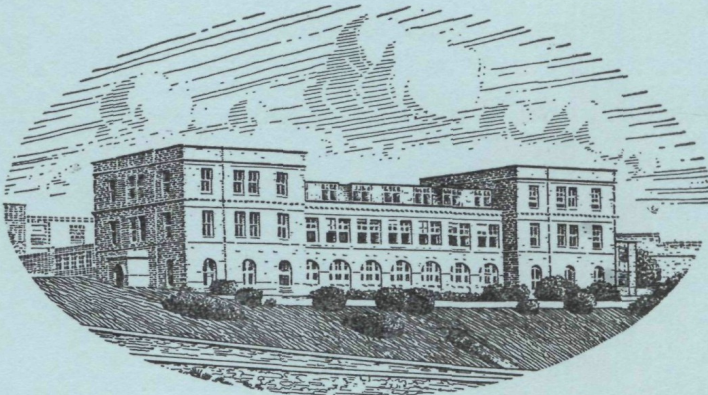


Member's Privilege Copy for personal use only

JOURNAL OF THE  
MARINE BIOLOGICAL ASSOCIATION  
OF THE UNITED KINGDOM



THE PLYMOUTH LABORATORY

VOLUME 55, No. 2  
*(issued May 1975)*

JMBAAK 55 (No. 2) 255-507 (1975) 0025-3154

CAMBRIDGE  
AT THE UNIVERSITY PRESS  
1975

*Price £8.50 net*

*(U.S.A. and Canada US \$26.50)*

*1975 Subscription for Volume (of four parts): £28.00 net (U.S.A. and Canada US \$90.00)*



# THE MARINE BIOLOGICAL ASSOCIATION OF THE UNITED KINGDOM

## PATRON

H.R.H. THE PRINCE PHILIP DUKE OF EDINBURGH, F.R.S.

## OFFICERS AND COUNCIL

*President:* Sir ALAN L. HODGKIN, O.M., K.B.E., Sc.D., P.R.S.

### *Vice-Presidents*

Prof. A. V. HILL, C.H., O.B.E., Sc.D., LL.D., F.R.S.	Sir C. MAURICE YONGE, Kt., C.B.E., D.Sc., F.R.S.
Sir EDWARD J. SALISBURY, Kt., C.B.E., D.Sc., LL.D., F.R.S.	Rear Admiral Sir EDMUND G. IRVING, K.B.E., C.B.
Prof. Sir JAMES GRAY, Kt., C.B.E., M.C., Sc.D., LL.D., F.R.S.	Sir FREDERICK S. RUSSELL, Kt., C.B.E., D.S.C., D.F.C., D.Sc., LL.D., F.R.S.
Prof. Sir ALISTER C. HARDY, Kt., D.Sc., F.R.S.	Sir EDWARD R. CHADWYCK-HEALEY, Bt., M.C.
	J. E. SMITH, C.B.E., Sc.D., F.R.S.

### *Honorary Members*

Prof. Sir JAMES GRAY, Kt., C.B.E., M.C., Sc.D., LL.D., F.R.S.	Prof. A. V. HILL, C.H., O.B.E., Sc.D., LL.D., F.R.S.
Prof. Sir ALISTER C. HARDY, Kt., D.Sc., F.R.S.	Dr A. C. REDFIELD
	Sir C. MAURICE YONGE, Kt., C.B.E., D.Sc., F.R.S.

## COUNCIL

### Elected Members

J. H. S. BLAXTER, D.Sc.	Prof. R. D. KEYNES, Sc.D., F.R.S.
P. C. CALDWELL, D.Phil., F.R.S.	A. J. LEE, D.S.C.
Prof. H. CHARNOCK	Prof. J. LLEWELLYN, D.Sc.
Prof. R. B. CLARK, D.Sc.	J. W. LUND, D.Sc., F.R.S.
E. B. COWELL	F. E. ROUND, D.Sc.
R. I. CURRIE	J. H. STEELE, D.Sc.
Prof. J. M. DODD, Ph.D., F.R.S.	Prof. W. D. P. STEWART, Ph.D.
Sir JOHN A. B. GRAY, Kt., M.B., Sc.D., F.R.S.	

