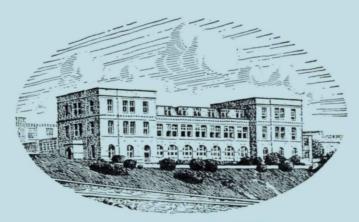
# JOURNAL OF THE MARINE BIOLOGICAL ASSOCIATION OF THE UNITED KINGDOM



THE PLYMOUTH LABORATORY

VOLUME 43, No. 2 (issued July 1963)

CAMBRIDGE
AT THE UNIVERSITY PRESS
1963

Price Seventy-five shillings net
(U.S.A. \$13.00)

### MARINE BIOLOGICAL ASSOCIATION OF THE UNITED KINGDOM

#### PATRON

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

#### OFFICERS AND COUNCIL

President: Prof. C. F. A. PANTIN, Sc.D., D.Sc., Dr Univ., F.R.S.

#### Vice-Presidents

The Earl of IVEAGH, K.G., C.B., C.M.G. Sir NICHOLAS E. WATERHOUSE, K.B.E. Prof. A. V. HILL, C.H., O.B.E., Sc.D., LL.D., F.R.S. Sir EDWARD J. SALISBURY, Kt., C.B.E., D.Sc., LL.D., F.R.S. Major E. G. CHRISTIE-MILLER

MORLEY H. NEALE, C.B.E. Prof. Sir James Gray, Kt., C.B.E., M.C., Sc.D., LL.D., F.R.S. G. M. GRAHAM, C.M.G., O.B.E. Prof. Sir Alister Hardy, Kt., D.Sc., F.R.S. Prof. C. M. Yonge, C.B.E., D.Sc., F.R.S.

#### Honorary Members

Dr H. B. BIGELOW Prof. Louis Fage E. H. E. HAVELOCK, C.B., C.B.E.

O. D. HUNT, F.R.S.E.

Dr A. G. HUNTSMAN Prof. HANS PETTERSSON, For. Mem. R.S. Dr A. C. REDFIELD

#### COUNCIL

#### **Elected Members**

G. E. R. DEACON, C.B.E., D.Sc., F.R.S. F. C. FRASER, C.B.E., D.Sc. Prof. J. E. HARRIS, C.B.E., Ph.D., F.R.S. Prof. R. J. HARRISON, D.Sc., M.D., M.R.C.S., L.R.C.P. Prof. A. V. HILL, C.H., O.B.E., Sc.D., LL.D., F.R.S. M. N. HILL, Ph.D., F.R.S.

Prof. B. KATZ, M.D., D.Sc., F.R.S. R. D. KEYNES, Ph.D., F.R.S. C. E. LUCAS, C.M.G., D.Sc. J. W. G. LUND, D.Sc., Ph.D., F.R.S. Prof. Sir John T. RANDALL, D.Sc., F.R.S. Prof. J. E. SMITH, Sc.D., F.R.S. H. G. VEVERS, M.B.E., D.Phil. Prof. C. M. YONGE, C.B.E., D.Sc., F.R.S.

#### Governors

H. GARDNER, C.B.E. (Ministry of Agriculture, Fisheries and Food) The Worshipful Company of Fishmongers: The Prime Warden Major E. G. CHRISTIE-MILLER Sir EDWARD CHADWYCK-HEALEY, Bt., M.C. Prof. Sir Alister C. Hardy, Kt., D.Sc., F.R.S. (Oxford University)

S. SMITH, Ph.D. (Cambridge University) EDWARD HINDLE, Sc.D., F.R.S. (British Association) Prof. G. P. Wells, Sc.D., F.R.S. (Zoological

Prof. Sir James Gray, Kt., C.B.E., M.C., Sc.D., LL.D., F.R.S. (Royal Society)

Hon. Treasurer: Sir EDWARD CHADWYCK-HEALEY, Bt., M.C., The Mill House, Hook, Basingstoke, Hants.

