

ABSTRACTS OF MEMOIRS

RECORDING WORK DONE AT THE PLYMOUTH LABORATORY

BINYON, J., 1972. The effects of diluted sea water upon podial tissues of the starfish *Asterias rubens* L. *Comp. Biochem. Physiol.*, Vol. 41A, pp. 1-16.

The degree of hydration of excised podia changes but little upon immersion in 70% sea water.

Intracellular isosmotic regulation would seem to be brought about by reduction of the initially high level of total non-protein nitrogen within the tissues and of the electrolytes.

The larger drop in the sodium level compared with that of potassium is consistent with the view that a large percentage of this ion is present in the extracellular space, whilst the potassium is mainly intracellular.

Reasons for the loss of neuromuscular co-ordination in dilute sea water are discussed. J.B.

BOALCH, G. T. & PARKE, M., 1971. The prasinophycean genera (Chlorophyta) possibly related to fossil genera, in particular the genus *Tasmanites*. In *Proceedings of the IInd Planktonic Conference, Roma 1970* (ed. A. Farinacci), pp. 99-105. Roma: Edizioni Tecnoscienza.

Plankton sedimentation methods may result in loss of material belonging to the Halosphaerales and hence the resulting sparse distribution records in the literature. Similarities and differences between genera *Halosphaera*, *Pachysphaera* and *Ptersperma* and the distinguishing characters for each genus are summarized. Two phases occur in the life-history: a pelagic phycoma phase and a motile scale-covered flagellate phase which can live independently by vegetative fission. It is emphasized that study of the structure of the outer wall of the phycoma is essential for specific identification. Possible affinities of the three recent genera with fossil genera are discussed.

M.P.

BONE, Q., 1971. Muscular innervation and fish classification. In *I Simposio Internacional de Zoofilogenia, 13-17 de octubre de 1969*, pp. 369-77. Facultad de Ciencias, Universidad de Salamanca.

All fish groups possess essentially the same arrangement of myotomal muscles, each myotome consisting of muscle fibres specialized for rapid contraction, and of fibres specialised for slow, sustained activity. The innervation of the fast fibres is similar in all fish groups except the teleosts, where a new pattern of innervation has arisen. Primitive teleosts possess the same pattern of innervation as do other fish groups, but advanced forms have a radically different pattern. The phylogeny of teleost groups is discussed in the light of observations upon their muscle innervation, and the relationships inferred compared with those deduced mainly from the study of skeletal elements.

Q.B.

CORNER, E. D. S. & DAVIES, ANTHONY G., 1971. Plankton as a factor in the nitrogen and phosphorus cycles in the sea. *Adv. mar. Biol.*, Vol. 9, pp. 101-204.

This review is mainly concerned with quantitative aspects of the relationship between organically bound forms of nitrogen and phosphorus in marine plankton and the inorganic forms of these elements dissolved in sea water. The nitrogen and phosphorus cycles are dealt with in sections on (1) the seawater-phytoplankton relationship, (2) the phytoplankton-zooplankton relationship, and (3) the zooplankton-seawater relationship. In the final section field observations that illustrate the interrelationships of plankton and nutrient levels in the open sea are discussed.

E.D.S.C.

DAS, P. K., WATTS, R. L., WATTS, D. C. & DIMELow, E. J., 1971. Distribution, specificity and function of some proteases, general esterases and cholinesterases from several species of starfish. *Comp. Biochem. Physiol.*, Vol. 39(B), pp. 979-97.

The distribution and pattern of proteases, lipases and esterases in extracts from the pyloric caeca and skin of several species of starfish have been determined by starch gel electrophoresis coupled with specific staining. In *Asterias rubens* the cardiac stomach, intestine and rectal sacs were also investigated.

Most protease activity originates in the caecae. The skin of *A. rubens* contained insignificant activity towards artificial protease substrates, but while that of *Solaster papposus* was about 10% of the caecal level, it would not digest gelatin. The significance of these findings for external digestion is discussed.

The proteases are first formed as inactive zymogens and become spontaneously active after extraction. The number of bands resolved by electrophoresis increases in the first day of extraction and then remains constant.

Using artificial substrates and specific inhibitors, distinct trypsin and chymotrypsin-like activities could be demonstrated in tissue extracts. Their distribution in various species is reported. Two bands of trypsin, two bands of chymotrypsin and one band of *p*-nitrophenylacetate esterase could be resolved in extracts of *A. rubens* by electrophoresis on Sephadex blocks. Michaelis constants and other properties of the partially purified enzymes and those in crude extracts are reported.

In caecal extracts tributyrin esterase showed two bands of activity on starch gel and these corresponded to the major bands of *p*-nitrophenyl acetate esterase activity. Triolein esterase activity was weaker and corresponded with the most electropositive of the other esterase bands. These esterase activities were distinct from the protease activity. *A. rubens* skin esterase was inactive with *p*-nitrophenyl acetate.