### Governors

J. GRAHAM (Ministry of Agriculture, Fisheries and Food)	M. J. WELLS, Sc.D. (Cambridge University)
The Worshipful Company of Fishmongers:	Prof. G. P. WELLS, Sc.D., F.R.S. (Zoological Society)
Sir EDWARD R. CHADWYCK-HEALEY, Bt., M.C.	Prof. SIR BERNARD KATZ, Kt., M.D., D.Sc., F.R.S. (Royal Society)
Col. Sir JOHN G. CAREW POLE, Bt., D.S.O., T.D.	Prof. G. E. FOGG, Sc.D., F.R.S. (British Association)
The Hon. HUGH WALDORF ASTOR, J.P.	
Prof. J. W. S. PRINGLE, M.B.E., Sc.D., F.R.S. (Oxford University)	

*Hon. Treasurer:* The Hon. HUGH WALDORF ASTOR, J.P., 14 Culross Street, London, W1Y 3HN

*Secretary:* E. J. DENTON, C.B.E., Sc.D., F.R.S., The Laboratory, Citadel Hill, Plymouth, PL1 2PB

## SCIENTIFIC STAFF

*Director:* E. J. DENTON, C.B.E., Sc.D., F.R.S.

P. G. CORBIN, B.A. ( <i>Zoologist</i> )	P. E. GIBBS, B.Sc., M.A., Ph.D. ( <i>Zoologist</i> )
N. A. HOLME, M.A. ( <i>Zoologist</i> )	B. L. ROBERTS, M.A., Ph.D. ( <i>Physiologist</i> )
G. R. FORSTER, B.Sc. ( <i>Zoologist</i> )	J. C. GREEN, B.Sc., Ph.D. ( <i>Phycologist</i> )
E. D. S. CORNER, M.Sc., Ph.D. ( <i>Biochemist</i> )	D. K. GRIFFITHS, M.Sc. ( <i>Physical Oceanographer</i> )
A. J. SOUTHWARD, D.Sc., Ph.D. ( <i>Zoologist</i> )	G. W. POTTS, B.Sc., Ph.D. ( <i>Zoologist</i> )
J. V. HOWARTH, B.Sc. ( <i>Physiologist</i> )	J. B. GILPIN-BROWN, B.Sc., Ph.D. ( <i>Zoologist</i> )
Q. BONE, M.A., D.Phil. ( <i>Zoologist</i> )	H. MEVES, M.D. ( <i>Physiologist</i> )
G. T. BOALCH, B.Sc., Ph.D. ( <i>Phycologist</i> )	M. WHITFIELD, B.Sc., Ph.D. ( <i>Physical Chemist</i> )
G. W. BRYAN, B.Sc., Ph.D. ( <i>Zoologist</i> )	M. R. CLARKE, B.Sc., Ph.D. ( <i>Zoologist</i> )
A. G. DAVIES, B.Sc., Ph.D. ( <i>Physical Chemist</i> )	R. P. HARRIS, B.Sc., Ph.D. ( <i>Zoologist</i> )
P. R. DANDO, B.Sc., Ph.D. ( <i>Biochemist</i> )	P. M. HOLLIGAN, M.A., Ph.D. ( <i>Biochemist</i> )

J. H. WICKSTEAD, D.Sc., Ph.D., F.I.Biol., Foreign and Commonwealth Office (O.D.A.) (*Zoologist*)

R. D. PINGREE, B.Sc., Dip.Ed., Ph.D., Institute of Oceanographic Sciences (*Oceanographer*)

## INSTRUCTIONS FOR THE PREPARATION OF MANUSCRIPTS

### TITLE

The title of the paper should be kept as short as possible.