Secretary: F. S. Russell, C.B.E., D.S.C., D.F.C., D.Sc., LL.D., F.R.S., The Laboratory, Citadel Hill, Plymouth, Devon

#### SCIENTIFIC STAFF

Director: F. S. Russell, C.B.E., D.S.C., D.F.C., D.Sc., LL.D., F.R.S.

D. P. WILSON, D.Sc., F.R.P.S. (Zoologist) L. H. N. COOPER, D.Sc., F.R.I.C. (Chemist)

G. M. SPOONER, M.B.E., M.A., F.R.E.S. (Zoologist) MARY W. PARKE, D.Sc., Ph.D., F.L.S. (Botanist)

P. G. CORBIN, B.A. (Zoologist)

J. A. C. NICOL, D.Sc., M.A., D.Phil. (Experimental

E. J. DENTON, B.A., B.Sc., Ph.D. (Physiologist)

N. A. HOLME, M.A. (Zoologist) G. R. FORSTER, B.Sc. (Zoologist)

G. T. BOALCH, B.Sc., Ph.D. (Botanist) G. W. BRYAN, B.Sc., Ph.D. (Zoologist)

F. A. J. ARMSTRONG, F.R.I.C. (Chemist)

T. I. SHAW, M.A., Ph.D. (Physiologist)

J. V. HOWARTH, B.Sc. (Physiologist)

Q. BONE, B.A. (Zoologist)

E. D. S. CORNER, M.Sc., Ph.D. (Biochemist) A. J. SOUTHWARD, D.Sc., Ph.D. (Zoologist)

A. G. DAVIES, B.Sc., Ph.D. (Special Appointment: Physical Chemist)

### JOURNAL OF THE MARINE BIOLOGICAL ASSOCIATION

#### 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.

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. Areas to be mechanically stippled should be indicated by light blue pencil shading.

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.

The size of the printed area of the Journal page is 18 × 12 cm. The maximum size for a full-page figure (with legend) is 19½× 13½ 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 textfigures, 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. Where several photographs make up a single plate, they are numbered 'Fig. 1', etc.

#### SUMMARY

Each paper must be accompanied by a Summary.

#### 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 abbreviated as in the World List of Scientific Publications (3rd ed., 1952). Volume (Vol.), Band (Bd.), or Tome (T.) numbers are in Arabic numerals. 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. J. mar. biol. Ass. U.K., Vol. 23, pp. 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 corrections exceeds a reasonable figure, the author is liable to be charged to the full extent of the excess.

<sup>1</sup> In the abbreviation for this Journal 'Mar.' is a misprint for 'mar.'.

# The Journal of General Microbiology

Editors: B. C. J. G. KNIGHT and A. F. B. STANDFAST

Contents of Volume 31, No. 3, June 1963

- H. G. Boman and K. G. Eriksson. Penicillin induced lysis in Escherichia coli.
- C. H. Clarke. Suppression by methionine of reversions to adenine independence in Schizosaccharomyces pombe.
- R. Macpherson and J. D. A. Miller. Nutritional studies on *Desulfovibrio desulfuricans* using chemically defined media.
- W. E. van Heyningen. The fixation of tetanus toxin, strychnine, serotonin and other substances by ganglioside.
- W. E. van Heyningen and R. J. Woodman. The fixation of tetanus toxin by frog brain.
- E. C. Cantino, J. S. Lovett, L. V. Leak and J. Lythgoe. The single mitochondrion, fine structure, and germination of the spore of *Blastocladiella emersonii*.
- **B.** A. Bridges: Effect of chemical modifiers on inactivation and mutation-induction by gamma radiation in *Escherichia coli*.
- R. F. Rosenberger and M. Shilo. Repression of inducible tartrate dehydratases in Pseudomonas strains.
- T. Cross, M. P. Lechevalier and H. Lechevalier. A new genus of the Actinomycetales: *Microello-bosporia* gen.nov.
- R. Fuller and L. G. M. Newland. The serological grouping of three strains of Streptococcus equinus.
- D. E. Bradley. The structure of coliphages.
- M. R. Kimmitt and P. J. le B. Williams. Systematic position of Gluconobacter liquefaciens.
- **B. J. Marshall, W. G. Murrell and W. J. Scott.** The effect of water activity, solutes and temperature on the viability and heat resistance of freeze-dried bacterial spores.
- A. R. Abou Akkada and T. H. Blackburn. Some observations on the nitrogen metabolism of rumen proteolytic bacteria.
- G. I. Barrow. Microbial antagonism by Staphylococcus aureus.
- T. R. G. Gray. Media for the enumeration and isolation of heterotrophic salt-marsh bacteria.
- L. E. Hawker and P.McV. Abbott. Fine structure of the young vegetative hyphae of *Pythium debaryanum*.
- M. Rancourt and H. A. Lechevalier. Electron microscopic observation of the sporangial structure of an actinomycete, *Microellobosporia flavea*.

