. A. Lynn  
\*Avebury, Rt. Hon. Lord, D.C.L., F.R.S.  
High Elms, Hayes, Kent

## B

Backhouse James Dale Side, Harrogate  
Baker W. E. Tilney All Saints  
Ballance H. A., M.D., F.R.C.S.  
46 Prince of Wales Road, Norwich  
Balls J. E. Bank House, Norwich  
Barclay Francis H. The Warren, Cromer  
Barclay H. G., F.R.G.S. Colney Hall  
\*Barclay R. High Lee, Hoddesdon  
Barlee Rev. W., M.A.  
Eaton Lodge, Eaton, Sutton, Surrey  
Barnard Miss A.  
Prince of Wales' Road, Norwich  
Barrett C. G., *Hon. Mem.*  
Tremont, Peckham Rye, S.E.  
\*Becher Major Edward F., R.A., F.Z.S.  
2 Berkeley Villas, Pittville, Cheltenham  
\*Becher Rev. William Wellow, Notts  
Bennett Arthur, F.L.S.  
5 Edridge Road, Croydon  
Beverley M., M.D., V.P.  
Prince of Wales' Road, Norwich  
Bidwell E. 1 Trigg Lane, E.C.  
Bidwell W. H. Thorpe Road, Norwich  
Bird Rev. M. C. H., M.A., M.B.O.U.  
Brunstead Rectory  
Birkbeck Sir Edward, Bart.  
Horstead Hall  
Birkbeck Gervase W. Westacre  
Birkbeck H. High House, Westacre  
Birkbeck H. A. Westacre  
\*Birkbeck W. J.  
Stratton Strawless Hall  
Bloomfield Rev. E. N., M.A., F.E.S.  
Guestling Rectory, Hastings  
Boardman E. T.  
Town Close House, Norwich  
Boileau Lady Ketteringham Park

Boileau Sir M. C., Bart.

Ketteringham Park  
Boileau R. F. Ketteringham Park  
Bolingbroke L. G. Ferryside, Norwich  
Bridgman Frank G.  
5 Duchess Street, Portland Place, W.  
Brittain Henry.  
St. Stephen's Street, Norwich  
Broeck Ernest Vanden, *Hon. Mem.*  
39 Place de l'Industrie, Brussels  
Brown Rev. J. L.  
Chapel Field Grove, Norwich  
Browne Frank Balfour  
The Cottage, Catfield  
Burnand G. B. Worstead  
Burrell W. H. Sheringham  
Burton S. H., M.B.  
St. Giles' Street, Norwich  
Bussey C. St. Martin-at-Palace, Norwich  
Butcher Mrs. H. F.  
Chester Place, Norwich  
Butler Colonel  
Plumpton House, Bury St. Edmunds  
Butterfield W. C. J. Ruskin  
4 Stanhope Place, St. Leonards  
Buxton A. F. 50 Cornhill, E.C.  
Buxton C. Louis Bolwick Hall, Norwich  
Buxton E. G. Thorpe, Norwich  
Buxton Geoffrey F., F.Z.S.  
Dunston Hall, Norwich  
Buxton H. E. Fritton  
Buxton H. G. Catton Hall  
Buxton S. G., F.Z.S.  
Catton Hall, Norwich  
\*Buxton Sir T. F., Bart., F.Z.S.  
Warlies, Waltham Abbey

## C

Campbell D. Fraser  
The Nutshell, Hunstanton  
Candler C. Weybread House, Harleston  
Cator John  
Church Farm, Woodbastwick  
Chase R. W.  
Priory Road, Edgbaston, Birmingham  
Christy Miller, F.L.S.  
Pryors, Broomfield, Chelmsford  
Clarke W. G.  
12 St. Philip's Road, Norwich  
\*Cocks A. H., M.A., F.Z.S.  
Poynnetts, Skirmett, Heuley-on-Thames



Collett Professor Robert, *Hon. Mem.*

The University, Christiania, Norway  
Colmau Russell J. Bracondale, Norwich

Connop E. M. Rollesby Hall

Cooke M. C., M.A., LL.D., *Hon. Mem.*

53 Castle Road, Kentish Town, N.W.

Cooper C. Forster

Marine Laboratory, Lowestoft

Corder Edward London Street, Norwich

Cresswell George Lynn

Creswell Rev. S. F., D.D., F.R.A.S.,

F.R.G.S. Northrepps Rectory

Cross J. M. Mile End Road, Norwich

Crossley Sir Savile B., Bart.

Somerleyton Park

Crowfoot W. M., M.B. Beeches

## D

Davies G. C. Town Close, Norwich

Day Rev. A. G., M.A.

Sunny Hill, Thorpe

Day Donald D. Surrey Street, Norwich

Digby A. Fakenham

Dowson E. T., F.R. Met. Soc. Geldeston

\*Dresser H. E., F.L.S., F.Z.S.

Topclyffe Grange, Farnborough

Duff Miss B.

The Heath, North Walsham

## E

Eade Sir Peter, M.D.

St. Giles' Street, Norwich

Eaton F. R.

Cleveland House, Eaton, Norwich

Edwards J., *Hon. Mem.*

Colesborne, Gloucestershire

Eldred E. J. H., *Treasurer.*

Castle Meadow, Norwich

Evans Dr. Muir Kirkley, Lowestoft

Everington W. D. Castle Acre

Everitt H. R.

Prince of Wales' Road, Norwich

Evershed Percy

Cringleford Grove, Norwich

## F

Falcon Michael Horstead

Farn A. B., Mount Nod, Greenhithe, Kent

\*Feilden Col. H. W., C. B., V.P., F.G.S.,

C.M.Z.S. Burwash, Sussex

Fitch Rev. H. C. Beeston Regis Rectory

Fletcher B. E., Marlingford Hall, Norwich

Fletcher H. R. Marlingford

\*Fletcher W. H. B.

Aldwick Mause, Bognor

Forrester J. B. Tomblaud, Norwich

Foster Charles

Thorpe St. Andrew, Norwich

Fowler W. Warde, Lincoln College, Oxford

Fryer H. F. The Priory, Chatteris

## G

\*Gainsborough The Right Hon. the Earl  
of Exton Park

Garstaug Walter, N.A.

Marine Laboratory, Lowestoft

Gawne Rev. R. M. Ashill Rectory

Geldart Miss Alice M.

Cotman Road, Thorpe Hamlet

Glanfield W. A.

St. George's Terrace, Great Yarmouth

Goose A. W.

Prince of Wales' Road, Norwich

Gunn T. E., F.L.S.

St. Giles' Street, Norwich

Gurney Miss Cicely

Keswick Hall, Norwich

\*Gurney Eustace

Sproston Hall, Norwich

\*Gurney Gerard H.

Keswick Hall, Norwich

\*Gurney J. H., V.P., F.L.S., F.Z.S.

Keswick Hall, Norwich

Gurney Q. E. Northrepps

\*Gurney Robert

Longmoor Point, Catfield

Guyett W. J. King Street, Norwich

## H

\*Hackblock W. H. Coltishall

\*Haigh G. H. Caton

Grainsby Hall, Gt. Grimsby

Haldinstein Alfred Thorpe

Hall H. Woodbridge

Hamblen W. W. Wells

Hamond Charles A.

Twyford Hall, East Dereham

\*Hamond Rear-Admiral R.H., R.N.

The Abbey, Westacre

Harcourt B. W., St. Giles Street, Norwich

Harmer F. W., V.P., F.G.S.

Cringleford, Norwich

\*Harmer S. F., Sc.D., F.R.S.,

96 Huntington Road, Cambridge

Harvey E. K. Lowestoft

Harvie-Brown J. A., F.R.S.E.

Dunipace House, Larbert, N.B.

Hastings The Right Hon. Lord

Melton Constable

Hebbert C. T., F.Z.S. The Rhodron,

Hook, Kingston-on-Thames

Hector Sir James, M.D., K.C.M.G., F.R.S.

*Hon. Mem.*

New Zealand Institute, Wellington

Herring Capt. H. L.

Thorpe St. Andrew, Norwich

Heseltine Leigh Yoxford, Suffolk

\*Hill Alexander, M.D.

Downing College, Cambridge

Hill B. 5 Tower Street, King's Lynn

Hinde F. C. Thorpe Hamlet, Norwich

Hinde G. J., Ph.D., F.R.S., F.G.S., *Hon.*

*Mem.* Avondale Road, Croydon

\*Hoare Sir S., Bart., M.P.

Sidestrand Hall

Hooker Sir J. D., M.D., K.C.S.I., C.B.,

F.R.S., *Hon. Mem.*

The Camp, Sunningdale, Surrey

Hotblack G. S. Brundall

Hotblack J. T., F.G.S.

Newmarket Road, Norwich

Howard Rev. John T.

41 Grove Road, Norwich

Howard R. J., M.B.O.U.

Shear Bank, Blackburn

Hurrell H. E.

7 Regent Road, Gt. Yarmouth

## I

Irby Colonel, F.L.S., F.Z.S.

14 Cornwall Terrace, Regent's Park, N.W.

## J

James R. Lewis  
7 St. Giles' Street, Norwich  
Jarrold W. T. F.  
Thorpe St. Andrew, Norwich  
\*Jodrell Sir Alfred, Bart. Bayfield Hall  
Jones Sir Laurence, Bart.  
Cranmer Hall, Fakenham

## K

Keartou Richard, F.Z.S.  
Ardingley, Caterham, Surrey  
Kerrison Colonel Burgh Hall, Aylsham  
King H. A. Exchange Street, Norwich  
Knight Edward Keswick Old Hall  
Knights J. E.  
36 Beaconsfield Road, Great Yarmouth

## L

Ladell H. R. North Walsham  
Laurence Rev. J. A. Dilham, Norwich  
Laurence R. Norfolk Club, Norwich  
Leathes Colonel H. M. Herringfleet Hall  
\*Lee Warner Henry Walsingham Abbey  
Lee Warner Henry Swaffham  
Lee Warner John Bracondale, Norwich  
Leicester The Right Hon. the Earl of,  
K.G., V.P. Holkham Hall  
Laney F. Castle-Museum, Norwich  
Lennard T. Barrett  
Horsford Manor, Norwich  
Le Pelley Rev. J. L., M.A. Riugland  
le Strange Hamon, F.Z.S.  
Hunstanton Hall  
\*Lindley, The Right Hon. Lord  
East Carlton  
Long F. The Close, Norwich  
Loug Dr. S. H.  
St. Giles' Street, Norwich  
Long J. Dunton  
Longe F. D. The Alders, Lowestoft  
Lowerison H.  
Ruskin School-Home, Hunstanton

## M

Macpherson A. H.  
51 Gloucester Terrace, Hyde Park, W.  
Manby A. R., M.D. East Rudham  
Mann Mrs. R. C.  
Wainford House, Ditchingham  
Marshall Major Rippon Hall  
Mayfield A., M.C.S.  
Mendelsham, Stowmarket  
Meade-Waldo Edmund G. B.  
Stonewall Park, Edenbridge, Kent  
Middleton C. Hellesdon  
Miller Henry, Jun. Bosmere House,  
Norwich Road, Ipswich  
Mills W. R. Brooke, Norwich  
Morgan Rev. E. C.  
St. Martin-at-Palace, Norwich  
Morley Claude, F.E.S.  
The Crescent, Ipswich  
Moss Rev. A. Miles The Close, Norwich  
Mottram James Bracondale, Norwich

## N

Newcome E. C. Feltwell  
Newcome F. d'Arcy  
Thursford Lodge, Bury St. Edmunds  
Newton Professor, M.A., F.R.S., Hon.  
Mem., V.-P.  
Magdalene College, Cambridge  
Newton E. T., F.R.S., Hon. Mem.  
H.M. Geological Survey Office,  
28 Jermyn Street, London  
Nicholson F., F.Z.S.  
81 Major Street, Manchester  
Nicholson W. A., Honorary Secretary  
St. Helen's Square, Norwich  
Noble Heatley  
Templecombe, Henley-on-Thames

## O

\*Ogilvie F. M. Sizewell House, Leiston  
Oxbrow A. W., F.R.M.S.  
Surrey Street, Norwich

## P

Page G. W. Fakeuham  
Palmer F. Danby, M.S.A.  
Hall Quay, Great Yarmouth  
\*Parkin Thomas, M.A., F.Z.S.  
High Wickham, Hastings  
Partridge Rev. W. H., M.A.  
Caston Rectory, Attleborough  
Pashley H. N. Cley  
Patterson A. Ibis House, Gt. Yarmouth  
Pattin H. Cooper, M.D.  
2 The Wilderness, Bracondale  
\*Paul J. J. Dawson  
Eaton Grove, Norwich  
Peake E. 36 Earlham Road, Norwich  
Pearson Henry J. Bramcote, Notts.  
Peckover Alexander Wisbech  
Pigott T. Digby, C.B., F.R.G.S.  
5 Ovington Gardens, S.W.  
Plowright C. B., M.D., Hon. Mem. Lynn  
Power F. D.  
299 Cold Harbour Lane, London  
Preston A. W., F.R. Met. Soc.  
Bradestone House, Brundall  
Preston F.  
47 Prince of Wales' Road, Norwich  
Purdy R. J. W.  
Woodgate House, Aylsham  
Pyett Claude A.  
Clarendon Road, Norwich  
Pycraft W. P., A.L.S., F.Z.S.  
British Museum (Natural History),  
London, S.W.

## R

Reeve J., F.G.S. Clarence Road, Norwich  
\*Reid Clement, F.R.S., F.L.S., F.G.S.  
H.M. Geological Survey Office, London  
\*Reid Capt. Savile G., R.E.  
Yalding, Maidstone  
\*Ringer Sidney, M.D.  
Cavendish Square, W.  
Ripley Rev. Canon W. N.  
Harford House, Norwich  
Roberts E. T. Castle Meadow, Norwich  
Robinson E. Kay Warham  
Robinson H. S. St. Giles' Plain, Norwich  
\*Rosebery The Right Hon. the Earl of,  
K.G. Berkeley Square, W.  
\*Rothschild Hon. Walter Tring, Herts

Royal Microscopical Society, President of  
the, *Hon. Mem.* 20 Hanover Square, W.  
Rye Walter

St. Leonard's Priory, Norwich  
Ryley Dr. J., *President Great Yarmouth*  
*Section*, Regent Road, Gt. Yarmouth

## S

Saunders Howard, F.L.S., F.Z.S.  
7 Radnor Place, London, W.

Savill-Onley C. A. O.  
The Priory, Ash Priors, Taunton  
Scherren H., F.Z.S.

9 Cavendish Road, Harringay, N.  
Shepherd A. C.

Burlingham House, Norwich  
Shipley W., Jun.

Southtown, Great Yarmouth  
\*Singh Prince Frederiek Duleep, H.H.

Old Buckenham Hall  
Slater Rev. H.

Thornhaugh Rectory, Wansford  
Smith W. R. Harleston

\*Sonthwell C.  
Gurrey Lodge, Childs Hill, N.W.

Southwell T., F.Z.S., V.-P.  
10 The Crescent, Norwich

Spelman W. W. Brundall  
Sterry E. V. Regent Road, Gt. Yarmouth

Sutton Francis, F.C.S.  
The Close, Norwich

Sutton W. Lincoln Eaton, Norwich

## T

Taylor Shephard T., M.B.  
Chingford House, Norwich

Thouless H. J.  
Corfe, Collego Road, Norwich

Tillett Eric de C., Suffolk House,  
5 Laurence Pountney Hill, E.C.

Tillett Wilfred S. Montrose, Old Catton  
Tingey J. C., M.A., F.S.A.

31 Surrey Street, Norwich  
Todd R. A., B.Sc.

Marine Laboratory, Lowestoft  
Todd J. T.

Chapel Field Gardens, Norwich  
True F. W., *Hon. Mem.*

U.S. National Museum, Washington,  
U.S.A.

Tuck Rev. J. G.  
Tostock Rectory, Bury St. Edmunds

Tuck W. H.  
5 Southgate Green, Bury St. Edmunds

## U

Upcher H. M., F.Z.S., V.P. Feltwell  
Utting S. W. Thorpe, Norwich

## V

Vaughan Matthew Haileybury College

## W

\*Walsingham The Right Hon. Lord,  
F.R.S., V.-P. Merton Hall, Thetford

Walter J. H. Drayton  
Ward E. F. Sallhouse Hall, Norwich

\*Watling R. A.  
Dunedin, Merton Road, Southsea

Whceler F. D., M.A., LL.D.  
Bracondale, Norwich

\*Whitaker Joseph, F.Z.S.  
Rainworth Lodge, Mansfield

Whitty C. R., M.D. Hunstanton  
Wigg T. J., *Hon. Sec. Great Yarmouth*

*Section*, Holland House, North Quay,  
Gt. Yarmouth

Wild Edward  
Christ Church Road, Norwich

Williams C.  
Prince of Wales' Road, Norwich

Wilson H. F. 35 Kensington Square, W.  
Wimble Rev. Henry North Walsham

Winter J. J. Drayton, Norwich  
Woodward Dr. Henry, F.R.S., *Hon. Mem.*,

British Museum (Natural History),  
London, S.W.

Woodward H. B., F.R.S., F.G.S., *Hon. Mem.*  
89 Marlborough Mansions, Cannon

Hill, N.W.  
Wright B. D. Z.

The Old House, Coltishall  
Wright C. A., Knight of the Crown of

Italy, F.L.S., F.Z.S.  
Kayhough House, Kew

Wright Miss Helen  
Beech Close, Newmarket Road, Norwich

Wright Miss K. Noel  
Beech Close, Newmarket Road, Norwich

Wyrley-Birch W. E. G.  
Petygard, Swaffham

## Y

Young J. J. Baldwin, M.A., M.B.O.U.  
Richmond Park, Sheffield



# The Treasurer in Account with the Norfolk and Norwich Naturalists' Society, Year ending March, 1903.

Dr.

	£	s.	d.
1902.			
To Balance from last year (including Mr. J. H. Gurney's Donation of £10 10s. towards the cost of New Bookcase)	14	12	2
1902-3.			
By Transferred from Life Membership Fund for moiety of cost of New Book Case	10	10	0
To Subscriptions:—			
2 for 1897-98	0	10	0
2 " 1898-99	0	10	0
4 " 1899-1900	1	0	0
6 " 1900-1	1	10	0
12 " 1901-2	3	0	0
172 " 1902-3	43	0	0
6 " 1903-4	1	10	0
Additional payments	51	0	0
" Sale of <i>Transactions</i>	0	15	0
" Transferred from Life Membership Fund	1	15	7
	20	0	0
	£98	12	9

## LIFE MEMBERSHIP FUND.

	£	s.	d.
1902.			
To Balance from last year	87	8	2
1902-3.			
" 2 Compositions for Life Membership	8	0	0
" Interest to November 20th, 1902	2	3	2
	£97	11	4

Norwich, 31st March, 1903.

Cr.

	£	s.	d.
1902-3.			
By Holmes and Son, New Bookcase	21	0	0
" Fletcher and Son, Limited, <i>Transactions</i> , 1901-1902	47	19	6
" Sundry Printing and Postage	1	0	4
" A. H. Goose, Printing and Postage	2	6	6
" Postage and Carriage	4	17	8
" Insurance	0	9	0
" Year Book of Societies	0	6	0
" Bookbinding	4	1	3
" Coe for Lantern at Meeting	1	1	0
" Dimmock, Framing Medallion	0	9	6
" Norfolk and Norwich Library	1	1	0
" Doorkeeper at Museum	1	0	0
" Assistant Secretary's Salary	5	0	0
" Subscription returned, paid in error	0	10	0
" Balance at Messrs. Barelay's Bank	7	11	0
	£98	12	9

	£	s.	d.
1902-3.			
By Transferred to General Account	30	10	0
" Balance in Norfolk and Norwich Savings Bank	67	1	4
	£97	11	4

Examined with vouchers and found correct,

STEPHEN WM. UTTING, Auditor.

*List of the Publications received by the Society as Donations  
or Exchanges from March, 1902.*

---

- BATH Natural History and Antiquarian Field Club, Proceedings of.  
Vol. x. no. 1. Bath, 1902. *From the Club.*
- BELFAST Naturalists' Field Club. Annual Report. Belfast, 1901.  
*From the Club.*
- BIRDS, A Dictionary of, by Alfred Newton and Hans Gatlow.  
London, 1893—96. *From Mr. J. H. Gurney, F.Z.S.*
- BRISTOL Naturalists' Society, Proceedings of the. Bristol, 1902.  
*From the Society.*
- BRITISH Association for the Advancement of Science, Report of.  
Belfast, 1902. *From the British Association.*
- BRITISH Birds. G. P. Moore, F.L.S. London, 1879.  
*From Mr. J. H. Gurney, F.Z.S.*
- BUCKLEY, Thomas Edward. In Memoriam, by J. A. Harvie-Brown,  
F.R.S.E., F.Z.S. Reprint from The Annals of Scottish Natural  
History. *From Mr. J. A. Harvie-Brown.*
- CARDIFF Naturalists' Society. Report and Transactions. Vol. xxxiii.  
Cardiff, 1902. *From the Society.*
- CETACEA, Recent Memoirs of the, by Professors Eshricht, Reinhardt,  
and Lilljeborg. Ray Society. London, 1886.  
*From Mr. T. Southwell, F.Z.S.*
- CHICAGO Academy of Sciences. Bulletin no. iii., Vol. ii. The Gross  
Anatomy of Limnæa Emarginata, Say, Var. Mighelsi, Binney,  
by F. C. Baker, June, 1900. *From the Academy.*
- Paleontology of the Niagaran Limestone in the Chicago  
Area. The Crinoidea, by Stuart Weller, June, 1900.  
*From the Academy.*
- CONSPECTUS Generum Avium. C. L. Bonaparte. Tom. 1 and 2, 1850,  
1857. *From Mr. J. H. Gurney, F.Z.S.*

- CROYDON Natural History and Scientific Society. Proceedings and Transactions. Croydon, 1902. *From the Society.*
- EALING Natural Science and Microscopical Society. Report for 1901—02. *From the Society.*
- EGGS of British Birds, Catalogue of, by Rev. S. C. Malan, M.A., London, 1878. *From Mr. J. H. Gurney, F.Z.S.*
- ESSAI sur la Constitution Morphologique de la Tête de l'Insecte, par Charles Janet. *From the Author.*
- ETUDES sur les Fourmis, les Guêpes et les Abeilles, par Charles Janet. *From the Author.*
- GENERA Insectorum of Linnæus. J. Barbot. London, 1781. *From Mr. J. H. Gurney, F.Z.S.*
- GEOGRAPHICAL Journal, The, including the Proceedings of the Royal Geographical Society. March, 1902—March, 1903. *From Mr. H. G. Barclay, F.R.G.S.*
- GEOLOGICAL Society, Quarterly Journal of the. Nos. 227—230. August 12th, 1901—15th May, 1902. *From Col. Feilden, C.B.*
- GLASGOW, Transactions of Natural History Society of. Vol. vi. New Series. Part 2. June, 1902. *From the Society.*
- HARVARD College, Bulletin of the Museum of Comparative Zoology at. Vols. xxxix., xl., xli. no. 1. *From the Librarian, Cambridge, U.S.A.*
- HASTINGS and St. Leonards Natural History Society. Ninth Annual Report, 1902. *From the Society.*
- HOOKE, Sir William Jackson. A Sketch of the Life and Labours of, by Sir J. D. Hooker, K.C.S.I., F.R.S. *From the Author.*
- IBIS (The) a Quarterly Journal of Ornithology. Edited by P. L. Selater, D.Sc., F.R.S., and A. H. Evans, M.A., F.Z.S. April, 1902—January, 1903. *From Mr. G. F. Buxton.*
- LATER Tertiary History of East Anglia, A Sketch of the, by F. W. Harmer, F.G.S. Reprinted from Proceedings of the Geologists' Association. *From the Author.*
- LEPIDOPTERA of the British Islands. Vol. viii., Heterocera. Geometrina. Charles G. Barrett, F.E.S. London, 1902. *From the Author.*
- LEWIN (W., F.L.S.) The Birds of Great Britain, systematically arranged, accurately engraved, and painted from nature; with descriptions, including the natural history of each bird. [In English and in French.] 8 vols. in 4. 4to. London, 1796—1801. *From Mr. J. H. Gurney, F.Z.S.*

- LEYDEN MUSEUM. Notes from the Royal Zoological Museum of the Netherlands at Leyden. Edited by Prof. H. Schlegel, and continued by Dr. F. A. Jentink. 10 vols. in 5. 8vo. Leyden, 1879—88. *From Mr. J. H. Gurney, F.Z.S.*
- LIFE of William Smith, LL.D., by Henry Woodward, LL.D., F.R.S., F.G.S. Reprinted from Proceedings of Bath Natural History and Antiquarian Field Club. *From Dr. Woodward.*
- LLOYD Library of Botany, Pharmacy, and Materia Medica, Bulletin of, Reproduction Series, No. 1 and 2, 1900—01. Pharmacy Series, No. 1, 1902. Cincinnati O., U.S.A. Mycological Series, Nos. 1 and 2. Mycological Notes, by G. G. Lloyd. Cincinnati O. Nos. 5—9. *From the Lloyd Library.*
- MANCHESTER Geological Society. Parts 10—17, Vol. xxvii. Parts 1, 2, 3, Vol. xxviii. *From the Society.*
- Literary and Philosophical Society. Memoirs and Proceedings. Part 1, Vol. xlv. Part 2, Vol. xlvii. *From the Society.*
- MEXICO, Boletín del Instituto Geológico de. Num. 15. Las Rhyolitas de Mexico. Mexico, 1901. *From the Director.*
- MICROSCOPICAL Society, Journal of the Royal. Parts 2, 3, 4, 5, 6, 1902. Part 1, 1903. *From the Society.*
- MONTANA, Bulletin of the University of. Summer Birds of Flathead Lake, by P. M. Silloway, 1901. *From the University.*
- MOSCOU, Bulletin de la Société Impériale des Naturalistes, Année 1901. Nos. 3 and 4. *From the Society.*
- MUSEUM d'Histoire Naturelle des Pays-Bas. Revue méthodique et critique de la Collection des Oiseaux, par H. Schlegel. In 4 vols. 8vo. Leyde, 1862—80. *From Mr. J. H. Gurney, F.Z.S.*
- MY Nature Note-Book, by E. Kay Robinson, London, 1903. *From the Author.*
- NORTHANTS Natural History Society, Journal of the. Vol. xi., nos. 85—88., 1901. *From the Society.*
- NORTH STAFFORDSHIRE Field Club. Annual Report and Transactions. 1901—1902. Vol. xxxvi. *From the Club.*
- NORTHUMBERLAND, Durham, and Newcastle-upon-Tyne, Natural History and Transactions of. Vol. xii. Part 2. Vol. xiv. Part 1. *From the Society.*
- NEW ZEALAND Institute, Vol. xxxiv., 1901. Wellington, N. Z. *From the Institute.*



NOTES sur les Fourmis et les Guêpes par Charles Janet.

*From the Author.*

NOVA SCOTIAN Institute of Science. Proceedings and Transactions of. Vol. x. Part 3. Session 1900—01. *From the Institute.*

PETERBOROUGH Natural History, etc., Society. Precis of Thirtieth Annual Report, 1901. *From the Society.*

PLYMOUTH Institution and Devon and Cornwall Nat. Hist. Soc. Annual Report. Plymouth, 1901. *From the Institution.*

ROYAL Institution of Great Britain, Proceedings of. Part 3. Vol. xvi. London, 1902. *From the Institution.*

ROYAL Physical Society, Proceedings of the. Session 1900—1901. Edinburgh, 1902. *From the Society.*

SCIENTIFIC and Learned Societies of Great Britain and Ireland, Official Year-Book of the. London, 1901.

*Purchased by the Society.*

SCOTTISH Naturalist, The. Vols. i.—vi., 1871—82.

*From Mr. J. H. Gurney, F.Z.S.*

SMITHSONIAN Institution, Annual Report of. Washington, 1902.

*From the Institution.*

SOUFRIERE, in St. Vincent, in 1902, Report on the Eruptions of the, and on a Visit to Montagne Pelee, in Martinique. Part 1, by Tempest Anderson, M.D., B.Sc., F.G.S., and John S. Flett, M.A., D.Sc., F.R.S.E. Phil. Trans. of Royal Society.

*From Dr. Tempest Anderson.*

SOUTH LONDON Entomological and Natural History Society, Proceedings of the, for 1901. *From the Society.*

SOUTHPORT Society of Natural Science. Sixth Report, 1900—01. Seventh Report, 1901—02. *From the Society.*

UNITED STATES Department of Agriculture. North American Fauna, nos. 20, 21, 22. Washington, 1902.

*From United States Department of Agriculture.*

——— Geological Survey. Twenty-first Annual Report, 1899—1900. Parts 5 and 7, and Maps to Part 5. Washington, 1900-1.

*From the Director.*

——— Reconnaissances of Cape Nome and Norton Bay Regions, Alaska in 1900. Geology and Mineral Resources of Copper River District Alaska, Washington, 1901. *From the Director.*

——— Geological Survey. Mineral Resources of the United States, by David T. Day, Washington, 1901. *From the Director.*

- UNITED STATES Geological Survey. Bulletins of the, nos. 177—190,  
192—194. Washington, 1901—2. *From the Director.*
- Geological Survey. Glacial Formations and Drainage  
Features of the Erie and Ohio Basins, by Frank Leverett.  
Washington, 1902. *From the Director.*
- UPSALA, Bulletin of the Geological Institution of. Part 2. Vol. v.  
Upsala, 1902. *From the Institution.*
- WIGHT, Natural History of Isle of, by G. A. Martin, M.D. London,  
1849. *From Mr. J. H. Gurney, F.Z.S.*
- YORKSHIRE Naturalists' Union, Transactions of the. Parts 26, 27,  
1900. *From the Union.*
- The Alga-Flora of, by W. West, F.L.S., and G. S. West, B.A.,  
A.R.C.S. *From the Yorkshire Naturalists' Union.*
- Naturalist, The. 2 vols. 1895—96, 1897—98.  
*From Mr. J. H. Gurney, F.Z.S.*
- ZOOLOGICAL Society, Catalogue of the Library of. London, 1887.  
*From Mr. J. H. Gurney, F.Z.S.*
- Society, Report of Council, for 1901.  
*From Col. Feilden, C.B.*
- ZOOLOGIST, The. A Monthly Journal of Natural History, 1902—3.  
*From Mr. G. F. Buxton, F.Z.S.*
-



## ADDRESS.

*Read by the President, HENRY WOODWARD. LL.D., F.R.S.,  
V.P.Z.S., F.G.S., Late Keeper of Geology, British Museum,  
to the Members of the Norfolk and Norwich Naturalists'  
Society, at their Thirty-fourth Annual Meeting, held at the  
Norwich Castle-Museum, March 31st, 1903.*

LADIES AND GENTLEMEN—In occupying this chair to-night, I feel somewhat like a stranger amongst you although known personally to a good many of your members. It has been (as you are aware) occasionally the practice of this Society, to elect as its President, some scientific man living at a distance: under these circumstances I was assured that an occasional visit would be accepted as a sufficient compliance with duty. I accordingly planned to be present and read a paper last November, but was unfortunately prevented from attending at the last moment, and the paper was read for me by my friend Mr. F. W. Harmer. To-night, however, I am here to deliver my address as your President, in person, and to thank you for your past forbearance and kindness towards myself.

As you have just heard from the Treasurer, the finances of the Society are in a fairly satisfactory condition, though owing to the heavy expense entailed by the last part of the 'Transactions,' we have had to draw £20 from the Life Membership Fund, in order to meet all liabilities. We have had to use some of the capital towards the expenditure of the year. However, I regard it as a sign of the vitality of a Society, rather to exceed its income, than to accumulate funds for which it cannot find an outlet.

The number of members now stands at 271, showing a slight increase over last year. We have lost, by death, the Earl of Kimberley, and Mr. H. D. Geldart, both Vice-Presidents of the

Society, also Mr. Francis Dix, Lord Cranworth, Mr. J. Nigel Gurney, and Dr. John Lowe; obituary notices of whom will appear in due course.

Our library is increasing rapidly. We have received donations of books and papers from Mr. J. H. Gurney, Colonel Feilden, Mr. H. G. Barclay, Mr. G. F. Buxton, Mr. C. G. Barrett, Mr. T. Southwell, Mr. F. W. Harmer, Mr. J. A. Harvie-Brown, Dr. H. Woodward, Mr. E. Kay Robinson, M. Charles Janet. Sir J. D. Hooker has also sent us a Sketch of the Life of Sir W. J. Hooker, and a medallion of Linnæus. The latter has been framed and hung in the Committee Room of the Castle-Museum. In addition to the above, we have received, as usual, the publications of a large number of Societies, with whom we exchange. I would draw your attention also to the increasing number of American publications received, especially to the Reports of the Smithsonian Institution, and those of the United States Geological Survey.

Last January, Major E. F. Becher presented the Society with a large number of Bird-skins, from India and the Mediterranean. These skins, which were in very fine condition, were examined by Mr. J. H. Gurney and Mr. Southwell. It was decided by the Committee that 187 of the skins should be presented to the Norwich Castle-Museum, and the remainder to the Yarmouth Museum, through the Hon.-Secretary of our Great Yarmouth Section.

At the April Meeting in last year Mr. F. D. Longe read a paper on "Protoplasm and Automatism," and Mr. W. Ayrton, who was introduced by the Hon. Secretary, exhibited some drawings of the earlier stages in the life history of various fishes, also, coloured sketches of *Stephanoceros*, *Melicerta*, etc. Mr. Thouless read a short entomological note.

In May Mr. J. T. Hotblack discussed a paper on "The Soils and Subsoils of Norfolk," by Mr. H. B. Woodward, F.R.S., F.G.S.

On 14th August an excursion of the members was undertaken to Whitwell Common. About ten members and friends formed the party, and some botanising was done.

On 30th September Rev. A. Miles Moss read a paper, entitled, "Three Weeks' Holiday among the Butterflies of Switzerland."



On 20th October Mr. T. Southwell contributed an account of a Diary kept in 1800—01, by the late Rev. Dr. Sutton, at Holme-next-the-Sea. Mr. Arthur Bennett, F.L.S., sent a paper on "The Distribution of *Peucedanum palustre* and *Lathyrus palustris* in Britain." Mr. F. Long made some remarks on an unusual form of *Mentha piperita* found in Norfolk, and Mr. Patterson read some "Notes from Yarmouth."

On 25th November Mr. F. W. Harmer, F.G.S., read a paper by the President on "East Anglian Geology," illustrated by lantern slides, and Mr. J. H. Gurney, F.Z.S., exhibited photographs of the Bass Rock during the nesting season of the Gannets.

At the meeting on 27th January, 1903, Mr. W. G. Clarke sent a paper on "The Meres of Wretham Heath," which was read by Mr. F. Leney. Other papers were, "*Pyrola rotundifolia*, Lin. in East Anglia," by Mr. A. Bennett, F.L.S.; A List of "Flowers, Fungi, and Mosses," from N.W. Norfolk, by Rev. W. E. Thompson; Entomological Notes by Mr. W. H. Tuck; Winter Notes by Mr. Patterson; and Mr. F. Long exhibited some Botanical Specimens mounted by himself.

On 24th February Mr. A. W. Preston, F. R. Met. Soc., read his "Meteorological Notes" for 1902; Mr. T. J. Wigg, "Notes on Herring Fishery" for 1902; and Mr. J. H. Gurney, F.Z.S., sent a Note on the nest of a Siberian Jay.

The subject I intend to bring before you to-night is:—

## THE DISTRIBUTION OF LIFE IN ANTARCTIC LANDS.

### INTRODUCTORY—GLACIAL AND INTERGLACIAL PERIODS.

During the past sixty years, Astronomers, Physicists, Meteorologists, and Geologists, have all laboured to elucidate the causes and extent of the *Glacial period*, or to speak more correctly—*periods*.

It seems certain that such epochs have been, *in great measure*, brought about by a combination of astronomical causes, such as the inclination of the earth's axis, the ellipticity of her orbit, and her position in relation to the sun in perihelion and aphelion. But to whatever combination of causes such alterations of climate in the

northern and southern regions of our globe may be due, we have a right to demand from the astronomers and physicists the concession, that mild interglacial periods *of considerable duration* must have prevailed at or near the poles, certainly within Tertiary times. Sir Robert Ball says: "It is essential to the astronomical theory of the Ice Age that such interglacial and glacial periods must have alternated with one another at the opposite poles of our earth."

The facts of the occurrence of extensive beds of coal and lignite, associated with shale-beds rich in leaves of dicotyledonous trees and shrubs in Arctic America, in North Greenland, Spitzbergen, &c., within the Arctic circle; and beds of coal with abundant tree-trunks in Kerguelen's Island,\* Chatham Islands,† &c., in the Antarctic, *where no trees now exist*, testifies to great changes of temperature in the circumpolar regions of our earth, such as would, if they recurred, render these lands again habitable by plants and animals belonging to warmer temperatures, and greatly reduce, if not entirely remove, all traces of snow and ice over these areas.

Let us take a glance at the two polar regions of our earth. First: let us note the fundamental difference between Arctic and Antarctic conditions as regards topography.

In the *Northern Hemisphere* there is a *polar sea* almost completely *surrounded by continental land*, and continental conditions for the most part prevail.

In the *Southern Hemisphere* there is *almost certainly a continent at the South Pole*, which is *completely surrounded by the ocean*, and the most simple and extended oceanic conditions are met with.

Below the parallel of 40° South latitude, lie, Tasmania, the South Island of New Zealand, numerous small Islands (such as the Chatham Islands, Auckland Island, Campbell Island, Kerguelen Island, Heard Island, Prince Edward Islands, Tristan da Cunha, Gough Island, Bouvet Island, South Georgia, Sandwich Group, South Shetland Islands, Falkland Islands), and about 1500 miles linear of the South American Continent and Cape Horn. At the pole itself lies the great unexplored Antarctic Continent, surrounded

\* 50° S. Lat. Kerguelen's Island.    † 45° S. Lat. (Chatham Islands).



by the vast waters of the Southern Ocean, covering an area of 30,000,000 square miles. Over the area, south of the parallel of 50° S. latitude, a temperature below 32° Fahr. prevails.

#### ATMOSPHERE.

South of latitude 45° S. we meet with low atmospheric pressure all the year with *strong westerly and north-westerly winds*, and large rain and snow-fall *all round* the South Polar regions. The mean pressure being *less than 29 inches*. But there are many indications that the extreme South Polar area is occupied by a vast *anticyclone*, out of which winds blow, towards the girdle of low pressure outside the ice-bound region.

Ross found a gradual rise of pressure south of latitude 75° S., and all antarctic voyagers agree that *when near the ice*, the majority of winds are from the *south and south-east*, and bring clear weather with a fall of temperature, while northerly winds bring thick fogs with rising temperature.

ANTARCTIC ICE.—The most striking feature of the Antarctic is the *huge table-shaped icebergs*. These flat-topped icebergs have a thickness of 1200 to 1500 feet, marked by regular stratification, and presenting lofty *perpendicular cliffs*, which rise 150 to 200 feet above, and sink 1100 or 1400 feet below the level of the sea.

Their form and structure clearly indicates that they were *formed on an extended land surface*, and have been pushed out over low-lying coasts into the sea.

Ross sailed for 300 miles along the face of a great ice-barrier from 150 to 200 feet high, off which he obtained depths of 1800 and 2400 feet. This was evidently the sea front of a great creeping glacier or ice-cap just then in the condition to give birth to those table-shaped icebergs, *miles in length*, which have been described by every antarctic voyager.

*But all* the Antarctic land is *not surrounded by inaccessible cliffs of ice*, for along the seaward face of the great mountain ranges of Victoria Land, the ice and snow which descends to the sea, apparently forms cliffs not higher than ten to twenty feet, and in

1895, Kristensen and Borchgrevink landed at Cape Adare on a pebbly beach, occupied by a Penguin rookery, without encountering any land-ice descending to the sea.

Where a Penguin-rookery is situated, we may be quite sure that there is open water for a considerable portion of the year, and consequently landing might be effected without much difficulty or delay. A party once landed might with safety winter at such a spot, where Penguins would furnish an abundant supply of food and fuel.

A properly equipped party of observers situated at a point like this on the Antarctic Continent for one or two winters might carry out a most valuable series of observations, make successful excursions towards the interior and bring back valuable information as to the probable thickness of the ice-cap, its temperature at different levels, its rate of accumulation, and its motion. As to the evidence of an Antarctic Continent, the form and structure of the Antarctic icebergs, show that they were built up on and had flowed over an extensive land surface. As they float north and break up in warmer latitudes they distribute over the floor of the ocean large quantities of glaciated rock-fragments and land detritus.

These materials have been dredged up by the "Challenger" in considerable quantities, and show the rocks of this land to be gneisses, granites, mica-schists, quartz-diorites, sandstones, limestones, and shales ; indicating continental land, and were clearly transported from land at the South Pole.

#### Rocks.

D'Urville describes rocky islets off Adélie Land composed of *granite and gneiss*.

Wilkes found on an iceberg, near the same place, boulders of red sandstone and basalt.

Borchgrevink and Bull fragments of mica-schists and other continental rocks from Cape Adare.

Dr. Donald brought back a piece of red jasper or chert containing *Radiolaria*, and Sponge spicules from Joinville Island.

Captain Larsen brought from Seymour Island pieces of fossil

coniferous wood, and fossil shells of *Cucullæa*, *Cytheræa*, *Cyprina*, *Teredo*, and *Naticæ*, having a close resemblance to species of lower Tertiary age in Patagonia, &c. These fossil remains indicate a much warmer climate in these areas in times past.

It is not to be expected that a *living land-fauna* will now be discovered beyond the Penguin rookeries. *Fossils* will, however, throw important light upon the age of the Antarctic land.

As Tertiary, Mesozoic, and Palæozoic Fossils have been freely met with in Arctic regions, we are justified in anticipating the discovery of like forms on the Antarctic lands, with corresponding former climatic changes, such as the presence of these forms of life would demand.\*

#### KERGUELEN ISLANDS, LAT. 49°20'S. LONG. 69°24'E.

In Sir James Clark Ross's voyage to the Antarctic (1847, 2 vols. Murray), he visited the Island of Kerguelen in 1840, and records the occurrence of a bed of Coal, *four feet thick* and forty feet in length (exposed), near Arched Point, *Christmas Harbour*, thirty feet above the sea, and covered by basalt. On the north side of the bay formed by Cape François, is a thin seam of coal (two or three inches in thickness) covered by a kind of "slag" and by basalt. Silicified trunks of trees are also met with, some of which (brought home by Sir Joseph Hooker) are preserved in the British Museum.

The coal is described as slaty, of a brownish-black colour, and the fracture is like wood-coal. Both the wood and the coal-seam are probably of Tertiary age. (A trunk of a large tree, seven feet in circumference, and much silicified, was dug out of soil below the basalt.) The wood, which for the most part is highly silicified, is found enclosed in the basalt, whilst the coal crops out in ravines, in close contact with the overlying porphyritic and amygdaloidal greenstone.

Ross mentions another bed of coal in Cumberland Bay, one foot in thickness (light and friable with a black glossy fracture like cannel coal, which does not soil the fingers). It is covered by a porphyritic amygdaloidal and greenstone rock. Another bed of coal

\* See Sir John Murray: Proc. Roy. Soc., 1898, vol. lxii. pp. 424—451.

in an adjacent hill is two feet thick, of a dull brownish black colour; and it is said to burn very well.