The name of the author at the beginning of the paper should be followed only by senior qualifications.

### TEXT

Manuscripts must be typed (double-spaced) on one side of the paper, leaving ample margins, with the folios numbered. Words to be printed in italic should be underlined. The first mention of Latin names of species should be followed by the authority except where reference is made to a work in which the authority appears (e.g. *Plymouth Marine Fauna*).

Manuscripts should be as concise as possible. Undue length will undoubtedly lead to delay in publication as the paper will be returned to the author for shortening.

All linear measurements and weights should be in the metric scale.

For symbols and abbreviations, the recommendations of the Royal Society (1951) are followed.

### TABLES

Tables should be set out on separate sheets numbered in Arabic numerals, and given a concise heading.

### TEXT-FIGURES

Text-figures should be in black ink. It is important to make the lines sufficiently black.

No drawing should be so large that it must be reduced to less than one-third of its original size. The degree of reduction need not be inserted by the author.

Illustrations requiring lettering should not be drawn on Ethulon.

The size of the printed area of the *Journal* page is 20 × 13.5 cm. The maximum size for a full-page figure (with legend) is 21 × 14 cm.

Lettering numerals, etc. should be marked clearly in blue pencil and indicating the position in which they are to be inserted by an arrow in blue pencil. This should be kept to a workable minimum, all details being included in the legend.

Axes and graduation marks on graphs must be inked in. The lines on graph paper are not normally reproduced, and should be blue or faint grey.

Legends for figures must be typed all together on a separate sheet, and not inserted on the actual illustrations.

Text-figures are numbered in arabic numerals, and referred to in the text as 'Fig. 1', etc. Where there is a plate containing several figures, the text-figures are referred to as 'Text-fig. 1', etc.

All line-drawings are printed as text-figures, as well as photographs for which fine detail is not required.

### PLATES

Photographs should be on smooth-surfaced paper, semi-matt or glossy. The edges of the photograph must be trimmed square. It is important that the background in the photograph be of a uniform tone and free from blemishes.

Divisions of plates, or separate figures on one plate, are indicated by capital letters.

### SUMMARY

Each paper must be accompanied by an informative Summary, giving the main results of the work published.

### REFERENCES

References are listed alphabetically at the end of the paper. The full title of the paper must be given. Titles of papers, but not of books, are decapitalized. Titles of Journals are given in full. Where a volume appears in parts the part need only be specified where each has separate pagination. References to books should include the publisher. Citations in text to be given by author's name followed by date in brackets.

#### *Examples:*

MARSHALL, S. M., NICHOLLS, A. G. & ORR, A. P., 1939. On the growth and feeding of young herring in the Clyde. *Journal of the Marine Biological Association of the United Kingdom*, 23, 427-55.

RUSSELL, F. S. & YONGE, C. M., 1928. *The Seas*. 379 pp. London: Frederick Warne.

**Authors are requested to see that their manuscripts are in finished form and completely ready for publication so that corrections may be reduced to a minimum, and these are confined as far as possible to the first proof. If the cost for correction exceeds a reasonable figure, the author is liable to be charged the full extent of the excess.**

#### SUBSCRIPTIONS

*Journal of the Marine Biological Association of the United Kingdom* is published quarterly. Single parts cost £8.50 net (US \$26.50 in the U.S.A. and Canada) plus postage.

Four parts form a volume. The 1975 subscription price of a volume (which includes postage) is £28.00 net (US \$90.00 in the U.S.A. and Canada).

Second class postage paid at New York, N.Y.

© The Marine Biological Association of the UK, 1975

#### PERMISSIONS

For permission to reproduce material from *Journal of the Marine Biological Association*, please apply to the London or New York office of Cambridge University Press.

ISI Tear Service, 325 Chestnut Street, Philadelphia, Pennsylvania 19106, U.S.A., is authorized to supply single copies of separate articles for private use only.





*E. V. Rieu.*

*(Facing p. 255)*