The subscription rate is 80s. net per volume of 3 parts, single parts 35s. each, plus postage. Three volumes will be issued each year. Orders should be sent to

CAMBRIDGE UNIVERSITY PRESS

BENTLEY HOUSE, 200 EUSTON ROAD, LONDON, N.W. I

## THE JOURNAL OF ECOLOGY

EDITORS: P. W. RICHARDS and D. E. COOMBE

Vol. 51, No. 1

FEBRUARY 1963

- William Macnae. Mangrove swamps in South Africa.
- B. W. Taylor. An outline of the vegetation of Nicaragua.
- Alec Lazenby. Studies on Allium vineale L. VI. Effects of cutting.
- M. W. Dick. The occurrence and distribution of Saprolegniaceae in certain soils of south-east England. III. Distribution in relation to pH and water content.
- H. A. Roberts. Studies on the weeds of vegetable crops. III. Effect of different primary cultivations on the weed seeds in the soil.
- Juliet C. Frankland, J. D. Ovington and C. Macrae. Spatial and seasonal variations in soil, litter and ground vegetation in some Lake District woodlands.
- P. R. Bell and E. Lodge. The reliability of Cratoneuron commutatum (Hedw.) Roth as an 'indicator moss'.

- P. W. Richards. Ecological notes on West African vegetation. II. Lowland forest of the Southern Bakundu Forest Reserve.
- A. S. Thomas. Further changes in vegetation since the advent of myxomatosis.
- D. J. Boatman and J. Roberts. The amounts of certain nutrients leached from peat by various extractants.
- A. J. Rutter. Studies in the water relations of *Pinus sylvestris* in plantation conditions. I. Measurements of rainfall and interception.
- Gordon T. Goodman. The role of mineral nutrients in Eriophorum communities. I. The effects of added ground limestone upon growth in an Eriophorum angustifolium community.
- P. Greig-Smith, K. A. Kershaw and D. J. Anderson. The analysis of pattern in vegetation: A comment on a paper by D. W. Goodall.

Articles are illustrated with plates and text-figures

The Subscription price per volume of 3 parts is 130s. net, single parts 50s. net

BLACKWELL SCIENTIFIC PUBLICATIONS LTD. 24-25 BROAD STREET · OXFORD

## THE JOURNAL OF ANIMAL ECOLOGY

Vol. 32, No. 1 EDITORS: O. W. RICHARDS and J. B. CRAGG FEBRUARY 1963

- John MacLeod and Joseph Donnelly. Dispersal and interspersal of blowfly populations.
- A. F. G. Dixon. Reproductive activity of the sycamore aphid, *Drepanosiphum platanoides* (Schr.) (Hemiptera, Aphididae).
- B. N. K. Davis A study of micro-arthropod communities in mineral soils near Corby, Northants.
- Robert Barrass. The burrows of Ocypode ceratophthalmus (Pallas) (Crustacea, Ocypodidae) on a tidal wave beach at Inhaca Island, Moçambique.