When Captain Cook visited Kerguelen *in the height of summer* (1768), *the land was covered with snow*, and only five plants in flower were collected.

The observations were made by Surgeon Robert McCormick and Assistant-Surgeon Joseph D. Hooker, of the "Erebus" (1839-43). Hooker records 150 living plants (18 flowering plants, 3 ferns, 25 mosses, 10 *Jungermannia*, 1 fungus, the rest (93) lichens and seaweeds).

Mr. R. McCormick who accompanied Ross, wrote:—"Since the successive overflowings of volcanic matter destroyed the forests which at one period clothed this land, of which the fossil trees and numerous beds of coal afford abundant proof, it has remained in a state of almost vegetable desolation ever since."

Writing of Victoria Land, Sir James Ross in February, 1841, said: "Had it been possible to have found a place of security upon any part of this coast where we might have wintered in sight of the brilliant burning mountain (*Erebus*), and at so short a distance from the magnetic pole; both of these interesting spots might easily have been reached by travelling parties in the following spring. It was, however, some satisfaction to know that we had approached the pole some hundreds of miles nearer than any of our predecessors."

And here I may record that on March 26th, 1903, Relief Ship "Morning" sends us good news from Port Lyttleton, New Zealand; and we know that Commander Scott with his crew in the "Discovery," entered the Antarctic Ice-pack on 23rd December, 1901, lat. 67° South, reached Cape Adare on 9th January, 1902, Wood Bay on 18th January, and landed on 20th in an excellent harbour, lat. 76° 30 m. South, visited Cape Crozier on 22nd, examined the Ice Barrier, and took soundings in long. 165° and found that the ice-barrier trended northwards. High snow slopes rose towards the glaciated lands with occasional bare precipitous peaks. They followed the coast as far as lat. 76°, long. 150° 30 min.; and then retired to *Winter Quarters* in McMurdo Bay, Victoria Land.



Sledge-parties reached lat.  $80^{\circ} 17'$  min. South, the furthest point ever attained. Ranges of high mountains were seen to continue through Victoria Land. Foothills resembling the Admiralty range were observed at  $160^{\circ}$ . Lowest temperature  $62^{\circ}$  below zero !

Dr. J. W. Gregory, F.R.S. ('Nature,' April 25th, 1901), following Bernacchi's Topography of South Victoria Land (R. G. Soc., March 18th, 1901) suggested various problems for the "Discovery" to work out.

(a.) Whether the Antarctic Lands to the South of Australia, Victoria Land, Wilkes' Land, Adélie Land, Geikie Land, Newnes Land, Termination Land, are all part of one great continent, or members of an Antarctic Archipelago.

The earlier voyagers all maintained the existence of an *Antarctic Continent*, and Suess' theory supports this view.

Ritter suggests that the Volcanic chain forming the Eastern face of Victoria Land is the continuation of the New Zealand volcanic line, and that the coast of Wilkes' Land is a southern extension of the Australian plateau. This plateau is bounded to the north and east by the great fold passing through New Guinea, New Caledonia, and New Zealand.

The rocks dredged by the "Challenger" and the "Valdivia" are like those of Southern Australia; and those of Victoria Land examined by Teall, are like the rocks of New Zealand. Geologically then the Antarctic is an Archaean land with rocks similar to those of Australia; and its eastern side is volcanic.

Indirect evidence favours a *land connection* with a chain of peaks stretching from Victoria Land and the vicinity of Mounts Erebus and Terror to Graham's Land.

If this great line can be proved, the volcanic chain encircling the Pacific Ocean will be rendered complete, joining up the Antarctic land with New Zealand and Australia on the one hand, and Graham's Land to South America on the other. We do not expect a land fauna on the Antarctic, but Secondary and Tertiary fossils may be discovered, and furnish still further evidence of an old land connection.

CORRESPONDENCE IN NORTH AND SOUTH CONDITIONS,  
OR, "BIPOLARITY," AND BIPOLAR FAUNAS.

There is an interesting question too, in reference to the littoral and shallow water fauna and flora of the Antarctic lands as compared with the Arctic.

The *Sirenia* are represented in the south by *Halicore australis*, off the coast of Queensland, Australia, 30° only south of the equator, whilst *Rhytina gigas* (= *R. Stelleri*) occurs in peat-deposits on Behring Island, and was living in numbers around its shores as lately as 1750, 60° north of the equator. Probably in earlier times *Halicore*, or its allies, may have extended southwards to the shores and islands of the Antarctic lands.\*

Of the Cetacea, the genus *Balæna* is represented in the Arctic Seas by *B. mysticetus*, *B. biscayensis* occurring in the North Atlantic and *B. japonica* in the North Pacific, the South Atlantic having *Balæna australis*, and the South Pacific *B. antipodarum* and *B. novæ-Zelandiæ*.

Of the *Pinnipedia*, Seals and Walruses, the Northern Sea Lion, *Otaria stelleri*, the largest of the genus, ten feet long, from the North Pacific is represented by *Otaria jubata*, the Patagonian and Southern "Sea Lion," and some other corresponding species as *O. californiana* (California) and *O. ursina*, North Pacific, Prybiloff Island; *O. pusilla*, Cape of Good Hope; *O. forsteri* and others from Australia. The Walrus (*Trichechus*) is only found in the Arctic Seas, North Atlantic, and North Pacific Oceans.

The true Seal (*Phoca*) is common to the North Atlantic and the North Pacific Coasts, but does not occur in the Southern Ocean.

"The Sea-Leopard" *Ogmorhinus* occupies the Antarctic and Southern temperate seas.

The Elephant Seal (*Macrorhinus*) or Sea Elephant, the largest of the whole family (twenty feet long), was formerly abundant in the Antarctic Seas and also found on the coast of California.

\* According to Ross and many other explorers, great banks of *Laminaria* and other sea-weeds, similar to those around Behring Island, on which the *Rhytina* fed, abound in the South Polar Seas.

The Honourable Walter Rothschild lately obtained one, at great expense, and presented it to the National Museum.

The Penguins (Impennes) may be said to represent in the Southern Ocean the Auks and Divers of the Northern Seas.

Whether these are *all* (as the Penguins and Auks are,) *merely representative forms*, or whether they may have in some cases been able to cross the equatorial region and reach the Arctic from the Antarctic is an open question. Certain deep-sea water forms of Crustacea may have done so along lines of cold currents in the ocean, but this does not so easily explain the presence of shore and surface-dwelling forms of life having a common faeies if not an actual close family relationship. Still, it must be borne in mind that, cold polar currents do reach near to the equator on the South American Chilian Coast. The Sea Lions and the Elephant Seal have thus, in all probability, been enabled to "cross the line."

#### ANTARCTICA IN CONNECTION WITH THE NEIGHBOURING LAND-AREAS.

Fifty years ago there were very few men of science bold enough either to suggest or to accept the theory that *the Geographical Distribution of Plants and Animals* had actually commenced far back in past geological time.

Professor Edward Forbes, S. P. Woodward, Darwin, Wallace, Huxley, Sclater, Blanford, H. O. Forbes, and others, have advocated these views, but they have become greatly modified in our own day since the time at which they were first expressed.

*Australia* was deemed to be a survival from the Jurassic period, *New Zealand* from the Triassic, and so on.\* *Australia* is now known to possess representatives of almost every formation from Cambrian and Silurian times, to the Tertiary.

The fact remains that the Flora and Fauna of *Australia* and *New Zealand* present remarkable characteristics which, until lately, were believed not to exist, on any other part of the earth's surface.

\* The great Struthious (wingless) birds of *New Zealand* were formerly supposed to be the descendants of the makers of the tridactyle footprints left upon the slabs of Triassic sandstone in the Connecticut Valley and elsewhere. These footprints have been described by the late Professor O. C. Marsh, and shown to have been left by bipedal Dinosaurian reptiles, which were living in the Triassic Period, before birds had made their appearance.



## IN FAVOUR OF A SOUTHERN CONNEXION OF ANTARCTIC LANDS.

A. R. WALLACE in 'Island Life,' says :—"Whenever we find a considerable number of the Mammals [*or flightless birds*] of two countries that exhibit distinct marks of relationship, we may be sure that an actual land-connection, or a close approach to one, has at one time existed."

CHARLES DARWIN ('Origin of Species,' vol. ii., p. 190, 1888,) says :—"New Zealand is plainly related to South America, although the next nearest continent is so enormously remote that the fact becomes an anomaly. This difficulty disappears in the view that New Zealand, South America, and the other Southern lands have been stocked in part from the Antarctic Islands, when they were clothed with vegetation during a warmer Tertiary period, before the commencement of the last Glacial epoch."

DR. W. T. BLANFORD, F.R.S. (Pres. Geol. Soc. 1890) wrote in his address :—"The biological evidence of a former land connection between South America and Africa is very strong, and if the difficulty about the *depth* of the intervening ocean is overcome, there is no improbability in the suggestion that, at some period of geological history, an important continent having connections with South America, South Africa, and New Zealand, may have occupied the Antarctic Arca."

PROFESSOR HUXLEY "On the Distribution of Gallinaceous Birds," P.Z.S., 1868, says :—"Of the two sections (the *Alectropodes* and the *Peristeropodes*), the former are restricted to the Northern, and the latter to the Southern Hemisphere." He goes on to compare the Curassows of South America with the Megapodes or Mound-builders of Australia ; and he considers that they are sprung from one stock ; and that the common ancestors must have developed on some large area in the Southern Hemisphere, from which there was access both to South America and Australia.

PROFESSOR W. K. PARKER compares the Crows' skulls, or *Egithognathous* birds, and finds that the "*Lyre-birds*" of Australia are much more closely related to the *Tinamous* than to the modern forms. The "*Jacanas*" (Rallidæ) : South America, Africa, India, Australia. The African Secretary-bird (*Serpentarius secretarius*), is

represented by the *Caracara* of Central and South America, and more closely by the *Cariama* (*Cariama cristata*), which has its fossil representative in the gigantic form, named *Phororhacos*, from Patagonia.

It is probable that a very large extent of ancient land around the present Antarctic continent has been lost to us by submergence, and that the rather numerous small islands in the surrounding ocean are but the buoys or land-marks indicating large areas of more or less, continuous land, which has since disappeared. This is supported by the many signs of volcanic activity in recent times which these islands display. Doubtless land connections stretched from South America, to the South Shetlands, the South Orkneys, South Georgia, and to Kerguelen Island.

#### PECULIARITIES OF SOUTHERN LAND-FAUNAS.

Let us look for a moment at the peculiarities of the Southern Land-faunas:—

In no other part of the world do we find such a remarkable assemblage of struthious birds, both of living and extinct forms, distributed over the continents and islands which encircle the Antarctic. In South America, we have the *Rhea americana*. In Africa, the Ostrich *Struthio camelus*. In Mauritius we have numerous (8) species of *Aepyornis* (an extinct wingless bird as large as the *Dinornis* of New Zealand), remarkable also from the great size of its eggs. In Mauritius we find the extinct Woodhen *Aphanapteryx*. In Rodriguez nearly the same form, *Erythromachus*, was also once common. In Australia we have the Emeu and Cassowary living, and the extinct *Dromornis* and *Genyornis*. In New Zealand about twenty species of *Dinornis*, or "Moa," the largest attaining a height of at least twelve feet, were once *most abundant*, and peopled both islands (as the presence of their bones everywhere testifies) but have now been entirely exterminated by the Maoris as the similar large bird, the *Aepyornis* was destroyed by the natives in Madagascar. The surviving form is the "Kiwi" or *Apteryx*, which is also found fossil (*Diaphorapteryx*) in the Chatham Islands 500 miles to the east of Port Lyttelton, New Zealand. *Cubalus*, a flightless Crane, akin to the Woodhens, also survives in

the Chatham Islands. This *Cabalus* occurs also on Lord Howe Island, 300 miles off the Coast of Eastern Australia to the far north west of Chatham Island.

Of other flightless birds, we have the *Aptornis defossor*, a large extinct Rail, and Mantell's *Notornis*, recently killed off in New Zealand, a *Porphyrio* also in New Zealand and Norfolk Island.

The Penguins, of which many species are known, occur on the Islands and Continents of all the Southern lands, just as the Great Auk was at one time distributed around all the circumpolar lands in the Northern Hemisphere, but the Great Auk was not found within the Arctic circle.

AUSTRALIA possesses a peculiar existing fauna belonging to the *Monotremata* and *Marsupialia*. The former: *Ornithorhynchus* and *Echidna* represent the sole surviving forms of the lowest division of the Mammalia, viz., the PROTOTHERIA, and to the order, *Monotremata* (egg-laying Mammals), which are confined to Australasia (New Guinea, Australia, and Tasmania). The latter comprising the pouched Mammals, known as the Kangaroos, Wombats, Dasyure, Thylacine, Rat-Kangaroo; *Macropus*, Rock-Wallabies (*Petrogale*), Hare-Wallaby (*Lagorchestes*), *Dorcopsis*, *Dendrologus* (Tree-Kangaroo); *Bettongia*, &c.

*Fossil forms* are numerous, some like *Diprotodon* and *Nototherium* far exceeding the living forms in size. There are also many other fossil genera, described by Owen, such as *Sthenurus*, *Procoptodon*, *Palorchestes*. In *Diprotodon*, the fore and hind limbs are not differentiated, but are of nearly equal length, and not adapted for rapid movement.

Added to these are the Phalangiers, Cuscus, Flying Phalangiers; the Koala; and the extinct *Thylacoleo carnifex*, most probably related to the Wombats (*Phascolomys*). Added to these are the Bandicoots (*Perameles*); the Tasmanian Wolf (*Thylacinus*); the Tasmanian Devil (*Dasyurus*); the Pouched Mole (*Notoryctes*); and the Opossums (*Didelphys*), common to America and Australia.

The curious and now almost extinct "Tuatara" Lizard (*Sphenodon* or *Hatteria*), now confined to an Islet off the North Island of New Zealand, formerly existed also in Chatham Islands 500 miles distant by sea.

P.S.—Those who are interested in following up the suggestions of this Address and inquiring further as to the special members of the Fauna and Flora of the Southern lands and their inter-relations, will do well to read Dr. H. O. Forbes' paper read before the Royal Geographical Society, March 13th, 1893, entitled: "The Chatham Islands: their relation to a former Southern Continent" (Supplementary Papers Royal Geographical Society's Journal, vol. iii. part 4, 1893, pp. 607-637), to which the author desires to acknowledge his indebtedness for many interesting facts recorded by him.

H. W.

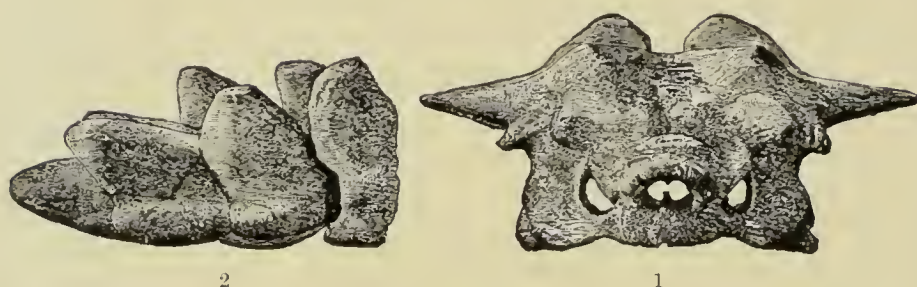
129 BEAUFORT ST.

CHELSEA, S.W.





SIMILARITY OF ANIMALS DISTRIBUTED OVER THE  
SOUTHERN CONTINENTS.



*MIOLANIA* FROM AUSTRALIA,

COMPARED WITH



3

*MIOLANIA* FROM S. AMERICA.

THE GREAT HORNED CHELONIAN (*Miolania*)

Fig. 1. Front view of skull and (2) side view of tail-sheath, of *Miolania oweni* (greatly reduced in size), from the Pleistocene Deposits of Queensland, Australia.

Fig. 3. Front view of skull, with the lower jaw in place, of *Miolania* from Patagonia Argentina (greatly reduced in size), original in the La Plata Museum.

The most remarkable discovery of late years bearing upon the wide distribution of similar animals over the Southern Continents, is that of *Miolania*, an extinct genus of land Tortoise, the head of which is ornamented with peculiar bony plates, and the tail is encased in a bony sheath, resembling the tail of *Glyptodon*. The first example of *Miolania* was found in Queensland, Australia; the second on Lord Howe Island, 300 miles to the eastward of the Great Barrier Reef. The third example was lately obtained by Dr. Moreno in Argentina, South America! yet they can only be differentiated specifically, notwithstanding their enormously wide geographical separation from one another.

Amongst the Amphibia the *Cystognathidae* occur in Australia, Tasmania, and South America.

Of Freshwater fishes we have the Southern "Salmon" *Haplo-chitonidae*, and the Southern Pikes *Galaxiide*, common to New Zealand, Chili, Patagonia, and the Falkland Islands.

Again the remarkable *Dipnoi* and *Osteoglossi* are peculiar to the rivers of Africa, Australia, and South America, and are unknown north of the equator.

*Peripatus* is only known from the West Indies, from South America, South Africa, and Australia.

Among the *Scorpionidae*, the genus *Cercophonius* is only met with in South-east Australia and in South America.

*Placostylus*, a genus of Land-Mollusc, is found in the Solomon Islands, in Fiji, the New Hebrides, Loyalty Island, New Caledonia, Norfolk Island, Lord Howe Island, and in New Zealand.

A summary of the Flora characteristic of the Southern Hemisphere fully confirms the conclusions derived from a study of the Fauna, and establishes beyond a doubt the former existence of extensive land-connections between the Southern Continents and Islands in Tertiary times which have since disappeared beneath the ocean.

#### PLANTÆ. SOUTHERN HEMISPHERE (*Notogera*).

SAXIFRAGÆ. Of the "Saxifrages" the genus *Donnatia* occurs in New Zealand, Tasmania, Chili, and Tierra del Fuego. *Escallonia*,

17 genera met with in New Caledonia, Australia, and Tasmania. *Cunoniæ*, 18 genera common to New Zealand, Mascarene Islands, South Africa, and South America. Only two out of thirty-five genera cross the equator into the Northern Hemisphere.

**PROTEACEÆ.** The *Banksias* have 49 genera and 950 species. Only twenty-five cross the equator. The others belong to Madagascar, Tasmania, New Zealand, and New Caledonia. Some occur fossil in Miocene and Cretaceous Plant-beds in Europe.

**MONOMIACEÆ** (related to the Laurels) 22 genera and 150 species, have the same distribution as above. One genus, *Laurelia*, is common to Chili and New Zealand.

**PERSEACEÆ**, the genus *Cryptocarya*, is common to New Zealand, South Africa, and South America.

**CONIFERÆ**, *Callitris* is common to Africa, Madagascar, Australia. *Fitzroya* is common to Chili and Tasmania.

**PODOCARPEÆ**, 3 genera; distributed 1 in Tasmania, 1 in Chili and South America, and 1 South Africa, Australia, and New Zealand.

*Todea barbara* occurs at the Cape of Good Hope, and in Australia.

*Lomaria alpina*, occurs at the Cape, in Australia, and South America.

*Fuschia* and *Passiflora* are common to New Zealand and South America.

New Zealand and South America have 74 genera in common, 11 identical and 32 closely allied species.

That Earth-movements, on a widely extended scale, have occurred in the South, is evidenced by the very late elevations and subsidences which have taken place in parts of the Andean chain and in Tierra-del-Fuego, also in Kerguelen Island, Eastern Australia, Tasmania, New Zealand, and the Chatham Islands; whilst the vast upheaval of the Himalayan range itself is only of newer Tertiary age.

Dr. Woodward's address was illustrated by about fifty-eight lantern slides, a great number of which were beautifully painted pictures of Birds by Külemann, kindly lent by Dr. H. O. Forbes, Director of the Liverpool Museum, and a series of Arctic views and maps kindly lent by the Royal Geographical Society, besides a number prepared expressly for his address, by Dr. H. Woodward.



## I.

THREE WEEKS' HOLIDAY AMONG THE BUTTERFLIES  
OF SWITZERLAND—JULY 5TH TO 30TH, 1902.

BY THE REV. A. MILES MOSS, M.A.

*Read 30th September, 1902.*

To attempt to give an account of the Butterflies of Switzerland after but a brief three weeks' holiday in that gorgeous country, so replete with its fauna and flora in endless variety, is rather more than *bordering* on presumption. Those three weeks, however, were to me weeks of hard labour in the Entomological sense, and of close and careful observation; and I think I may fairly add, by no means unattended with success.

It is on this account that I have with great pleasure responded to the Secretary's request, and have brought here this evening for your inspection four cabinet drawers containing my captures. I should like to say at once that they of course represent but the merest fraction of those seen, and, for one cause or another, not taken.

Confining oneself to the Butterflies proper, and for the present, at any rate, excluding the Moths, they will be found to contain some 68 species. I observed, in more or less abundance, some 14 others which I had no special desire to take; and there is little doubt that at different times and places several other species whose identity I cannot swear to were seen.

Here, in England, we have barely 60 species; Switzerland, I believe, possesses more than 170; so that I regard my net total of 82 for July as satisfactory and encouraging.

After spending a few days in Dieppe, with which I do not now propose to deal, I journeyed, *via* Paris and Lausanne, to Villars near Bex, at the western extremity of the Rhone valley, reaching it at 5 p.m. on Saturday, July 5th. Here I stayed three weeks, leaving on Monday, July 27th, and concluding my holiday with a couple of days in the district of Zermatt.

After the miseries of a long cold night journeying from Paris, observations commenced through the window of the railway carriage. The snow-clad peaks of the Alps came in sight, the sun streamed forth in a cloudless sky, and the Butterflies were quickly on the wing.

Among the first to show up in considerable numbers were the Marbled Whites (*Melanargia galatea*) and the Ringlets (*Epinephele hyperanthus*).

Then, as though to tempt one to do something rash, the train pulled up for a minute at a luggage siding, and a magnificent specimen of *Limenitis populi* displayed its glory in a few graceful turns over a pile of stones right in front of my carriage window. Once and again it settled, and had my net been rigged up, I should certainly have got out, regardless of consequences. Such want of discretion was, however, outmatched by disability, and on we sped, leaving *populi* to enjoy its freedom, and reaching Bex about 1 p.m. Here there was not much to be done, and I was destined to wait two solid hours before the electric tram could make up its mind to toil up the steep incline to Villars, some 4,000 feet above sea level. The climb took another two hours, but the lethargic pace of the car was to some extent compensated by the gorgeous views which met one at every turn, and here the Butterflies began to show up in great force—Fritillaries, Vanessas, Whites, and Erebias appearing in almost the same profusion as the flowers which lined the banks. On reaching the hotel my first capture was *Aporia crataegi*—the Black-Veined White, a specimen of which I knocked down with my straw hat as I crossed the garden. This fly, now so rare in England, soon proved to be one of the commonest in the district. Entomology, however, had to be put aside for a time, for the primary object of my visit was to take charge of the little church at Villars as Chaplain for four Sundays, and it was now late on Saturday afternoon.

Though I could not resist the temptation of boxing a nice specimen of *Scoria dealbata* which flew out of the grass on my way to church, Entomology proper began on Monday, and as there were no other bug-hunters in the place, I had it all to myself. As a matter of fact, I don't think my captures would have been seriously diminished if half the lepidopterists of Great Britain had been staying there.

Every field was full of flowers, and every flower seemed to have its Butterfly. I knew nothing of the place before starting, but it was very soon clear that it was an admirable hunting ground.

After the customary and, to the Englishman, highly unsatisfactory repast of coffee and rolls, I started off with my big balloon net and a knapsack full of pill boxes, a cyanide bottle, and corked zinc for pinning, intending to give the place a general survey. In an hour and a half I was back at the hotel, full up, having travelled but one hundred yards from the bottom of the grounds. I began to realise that there was work in store for me if I wished to get my insects set, and that I should have to exercise a considerable amount of discrimination in the matter of what to take and what to leave. After emptying my boxes I was off again, and returned with them once more quite full in good time for *déjeuner* at 12.30, and this after rejecting many specimens that I would have made a day's excursion for in England. This second trip carried me through sheer force of will about a quarter of a mile from the hotel. It was quite unnecessary to walk so far, for I believe I could have taken every species in the field immediately adjacent to the grounds.

Given a net and enough boxes I verily believe that if I had been penned up in that one undulating and flowery meadow I could have topped the whole British list in point of species in a remarkably short time.

The sun shone forth in all its splendour, the weather continued hot and fine, and though we had three excessively grand thunderstorms with deluging rain, it always seemed to pick up again. One expected that rain would polish the Butterflies off the face of the earth. There were, for the time at any rate, fewer stinging flies, which were generally an intolerable nuisance, and of course many delicate and wasted Butterflies must inevitably have perished.



A generation of *passé* Mazarine Blues (*Lycaena acis*) seemed to have departed after the first big storm, but I was surprised to notice many species in excellent condition, notwithstanding the rain. Freshly-emerged specimens no doubt they were in many cases, but even *acis* turned up again quite fresh.

Day after day, morning and afternoon, I was employed in the same way, and much of the time very near the same place, rarely returning without a full bag, and I am bound to say the interest never once flagged. New species kept putting in an appearance, and scarce a day passed which did not afford me the indescribable pleasure of taking a thing for the first time—a fly that one had read of in books, and possibly seen in a museum collection, but which was now a living reality, and possessed of more than doubled interest.

I must now wade through a list of species taken, some of them on the heights above Villars—Chamossaire, Perche, Col de la Croix, and the neighbourhood of the Diablerets—but mainly near the road between Villars and Gryon—Gryon being a village of delightful Swiss chalets, about three miles down the chemin de fer, in the direction of Bex.

And first in the order of species comes our well-known Swallow-tail of the broads, but in Switzerland by no means confined to swamps. There he was, in company with the Red Admiral and Painted Lady, swirling over the dizzy precipice at the top of the Chamossaire mountain, an elevation of over 7,000 feet. I took him again near Gryon, and in the pass between the Diablerets and Argentines, but was apparently too late in the season for his congener *podalirius*. In the same pass I took a solitary specimen of *Parnassius delius*, first cousin to the famous *apollo*. Then *Aporia crataegi*, the Black-Veined White, was everywhere, and in excellent condition. One specimen I bred from a pupa found belted upon a twig of *Pyrus aria*. I contented myself with merely spotting the common Whites, and did not notice any of the smoky-coloured variety of *napi*, which goes by the name of *bryoniae*. A single specimen of *Euchloë belia* was netted near Gryon, and *cardamines*, the orange tip, appeared on several occasions. The Wood White, *Leucophasia sinapis*, turned up sparingly, and I dare say would have been common if worked for.



There were plenty of *Colias hyale*, the pale clouded yellow, but they were not all in good condition; and I only detected *edusa* in the Rhone valley.

A nice series of *C. phicomone* were taken at the foot of the Argentines, and a few specimens of the Brimstone, *Gonepteryx rhamni*, were noted here and there. *Thecla rubi* was seen several times in poor and wasted condition. Then, turning to the *Lycaenidae*, I took three species of Coppers near Villars—our familiar friend *phlaeas*, one worn specimen of *Polyommatus helle*, and a short but good series of *hippotoë*, with one under side variety, possessing two large and irregular black spots.

The Blues noted in the same district comprised the following: *Lycaena aegon*, *astrarche*, and *icarus*, all no doubt common had they been worked for; *L. corydon*—the chalk hill blue—very common after July 12th; the lovely sky-blue *hylas*, much like *adonis* on the upper surface, some worn, but several in perfect condition; the even more lovely *damon*, as fresh as a daisy, and plenty of them; *alsus*, a few; *acis* or *semiargus*, the commonest of all the Blues, and, as we have already said, in variable condition; *alcon*, one worn specimen; and last, a good and varied series of *arion*, the Large Blue. One worn specimen of *Nemeobius lucina* was netted and released. Among the *Nymphalidae* I only secured one much torn specimen of *Limenitis populi*, but saw others on several occasions when they were out of reach.

I was successful in finding eight pupæ of *L. camilla*—a Butterfly which strongly resembles our English White Admiral, but is even more intense and beautiful in its colouring. They were found hanging on the extremities of the twigs of a species of honeysuckle which grew abundantly in the woody undergrowth adjoining the hotel, and nothing could have so admirably resembled curled up dead leaves. Four of them emerged satisfactorily, one producing an *ichneumon* instead. *Vanessa levana* I think I detected from the railway carriage, but I cannot be quite sure as I did not catch any.

*Grapta c-album* was fairly common, but somewhat *passé*; *urticae*, as usual, was everywhere, and *atalanta* and *cardui* were common, especially over the top of mountain ridges. *Antiopa*,

so inaptly described as the Camberwell Beauty, has the reputation of being a common Butterfly in that part of the world, but it surprised me by not showing up at all.

Next come the extremely interesting but no less confusing race of Fritillaries. *Militia artemis*, one freshly emerged specimen; *cinxia*, several worn; *athalia*, and I think *dictynna*, very common everywhere; *euphrosyne*, common but *passé*; *pales*, common at a higher altitude; *dia*, fairly common; *amathusia*, very common, one in the larval state crawling with great speed in the hot sun on the banks of Lac des Chavannes, and seeking a place to pupate. It fixed itself up for the purpose in the pill box before I got back to the hotel, and leaving it undisturbed, it emerged satisfactorily in Paris on the home journey. Also in the fields round Villars I took two fresh specimens of *Argynnis ino*. *A. lathonia* I noticed and missed on several occasions, only catching two near Perche. *A. aglaia* was common, and I caught one truly magnificent black variety, with the majority of the silver spots on the under surface, represented in deep bronze set in a dark green belt. It was taken casually as it flew across the road near the hotel, and for a moment I did not know what to make of it. It is in perfect condition, and as I carefully pinned it out I wished much that it was possible to show both sides. I find that the form is to some extent known, as one very much like it is figured in Curtis, from a specimen caught at Ipswich in 1827; but mine is, I believe, an even more striking variety. *A. niobe* was very common, though I have, apparently, taken only one of the silver-spotted form. *A. adippe*, too, was common, and one specimen which I set to show under-side, is very richly banded with brown.

*A. paphia* I ascertained was common in the district but it was evidently over.

Then, in the *Satyridae*, *Melanargia galatea* was one of the commonest Butterflies, and was accompanied in plenty by *Pararge maera*. I cannot recollect whether I noticed *P. megaera*, but *Satyrus semele* and *Epinephele ianira* were there, and *E. hyperanthus* in the greatest abundance. As to the *Erebias*, I am still in doubt as to the identification of some of my species. I believe I took nine, and some were very common. I certainly took good series of *E. melampus*, *manto*, *tyndarus*, *aethiops*, *ligea*, and one specimen

of *euryale*. What the others are I cannot at present say for certain. I have also omitted another Villars Blue, which is nearly black on the upper surface, and which I cannot yet identify.

*Caenonympha iphis*, and I think *C. satyrion*, were taken in small numbers, and the ever abundant *pamphilus* left to enjoy freedom. On turning to the last order of the Butterflies, the *Hesperiidae*, I am again in trouble. There was no doubt about the presence of *Hesperia sylvanus*, and *linea*, and *Nisoniades tages*, and I think I am safe in labelling one odd specimen *Spilothyrus althae*; but four others in the genus *Syrichtus*, all more or less like one another, and like Mr. Lang's excellent figures in his work on the European Butterflies, are probably all different species, and defy my poor attempts at nomenclature. I wish I had had time to collect more, for there were plenty on the wing.

And now I must hurry on, and quickly enumerate the additional species which my two days' hunting about Zermatt afforded.

First comes the grand *Parnassius apollo*, perhaps the most characteristic of Swiss Butterflies. I feared that I should have to go home without it, but was saved at the eleventh hour by securing six or eight good specimens in the Visp valley below Zermatt. On the Riffel Alp I noticed *A. pales* again in some abundance, and higher up, in fact at the top of the Gornergrat, I took a good specimen of *Pieris callidice*, and rejected several others that were too much worn. No *P. daphidice* were seen. On returning by a short cut to the Findeln Glacier Hotel where I was staying, I took *Erebia tyndarus* and *manto*, one specimen of *Colias palaeno* in company with *phicomone*, and three specimens of the little Alpine Blue, *Lycæna orbitulus*. Had there been time I should have taken more, but its condition was distinctly shabby. Some very fresh specimens of *L. acis* were again noticed flitting over puddles in the road. A lovely fresh specimen of *Melitæa phoebe* was netted on the way down to Zermatt, and two specimens of a neat little fritillary, which I hope I am right in designating *M. parthenii*, also a small series of the Skipper, *Hesperia comma*. As the sun set behind the Matterhorn I found the grass blades and scrubby Juniper bushes on the banks of the Visp literally covered with a small species of Blue, which I at once put down as *aegon*, and only took a couple from the thousands which I saw.

I now find that it is the next species *L. argus*, and I should have been glad of a series.

Amongst many others of which we have already spoken, and which I had no time to pay further attention to, I must not fail in conclusion to mention the Coppers. Some twenty of these gaudy little creatures were secured on the hill slope by a small rivulet between Findeln and Zermatt, and many others seen. Those I took were all together, and were all males, and I went away with the impression that they were all *Polyommatus virgaurae*. On closer investigation I found that I had undoubtedly got two species. Eight or nine were *virgaurae*, and the rest I have now come to the conclusion are not *rutilus*, but a local Alpine form of *hippotoë* without the purple sheen, which goes by the name of *eurybia*.

I had again taken an underside variety, the spots on the hind wings on one side only being elongated into narrow radial streaks.

To deal with the Moths on the present occasion would, I fear, make my paper disproportionately long and perhaps tedious. I will therefore content myself by merely exhibiting a few of the rarities which I took.

I conclude by confidently recommending both Villars and Zermatt as excellent holiday resorts for the lepidopterist.



## II.

## LEAVES FROM AN OLD DIARY IN THE YEARS 1800-2.

BY THOMAS SOUTHWELL, F.Z.S., V.-P.

*Read 28th October, 1902.*

PERHAPS there is nothing more interesting than an old note-book ; whilst perusing its pages we seem to live again with the writer, and if it be of ancient date, for the time being identify ourselves with the knowledge of the subject then prevailing, passing in mental review the gradual steps by which a clearer light has dawned, and, it may be, more accurate knowledge has been developed.

Occasionally we come across passages which are like little rifts in the clouds that obscure the past, and even should the records not be of very great importance, still they are possessed of value for the light which they cast on the mode of life of our ancestors, their prevailing lines of thought, or the condition of the country and of its natural productions at the time they were penned. To no class of observations do these remarks apply more fully than to Natural History subjects, particularly when they relate to our own locality, and it seems to me highly desirable that such records should find a place in the 'Transactions' of our Society, where they will no longer be in danger of being lost.

Recently the Rev. J. W. Millard has been kind enough to lend me a fragmentary diary kept by the Rev. Dr. Sutton in the Autumns of 1800-2, in the parish of Holme-next-the-Sea, and although there is perhaps nothing very striking in the entries, they are still, I think, interesting from their local character and the frequent references to men celebrated in their generation as well as to events long past. Mr. Millard has therefore, at my request, been so good as to give me permission to lay them before our Society.

The writer of the Diary, the Rev. Charles Sutton, D.D., is fully entitled to rank among the Norfolk Naturalists of the early part of the 19th century, but hitherto has met with very little recognition in that capacity. The son of Edward and Rebecca Sutton, he was born early in March, 1756, in the parish of St. Andrew's, Norwich, and educated at the Norwich Grammar School, at that time in the charge of Rev. George William Lemon as head master. In 1775 he was entered at St. John's College, Cambridge, and took his B.A. degree in 1779; he passed tenth Wrangler among an extraordinary number of distinguished men of his own College; of the seventeen Wranglers of that year no less than ten were of St. John's; among these were Bishop Marsh, Professor Christian, and Serjeant Lens. In due time he was elected a Fellow of his College, and proceeded to the degrees of M.A. in 1782, of B.D. in 1789, and of D.D. in 1806. In 1788 he was presented to the Perpetual Curacy of St. George, Tombland, by Dr. Yorke, Bishop of Ely. In 1793 he was presented to the Rectory of Alburgh, Norfolk, by Sir Richard Hill, Bart., which patronage is restricted to the Fellows of St. John's, but without regard to seniority; he was personally unknown to Sir Richard Hill, and owed his appointment to his reputation for zeal, diligence, and exemplary conduct in his professional duties. Soon after this he married Charlotte, the sister of the Rev. William Kirby, Rector of Barham, Suffolk, with whom he lived forty years in uninterrupted affection and happiness. In 1794 he was further presented to the Vicarage of Thornham-cum-Holme, *juxta mare*, by Charles Manners-Sutton, Bishop of Norwich.\*

Dr. Sutton spent most of his time in Norwich, and took great interest in the charitable institutions of the City, with most of which his name was associated, and it was not until the year 1842 that he resigned the Perpetual Curacy of St. George, Tombland. He died on the 28th of May, 1846, at his residence in King Street, Norwich, in his 91st year, and was buried by his own request in

\* An amusing anecdote is related with regard to this similarity of names Dr. Sutton who was on very friendly terms with his Bishop, on one occasion remarked to him, "I think, Bishop, there must be some family connection between us, the similarity of names is so remarkable," "Oh, no, that cannot be," replied his Lordship, "I quite admit the similarity of names, but, alas! you want the 'Manners.'"

the churchyard of his Rectory of Alburgh, by the remains of his beloved wife, who pre-deceased him in the year 1832. For these particulars I am mainly indebted to the Rev. J. W. Millard.

Dr. Sutton was early attached to botanical pursuits, and to the study of Natural History in general as well as to antiquarian research; he contributed a monograph of the genus *Orobanche*, in which he established a new species *Orobanche elatior* (which had previously been confounded with *O. major*), to the Linnean Society, which was published in their 'Transactions' for 1798 (vol. iv. p. 173), where he is described as "B.D., A.L.S., Fellow of St. John's College, Cambridge," and Cotman's Plate of the South doorway of Wimbotsham Church is dedicated to him. His first and friendly instructor in Botany was John Pitchford, a surgeon of Norwich, who Sir J. E. Smith regarded as one of his oldest botanical friends, and the only survivor in 1804 of the Linnean School of Norwich Botanists (T.L.S., vol. vii. p. 295), and of whom Dr. Sutton always spoke in the warmest terms. He was in frequent communication with Sir J. E. Smith, and of course had constant opportunities of interchange of ideas with his distinguished brother-in-law, William Kirby, the entomologist, during a long period of mutual esteem. It is not known that he published anything except what appears in the Linnean Society's 'Transactions.' Such was the man from whose too brief note-book the extracts which follow were taken.

The note-book was only kept between August the 8th and October 22nd, 1800; August 5th and September 7th, 1801, and July 9th to August 9th, 1802, on which day the last entry occurs. It seems likely that he only recorded in it the events which occurred during his visits to his vicarage of Holme, in the autumn of each year; at other times he probably resided at Norwich.

The first entry in the note-book refers to an abominable practice which, in spite of every precaution, prevails to a serious extent in the present day. After mentioning that *Picus medius* or *P. minor* was seen upon the Plum tree before the parlour window under date of August 8th, 1800, he goes on to say:

"Dined with Mr. A. S. — who told me that Mr. Brooks, the Bird dealer in Town, sends people into Norfolk to buy the Pheasants' eggs at 2s. per doz.: which he puts under hens at his villa near Town. Mr. Rolfe told him it was supposed 2000 eggs had been



sent out this year, the nests are found by means of Dogs. Qy. Since in mowing fields of Clover many nests of Pheasants are spoiled, would it not be right to turn a Pointer into such fields before mowing who might discover the nests so that the eggs might be preserved."

The original entry looks like 2 gs. (two guineas) per dozen, but I have ventured to interpret it two shillings. I have no idea what is paid for "poached eggs" in the present day, but 3s. 6d. an egg seems too high a price, not including the cost of collection which must have been considerable, and they would surely at a time when game was not so cagerly cultivated as it now is, be of less value than at present. The Mr. A. S. — referred to was the Rev. Armine Styleman, Rector of Ringstead, and great-grandfather of Mr. le Strange of Hunstanton. He continued to reside at his Rectory after he came into the Hunstanton and Snettisham estates, and died there in 1803. Arthur Young mentions that "Mr. Styleman" farmed some 2000 acres of his own land in Snettisham, and speaks with approval of his enterprise, adding that he was the first in Norfolk to use the drill in sowing corn.

On the 11th of August Dr. Sutton writes: "Mr. Styleman told me he had an account somewhere of the havoc done at sea in the memorable storm in 1703, when the coast was covered with wreck from Snettisham to Cromer."

Mr. le Strange was good enough to look through the note-book of Sir Nicholas le Strange, who lived in the early years of the 18th century, but can find no mention of this storm; he has, however, some recollection of a small sketch in the margin of some diary or note-book, showing the sea dashing over Hunstanton Cliff, which must have been the result of a considerable storm. He sends me the following extract from Sir Nicholas le Strange's Note-book (part ii., p. 46) descriptive of a still earlier storm which occurred on the 2nd September, 1695:

"There rose up in the night a very dreadfull Storme & Tempest w<sup>ch</sup> drove ashore the greatest p<sup>r</sup> of y<sup>e</sup> Southerne Collicr Fleet then rideing over the Burnham Flatts & in the next morning the whole shore from Blakeney to Lynn was full of vessels aground & wreck. 3 disabled shipps were driven upon Holme Sands 1 large Yarmouth vessell upon the black rocks under y<sup>e</sup> Cliffe 3 upon Hcacham Beach at y<sup>e</sup> greeve 3 more at y<sup>e</sup> entrance into y<sup>e</sup> Haven.



1 great Ipswich vessell brake upon the gore but y<sup>e</sup> Mar & 21 men escaped in their long boat 1 other great London vessell strake upon y<sup>e</sup> sands & broke off Thornham and prt<sup>e</sup> of her rigging came up at Holme wch I bought.”\*

This storm of 1703 was long referred to as the “Great Storm,” it occurred in the night of the 26—7th of November (O.S.). By it the first Eddystone Light-house was destroyed, and many lives were lost, both at sea and on land. Dr. Kidder, Bishop of Bath and Wells, and his wife were killed by the fall of part of his palace. Addison refers to it in ‘The Campaign,’ in the following lines:—

“So when an angel, by divine command,  
With rising tempests shakes a guilty land  
Such as of late o’er pale Britannia passed.”  
(Works, edit. 1811, vol. i. p. 60).

A passage which called forth the caustic criticism of Thackeray in his ‘English Humourists.’

Dr. Derham communicated an account of this storm to the Royal Society which was published in the ‘Philosophical Transactions’ for 1704. There are also some particulars in the ‘Penny Magazine’ for 1836, p. 490, and in ‘Notes and Queries,’ third series, vols. iii., v., and vii.

Dr. Sutton had an eye to the utilisation of the waste products of the ocean, as is evinced by the following extract dated August 13th, 1800: “Tythe taken at Thornham. An account of bushels of Asterias, [*Asterias rubens*, L. The common Star-fish or Five-finger of the Fishermen] taken in the Oister nets which it is thōt might be made an useful manure & might be had for 3<sup>d</sup> a bushel.”

\* Mr. le Strange also sends me another extract from the same Note-book (p. 49), which is so curious that I cannot refrain from quoting it:

“Dec 11<sup>th</sup> 1705. A large Hamborough fly boat havinge 2<sup>d</sup> before struck upon some sand & slipt her rudder in y<sup>e</sup> channell, put ashore at y<sup>e</sup> Greeve her chief ffreight was 50 Red-Deer being a present from y<sup>e</sup> king of Russia to y<sup>e</sup> Duke of Newcastle & bound for Hull. The Deer were most in Deal cases fitted to their heights. The Staggs had their horns sawn off abt 6<sup>ln</sup> long from y<sup>e</sup> Burr. The old Deer were of a very large size and of a Badger color. The Mar of the Vessell being judg’d a very careless & Knavish fellow quitted his shipp & sold her whole, as she lay to Mr. W. &c., who design’d to have gott her off to sea the very next tide, if the Wind had not turned cross, but soon after took her away to Wells. I mention this for y<sup>e</sup> curiosity of the Lodeing, since she came up whole & went to sea againe.”

Under the same date occurs the following: "Wheat troubled with the Insect but [?] had none of the orange gum."

Dr. Sutton evidently here refers to the Wheat Midge, *Cecidomyia tritici*, Kirby, an insect infesting wheat during the period of its inflorescence, which was attracting a good deal of attention at that time from entomologists, and it is probable that his friend Kirby had asked his co-operation in the study of its habits and distribution, a task in which the latter was then engaged. The way in which the life history of this minute insect and its parasites was worked out by Marsham, Goodenough, Markwick, and Kirby, and their admirable papers on the subject, published in the 'Transactions' of the Linnean Society (vols. iii. and iv.), are a standing monument to their perseverance and capacity for critical observation, and a lasting object lesson to their followers.

Excellent coloured figures of the insect in its various stages of development, from drawings made for Sir Joseph Banks of Yorkshire specimens, are given in Vol. iii. of the 'Transactions,' Tab. 22. Kirby named this insect *Tipula tritica*, and an Ichneumon which made the larva the host in which to deposit its ovum, *Ichneumon tipulæ*; he subsequently discovered two other species of Ichneumon which also infested the larvae of this Fly; these three species Mr. James Edwards tells me are now known as *Leptacis tipulæ*, Kirby; *Isostasius inserens*, Kirby; and *Eurytoma penetrans*, Kirby. The "orange gum" mentioned, called by the farmers the "red gum," Dr. Plowright tells me is the Uredospore of *Puccinia glumarum*, formerly known as *Uredo glumarum*, a rust which attacks the ear of the wheat, and which, at a certain stage of its development, has the appearance of a yellow exudation or gum.

August 18. "Tythe diunr at Holme, Mr. Faircloth said that in large tides the water in the wells at Holme was known to rise sometimes 2 foot. Wells are supplied w<sup>th</sup> water sometimes by land springs & sometimes by private springs. He [Faircloth] is knowing about Bees & has hived 'em in skeps where the comb has been left by Bees w<sup>ch</sup> have died."

— „ — 20th "Party at Hunstanton Cliff. Mem. The Cliff is 55 feet high being 5 higher than at Margate, Mr. N. Styleman measured it. Pleasant rain after 7 weeks continued drought."

The Mr. Nicholas Styleman here mentioned was a younger son of the Rev. Armine Styleman. He lived at Heacham, and is there buried. The rainfall, according to the 'Gentleman's Magazine' for the two months, June and July, 1800, was only '64 of an inch; in August, 1.40 inch fell, chiefly after the middle of the month.

August 21 "Found 2 or 3 Natterjacks, observe the yellow line down the back begins at the nose and ends at the vent." A further note on this subject will be found under date of 14th July, 1802.

August 27 "A Soland goose was shot lately at the beach here by Mr Elsdon; E. Renant this day (Aug 27<sup>th</sup>) shew'd it to me—it is a very powerful bird, it is *pelecanus bassanus* & agrees w<sup>th</sup> the description except the pouch being but slightly visible & the bill but little jagged—he called it a Herring Gant—the last word is a corruption of Gannet. There is a similar bird somt<sup>s</sup> found out at sea call'd a Willock, of w<sup>ch</sup> they report that it hatches its eggs und<sup>r</sup> the wings and that they take their young as soon as hatch'd upon their backs & swim with them many fathoms out at sea." The Willock is the Puffin (*Fratercula arctica*), and, of course, the mode of incubating its egg here mentioned is mythical.

August 28 "Found a Tarrock dead on the shore at high-water-mark, one of the Phalaranopi [sic] observe the rudiment of a back toe, discript<sup>n</sup> in Berkenhout very good, it may be call'd the Sea Ringdove." The "Tarrock" is a local name for the Kittiwake Gull, *Rissa tridactyla*, which is distinguished from the other Gulls by the absence of, or the presence of only a very rudimentary hind-toe; it, of course, has no connection with the genus Phalaropus. Berkenhout was the author of a 'Natural History of Great Britain and Ireland,' published in 1769, which appears to have been esteemed in its day.

August 29 "Arthur Young call'd on me this morning. I learnt from him the name of my Grass, *Cynosurus cristatus*, which he spoke highly of. Sowed the Pightle this morning" He again records on the 29th of August, 1801, that he sowed seeds of *Cynosurus cristatus* in his pightle, just a year afterwards. Arthur Young was probably on one of his agricultural tours when he visited Dr. Sutton.

September 13 "W K & S K & Mrs & Miss & H Trimmer



Found *Atroplex pedunculata*, *Ruppia maritima* & *Lannich ellia palustris*” The Ks here mentioned were doubtless the Kirbys, but who H. Trimmer was I cannot tell. Mr. Millard suggests that he may have been the elder brother of the Rev. Kirby Trimmer, late of St. George, Tombland, the botanist, who certainly had a brother Henry.

September 15th “Went to Heacham, Mr. N. Styleman observed the Swallows to have congregated that morn<sup>g</sup> & covered the roof of a house there. H. Trim<sup>r</sup>. shot a *Larus canus* & *Nævius* and a *Sterna* with a Blackcap not mentioned in Berkenhout—neck breast & underpart of the wings white, head black, back & upper part of the wings ash colour, remiges black w<sup>th</sup> a broad white margin, rectrices white. 18 inches in length. 3 ft from wing to wing.” Berkenhout, whom Dr. Sutton probably follows, applies the name *Larus nævius*, Lin., to a bird formerly known as the Wagel Gull; this name was probably used indiscriminately for the young of both the Herring and the Lesser Black-backed Gull, the immature forms of both these birds not having been recognised as such, but regarded as one distinct species. The Tern, I think, seems most likely to have been the Sandwich Tern, although the description does not quite agree with the plumage of that species—Berkenhout mentions only three species of Tern, the Common, Lesser, and Black Terns.

October 22. After mentioning a very high tide occurring at the high spring with a hard N.W. wind which, however, did little damage except to the Rabbits, 4 doz. and 11 of which were picked up drowned at the marsh gate near his house, he goes on to say: “A whale was cast ashore first at Thornham where they cut off its tail & one fin & the bacon off its sides, & made 15£ of the oil they sold at the rate of 5<sup>d</sup>. a pint. it floated afterwards & was cast on the bank of Mrs. Panton’s fresh marsh, where I saw it, it appeared to have been 18 ft. long—a row of teeth in both jaws & a spout hole of the shape of a horse shoe at the back of the head the eye (I co<sup>d</sup> see but one as it lay on its side) was small & very nearly on a line with the mouth—whether it had had a fin on the back, co<sup>d</sup> not tell, the side fins were large boney & bent like elbows—it is the *Delphinus orca* Lin. anglice a Grampus.” See also 14th August, 1801.



1801.

Aug. 5. "Came to Holme."

7. "Found on the shore dead *Syngnathus ophidion*, Tobacco-pipe fish or Sea Adder. On my return home cross the salt marsh I observed the Rabbits who had wandered from the warren into an enclosure surrounded w<sup>th</sup> a dyke contain<sup>g</sup> water near 4 foot wide on the surface, leap over same back again with great agility as soon as they perceived me to approach."

"Note—Mr. Hurlock brought a marvellous story which he had heard at Mr. Wincops at Lynn respecting the growth of the *Vicia faba* w<sup>ch</sup> he was told grew this year in the pod the contrary way, viz. with the hilum upwards, whereas it is said the hilum should be downwards or near the bean stalk so as the bean may project itself upwards—and this Mr. Whincop assures him he has undoubted evidence to prove was the case one year about a century ago after a year of scarcity like the present." A Rev. Wm. Milton Hurlock was Perpetual Curate of Hillington & from payments to "Mr. Hurlock" in an account-book marked "Holme" outside the cover it seems not unlikely that he acted as Curate for Dr. Sutton. His Bean story passes my understanding, the hilum seems to have been in the correct position.

Aug 14 "Ned Renant found on the beach a young Grampus, but just dead, it was about 8\* feet long, & the teeth scarcely formed, most probably a sucking fish." I have the measurements of two very young examples of *Orca gladiator*, the dentition of which corresponded with the above description, which measured 7 ft. 6 in. and 7 ft. 5 in. respectively in a straight line; they were both taken in the month of November; the adult will reach a length of 21 feet.

Aug 17. "While at dinner wife & I perceived on the edge of the dish a curious insect which appeared to be of the Diptera Class if not of the Hymenoptera, but I co<sup>d</sup> not perceive any shells to the 2 wings, it was about 4 lines in length, w<sup>th</sup> cheliform antennæ, the tips of w<sup>ch</sup> were setaceous & divided into 2 segments with rings of white & brown, the thorax caput (head) & antennæ were brown, the eyes large and prominent, the wings upwards were semi-crustaceous & hairy, lower they were clear & transparent like

\* The figure is doubtful, but I think it must be intended for an eight.

those of the Neuroptera, the abdomen was of a burnished purple & a little hairy, the six legs were of a light green, there appeared to be two palpi proceeding from the under part of the head, also a light green colour. It was very active & clapped together its two cheliform antennæ w<sup>th</sup> great briskness [added subsequently]. I sent the above insect to Mr. Marsham, who informed me it was the *Cimex spessicornis* a curious but not a very uncommon Insect of the hemiptera class." Mr. Thouless informs me that the above insect is now known by the name of *Heterotoma merioptera* and that it is a common species generally occurring on nettles; the Mr. Marsham referred to was Thomas Marsham, entomologist, Secretary to the Linnean Society from 1788 to 1798, he died in November 1819. Both Marsham & Sutton were original Associates of the Linn Soc. 1788.

August 19th "Rode in the afternoon to B [illegible]\* thorp, observe the Gleaners in that & the large parish of Docking conveying home their burdens upon asses in large bundles suspended on each side of the Asses" (See 24th August).

—, — 21st "Rode to Brancaster walked to the sea shore, found *Althea officinalis*, *Convolv[ulus]* *Sold[anella]* *Geran[Erodium?]* *cicut[arium]* w<sup>th</sup> very hairy stalks and leaves, hairs very long and white, petals white sometimes pink,  $\frac{1}{2}$  longer than calyx; *Silene marit[ima]*, *Eryngium marit.* 2 species [?] of *Salsola*, *Beta marit.*, *Althea officin[alis]*; gathered by the road-side *Marrub[ium]* *album* for Tom. Booker."

The following interesting note on the customs regulating gleaning, at that time a matter of great importance to the villagers with a view to their winter supply, is worthy of recording; it is an example of the unwritten laws which were strictly obeyed in many instances, such as marsh-mowing in the common lands in the Lincolnshire Fens, and the placing of eel-sets on our own rivers (See *ante*, vol. iv. p. 442).

August 24th. "Took tea at Thornham at Bentons It is worthy of remark the regularity w<sup>th</sup> w<sup>ch</sup> gleaning is performed at Holmc— here the Gleaners collect together at 8 O'Clock in the morning come home about 12—go out again after having dined & return again at 6 in the evening as regular as they went out. They may

\* Probably Bagthorpe, he would pass through Docking on the way.

go out of the Parish if the Farmers occupy land out of it, yet glean<sup>g</sup> is not an act w<sup>ch</sup> the Poor may claim by common Law of the Land, the case was decided in one of the courts a few years ago when it was contended for on that ground, when the verdict given was that glean<sup>g</sup> was only by sufferance, a good custom but still under restriction as seems fit & right it sh<sup>d</sup> be. The women in general in this parish have gleaned this year 5 bushels each some small householders who keep a maid-servant send her out to glean & receive by contract one-half." The corn so gleaned was as a rule sent to the miller, and the grist went far towards supporting the family during the winter. The children became bread-winners at a very early age, and although individually small, the united earnings of the family, assisted by the garden produce and many a help from the farm-house, for these were patriarchal days, went further to supply their simple wants than perhaps we can now imagine. Their clothing was chosen for its durability, the expenditure on finery was *nil*, and many of the unmarried hands boarded in their masters' houses.

August 27 "Took an even<sup>g</sup> ride to Hunstanton & put the seeds of *Uineraria palust.* into the boggy ground under water at the pool near the Boat house at the turn of the corner on the left hand if you were [going ?] to the Boat" (a very reprehensible practice, Dr. Sutton.)

—, — 29th "Sowed seeds of *Cynosurus cristatus* in the Pightle."

Sept. 1 "Went to the Cliffs observ<sup>d</sup> among the stupendous pieces of Rock which had fallen down, one which had the impression of a large *Cornu ammonis* [an Ammonite] upon it about 20 inches in diameter, it was upon the Calk [Chalk?] stratum I could not find the corresponding part."

Sep 2. Rain this morning after a drought of 5 weeks here (last Sum<sup>r</sup> there was a drought of 7 weeks) the rain however was trifling. Sowed seeds of *Poa pratensis* on the 3rd Sept<sup>re</sup>."

Sept 4. "The rain now comes plentifully ; the farmers say they never remembered so great & piercing a drought, some of the weather has been excessively hot & for a continuance. I observed the white-thorn fences in the new enclosures at Thornham (planted about 5 years) to have shed their parched leaves as tho' blighted, it was a singular sight in harvest time—some farmers were obliged to open their hay-stacks the pastures being quite sear."



Sept. 7th. "Last night the rain was so violent & incessant as to have made great inundat<sup>ns</sup> in Holme, our Cellar was filled w<sup>th</sup> water & the rump of beef with the tub of Pork were altogether overflowed—the Cottagers rec'd great damage by rain getting at their late gleanings & those farmers whose Barley stacks were not thatched must have suffer'd considerably as the rain was excessive, the wind was in the south east & it drifted the rain into the roofs of dwellings & pent-houses so that not a house in the village escaped being soaked. At Stanhoc the effect seems to have been the greatest, Mr. Wright had a great deal of his Barley car<sup>d</sup> away in the swathe & Mr. Etheridge's beer vessels in his Cellar were actually rolled in the water & the beer spilled out of the bunghole."

"Speaking of Barometers the other day, Mr. Styleman said he remembered at Trinity College within side of the King's Gate, viz. next Trumpington Street there was one which worked w<sup>th</sup> water instead of Quicksilver & that it was 34 Feet long. Qu. if this was not erected by Roger Cotes? it must have been difficult to have procured a glass tube long enough to shew the variations. Ned Renant bro't us 6 Knots whose plumage is very handsome . . . the papers inform us that Mr. Ball of Lewis saw on the 4th of this month 4 or 500 on the wing and that he shot one w<sup>ch</sup> was probably a male hav<sup>g</sup> the breast red—ours was brown inclining to red."

I am sorry I cannot learn any particulars about the Water Barometer, formerly at Cambridge. Roger Cotes was the first Plumian Professor of Astronomy (1706) and he commenced building an Observatory over the King's Gate at Trinity College, but he died in 1716 before it was completed—it does not seem probable that so unwieldy an instrument would have been erected while the building was in an uncomplete state. Sir Isaac Newton's rooms were in the staircase next the gateway; he certainly contributed an astronomical clock to the Observatory, and possibly he may have had a hand in the construction of the Barometer after Cotes' death, this however is mere conjecture. The Observatory was dismantled in 1797. Toricellis' first experiments were conducted by means of a water tube, but he speedily had recourse to mercury on account of its greater specific gravity, and although other liquids were experimented with, for many reasons they were soon discarded. The Royal Society's Water Barometer constructed by Daniell in 1830 was subsequently found to read seven inches of the water



scale too low. It was afterwards reconstructed and removed to the Crystal Palace at Sydenham, where it was destroyed by fire. The most successful Barometer, in which a fluid other than mercury was used, was constructed by J. B. Jordan; it was filled with Glycerine, and from it the daily readings in the 'Times' newspaper are still, I believe, given.

1802.

9th July. "Arrived at Holme after having stay'd two days & 3 nights with Fawcett at Snoring." He gives a description of the Parsonage house, &c.

July 14 "Saw several Natter Jacks, both old & young ones, their colour brownish green, with darker tubercles, the tubercles of the old ones are tipp'd with red, eyes green with yellow irides, belly lighter coloured with black spots. Mem. they have claws both on their fore & hind feet, & they move rapidly setting out with first a hop & then a run. Also another species of Frog nondescript, olive green above, lighter underneath with no black spots, eyes green with red irides, nostrils very distinct, belly rather swelling—note—the common Frog is of a greenish-yellow colour, sometimes brown, a sharp nose with black moustaches, back narrow with ridges along the edges of it."

Dr. Sutton's "nondescript" Frog I am inclined to think was merely a variety of the common Frog, he does not seem to realise how greatly this species is given to vary; the absence of the "black moustaches" which he seems to imply, is perhaps the most unusual feature, for they are very constant.

Professor Bell (Brit. Reptiles, p. 100) calls attention to this tendency to variation in colour and marking in the whole family to which this species belongs, owing to variations of temperature, the intensity of light, the influence of fear or other "mental excitement," and Dr. Gadow (Camb. Nat. Hist. Amphibia, p. 252) is even more emphatic. Sutton does not state whether he observed more than one individual of this variety, and I do not think there is evidence to found a new species!

August 1. "Owing I suppose to the late continued rain the quickset fences in some instances brought forth blossoms a second time, especially on their eastern side."

August 9th. "Whilst in the garden last night about 8 o'clock, I heard a sound in the air which was continued, & which seem'd to me like the buzz of Bees which had swarmed. The night was extremely calm & serene, I looked around but saw no Bees, at length looking up, I perceived a prodigious N<sup>o</sup> of Rooks high in the air, which were moving home to the Park at Hunstanton for the night, as they moved along their flight seem'd to be with labour as if fatigued with the exertion of the past day, & the beat of their wings against the air which was slow and gradual, resembled the beat of oars of expert Seamen who kept an equable slow time together."

This record of what was probably an early migratory arrival, one of those "rushes" with which we have become so familiar on the east coast, is the last entry in the Diary which concerns us as naturalists, there are various notes and rough pencil sketches of fonts, windows, armorial bearings, &c., in different parts of the County with which I doubt not, our archæological confrères are well acquainted, but here the regular entries cease. I must plead guilty to having been very discursive, perhaps unnecessarily so, in my endeavour to breathe life into the brief notes which the diary contains; but I trust my remarks may have rendered the somewhat dry bones of the entries not only more intelligible, but also may have in some degree developed the interest which their brevity and the lapse of time may have somewhat obscured.

III.

DISTRIBUTION OF *PEUCEDANUM PALUSTRE* AND  
*LATHYRUS PALUSTRIS* IN BRITAIN.

BY ARTHUR BENNETT, F.L.S.

*Read 28th October, 1902.*

IN the 'Norfolk and Norwich Transactions,' vol. vi. p. 457 (1899), and again in vol. vii. p. 333 (1902), I submitted to the Society some Notes on rare East Anglian Plants; and following these up I here give the distribution so far as known of the above two species.

I do so as a contribution to what I trust may some day appear, a Historical Record of the British Flora, tracing the species from their first records to the then time, with all their varying nomenclature, &c., under which they have appeared. It may seem needless to record all their localities, but if the rate at which some of our common species even are disappearing, it will not be so. Around this town (Troydon) Primroses are now rare, yet forty years ago thousands might have been gathered, and not been missed.

*PEUCEDANUM PALUSTRE*. Moench. *Methodus* pl., Marburg, 82. 1794.

*THYSSELINUM PALUSTRE* (Tournef.). Gray, *Nat. Arrang. Brit. Plants*, 518, 1821.

*SELINUM PALUSTRE*. Linn. *Sp. plant*, ed. 1, p. 244, 1753.

In Ledebour's *Flora Rossica*, vol. ii. p. 310, 1844; 15 synonyms are given of this plant.

English names :—

MARSH SELINUM. Huds. *Fl. Ang.*, ed. 3, p. 115, 1798.

MARSH MILKY PARSLEY. Relhan. *Fl. Cantab.* ed. 3, p. 115, 1820.

MARSH MILKWEED. Withering *Arrang.*, ed. 7, p. 2, 372. 1830.

MARSH HOG'S FENNEL. Hooker. *Brit. Fl.*, ed. 1, p. 118, 1830.

MILK PARSLEY. Henslow and Skepper. *Fl. Suff.*, 36, 1860.

MARSH PEUCEDAN. Bentham. *Hand. B. Fl.* 255, 1858.

WATER PARSNEP. 'Tosfield' ex Lees. *Fl. W., Yorkshire*, 260, 1888.

With regard to this last name in Dr. Prior's *Pop. Names of Brit. Plants*, 246, 1870; and in the Rev. K. Trimmer's *Fl. Norfolk*, this

name is given to *Sium latifolium*, and to that species it seems generally to be applied in books ; but in Eng. Bot. ed. 3, it is called Great Water-Parsnip, and *S. angustifolia* is called Water-Parsnip. In the Flora of Skipton (York.) this is called Broad-leaved Parsnep, and in the first issued Flora of the E. Riding of York it bears the same name.

In Europe, *Peucedanum palustre* is found in Sweden, Norway, Finland (22 districts), Denmark, Germany, Holland (23 stations), Belgium, Spain, France, Italy N., Austria, Poland, Hungary, Croatia, Banat, Transylvania, Serbia, Russia. Russian Asia.

In England :—

SOMERSET N. Co., 6.

On Cuckoo Bank, Glastonbury Moor. Sir T. G. Cullum, Bot. Guide, 521, 1805.

Burtle Moor ! ; Sole in Collinson's Hist. of Somerset.

Still in fair quantity on Shapwick Moor !

Murray, Fl. Som., 167, 1896.

SUSSEX E. Co., 14.

Near Hurstmonceaux, July, 1899. Messrs. Hilton and Druce ex Club. Rep. for 1899, 606 (1900).

ESSEX S. Co., 18.

Marshy place on the border of the Upper Forest (Epping), near the Windmill, and on the Epping side of Roydon in a sort of broad ditch. J. Ray. Gibson Fl. Essex, 129, 1862. Doubted by Watson, but Mr. Ray knew the plant well in Cambridgeshire.

SUFFOLK E. Co., 25.

Worlingham Common, by the side of the ditches, but sparingly. Rev. G. Crabbe, Bot. Guide, 544, 1805.

Blundeston. Wigg in Bot. Guide, 545, 1805.

Alder Cars at Fritton. D. Turner, *l.c.*

St. Olaves. Phyt, 370, 1862.

Marshes at N. Cove, Holmes ; Barnby Broad, Leach in Hind's Fl. Suffolk, 175, 1889.

Belton Bog. Paget in herb., Watson !

SUFFOLK W. Co., 26.

College Plantation, and other plantations near Mildenhall. Sir C. J. F. Bunbury, in herb., Borrer !

NORFOLK E. Co., 27.

Between Norwich and Heigham towards the river. Mr. Pitchford. Alder Cars at Mautby, and in the range of marshes between



Stalham and Ludham Bridge in immense quantity, and marsh adjoining Wayford Wood at Stalham! Mr. Wigg. Still there in some plenty, 1900.

Horning, near the Broad. D. Turner, Bot. Guide, 427.

Honing. Woodward Ann. Nat. History, vol. vii., 1841.

Ormesby! and Oby. Paget Hist. Yarmouth, 54, 1835.

Caistor and Ranworth! Winter Phyt., 227, 1862.

S. Walsham, Surlingham, Wroxham. K. Trimmer, Fl. Norf., 61, 1866.

Lessingham, Somerton, Horsey! H. T. Mennell, Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 256, 1886.

Hoveton Broad. Linton Journ. of Bot., 264, 1900.

Belaugh and Bridge Broads. C. E. Salmon, 1900.

Thurne, Martham, Whitesley, Blackfleet and Rollesby Broads. Salmon and Bennett.

Flegg Burgh, Filby, Acle, Brundall, Potter Heigham, Hickling. A. Bennett.

NORFOLK W. Co., 28.

Forster's Alder Carr. E. Winch. Crowe in Hudson's Fl. Anglica MS.

Worthing,\* Feltwell, K. Trimmer Supp. Fl. Norf., 23, 1884.

Shouldham Fen near Lynn. B. Bray.

CAMBRIDGE Co., 29.

Sides of drain running eastwards from Prickwillow, I. of Ely. Rev. Dr. Goodenough Bot. Guide, 49, 1805. Sp. from him in York Museum!

Anglesy Abbey. Henslow in Bab. Fl. Camb., 99, 1860.

Burwell Fen! 12, 8, 1835. Dr. Power. Borrer herb., 1838!

Wicken Fen. 1875 to 1883, plentiful! G. Goode, 1892! Reche Fen, Babington, *l.c.*

HUNTINGDON, Co., 31.

Banks of Whittlesea Mere. Sir J. Bank's Bot. Guide, 336, 1805.

It is evident from the observations of the Rev. E. C. F. Jenkins (Ent. Intel. 1859, p. 79) that in the Fens around Whittlesea Mere,

\* Given as E. and W. by Trimmer, but falls wholly into Watson's W. and into Mr. Geldart's 'N.C.' in which he does not record it in Trans. Norfolk and Norwich Nat. Soc. 1874-5. or in the Victoria County History, but in the Trans. vol. iv. p. 719, 1889, he seems to have wholly referred Worthing to his S.C.

*Peucedanum* must have abounded, as he speaks of the Swallow-tailed Butterfly (*Papilio machaon*) "might then be had to any amount" and its principal food-plant would be there also. The Butterfly there, as with the Large-Copper, is a thing of the past.

Mr. Fryer writes that he gathered it in "the bog in Holme Fen, Hunts, on September 17th, 1891, I think it was there some four or five years ago."

LINCOLN S. Co., 53.

Lees' Out. Fl. of Lin. in White's Directory, 14, 1892.

"There is no record for S. Lincoln, but I have no doubt *P. palustre* was about Bourne and the Deepings in say 1800." A. Woodruffe-Peacock 14, 8, 1902. From the history of the land and old maps I have no doubt Mr. Peacock is right, in one of 1824, very wet land is shown from Bourne to Cowbit, south to Deeping and Gedney. Mr. H. C. Watson in Top. Botany gives S. and N. Lincoln, he seems to have been under the mistaken idea that the East Fen was in his V.C. of S. Lincoln, which certainly is not so. He makes the same mistake under *Senecio paludosus* and *palustris*; as Banks stations were certainly in N. Lincoln.

LINCOLN N. Co., 54.

In the East Fen in vast plenty, about the only umbelliferous plant that grows in the immense common meadows there. Sir J. Banks' Bot. Guide, 387, 1805. Long since extinct.

Sandtoft, 1879. Laughton Common, 1878. Rev. W. Fowler, Woodruffe-Peacock, 'Naturalist,' 341, 1894. In both places now (1902) verging on extinction. As it occurs near Wroot on the York side of the Toun Dyke (Lees' W. York, 260, 1888), it may occur on the Lincoln side as Wroot itself is in that County.

NOTTINGHAM Co., 56?

By the side of a small stream between Mansfield Wood House and Park Hill. New Bot. Guide, Supp., 644, 1837. No recent record.

It is probable the plant existed in the extreme N. of the County, in the area between Gringly, Misterton, and Finningley, as it did (or does?) exist in the adjacent parts of York and Lincoln. "I have no doubt it was in all three twenty-five years ago." Peacock in litt.

YORK S.E. Co., 61.

Beverley, 1796. Col. Machell in herb., Dalton.

York Phil. Society.

At Weel Carr, and other places near Beverley. Sir T. Frankland in Smith Fl. Britt. 1, 303, 1800. Marshes near Beverley abundantly. Teesdale Bot. Guide, 679, 1805.

Extinct *file*, Mr. Robinson's Fl. E. Riding of York, 116, 1902. YORK S.W. Co., 63.

Whitgift. Rev. W. Wood. Smith Fl. Britt., 1, 303, 1800.

Potterie Carrs. E. Miller, 1804.

Marshes near Doneaster. Tofield in Hudson, 1762.

Low Moors between Goole and Thorne. Rev. W. Wood, Bot. Guide.

Thorne Moor. O. A. Moore in herb. York. Very abundant in July, 1845. O. A. Moore in herb. Wntson! In 1844, Inehbald, 1872—1883. By the Tonne Dyke near Wroot. Lees' Fl. W. York, 260, 1888. To the years 1840—50 it seems to have been tolerably plentiful, here and there abundant in Yorkshire, but gradually since has been getting scarcer year by year, and now verging on extinction.

59. LANCASHIRE S.

"Southport, where I saw it still in 1870." F. A. Lees' Fl. W. York, 260, 1888.

69. (Lake Lancashire) Westmorland.

"Discovered in 1779 or 1780 by Mr. Seattie at Canon Winder, near Flackburgh in the ditches, on the sand side not very plentiful, and I have since found it round the side of Ayside Tarn, three miles N. of Cartmell, Mr. Hall." With. Arrang. Brit. Plants, ed. 7, vol ii. p. 372, 1830.

In a ditch on the right hand side, in a level field below Witheslode" Winsor (Dr. Windsor?) M.S. in Townsend's copy of Bot. Guide, 1805. Lees' Fl. York, 260, 1888.

Between Ambleside and Kendal. Mr. Jackson Bot. Guide, 641, 1805.

Specimen from the first named station in Herb. Winch at Linnean Society! See 'Naturalist,' 267, 1901, and 368, 1901, as to names, &c. Sought lately by Mr. Petty, without success.

Other counties reputed but not confirmed :

24. BERKS. Druce J. of Botany, 308, 1901.

Flora Berks, 249, 1897. Planted?

36. HEREFORD. About the Malvern Hills. Dunseomb, an error. Fl. Hereford, 151, 1889.

76. RENFREW. I have no information as to this county.

83. EDINBURGH. Marsh near Colinton, G. Don. Greville Fl. Edinb., 64, 1824.

99. DUMBARTON.

In a ditch, Ardencaple Wood. Hopkirk Fl. Glottiana, 1813. First record in England.

"*S. palustre* . . . in *Salubibus* proper Doncaster. D. Tofield. Hudson Fl. Angl., 115, 1778." Clarke First Records Brit. Plants, ed. ii. p. 65, 1900.

From the above records it will be seen the head-quarters of this species in England is Norfolk; no less than thirty-three stations being now on record. This is quite as much so as to stations, as to numbers of specimens. The only county at the present time in which it exists in any quantity outside Norfolk is Suffolk. And I have little doubt that these numbers in Norfolk would be largely increased if looked for; wherever I have searched marshy ground I have found it, though sometimes in very small quantity. Mr. Winter (Phyt. 227, 1863) speaks of its abundance at Ranworth by saying "One might gather waggon-loads of it." I have never seen it in such quantities as this would imply, but it is abundant at Rollesby Broad. The finest specimens I have seen were at a dyke-side in Filby Broad, and were six feet high, with branches in proportion, and fine umbels.

There is however no doubt that before the systematic drainage of the Fens, Marshes, Carrs, &c. began, it was plentiful in many counties, but until Mr. H. C. Watson began his series of works (1832), little trouble was taken to record localities in any systematic manner, hence our records are very meagre, though I believe that closer searching among old books and herberia might afford more data than at present we possess. The Caterpillar of the Swallow-tailed Butterfly not only feeds on this plant, but also on *Angelica sylvestris*, as I observed it doing so in 1900, at Thurne and Ranworth.

LATHYRUS PALUSTRIS, Linn.; Sp. Plant, vol. ii. p. 733, 1753.

#### *English Names.*

MARSH LATHYRUS. Hudson's Fl. Ang., ed. 3, 317, 1798.

BLUE MARSH VETCHLING. J. E. Smith, Eng. Fl., ed. 2, v. 3, p. 278, 1829.

CHICKLING VETCH. Withering, An. Brit. Pl. ed. 7, v. 3, p. 840, 1830.



MARSH PEA. Bentham, Hand. Brit. Fl., 182, 1858.

DUCKLING VETCH, MARSH VETCHLING. Townsend, Fl. Hants, 97, 1883.

Distribution :—

Norway, Sweden, Finland, Denmark, Germany, Holland, Belgium, France, Spain, Portugal, Italy, Switzerland, Austria, Russia.

Russian Asia. North America, Labrador to Alaska; Mass, U.S. A. to Dakota.

In England.

#### 6. SOMERSET N.

Near Burtle, eastern side of Calcott Drove, and on the N. side of the Bure. T. Clarke, sp. about 1850. Still plentiful by Calcott Drive. Murray, Fl. Som., 93, 1896.

Burtle Turf Moor. J. C. Collins' New Bot. Guide, 556, 1837

Shapwick Moor. H. Fisher, 1883. York Herb!

#### 11. HANTS S.

Botany Bay. Notcutt, Phyt. 1, 328, 1842. Not seen of late years.

#### 17. SURREY.

Peckham Fields in a squalid watery place. T. Willest. Sp. in herb. Sherard at Oxford!

#### 25. SUFFOLK E.

Burgh Castle Marshes, Herb. Buddle, circa., 1698. Phyt., 362, 1862. I failed to find it in 1877. Beccles and Worlingham Fens, D. Turner's Bot. Guide, 559, 1805.

Belton Bog. Paget's Hist. Yarm. 1835. Woodward 1840 in herb. Watson!

Carlton Colville. Herb., Skepper.

Flixton. L. Wigg, Bot. Guide, *l.c.*

Oulton Marshes, directly S. of the Broad. Henslow and Skepper, Fl. Suff., 24, 1860.

Roos Hall Marshes, Leach. Marshes at N. Cove and Barnby Holmes in Hind's Fl. Suff., 123, 1889.

#### 26. SUFFOLK W.

Lakenheath. F. R. Eagle in herb. Miss Lathbury. Tuddenham. Herb., Wilson. Hind, *l.c.*

#### 27. NORFOLK E.

Near Ranaugh (Ranworth), Humphrey. Smith in Fl. Britt., 2, 767, 1800. A. Bennett, 1901. D. Turner in Herb. Brit. Museum! Near Yarmouth. Wineh, herb!

Ormesby Broad. H. G. Glasspoole!

Surlingham, Potter Heigham (1883!), Hoveton St. John, Buckenham, Strumpshaw. K. Trimmer, Fl. Norf., 43, 1866.

S. Walsham, 1876; Ludham, 1880. Trimmer Supp., 19, 1884.

Marshes at Hickling. L. Wigg, Bot. Guide, 440, 1805. Mr. Geldart recently.

Marshes at Horning. R. Wigham, Bot. Guide, *l.c.*

Abundant between Ranworth Dyke and Horning Church, right hand of the river. C. E. Salmon, 1902.

Acle near the Station, 1883. A. Bennett.

Caistor, Aldby, Lopham, Loddon-Norton, Kirby-Cane, Bressingham near Thetford. Winter in Phyt., 227, 1862.

Wroxham, abundant; Mennell, Salmon, 1900.

Marsh near Rockland Broad. Nicholson, 1902.

#### 28. NORFOLK W.

N. Wootton. Dr. Lowe ex Geldart.

Against Euston Bridge near Thetford, Norfolk, 1836. Herb. Salmon, Norwich ex Linton.

#### 29. CAMBRIDGE.

Burwell Fen. Dr. Power, 1833. Borrer, herb., 1838. G. S. Gibson, 1848, Phyt. vol. iii., 310, 1848.

Wicken Fen. Babington, 1851. A. Bennett, 1870. Still plentiful there.

Anglesey Abbey. Henslow. Bab. Fl. Camb., 65, 1860.

Reche Load, before the Cut divides; Swaffham Fen; Little Eversden. Relhan Fl. Cant., 293, 1820.

#### 31. HUNTS.

Whittlesea, 21, 7, 1837. J. A. Power!

Yaxley and Stilton Fens! 1840. Bree in Phyt. 4, 103, 1851.

Monk's Wood. Syme in Eng. Bot., ed. 3. vol. iii., p. 108, 1864.

#### 37. WORCESTER.

Longdon Marshes, near Upton-on-Severn. E. Lees, Phyt., 4, 799, 1853; 113, 1855.

#### 41. GLAMORGAN.

Llanrhidian, Mt. Eve. C. Crouch, J. of Botany, 251, 1891.

#### 48. MERIONETH.

Margin of Bala Lake. J. C. Bowman in New Bot. Guide, 224, 1835.

49. CARNARVON.

Wet field near Little Ormes Head, 1831. Dr. Howitt!

Plentiful in a field between the two Ormes Heads, July, 1836.

Babington! Journal, 50, 1897.

Gloddoeth. R. Crutch, sp. 1840. Extinct. Griffiths in litt.

53. LINCOLN S.? Top. Bot.

No record in Lees' Outline Flora, or Peacock's Lincoln List in 'Naturalist.'

54. LINCOLN N.

In the meadows in the E. Fen in abundance, when they are liable to be overflowed. Sir J. Banks, Bot. Guide, 390, 1805.

Grainthorpe, 6, 1857. Messrs. Bogg & Lees, *l.c.*

Near Lincoln, 1891, J. S. Smith. Peacock in 'Naturalist,' 219, 1894.

61. YORK S.E.

Near Hull. P. W. Watson, Bot. Guide, 705, 1805.

Marshes near Beverley, abundantly. Teesdale, 1796. Sp. in York Herb!

Heslington Fields. Middleton, sp., 1830.

H. T. Mennell, 1851. Extinct here.

Near Arram, 7, 7, 1890. J. F. Robinson, sp.

63. YORK S.W.

Marsh below Brampton. G. E. Smith, 1845. Border of Thorne Moor, 1872. F. A. Lees' Fl. W. York, 203, 1888.

64. YORK M.W.

Ascham Bogs near York. H. Ibbotson, 1830, in York Herb.

74. WIGTON?

Galloway. Mr. Mackay. Hook. Brit. Fl., ed. 3, 324, 1835; never confirmed. See Ann. Scott Nat. Hist., 247, 1896; 51, 1897.

The following Counties have been reported, but no recent confirmation seems to have been made:—

12. HANTS N.

"In the low meadows near Stoke Common, near Bishopstoke, collected by Dr. Garnier, Dean of Winchester," Dr. Bromfield in Watson's Cyl. Brit. vol. iii. p. 414, 1852. The species so named in Herb. Reeves, from "Herb. the very Rev. the Dean Bishopstoke, August, 1839, in the narrow-leaved form of *Lathyrus montanus*. Townsend, Fl. Hants., 97, 1883.

22. BERKS. See Druce Fl. Bot. 157, 1897.

## 55. LEICESTER.

Bogs in Charnley Forest, near Bardon Hill. Dr. Pulteney, 1759 Retained as having formerly occurred in the Fl. of Leic., 44, 1886, with the note "this is now extinct."

## 57. DERBY.

Pinxton. Mr. Coke in Pilkington's History, Bot. Guide, 190, 1805. No further information in Rev. Painter's Fl. D., p. 40, 1889.

## 58. CHESTER.

A sp. labelled from Cheshire in the handwriting of (and given to Lord de Tably) Rev. A. Bloxam; Fl. Cheshire, 91, 1889.

## 69. L. LANCASHIRE.

Hudson's "passim" may have covered this part of Lancashire.

## IRELAND.

Counties of Galway, King's Co., Wicklow, Meath, Westmeath, Longford, Roscommon, Cavan, Fermanagh, Tyrone extinct, Armagh, Antrim extinct in 1840.

Cyl. Hib., ed. 2, 94, 1898; Praeger Irh. Top. Bot., 92, 1901; Irh. Nat., 184, 1902.

First record in Britain.

"*Lathyrus flore ex cœrulea et rubro mixto.*" In a wet marsh on the left hand of Peckham Fields from London. Merrett Pin. Rer. Nat. Brit., 70, 1666. W. A. Clarke. First record of Brit. Pl., ed. 2, 43, 1900.

In various parts the sp. varies. The var. *myrtifolius*, Gray (*L. myrtifolius*, Muhl) is a broad-leaved form of the plant; the only specimen approaching this from England is one from the Rev. W. Peacock, from "near Lincoln," this might perhaps have been a casual (Nat., 220, 1894). The var. *linearifolius*, Ser. in Dd. Proc., 271, 1825 – *v. tenuifolius*, Meyer Ch. Hann., 148, 1836, which I suppose is the same as *L. viciaefolius*, Wallr., Sch. crit., 388, 1822 (this was founded on a single sp.) can be matched among English specimens.

This sp. may yet occur in Scotland, as it extends to 70° 27' N. Lat. in Norway (Norman Norg. Art. Fl., 216, 1895); and in Finland to 69° N. Lat. (Mus. Fl. Fenn, 79, 1889).

The next two species I hope to mention, are *Carex paradoxa* and *Lastrea cristata*, for any notes on either, I shall be greatly obliged.



## IV.

EAST ANGLIAN GEOLOGY—HISTORICAL SKETCH.  
DAWN OF THE SCIENCE OF GEOLOGY.

BY HENRY WOODWARD, LL.D., F.R.S., F.G.S., F.Z.S.,  
President, N. & N. Nat. Soc.

*Read 25th November, 1902.*

THE Eastern Counties appear to me to offer a favourable country for the manufacture of good home-made geologists, and I am convinced that the subsoil is accountable for the circumstance. Indeed it is an interesting fact, that wherever scientific observers have arisen in the old days, before geology became established as one of the natural sciences, such observers were first led to reflect by noticing around them the presence of fossil shells and other marine organisms scattered over the surface, often on high elevations far removed inland away from the present sea-margin, as they may frequently be seen in Norfolk and Suffolk to-day. But even men of intelligence do not view the phenomena of nature from the same stand-point, and thus it happens that whilst a few able men in the early days convinced themselves that such remains indicated the former presence of the sea over those lands, the larger number accounted for them by saying that such bodies were *lusus nature*, and had never been alive—or that they were incontrovertible evidence of the Noachian Deluge.

In Italy, one of the earliest intelligent observers was STENO, a Dane, Professor of Anatomy at Padua, who in 1669 dissected a recent Shark, and showed that its teeth were like those of the fossil Sharks found on the Tuscan hills, and that the fossil shells found there resembled those living in the adjacent sea.

Another early writer suggested that the extinct bivalve shells known as *Pecten jacobæus* found on the Tuscan hills, were dropped

by pilgrims (who wore this badge) on their way to Rome : thus the poet writes :—

“The pilgrim’s staff and scrip he bore,  
And placed the cockle in his hat before.”

GESNER, a botanist of Zurich, adopted in 1759 the same views as Steno, and showed that as many changes of land and sea had taken place, and that by slow degrees, occupying thousands of years in their accomplishment, such fossils could not possibly be referable to the Noachian Deluge ; the animals and shells having lived upon the spots where they were discovered.

Although many great names may be cited as having published learned works, a few in favour of natural causes, but many more advocating fantastic explanations to account for geological phenomena, it was not until the days of WILLIAM SMITH (1769—1839), that a real and solid advance was made towards the establishing of geology on a sure foundation.