- F. P. Rowe, E. J. Taylor and A. H. J. Chudley. The numbers and movements of house-mice (*Mus musculus* L.) in the vicinity of four corn-ricks.
- L. R. Taylor. Analysis of the effect of temperature on insects in flight.
- J. B. Free. The flower constancy of honeybees.
- W. B. Banage. The ecological importance of free-living soil nematodes with special reference to those of moorland soil.
- Ian E. Efford. The parasitic ecology of some watermites.
- Monte Lloyd. Numerical observations on movements of animals between beech litter and fallen branches.

Abstracts.

Subscription price 126s. per volume of three parts (single parts 50s. each)

BLACKWELL SCIENTIFIC PUBLICATIONS LTD.

24-25 BROAD STREET · OXFORD

# THE JOURNAL OF EXPERIMENTAL BIOLOGY

Edited by V. B. WIGGLESWORTH and J. A. RAMSAY

Vol. 40, No. 1

March 1963

DICKMANN, Z. Chemotaxis of rabbit spermatozoa.

Dan, K. and Kuno Kojima, M. A study on the mechanism of cleavage in the amphibian egg.

Fraser Rowell, C. H. The relation between stimulus parameters and current flow through stimulating electrodes

Bainbridge, Richard. Caudal fin and body movement in the propulsion of some fish.

WATANABE, AKIRA and TAKEDA, KIMIHISA. The change of discharge frequency by A. C. stimulus in a weak electric fish.

KENNEDY, J. S. and BOOTH, C. O. Free flight of aphids in the laboratory.

HOUSE, C. R. Osmotic regulation in the brackish water teleost, Blennius pholis.

LAGERSPETZ, KARI. Humidity reactions of three aquatic amphipods, Gammarus duebeni, G. oceanicus and Pontoporeia affinis in the air.

NEVILLE, A. C. and Weis-Fogh, Torkel. The effect of temperature on locust flight muscle.

NEVILLE, A. C. Motor unit distribution of the dorsal longitudinal flight muscles in locusts.

Mellon, Jr. DeForest. Electrical responses from dually innervated tactile receptors on the thorax of the crayfish.

BROKAW, C. J. Movement of the flagella of *Polytoma uvella*. MENDELSON, MARTIN. Some factors in the activation of crab

movement receptors.

WILSON, DONALD MELVIN and GETTRUP, ERIK. A stretch reflex controlling wingbeat frequency in grasshoppers.

Wells, M. J. Taste by touch: Some experiments with Octopus.

REEVE, M. R. The filter-feeding of Artemia. 1. In pure cultures of plant cells. 2. In suspensions of various particles. 3. Faecal pellets and their associated mem-

BENNET-CLARK, H. C. Negative pressures produced in the pharyngeal pump of the blood-sucking bug, Rhodnius prolivus.

WIGGLESWORTH, V. B. The action of moulting hormone and juvenile hormone at the cellular level in *Rhodnius prolixus*.

Subscription 84s. per volume, single parts 30s. net

Orders may be placed through your bookseller or direct with the

Cambridge University Press, Bentley House, 200 Euston Road, London, N.W.1

# THE QUARTERLY JOURNAL OF MICROSCOPICAL SCIENCE

JOINT EDITORS:
JOHN R. BAKER, D.Sc., F.R.S.
H. G. CALLAN, D.Sc.

After full discussion with the Board of Directors of the Company of Biologists it has been decided to make a gradual change in the scope of this Journal. It is the Editors' intention to transform the Quarterly Journal of Microscopical Science into a journal of cytology and of the study of organic fine structure. The subject-matter of the journal will continue to be varied, since we interpret the word cytology in the widest sense.