WILLIAM SMITH, LL.D. (born 1769, died 1839, aged 70 years). Though only a poor lad, brought up at Churchill, a village in Oxfordshire, Smith early displayed a keen power of observation, and a habit of collecting fossils ; in time he became a land surveyor. Whilst thus employed he discovered that the strata composing the country followed each other in a regular and orderly succession, each bed being characterised by its own particular fossils, and having a general tendency or “dip” to the south-east. In the course of his work he produced (in 1815) a Geological Map of England and Wales on which he laid down the main lines of the various formations, which (with slight modifications) remain the same to the present day, showing the patient and exhaustive manner in which his task was performed.

As a geologist of the highest eminence, and a teacher, the name of PROFESSOR SEDGWICK (1784—1873) must always rank in the first place. He was a fellow of Trinity College in 1810, and succeeded Professor Hailstone in the chair of geology at Cambridge in 1818. This chair (founded by Dr. John Woodward) was originally designed by him to maintain the doctrine “that all fossils were the result of a universal deluge which had once swept over the whole earth, and to the agency of which, by gravitation, all the strata

owed their origin!" Also to oppose the views of a certain Dr. Camerarius of Tubigen, who disagreed with him!

Sedgwick was the first Professor who delivered regular courses of lectures based on sound geological views, and upon the orderly succession of the rocks and their identification by fossil contents, as enunciated by William Smith. Like the late Sir Roderick Murchison, Sedgwick worked and wrote principally on the older Palaeozoic rocks of England and Wales, yet he contributed to the geology of the neighbourhood of Cambridge, including the formations between the Chalk and the great Bedford level; and he turned out a large number of men who, like himself, became eminent and enthusiastic geologists,\* many of whose names are the glory of English Geology.

Among East Anglian Geologists the name of SAMUEL WOODWARD (1790—1837) of Norwich deserves a place. At an early age he commenced to make careful observations, collect fossils, and to study the works of Parkinson, William Smith, Conybeare, and Phillips, whilst the discovery of fossil bones on the coast of East Suffolk by Richard Taylor in 1822, induced him to make further researches at Cromer and Happisburgh, and ultimately to prepare and publish his "Outlines of the Geology of the County of Norfolk," which appeared in 1833, and "Some Remarks on the Crag formation of Norfolk," in 1835 (*Phil. Mag.*). He also prepared a "Synoptical Table of British Organic Remains," issued in 1830, which was the basis of Prof. Morris's Catalogue of British Fossils.

Three sons and four grandsons of Samuel Woodward of Norwich have all pursued scientific careers.

B. B. WOODWARD, F.S.A. (formerly the Queen's Librarian), born in Norwich, 1816, died 1869. In his early days wrote upon geology and edited his father's works.

SAMUEL P. WOODWARD, F.G.S., born 1821, died 1865, sometime Professor of Geology in the Royal Agricultural College, Cirencester, was afterward for seventeen years assistant in the Geological Department of the British Museum. He wrote several articles on

\* Sedgwick did great honour to William Smith, and when President of the Geological Society, he presented (in 1831) the first Wollaston Medal to Smith, and styled him in his address, "the Father of English Geology," a title which we still desire to see associated with his name.



the Geology of Norfolk, and upon Chalk and Crag Fossils. His Manual of Recent and Fossil Shells attained to a sale of more than 11,000 copies. He was followed by his youngest brother, DR. HENRY WOODWARD, F.R.S., President of the Geological Society of London in 1894—96, who has lately completed forty-three years' service in the same department, of which he was for a long time the Keeper; he has also edited the Geological Magazine for thirty-nine years.

B. B. WOODWARD, F.L.S., F.G.S. (British Museum, N. H.), son of the late Queen's Librarian, has contributed various papers on Pleistocene Land and Freshwater Mollusca, and has edited the Proceedings of the Malacological Society of London, 1893—1903, of which Society he was one of the founders.

B. H. WOODWARD, F.G.S. (son of S. P. Woodward), is now Director of the Perth Museum, Western Australia. His younger brother, HORACE B. WOODWARD, F.R.S., F.G.S., is well known to the members as a past-President of this Society, and is now Assistant-Director of the Geological Survey of England and Wales. H. P. WOODWARD, F.G.S., Assoc. Memb. Inst. C.E. (son of Henry Woodward), is Hon. Consulting Geologist and Mining Engineer to the Colony of Western Australia, and actively engaged in Mining Geology. A fifth grandson, MARTIN F. WOODWARD, (Hon. Sec. Malacological Society, and Demonstrator in Biology in the Royal College of Science), was lost to the world a year ago, after a brief but brilliant career, being unfortunately drowned at Moyard, Connemara, in September, 1901.

SIR JOSEPH PRESTWICH, D.C.L., F.R.S. (born 12th March, 1812, died 23rd June, 1896), some time Professor at Oxford, took a deep interest in the geology of the Eastern Counties, and together with Charlesworth and Searles Wood worked assiduously at the Geology of the Crag. We owe to Prestwich a comparison of the Suffolk Crag, with the Antwerp and other Belgian Crag deposits of a similar age. He wrote papers also upon the Drift deposits of Suffolk and those of the Norfolk Coast.

Another eminent geologist (still surviving and now in his 85th year), is the REV. OSMOND FISHER, M.A., F.G.S. (born 1817), of Harlton near Cambridge, who has written on the "Warp and Trail" of Trimmer, studied the Mammalia of the Peat-deposit at Lexden,



in Essex, and described the geology of the Coast of Norfolk. He is also a great Mathematician and has spent years in calculating the age of the earth, and in investigating the causes of earth-movements and the elevation of mountains.

SEARLES V. WOOD, F.G.S. (born February 14th, 1798, died October 26th, 1880). It is interesting to mention that *the first volume* contributed to the Palæontographical Society of London was prepared by the late SEARLES V. WOOD, F.G.S., and describes the fossil Mollusca of the Crag formation. This work (which extended from 1848 to 61, with supplements, 1871, 73, and 79), is illustrated by 71 quarto plates, and contains in addition to the shells, a geological description of the Crag formation, by S. V. Wood, Jun., F.G.S., and F. W. Harmer, F.G.S. (1871—73).

SEARLES V. WOOD, JUN., F.G.S., born 1830, died 1884. Mr. F. W. Harmer, who delights to call himself "the pupil of S. V. Wood, Jun.," and was for many years his friend and coadjutor, thus writes in appreciation of his "dear old Master": "The distinguished son of a distinguished father, the name of SEARLES VALENTINE WOOD, THE YOUNGER, must be placed in the front rank of East Anglian Geologists. It is difficult for us now to realise the position of the Glaciology of the East of England when Wood entered on its study. No map of the drift beds was in existence, nor had any attempt been made to produce one. Wood saw, however, that until this was done, no further progress was possible, and he set before himself the great task of surveying the whole of the eastern part of England, from the Humber to the English Channel, and from the shores of the North Sea to the Midlands. Worn out by his incessant labours, but not before his task had been fulfilled, he died, alas, comparatively young, a martyr to science—too soon for his own reputation, for his friends, and for the interests of geological investigation. He has left behind him an imperishable record in glacial literature, *vere perennius*, and has earned the undying gratitude of all students of the subject."

MR. F. W. HARMER, F.G.S., has devoted many years (at first in association with Mr. S. V. Wood, Jun.) in working out the Geology of the Crag and Glacial deposits of East Anglia. After the death of his friend he continued the work alone, and indeed has never abandoned the subject, having, during the last ten years, contributed

a number of important papers thereon to the Geological Society of London, and to other Scientific Societies.

In February last (when presenting Mr. Harmer with the Murchison Medal of the Society), the President (Mr. J. J. H. Teall, F.R.S.) said to him : "In speaking of your earlier work, it is impossible to separate your name from that of Searles V. Wood, Jun., who, I believe, *discovered* you on the Cromer Coast, nearly forty years ago, when you were trying to solve the riddle of its complicated drifts. Wood, who had previously made a Drift Survey of the whole of Essex, on the scale of one inch to the mile, soon enlisted your services in Norfolk, while he continued his work in Suffolk ; and in the course of about four years, you were together able to bring before the British Association at Norwich, a summary of the results at which you had arrived from the mapping of the Crag and Glacial beds. Your map was published by the Palæontographical Society in 1872, with a memoir elaborating many points touched upon in your previous work. These original surveys formed an excellent basis for your further researches into *the structure and method of formation of these deposits, and for the labours of all who have followed in your footsteps*. Freed from the cares of business and municipal duties, which occupied much of your time in earlier years, your attention has latterly been given to a study of the minuter divisions of the Crag series, not only in England, but abroad—in Holland, Belgium, etc. ; thereby dealing with the zonal succession in the Crag series, and with the distribution of molluscan life generally in the Pliocene period, you have enlarged our knowledge of the physical and climatal conditions under which both Pliocene and Pleistocene deposits were laid down, and have drawn especial attention to the way in which Meteorology can aid in the solution of Geological problems." [Quart. Journ. Geol. Soc., London, 1902].

Another Norfolk worthy must be specially mentioned, viz., JOHN GUNN, F.G.S. (born 9th October, 1801, died 28th May, 1890). He was a Norfolk geologist of repute, and for many years held the living of Irstead and Barton, but resigned in 1869, and devoted his time wholly to geology. His investigation of the remarkable Forest-bed on the Norfolk Coast occupied the greater part of his long life, and the collection in the Norwich Castle-

Museum of the Mammalia obtained by him from that deposit testifies to his earnest and untiring work.

He wrote a paper, read before the Geological Society of London in 1870, on the position of the Forest-Bed and the Chillesford Clay in Norfolk and Suffolk, and on the real position of the Forest-Bed; and a second paper on the Forest-Bed at Kessingland and Pakefield in 1876. After his death a memoir on the same subject was published, partly written by him, and edited by Horace B. Woodward, F.R.S., with descriptions of the fossils by E. T. Newton, F.R.S., and several plates. He was President of the Norwich Geological Society for fourteen years, viz., from its foundation to 1878, and was the author of a well-known article on the Geology of the district in White's 'History of Norfolk.'

The Geological Survey in the Eastern Counties has been represented by Mr. WILLIAM WHITAKER, B.A., F.R.S., F.G.S., who has worked for many years upon the geology of the Chalk and the Lower Tertiaries, the Red Chalk of Hunstanton, on Subaerial Denudation, and on that most important question, water supply. He was engaged for about eight years on the geology of the Eastern Counties, and will be remembered no doubt by many.\*

No record of the Crag formation would be complete without a reference to EDWARD CHARLESWORTH (born 13th September, 1813, died 28th July, 1893). He was an F.G.S. from 1835, and was at one time employed in the British Museum, and as the editor of 'Loudon's Magazine of Natural History.' He was also Honorary Curator of the Ipswich Museum, where some of his early collections of Crag fossils are still preserved. After his return from a trip to South America in 1840, he gave up other work and devoted himself to collecting in the Eocene Tertiaries, and in the Crag. He also wrote a paper on the Sperm-whale (*Physeter*) from the Red Crag of Felixstowe. In 1844 he was appointed to succeed Professor Phillips as Curator of the York Museum, where he continued till 1858, when he resigned and returned to London. He spent much time collecting fossils, and never to the end lost his love for the Crag formation.

\* The geological survey of Norfolk and part of Suffolk was carried on by Mr. HORACE B. WOODWARD, F.R.S., Mr. CLEMENT REID, F.R.S., Mr. J. H. BLAKE, F.G.S., and others.



DR. JOHN ELLOR TAYLOR, F.L.S., F.G.S. (born September 21st, 1835, died September 28th, 1895), an enthusiastic lover of Nature ; was connected with the press in Manchester and Norwich, and in 1872 was appointed Curator of the Ipswich Museum. All his leisure hours were devoted to Geology, and he was the means, both in Norwich and Ipswich, by his lectures and writings, of stirring up people to take an interest in the geology of their own neighbourhood ; he also made many excellent observations on the Chalk and Crag deposits. For many years he edited 'Science Gossip,' but his health failing he retired from that position. His last appearance was at the British Association Meeting in Ipswich, in September, 1895, when he spoke on the Stutton boring.

#### THE "VALHALLA."

King Louis of Bavaria conceived the idea of erecting a "Valhalla," or Temple of Fame, consecrated to men who had become renowned in war, statesmanship, literature, science, and art.

This remarkable building stands at Ratisbon, on the Danube. On one occasion King Louis took our countryman Sir Roderick I. Murchison (the celebrated geologist) and showed him that the name of Murchison had been inscribed upon one of the tablets, although he was an Englishman. The British Museum (Natural History) in Cromwell Road is gradually assuming the character of a "Valhalla," having Statues of Sir Joseph Banks, Darwin, Owen, Huxley, busts of William Smith, Gray, Falconer, and Bowerbank, and portraits of Agassiz, Egerton, Enniskillen, and others. The bust of Sir William Flower is about to be added to the collection.

In the Blackmore Museum at Salisbury the plan has been adopted of inscribing the names of men of science on the walls above the cases.

I would suggest that the names and dates of donors to the Norwich Castle Museum, and those of workers in Geology and other branches of Natural History, or in Archæology, might similarly be inscribed on the walls of the several Galleries, "as a memorial to them that shall come after."

Your list of *Norfolk worthies* is great and so also is the list of those who have wrought in the geology of East Anglia and it deserves to be perpetuated.



## GENERAL GEOLOGICAL FEATURES.

A glance at a geologically coloured map of the British Isles reveals to the observer the fact that the strata are so arranged in chronological sequence across the country from west to east, that if a straight line were drawn down the map from the Tees to the Solent, all the older sedimentary rocks would be found cropping up to the West of that line, and *nearly all* the younger ones to the East of it.

Of these younger deposits the kingdom of East Anglia is chiefly built; nevertheless, considerations of relative geological antiquity need not trouble us, seeing that even the youngest of these strata is so immeasurably older than the whole period of time over which human records extend, that we can afford to dismiss the question of years in geology, as trivial and out of place.

What then are the deposits which make up our native counties? for, as a Norfolk man, I may claim a close interest in and attachment to everything appertaining to East Anglia and its environments.

## THE GREAT CHALK FORMATION.

Although the solid geology of East Anglia is, superficially, very largely masked by deposits of *Boulder-clay*, yet the backbone of the district is the great *Chalk Formation*, extending from Flamboro' Head in Yorkshire, through Lincolnshire, Norfolk, Cambridgeshire, Suffolk, Herts, Berks, Wilts, Hants, and Dorset, down to the Sea at Beer Head in Devon, and forming the bulk of the Isle of Wight and the counties of Kent and Sussex.

The Chalk is a great marine deposit and attains a thickness of over 1,000 feet (at Carrow, Norwich 1,152 feet and 1,187 at Mousehold). It is like a white limestone, not thoroughly solidified—but *some parts* of the lower Chalk known as Hard Chalk are employed for Building-stone as at Beer in Devonshire, in Lincolnshire (Louth Abbey), and in *West Norfolk*.

It is almost wholly composed of pure carbonate of lime. But throughout the greater part of the Chalk there occur nodules of black flint, and grey flint, *usually in bands, that coincide* with the stratification or layers of deposit of the materials composing it. Where the Chalk is destitute of layers of flints, it is found to

contain over 21 per cent. of silica, so that it is now generally concluded that the flint has segregated out of the Chalk and formed into concretionary nodules, much in the same way as iron-pyrites forms into nodules or concretions in the Gray Chalk and the Gault-clay, and in which "*Septaria*" (which are nothing more than concretions) are formed in layers in the London Clay.

Large pear-shaped or cylindrical flints of great size, with a cavity through the centre (called by Dr. Buckland "*Paramoudra*," a name given to similar large flints in the Chalk of Antrim and Co. Down, Ireland), occur singly in many localities in the Chalk and in some places forming more or less regular columns, the pot-stones resting one upon another as in the Chalk at Trowse and Whitlingham, and at Horstead on the river Bure in Norfolk. They are no doubt due originally to the dissolving up and the redeposition of the siliceous spicules of Chalk sponges which must have flourished to an enormous extent in the sea of the Chalk-period, as their remains are very numerous in some beds, although the spicules of flint are often destroyed or converted into an almost amorphous mass of flint. From the nature of the materials forming the Chalk, as well as the organic remains which occur in it, the Chalk is considered to have been formed in a deep and open sea; indeed recent researches carried on in the North Atlantic Ocean show that material for a continuous calcareous deposit with flint-nodules is now being deposited at depths of from 400 to 2,000 fathoms, while many forms of microscopic animal life such as *Globigerina*, and *Coccoliths* and *Coccospheres* occur in equal abundance in both the modern marine deposit and the ancient Chalk.

#### WHAT DOES THE CHALK REST UPON?

#### COAL-BORING IN THE EASTERN COUNTIES.

I have said that the oldest formation cropping out at the surface in East Anglia is the Cretaceous, this term including the "Red Chalk" of Hunstanton, the "Carstone" of West Norfolk, the Cambridge Greensand, and the Gault-clay. Until 1854, when the Harwich well-boring was carried to a depth of 1098 feet, the base of the Chalk had never been reached in this neighbourhood, although 500 well-borings have been made within the last twenty years.

The greatest depth of a well at Norwich appears to be that at the workhouse which did not exceed 360 feet.

At Harwich (Essex), a boring passed through the following strata :—

Drift			
London Clay and	{	Thickness. 69 feet.	
Reading Beds			
Chalk	...	890	„
Gault	...	70	„
		<hr/> 1029	
Palæozoic Rocks		69	„

At a depth of 1029 feet the borer entered a slaty rock which it penetrated for 69 feet, when the boring was terminated.\*

Professor Prestwich assumed that this slaty rock was of Carboniferous age, on account of the supposed presence of *Posidonomya*. But the organic nature of this fossil has been doubted by Mr. Etheridge, F.R.S., and Professor W. W. Watts, who recently examined it.

Professor Watts has detected an *Orthoceras* in the same rock from the *Stutton* boring.

#### CULFORD BORING, near Bury St. Edmunds.

A Boring was undertaken in 1890—91, north of Culford Park, five miles N.N.W. of Bury St. Edmunds, to obtain water for new buildings on Earl Cadogan's estate. The bore-hole yielded the following particulars :—

			ft.	in.
Soil, &c.	...	...	6	0
Chalk	...	...	526	0
Gault	...	...	73	0
Lower Greensand	...	...	32	6
Palæozoic Slaty Rocks	...	...	19	9
			<hr/> 657 3	

Messrs Whitaker and Jukes-Browne say—"there is only one point on which all are agreed, namely, that these Culford Slates are *older* than the Coal-Measures."†

#### STUTTON BORING.

On the Northern side of the estuary of the Stour the Eastern

\* [Annual Report of the Geol. Survey for 1896].

† Quart. Journ. Geol. Soc. vol. 50, p. 495.

Counties Coal-boring Association put down a trial boring at Stutton, which gave the following section viz :—

			ft.	in.
River Gravel	...	...	16	0
London Clay and Reading Beds	...	...	54	0
Chalk	...	...	874	6
Gault	...	...	49	6
				———— 994 feet.

The greatest known thickness of Cretaceous Rocks in Suffolk, viz., 924 feet, was found here.

Palæozoic rocks were reached at depth of 994 feet, these were penetrated to a depth of 531 feet. The bore was carried down to a depth of 1525 feet. The consulting Geologist and the Mining Engineer-expert are agreed that the rocks reached are older than the Coal-measures (Geol. Mag. 1896, p. 95).

The old rocks reached are represented by a slaty rock, possibly Silurian, possibly Cambrian, but no fossils have been observed in the cores (an *Orthoceras* has since been found in one of the cores by Professor W. W. Watts).

#### PROSPECTS OF FINDING COAL UNDER EAST ANGLIA.

On the probable discovery of Coal. The finding of rocks, older than the Coal-measures at Culford, Stutton, and Harwich, does not demonstrate that Coal-measures cannot be found under the Eastern Counties, for it should be borne in mind that not far from the very ancient rocks of Charnwood Forest the Leicestershire Coal-field occurs ; and again quite close to the old Cambrian rocks of Nuncaton we find the productive Warwickshire Coal-field.

Beyond the outcrop of the lower beds of the Cretaceous series in Cambridgeshire and Norfolk, we find a powerful development of the great Jurassic series, but in the only three recorded deep borings in Essex and Suffolk that have pierced through the Cretaceous base, viz., at Harwich, Culford, and Stutton, not a trace of anything Jurassic has been met with, the borings pass suddenly from Cretaceous into far older rocks [Whitaker, Geol. Mag. 1895, p. 466].

#### THICKNESS OF CHALK AT NORWICH.

Messrs. J. & J. Colman's well-boring at CARROW proved the Chalk to be 1152 feet ; Greensand 6 feet ; Gault 36 feet = 1194 feet.

At STUTTON boring, Chalk 874 ft. 6 in. ; Gault 49 ft. 6 in. = 924 ft.



At CULFORD boring, Chalk 526 ft. ; Gault 73 ft. ; Lower Greensand 32 ft. 6 in. = 631 ft. 6 in.

#### THE KENT COAL EXPLORATION.

At Brabourn, Palæozoic rocks were reached, but no coal.

At Dover, 15 m. to the E. of Brabourn, coal was found !

#### BEDS ABOVE THE CHALK.

Overlying the CHALK we come to the TERTIARY SERIES.

(1) "WOOLWICH AND READING BEDS" have been observed at Sudbury, and in well-borings at Woodbridge, Saxmundham, and perhaps at Hoxne. Prestwich records them in a well at Yarmouth, 46 feet thick, 310 feet of London Clay, and 170 feet of newer deposits. These Eocene beds are probably present above the Chalk to the east of Surlingham and Wroxham in Norfolk.

(2) "LONDON CLAY." This formation was so named by William Smith in 1812, from its development around London. It consists of a stiff brown and bluish Clay, containing layers of septaria or cement-stones which mark the lines of stratification. There is a green and yellow sandy and loamy bed at its base, containing flint-pebbles, sometimes cemented by carbonate of lime into semi-concretionary tabular masses. The top strata are also sandy, passing in places into the lower Bagshot Beds above ; much used for *brick-making*, but the bricks are of a bad colour.

The LONDON CLAY contains much iron-pyrites and selenite, due to the decomposition of iron-pyrites and the destruction of organic remains ; the  $\text{SO}_3$  from the pyrites uniting with  $\text{CaCO}_3$  of the fossils forms selenite. The thickness of the London Clay varies from 50 to 60 feet in Berks, to 500 in S. Essex, often with abundant fossils. The London Clay extends over N. Kent, Surrey, Berks, Middlesex, Herts, and Essex, and the borders of Suffolk to Yarmouth. The fossils of the London Clay, *eroded and often partly coated by* or enclosed in phosphatic nodules, occur at the base of the Suffolk Crag at Felixstowe and elsewhere, and include the teeth of land animals ; also crustacea and the teeth of Sharks. Those of *Chelonie* are frequently obtained in the Septaria dredged up off the mouth of the Orwell at Harwich.

These Septaria or Cement-stones were largely used in the manufacture of Roman, Portland, or Parker's cement.\*

Passing over the other members of the Eocene series which are wanting in Norfolk, comprising:—

THE LOWER BAGSHOT BEDS, with their sands, loams, pipe-clay and beds of pebbles, 100 to 150 feet in thickness.

THE MIDDLE BAGSHOT BEDS, including the BARTON CLAY and the BRACKLESHAM BEDS.

THE UPPER BAGSHOT BEDS and THE HEADON BEDS, all characteristic of the South and South-east coast.—We next come to THE PLIOCENE SERIES (for the MIOCENE is also *wanting* in England). The English beds classed as *Pliocene* occur chiefly in Norfolk and Suffolk.

The PLIOCENE period embraces:—

The Cromer Forest-bed series.		The Red Crag series.
The Norwich Crag series.		The Coralline Crag series.

### 1. THE CORALLINE CRAG.

1. The *Coralline* Crag consists of yellow calcareous shelly sands, from 40 to 80 feet in thickness.

The term "*coralline*," refers to the abundant presence of the hard chitinous fronds of Bryozoa (commonly spoken of as "horny Corallines"), which are almost always present in the so-called Coralline Crag. Every one who has walked along the sea-shore will have noticed the delicate fronds of the "Horn-wrack" (*Flustra foliacea*) strewn upon the beach at times. This horny structure is easily seen to be composed of numbers of microscopic cells, and is in fact (like the *Bryozoa* of the "*Coralline Crag*"), the empty composite skeleton (*zoarium*) or *house*, in which hundreds of minute polypes (or *zooids*) once found a home. The main mass of the CORALLINE CRAG stretches from Aldborough in the north to Gedgrave in the south, embracing Orford, Sudbourne, &c.

The Coralline Crag is well exposed in the neighbourhood of Alborough and Orford, and at Sutton, Ramsholt, Tattingstone, Iken, Sudbourne, Broom Hill, Gedgrave, Gomer, &c.; the Mollusca of the Coralline Crag have a more southern facies than the Norwich

\* PRINCIPAL COMPONENTS: Carb. Lime 64.00, Silica 17.75, Alumina 6.75, Magnesia 0.50, Iron 6.00, Ox. Magnesia 1.00, Water 3.00=100. (Loss 1.00.

Crag and suggest a milder climate like that of the Mediterranean.

Among its more abundant Mollusca may be mentioned :—

GASTEROPODA. (Univalves)	LAMELLIBRANCHIATA. (Bivalves)
<i>Cypræa europea</i>	<i>Anomia ephippium</i>
<i>Voluta Lamberti</i>	<i>Ostrea edulis</i>
<i>Buccinopsis Dalei</i>	<i>Pecten opercularis</i>
<i>Turritella incrassata</i>	„ <i>maximus</i>
<i>Fusus consocialis</i>	„ <i>Gerardii</i>
<i>Trophon muricatus</i>	<i>Pectunculus glycymeris</i>
<i>Scalaria clathratula</i>	<i>Nucula nucleus</i>
<i>Natica multipunctata</i>	<i>Lucina borealis</i>
<i>Calyptræa chineusis</i>	<i>Diplodonta rotundata</i>
<i>Trochus Adansonii</i>	<i>Cardita senilis</i>
<i>Fissurella græca</i>	„ <i>scalaris</i>
<i>Emarginula fissura</i>	„ <i>corbis</i>
BRACHIOPODA.	<i>Astarte Omalii</i>
<i>Terebratula grandis</i>	„ <i>gracilis</i>
CIRRIPEdia.	<i>Cyprina islandica</i>
<i>Balanus crenatus</i>	„ <i>rustica</i>
POLYZOA OR BRYOZOA.	<i>Venus casina</i>
Very numerous.	<i>Mactra triangula</i>
CRUSTACEA.	<i>Panopea Fajjasii</i>
CORALS.	ECHINODERMATA.
	<i>Echinus Woodwardii</i>
	<i>Temnechinus excavatus</i>

#### THE Suffolk “BONE-BED” OR “COPROLITE-BED.”

The occurrence of a pebbly-bed, or a bed of *nodules*, in the Red Crag at Felixstowe, and generally in Suffolk where the base of the Red Crag or the Coralline Crag has been reached, has been described by Professor E. Ray Lankester, D.C.L., F.R.S. (Quart. Journ. Geol. Soc 1865, vol. xxi. pp. 221—232, Pls. x & xi, and *ibid* 1870, pp. 493—514, Pls. xxxiii & xxxiv.). This bed which is from half a foot to three feet in thickness occurs at the base of the Crag and rests upon the London Clay. It is composed of rounded phosphatic nodules called “coprolites,” and water worn teeth and bones of *Mastodon arvernensis*, *Rhinoceros incisivus*, *R. Schleirmachéri*,

*Cervus dicranoceros*, *Sus*, *Tapirus*, *Ursus arvernensis*, *Canis vulpes*, *Hyænarctos*, *Felis pardoides*, *Hipparion*, *Hyæna striata*, *Hali-therium Canhami*, *Belemnoziphius*, *Choneziphius*, *Trichechus*, *Delphinus*, *Cetotolithes* or ear-bones of Whales (*Balæna*, &c.); bones of Bird (*Diomedea*); teeth of Sharks (*Carcharodon megalodon*) &c., &c. Professor Lankester considers that the Cetacean remains were derived from the lowest Crag-deposits, known in Belgium as the "*Diestian*" or *Black-crag of Antwerp*. Professor Prestwich believed that the *Mastodon* and *Rhinoceros* of the Crag "Bone-bed" might have lived on land adjacent to the Suffolk area during the period of the formation of the Coralline Crag. The Whales he considered must certainly have existed at that time. Mr. Harmer is, however, strongly of opinion that most of these fossils, found, not in the Crag, but in a *remanié* bed at its base, have been derived from strata older than the East Anglian Crag.

Sir Charles Lyell was struck by the identity in lithological character between the matrix of the round stone bodies containing casts of shells and known as *Suffolk "Box-stones,"* and certain beds of the Antwerp Crag seen at Berchem; he had no doubt that they had been derived from that deposit. He thought that the area between Belgium and England might have contained a large number of terrestrial beds which eventually left certain of their contents to be mingled together in the lower beds of the later marine deposits of Suffolk.

Ear-bones of Whales, and teeth of *Carcharodon* attached to nodules of glauconite and manganese closely resembling those of the Suffolk Crag, were dredged up by the "*Challenger*" in deep water in the Atlantic and elsewhere.

Sir John Murray believes that all these phosphatic nodules have been similarly formed in deep water deposits by *chemical action* upon the organic matter on the sea-floor and in the sea-water. The teeth of the Sharks are being dissolved away by this action, leaving often only a shell of enamel behind.

Similar vast accumulations of marine and land animals with phosphatic matter have been met with in Tertiary deposits at Charleston, Carolina, and of mammalian remains in France at *Caylux*.

The Cambridge Greensand and the Pottou Beds are also examples of phosphatic deposits of a similar nature to the Crag, but older than Tertiary.



## THE RED CRAG.

This deposit consists generally of dark red shelly sand, exhibiting false-bedding, and having a thickness rarely exceeding twenty-five feet. Sometimes the colour is yellow, brown, or grey. Seams of laminated clay are occasionally met with in it. The Red Crag is well shown at Walton-on-the-Naze, Felixstowe, Waldringfield, Sutton, Ramsholt, Butley, and other places. At Tattingstone, near Ipswich, at Sutton, and at Sudbourne, the Red Crag is seen in section *superimposed upon the Coralline Crag*, but the beds are more or less unconformable. Over the greater part of the area the Red Crag rests on the London Clay.

Like the Coralline Crag, the Red Crag contains at its base a bed of derivative fossils which have been washed out of the London Clay, such as the teeth of sharks, *Lamna elegans*, Crabs, and some London Clay *Mammalia*, vertebræ of fishes, &c. *Many of these are phosphatised.*

Among the more common Mollusca of the Red Crag may be mentioned :—

## GASTEROPODA.

*Trophon (Fusus) antiquus*  
 „ „ *contrarius*  
*Purpura tetragona*  
 „ *lapillus*  
*Nassa granulata*  
 „ *reticosa*  
*Buccinum undatum*  
*Natica catena*  
 „ *multipunctata*  
*Littorina littorea*  
*Turritella incrassata*

## LAMELLIBRANCHIATA.

*Mactra arcuata*  
 „ *ovalis (solida)*  
*Tellina obliqua*  
 „ *crassa*  
 „ *pretensis*  
*Lucina borealis*  
*Cardium edule*  
 „ *angustatum*  
*Mytilus edulis*  
*Pecten opercularis*  
*Pectunculus glycymeris*

## ECHINODERMATA.

*Echinocyamus suffolciensis*

## CRUSTACEA.

*Balanus crenatus*, &c.

The Red Crag is generally *more ferruginous* than the shelly sands of the Coralline Crag, hence its name. The Coralline was originally

called the "White Crag" formation, but the upper part of the latter is also highly ferruginous.

#### NORWICH CRAG.

The NORWICH CRAG, so called by Lyell in 1839, is composed of a variable group of sands, pebbly-gravels, and laminated clays, with seams and patches of shells. These beds (in Norfolk) rest on the Chalk; sometimes as at Thorpe pit near the Asylum, the *Annelides* of the Crag sea have bored into the eroded Chalk floor for several inches.

4. Buff and red false-bedded sand and gravel, flint, pebbles, (iron-pan) seams of laminated clay sometimes cemented by iron.

3. Laminated clay with seams of sand and gravel, "Chillesford Clay."

2. White and brown sand with pebbly gravel and iron-stone nodules, sometimes called "Fluvio-Marine-Crag."

1. Unworn and rolled flints called the "*Mammaliferous stone-bed*." Shells are often absent. They are most frequent in beds one and two, to which the term "Norwich Crag" has usually been restricted.

Mammalian remains, no doubt derivative, occur in No 1 bed, as *Elephas*, *Mastodon*, *Hippopotamus*, *Cervus*, &c.; among the more characteristic Mollusca may be mentioned:—

#### GASTEROPODA.

*Natica catena*  
 „ *clausa*  
*Littorina littorea*  
*Conovulus pyramidalis*  
*Paludina media*  
*Purpura lapillus*  
*Trophon antiquus*  
*Turritella terebra*  
*Cerithium tricinctum*  
*Scalaria groenlandica*

#### LAMELLIBRANCHIATA.

*Tellina obliqua*  
 „ *lata*  
 „ *praetenuis*  
*Cardium edule*  
*Astarte borealis*  
 „ *compressa*  
*Mytilus edulis*  
*Mya arenaria*  
*Macra ovalis*  
 „ *subtruncata*

#### BRACHIOPODA.

*Rhynchonella psittacea*

#### CIRRIPEDIA.

*Balanus crenatus*  
 „ *porcatus*

The NORWICH CRAG also covers a large area in Suffolk, as at Hoxne, Halesworth, Easton-Bavent, Dunwich, Saxmundham, Leiston, and Thorpe by Alboro'.

#### THICKNESS OF THE CRAG.

Recent information, derived from borings in search of water, show that the Norwich Crag is a more important deposit in *thickness* than was formerly supposed.

A boring at Messrs. Youngman and Preston's Brewery at Lowestoft has been carried about 180 feet below sea-level without piercing the Crag; the lowest bed reached being *apparently* NORWICH CRAG.\*

At *Beccles*, the NORWICH CRAG series (if we include thirty-three feet of Pebbly gravel) was proved to be 129 feet in thickness; and at *Southwold* 147 feet of Shelly Crag—all of Norwich Crag age—was proved in a boring for water-works, 1886—87.†

At *Saxmundham* Brewery, 105 feet of CRAG, probably of Norwich Crag age, was proved in the well-boring.

#### CLIMATE OF THE SUFFOLK CRAG PERIOD.

Mr. F. W. Harmer observes:—"A considerable percentage of the species of mollusca found in the oldest Crag beds (Coralline and Walton Crag) some of them survivors from Miocene times, are not known living; as to the rest, the general character of the fauna is more or less similar to that of the Mediterranean at the present day, the presumption being that the climate of the Eastern counties of England was somewhat warmer at that period than it now is. The upper zones of the Crag, however, those represented by the Butley, Norwich, and Weybourn deposits give evidence of more boreal, and even of arctic conditions.

#### THE FOREST-BED SERIES OF THE NORFOLK COAST.

A portion at least of the Norwich Crag Beds (known as the "Chillesford series") underlies the "Forest-Bed" at Kessingland and Corton.

4. The Cromer or *Forest-Bed series* extends for a considerable distance around the Norfolk coast, and, although not always to be

\* Geol. Survey, Summary of Progress, 1898, p. 146.

† Reid, Pliocene Deposits of Britain, p. 104.

seen, is often exposed in places on the beach after storms which have scoured the beach and laid this bed bare.\*

It is of Preglacial age, although it has sometimes been grouped as *Pleistocene*, and contains the fossil remains of *Machærodus*, *Trogontherium Cuvieri*, *Elephas meridionalis*, *E. antiquus*, *Cervus dicranoceros*, *Rhinoceros etruscus*, *Equus fossilis*, *Cervus bovides*, *C. Sedgwickii*, *C. verticornis*, *Hyæna crocuta*, *H. spelæa*, *Hippopotamus amphibius*, *Ursus ferox*, *Gulo luscus*, and others.

It occurs below the *Glacial Drift* and above the Weybourn Crag, with a total thickness of twenty to thirty feet. It has been divided by Mr. C. Reid into an Upper Freshwater Bed, Forest Bed so called (Estuarine), and a lower Freshwater Bed.

Among those who have collected from the Forest-bed may be mentioned the Rev. John Gunn, Rev. Jas. Layton, Mr. S. Woodward, Rev. S. W. King, Mr. Randall Johnson, and Mr. Savin of Cromer. Its mammalian fauna has been described by Mr. E. T. Newton F.R.S., Mus. Præst. Geol., Jermyn St. For collections of fossils, see British Museum of Natural History, Cromwell Road; Jermyn St. Museum, and the Castle Museum at Norwich.

#### GLACIAL PERIOD, BOULDER CLAY, &c.

The CHALKY BOULDER CLAY occupies a large area of Central Suffolk, *west of Ipswich, Woodbridge, Saxmundham, and Halesworth*. The Rev. E. Hill of Cockfield observes: "It rises up to a height of 340 feet; but none of the neighbouring outcrops of Chalk reach 300 feet, so that the denudation of the Chalk must have been very considerable."

"The Boulder-clay" is connected by geologists with a period of extreme cold which spread over the northern parts of Europe in Pleistocene times, when the higher lands were covered with snow and ice, and when icebergs and floe-ice brought and deposited erratic blocks from distant parts of the North of England, and from Scandinavia.

But even this geological cataclysm was not devoid of benefit to mankind, for it left behind it soil which forms some of the best corn-lands in England.

The late Dean Buckland remarked, 80 years ago, that he always knew when he was travelling over the Boulder Clay, by the happy and contented faces of the agricultural population whom he met.

\* It extends from Weybourn in Norfolk to Kessingland in Suffolk.



I hope it is the case in the Boulder Clay districts of Norfolk and central Suffolk to-day.

#### SUBMARINE DEPOSITS OFF THE COAST.

All along the East Anglian Coast (from *Essex, Suffolk, Norfolk, and Lincolnshire to Yorkshire*) deposits have long been known to exist on the floor of the North Sea (which is here comparatively shallow) which at times form banks, as the "*Dogger-bank*," of very large extent, the "*Knole-sand*," the "*Scroby-sand*," and many others. These banks have been the favourite resort of our fishermen from very early times for trawling and line-fishing. We have records extending over more than a hundred years, showing that the fishermen were in the habit of hauling up in their trawl-nets vast numbers of bones of extinct animals, grinders and tusks of Elephants, antlers of Deer, and horn-cores of Musk-ox and Bison. These were at first destroyed (with many imprecations) on account of the damage to their nets; but at last there grew up a considerable number of curious and observant Naturalists and Geologists, who encouraged the fishermen to preserve these remains. Hence the collections of the Rev. J. Layton, Mr. Taylor, Mr. J. J. Owles of Yarmouth, Samuel Woodward, Rev. John Gunn, Mr. Backhouse, Mr. J. J. Colman, M.P., Mr. Savin, and many others. Thus a large number of interesting records have been preserved of this old submarine land. One very striking feature of the remains is that *they have not been rolled* like those found in the nodule beds at the base of the Coralline and Red Crag, but retain their original sharpness as if they had been quietly left on the old land-surface where the animals had died. But for the fact that they represent a younger fauna than the Norfolk Forest-bed one would have wished to correlate them with that deposit so near at hand. But a long period of time must have intervened between the two, and it serves to show how many periods of past geological time are represented by these fragmentary deposits left to us in East Anglia and upon its coasts.

#### QUARTERNARY DEPOSITS AND PREHISTORIC MAN.

The latest changes brought about were due to *local causes*, floods, and river-action, leaving behind, in the present or former valleys, deposits of brick-earth and gravel. One such deposit was noticed

by Mr. Frere at Hoxne on the Waveney (in 1800), where Palæolithic flint implements lay in great numbers at a depth of twelve feet in stratified soil which was dug into for making bricks. These implements were associated with Rhinoceros, Deer, Horse and Elephant, and with shells of *Cyclas*, *Pisidium*, *Unio*, *Bithynia*, *Helix*, *Limnæa*, *Planorbis*, *Succinea*, and *Valvata*.

Since then numerous other discoveries have been made, more especially in the last forty years, in different parts of England, revealing similar types of Prehistoric remains. At Mildenhall, at Thetford, Livermere, in the valley of the Little Ouse, &c., &c., such evidence has been obtained, whilst attempts have been made by Mr. S. B. J. Skertchley and the late Dr. J. E. Taylor to prove the existence of Man even in the Crag Period!

In conclusion, I have only to add that those of my hearers who have been sufficiently interested by this brief sketch of East Anglian Geology to desire to read a fuller account of the physical conditions existing in this area in later Tertiary times may consult with advantage the admirable series of papers published by the late Mr. Searles V. Wood, Jun., and Mr. F. W. Harmer, and subsequently by Mr. Harmer alone, on the Geology and Climate of Eastern England and its later Tertiary History.\*

My thanks are also due to Mr. Harmer, who, in my unavoidable absence, kindly undertook the reading of this paper for me, and superintended the exhibition of the series of lantern slides with which it was illustrated.

\* S. V. WOOD, JUN., and F. W. HARMER:—

"An Outline of the Geology of the Upper Tertiaries of East Anglia," with Map and Sections. Pal. Soc., Supp. Crag Mollusca, pp. 2-31, 1872.

"Later Tertiary Geology of East Anglia." Quart. Journ. Geol. Soc., vol. xxxiii. pp. 74-119, 1877.

F. W. HARMER:—

"A third Boulder Clay in Norfolk." Quart. Journ. Geol. Soc., vol. xxiii. pp. 87-90, 1866.

"The Kessingland Cliff Section." Quart. Journ. Geol. Soc., vol. xxxiii. pp. 134-140, 1877.

"The Pliocene Deposits of Holland, and their Relation to the English and Belgian Crags." Quart. Journ. Geol. Soc., vol. lii. pp. 748-781, 1896.

"The Lenham Beds and the Coralline Crag." Quart. Journ. Geol. Soc., vol. liv. pp. 308-354, 1898.

"The Crag of Essex, Waltonian." Quart. Journ. Geol. Soc., vol. lvi. pp. 705-743, 1900.

"The Influence of the Winds upon Climate during the Pleistocene Epoch." Quart. Journ. Geol. Soc. vol. lvii. p. 405-476, 1901.

"A Sketch of the Later Tertiary History of East Anglia." Proc. Geol. Assoc., vol. xvii. pp. 416-479, 1902.

## V.

## THE MERES OF WRETHAM HEATH.

BY W. G. CLARKE.

*Read 27th January, 1903.*

THE remarkable pools of water called Meres, or locally "Pits," situated on the extensive heathland north of Thetford and close by the boundary between the parishes of Wretham and Croxton have hardly received the attention they deserve. Various writers have made bare mention of them; some because of their strange formation or picturesqueness; others, within the past twenty years, because of the almost unique character of their bird-life, Mallard, Gadwall, Shovclers, Teal, Garganey, Pochard and Tufted Duck, having been known to nest in the vicinity of one or the other of these meres. This aspect of the subject need not now be dwelt upon, although the question will naturally occur in connection with the strange fluctuations in the area of the meres, the subject with which I propose to deal, the facts solely relating to Ringmere, Langmere, Fowlmere, and the Devil's Punch Bowl.

The meres have neither visible inlet nor outlet and are only found in that portion of the district where the chalk comes to the surface or is only thinly covered by sandy drift. As to the origin of these sheets of water we must accept the opinions of expert geologists. Mr. F. J. Bennett, F.G.S., thinks that many small meres have become dry through the lowering of the water-level in the chalk, consequent upon increased cultivation and drainage. "Pipes" in the chalk were filled with drift-sand. These, after a heavy rainfall, would be filled with water, so far as they were affected by the

water-level of the chalk. As this level rose, so would the water ascend and thus enlarge the areas until the basins were formed. Sir John Evans has noted that in Hertfordshire the chalk level of saturation has varied as much as seventy feet in the course of a single year. A process similar to that by which these meres were formed is even now going on in the neighbourhood of Thetford, and extensive subsidences have taken place. Mr. Bennett thought that the meres were fed by springs from the chalk at the same level, as they were all nearly the same height above the sea. Dr. J. E. Taylor said in 1871 that the meres dried up during drought, their water supply being simply the storage of the wet seasons. Dealing with the meres of Norfolk generally, he did not think many were fed by springs, because they were frequently active during seasons of drought. Mr. Robert Stevenson, the tenant of Fowlmere Farm, says he is certain that Fowlmere is fed by surface water and not by any spring. Later, we shall see in which direction the evidence tends. The fact that three of the more northerly meres contained, when drained, traces of the pile-dwellings of prehistoric man, proves that these pools have not been formed during the historic period.

#### RINGMERE.

In the collection of Norse sagas known as the "Heimskringla" mention is made of a battle fought on "Hringmar Heath," probably in the year 1010 A.D. There appears to be no further mention of the spot until, in 1724, or the following year, Salmon, the author of "Roman Stations" saw a "remarkable cavity called Ringmere Pit." He said:—"It is in the form of an amphitheatre to the bigness of six or seven acres with an uniform descent on every side to the arena. There was not in the latter end of October a drop of water in it, which the wet summer must have filled if it had been a pond." Writing in 1739, the Rev. Francis Blomefield said that there was in this nothing uncommon to those acquainted with it. It was generally full of water, he said, and the ground being a sand the water occasioned the uniform descent. He continued thus:—"It is supplied with landsprings from the adjacent hills (*sic*) which in the extreme dry year ceased running and so the water shrank into



the sand." When a schoolboy at Thetford he had angled fine perch out of it, and thought it was artificially stored with fish after being dry. For over a hundred years there seem to have been no references to the meres, until Mr. Henry Stevenson wrote an excellent account of his visit on August 8th, 1869. Ten years previously Ringmere was quite dry. A hole about four feet deep was then dug in the middle of the mere, but supplied no water. There are traces of some such excavation now. An old shepherd once told me that nettles of gigantic size grew in the bed of the mere at this time. In the hot summer of 1868 the water was very low in all the meres but they were never quite dry. It was recorded then, and a similar state of affairs has occurred several times since, that in very wet seasons the waters of Ringmere have flowed over the highway on its eastern side till the horses were knee-deep in passing through, and covered the low-lying part of the heathland for a mile or so. The members of the Ordnance Survey visited this district in 1882 when all the meres were very full of water. Ringmere was then about 250 yards long and 150 wide at its widest part. Mr. T. Southwell, who has kindly allowed me to see his notes, records that on June 5th, 1882, all the meres were very full of water. On Ringmere there were two old Shovelers with broods of young—one had eight—some Coots, and several Little Grebe, and a similar record was made on May 29th, 1884, when, despite the drought, the waters were higher than in the previous year. At Ringmere, on May 19th, 1887, Mr. Southwell saw the following birds, viz., Pochard, Tufted Duck, Mallard, Shoveler, Green Sandpiper, Cuckoo, and Stone Curlew, and a Gadwall on the wash-pit close by.

My personal acquaintance with the meres dates from 1889. At four visits between April and September of that year the water in Ringmere was at a medium height, namely about twenty feet from the crown of the road to the verge of the pool. The levels changed but little during 1890. After a heavy shower of rain on September 7th a large number of Stone Curlews flew down to the mere from the surrounding heathland, all whistling during flight, and apparently finding food among the scrubby grass and rushes that surround the pool. On April 2nd, 1892, the meres were extremely high. Thousands of empty shells of *Limnea stagnalis* floated about close to the edge of the water. Twenty-seven Coot

and a pair of Mallard, were swimming on Ringmere on March 25th, 1893, the water then being at a medium height. On the 15th of the following April, the only birds on the mere were a pair of Little Grebe. The water was rather low on May 26th, 1894, but Coots were present in abundance. The autumn was a very wet one, yet on November 25th, Ringmere was lower than I had previously seen it. There was no sign of life on or around it. Where the waters had receded, thousands of empty shells of the freshwater whelk had been left on the mud. There were four distinct zones, each several inches in width quite round the mere. The water was still very low on Christmas Day and a Hooded Crow was the only sign of bird-life. Early in September, 1895, the level was approximately the same, with about twenty Coots on its surface. It had changed from its usual circular form to a more oval shape. It was much higher on November 6th of the following year. There was scarcely any water in Ringmere, as Mr. Southwell records, on March 18th, 1899. In the September of 1901 all the meres became quite dry. Ringmere was so dry on May 17th, 1902, that I walked all over its bed. The mud had not become grass-grown and was fissured as one might suppose it would be from a miniature local earthquake. Shells of *Limnaea peregra* were almost as common as those of *L. stagnalis*. A few birch posts projected from the mud on the northern bank of the mere; but there is said to have been at one time a boathouse on the spot. The bed of the mere was fairly level, save for one place about six feet across and six inches lower than the remainder. This is almost in the centre, but slightly nearer the southern shore, and may possibly be the result of excavation when the pit was last dry. When Hill Mere was drained, a circular hole about  $4\frac{1}{2}$  feet in diameter, and some six feet deeper than the bottom of the mere was found, and seemed to have been the site of a pile-dwelling. There were no traces of moles in the bed of Ringmere, but numerous well-defined hare and rabbit runs were beaten down smooth in striking contrast to the remainder of the surface. On September 4th, 1902, the bed of Ringmere was filled with a closely-matted growth from a foot to eighteen inches in height of spotted persicaria and curled dock, while on the old shores were scorpion grass and golden water-dock in abundance, but no trace of water.

## LANGMERE.

It may be well to define the positions of the meres. Ringmere is on the western side of the road leading from the Thetford-Norwich highway to East Wretham. To the east is the highway, to the north and west the heathland, while on the south is the base of a triangular plantation of firs, beech, larch, and silver birch. Croxton and Kilverstone parishes both reach Ringmere—seven parishes have the right of there watering sheep—and the boundary between them is that of the Shropham and Grinshoe hundreds. The Croxton boundary touches Ringmere, then goes to Langmere, continuing along the northern bank of the "Drove," a well-defined green trackway which runs from the fenland at Hockwold to Roudham heath and seems to the writer to be undoubtedly pre-Roman. It follows the high chalky ridge and divides Ringmere and Langmere, and Fowlmere and the Punch Bowl.

Blomefield, in 1739, said that other large pits on the heaths were mostly dried up in the summer-time and had water in them in winter. When Ringmere was dry in 1859 water was found in a pond between that mere and Langmere and also near the highway towards Wretham. Both these ponds still exist. About sixty Blackheaded Gulls flew from the former in June, 1898, and there was ample proof that they had nested there in greater numbers than they had previously done since 1883, which in its turn had eclipsed previous years. On May 17th, 1902, when Ringmere and Langmere were quite dry, this pool was half full of water and a pair of Mallard rose from it, and flew round overhead. It is on a decidedly higher level than either of the adjacent meres, and is probably supplied by surface water and not from the chalk. There was still a good depth of water on September 4th, 1902, but no sign of wild fowl.

Langmere is of long oval form and when full is a quarter of a mile from end to end, with an island on which are Scotch firs and gorse in the centre. It was quite dry in 1859 and ten years later only reached one third of its proper extent. Mr. H. Stevenson then saw on its surface ten or twenty couple of Duck and Mallard, a female Shoveler, and two or three couple of Grebe. Not long previously the grassy knoll had been almost an island, the waters



surrounding it in all but one spot. At night, stock were driven across the isthmus and securely folded within a natural inclosure. On June 5th, 1882, as Mr. Southwell records, the tumulus-like knoll was surrounded by a broad sheet of water. There were great quantities of Coot, Grebes, Gulls, Tufted Duck, Pochard, Shovelers, and Common Duck, many with broods. It was at that time about 440 yards long and 275 wide. On June 27th, 1882, there were Gadwall and Great Crested Grebes on Langmere, and Mr. J. H. Gurney caught a young Teal on the shore. There was a large number of ducks' nests and eggs on the shores of the mere on May 29th, 1884. Tufted Ducks and Common Ducks were more common than previously, Pochards less so, Teal about as usual. Young Gadwalls were seen, and Coots were very common. Mr. C. J. Staniland, R.I., visited the mere in July, 1887, and describing his visit in the 'Graphic' of October 15th, he said of Langmere:—"It is the most impressive of the meres that we saw, lying in the midst of a wild scrubby heath, not a sound but the melancholy wailing of the Peewit or the scream of a Gull to break the silence; the dozen or so of fir trees on the peninsula standing up in solitary grandeur against the sky. The immediate surroundings of the mere a dried-up, starved, stalky growth of thistles and what-not." In 1889 Langmere was well filled with water, and the level changed little during 1890. Hundreds of wild fowl, a goodly proportion of which were Coots, disported themselves on the mere on March 25th, 1893. The water was then extremely high. The mere was divided into two large ponds, one round, the other oval, on May 26th, 1894, and there were several Coots' nests near the shore. By September 27th of the same year the waters had quite disappeared. In 1895 it was partly refilled, and on November 6th 1896, the volume of water had still further increased. There was a flock of about 200 Coots on the mere, and I successfully watched their movements by creeping on the knoll and sheltering behind the gaunt firs. Langmere was very low in June, 1898, but a dozen brace of Wild Duck flew from it ere I could distinguish the species. On March 18th, 1899, Langmere was, as Mr. T. Southwell notes, only a long splash, and with the other meres was quite dry by September, 1901. A visit on May 17th, 1902, proved that in spite of various opinions to the contrary, Langmere when full of



water must be the deepest of the meres. The long pool on the northern side had apparently been dry for some considerable time, for the bed was covered with grass and seemed to be the playground for hundreds of rabbits, which scampered off at our approach. The water had obviously remained longest in a circular hollow eastward of the knoll, for this still retained an element of moisture. It was everywhere undermined with mole runs, and one could nowhere find a clear space of a foot square which had not thus been tunnelled. Among the tufts of grass were thousands of shells of *Limnaea stagnalis*. A further visit on September 4th showed little change, save that the grass had grown somewhat higher.

#### FOWLMERE.

This, the largest of the heathland meres, lies about a mile west of Langmere on the northern side of the "Drove." It is nearly three times as big as Ringmere and was also dry in 1724—5. It lies partly in Croxton and partly in Wretham, and when Blomefield wrote in 1739 the Croxton part of the fishery pertained to the estate of the Thetford School and Hospital Foundation. For a century there appears to be no further mention of it, but on June 16th, 1842, as recorded on a tombstone in the churchyard of St. Mary's, Thetford, John Goodbody and Edmund Craske of that town, were accidentally drowned in Fowlmere, which must at that time have been fairly high. When Langmere and Ringmere were dry in 1859, Fowlmere consisted of a small pond at the northern end of the basin. All the other portion, as Mr. Henry Stevenson records, was a flourishing crop of wheat, oats and vetches. The last did not do well, and were therefore mown, cabbages being substituted. There was a tradition that Fowlmere had previously been dry and that a crop of oats grown upon it was entirely lost by the sudden influx of the waters. Mr. Robert Stevenson of Fowlmere Farm, says that the mere was quite dry in the summer of 1862, and was then planted with cabbages. This is possibly a confusion of date, or the mere may have remained practically dry for several years. When the mere only occupied a circumscribed area, before becoming quite dry, a Croxton man, named Taylor, secured twelve stone of fish at this spot. Mr. Henry Stevenson

wrote in 1869 : " Charming as is the aspect of this wide expanse of water with its green islets and thick belt of rushes at the further end, there is an absence of that utter wildness of character which marks the other two." The mere showed evidence of having extended far beyond its area in 1869, and a crop of grain was fenced in and grown on the reclaimed soil. The water was extremely deep in places, and contained good Perch. Mr. Robert Stevenson says that Fowlmere gradually increased in size from November 1862, until March 1883, when it was eighteen feet deep in parts and covered thirty aeres. According to the Ordnance Survey map, in 1882, the mere was 528 yards long and 330 wide ; a fine sheet of water for that part of the county. On June 5th of that year, Mr. Southwell saw a large number of Ducks on this mere, five, with their broods, being under the field of his glasses at one time. In January, 1884, the mere covered a considerable area and there were two smaller meres on the eastern side. Later in the year several fields were flooded in spite of the drought, and a noteworthy item in nidification was that a number of waterhens' nests appeared to be built in old blackbirds' nests in the hedges. The following year the mere was reduced to half its extent in 1884. Mr. C. J. Staniland visited Fowlmere in July 1887, and in the 'Graphic' of October 15th, had a sketch of the mere, reproduced in the 'Daily Graphic' of August 30th, 1890, and the following brief description :—"Fowlmere repaid us for all our exertions. Imagine a solitary pool surrounded by firs at one end and open country at the other, swarming with Peewit, Teal, Duck and Seagulls, set in the midst of a lonely heath." In 1889 and the following year this mere was well filled with water. It was higher than usual on May 26th, 1894, and the wind raised moderate-sized wavelets that beat on the marge. The mere had overflowed part of the western shore and the green tops of the bushes just peeped above the surface for some yards from the edge of the water. Fowlmere was still as high as it had been in the previous May on January 12th, 1895, when every part was frozen over and provided a splendid area for skating. The difference in the rhythm sufficiently attested the difference in depth in the various parts of the mere. The northern end was much the deeper, further proved by the fact that this remained open much longer than other

portions. In 1896 the dog of the shepherd who then lived close by the Punch Bowl, would go into Fowlmere and catch the sluggish Tench which there abounded—often bringing out large-sized specimens. This mere was fairly high in June, 1898, but by March 18th, 1899, it was almost dry. In September of that year the waters covered half their full area, and on the 26th, over 150 dead Tench lay upon the southern shore. Before the heavy rains of the previous week or so the waters had been lower and as many more Tench, ranging from one to three pounds in weight, had been exposed. Mr. R. Stevenson of Fowlmere Farm says in a letter to the writer that Fowlmere gradually decreased from 1883 to September, 1901, when it became quite dry. He had it harrowed and ploughed without any difficulty. The horses could walk as well as though on an ordinary field, with the exception of two low places, where the animals were not allowed to go. As the mere lies half in Croxton and half in Wretham the occupier of each farm planted about four acres of beet, swedes, and cabbages. When I visited the mere on May 17th, 1902, it was absolutely dry and apparently about two-thirds of the bed of the large pool was ploughed up and partly protected by wire netting. The soil seemed a stiff loam, rather chalky, and contained numbers of large flints. The bed of the mere slopes downwards from east to west, the lowest part being at the north-west, but there was nowhere any indication of moisture. The extremely stony beach on the eastern shore had not been ploughed up. On the high land close by I found a number of Neolithic flint implements, also a Wood Wren's nest with six eggs, neatly built beneath the sere and overhanging bracken fronds of the previous year. The aspect of the southern end of the mere has been greatly changed of late years by the planting of trees. On September 4th there was promise of a splendid root crop in Fowlmere. A belt of ground across the middle of the mere, dividing the parochial areas, was covered with weeds, chiefly spotted persicaria, while thistles and nettles flourished exceedingly around the borders. The promise of a good crop was fulfilled. From the Croxton portion of the mere a swede weighing twenty-three pounds, and a cabbage weighing fifteen pounds, were taken, and exhibited in Thetford market on November 8th. On the Wretham portion there were about  $2\frac{1}{2}$  acres of beet from



which 126 big cart loads were taken, or about forty tons per acre. The roots were large, many of them twenty-eight inches in circumference, sound and of good quality, the best crop Mr. Robert Stevenson had ever seen. From half an acre of drumhead garden cabbage between fifty and sixty loads were taken. These were of excellent weight and quality but would have been larger had cattle cabbage been planted. Carting was quite easy; in the middle of November the bed of Fowlmere was as dry as any upland field. Rabbits had burrowed deeply into some parts and the soil brought up from the greatest depth was quite dry. During agricultural operations part of an old harrow was found in the soil. The woodwork had decayed, several iron teeth alone indicating the nature of the implement. This might have been a relic of the 1859-62 dry period or even of some earlier occasion.

#### THE DEVIL'S PUNCH BOWL.

This, the smallest of the four heathland meres, lies to the southwest of Fowlmere on the further side of the "Drove." Although its basin is the most typical in formation of any of these meres, I have fewer observations concerning it. A sketch of it by Mr. C. J. Staniland appeared in the 'Graphic' of October 15th, 1887, and the 'Daily Graphic' for August 30th, 1890. Both in 1889 and 1890 there was a good depth of water in the mere. On July 26th, 1894, there was on the contrary very little and that of inky blackness. A similar state of things existed in June, 1898, when two Moorhens flew from the water and sheltered among the braeken half-way up the slope. On March 18th, 1899, there was only a wet spot at the bottom of the basin, and in the summer of 1901 it became quite dry, as it still was when I visited the spot on May 17th, 1902. Towards the southern edge of the mere was a small hollow several feet below the general level of the bed. One can never get a better idea of the remarkable character of this mere than by standing in the middle of the pit when it is dry. On the table-land above, a line of gaunt firs cuts off the outside world. Towards the mere there is next the level turf, and then a sharp descent of between twenty and twenty-five feet, forming the huge circular basin which popular fancy pictured as the



"Devil's Punch Bowl." The patch of mist that sometimes hangs over the mere at night time is also called the "Devil's Nightcap." Two-thirds of the sloping sides of the mere are covered with bracken, and from that there is close slippery turf to the gravelly beach which edges the black mud in the bed of the mere. In 1882 the water had a length and breadth of 110 yards. In May last the basin contained discoloured skulls of Sheep, Lambs, Dogs, and Cats, and the mud was covered with decaying water-weeds. The mud in drying had fissured in every direction. In the bed of the pool I found a Neolithic flake and a scraper. I was informed that the water in the well belonging to the cottage on the southern side of the mere had been low, owing to the small rainfall, but never so low as to cause any serious difficulty. On September 4th there was little difference in the aspect of the mere, save that the grass and vegetation had increased somewhat in height.

#### CONCLUSIONS.

In addition to the various opinions recorded in the introduction, Mr. Henry Stevenson said in 1869, that it had been asserted that the meres never covered so large an area after Wretham West Mere was drained in 1851, and Great Mere in 1856. In 1884, on the contrary, Mr. F. J. Bennett wrote:—"Since Mickle Mere was pumped dry and deepened in 1856 the water has stood higher in them all and none have since been dry." Many Thetford people assert that the meres have been gradually getting dry since the well was made at Thetford Waterworks in 1876. It has also been stated that there is most water in the meres in the driest summers, and similarly that in the winter-time the waters of the Punch Bowl receded, rising as the heat of summer increased. Facts prove that there is as little reason in these contentions as in the tradition which said that the price of corn rose with the waters of Ringmere. In 1859 the mere was dry and wheat was £11 per ton; in 1884 it was full to overflowing and wheat was £8 19s. per ton. It can, I think, be shown that the rainfall is solely responsible for the fluctuations of the water in the meres, not as surface water—or why should ponds and wells on higher levels contain water when the meres are dry?—but so far as the rainfall affects the

level of saturation in the Chalk. The height above sea-level of the beds of these meres is apparently about the same. To the east of Ringmere the road is 106 feet above sea-level; the "Drove" immediately south of Langmere is 110 feet above sea-level, the track rising to  $137\frac{1}{2}$  feet at the plantation about mid-way between Langmere and Fowlmere. Nearer the latter mere a height of 140 feet is attained, dropping at the southern end of the mere to 120·8 feet. Taking the years 1859 and 1862, one or both of which were dry years so far as the meres are concerned, 1882 which was a full year, and 1902, which was a dry year, and comparing the Norfolk rainfall for periods of five and ten years preceding, we get the following data: In the ten years from 1872 to 1881, inclusive, the rainfall was 277·62 inches; from 1849 to 1858, 224·33 inches; and from 1852 to 1861, 226·04 inches; while from 1892 to 1901, inclusive, the rainfall was 243·61 inches. Between the ten-year dry periods and the ten-year wet periods there is thus a maximum difference of fifty-three inches or 5·3 per year, and a minimum difference of thirty-four inches or 3·4 per year. In the five years preceding the full meres of 1882 and the dry meres of 1862 and 1902 the figures show a far greater divergence. The rainfall from 1854 to 1859, inclusive, was 102·31 inches; and from 1857 to 1861, inclusive, 112·18 inches; from 1897 to 1901, inclusive, 117·39 inches; while in the wet period of 1877 to 1881, inclusive, the rainfall was 149·69 inches. This shows a maximum difference in the quinquennial periods of forty-seven inches or 9·4 per year and a minimum of thirty inches or six per year. This seems quite sufficient to account for the remarkable fluctuations of the water in these meres, while the fact that in the intervening periods one mere is sometimes high while at the same time another close by is low, may perhaps be due to the slight differences in level. For instance, if the saturation level were eighteen feet beneath the ordinary surface, a mere whose bed was nineteen feet from the surface would contain a foot of water when one whose bed was seventeen feet from the surface would be quite dry. It may also be noted that in 1882 when the meres were at their highest level for many years, the rainfall was 33·34 inches, the highest yearly register for many decades.

Reasoning from previous experience it may therefore be

anticipated that with an increased rainfall the chalk level of saturation will rise, and the beds of these meres once more become filled with water and serve as the nesting-places of some of the rarer wild-fowl.

## FLUCTUATIONS IN THE MERES OF WRETHAM HEATH.

DATE.	RINGMERE.	LANGMERE.	FOWLMEER.	PUNCH BOWL.
1712-20	Full	—	Full	—
Oct. 1724-25	Dry	—	Dry	—
June 16th, 1842	—	—	Fairly high	—
1859	Dry	Dry	Nearly dry	—
1862	Dry	Dry	Dry	Dry
1868	Low	Low	Low	Low
Aug. 8th, 1869	Fairly high	Low	Low	—
June 5th, 1882	Full	Full	Full	Full
1883	Full	Full	Full	Full
May 29th, 1884	Full	Full	Full	Full
May 19th, 1887	Fairly high	Fairly high	Fairly high	Fairly high
July 1887	—	Fairly high	Fairly high	Fairly high
1889	Medium	Fairly high	Fairly high	Fairly high
Sept. 7th, 1890	Medium	Fairly high	Fairly high	Fairly high
April 2nd, 1892	Full	Full	Full	Full
Mar. 25th, 1893	Medium	Full	—	—
May 26th, 1894	Low	Low	Full	Low
Sept. 27th, 1894	—	Dry	—	—
Nov. 25th, 1894	Very low	—	—	—
Dec. 25th, 1894	Very low	—	—	—
Jan. 12th, 1895	—	—	Full	—
September, 1895	Low	Low	—	—
Nov. 6th, 1896	High	High	—	—
June 1898	Low	Low	Fairly high	Very low
Mar. 18th, 1899	Nearly dry	Nearly dry	Low	Nearly dry
September, 1899	—	—	Nearly dry	—
September, 1901	Dry	Dry	Dry	Dry
May 17th, 1902	Dry	Dry	Dry	Dry
Sept. 4th, 1902	Dry	Dry	Dry	Dry

## VI.

*PYROLA ROTUNDIFOLIA*, L., IN EAST ANGLIA.

BY ARTHUR BENNETT, F.L.S.

*Read 27th January, 1903.*

IF you look at a map of England and mark the Counties in Mid. and E. England in which this species occurs, you will see how curious its distribution is. It occurs in E. and W. Kent! E. Suffolk! (extinct?). Norfolk E! and W., and then not till Worcester, Stafford! and Salop, in all of which it is very rare; then to Flint! Yorkshire and Lancashire! In no southern county is it recorded except Sussex, where there is an old unconfirmed record for it. But in last August (1902) it was found in E. Sussex and sent to the Rev. E. N. Bloomfield. It is given in the 'Flora of Herts,' p. 269, 1887 (by A. R. Pryor, edited by B. Daydon Jackson), but I much doubt this record, neither author or editor put a ! to it.

In Kent it occurs in woods, not in marshes as in Norfolk. In Koch's 'Synopsis of the German and Swiss Flora' its habitat is given as "in sylvis umbrosis." In N. America in "dry woods," while another species, *P. uliginosa*, Torrey, is found in bogs and marshes; in the 'Flora of Schleswig-Holstein,' by Dr. Prah! (1890), it is given from "Turf-moors, but oftener in woods." In Scotland it grows "on moist rocks and woods." In the station near Heigham Sounds it grows in very wet ground, and in drier on the hillocks in the marsh; close by *Cladium mariscus* is growing in twelve inches of water. In Britain we have so little data as to groupings of plants (except the work commenced by the late Mr. Smith in Scotland) that we have no means of comparing what species grows with it in other counties.

The earliest record for Suffolk seems to be 1800. Meadows at Gorleston and Bradwell Common among the furze, Lilly Wigg; but Sir J. E. Smith says it was extinct here in 1828.



Sir J. E. Smith recorded it from "a Wood at Middleton," and Hooker (1830) says a Mr. D. E. Davy found it there.

Henslow and Skepper (Fl. Suff., 53, 1860) give Ashen Spring near the Roundhouse, Theberton. The Rev. Dr. Hind in his Fl. Suff., 232, 1899, gives these stations, but no intimation that he had ever seen it, and this I know was so, by letters received while he was compiling the Flora. Specimens from Suffolk are in the British Museum Herbarium. In Norfolk the first record I can find is that of Larlingford, Rev. G. R. Leathes in Hooker's Brit. Flora, 192, 1835. The Rev. K. Trimmer gives the station for *P. minor* with the reference "H. A. B. F." *i.e.*, Hooker and Arnott Brit. Fl., ed. 6, 276, 1860; but they have no such locality under *minor*, no doubt he intended to quote it under *rotundifolia*. But it was known to R. Wigham at Upton before this, as he records it in MS. in a copy of Sir J. E. Smith's Fl. Britannica, 1800, formerly in the possession of the late Rev. K. Trimmer, and Paget Nat. Hist. of Yarmouth, 1834, remarks "Bradwell Common, but now lost, but still at Upton, fifteen or twenty miles off." It still grows there as the late Mr. Geldart and Mr. Southwell found it on July 16, 1886 (Trans. 1886, p. 258). In 1866 Mr. Trimmer records it from Gunton on his own authority; and from Bawsey, on the authority of Mr. J. Balding. Mr. Geldart (Trans. 1875) gives it from Roydon Common, on the authority of Dr. Lowe. In 1884, Mr. Trimmer (Supp. Fl. Norfolk, 28) adds Edgefield, Aug., 1873; Felthorpe, July, 1876; and Gressingham, Aug., 1877, as stations for it.

About 1890, Mr. and Mrs. Cotton found it in abundance near Heigham Sounds by the Meadow Dike, and sent me specimens. In Aug. 1900, and June 1902, my wife and I saw it there in plenty. Near to it grew *Lastrea cristata*, *uliginosa*, and *spinulosa*, the two last on the raised hillocks on the marsh on which the small Willows grow, while *cristata* in the wettest part flourishes.

In June, 1902, my friend Mr. C. E. Salmon found it at Thurne, where it grows with *Carex limosa* and *teretiusecula*, *Peucedanum palustre*, *Liparis Loeselii*, and other marsh plants, a rich little spot.

We have now ten stations in Norfolk, six being in E. Norfolk, and four in W. Norfolk. It will probably be found in other places if sought for, and I should be very glad to hear of any such.

## VII.

A LIST OF PLANTS GATHERED ON  
A SMALL STRIP OF THE NORTH COAST OF NORFOLK  
IN THE YEAR 1902.

BY THE REV. W. E. THOMPSON, M.A.

(Communicated through the Hon. Sec.)

*Recd 27th January, 1903.*

THE above mentioned district is in V.C. 28, and is the most northerly part of the Norfolk coast. It has a length of about eight miles coast line, from the Hunstanton links to the Brancaster links inclusive, and a breadth of about three miles inland. It comprises the parishes of Titchwell, Thornham, and Holme, and the adjoining borders of the parishes of Brancaster, Ringstead and Hunstanton; all being on the coast except Ringstead. This small strip of country therefore presents great variety of surface, consisting as it does of three different parallel tracts running due east and west; namely, on the north the sand dunes bordering the sea; then the marshes; and inland the southern portion of cultivated land with its villages, gardens, fields, hedgerows, copses, lanes and roads.

From the marshes the ground rises inland to a height of from 150 to 180 feet, at the southern limit of the district here included.

The marsh tract is about three quarters of a mile wide, and consists of alternate salt and fresh water marshes. The Brancaster and Thornham marshes are almost entirely salt, and under water at high tides. The marshes of Titchwell and Holme are, on the landward side of the dunes, entirely fresh water, being land reclaimed from the sea, and intersected by numerous dykes and ditches, which carry off the spring and surface waters to the sea;

these so called marshes are in fact, dry, firm, grazing land, affording excellent pasture, and an abundant supply of mushrooms in season ; while the numerous banks by which they are protected from the tides offer a variety of slope and aspect for many plants. Each of these marshes has some extent of fresh running pools which give harbour to many wild fowl. A pair of Sheldrake brought up a family on the Holme marsh this season. The landward side of the sand dunes, with its southern slope, deep rich moist subsoil and sandy surface, is a perfect garden for flowers, and almost every plant that finds a home there spreads and blooms in profusion from end to end.

Perhaps the most varied and interesting portion of this district is the parish of Holme ; its fresh water marsh is more extensive ; though the beauty and fertility of its pasture has lately been twice spoilt by incursions of the sea ; its sand dunes are larger and more diversified, and it has besides considerable tracts of salt marshes on the seaward side of its dunes, one of which marshes becomes in its season one large oval lake of violet bloom of the *Statice limonium*, many acres in extent.

It is remarkable that in this year, 1902, which has generally seemed so dull, cold, wet, and windy, and unpleasant, the growth, bloom and fruit of all wild plants have been unusually fine and plentiful ; while the cultivated crops of hay, corn, and roots, have in this district been above the average both in quantity and quality ; indeed some of the barley has been amongst the best ever placed on the market.

The following list is a selection only of some of the plants which have come under my observation during a year's botanising ; unless otherwise stated, the nomenclature is that of the London Catalogue, 9th ed.

For economy of space names of orders are generally omitted.

THALICTRUM FLAVUM, Linn. Rare, on banks of ditches, Titchwell marsh. With regard to a variety, *T. sphaerocarpum*, Lej., in the ripe panicles gathered here, whilst most of the achenes were small and narrow, several were often large and spherical as if formed by absorption of several into one fruit, which was also 8—10 ribbed.

RANUNCULUS TRICHOPHYLLUS, Chaix. Thornham freshwater marsh.

RANUNCULUS CIRCINNATUS, Sibth. Thornham and Titchwell marshes ; abundant.

„ SCELERATUS, Linn. Thornham and Titchwell marshes ; common.

PAPAVER ARGEMONE, Linn. Hedge banks, Brancaster, and Thornham ; occasional.

„ HYBRIDUM, Linn. Hedge banks, Brancaster ; occasional.

GLAUCIUM FLAVUM, Crantz. Abundant on shore between Hunstanton and Heacham, just outside this district.

CHELIDONIUM MAJUS, Linn. Occasional.

ARABIS HIRSUTA, Scop. (*Turritis hirsuta*, Linn). Chalk pits, banks.

EROPHILA VULGARIS, D.C. Mentioned on account of the wonderful abundance in which this first of flowers over-spreads this district wherever it can grow ; sand dunes, walls, roadsides, &c.

COCHLEARIA ANGLICA, Linn. Abundant.

SISYMBRIUM SOPHIA, Linn. Banks, Brancaster, and abundant in one spot at Choseley, S. end of Titchwell parish.

ERYSIMUM CHEIRANTHOIDES, Linn. Locally abundant on arable land, Thornham and Titchwell.

CORONOPUS RUELLII, All. Abundant everywhere.

LEPIDIUM RUDERALE, Linn. Abundant along Thornham sea bank.

„ DRABA, Linn. One spot near the windmill, Thornham.

CAKILE MARITIMA, Scop. Occasional along the coast.

RESEDA LUTEOLA, Linn. Common ; grows to over six feet high.

„ LUTEA, Linn. Common.

FRANKENIA LÆVIS, Linn. Abundant on Holme and Brancaster salt marshes. In exceptionally fine flower this year. In 'The Students' Flora' Hooker gives Yarmouth as the most northern station for this plant.

SAPONARIA OFFICINALIS, Linn. Hunstanton links.

SILENE MARITIMA, With. Frequent.

„ ANGLICA, Linn. Very abundant in some arable fields, Thornham.

„ NOCTIFLORA, Linn. Abundant.

CERASTIUM TETRANDRUM, Curtis. Plentiful on Titchwell dunes, and doubtless frequent elsewhere.

„ SEMIDECANDRUM, Linn. Abundant all along the coast, and the earliest flower after Erophila.



*CERASTIUM ARVENSE*, Linn. Abundant inland especially on high ground, banks, rough roadsides, &c. This plant here takes the place occupied in the West of England by *Stellaria holostea*, and to the casual observer has much the same appearance. *Stell. holost.* does not grow in this district, nor have I ever seen *C. arvense* in West England.

*STELLARIA GRAMINEA*, Linn. Locally abundant in same positions as the last, Thornham heath, &c.

*ARENARIA TENUIFOLIA*, Linn. Thornham and Titchwell chalk-quarries; plentiful in one spot in the former place.

„ *var. LAXA*, Jord. On a wall in Thornham village; in these specimens, 5 stamens, calyx with glandular hairs (not regular in position, and sometimes wanting); capsule often twice the length of calyx, but sometimes the sepals appear to grow equal to it after ripening and opening.

*SAGINA MARITIMA*, Don. Abundant on Titchwell dunes.

„ *NODOSA*, Fenzl. Abundant along the coast.

*BUDA MEDIA*, Dinn. Most abundant.

*HYPERICUM PERFORATUM*, Linn. Frequent.

„ *QUADRATUM*, Stokes. (*H. tetrapterum*, Fries). Ditch banks on Titchwell marsh, plentiful.

*MALVA ROTUNDIFOLIA*, Linn. Locally abundant; always at foot of some wall or building.

*LINUM ANGUSTIFOLIUM*, Huds. Abundant on sea-bank of Titchwell marsh. In the 'Students' Flora' Hooker appears to confine this plant to West England.

*GERANIUM PUSILLUM*, Linn. Locally abundant, especially on banks near Thornham village. I have found this rare in West England.

„ *DISSECTUM*, Linn. Frequent and very fine on sea-banks, Thornham.

*EUONYMUS EUROPEUS*, Linn. Copse, Thornham heath.

*ONONIS REPENS*, Linn. Frequent.

*TRIFOLIUM SUBTERRANEUM*, Linn. A considerable quantity of this interesting plant on the sea-bank of Titchwell marsh. It flowers early in May. The heads consist of three to five perfect flowers. When the flowers fade the peduncles begin to bend down to

the soil, at the same time the individual flowers with their pedicels also reflex, which brings them upright as the stem bends downwards; at the same time also from the apex of the floral axis at the base of the pedicels singular organs begin to develop which I would term calyx-radicles; these develop, several in succession, from the recurved apex of the stem, first downwards into the soil, then curving laterally and finally upwards, so without doubt helping to bury the pods in the ground and retain them there; the stiff spreading lobes which terminate each of the calyx-radicles acting like claws. Any plant will show all stages at once from the opening flowers to the buried pods, as soon as the burying process has begun. Many descriptions of this singular flower appear to me misleading. In 'The Student's Flora' Hooker writes, "Pods burrowing in the earth, then covered by the reflexed deformed calyces of the other flowers"!! A most strange statement. There are no other flowers, and the three to five flowers of which alone the head consists have withered before the so-called "deformed calyces" even begin to develop. Here is evidently an example of the numerous errors which appear in books on botany, due to the use of dried specimens uncorrected by the additional use of the living book of nature. It is true that dried specimens do show what appears to be several deformed calyces covering the fruit. But then the calyx-radicles are attenuated and withered, and their history lost. Another book terms them "abortive calyces;" and both give the false impression that the *original heads* consist of these deformed or abortive calyces in addition to the perfect flowers.

TRIFOLIUM OCHROLEUCON, Huds. A bed of this on bank of Brancaster fresh-water marsh.

„ STRIATUM, Linn. Abundant on sea-bank, Titchwell marsh.

„ FRAGIFERUM, Linn. Brancaster fresh-water marsh.

- ANTHYLLIS VULNERARIA, Linn. Abundant.
- VICIA ANGUSTIFOLIA var. BOBARTII. Titchwell marsh.
- PRUNUS PADUS, Linn. Several in copse on Thornham heath.
- SPIRÆA FILIPENDULA, Linn. Abundant on Thornham heath and neighbouring lanes.
- ROSA RUBIGINOSA, Linn. Frequent; diffusing a delightful odour for many yards round it as soon as the young leaves appear in March.
- SAXIFRAGA TRIDACTYLITES, Linn. Abundant on walls, Thornham, &c.
- MYRIOPHYLLUM SPICATUM, Linn. Ditches, Titchwell marsh.
- BRYONIA DIOICA, Jacq. Plentiful.
- ERYNGIUM MARITIMUM, Linn. Occasional along coast.
- CONIUM MACULATUM, Linn. Road-sides, Holme; not common.
- SMYRNIUM OLUSATRUM, Linn. Most abundant in hedgerows and copses from Hunstanton to Thornham within mile of sea.
- BUPLEURUM TENUISSIMUM, Linn. Locally abundant on banks and waste ground on Titchwell and Thornham marshes, near the sea.
- APIUM GRAVEOLENS, Linn. Abundant on the marshes.
- CARUM SEGETUM, Benth. and Hook. fil. In quantity on one or two positions on banks of Holme and Thornham marshes.
- Sium LATIFOLIUM, Linn. Thornham marsh.
- SCANDIX PECTEN-VENERIS, Linn. Locally abundant. Titchwell and occasional at Thornham.
- ANTHRISCUS VULGARIS, Bernh. Occasional in some quantity.
- FENICULUM VULGARE, Mill. Frequent.
- CEANANTHE LACHENALII, C. Gmel. Holme marsh.
- „ FISTULOSA, Linn. Holme marsh.
- PEUCEDANUM SATIVUM, Benth & H. Common.
- CAUCALIS NODOSA, Scop. Abundant, banks Titchwell marsh.
- GALIUM ULIGINOSUM, Linn. In bog on Titchwell marsh. In S.W. corner of Titchwell marsh is the only bit of genuine peat bog in this district which I have noticed; several plants hereafter referred to it.
- DIPSACUS SYLVESTRIS, Huds. Frequent.
- SCABIOSA COLUMBARIA, and ARVENSIS, L. Common.
- EUPATORIUM CANNABINUM, Linn. Titchwell marsh.
- ASTER TRIPOLIUM, L. Abundant.

ERIGERON ACRE, Linn. Frequent along the sand dunes.

„ CANADENSE, Linn. *One plant* on the Hunstanton links, on *wet* ground. I also gathered one solitary plant of this in a sand quarry at Ryburgh in this county in 1896. Strange that a plant which blooms and seeds so freely should be so rare, and then only in solitary specimens.

FILAGO GERMANICA, Linn. Abundant on fallow land, and especially fine this year at Thornham Lyng.

„ MINIMA, Fries. In considerable patches on the Holme dunes.

PULICARIS DYSENTERICA, Gærtn. Ditch sides, frequent.

ARTEMISIA VULGARIS, Linn. Frequent and very fine. Titchwell, &c.

„ MARITIMA, Linn. Most abundant, strongly and deliciously aromatic.

„ GALLICA, Willd. Plentiful on Thornham marsh. This is now recognised as a separate and well marked species; leaves habit and facies well differentiated.

SENECIO SYLVATICUS, L. Banks on Titchwell marsh, inland.

„ ERUCIFOLIUS, L. Banks, Titchwell and Thornham marshes.

CARLINA VULGARIS, L. Frequent inland.

CARDUUS NUTANS, L. Frequent inland.

CNICUS ACAULIS, Willd. Thornham heath.

CICHORIUM INTYBUS, L. Occasional.

PICRIS ECHIOIDES, L. Ditch banks, Titchwell marsh, east end. Said to be common, but I have only found this plant in three places, each near the sea, viz., on Ormes Head above the Irish Sea, on Downs near Dartmouth above the Channel, and here on this coast.

CREPIS TARAXACIFOLIA, Thuill. Hunstanton elifs.

LACTUCA VIROSA, Linn. Abundant on the Hunstanton links.

TRAGOPOGON PRATENSIS, L. Occasional.

STATICE LIMONIUM, L. Grows in mud and flowers last.

„ AURICULÆFOLIA, Vahl. Grows on edge of mud, outside, flowers second.

„ RETICULATA, Linn. Grows on drier ground and flowers first. All three abundant and growing near one another on the salt marshes: Holme, Thornham, Titchwell, Braneaster.



*PRIMULA ACAULIS*, L. Rare. Copse, Titchwell; side of pool, Ringstead.

„ *VERIS*, L. Occasional on turf.

*GLAUX MARITIMA*, L. In extensive patches along Holme dunes,  
on lower landward side, and elsewhere along coast.

*ANAGALLIS TENELLA*, Linn. Bog on Titchwell marsh.

*SAMOLUS VALERANDI*, L. Frequent.

*ERYTHRÆA PULCHELLA*, Fries. Wet ground on Hunstanton links,  
flower buds often yellow.

*MENYANTHES TRIFOLIATA*, L. Titchwell marsh.

*CYNOGLOSSUM OFFICINALE*, Linn. All along dunes, abundant.

*SYMPHYTUM ASPERRIMUM*, Brit. One clump on the Holme dunes  
amongst some pines; probably introduced with  
soil when they were planted.

*LYCOPSIS ARVENSIS*, L. Frequent.

*LITHOSPERMUM OFFICINALE*, L. Chalk quarry, Holme.

*ECHINUM VULGARE*, L. Common.

*VOLVULUS SOLDANELLA*, Junger. All along dunes; abundant.

*SOLANUM DULCAMARA*, Linn. Frequent on coast and inland.

„ *NIGRUM*, L. On Hunstanton shore; Holme dunes.

*PLANTAGO*, L. All five Plantains, common.

*VERBASCUM PULVERULENTUM*, Vill. Very occasional; Brancaster  
dunes, and Thornham and Ringstead, inland.

*VERONICA POLITA*, Fries. Thornham roadside; occasional.

*OROBANCHE MINOR*, Sm. Plentiful in clover-fields. In one field  
just above Thornham village, this year in July,  
this plant was so excessive as to colour the field;  
the colour of the plants ranged from a dirty  
purple-tinged yellow to a bright pure golden yellow.

*VERBENA OFFICINALIS*, Linn. Occasional.

*MENTHA ROTUNDIFOLIA*, Huds. One spot, roadside, Thornham.