Subscription Price per Volume of 4 Parts £4. 4s. Single Parts 3os. net (postage extra)

OXFORD UNIVERSITY PRESS
Amen House, Warwick Square, London, E.C. 4

# MARINE MICROBIOLOGY

A. E. KRISS

Translated from Russian by

J. M. SHEWAN and Z. KABATA

For fourteen years the Institute of Microbiology of the Academy of Science of the U.S.S.R., of which Professor A. E. Kriss is Head, has been engaged in microbiological investigations of the deep layers of various seas and oceans. A representative selection of types of marine basins has been dealt with over a most impressive range. Professor Kriss concentrates on data of deep-sea microbiology which may be regarded as a new development of marine microbiology. Quite apart from the value of the work for marine microbiologists the significance of micro-organisms as indicators of hydrological phenomena in seas and oceans clearly emerges from Professor Kriss's investigations and the book may fairly be claimed to be a most important contribution to oceanographic literature.

£6. 6s.

#### **OLIVER & BOYD**



# PROCEEDINGS OF THE MALACOLOGICAL SOCIETY OF LONDON

Vol. 35, No. 4, April 1963

£1 net or \$3

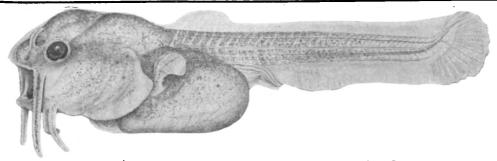
- K. C. Ghose. Morphogenesis of the shell gland, lung, mantle and mantle cavity of the giant land snail, Achatina fulica.
- T. Soot-Ryen. Some nomenclature changes in the family Mytilidae.
- F. A. Schilder. An abnormal cowry radula.
- Bent Muus. On Danish Hydrobiidae with description of a new species.
- A. J. Berry. The anatomy of two Malayan hill Streptaxidae, Sinoenna kanchangensis Tomlin and Oophana diaphanopepla van Bentham Jutting, with special reference to the genital system.
- N. H. Odhner. Cathaica (Pseudiberus) chitralensis n.sp.
  K. H. Barnard. Notes on the animals of Gyrina gigantea (Lam.) and Pleurotomaria africana Tomlin.
- R. K. Dell and S. P. Dance. The Molluscan genus Ranella and the distribution of Ranella olearium (Linnaeus).
- M. I. Baxter and R. H. Nisbet. Features of the nervous system and heart of Archachatina revealed by the electron microscope and by electrophysiological recording.

Annual report of the Council.

Copies may be purchased from

BLACKWELL SCIENTIFIC PUBLICATIONS LTD.

24-25 Broad St., Oxford



# STAGES IN THE DEVELOPMENT OF

# Ictalurus nebulosus

Text by PHILIP B. ARMSTRONG, M. D.

Drawings by Julia Swope Child

This portfolio of 89 drawings illustrating the stages of normal development of the brown bullhead is unique in its detail and precision of execution.

The drawings were made at the Woods Hole Marine Biological Laboratory by Julia Swope Child, under the direction of Dr. Philip B. Armstrong, Director of the Woods Hole Laboratory and Chairman of the Department of Anatomy, Upstate Medical Center, State University of New York, in Syracuse.

The Ictalurus nebulosus portfolio, designed for laboratory use, consists of 16 plates of drawings mounted on heavy board and lacquered for maximum durability. The 8½" x 11" boards are punched for loose-leaf binder.

In the 8-page booklet accompanying the plates, Dr. Armstrong describes the principal diagnostic features of each developmental stage, discusses the nesting habits and parental care of Ictalurus nebulosus, and suggests procedures for raising the eggs in the laboratory.

Reproduction of the drawings by 300-line screen offset lithography has resulted in plates which are exceptionally faithful to the precision of the original drawings. This portfolio is a major contribution to research in the embryology of the Teleosts.

16 plates, 8-page booklet, boxed. \$4.95

ORDER Syracuse University Press SYRACUSE 10, N.Y.