*LYCOPUS EUROPEUS*, L. Titchwell marsh, ditch banks.

*CALAMINTHA OFFICINALIS*, Mæneh. Rare, on Holme dunes.

„ *ACINOS*, Clairv. (! London Catalogue) abundant inland  
in Thornham parish especially at Thornham Lyng.

*SALVIA VERBENACA*, L. Frequent on dry banks.

*NEPETA CATARIA*, Linn. Frequent, especially at Thornham Lyng.

*MARRUBIUM VULGARE*, L. Frequent, abundant at Thornham Lyng.

*BALLOTA NIGRA*, L. Abundant.

*BETA MARITIMA*, L. Hunstanton shore.

*ATRIPLEX LITTORALIS*, L. Plentiful, Titchwell, Thornham.

- ATRIPLEX PATULA and NASTATA, L. Common.  
 „ PORTULACOIDES, L. Most abundant.  
 SALICORNIA HERBACEA, L. In enormous beds.  
 „ RADICANS, Sm. Common.  
 „ ADPRESSA, Dum. Occasional with the two last on the  
 Thornham and Titchwell coast. A small plant,  
 with few branches *closely pressed* to the ground  
 in a *fan-shaped* manner. I have not had this  
 authenticated however, and do not know it from  
 var. *procumbens* of *S. herbacea*; but the term  
 “*procumbens*” seems scarcely suitable to this.  
 This remark is added because only one county is  
 assigned to this plant in the London Catalogue,  
 and that, I believe, is Kent.  
 SUEDEA MARITIMA, Dum. Common.  
 „ FRUTICOSA, Forsk. Abundant.  
 SALSOLA KALI, L. Frequent.  
 PARIETARIA OFFICINALIS, L. Abundant locally.  
 CERATOPHYLLUM DEMERSUM, L. Freshwater ditches, Brancaster  
 marsh.  
 HYDROCHARIS MORSUS-RANÆ, L. In extensive abundance, filling  
 many hundred yards of ditches on Brancaster fresh  
 water marsh, but showing very few flowers.  
 ELODEA CANADENSIS, Michx. Occasional.  
 LISTERA OVATA, R. Br. Titchwell marsh.  
 SPIRANTHES AUTUMNALIS, Rich. Locally abundant, Ringstead Park.  
 ORCHIS PYRAMIDALIS, L. Titchwell chalk quarry, &c., occasional.  
 „ MORIO, L. Titchwell marsh.  
 „ LATIFOLIA, L. Titchwell marsh; from six inches to three  
 feet high.  
 „ MACULATA, L. Titchwell marsh.  
 JUNCUS BUFONIUS, L. Occasional, Titchwell marsh.  
 „ GERARDI, Loisel. Abundant in considerable beds.  
 „ MARITIMUS, L. Abundant.  
 „ ACUTUS, L. A few clumps on Brancaster marsh; in fruit  
 when *maritimus* is beginning to flower.  
 „ EFFUSUS, L. Abundant: *J. acutiflorus*, Ehrh; occasional.  
 TYPHA LATIFOLIA, L. Occasional, Titchwell and Thornham marshes.  
 „ ANGUSTIFOLIA, L. Plentiful, Titchwell and Thornham  
 marshes.

- SPARGANIUM RAMOSUM, Huds. Common, Titchwell marsh.  
 „ SIMPLEX, Hudson. Plentiful, same place.  
 LEMNA GIBBA, L. In flower, ditches, Titchwell.  
 ALISMA PLANTAGO, L. Frequent.  
 BUTOMUS UMBELLATUS, L. Thornham fresh marsh.  
 SAGITTARIA SAGITTIFOLIA, L. Brancaster marsh, plentiful.  
 TRIGLOCHIN PALUSTRE, L. Occasional.  
 „ MARITIMUM, L. Abundant.  
 POTAMOGETON NATANS, L. *densus*, L.: *pusillus*, L. Occasional.  
 „ PECTINATUS, L. Abundant on Holme marsh.  
 ZANNICHELLIA PEDUNCULATA, Reichb. Entangled with *Potamogeton*  
*pusillus* in ditches, Brancaster and Titchwell  
 marshes, and in good fruit.

## CYPERACEÆ.

- ELEOCHARIS PALUSTRIS, R. Br. Titchwell and Thornham marshes.  
 SCIRPUS TABERNEMONTANI, Gmel. Titchwell and Thornham ;  
 abundant.  
 „ MARITIMUS, L. Abundant.  
 „ SETACEUS, L. In bog on Titchwell marsh.  
 ERIOPHORON (POLYSTACHION, L.). ANGUSTIFOLIUM, Roth. In bog  
 on Titchwell marsh.  
 CAREX PULICARIS, L. In bog on Titchwell marsh.  
 „ DIVISA, Huds. Holme marsh, plentiful in one spot.  
 „ ARENARIA, L. Abundant.  
 „ DIVULSA, Good. Frequent.  
 „ VULPINA, L. Frequent.  
 „ MURICATA, L. Banks inland ; frequent.  
 „ ECHINATA, Murr. In bog on Titchwell marsh.  
 „ OVALIS, Good. Holme marsh with *C. divisa*.  
 „ GOODENOVI, Gay. Occasional.  
 „ GLAUCA, Murr. (? London Catalogue) frequent.  
 „ PANICEA, L. Frequent.  
 „ PRECOX, Jacq. (? London Catalogue) common.  
 „ DISTANS, L. Abundant.  
 „ FLAVA, L. Titchwell marsh in bog.  
 „ EXTENSA, Good. Hunstanton and Holme marshes, abundant.  
 „ HIRTA, L. Frequent.  
 „ RIPARIA, Curtis. Abundant.

## GRAMINEÆ.

- PHLEUM ARENARIUM, L. Titchwell dunes.  
 AGROSTIS PALUSTRIS, Huds. Titchwell marsh.  
 AMMOPHILA ARUNDINACEA, Host. Abundant all over the dunes.  
 SIEGLINGIA DECUMBENS, Bernh. One spot on Titchwell marsh.  
 PHRAGMITES COMMUNIS, Trin. Abundant.  
 CATABROSA AQUATICA, Beauv. Titchwell and Brancaster marshes.  
 POA PRATENSIS, var. SUBCÆRULEA, Lin. Abundant on the dunes.  
 GLYCERIA FLUITANS, R. Br. Frequent.  
 „ AQUATICA, Sm. Ditches on Thornham marsh.  
 „ MARITIMA, Mert. & Koch. Abundant.  
 „ DISTANS, Wahl. Plentiful on Holme marsh ; Titchwell occasional.  
 „ BORRERI, Bab. Frequent on Holme marsh ; Titchwell ; one spot.  
 FESTUCA RUBRA, L. Abundant along the dunes.  
 AGROPYRON PYCNANTHUM, Gr. & Godr. Titchwell marsh on banks of ditches at foot of the sand dunes. Very glaucous, spike compact.  
 „ JUNCEUM, Beauv. Plentiful.  
 LEPTURUS FILIFORMIS, Trin. Most abundant.  
 HORDEUM SECALINUM, Schreb. Brancaster marsh.  
 „ MURINUM, L. Abundant.  
 „ MARINUM, Huds. Plentiful.  
 ELYMUS ARENARIUS, Linn. Locally abundant on the dunes.

## FILICES.

A note on these merely to express some wonder at finding any at all, where such as do occur are so very few and far between, and often deformed and pauperised.

- ASPLENIUM TRICHOMANES, L. A bed of this, about 10 ft. by 1 ft. broad, running down the east wall of the porch of Thornham Church, being in fact exactly coextensive with the drip of the gargyle.  
 „ RUTA-MURARIA, L. One or two solitary samples.  
 SCOLOPENDORIUM VULGARE, Symons. Occasional dwarfed and distorted samples on shady damp stone work.  
 NEPHRODIUM SPINULOSUM, Desv., (*Lastrea spinosa*, Newman), however flourishes well in one place in Titchwell parish.



## FUNGI.

**TULOSTOMA MAMMOSUM**, Fries. This very rare fungus occurs on two positions within a few yards of each other amongst a small pine plantation on the Holme sand dunes; in the one place were a dozen, in the other a couple of score or more. This fungus is like a small puff ball on the top of a stem; the stem is buried to the top in its sandy bed; the orifice of the ball is a clean cut nipple. Entire length,  $1\frac{1}{2}$  to two inches, of which the ball is about  $\frac{3}{8}$  inch. February, and again in December.

**CANTHARELLUS TREMULUS**, Schæff. Also somewhat rare, in the same part of Holme dunes, in October; plentiful as a parasite on the moss *Tortula ruraliformis*.

**MARASMIUS ROTULA**, Fries. Very common in same place as a parasite on the base of grass stems just where they leave the soil. October.

**MORCHELLA ESCULENTA**, L. Fine specimens in lane near Thornham vicarage; spring.

There is some variety and abundance of common fungi over the dunes and marshes.

## MOSESSES.

I have gathered some eighty different Mosses in this district. These give forty-seven additions to the moss list for this vice-county, including fifteen to the county list, of which two are also new to the British Flora.

On the Hunstanton links it was my good fortune to find, in some quantity and with abundant fruit, a new *Bryum*.

**BRYUM MAMILLATUM**, Lindb. Which has, I understand, only been found before on one or two positions on the shores of the Baltic. And on the seaward slope of the Holme dunes I found a considerable bed of a *Bryum*. with abundant fruit, which experts consider a new variety of the common *B. caespiticium*.

This moss list will be incorporated by Mr. H. N. Dixon, F.L.S., with his supplementary list for the county.

## VIII.

## ENTOMOLOGICAL NOTES FOR 1902.

BY W. H. TUCK, M.A.

*Read 27th January, 1903.*

THE weather all the collecting season was very broken and varied, but I managed to get through a good lot of field work, my chief occupation being the somewhat neglected groups of water insects. Starting with the Aculeate-Hymenoptera as usual, I record a new Wasp for Britain, *Odynerus bifasciatus*, Linn. I took specimens of both sexes as long back as June 1895 and 1897, but Mr. Edward Saunders has only recently identified them, as they were mixed up with a large colony of *Odynerus sinuatus*, to which they bear a striking resemblance. This brings the list of Suffolk Wasps to 17.

At Cromer, in August, I found the large Ant, *Formica fusca* in plenty, together with the winged sexes of another, *Lasius umbratus*, which does not appear in Mr. Bridgman's list. The next day, August 16th, being very fine and sunny, I took two females of *Tiphia femorata* upon Wild Carrot (*Daucus carota*) in the same locality that the late F. Smith found it twenty-five years ago.

Close to the old Station, I took a scarce Bee, *Andrena nigriceps*, together with its parasite, *Nomada jacobææ*, which were flying around its burrows and entering them. At Plumstead Lake, on June 7th, I took on Hawthorn bloom a male Bee, new to Norfolk, *Andrena ambigua*, which I have twice before taken at Tostock.

I added ten Beetles to the list for Suffolk, published by Claude Morley in 1899; of these *Homalota ravilla* and *Quedius oblitteratus* were both in an old nest of *Vespa vulgaris*, which I opened March 13th. I understand that the obscure genus of "Quedius" in Coleoptera still needs much revision.

The waters supplied me with the other eight novelties. The best thing, *Dytiscus circumcinctus*, a fen species, I took in a ditch at Tostock, May 23rd, a dimorphic female with the elytra of the male.

*Rhantus grapii* and *bistriatus*, *Cercyon terminatus*, *Hydroporus discretus*, *Helophorus mulsanti*, were the novelties which the other home waters yielded; while at Bungay I got *Dytiscus punctulatus* and *Doronectes depressus*, the latter in plenty by dredging a tributary stream of the Waveney in the town. Other notable captures in water were: *Copelatus agilis*, *Agabus paludosus* and *sturmi*, *Cælambus confluens*, *Hydroporus memnonius*, *Haliphus fluviatilis* and *Bagous alismatis*; the last two at Bungay. At Brundall, in Dr. Beverley's garden, I took two brilliant specimens of *Donacia dentipes*, and by Plumstead Lake the same day (June 7th) *Anaspis flava* on Hawthorn bloom.

At Ditchingham, the next week, I found *Mordellistena brunnea* upon Ragwort, and upon Hazel by the Bath Hills, the curious Weevil, *Balaninus turbatus*. The only Sawfly of note at Bungay was *Tenthredopsis coqueberti*, where I also found two rather local Hemiptera, *Megalocera longicornis* and *Plagiognathus roseri*. The fine *Ranatra linearis* I took twice at Tostock both in deep and shallow water. The fungi were rather abundant and very early in appearing, but the only good thing I obtained was *Cis nitidus*, from a beech fungus.

## IX.

## METEOROLOGICAL NOTES, 1902.

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

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

*Read 24th February, 1903.*

## JANUARY.

THE month was exceedingly mild up to the 24th, maxima of over 50 degrees were recorded on eight days. There was but little frost till the last week, when the weather was of a winterly type, with snow. The mean temperature of the month was 3 degrees above the average, and the rainfall, .71 ins. deficient. Between the 4th and 24th, the falls of rain were very trifling.

## FEBRUARY.

Unbroken cold weather prevailed to the 22nd, without one mild day, and many of the nights were as cold as in some of the severest of our winters. On the 16th the screened thermometer fell to 14 degrees, the reading by the exposed instrument having been as low as 7.8 degrees. Although these readings fell far short of the minimum of the 14th February, 1901 (9.2 degrees and 5.8 degrees respectively), they were, nevertheless with that single exception, lower than any recorded in February since 1895. The hard frost gave several days sport to the skaters, good ice being found on the marshes. The rainfall of the month was greatly deficient, the total having been less than half the average. Snow in small quantities fell on five days, but it was sufficient to impart a wintry aspect to the country, and remained on the ground about ten days.



## MARCH.

The month was more genial than for several years past, and although no day was exceptionally warm for the season, there were a great many moderately mild days which kept the mean temperature high. The rainfall was .65 deficient, and there was no snow. Thunder occurred on the 21st.

## APRIL.

The second week was very cold, the mean temperature being as low as 40.9 degrees. Between the 5th and 12th, the thermometer did not once touch 50 degrees. Milder weather followed in the third week, but the last week was again exceedingly cold. With the exception of .80 of rain which fell on the 5th, and which was accompanied by thunder, the falls of rain during the month were exceedingly trifling.

## MAY.

So cold, wet and ungenial a May has not been recorded for many years, notwithstanding the capricious character of the month in many seasons, particularly of late. Down to the 23rd day the thermometer readings were so persistently low that it was difficult to realize that May had come, and the coldness was accompanied by much wet weather, rain having been recorded on 22 consecutive days. Snow fell on the 5th, 12th and 13th, and frost occurred on the grass on no less than twelve nights. The last week was more genial, but, on the mean, the month was the coldest May since 1887, and the wettest since 1878.

## JUNE.

The first half of the month was cold, wet and ungenial, and attended by much thunder in the earlier days. A severe thunderstorm which commenced about 10 p.m. on May 31st, continued till about 2 a.m., on June 1st, accompanied by heavy rain, and very vivid lightning. The thermometer did not touch 60 degrees between the 5th and 12th, and on the nights of the 9th and 10th, fell to 39.2 degrees and 36.3 degrees respectively in the screen, and to 32.6 degrees and 32.5 degrees on the grass. The last ten

days of the month were very warm and bright, the temperature reaching 80.2 degrees on the 30th.

#### JULY.

This month was less warm and more cloudy than for several years past, but the rainfall was three quarters of an inch below the average. The thermometer only once rose above 80 degrees (viz., 83.4 degrees on the 15th), and some of the nights were unseasonably cold, notably the 3rd and 12th, the minimum on which occasions having been as low as 40.6 degrees and 41 degrees respectively in the screen, and 36.5 degrees and 35 degrees on the grass. Strong winds occurred on the 27th during the passage of a cyclonic disturbance from the South-west of Ireland to Norway.

#### AUGUST.

On the mean, this was the coldest August since 1888. There were no days of excessive heat, and in the first week there were some unseasonably cold nights. The prevalence of cloud kept down the temperature on many days, and the month presented a great contrast to the hot and dry August of the previous year. The rainfall was an inch above the average, but fell considerably short of the heavy fall of August 1900.

#### SEPTEMBER.

On the whole, this was a very fine month, though some of the mornings were chilly, and, during the second week, there was a considerable amount of cloud. Some fine, dry days in the latter part of the month enabled the farmers to complete the harvest which had been considerably delayed by the cool and broken weather of August. The rainfall of the month was only about half the average, and it nearly all fell on the 2nd and 11th. After the 12th the month was almost rainless.

#### OCTOBER.

This was rather a cloudy and humid month, but although rain was registered on twenty-three days the amounts were generally small, and the total for the month was less than half the mean.

Temperature was in close agreement with the average, but absence of frost kept garden flowers, particularly roses and dahlias, in bloom most luxuriantly to a much later period than usual.

#### NOVEMBER.

The first fortnight was exceedingly mild, the mean of the period having been about 5 degrees above the average, and 4.7 degrees higher than that of the first fortnight of the previous May! An abrupt change to cold took place on the 16th followed by milder weather at the month's close. There were no particularly sharp frosts during the month, although the East wind accompanying the cold weather of third week killed many of the more delicate of the garden flowers. The mildness of the earlier days of the month resulted in good dishes of peas being gathered from the garden as late as the 14th, five days later than I ever recollect having had them from the open. Rain fell on ten days only—a rare occurrence in November—and in the third week the roads were as dry and dusty as in March.

#### DECEMBER.

The month at first promised to be a cold one, the day readings of the earlier part of the month having been persistently low. The easterly winds and gales of this period, accompanied as they were on some days, by snow, made the meteorological conditions exceedingly uncomfortable. The rainfall was deficient, for the fourth month in succession. During Christmas week the weather was exceedingly fine, mild and spring-like, with a remarkable absence of frost.

#### THE SEASONS.

The following Tables show the mean temperature and rainfall of the four seasons, together with those of the five previous years, compared, as to temperature, with the average of the twenty years 1883—1902, and as to rainfall with the 38-year average mentioned below. Winter comprises the three months, December to February inclusive; Spring, March to May; Summer, June to August; and Autumn, September to November.

TEMPERATURE.								
Seasons.	1897.	1898.	1899.	1900.	1901.	1902.	20-year average, 1883—02	Departure of 1902 from average.
	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.	degrees.
Winter ...	38.3	41.3	42.6	37.4	39.0	37.9	38.0	— 0.1
Spring ...	46.9	45.8	46.2	45.3	46.3	46.3	46.3	0.0
Summer ...	61.9	59.7	61.9	61.6	61.4	58.7	60.3	— 1.6
Autumn ...	50.3	54.0	51.2	51.6	50.7	50.1	50.2	— 0.1
Year ...	49.5	50.5	49.8	49.6	48.8	48.4	48.7	— 0.3

RAINFALL.								
Seasons.	1897.	1898.	1899.	1900.	1901.	1902.	38-year average, 1865—02	Departure of 1902 from average.
	in.	in.	in.	in.	in.	in.	in.	in.
Winter ...	7.86	4.11	5.82	7.42	5.88	6.09	5.96	+ 0.13
Spring ...	5.05	6.18	6.84	4.26	5.10	6.77	5.27	+ 1.50
Summer ...	4.17	6.90	3.52	8.77	3.61	7.82	6.94	+ 0.88
Autumn ...	6.42	5.65	8.31	5.32	5.11	4.14	8.01	— 3.87
Year ...	22.07	23.33	23.94	26.99	21.06	22.30	26.18	— 3.88

It will be observed from the foregoing that, with the exception of the summer, which was about one and a half degree below the average, each of the seasons gave about normal temperature, the severity of February counterbalancing the mildness of January, and the coldness of May proving a set-off to the warmth of March. As to the rainfall, that of the winter was of normal amount, the spring (through the wet May) excessive, and the summer slightly in excess, whereas the autumn yielded but little more than half the usual amount.

#### THE YEAR.

The special feature of the year was the unusually cold spring (in the latter part), and the exceptionally wet May. Although the summer was cool and humid, with a conspicuous absence of hot days, the rainfall was not much above the average, and there were intervals of fine weather at times. The year's rainfall was nearly four inches deficient, and, following as it does, so many dry years, the want of water was much felt in the late autumn and early winter. A really rainy year has not been experienced since 1892, and in seven out of the last ten years the total rainfall has failed to reach twenty-four inches. Harvest commenced about August 14th.



## INSPECTION OF STATION.

This station was inspected on September 2nd by Mr. W. Marriott, F. R. Met. Soc., Assistant Secretary and Inspector of Stations for the Society. The instruments were all found to be in proper working order, and Mr. Marriott expressed his satisfaction at the general arrangements.

## GENERAL.

Having on the 31st December, 1902, completed twenty years' daily observations of the temperature and rainfall of this district, a brief summary of some of the results obtained may not be altogether out of place.

The highest reading of the thermometer in the shade during the period under review occurred on the 11th August, 1884, when a maximum of 91.0 degrees was recorded. The coldest night was on the 6-7th February, 1895, when the thermometer in the screen fell to 4.0 degrees; on this night the exposed thermometer fell to 3.5 degrees below zero.

The warmest month was August, 1884 (mean temperature 66.1 degrees), and the coldest month was December, 1890 (mean temperature 30.2 degrees).

The warmest year, on the mean, was 1898, averaging 50.5 degrees, and the coldest year was 1888 (46.9 degrees).

The mean temperature of each of the months for the twenty-year period was as follows:—

## MEAN TEMPERATURE.

	degrees.
January ... ..	37.3
February ... ..	38.2
March ... ..	40.9
April ... ..	46.3
May ... ..	51.6
June ... ..	58.4
July ... ..	61.4
August ... ..	61.0
September ... ..	57.4
October ... ..	49.3
November ... ..	43.8
December ... ..	38.5
Year	48.66

With regard to the rainfall, the largest amount recorded on any day for the twenty-four hours ending 9 a.m. was 2.57 ins. on 13th July, 1889.

The wettest month was October 1892, with a total of 7.62 ins. The driest month was February 1891, when but .07 ins. of moisture was registered.

The wettest year was 1892, the total fall being 31.05 ins. The driest year was 1893, when only 19.66 ins. of rain fell.

The mean monthly falls are given below, but, as from the number of abnormally dry years that occurred during the period the averages are undoubtedly too low to represent the standard values of the district, a further set of averages has been prepared, obtained from adding the previous eighteen years' falls, taken from the register kept at St. Catherine's Close, Norwich, by the late Mrs. Evans. There is no doubt that many of these eighteen previous years were abnormally wet, comprising, as the period does, the rainy years of the late seventies and early eighties, which were doubtless the primary cause of the setting in of the agricultural depression. Taking these unusually wet years as a set-off against the dry ones which occurred during the last ten years, the mean of the thirty-eight years rainfall 1865 to 1902 would appear to fairly represent that of this district.

#### MEAN RAINFALL.

			Mean of 30 years 1883—1902. ins.	Mean of 38 years 1865—1902. ins.
January ...	...	...	1.90	1.89
February ...	...	...	1.42	1.71
March ...	...	...	1.75	1.74
April ...	...	...	1.57	1.68
May ...	...	...	1.98	1.85
June ...	...	...	1.78	1.90
July ...	...	...	2.61	2.66
August ...	...	...	2.22	2.38
September ...	...	...	2.14	2.47
October ...	...	...	3.04	2.90
November ...	...	...	2.43	2.64
December ...	...	...	2.13	2.36
	Year	...	<hr/> 24.97 <hr/>	<hr/> 26.18 <hr/>

MONTH.	BAROMETER.				THERMOMETER.				HYGRO-METER.	CLOUD.	RAINFALL.		WIND.											
	Highest.	Date.	Lowest.	Date.	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Estimated proportion	Inches.	No. of days.	Direction.								Mean esti- mated force.		
														N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.			
JAN. .	30.82	31	29.14	25	30.116	52.4	4	25.4	30	40.5	88	7.1	1.18	17	2	0	1	1	1	6	10	10	3.5	
FEB. .	30.74	1	29.26	27	29.896	54.0	28	14.0	15	34.9	90	6.6	0.77	14	0	3	5	10	1	1	3	5	2.2	
MARCH	30.21	16	29.12	24	29.829	60.0	17	26.2	6	43.8	86	7.0	1.07	15	1	0	0	1	4	11	7	7	3.4	
APRIL	30.29	7	29.54	1	29.961	65.2	19	29.2	9	46.8	75	5.7	1.31	13	4	4	4	5	3	4	3	3	3.6	
MAY .	30.42	25	29.19	17	29.935	72.8	31	31.2	14	48.2	77	7.6	4.39	25	9	3	0	1	1	3	4	10	3.5	
JUNE .	30.82	25	29.37	13	29.935	80.2	30	36.3	11	57.9	79	6.2	2.34	16	4	3	7	5	2	3	5	1	2.9	
JULY .	30.31	2	29.45	26	30.016	83.4	15	40.6	3	59.7	74	6.2	2.11	14	4	1	1	2	2	3	12	6	2.8	
AUG. .	30.22	22	29.65	18	29.927	77.8	29	39.8	2	58.4	80	6.8	3.37	18	2	7	2	1	5	6	7	1	2.6	
SEPT. .	30.48	26	29.63	3	30.079	73.0	3	38.0	19	56.3	82	6.0	1.88	8	5	2	5	4	4	2	4	4	3.1	
OCT. .	30.52	24	29.36	16	29.981	65.3	10	35.6	31	50.1	88	7.5	1.34	23	1	0	9	1	6	2	7	5	3.0	
NOV. .	30.43	18	29.34	28	29.935	60.8	1	29.0	22	43.9	91	6.8	1.42	10	0	0	8	9	5	5	3	0	3.2	
DEC. .	30.58	4	28.89	30	30.030	56.0	16	26.0	4	40.4	89	7.2	1.62	19	1	0	10	1	2	4	8	5	4.0	
MEANS					29.970					48.4	83	6.7											3.1	
EXTREME & TOTALS	30.82	Jan. 31st	28.89	Dec. 30th		83.4	July 15th	14.0	Feb. 16th				22.30	192	33	23	52	41	36	50	73	57		

## X.

## NOTES ON THE HERRING FISHERY OF 1902.

BY T. J. WIGG,

*Honorary Secretary Great Yarmouth Section.**Read 24th February, 1903.*

IN again presenting my notes on the Herring Fishery, I have to chronicle the events of a most unprecedented season. In fact there is so much to talk about that I hardly know where, or how to commence. The change from a holiday-making resort, with the sea-front thronged with visitors, and the streets noisy with the rush of well-filled brakes, to the bustle of the Herring Fishery, cannot fail to impress even the most casual observer. The town reeks of fish and the Herring is in evidence from Wharf to curing houses and railway stations.

If the thousands of people who flock to Yarmouth during the summer months only realised what October would enable them to see, they would certainly wish that their holiday could be extended.

The scene on the Fish Wharf and its surroundings can hardly be described. During my visits to the South Denes I was struck with the vast quantities of all kinds of material required in the preparation of the Herring. Here were piles on piles of barrels, thousands of swills, and there, hundreds of women, chiefly Scotch, at the enormous troughs containing the Herrings to be pickled. Thence I went to the Fish Wharf, where I found that not only was the whole covered market occupied by the "silver beauties," but almost every foot of ground beside the river was covered with "swills" or with barrels full of Herrings, while the scene was quite beyond my powers of description.

The Autumn fishing at Yarmouth began in earnest during the second week in October, and continued without intermission up to December 20th, while a few boats actually worked during Christmas week.

The main features of the fishing have been enormous catches



and, as a rule, very good prices obtainable. This was owing to the very large export trade, which I shall mention later.

I stated in my notes for 1901, that about 2,000 Scotch girls and women came to Yarmouth for the Herring Fishery. In 1902 this number was doubled, there being altogether about 4,000 of these hardworking women employed at the various fishing premises and on the South Denes plots. Many local men who used to employ Yarmouth people, now give preference to the Scotch girls. Employers in such a business want good, reliable helpers, and these they obtain when they employ the professional gutting lasses from Scotland. The outer dress of these women consists of an oilskin, which covers them from head to foot, and a pair of top boots, similar to those worn by the men. Thus attired, and with their hands bound up with linen bandages to guard against cuts from their sharp knives, they go to their work. The dexterity with which they use their knives is a sight that must be seen to be thoroughly understood. Many of the residents in Yarmouth took a keen interest in the proceedings on the South Denes, and numbers visited the place during the day. In the evening the grounds were illuminated by thousands of lamps, torches and electric lamps, the scene up to ten o'clock being a very animated and remarkable one. Some excitement was created during the earlier part of the season by the arrival in port of several foreign steamers loaded with barrels from Sweden and Norway. The coopers, a most important body of men, protested, and informed their employers that the barrels would not be used by them or the Scotch girls. A compromise was effected and work proceeded. Steamers from Fraserburgh, Aberdeen, and other Scotch ports brought in huge cargoes of barrels which were soon filled for export. With regard to the export trade, expectations formed a few years ago have been more than realised, and at the present time there is a great and firm continental demand for Yarmouth Herrings. Thousands of barrels of salted Herrings were taken by steamers for the Baltic, for use by the Russian and German peasants, while others are taken to the Mediterranean ports for distribution through the countries bordering on that sea.

The following statement appeared in the 'Eastern Daily Press' of January 2nd, 1903 :—"In nine years the shipments of Herrings to the Baltic in direct chartered vessels have grown from 16,000

barrels to over a quarter of a million barrels. Here is expansion on a truly generous scale! And yet these figures only relate to a part of Yarmouth's export Herring trade, for there are thousands of barrels sent away by the Hull and London steamers, while tens of thousands more are hauled away in special trains from Yarmouth to Liverpool for shipment to the Mediterranean, the Levant, and elsewhere. So there is also a big coastwise trade in Herrings of which no note has been taken in the figures quoted. Well may it be said that a single Herring boat is worth to the town far more than a whole row of lodging-houses, since at every turn the handling of the Herring means lucrative employment for labour. The Corporation is now deriving a handsome revenue from the Herring in various ways, and in a short time its splendid Fish Wharf and Market will have been completely paid for. There was more accommodation offered last season for the Herring steamers to load, but the Quay space available for this purpose was not nearly enough to meet the requirements, and before next season comes round there must be a better provision of loading berths, or the trade will be seriously hampered."

The week ending November 15th, 1902, was a record breaker so far as the Herring Fishery is concerned. On the whole the weather had been gloriously fine, fish plentiful, and boats doing very well, but about midnight on Monday, November 10th, a number of steamers reached the harbour, and as they had on board enormous catches of Herrings, varying from fifteen to twenty lasts per boat, the news soon spread, and at a very early hour in the morning of Tuesday it was evident that there was a probability of a busy day. As the morning advanced, boat after boat came in heavily laden, and by noon the unloading was progressing all along the South Quay, as far as the Haven Bridge. Crowds of people were attracted by the extraordinary scene.

At one time there was such a wild scramble of boats to obtain a berth, that the breaking of a rope caused quite a block in the river, so that it was possible for several venturesome people to cross from one side to the other by passing over the boats.

Of course with all this mass of Herrings in swills and barrels, there was bustle everywhere but not confusion, as everybody worked with precision and tact, and soon the huge deliveries were dealt with, and room provided for others. It was estimated that

the total number landed this day amounted to 4,000 lasts, or 52,800,000 fish, worth about £25,000. One boat of the Smith's Dock Trust landed nearly twenty-six lasts of Herring, the largest catch by any boat during the season. The price realised was something like £12 per last. The Scotch boats did exceedingly well, and left several weeks before the end of the fishing, as they were evidently well satisfied with their harvest.

On Saturday, November 15th, 1902, I went over to Lowestoft for the purpose of gaining some information concerning the fishing, but found that I had set myself a difficult task. Everybody was so busy that they had no time to spare for answers to my questions. However, a little perseverance was rewarded and I was able to ascertain a few facts. The harbour was crowded, and had been in a congested state all the week. Boats lay for hours near the centre of the Dock basin unable to deliver their catches, and some were not able to move more than a few inches at a time. Nearly the whole area of the Fish Market was taken up by the Herring industry. There were Herrings everywhere in barrels, boxes, swills, heaped up on the floor of the market and on the quayside, until it was almost impossible to walk about.

One boat LT.738, brought in about thirteen lasts, and the steamer Dons 890 had about twenty lasts on board. As far as I could ascertain there were nearly 2000 Scotch girls and women working at Lowestoft.

It is interesting to learn that the Scotch fishermen still regard Yarmouth with great favour. I find that a larger number fished from this port during the past season, the total reaching 459 Scotch boats, and 29 from other ports. The Scotch boats comprised 139 from Banff, Kirkcaldy 78, Inverness 48, Fraserburgh 43, Leith 39, Berwick 35, Wick 22, Peterhead 20, Montrose 19, Aberdeen 13, Arbroath 2, Stornoway 1. In addition to these, North Shields sent 18, Hull 7, Grimsby 2, Sunderland 1, and Southampton 1.

From 'Eastern Daily Press':—"SCOTTISH BOATS EARNINGS.—Now that the Scottish fleet has arrived home, it is possible to obtain some information as to their earnings at our Herring fishing. From all the northern stations it is admitted that their 1902 season has been the best they have ever had. The Peterhead steam drifters have earned from £700 to £1100 each, the Banff steamer Promote is just £27 short of £1000. The Buckie steamers, Fame



and Speedwell, had between £600 and £700 each. The sailing boats have done well, as a few examples will show. Among the earnings reported by Peterhead boats are the Mary Stephen £535, Unity £475, Pansy £450, Jeannics £430, Watchful, Speedwell, and Valiant £400 each, Maggie M. Birnie £350, Onward, Mary, and Victory £300 each, Brilliant £270, Nobles £230, Harmony, and British Ensign £200 each. The Fraserburgh boats that have done well are Philorth £640, Crawford's £560, Guide Me £550, Bill £510, and Speedwell £496. The Buckie boats have grossed between £300 and £400 per boat, and some of the Lossiemouth fleet have made over £600. The Scotch crews are now considering the best means of investing their well-earned money, and the popular idea is to go in for steam drifters. Already one first-class steam drifter has been ordered on Scotch account from Smith's Dock Trust, Limited, of Shields, and it is stated that it is in contemplation to place several similar contracts with this concern."

In conclusion I may add, that the total number of Herrings landed at Yarmouth and Lowestoft, as shown by the returns, amount to 78,774 lasts, giving the enormous total of 1,039,816,800 Herrings, which is nearly three times as many as were caught during the year 1897. In the latter year I find that altogether 530 boats sailed out of the two ports. This number has increased to 1216 in the year 1902.

I desire to acknowledge my indebtedness to Mr. W. L. Smith, the Borough Accountant of Great Yarmouth, and to Mr. H. J. Henderson, the harbour master of Lowestoft, for the returns of Herrings landed at those ports during 1902, also to Mr. H. D. Sayers for particulars concerning the various boats sailing out of Yarmouth for the fishing.

#### RETURN OF HERRINGS LANDED AT YARMOUTH IN 1902.

Month.	Lasts.	Month.	Lasts.
January . . .	—	Brought forward	740
February . . .	—	July . . .	525
March . . .	2	August . . .	1,230
April . . .	64	September . . .	2,603
May . . .	79	October . . .	18,442
June . . .	595	November . . .	19,552
		December . . .	2,227
Carried forward	740	Total	45,319
Number of Yarmouth boats employed, about	150		
„ Scotch and other boats employed, about	488		



## RETURN OF HERRINGS LANDED AT LOWESTOFT IN 1902.

Month.	Lasts.	Month.	Lasts.
January . . .	—	Brought forward	2,405
February . . .	—	July . . .	665
March . . .	170	August . . .	54
April . . .	1,009	September . . .	419
May . . .	674	October . . .	13,498
June . . .	552	November . . .	13,386
		December . . .	3,028
Carried forward	2,405	Total	33,455
Number of Lowestoft boats . . .	235		
„ Scotch „ . . .	338		
„ West Country boats . . .	5		

## XI.

## NORFOLK DIPTERA.

BY REV. E. N. BLOOMFIELD, M.A., F.E.S.

*Read 31st March, 1903.*

As no list of Diptera has thus far been published by our Society, it may be thought well to print a preliminary list. I trust however that ere long some resident in the County will take up the subject and incorporate the present list with his own.

The main source of the following enumeration is Mr. Verrall's "Diptera of the Norfolk Broads," published in the 'Entomological Magazine,' vol. xviii. p. 149. Mr. C. Morley on his visit to the Broads in June, 1901, also took a good number of *Diptera*, most of these however being the same species as those met with by Mr. Verrall. Messrs R. C. Bradley and C. J. Wainwright of Birmingham spent a few weeks at West Runton in August, 1900, and have recorded some of the species met with by them in the

'Entomologist's Monthly Magazine' and 'The Entomologist.' Mr. Tuck of Bury St. Edmunds has sent me a few specimens from Mousehold and Cromer, and Mr. Connold of St. Leonards brought a few from Aylsham; but the list is still extremely imperfect, and the various families are very unequally represented.

The sources from which this list is compiled and the abbreviations used are as follows.

R.C.B. R. C. Bradley, British Trypetidæ, Ent. Mo. Mag. vol. xxxvii. p. 9.

C.M. Claude Morley, F.E.S.

G.H.V. G. H. Verrall, F.E.S. "Diptera of the Norfolk Broads," Ent. Mo. Mag. vol. xviii. p. 149.

V. Verrall, 'British Flies,' vol. viii.

C.J.W. Colbran J. Wainwright, F.G.S., "Diptera in Norfolk," 'Entomologist' 1901, p. 201.

Tachinidæ, in 1901 Ent. Mo. Mag. vol. xxxvii. p. 212.

Where no authority is given in the general list the Diptera of the Norfolk Broads is to be understood, but in the Tachinidæ Mr. Wainwright's paper on that family.

#### PULICIDÆ.

PULEX IRRITANS, L. Common.

„ CANIS, Curt. Common.

TRICHOPSYLLA HIRUNDINIS, Curt. Thetford, in nests of the Sand Martins, C.M.

#### CECIDOMYIDÆ.

LASIOPTERA RUBI, Schrk. Aylsham, Connold.

CECIDOMYIA GALII, Lw. Mundesley. Transactions, vol. iii. p. 110.

„ BURSARIA, Bremi.

„ CRATAEGI, Winn.

„ MARGINEMTORQUENS, Bremi.

„ ROSARIA, Lw.

„ ULMARIÆ, Bremi.

„ URTICÆ, Perris.

DIPLOSIS BOTULARIA, Winn.

„ LOTI, Deg.

Aylsham, Connold.  
Norfolk Galls.  
Transactions, vol. vii.  
p. 110.

#### MYCETOPHILIDÆ.

PLATYURA CINCTA, Winn. Ormesby, Verrall, Ent. Mo. Mag. vol. xxx. p. 79.

## BIBIONIDÆ.

SCATOPSE HALTERATA, Mag. The Broads.

„ TRANSVERSALIS, Lw. Near Thetford, Ent. Mo. Mag  
vol. xxii. p. 180.

„ NOTATA, L. Common, Hist. Yar.

BIBIO MARCI, L. Common, Hist. Yar.

## CHIRONOMIDÆ.

CERATOPOGON UNIMACULATA, Mcq. }

„ BICOLOR, Mg. }

„ SOLSTITIALIS, Winn. }

Ormesby.

Ent. Mo. Mag. vol. xxx. p. 140

## PTYCHOPTERIDÆ.

PTYCHOPTERA CONTAMINATA, L. Common on the Broads, C.M.

## LIMNOBIDÆ.

LIMNOBIA BIFASCIATA, Schrk. Oby, Hist. Yar.

„ TRIVITTATA, Schum. Brockdish near Scole, Verrall, Ent.  
Mo. Mag. vol. xxv. p. 125.

RUPIPIDIA MACULATA, Mg. Rare, Hist. Yar.

TRICHOCERA HIEMALIS, Deg. Norwich, C.M.

## TIPULIDÆ.

PACHYRRHINA CROCATA, L. Northend gardens, common, Hist. Yar.

„ GUESTFALICA, Westh. Dickleburgh, in June, Ent.  
Mo. Mag. vol. xxv. p. 21.

TIPULA GIGANTEA, Schrk. Northend gardens, Hist. Yar.

„ OLERACEA, L. Common.

„ PALUDOSA, Mg. Common in marshes, C.M.

„ FASCIPENNIS, Mg. Dickleburgh, in June, Ent. Mo. Mag.  
vol. xxv. p. 26.

## RHYPHIDÆ.

RHYPHUS FENESTRALIS, Scop. Common, Hist. Yar.

## STRATIOMYIDÆ.

OXYCERA PULCHELLA, Mg. West Runton, C.J.W.

STRATIONYS CHAMÆLEON, L. West Runton on flower-heads of  
*Angelica*, C.J.W.

„ POTAMIDA, Mg. Oby, common in meadows, Hist. Yar.  
ODONTOMYIA ? ARGENTATA, F. Wroxham, C.M.

„ VIRIDULA, F. Marshes, common, Hist. Yar.  
SARGUS FLAVIPES, Mg. Mousehold, Tuck.

„ IRIDATUS, Scop. Not common, Hist. Yar. Martham.  
CHLOROMYIA FORMOSA, Scop. Common, Hist. Yar. Earlham, C.M.

MICROCHRYSA POLITA, L. Common, Hist. Yar. Hickling, G.H.V.  
Mousehold, Tuck.

„ FLAVICORNIS, Mg. Hickling, G.H.V. and C.M.  
Surlingham, C.M.

BERIS CLAVIPES, L. Common, Hist. Yar.

„ VALLATA, Forst. Hickling, G.H.V. Horning, C.M. Cromer,  
Tuck.

CHORISOPS TIBIALIS, Mg. West Runton, C.J.W.

#### TABANIDÆ.

HÆMATOPOTA PLUVIALIS, L. Common.

CHRYSOPTERUS CECUTIENS, L. Common, Hist. Yar.

„ RELICTA, Mg. Common, Hist. Yar. Horsey, C.M.

#### LEPTIDÆ.

LEPTIS SCOLOPACÆA, L. Common on tree trunks, C.M.

„ LINEOLA, F. Aylsham, Connold.

CHRYSOPTERUS AUREUS, Mg. Cromer, Tuck.

„ AURATUS, F. The Broads, G.H.V. Aylsham and  
Surlingham.

#### ASILIDÆ.

DIOCTRIA RUFIPES, Deg. Earlham and Rockland, C.M.

„ BAUMHAUERI, Mg. Aylsham, Connold.

DYSMACHUS TRIGONUS, Mg. Winterton, C.M. West Runton, C.J.W.

#### BOMBYLIDÆ.

ANTHRAX PANISCUS, Rossi. West Runton, C.J.W.

#### THEREVIDÆ.

THEREVA NOBILITATA, F. Gillingham, E. A. Butler. Cromer, Tuck.



*THEREVA* BIPUNCTATA, Mg. Cromer.

„ ANNULATA, F. Sandy coasts, G.H.V. Yarmouth, Verrall.

DOLICHOPODIDÆ.

*DOLICHOPIUS* VITRIPENNIS, Mg. Hickling and Martham.

„ ATRATUS, Mg. Hickling and Ormesby.

„ LEPIDUS, Stæg. Hickling.

„ NUBILUS, Mg. The Broads.

„ PLUMIPES, Scop. Ormesby and Martham.

„ PENNATUS, Mg.

„ POPULARIS, W.

„ SIGNATUS, Mg. } Martham

„ NITIDUS, Flh.

„ GRISEIPENNIS, Stan. }

„ SIMPLEX, Mg.

„ BREVIPENNIS, Mg. } The Broads.

„ ÆNEUS, Deg.

*GYMNOPTERNUS* CUPREUS, Flh.

„ CELER, Mg. } Martham.

„ CHALYBÆUS, W. }

„ ÆROSUS, Flh. The Broads.

„ ASSIMILIS, Stæg. Martham and Hickling.

*HERCOSTOMUS* NANUS, Mcq. Ormesby.

*CHRYBOTUS* NEGLECTUS, W.

„ CUPREUS, Mcq.

„ GRAMINEUS, Flh. } Martham.

*ARGYRA* DIAPHANA, F.

„ ARGENTINA, Mg. }

*SYNTORMON* MONILIS, Wlk. Hickling.

*MEDETERUS* PETROPHILUS, Kow. Cromer.

*SCELLUS* NOTATUS, F. Gardens, somewhat rare, Hist. Yar.

*HYDROPHORUS* BIPUNCTATUS, Lehm. The Broads in thousands.

„ LITOREUS, Flh. Martham and Ormesby.

„ PRÆCOX, Lehm. Ormesby.

„ VIRIDIS, Mg. Ormesby.

*CAMPSICNEMUS* SCAMBUS, Flh. Martham.

„ CURVIPES, Flh. The Broads.

*THIRYPTICUS* BELLUS, Lw. Ormesby.

*SYMPYCINUS* ANNULIPES, Mg. The Broads.

## PIPUNCULIDÆ.

- PIPUNCULUS CONFUSUS, Verr. Wroxham and Horning, C.M.  
 „ HÆMORRHOIDALIS, Zett. Wroxham, V.  
 „ LITTORALIS, Beck. Yarmouth sand dunes; Martham, V.

## SYRPHIDÆ.

- PIPIZELLA VIRENS, F. Ormesby.  
 „ FLAVITARSIS, Mg. Martham.  
 PIPIZA NOCTILUCA, L. Ormesby.  
 LIOGASTER SPLENDIDA, Mg. Martham.  
 „ METALLINA, F. Wroxham, C.M. Cromer, Tuck.  
 CHRYSOGASTER SPLENDENS, Mg. Ormesby.  
 „ HIRTELLA, Lw. Hickling, G.H.V. & Common, C.M.  
 „ CHALYBEATA, Mg. Martham and Hickling.  
 „ SOLSTITIALIS, Flin. Martham.  
 CHILOSIA PULCHRIPIPES, Lw. Hickling, G.H.V. Cromer, Tuck.  
 „ VARIABILIS, Pz. Hickling, Martham.  
 „ ALBITARSIS, Mg. Hickling, Martham.  
 „ FRATERNA, Mg. Ormesby, G.H.V.  
 PLATYCHIRUS MANICATUS, Mg. The Broads, G.H.V. Mousehold,  
 Tuck.  
 „ PELTATUS, Mg. Hickling.  
 „ ALBIMANUS, F. The Broads.  
 „ FULVIVENTRIS, Mcq. Martham, G.H.V. Wroxham,  
 C.M.  
 „ CLYPEATUS, Mg. Cromer, Tuck.  
 PYROPHÆNA GRANDITARSA, Forst. Ormesby and Martham, G.H.V.  
 Gillingham, E. A. Butler. Common throughout  
 the Broads in June, C.M.  
 „ ROSARUM, F. Martham, G.H.V. Wroxham, C.M.  
 MELANOSTOMA SCALARE, F. Horning, C.M.  
 LEUCOZONA LUCORUM, L. Earlham, C.M.  
 CATABOMBA PYRASTRI, L. Common.  
 SYRPHUS RIBESII, L. Common.  
 „ LATIFASCIATUS, Mcq. Martham.  
 „ COROLLÆ, F. The Broads.  
 „ BALTEATUS, Deg. Cromer, Tuck.  
 „ AURICOLLIS, Mg. Martham.

*SPHÆROPHORIA MENTHASTRI*, L.

„ *var. PICTA*, Mg. The Broads.

*ASCIA PODAGRICA*, F. Doubtless common.

„ *FLORALIS*, Mg. Martham, &c.

*RIHINGIA CAMPESTRIS*, Mg. Common, Hist. Yar. The Broads.

*VOLUCELLA BOMBYLANUS*, L. Caistor, Hist. Yar. The Broads.

„ *PELLUCENS*, L. Mousehold, Tuck.

*ERISTALIS SEPULCHRALIS*, L. Ormesby.

„ *TENAX*, L. Common.

„ *INTRICARIUS*, L. Martham.

„ *ARBUSTORUM*, L. Common.

„ *PERTINAX*, Scop. Doubtless common.

„ *HORTICOLA*, Deg. Ormesby.

*HELOPHILUS HYBRIDUS*, Lw. Ormesby, Martham.

„ *PENDULUS*, L. The Broads.

„ *FRUTETORUM*, F. Ormesby, Martham.

„ *VERSCOLOR*, F. Ormesby, Martham, G.H.V. Rockland, C.M.

„ *TRANSFUGUS*, L. Breydon Marshes, Hist. Yar. Martham.

„ *LINEATUS*, F. Ormesby, Martham, G.H.V. Surlingham, C.M.

„ *VITTATUS*, Mg. Breydon Marshes, Hist. Yar.

*TROPIDIA SCITA*, Harr. Eaton, Norwich; very common throughout the Broads in June, C.M.

*XYLOTA SEGNIS*, L. Martham.

*SYRITTA PIPENS*, L. Aylsham, Connold.

*EUMERUS STRIGATUS*, Fln. Hunstanton, V.

*SERICOMYIA BOREALIS*, Fln. Caistor Marrams, Hist. Yar.

*CHIRYSOTOXUM OCTOMACULATUM*, Curt. Dickleburgh, V.

„ *FESTIVUM*, L. Norfolk, V. West Runton, C.J.W.

#### CONOPIDÆ.

*CONOPS FLAVIPES*, L. Mousehold, Tuck.

*PHYSOCEPHALA RUFIPES*, F. West Runton, C.J.W.

*ONCOMYIA ATRA*, F. West Runton, C.J.W.

*MYOPA FASCIATA*, Mg. Mousehold and Cromer, Tuck.

## TACHINIDÆ.

- MEIGENIA FLORALIS, Mg.  
 CEROMASIA MACHAIROPSIS, Br. & Berg.  
 „ SENILIS, Mg. Common.  
 „ STABULANS, Mg.  
 EXORISTA NOTABILIS, Mg. Common.  
 EPICAMPOCERA SUCCINCTA, Mg.  
 BLEPHARIDEA VULGARIS, Flin. A common species.  
 CHÆTOLYGA QUADRIPUSTULATA, F. Common.  
 TACHINA RUSTICA, Mg.  
 THELYMORPHA VERTIGINOSA, Flin.  
 MELANOTA VOLVULUS, F.  
 MINTHO PRÆCEPS, Scop. Cromer, Tuck.  
 MACQUARTIA TENEBRICOSSA, Mg. West Runton.  
 ANTHRACOMYIA NANA, Mg. West Runton, C.J.W. Wroxham,  
 C.M.  
 THELAIRA LEUCOZONA, Pz. The Broads, G.H.V. West Runton,  
 common.  
 OLIVIERIA LATERALIS, F. Common.  
 MICROPALPUS VULPINUS, Flin.  
 ERIGONE RADICUM, F. A common species.  
 RÆSELIA ANTIQUA, Flin.  
 PHYTO PARVICORNIS, Mg. (P. MELANOCERPHALA var.?)  
 FRAUENFELDIA TRILINEATA, Mg. New to Britain.  
 BRACHYCOMA DEVIA, Flin.  
 CLISTA LEPIDA, Mg.  
 SARCOPHAGA CARNARIA, L. Common.  
 HETERONYCHIA CHÆTONEURA, Br. & Berg. One  
 specimen.  
 MILTOGRAMMA PUNCTATUM, Mg. Several with  
 Aculeates and on Ragwort bloom.  
 METOPIA LEUCOCEPHALA, Rossi.  
 MACRONYCHIA AGRESTIS, Flin.  
 DEXIOSOMA CANINUM, F. Abundant on Bracken.  
 PROSENA SYBARITA, F. Common on Ragwort,  
 but also on other flowers.  
 DINERA GRIESENS, Flin.

West Runton.

West Runton.

West Runton.



## MUSCIDÆ.

- STOMOXYS CALCITRANS, L. Common.  
 GRAPHOMYIA MACULATA, Scop. The Broads, G.H.V. Mousehold,  
 Tuck.  
 „ PICTA, Zett. Martham.  
 MUSCA DOMESTICA, L. Common.  
 „ CORVINA, F. Common.  
 MORELLIA HORTORUM, Flin. Mousehold, Tuck.  
 „ CURVIPES, Meq. Hickling.  
 MESEMBRINA MERIDIANA, L. Common, Hist. Yar.  
 PYRELLIA CADAVERINA, L. Mousehold, Tuck.  
 CALLIPHORA ERYTHROCEPHALA, Mg. Common.  
 LUCILIA CÆSAR, L. Common.

## ANTHOMYIDÆ.

- POLIETES LARDARIA, F. St. Benets Abbey, C.M.  
 „ ALBOLINEATA, Flin. Hickling.  
 HYETODESIA INCANA, W. Hickling and Ormesby.  
 „ LUCORUM, Flin. The Broads.  
 „ VARIABILIS, Flin. Horning, C.M.  
 „ ERRANS, Mg. Surlingham and Rockland, C.M.  
 „ SIGNATA, Mg. Hickling, Verrall.  
 „ BASALIS, Zett. The Broads.  
 „ RUFIPALPIS, Meq. Ormesby.  
 MYDEA URBANA, Mg. Surlingham, C.M. The Broads.  
 „ ALLOTALLA, Mg. Martham.  
 „ PAGANA, F. Aylsham, Connold,  
 SPILOGASTER PROTUBERANS, Ztt. Yarmouth, Ent. Mo. Mag. vol. xxx.  
 p. 143.  
 SPIECOLYMA INANIS, Flin. Martham.  
 MELANOCHILA RIPARIA, Flin. Hickling, C.M.  
 HYDROPHORIA CONICA, W. The Broads.  
 „ SOCIA, Flin. Royden Fen, Diss, C.M.  
 HYLEMYIA STRIGOSA, F. Wroxham, abundant, C.M.  
 „ PUELLA, Mg. Horning, C.M.  
 ANTHOMYIA PLUVIALIS, L. The Broads, G.H.V. Aylsham,  
 Connold.

PHORBIA DISCRETA, Mg. South Walsham. Ent. Mo. Mag. vol. xxii. p. 232.

HOMALOMYIA CANICULARIS, L. Doubtless common.

HOPLOGASTER MOLLICULA, Flin. Surlingham and Horning, C.M.

CÆNOSIA ELEGANTULA, Rnd. (*H. tricolor*). Wroxham, C.M.

#### CORDYLURIDÆ.

PARALLELOMMA ALBIPES, Flin. Rockland, C.M.

CNEMOPOGON APICALIS, Mg. S. Walsham, Verrall.

TRICHOPALPUS PUNCTIPES, Mg. Martham, Verrall.

GYMNOMERA TARSEA, Flin. Hickling.

SCATOPHAGA STERCORARIA, L. Common.

} Ent. Mo. Mag.  
vol. xxx. p. 144.

#### SCIOMYZIDÆ.

ACTORA ÆSTUUM, Mg. Common on the beach in August, Yarmouth.  
Hist. Yar., and G.H.V.

SCIOMYZA ALBOCOSTATA, Flin. Horning, C.M.

TETANOCERA FERRUGINEA, Flin. Hickling.

„ CORYLETI, Scop. The Broads.

LIMNIA MARGINATA, F. Marrams, Hist. Yar.

„ UNGUICORNIS, Scop. West Runton, C.J.W.

„ RUFIFRONS, F. West Runton, C.J.W.

SEPEDON SPHEGEUS, F. Marshes, common, Hist. Yar.

„ SPINIPES, Scop. Hickling, G.H.V. Horning, C.M.

#### PSILIDÆ.

PSILA FIMETARIA, L. Rather rare, Hist. Yar. Aylsham, Connold.

#### MICROPEZIDÆ.

MICROPEZA CORRIGIOLATA, L. Cromer, Tuck.

CALOBATA PETRONELLA, L. Horning, common, C.M.

#### ORTALIDÆ.

PTEROPECTRIA FRONDESCENTIÆ, L. Hickling, C.M. West Runton,  
C.J.W.

CEROXYS CRASSIPENNIS, F. Ranworth, C.M.

PLATYSTOMA SEMINATIONIS, F. Wortham, abundant on flowers, C.M.

RIVELLIA SYNGENESIÆ, F. West Runton, C.J.W.

SEOPTERA VIBRANS, L. Aylsham, Connold.

## TRYPETIDÆ.

- SPILOGRAPHIA ALTERNATA, Flh. West Runton, 1 ♂ R.C.B.  
 TRYPETA CORNUTA, F. West Runton, common on *Centaurea scabiosa*, R.C.B. & C.J.W.  
 „ TUSSILAGINIS, F. West Runton, common on Burdock, R.C.B. & C.J.W.  
 „ CYLINDRICA, Martham.  
 UROPHORA SOLSTITIALIS, L. West Runton, common on *Centaurea nigra*, R.C.B. & C.J.W.  
 SPHENELLA MARGINATA, Flh. West Runton, common on Ragwort, R.C.B.  
 ENSINA SONCHI, L. West Runton, R.C.B.  
 TEPHRITIS MILIARIA, Schrk. The Broads.  
 „ TESSELLATA, Lw. West Runton, seven specimens, R.C.B. & C.J.W.  
 „ VESPERTINA, Lw. West Runton common, R.C.B.  
 „ BARDANÆ, Schrk. Aylsham, Connold. West Runton, abundant on Burdock, R.C.B.  
 URELLIA ELUTA, Mg. West Runton, 1 ♀ R.C.B.  
 „ STELLATA, Fuessl. West Runton, R.C.B.

## LOUCHEIDÆ.

- PALLOPTERA USTULATA, Flh. Dickleburgh, Verrall. Mousehold and Cromer, Tuck.

## SAPROMYZIDÆ.

- SAPROMYZA FASCIATA, Flh. Cromer, Tuck.  
 LAUXANIA HYALINATA, Mg. Cromer, Tuck.

## OPOMYZIDÆ.

- BALIOPTERA TRIPUNCTATA, Flh. Yarmouth, G.H.V. Cromer, Tuck.  
 OPOMYZA GERMINATIONIS, L. Cromer, Tuck.

## EPHYDRIDÆ.

- NOTIPHILA ULIGINOSA, Hal. Horning, abundant in flowers of *Nymphæa lutea*, C.M.

## HIPPOBOSCIDÆ.

- OXYPTERUM PALLIDUM, Leach. On Swifts, rare, Hist Yar.

## XII.

## HEPATICÆ OF NORFOLK.

BY REV. E. N. BLOOMFIELD, M.A., F.E.S.

*Read 31st March, 1903.*

THE county of Norfolk, like the rest of the Eastern counties, has no hills worthy of the name ; the air is dry and the rainfall less than that of the western part of England. We cannot therefore expect that any large number of the Hepaticæ should be found in the county, since they generally require a moist climate. In Norfolk, however, the British Hepaticæ seem to have been most diligently studied early in last century, especially by the Rev. R. B. Francis, and to him is due the first discovery in Britain of several very interesting species : these were mostly found by him at Holt and Edgefield, and we are indebted to Sir W. J. Hooker for the record of Mr. Francis' more notable discoveries. There were at that time, however, several good botanists from whom we have records of Norfolk Hepaticæ ; of these I might mention Sir W. J. Hooker himself, Mr. Dawson Turner of Yarmouth, and Messrs Woodward and Stone of Bungay ; but since the early part of the last century very little attention has been given to this class of plants, as far as Norfolk is concerned.

Within the last two or three years, however, a few fresh observations have been made by Mr. E. M. Holmes of Sevenoaks, Kent, and by Mr. W. H. Burrell of Sheringham. The majority of their specimens were collected in the same localities which Mr. Francis investigated so successfully, and it is very interesting to find that most of the species observed by him about a hundred years ago are still found in the same stations.



I am indebted to Mr. W. H. Pearson, the author of British Hepaticæ, for full extracts from Hooker's Jungermanniæ, and also for a record of the species found by Mr. E. M. Holmes when visiting Norfolk in 1900, while Mr. M. B. Slater of Malton, Yorkshire, has very kindly determined or confirmed Mr. Burrell's specimens. Most of the early records are from Hooker's Jungermanniæ, but some are from the 'Old Botanists' Guide,' 'Withering's Arrangement,' and 'Paget's Natural History of Yarmouth.' The Herbarium of the late Mr. E. Skepper of Bury St. Edmunds also contains a few Norfolk specimens, and there is a list of Hepaticæ by Miss A. M. Barnard in 'Mason's History of Norfolk.' The nomenclature is for the most part that of the London Catalogue of British Mosses and Hepatics, 1881.

The Abbreviations are as follows:—

W. H. B. Mr. W. H. Burrell, Sheringham.

E. M. H. Mr. E. M. Holmes, F.L.S., Sevenoaks.

O. B. G. 'Old Botanists' Guide,' 1805.

With: 'Withering's Arrangement,' Edition VI.

Hist. Yar. Sketch of the Natural History of Yarmouth, by  
C. J. and James Paget, 1834.

The numbers are those of the vice-counties, 27. East Norfolk. 28. West Norfolk.

#### MARCHANTIÆ.

MARCHANTIA POLYMORPHA, L. 27. Holt, W. H. B. Doubtless, common.

CONOCEPHALUS CONICUS, L. 27. Very common, but only found in fruit at one place on the shady bank of a ditch at Ditchingham, Mr. Woodward (With.). Bank of stream near Blickling Mills, W. H. B.

ASTERELLA (REBOULIA) HEMISPHERICA, L. 27. At Thorpe Market by the road from North Walsham to Cromer, Rev. G. R. Leathes. On an old bank at Antingham near the ponds, D. T. (O. B. G.) Guestwick, Skepper's Herbarium. Roughton, on hedge bank by roadside in considerable quantity, several square feet in area: Beeston Regis, growing on a small hillock raised a few inches above the swampy ground, W. H. B.

## RICCIEÆ.

- RICCIA GLAUCA, L. 27. Common, Hist. Yar. In clover stubbles near Bungay, frequent, Mr. Stone. Usually growing with *Targionia sphaerocarpus*, and at the same time, Mr. Woodward (With.).
- RICCIELLA FLUITANS, L. 27. Ditches at Heigham, Hist. Yar.
- RICCIOCARPUS NATANS, L. 27. Near Heydon, Mr. Bryant (O. B. G.).

## JUNGERMANNIACEÆ.

- FRULLANIA DILATATA, L. 27. Trees at Caistor &c., Hist. Yar. Sheringham, W. H. B. Usually very abundant.
- RADULA COMPLANATA, L. 27. Trunks of trees, Caistor &c. Hist. Yar. And in Miss Barnard's List.
- PORELLA PLATYPHYLLA, L. Miss Barnard's List.
- LEPIDOZIA SETACEA, Mitten. 27. Holt Bogs among *Sphagna*, Rev. R. B. Francis, E. M. H. and W. H. B. 28. Wolverton, E. M. H.
- „ REPTANS, L. 27. Blickling, near Aylsham, on the ground under trees, W. H. B. And in Miss Barnard's List.
- CEPHALOZIA (ODONTOSCHISMA) SPHAGNI, Dicks. 27. Holt Bogs, Rev. R. B. Francis, and W. H. B.
- „ FRANCISCI, Hook. 27. About Holt and Edgefield. "I gladly take the opportunity of distinguishing the present species by the name of its discoverer, my friend the Rev. R. Francis, who has so successfully investigated the vicinity of his residence in search of the plants of this genus and has so kindly and liberally communicated to me numerous specimens, and much valuable information respecting them." W. J. Hooker. Holt bogs, scarce, W. H. B.
- „ FLUITANS, Nees. 27. Holt Bogs, E. M. H. and W. H. B. 28. Wolverton, E. M. H.
- „ DIVARICATA, Sm. (*Jung. byssacea*). 27. Holt and Edgefield Heaths, Rev. R. B. Francis, (O. B. G.) First discovered in this country by the Rev. R. B. Francis, on heathy and exposed situations in the

neighbourhood of Holt. Far from uncommon in similar places in various parts of Norfolk, W. J. Hooker. Mr. Dawson Turner found it growing in great profusion, but always barren on the sand-hills at Hemsby.

CEPHALOSIA BICUSPIDATA, L. 27. Damp banks, &c., common, Hist. Yar. Sheringham, W. H. B. 28. Outside Sandringham Park, E. M. H.

„ LAMMERSIANA, Hübn. 27. Holt Bogs, W. H. B.

„ CONNIVENS, Dicks. 27. In boggy places in the neighbourhood of Holt and Edgefield, Rev. R. B. Francis. Holt Bogs, E. M. H. and W. H. B.

„ CATENULATA, Hübn. 28. Wolverton, E. M. H.

LOPHOCOLEA BIDENTATA, L. 27. Among Hyphnum, Hist. Yar. Sheringham, W. H. B.

„ var. OBTUSATA, Hook. Found by the Rev. R. B. Francis in very wet and boggy parts of Holt Heath.

„ HETEROPHYLLA, Schrad. 27. "First detected in this country by the Rev. R. B. Francis growing on decaying trunks of trees in Edgefield Wood, also at the foot of Alders in Hanworth Meadows, Norfolk," W. J. Hooker.

KANTIA TRICHOMANIS, L. 27. Near Holt, E. M. H. Holt, &c., W. H. B.

BLEPHAROSIA CILIARIS, Nees. 27. On a dry sandy bank on Brome Heath near Bungay, Mr. Stone (With.).

SCAPANIA COMPACTA, Roth. (J. RESUPINATA, Hook). 27. About Edgefield on a loamy soil and on the heath at Hempstead Hill, Rev. R. B. Francis. Not unfrequent in various parts of Norfolk in shady places under the trailing stems of *Ericæ*, W. J. Hooker.

„ NEMOROSA, L. 27. Woods near Holt, Rev. R. B. Francis, (O. B. G.). Woods near Norwich, W. J. Hooker. var. *asper*. 27. Holt Bogs, W. H. B.

„ CURTA, Mart. (J. NEMOROSA var. DENUDATA, Hook.) 27. Edgefield, Rev. R. B. Francis.

- DIPLOPHYLLUM ALBICANS, L. 27. Muekle Moor near Holt, Skepper's Herbarium. Sheringham, in woods, W. H. B.
- PLAGIOCHILA ASPLENIODES, L. 27. Earsham and Sexton Woods near Bungay, Mr. Stone (With.). Miss Barnard's List.
- MYLIA TAYLORI. Hook. 28. Wolverton, E. M. H.
- „ ANOMALA, Hook. 27. Holt Lows; Bogs on the south side of Edgefield Hill on the road to Holt and in Holt Wood, growing both upon peat, earth and among *Sphagna*, Rev. R. B. Franeis. Holt Heath, E. M. H. Holt Bogs, W. H. B. First detected by the Rev. R. B. Franeis in Holt Moss.
- JUNGERMANNIA CRENULATA, Sm. 27. On the boggy parts of Holt Heath, Rev. R. B. Francis.
- „ var. GRACILLIMA, Sm. 27. Loamy soil in Edgefield Wood, and by the road sides in the vicinity, Rev. R. B. Franeis.
- „ GRACILIS, Sehl. (J. BARBATA var. MINOR Hook). 27. Discovered by the Rev. R. B. Francis, growing among *Dicranum glaucum* in Holt Wood.
- „ EXSECTA, Schmid. “Moist and especially boggy heaths in various parts of Norfolk as—27. Holt and Edgefield Heaths, (where it was for the first time discovered in England by the Rev. R. B. Francis,) and Mousehold Heath, Norfolk.”
- „ VENTRICOSA, Dieks. 27. “The Rev. R. B. Franeis has for many years noticed it in the neighbourhood of his residence attached both to a boggy and loamy soil, in Holt Wood and Lows, as well as Edgefield Wood, and on the heath, growing also among *Sphagnum*.” W. J. Hooker.
- „ PORPHYROLEUCA, Nees. 27. Holt Bogs, W. H. B.
- „ CAPITATA, Hook. (J. EXCISA Dieks, p. p.) 27. Edgefield in wet places plentiful, Rev. R. B. Franeis. Abundant upon Mousehold Heath near Norwich, and on hedge banks and heathy places near Yarmouth, W. J. Hooker.



- JUNGERMANNIA BICRENATA, Lind. 27. Ballast heap in brick pit Holt, W. H. B.
- „ INCISA, Schrad. 27. Holt Lows and Edgefield Heath, Rev. R. B. Francis.
- „ INFLATA, Huds. 27. Holt Bog with *C. Francisci* sparingly, W. H. B. 28. Outside Sandringham Park, E. M. H.
- NARDIA SCALARIS, Schrad. 27. Shady side of bank on heathland, Sheringham, W. H. B. Miss Barnard's List.
- PELLIA EPIPHYLLA, L. 27. Near Yarmouth, Hist. Yar. Sheringham, W. H. B. Doubtless common.
- ANEURA PINGUIS, L. 27. Near Yarmouth, Hist. Yar. Holt Bogs, E. M. H. and W. H. B.
- „ MULTIFIDA, Dill. 27. Among *Sphagna*, Hist. Yar. Holt Bogs, W. H. B.
- METZGERIA FURCATA, L. 27. Sheringham and Beeston Regis, W. H. B.
- SPIREROCARPUS TERRESTRIS, S. M. 27. Clover field at Heydon, Rev. H. Bryant. Near Norwich, Mr. Crowe. Abundant at Caistor and other places round Yarmouth, D. T. (O. B. G). Very common in our clover-fields in autumn on sandy loam, along with *Riccia glauca*, the first year of the clover, Mr. Woodward (With.). Turnip and clover-fields and hedge banks, Caistor, Hist. Yar.
- ANTHOCEROS PUNCTATUS, L. 27. Brome on the borders between the high and boggy ground Mr. Woodward, (O. B. G). Ellingham Fen, Mr. Stone (With.).

## XIII.

## SUPPLEMENTARY LIST OF NORFOLK MOSSES.

BY H. N. DIXON, M.A., F.L.S.,

*Hon. Mem. Caradoc and Severn Valley Field Club.**Read 31st March, 1903.*

SINCE the publication of 'A Preliminary List of Norfolk Mosses, in these Transactions (vol. vii. p. 212) in 1901, a number of additional records have been made. The principal contributions have been made by the Rev. W. E. Thompson, M.A., who, collecting in the shoreward parishes of Thornham, Titchwell, Holme, and the neighbourhood, has added a considerable number to the recorded species from the western division of the county, vice-county 28. His list includes also several new county records, to which must be added some further records by Mr. W. H. Burrell and Sir Jas. Stirling. The names of these collectors are abbreviated in the succeeding list as follows, W. E. T., W. H. B., J. S.

The total number of species here added to the county list is twenty-one (in addition to the confirmation of two or three as to which the previous records admitted of some slight doubt), thus bringing the total number hitherto recorded to about 190. An asterisk is prefixed to county records; vice-county records are indicated by the number of the V.C. In a few instances additional localities for rarer species already recorded have been given, not constituting a V.C. record, in these cases the V.C. number is enclosed in brackets.

The most interesting observation is the addition to the British Flora of *Bryum mamillatum*, hitherto only known as an inhabitant of the Baltic region; of this a fuller notice will be found in the list.

I may add that nearly all the species enumerated below, all the critical ones at least, have passed through my hands.

## DICRANACEÆ.

- \* *SELIGERIA CALCAREA*, B. and S. 28. Thornham chalk quarry and quarries at Holme and Ringstead (W. E. T.). Fruit abundant in winter and spring, ripe in spring. A form with short seta, almost overtopped by the perichaetial bracts, probably the form which is described as the type by Limpricht, but which is certainly not ours.

*DICRANELLA VARIA*, Schp. 28. Occasionally on inland banks of Thornham Marsh (W. E. T.).

„ *CERVICULATA*, Schp. 28. Roydon Common (J. S.).

- \* „ *RUFESCENS*, Schp. 27. Beeston Regis (W. H. B.).

- \* „ *SCHREBERI*, Schp. 27. Brick earth pit, Beeston Regis (W. H. B.).

*DICRANUM SCOPARIUM*, Hedw. 28. Snettisham, Sandringham (J. S.). Hunstanton and Holme Dunes, and Ringstead Heath (W. E. T.).

- \* „ *BONJEANI*, De Not. 28. Snettisham Common (J. S.).

- \* *CAMPYLOPUS FLEXUOSUS* Brid. 28. Snettisham Common (J. S.).

„ *BREVIPILUS*, B. and S. 27. Roughton Heath (W. H. B.).

## FISSIDENTACEÆ.

*FISSIDENS BRYOIDES*, Hedw. 28. Abundant on all moist banks inland (W. E. T.).

- \* „ *ADIANTOIDES* var. *COLLINUS*, Braithw. 28. Plentiful on roadside bank, Thornham Heath, high ground, inland (W. E. T.). The cells are distinctly smaller than in the type, though not obscure as in *F. decipiens*; in this as in the habit the plant agrees well with Mitten's description of *F. collinus*, as well as with the Southdowns plants of *F. adiantoides*, to which the name is no doubt intended to apply (although some authenticated specimens have proved to belong to *F. decipiens*).

„ *TAXIFOLIUS*, Hedw. 28. Abundant on all moist banks inland (W. E. T.).

## GRIMMIACEÆ.

- \* *RHACOMITRIUM CANESCENS* var. *ERICOIDES*, B. and S. 28. North Wootton Common (J. S.).

## TORTULACEÆ.

- PHASCUM CUSPIDATUM, Sehreb. 28. Locally abundant, Thornham Marsh, etc. (W. E. T.)
- „ „ var. PILIFERUM, H. and T. 28. Sea-bank of Titchwell Marsh, March, 1903 (W. E. T.).
- POTTIA BRYOIDES, Mitt. (27). Fallow land, Sheringham (W. H. B.).
- „ HEIMII, Fürnr. 28. "Literally swarms over the whole of Holme Marsh, and occurs occasionally on Thornham and Titchwell Marshes" (W. E. T.). (27). Weybourne (W. H. B.).
- „ TRUNCATULA, Lindb. 28. Sandringham (J. S.). Thornham (W. E. T.).
- „ INTERMEDIA, Fürnr. 28. Sandringham (J. S.). Thornham (W. E. T.).
- „ MINUTULA, Fürnr. 28. Thornham Viarage grounds and quarry (W. E. T.).
- „ LANCEOLATA, C. M. 28. Titchwell and Thornham (W. E. T.). 27. Sheringham (W. H. B.).
- TORTULA PUSILLA, Mitt. 28. Mud-capped walls, Titchwell and Ringstead (W. E. T.).
- \* „ LAMELLATA, Lindb. 28. Same walls as the last, plentiful (W. E. T.).
- „ AMBIGUA, Angstr. 28. Same walls as the above, poor but plentiful (W. E. T.). Mr. Thompson adds that these three last mentioned Mosses must have been once very abundant in this district, and are still plentiful at Titchwell where many mud-capped walls may still be found; but the mud-capping is rapidly being replaced by cement or brick coping, and these Mosses will probably disappear at an early date.
- \* „ LEVIPILA, Schwaeg. 28. On Elder and Thorn in hedges, Thornham, and Holme (W. E. T.).
- „ RURALIS, Ehrh. 28. "Occasional" (W. E. T.).
- „ RURALIFORMIS, Dixon. (28). "Abundant in fruit. Swarms over Holme Dunes, and extends along the coast on either side" (W. E. T.).
- \* BARBULA RUBELLA, Mitt. 28. Titchwell, Thornham (W. E. T.). The previous record may possibly have been for Suffolk.



- BARBULA TOPIACEA, Mitt. 28. Thornham Marsh (W. E. T.).  
 „ FALLAX, Hedw. 28. Thornham, etc. (W. E. T.)  
 \* „ CONVOLUTA, Hedw. 28. Sandringham; N. Wootton  
 Common (J. S.).  
 \* WEISIA MICROSTOMA, C. M. 28. Inland bank of Thornham  
 Marsh (W. E. T.).  
 „ VIRIDULA, Hedw. 28. "Abundant on banks" (W. E. T.).

## ORTHOTRICHACEÆ.

- \* ORTHOTRICHUM ANOMALUM var. SAXATILE, Milde. 28. Holme  
 church wall (W. E. T.).  
 „ AFFINE, Schrad. 28. Thornham (W. E. T.).

## FUNARIACEÆ.

- PHYSCOMITRIUM PYRIFORME, Brid. 28. Sides of wet ditches,  
 Titchwell, etc. (W. E. T.).  
 FUNARIA FASCICULARIS, Schp. 28. One fine patch at Thornham  
 Vicarage (W. E. T.). 27. Holt; Sheringham;  
 West Beckham (W. H. B.).  
 „ HYGROMETRICA, Sibth. 28. Titchwell (W. E. T.).

## MEESIACEÆ.

- \* AULACOMNIUM ANDROGYNUM, Schwaeg. 27. Norwich; Hemp-  
 stead near Holt; Weybourne (W. H. B.).

## BARTRAMIACEÆ.

- \* PHILONOTIS CALCAREA, B. and S. 27. Holt bog (W. H. B.).

## BRYACEÆ.

- \* WEBERA ANNOTINA, Schwaeg. 28. Beeston Regis (W. H. B.).  
 A rather perplexing form. Some of the specimens  
 showed the numerous short bulbils characteristic  
 of *W. annotina* (segregate), as defined by Correns,  
 while others were equally clearly *W. prolifera*,  
 Kindb. Some of the latter form, however, showed  
 a tendency to produce the shorter, not fusiform  
 bulbils in the lower leaf axils, indicating  
 a connection between the two forms. I also  
 detected a single stem of the var. *erecta* (Correns).

WEBERA CARNEA, Schp. 28. Roydon Common (J. S.).  
Thornham (W. E. T.).

\* BRYUM MAMILLATUM, Lindb. 28. Among *Juncus gerardi* on  
low ground between sand dunes. Hunstanton  
Links, May, 1902. Rev. W. E. Thompson.

As this is the first record of this very rare species in Britain it deserves a somewhat extended notice. Mr. Thompson sent me the plant in June, for determination. I could not make it agree with any of our British species, and on comparing it with the descriptions of continental species I could find none with which it agreed but *Bryum mamillatum*, Lindb., a species only recorded hitherto from the sandy shores of the islands of Gothland and Aland in the Baltic. On comparing it with my specimens gathered there by Bomansson I could detect only slight and as it seemed to me comparatively unimportant differences. In order to clear up any doubt I sent specimens to Dr. Hagen, the acknowledged authority on, at any rate, the northern species of this very critical group. Dr. Hagen was at first inclined to think the differences of somewhat greater importance, but upon a further study of fresh material of *B. mamillatum* from its Scandinavian stations he recognised that its variations were sufficiently extended to include our plant, so that its identification with *B. mamillatum* may be looked upon as unquestioned. I am describing and figuring it in a second edition of the 'Student's Handbook of British Mosses' now in preparation, and it is scarcely needful to give a full diagnosis here; but some notes as to its distinguishing characters may be worth giving. Systematically it holds a position of somewhat peculiar interest, as it affords a link in some degree between the sections Ptychostomum and Cladodium in the genus Bryum. In each of these sections the peristome is imperfect, the cilia of the inner peristome being more or less undeveloped, sometimes quite rudimentary or wanting, or if longer, always without the transverse appendages or bars which characterise the fully developed peristome of Eu-bryum and of most Hypnaceæ; while the inner peristome is usually more or less united with the outer. The two sections differ from one another in the structure of the inner surface of the teeth of the outer peristome. This surface in Cladodium consists of rectangular plates set one above another, and separated by transverse divisions or bars which are strongly thickened, projecting

inwards like the rungs of a ladder. The tooth therefore when viewed by transmitted light and a low power presents the simple structure of a yellow strip with regular transverse bars. In *Ptychostomum* it is different. The internal transverse bars are connected with one another by a series of irregular partitions, some vertical, some oblique, giving the appearance of an irregular network of lines when the tooth is examined as above. This is especially marked in *B. pendulum*, and often nearly as distinct in *B. warneum*. In some species however, such as *B. arcticum*, the irregular connecting lines are much fewer, and may be reduced to a single almost vertical connection between each pair of transverse bars, down the median line of the tooth. Now in *B. mamillatum* the teeth are almost entirely free from these connecting partitions, so that it appears to belong to the section *Cladodium*; but on careful examination a single oblique partition or two may be seen here and there between the lowest transverse bars at the very base of the tooth. It therefore, as has been said, forms in some degree a connecting link between the two sections.

This structure of the peristome distinguishes *B. mamillatum* clearly from *B. warneum*, which in other respects it resembles more closely than any other of our species. In addition to this the leaf margin is more strongly recurved than is *B. warneum*, the mouth of the capsule wider, the lid flatter, and the cells of the outer layer of the capsule wall much less incrassate; *B. lacustre* differs in the much smaller spores, the smaller more pointed lid, the less strongly bordered leaves, and the inflorescence synoicous, not autoicous. *B. pendulum* differs at once in the peristome, while both it and *B. inclinatum* have more tapering leaves with more excurrent nerve, and leaves red at the base. The other allied British species of these two sections (except the high alpine species, *B. arcticum*, *B. purpurascens* and *B. lawersianum*) are known at once by the obtuse or sub-obtuse leaves with nerve ceasing below the apex.

The spores in *B. mamillatum* are larger than in any other species of *Bryum* with which I am acquainted. In Bomansson's specimens from Åland they measure 40—50 $\mu$ . In the Norfolk plant they average 48 $\mu$ , many reach 55 $\mu$ , and a few as much as 62 and 67 $\mu$ . Altogether it is a very interesting plant, and a great acquisition to our moss flora.

- BRYUM PENDULUM, Schp. (28). Fine specimens in good fruit, on bank of ditch on Titchwell Sand Dunes (W. E. T.).
- „ PSEUDOTRIQUETRUM, Schwaeg. 28. Bog on Titchwell Marsh (W. E. T.).
- \* „ CAPILLARE var. ELEGANS, Braithw. In velvety cushions on Titchwell Dunes, rare (W. E. T.).
- \* „ OBCONICUM, Hornsch. 28. Ringstead Heath (W. E. T.).
- \* „ CÆSPITICIUM L. var. With the *Bryum mamillatum* described above Mr. Thompson sent another *Bryum* from Holme Sand Dunes, which on examination proved to be a *Bryum caespiticium*, but to differ in some points, which while not very conspicuous were of no unimportant value. The spores were considerably larger than in the type, (where they average  $10-14\mu$ ), viz.  $16-22\mu$ , averaging about  $18-20\mu$ , a few being oval and considerably longer. The inner peristome was of a deeper orange than is usual; and the outer teeth frequently showed a few oblique partitions here and there between the lamellæ on the ventral surface, as in the section *Ptychostomum*. This curious plant has been submitted to Dr. Hagen, who considers it a marked form of varietal rank at least.
- \* „ ERYTHROCARPUM, Schwag. 28. Hedgebank, Thornham (W. E. T.).
- „ ATROPURPUREUM, W. and M. 28. Thornham (W. E. T.).
- „ ROSEUM, Schreb. (27). Holt (W. H. B.).
- MNIUM ROSTRATUM, Schrad. 27. Edgefield Heath, bog (W. H. B.).
- „ UNDULATUM, L. 28. Thornham (W. E. T.).
- \* „ PUNCTATUM, L. 27. Bog, Edgefield Heath (W. H. B.).

## NECKERACEÆ.

- \* NECKERA PUMILA, Hedw. 27. On tree, Sheringham (W. H. B.).
- „ COMPLANATA, Hübn. 28. Snettisham (J. S.).

## HYPNACEÆ.

- CAMPTOTHECIUM LUTESCENS, B. and S. (28). Fruiting, Ringstead (W. E. T.).



- BRACHYTHECIUM ALBICANS, B. and S. (28). Fruit abundant on the sea coast (W. E. T.).
- „ VELUTINUM, B. and S. 28. "Frequent" (W. E. T.).
- „ PURUM, Dixon. (28). "Common. One patch with fine fruit, Thornham" (W. E. T.).
- EURHYNCHIUM PUMILUM, Schp. 28. Near Thornham windmill, on moist banks (W. E. T.).
- \* „ MYOSUROIDES, Schp. 28. A small quantity, barren, growing with *E. confertum*; tree stump behind Ringstead Church (W. E. T.).
- „ STRIATUM, B. and S. 28. Thornham (W. E. T.).
- \* „ MEGAPOLITANUM, Milde. 28. With abundant fruit, Thornham Heath on hedge-bank (W. E. T.).
- \* PLAGIOTHECIUM BORRERIANUM, Spr. 28. Beeston Regis (W. H. B.).
- AMBLYSTEGIUM SERPENS, B. and S. 28. "Abundant" (W. E. T.).
- „ FILICINUM, De Not. 28. In fine fruit, Titchwell Marsh (W. E. T.).
- HYPNUM STELLATUM, Schreb. 28. A small form, in bog on Titchwell Marsh (W. E. T.).
- „ ADUNCUM, Hedw. 28. Boggy pool, Ringstead, Thornham Marsh (W. E. T.). Plants of the "*pseudofluitans* group" also were sent by Mr. Thompson from Ringstead.
- \* HYPNUM WILSONI, Schp. "Norfolk, coll. Rev. W. W. Mason, teste Renauld." Mr. J. A. Wheldon informs me that he has a specimen of the above plant in his herbarium.
- „ CUPRESSIFORME var. TECTORUM, Brid. 28. "Abundant" (W. E. T.).
- „ MOLLUSCUM, Hedw. 28. Thornham and Ringstead (W. E. T.).
- „ CUSPIDATUM, L. 28. Sandringham (J. S.). Titchwell, etc. (W. E. T.).
- „ CORDIFOLIUM, Hedw. 28. Damp places, North Wootton Common (E. M. Holmes).
- HYLOCOMIUM SPLENDENS, B. and S. 28. Ringstead (W. E. T.).
- „ SQUARROSUM, B. and S. 28. In fine fruit, Thornham (W. E. T.).

XIV.

NATURAL HISTORY NOTES FROM YARMOUTH.

BY A. PATTERSON.

*Read 31st March, 1903.*

1902—1903.

MARCH 13th. A ten-inch Ballan Wrasse (*Labrus maculatus*) was found amongst a parcel of Whittings.

On March 17th, a twelve-inch example of the Lumpsucker (*Cyclopterus lumpus*) was taken with shrimps in a net off-shore. Six hours after it had left the water it was still alive ; so much so that when brought to me and laid upon a dish, it adhered so tenaciously that the dish did not fall off when the fish was lifted.

On March 27th, Müller's Topknot. A very beautiful, fresh example of (*Zeugopterus punctatus*) was landed. Length  $7\frac{1}{2}$  inches. It has been preserved for the Yarmouth Museum.

As late as April I saw Dunlins and other small Waders wearing the grey dress of winter.

On April 5th, after a gale from the N.E., during a long ramble on the beach, north of Yarmouth, I observed hundreds of five-rayed Starfishes (*Uraster rubens*) and eleven, twelve and thirteen-rayed Stars (*Solaster papposa*), with hundreds of empty shells of the Horse Mussel (*Modolia modiolus*). And with them many "Sea-mice." I was surprised at not finding a single Rockbird ; these had probably already gone safely north.

An interesting accident *anent* the Starfishes happened to Mr. B. Dye's Cat. I had left him a few Sunstars ; and during the tea-hour the feline member of the family managed to devour the half of one. In half an hour's time she could not walk straight, and groaned piteously. After a collapse of some hours' duration she got upon her feet, and could just manage to stagger along ; her jaws which had become rigid, relaxed. The symptoms were altogether those of poisoning, next day however, she was herself again ; and I received emphatic orders never to bring Starfishes there again.

April 9th. An unusually large Haddock, 2 feet 9 inches in length, weighed  $10\frac{1}{2}$  lbs., empty.

Three Cuckoo Rays (*Raja miraletus*) were seen on a fish slab on April 11th, the longest one measuring 22 inches. They had been brought in by a steam trawler.

April 12th. About thirty Hooded Crows on a Breydon mudflat. These were a late lot of emigrants; from their actions I judged most of them had paired.

Sanderlings. A very thick fog on Breydon allowed me a very near approach to a number of Sanderlings. With them were Dunlins and Ringed Plovers. The "wick-wick" of the Sanderling is most easily distinguishable. Wind, S.E.

On April 20th, I saw two Spoonbills. May 2nd, several Wimbrel on Breydon.

May 6th. An hour and a half's snow this morning!

May 7th. Several Land Dotterel (*Eulromius morinellus*) on the Caister Marshes.

"12th of May—Godwit day!" is a very old local tradition. I went on Breydon to-day but did not see a single example! *O tempora, O mores!* On the 14th, the watcher informed me he had seen a few.

May 16th. A day as gloomy as November. Saw two Swans in a Breydon 'Drain'; and several Wimbrel. In the evening I saw about 50 Herons scattered singly all over Breydon. One grand old bird, with flowing crest, reluctantly rose on three occasions just ahead of my punt as I sailed her up the Ship Drain, the bird alighting each time only a few yards ahead.

The movements of several Lesser Terns (*Sterna minuta*) in May, 1902, were exceedingly interesting. The wind blowing somewhat stiffly on the morning of the 23rd made a dinner on Breydon difficult to find, whereupon they betook themselves, two pairs of them, to one of the ditches on the rear of Suffolk side of the walls. One after another they repeatedly dipped, securing a Three-spined Stickleback at every stoop. I laid hidden in the long grass at the ditch end and so had a capital chance of observing them closely. Several still remained on Breydon on June 2nd, and I felt convinced at least two pairs had intentions of nesting in the vicinity. I at length located a spot evidently selected for that purpose, at that higher portion of mud-flat at the entrance of the Ship Drain. Up

till the middle of June low tides prevailed, but a higher spring tide washed everything clear of the flat, and the birds disappeared with the exception of one pair; these remained until June 27th. Plenty of Lesser Terns came back to this neighbourhood in August; and it was pretty to watch the old birds catching Herring-fry and feeding their young which remained fluttering and floating on the water.

June 1st. Ringed Plovers in some numbers on Breydon. My small son Gilbert, watching the Ringed Plovers on the shingle patches on the North Beach, discovered two young birds, that, on his stooping over them, squatted flat on the sand; they did not move when he gently lifted them in his hands; and ran away, on being released, in amusing haste.

June 2nd. Several Turnstones on Breydon Very late travellers.

The neighbourhood of Belton, four miles S. of Yarmouth, must be the metropolis of the Natterjack Toad (*Bufo calamita*). It abounds everywhere, on marsh, in market garden, on furzy common. In a sandy bank, creased with deep lines as if done by a stick, on the evening of June 4th, I saw rows of heads peering out; at sundown they come out and patrol the gardens, waging war on slugs and beetles; they are then seen running about from duck's-egg sized individuals to little fellows no larger than Barcelona nuts, all intent on a supper. It is not to be wondered at that nowhere within many miles' radius are heavier crops of strawberries gathered. The country folk treat them kindly; and have evidently learned their worth.

Several blotched and semi-albino Soles, Brills and other flat fish have been preserved for my inspection during the past year.

June 20th. A late Oyster-catcher on Breydon. When well-fed, Gulls sometimes amuse themselves by catching crabs and small flounders that they detect flapping or scurrying in the grass-covered flats when they are resting upon them. On June 19th, several actually captured these creatures, and flying up repeatedly, simply dropped them again as if for the very fun of the exercise; this occurred quite opposite my houseboat.

The following note may be worth quoting as written:—"June 25th. An unusual scarcity of Redshanks on Breydon. Day after day and not a bird is seen. I'm told there is a goodly number up the Beccles River."



"June 26th. Several to-day near the houseboat."

"July 3rd. Three seore around me."

"July 28th. At least 100 on the ground near the boat."

A most unusual number of Lesser Saddlebaek Gulls (*Larus fuscus*) in various states of plumage on the flats, during the latter half of June.

July 2nd. A young Blaek-headed Gull pottering about on Breydon.

July 2nd. Picked up the head and three parts of a Stork's skin, floating on Breydon. How it came there I cannot say. Whether thrown into the river from a vessel, or by any bird-interested wag I should not like to venture an opinion. Anyway I saw some unusual object floating in the Duffell's Drain and found it to be as above.

July 4th. Two adult Dunlins on Breydon.

July 11th. A White-beaked Dolphin (*Delphinus albirostris*) 54 inches in length was captured in a herring net, and brought into Yarmouth next day.

On July 30th, a Caspian Tern (*S. caspia*) was observed by Jary the watcher on Breydon. I saw two Little Stints (*Tringa minuta*) on the flats.

I have been gratified in making another addition to the list of Yarmouth Fishes viz:—the Eekstrom's Topknot (*Zougopterus unimaculatus*). This was given to me in a dried state, in September, 1902, having been kept hung over his mantel-piece by a shrimper friend of mine ever since he took it with his shrimps some weeks before. Knowing my interest in such matters he said he thought he'd keep it till he saw me! It was taken just off the shore, and there is not the least suspicion of untruth in the man's statement. The fish which is new also to the county measured about five inches in length, and was shaped very much after the fashion of a Smeared Dab. The specimen, through the kind offices of Mr. Distant of the 'Zoologist,' was submitted to Mr. Boulenger who at once confirmed my finding.

On October 8th a Porbeagle Shark (*Lamna cornubica*) 8 ft. 3 in. long was landed on Fish Wharf. Another taken in a lugger's nets was thrown overboard at about the same time.

A Smeared Dab (*Pleuronectes microcephalus*) 10 inches long, of the usual colour, had white fins entirely encircling it.

In the middle of October a number of Shorelarks (*Otocorys alpestris*) were taken.

Nov. 10th. Was quite a Jackdaw day. I saw flocks up to fifty at a time pass over.

On November 18th an example of the Lesser Forkbeard (*Raniceps raninus*) was washed ashore during a rough sea. Length  $10\frac{1}{2}$  inches.

On November 23rd. An inrush of Dunlins and other shore-birds, also some Godwits. Wind S.E. strong.

On November 27th. Glossy Ibis (*Plegadis falcinellus*) shot by a wherryman, near Ludham, on the Bure.

### 1903.

A Shag (*Phalacrocorax graculus*) caught on the beach early in January was brought to me alive, but was so exhausted by want of food and by the buffetings of the waves that it never recovered, dying in a few hours in my aviary. Strong wind from S.E.

During the first week in January a large Seal was seen about Breydon. It was shot at several times, but eventually got away apparently unhurt.

About the 8th January nine White-fronted Geese (*Anser albifrons*) on Breydon.

In February I had a conversation with a lightsman employed on the Outer Dowsing. He told me that in the previous November an unusually large number of Rooks and Crows, with Hooded Crows and Jackdaws, visited the vessel. On one or two occasions during foggy weather they settled on every conceivable place affording foothold—ropes, bulwarks, rigging, lantern, and went to sleep there. He estimated they had on one occasion fully a thousand birds at one time. They knocked them down wholesale. In the morning the decks looked as if they had been whitewashed.

Unusual numbers of Conger Eels (*Conger vulgaris*) with Ling (*Molva vulgaris*) on the fish stalls, latter end of February.

Six Jackdaws took up their quarters in the parish church steeple, early in March, and subsequently some others. I believe they have settled there for nesting purposes. This they did successfully.

Rooks again took possession of the trees in the old disused burial ground behind the Butchery in the market-place. At the time of writing (April 22nd), six nests have weathered the

storms of March and April and the prospects of a successful hatching seem assured. The persistency of the birds in nesting here after the cutting down of the first nest in 1901, the blowing down of two others in 1902, is interesting to note ; and the inhabitants in the vicinity are without exception delighted at the idea of possessing in our midst a permanent rookery. About twenty young birds were eventually hatched off.

Several Prawns (*Palæmon serratus*) taken by the early shrimp-boats going out in the beginning of March.

I hear an exceedingly good account of the increased numbers of Lapwings nesting on the Mautby marshes since greater protection has been afforded, and shooting on the Bure altogether abolished. Marshman Smith informs me (April 22nd) that some Lapwings have actually nested on the ronds beside the river, but fears that high tides may sooner or later disturb the sitting birds.

## XV.

### SOME ADDITIONS TO THE NORWICH CASTLE-MUSEUM IN 1902.

BY FRANK LENEY,

*Assistant-Curator of Norwich Museum.*

*Read 31st March, 1903.*

DURING the year ending December 31st, 1902, the additions to the Museum include a beautiful example of the White-eared Cob or Antelope (*Cobus leucotis*), labelled by Mr. Buxton, "Inhabits marsh and jungle. Killed near Kaka, White Nile, March, 1901"; and four heads of other Antelopes, *viz.*, Swayne's Hartebeest (*Bubalis swaynei*), "Sig of the Somalis. Inhabits open grassy plains. Killed, Marar Prairie, March, 1895." Impala (*Epyceros melampus*) "British East Africa. Killed, August, 1899. Kilimanjaro." Speke's Gazelle (*Gazella spekei*) "Dhero of the Somalis. Inhabits the Haud Plateau in Somaliland. Killed, Gibili, 1895." Waller's Gazelle (*Lithocranius walleri*) "Gerenuk of the Somalis. Killed, Marah Prairie, Somaliland, 1885." These valuable

specimens were given by Mr. Edward North Buxton, and form a noticeable exhibit in the animal room. Mr. Geoffrey Fowell Buxton presented a fine head of a Norfolk Ram (*Ovis aries*), and Sir Reginald Beauchamp a buff variety of Hedgehog (*Erinaceus europæus*) taken in Langley Park, Norfolk. Skeletons of Man and Horse have been mounted after the group shown in the Natural History Museum in London. The skeletons were the gift of Mr. A. H. Santy.

Mr. J. H. Gurney added to the collection of Raptorial Birds specimens of *Leucopternis plumbea* and *Tinnunculus sparverius*; he has kindly sent me the following note on *L. plumbea*. "An adult female of *Leucopternis plumbea*, Salv. marked 'Rio Bogota, N. Ecuador, January, 1901,' makes a good pair to the male already recorded, Trans. Norfolk and Norwich Nat. Soc. vol. vii. p. 172. This species was described by the late Mr. O. Salvin in 1872, and has long remained a very rare bird in collections; there appears to be no difference in sex."

Also eighteen birds' skins from South Africa collected by the late Mr. Thomas Ayres, and a White-headed Diving Duck (*Anas mersa*) from Lenkoran. The Hon. G. Lascelles presented a female specimen of Amherst's Pheasant (*Chrysolophus amherstiae*) which had assumed the plumage of the male, and the Rev. T. C. Hose gave a Tabuan Parrakeet (*Pyrrhulopis tabuensis*) from Fiji Islands.

Colonel Irby presented two cabinets of British Moths, one with twenty-eight drawers containing the Nocturni, Cuspidates, and Noctuas; the other, with twenty drawers, containing Geometers. Mr. Frederick Ringer of Nagasaki presented a specimen of the beautiful Glass Rope Sponge (*Euplectella oweni*) enclosing some small Crustaceans (*Spongicola venusta*), and Mr. John Morgan of Worthing added twelve species to the collection of Corals.

To the geological collection, Mr. G. W. Colenutt contributed some small fossil fishes (*Clupea vectensis*) from Eocene deposits in the Isle of Wight. Mr. T. Fowell Buxton presented the iliac portion of a huge pelvis of *Elephas meridionalis* from the "Forest-Bed" at Overstrand, near Cromer. This bone was discovered by some fishermen at the base of the cliff after a high tide on the 14th of October, 1902.

The general interest in the Museum has been well maintained, as is evidenced by the fact that 118,697 visitors passed through the turnstiles as against 109,249 in 1901.





*Trans. Norfolk & Norwich Nat. Soc. vol. vii. p. 573.*



*Your very truly*

*W. D. Geldart*

XVI.

OBITUARY NOTICES.

HERBERT D. GELDART.

1831—1902.

ON 21st September last the death occurred, at his residence, Thorpe Hamlet, of Herbert Decimus Geldart, an original member of the Society, the Treasurer for many years, President on three separate occasions (1874—75, 1882—83, 1895—96), and a Vice-President from the year 1875. He belonged to an old Norwich family, and one which took an honourable position in a literary circle which flourished in this city early in the last century.

His official connection with the Society dated from its beginning in 1869, when he served on the first Committee. He read a paper 'On the Division of the County for Botanical Purposes' at the first meeting of the Society, 27th April, 1869. From that date to the year of his death his interest in the work of the Society never abated. His botanical contributions to the Transactions must have entailed an enormous amount of work, and will prove invaluable to all future students of the botany of Norfolk. A glance through the list of papers by him, published in the Transactions, will show, however, that though Norfolk Botany was his principal study, his interests were by no means confined to that county. He had devoted considerable attention to the Arctic Flora and its distribution, in which he collaborated with Colonel H. W. Feilden, C.B., who had brought home collections of plants from Spitzbergen, Russian Lapland, and the island of Kolguev. In a letter to the Hon. Secretary of the Society, Colonel Feilden writes: "His extraordinary general knowledge was combined with such accuracy and exactitude that I never found him tripping in the thousands of references that have passed between us. What I should feel inclined to dilate upon is the great knowledge, perseverance, and unflagging energy with which he worked out, in co-operation with me, the various botanical collections that I brought back from time to time from the Arctic Regions." Mr. Geldart's third Presidential Address, delivered 30th March, 1896

(vol. vi. p. 119, Transactions), dealt with the whole subject of the Distribution of the Arctic Flora. In this address, a wide acquaintance with the work of others in the same field is combined with his own most interesting views on the permanence of the Arctic Flora throughout the Glacial period.

The lists of Flowering Plants, Ferns, etc., contributed to the Transactions from time to time were all carefully done. A small botanical note, now and then, also showed that a watchful eye was being kept upon any new occurrence or new station for a plant. Those who have had the privilege of looking through the papers and MSS. left by Mr. Geldart will realise how thorough and painstaking his labours were. Nothing relating to the distribution of plants in Norfolk seemed to escape him. His love of plants, however, was such, that in the case of a rare one nothing would induce him to publish a specific locality, through his fear of its leading to the extermination of the plant through ruthless gathering. His friendship with the late Hampden G. Glasspoole, who died in 1887, led to the latter leaving him his herbarium. In addition to this, Mr. Geldart has left a valuable herbarium formed by himself, which is now in the possession of his daughter, Miss Alice M. Geldart.

Besides numerous papers and notes published in our Transactions, Geldart compiled the article on Botany in Mason's 'History of Norfolk,' 1883, a paper on "Botany in Norfolk" in W. A. Dutt's 'Norfolk' published 1900, and the Botanical portion for this county in the Victoria History, Westminster, 1901. It may also be mentioned, that, in the 4th and 5th editions of White's Norfolk, published 1883 and 1890 respectively, Mr. James Britten, F.L.S., acknowledges his dependence on Mr. Geldart's work in his Botanical articles in both these volumes.

He had, since boyhood, possessed a microscope, and had worked assiduously at many of the lower forms of life. His exhibit of *Filaria sanguinis hominis (nocturna)* on 30th May, 1893, at a Meeting of the Society, showed that he possessed great manipulative skill in mounting objects for the microscope. A paper on this comparatively rare parasite (in England) was also read the same evening.

We have hitherto spoken of Mr. Geldart only as a Botanist and Microscopist, but during his frequent visits to the coasts he studied its Marine Fauna, and had a considerable acquaintance with the Crustacea especially, a branch which has been so little worked at;



and although he never contributed anything personally to the literature of the subject, he has from time to time rendered great service to more than one member of the Society who has sought his help in that direction. In fact he was one of those all round naturalists so rapidly giving way to specialists and becoming more and more rare, but his innate modesty led him to confine his published contributions to his favourite subject Botany.

Mr. Geldart's presence at the Meetings of the Society was always a guarantee that any discussion which took place would be enriched from the storehouse of his great knowledge, and raised in tone by his dignified manner of speech. Vague or incorrect statements were promptly challenged by him, and the speaker, kindly but firmly, led to see where the error lay. It is not too much to say that the character of the work done by the members of the Society was greatly influenced by Mr. Geldart's example; looseness of style and superficiality he abhorred; but no genuine searcher after knowledge appealed to him in vain, and his help was as freely given as it was thorough and effectual. A frequent attendant at the excursions of the Society, he was always a centre of interest and a delightful companion.

LIST OF PAPERS CONTRIBUTED BY THE LATE  
MR. H. D. GELDART TO THE TRANSACTIONS OF THE  
NORFOLK AND NORWICH NATURALISTS' SOCIETY.

ON THE DIVISION OF THE COUNTY FOR BOTANICAL PURPOSES. 27th April, 1869. Vol. i. p. 19.

PRESIDENT'S ADDRESS. 30th March, 1875. Vol. ii. p. 1.

FAUNA AND FLORA OF NORFOLK: Section i. FLOWERING PLANTS AND FERNS. 23rd February, 1875. Vol. ii. p. 71—80. Section ii., Vol. ii. p. 229.

AMBROSIA PERUVIANA IN NORFOLK. Note. Vol. ii. p. 228.

PYROLA MINOR. Note. Vol. ii. p. 335.

NOTES ON THE LIFE AND WRITINGS OF EDWARD BLYTH. 28th October, 1879. Vol. iii. p. 38.

ADDITIONS TO NORFOLK FLORA (Three very rare plants found by Mr. A. Bennett.) Note. Vol. iii. p. 268.

THE LOMBARDY POPLAR (Its destruction in Norfolk by severe winter of 1880—81). Summary of replies to circular. 31st January, 1882. Vol. iii. p. 354.

PRESIDENT'S ADDRESS. SYMBIOSIS. 27th March, 1883. Vol. iii. p. 425.

FAUNA AND FLORA OF NORFOLK: MARINE ALGÆ. 27th March, 1883. Vol. iii. p. 532.

FAUNA AND FLORA OF NORFOLK: FLOWERING PLANTS AND FERNS, ADDITIONS AND CORRECTIONS. March 25th, 1884. Vol. iii. p. 719.

BOTANICAL NOTES, 1884 (from E. F. Linton, A. Bennett and others.) Notes. Vol. iv. p. 142.

BOTANICAL NOTES, 1885. Notes. Vol. iv. p. 255.

NOTES ON PLANTS COLLECTED BY CAPTAIN MARKHAM, R.N., IN HUDSON'S BAY, ETC., IN JULY AND AUGUST, 1886. 25th January, 1887. Vol. iv. p. 354.

BOTANICAL NOTES, 1887. Vol. iv. p. 511.

NOTES ON GALPIN'S FLORA OF HARLESTON. 29th May, 1888. Vol. iv. p. 578.

SPIRÆA TOMENTOSA AND SAMBUCUS RACEMOSA. Note. Vol. iv. p. 689.

FAUNA AND FLORA: FLOWERING PLANTS AND FERNS. Supplemental to previous lists. 26th March, 1889. Vol. iv. p. 711.

BOTANICAL NOTES, 1889. Vol. v. p. 108.

BOTANICAL NOTES, 1890, '91, '92. Vol. v. p. 328.

NOTES ON FILARIA SANGUINIS HOMINIS (NOCTURNA). 30th May, 1893. Vol. v. p. 547.

FAUNA AND FLORA: FLOWERING PLANTS AND FERNS (5th List). Additions to previous list. 27th March, 1894. Vol. v. p. 652.

NOTES ON A SMALL COLLECTION OF SPITSBERGEN PLANTS. By Colonel H. W. Feilden and H. D. Geldart. 27th November, 1894. Vol. vi. p. 47.

PRESIDENT'S ADDRESS. (Distribution of Arctic Flora.) 30th March, 1896. Vol. vi. p. 119.

CONTRIBUTIONS TO FLORA OF RUSSIAN LAPLAND. By Colonel H. W. Feilden and H. D. Geldart. 24th February, 1896. Vol. vi. p. 161.

CONTRIBUTIONS TO FLORA OF KOLGUEV. By Colonel H. W. Feilden and H. D. Geldart. 24th February, 1896. Vol. vi. p. 168.

THE MISTLETOE: ITS HOSTS AND DISTRIBUTION IN GREAT BRITAIN. 31st January, 1899. Vol. vi. p. 453.

The death of the EARL OF KIMBERLEY was a national loss, and his biography belongs to his country, but it is fitting that we as a Norfolk Society should bear our testimony to his worth, and acknowledge the assistance we derived from his long connection with our Society.

The name of Lord Kimberley appeared at the head of our first printed list of Vice-Presidents; in the year 1875 we published in our Transactions a list from his pen of birds observed on the Kimberley estate since 1847, nearly all the species, which amounted to 139, having been seen by Lord Kimberley himself, who was a most observant naturalist as well as a keen sportsman and a good shot; a second list, published in 1888, brought the number to 147.

Sir M. E. Grant Duff has given in the 'Spectator' some reminiscences of Lord Kimberley, and a remark there quoted, shows him to have been much in sympathy with one of the objects of our Society—the protection where needed of our avifauna—"Almost

the greatest crime," said Lord Kimberley, "which any one can commit on my estate, is to kill an Owl."

While we like to remember that the Earl of Kimberley was eminently gifted with those qualities which go to the making of an English country gentleman, and that he took an active part in the work of the County Council and in all that concerned the interests of his neighbours, we do not forget that he was also a distinguished statesman, the long list of whose services to the State is a record of which Norfolk may well be proud.

The Earl too was proud of his county. On one occasion when speaking of the long connection of his family with Norfolk, he said that he could boast that this had lasted for more than 500 years, and that the Wodehouses had lived uninterruptedly in the same place, from the end of the 14th century, the estate having descended in a direct line during that time. During his tenure of office as Colonial Secretary, the name of the Norfolk village from which he took his title, was given to a spot in South Africa, afterwards to become famous in the world; and though at the time of Lord Kimberley's death the thoughts of men were turned to the last resting-place on the Matoppo Hills of Cecil Rhodes who made it famous, yet the thoughts of not a few were recalled with feelings of affectionate regret to the little church in Norfolk, where John Wodehouse, 1st Earl of Kimberley, had been laid to rest.

MR. FRANCIS DIX had been for many years a member of our Society and we shall long remember his genial presence at our meetings, and the many pleasant excursions which we have taken, with him as our conductor. Mr. Dix in early and middle life was engaged in farming at Dickleburgh and for thirty-six years from January, 1839, he kept a record of the rainfall at that place, which record was afterwards continued in Norwich, and in February, 1889, he read a paper at our meeting on fifty years' rainfall, and twelve years later he exhibited a chart of the rainfall of the 19th century; his notes on which, with a summary, were also printed in our Transactions. In addition to his interest in meteorology, Mr. Dix occupied much of his leisure in the study of astronomy and the phenomena of electricity. On one occasion he astonished his neighbours by experimenting on the effect on growing crops of the passage of the electric current through wires stretched on the plants, his friends exclaiming in wonder: "Here's Quaker Dix



mucking his fields with lightning." Mr. Dix lived to a great age, enjoying good health nearly to the last, a member of the Society of Friends, he was much respected and beloved and with him has died out the Quaker costume, once so well known in Norwich.

LORD CRANWORTH who died on 13th October, 1902, had been for many years well known and deservedly popular in the county in which he had done such active work, especially as President of the County Council. When the new year's honours for 1899 were announced it was felt that none were more deserved than the peerage for Mr. Gurdon. In early life Lord Cranworth had been an active volunteer officer and before his elevation to the House of Lords he sat for twelve years in the House of Commons.

MR. JOHN NIGEL GURNEY, who died October, 26th, 1902, was the eldest son of the late John Gurney of Sprowston, to whom the members of our Society owe so much for the munificent and thoughtful care, with which he started the scheme for converting a prison into the splendid building in which the Natural History collections are now housed. Mr. Nigel Gurney, who was born in 1874, was of a retiring disposition and his interest in Natural History was rather that of a sportsman than a man of science, but he was always glad to help forward the work in which other members of his family were actively engaged. At the time of his death Mr. Gurney filled the office of High-Sheriff of the County.

DR. JOHN LOWE died at his residence, Oatlands Wood, Weybridge, on 12th December, 1902, he had been for upwards of thirty years a member of our Society and had during that time contributed many valuable papers to our Transactions, among which we may mention his lists of Norfolk Fishes and wayside Botany in Norwich. John Lowe was born at The Old Place, Sleaford, and after having been a pupil to his uncle Dr. Harvey of that town, studied at Edinburgh, at which university he gained the gold medal awarded for the best herbarium of Scotch flowering plants. On leaving Edinburgh, where he graduated M.D. with honours in 1857, he took the diplomas of M.R.C.S., Eng. and L.S.A., and commenced practice in Lynn. In 1859 he was appointed honorary surgeon to the West Norfolk and Lynn Hospital, which post he filled until the increase of his private practice precluded his holding it longer. In 1871 he was appointed medical attendant at Sandringham and was







*W. H. Bidwell, photo.*

ST. HELEN'S SWAN PIT, NORWICH.

the first to diagnose the nature of the serious illness of His Royal Highness the Prince of Wales. In 1883 Dr. Lowe was President of the East Anglian Branch of the British Medical Association, in which year the meeting was held in Lynn and on relinquishing practice in that town he resided in London. He was one of the Physicians Extraordinary to the King.

In his early years Dr. Lowe was a frequent contributor to the *Transaction of the Botanical Society of Edinburgh*, and while resident in Norfolk he devoted much of his scanty leisure to cryptogamic botany, turning his attention to fungi, mosses, lichens and algæ. His best known botanical work is perhaps his book on the 'Yew Trees of Great Britain and Ireland.' He contributed the article on Fishes to the 'Victoria History of Norfolk' and also, compiled a list of the Flowering Plants of West Norfolk.

## XVII.

## MISCELLANEOUS NOTES AND OBSERVATIONS.

ST. HELEN'S SWAN-PIT.—The accompanying view of the Swan-pit at the Saint Helen's Hospital, is from a photograph taken some time ago by Mr. W. H. Bidwell, and as the continuance of this ancient institution has become jeopardised it is thought the members would be glad to possess a copy by way of a possible memento.

The origin of this probably unique establishment, which has already formed the subject of two communications to the Society (*Vide* 'Transactions' vol. v. p. 265 and vol. vi. p. 387\*), is lost in the obscurity of the past, but as has been mentioned, the first reference to it hitherto discovered was an entry in the Corporation accounts of a payment to William Bylney of 3s. 4d. for keeping the Swans of St. Giles' Hospital for the year 1487—8, and up to the year of the Municipal Reform Act (1835) a sum of two guineas was annually paid to the "Swanner," since which time the Swans for fattening have been consigned to the care of the master of the Hospital. It

\* See also 'Birds of Norfolk,' vol. iii. p. 96.

is evident that as early as the year 1487 the Swan-pit was a working concern and it is probable that it came into existence as an appendage to the great religious houses, which were possessed of Swan rights, the Cygnets being taken up at the proper season, marked with their proprietors' *Cygninota* and transferred to the *Cygnorum* to be fattened for the table. Of late years, the demand for these fatted Swans has fallen off, many of the former patrons having died and their places not having been filled by others; the dish seems also to have been less favoured or perhaps neglected, and although the numbers sent in in the last two seasons were only fifty-seven and fifty-two respectively, the supply exceeded the demand and resulted in a serious loss to the master of the Hospital whose privilege it was to fatten them, this loss having occurred repeatedly of late he cannot be expected to bear.

It is I believe under the consideration of the Trustees of the St. Helen's Hospital whether some means can be devised for continuing this interesting relic of the past, and it is sincerely to be hoped that so lamentable an event as the extinction of the ancient *Cygnorum* may be averted.

The illustration shows the Cygnets in the Swan-pit which is connected with the river, the rise and fall of which ensures a constant fresh supply of water; the floating troughs near the wall which adjust themselves to the water level; also, near the attendant, the spouts by which the dry food is conveyed to the troughs. The high land in the back-ground is Mousehold Heath, the site of Kett's rebel encampment in 1594, and now occupied by two large buildings the one being barracks for cavalry the other for infantry. The ancient circular building in the foreground is one of the towers which long since formed the defence of the river front of the city and is known as the Cow Tower.—T. SOUTHWELL.

MARTEN CATS IN SUFFOLK.—(Correction of an error). At p. 224, vol. ii., our 'Transactions' in a list of vermin killed on a Suffolk Manor in the year 1811, the number of Martens killed is given as forty-three. As this has been frequently quoted in evidence of the abundance of this animal so late as the year named (notably in the 'Zoologist' for 1891, p. 455, for 1892, p. 20, and in the list of Norfolk Mammals in the 'Victoria History of the Counties,' Norfolk, vol. i. p. 248), I take the present opportunity of correcting what is a very serious and misleading error. Having an opportunity of referring to a file of the 'Norwich Mercury,' I find there published



the list quoted in the paragraph referred to under date of 21st December, 1811, and the number of Martens is given as three not forty-three, the other numbers quoted are quite correct. In reply to some doubts expressed by Mr. Harting as to the correctness of the number of forty-three ('Zoologist,' 1891, p. 455,) I ventured to prefer a local contemporaneous record to one published by Daniel 'Rural Sports' (Supplement p. 585) two years after, especially as out of three records no two agree (see 'Zoologist,' 1892, p. 20), but at the same time expressed the opinion that "the smaller the number the more likely it was to be correct," which has proved to be the case.—T. SOUTHWELL.

STICKLEBACKS AS MANURE.—In the 'General View of the Agriculture of the County of Norfolk,' by Arthur Young (1804 but referring to a period before 1802), the author writes as follows: "These little fish, which are caught in immense quantities in the Lynn rivers about once in seven years, have been bought as high as 8d. a bushel. The favourite way of using them now, is by mixing with mould and carrying on for turnips. Great quantities have been carried to Marham, Shouldham, and Beachamwell. Mr. Fuller there, is reported to have laid out £400 for them in one year, they always answer exceedingly. Mr. Rogerson, of Narborough, has gone largely into this husbandry, laying out £300 in one year, at from 6d. to 8d. a bushel, besides carriage from Lynn; he formed them into composts with mould mixed well by turning over, and carried on for turnips: the success very great."—T. SOUTHWELL.

ROOKS AND OWLS IN AGRICULTURE.—The following testimony as to the value of these birds to agriculturalists is to be found in Arthur Young's, 'General View of the Agriculture of the County of Norfolk' (1804), p. 531 [Quoted from 'Marshall's Rural Economy of Norfolk' (1787), vol. i. p. 171]. Rooks. "Seldom attempted to be shot in East Norfolk, where a notion prevails, and is, perhaps, well founded, that Rooks are essentially useful to the farmer, in picking up worms and grubs, especially the grub of the Cockchafer, [which, it is believed, is (*in the original*)] injurious to meadows and marshes.—Mr. Marshall. Confirmed in the following note by Mr. Johnson of Thurning: 'I cannot but notice two growing evils with us, of which but little notice is taken:—1st, the number of insects in the lands, owing to the loss of Rooks, by felling so many rookeries, and not taking care of what are left; 2nd the increase of mice, and, were I to give my opinion as to quantity and damage

done, but few would give credit to it. I have, at different times, had five mice killed to every coomb of corn moved off the stacks in the summer season, and sometimes double that quantity; besides being on every other part of the premises, corn and grass pieces not excepted. Some are driven into the barns and stacks in wet seasons; but when wheat stands long on the shock, we are sure to have most mice in our barns and stacks except where they are driven away by some other vermin:—in my memory there were twenty GREY OWLS, [the Tawny Owl, *Syrnium aluco* (Lin)] where there are now one, and though the country was in a rougher state, we had not so many mice, the owls prey [p. 532] very much on them, and in wet weather they are more exposed to the owl than to any other vermin. The Grey Owl is destroyed by the game-keepers, and by felling the pollards. I have seen a young hare in their nests, but never saw a young pheasant or partridge:—the WHITE OR CHURCH OWL [*Strix flammea* Lin.] are not so destructive to game; and where there are places made within side the top of one end of every barn, like a box, for them to pass through as they come into the barn, they would there make their nests, and become more numerous, and be of great service. (Signed) S. Johnson.”—T. SOUTHWELL.

NOTE ON THE FLOWERING OF NYCTERINIA CAPENSIS.—In the autumn of 1902 this plant, which was exhibited by me at one of our evening meetings, was flowering freely in a cool greenhouse; and I made observations as to the conditions under which it opened and closed. On September 14th, the flowers unfolded at 3 p.m. and at 4 o'clock were wide open but scentless, at 4.45 there was a slight scent, and strong perfume at 5.30; the pot was then placed in a dark shed, and when the door of this was opened the next morning at 9 a.m. the flowers were all closed. The pot was placed in the evening near an electric lamp, but remained open and at 3.30 a.m. the flowers were still wide open, while at 5 a.m. they were partly closed but scented, and at 6 a.m. quite closed. On 26th September, the morning was bright but cold and some flowers were found open at 9.30 but without perfume, these when held near to the mouth, and breathed on, closed slightly but in the cool air soon re-opened. Two of the sub-divisions of the corolla closed first, when the other three closed over them making little purple balls, the flowers being white when open, these divisions were irregularly sub-divided. When opening, there was some interval

between the expanding of the flowers and the giving off of the scent, but in the warmer weather the odour would hang about the plant for some little time after the flowers were closed. It would seem therefore that the absence of heat, and not the absence of light, was the cause which influenced the opening of the flowers and the giving off of perfume and the difference in the temperature between night and morning would be much more marked in the Cape of Good Hope which is the habitat of the plant. A telegram describing the difficulties of the march of the British troops in Somaliland, in the desert where Camel Thorns and Mimosa were thinly scattered, gives an illustration of this,—“much of the bush was in flower, burdening the air in the cooler hours with aromatic perfumes.”—  
W. H. BIDWELL.

THE SIBERIAN JAY (*Garrulus* [*Perisorius*] *infaustus*).—Professor Newton having questioned the determination of the supposed Heron's feather in a nest of the Siberian Jay (*G. infaustus*) in the notes on that species communicated to our 'Transactions' (vol. vii. p. 368), I have carefully re-examined it with the assistance of Mr. Southwell and Mr. Reeve. It is about four inches long, and slightly faded with age, and I find that it comes nearest to the back feathers of a Crane (*Grus communis*), and to that species there is little doubt that it belongs.

This Jay's nest is § 2609 of 'The Ootheca Wolleyana,' vol. i. p. 484, and was obtained in Lapland where *Ardea cinerea* is not found, although it breeds in the south of Norway, and perhaps is not very uncommon at Lesje Værk where my companion met with at least one pair of Herons.

It appears from the narrative in 'Ootheca Wolleyana' that a considerable interest attaches to this nest. It was taken in Lapland on April 30th, 1856, by one Peter Nilsson who was hewing wood. He felled a small spruce fir-tree, and on beginning to lop off the branches, saw two Jay's eggs lying on the snow, and then the nest itself among the branches. The *Kuuki* as he terms the bird sat fast although the tree was on the ground, and when Peter drove her off there were still two eggs in the nest: all four are now in the Cambridge Museum.—J. H. GURNEY.

CARDAMINE PALUSTRIS, Peterm.—Mr. Arthur Bennett has identified a specimen of this plant, which I sent him from the neighbourhood of Norwich, as being near var. : *dentata* Schult. He writes “the plate in Eng. Bot. of *C. pratensis*, L. represents



*C. palustris*, Peterm; of continental authors. The true *C. pratensis* L. has radicle leaves with five to eight pairs of *sessile* leaflets, which are rounded at the base, but not cordately emarginate, and the flowers are usually white. We in England do not consider that these forms differ sufficiently to constitute a species, so we should name your plant *C. pratensis* L. var. *palustris* (Peterm), f.

According to Mr. Druce of Oxford, *C. pratensis*, L. is rare in England.—F. LONG.

BOX VULGARIS IN NORFOLK.—About the middle of December last (1902), through the courtesy of Mr. Cole, to whom it was sent for preservation, I had the opportunity of examining a specimen of this fish which was found on the beach near Cromer; when fresh it was very beautifully coloured, the back being dark olive green merging into silvery white on the sides and under parts with stripes of a golden colour along the sides below the lateral line the caudal fin a fine crimson, increasing in depth of colour towards the margin—length 9 inches and greatest depth  $2\frac{3}{4}$  inches. This fish, which belongs to the family of Sparidae (Sea Brems) is not sufficiently well known in England, to have acquired a vernacular name but in France it is known as “Bogue.” Although it has occurred in a few instances on this south coast of England, I am not sure that it has been recorded so far north as Norfolk, its true home being the waters of the Mediterranean sea, the range extending as far south as the West India Islands. Like most of the southern stragglers to our coast its occurrence appears to be the result of stormy weather. Being for the most part a vegetable feeder, and accustomed to the profusion of marine vegetation covering the rocks of the warmer seas of the south, the sandy shores of our shallow waters would be very unsuitable as a habitat for this handsome species which paid the penalty of its visit to our troubled waters with its life.—T. SOUTHWELL.

THE MOLLUSCA OF A SUFFOLK PARISH (see vol. vii. p. 348). *Additions and Corrections.* Since the above-named paper was written the following species have been found:—

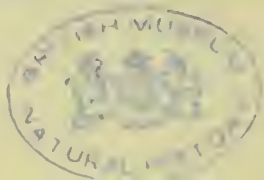
*Arion minimus* Simroth

*Succinea elegans* Risso

*Limax marginatus* (Mull)

*Hyalima alliaria* (Miller)

The name of one species recorded before requires correction, for *Pisidium nitidum*, p. 349, l. 27 and p. 352, l. 39, read *Pisidium milium*, Held.—A. MAYFIELD.



PRESENTED

21 AUG. 1906



*Copies of the TRANSACTIONS OF THE NORFOLK AND NORWICH NATURALISTS' SOCIETY can be obtained of the Hon. Secretary, Mr. W. A. Nicholson, St. Helen's Square, at the following reduced prices, owing to damage by fire.*

			<i>s. d.</i>		
Vol. 1.	Part 1.	1869—70	...	—	Out of print.
"	"	2.	1870—71	...	Out of print.
"	"	3.	1871—72	...	0 6
"	"	4.	1872—73	...	0 6
"	"	5.	1873—74	...	Out of print.
Supplement ...			...	—	
Vol. 2.	Part 1.	1874—75	...	—	} Out of print.
"	"	2.	1875—76	...	
"	"	3.	1876—77	...	
"	"	4.	1877—78	...	
"	"	5.	1878—79	...	
Vol. 3.	Part 1.	1879—80	...	—	Out of print.
"	"	2.	1880—81	...	Out of print.
"	"	3.	1881—82	...	1 0
"	"	4.	1882—83	...	1 0
"	"	5.	1883—84	...	1 0
Vol. 4.	Part 1.	1884—85	...	1 0	
"	"	2.	1885—86	...	1 0
"	"	3.	1886—87	...	—
"	"	4.	1887—88	...	1 0
"	"	5.	1888—89	...	1 0
Vol. 5.	Part 1.	1889—90	...	2 0	
"	"	2.	1890—91	...	2 6
"	"	3.	1891—92	...	2 0
"	"	4.	1892—93	...	2 6
"	"	5.	1893—94	...	2 6
Vol. 6.	Part 1.	1894—95	...	2 0	
"	"	2.	1895—96	...	2 0
"	"	3.	1896—97	...	2 0
"	"	4.	1897—98	...	2 0

*The following Parts are undamaged:—*

Vol. 6.	Part 5.	1898—99	...	3 6
"	7.	1.	1899—1900	2 0
"	"	2.	1900—1901	3 6
"	"	3.	1901—1902	3 6
"	"	4.	1902—1903	3 6

#### MEMBERSHIP.

The Society consists of two classes of Members, viz., Ordinary and Honorary Members.

Ordinary Members proposed and seconded at any meeting of the Society, are balloted for at the next meeting. The Annual Subscription is 5s., payable in advance on election, subsequent subscriptions becoming due on the last Tuesday in March annually. This subscription may be compounded for by a single payment of £4.

Ladies or Gentlemen distinguished for their attainments in Natural Science, or who have rendered valuable services to the Society, may be nominated by the General Committee as Honorary Members, and elected by a show of hands at the next meeting of the Society. Such Honorary Members have all the privileges of Ordinary Members.

# CONTENTS.

---

List of Officers . . . . .	v
List of Members . . . . .	vi
Statement of Accounts . . . . .	x
Catalogue of Additions to the Library . . . . .	xi
President's Address . . . . .	429
I. Three Weeks' Holiday among the Butterflies of Switzerland. By the Rev. A. Miles Moss, M.A. . . . .	445
II. Leaves from an Old Diary in the Years 1800-2. By Thomas Southwell, F.Z.S., V.-P. . . . .	453
III. Distribution of <i>Peucedanum palustre</i> and <i>Lathyrus</i> <i>palustris</i> in Britain. By Arthur Bennett, F.L.S. . . . .	467
IV. East Anglian Geology—Historical Sketch. Dawn of the Science of Geology. By Henry Woodward, LL.D., F.R.S., F.G.S., F.Z.S., <i>President</i> . . . . .	477
V. The Meres of Wretham Heath. By W. G. Clarke . . . . .	499
VI. <i>Pyrola rotundifolia</i> , L., in East Anglia. By Arthur Bennett, F.L.S. . . . .	512
VII. A List of Plants gathered on a small strip of the North Coast of Norfolk in the Year 1902. By the Rev. W. E. Thompson, M.A. . . . .	514
VIII. Entomological Notes for 1902. By W. H. Tuck, M.A. . . . .	526
IX. Meteorological Notes, 1902. By Arthur W. Preston, F. R. Met. Soc. . . . .	528
X. Notes on the Herring Fishery of 1902. By T. J. Wigg, <i>Hon. Sec. Gt. Yarmouth Section</i> . . . . .	536
XI. Norfolk Diptera. By Rev. E. N. Bloomfield, M.A., F.E.S. . . . .	541
XII. Hepaticæ of Norfolk. By Rev. E. N. Bloomfield, M.A. . . . .	552
XIII. Supplementary List of Norfolk Mosses. By H. N. Dixon, M.A., F.L.S. . . . .	558
XIV. Natural History Notes from Yarmouth. By A. Patterson . . . . .	566
XV. Some Additions to the Norwich Castle-Museum in 1902. By Frank Leney . . . . .	571
XVI. Obituary Notices . . . . .	573
XVII. Miscellaneous Notes and Observations . . . . .	579