Extracts were also investigated for the presence of enzymes similar to human acetylcholine esterase and serum cholinesterase. Evidence was obtained for an acetylcholinesterase which is tentatively suggested to be involved in nervous function.

P.K.D.

GIBBS, P. E., STODDART, D. R. & VEVERS, H. G., 1971. Coral reefs and associated communities in the Cook Islands. In *Cook Bicentenary Expedition in the South-west Pacific 1969*, *Bull. R. Soc. N.Z.*, No. 8, pp. 91-105.

Based on investigations carried out during the Cook Bicentenary Expedition, 1969, the topography of the coral reefs, lagoon and reef islands on the almost-atoll of Aitutaki in the southern Cook Islands is described and the recent reef history discussed. Preliminary accounts of the coral communities, lagoon fauna and sediments, and the vegetation and flora of the reef islands are given.

P.E.G.

KRESS, A., 1971. Über die Entwicklung der Eikapselvolumina bei verschiedenen Opisthobranchier-Arten (Mollusca, Gastropoda). *Helgoländer wiss. Meeresunters.*, Bd. 22, pp. 326-49.

On the development of egg-capsule volumes in different opisthobranch species (Mollusca, Gastropoda). An attempt has been made to estimate the volumes of eggs and egg-capsules employing the formula for the rotation-ellipsoid, first after oviposition, second for the capsules during different stages of embryonic development until hatching. The results of the calculations permitted analysis of: (a) the relationship between egg-case volume and egg volume immediately after oviposition; (b) the size of capsules during development until hatching; (c) the relationship of the capsule volume at hatching in comparison to that after oviposition (enlargement-factor). *Placida dendritica* shows no increase in capsule volume during development. *Goniodoris nodosa*, *Rostanga rufescens*, *Trinchestia viridis*, *Acanthodoris pilosa*, *Archidoris pseudoargus*, *Tritonia hombergi* and *Aeolidia papillosa* show a distinct increase in capsule volume at the time of velarclia appearance. The degree of egg-case enlargement and the time of its beginning reveal interspecific differences; within some of the species, both also depend on the number of larvae present in the egg-case. The reasons for such behaviour are not yet known; some possible explanations are discussed.

A.K.

LYONS, K. M., 1971. Comparative electron microscope studies on the epidermis of the blood living juvenile and gill living adult stages of *Amphibdella flavolineata* (Monogenea) from the electric ray *Torpedo nobiliana*. *Parasitology*, Vol. 63, pp. 181–90.

The covering layer of *Amphibdella flavolineata* has been found to be a syncytial cytoplasmic epidermis bearing scattered microvilli and connecting with parenchymally situated 'cell' bodies or cytons by means of conspicuous, microtubule-lined cell processes. There was no evidence from a comparison of the covering epidermis of the juvenile blood living form and that of the gill living adult that this layer in the juvenile was especially modified for life in the host blood system. The epidermis of adult and juvenile worms was found to be remarkably similar, the main difference being that that of the adult was slightly thicker and bears longer microvilli. Apart from some lamellate bodies of doubtful significance, the inclusions found in the epidermis of adult and juvenile forms were also very similar. The outer epidermis of the juvenile monogenean was found to be quite different from that of *Schistosoma mansoni* in that it is not permeated by incursive channels and contains many more mitochondria than the epidermis of the digenean. The epidermal cell bodies of *Amphibdella* tend to have electron-lucent areas especially in the 'apical cell' regions leading to the cell processes that connect with the outer layer. Electron-dense granules secreted by the epidermal cells accumulate in these 'clear' regions before being transferred to the outer layer. There is some slight evidence that these electron-lucent regions may have contained glycogen. The epidermal 'cell' bodies of the juvenile tend to be multinucleate, whilst those of the adult are usually uninucleate.

K.M.L.

PARKE, M., 1971. The production of calcareous elements by benthic algae belonging to the class Haptophyceae (Chrysophyta). In *Proceedings of the II Planktonic Conference, Roma 1970* (ed. A. Farinacci), pp. 929–37. Roma: Edizioni Tecnoscienza.

The information available concerning the types of life-histories recorded for coccolithophorids is summarized. Details are given of the structure of the scale-covered motile cells for the genera *Isochrysis*, *Chrysotila*, *Sarcinochrysis*, *Ochrosphaera* and for one species of *Apistonema*. Two types of motile cell may be produced in some genera, one type with a reduced haptonema and the other without one. The production of coccoliths and of the calcareous deposits by the benthic phase of the different genera are described and discussed. Calcareous elements, sometimes identical to the fossil genus *Tetralithus*, are deposited in the mucilaginous matrix surrounding the cells of the benthic phase in the majority of the genera.

M.P.

PILKINGTON, M. C., 1971. The veliger stage of *Hydrobia ulvae* (Pennant). *Proc. malac. Soc. Lond.*, Vol. 39, pp. 281–7.

Embryos of *Hydrobia ulvae* (Pennant) from Plymouth were reared through to adults in the laboratory. The veliger stages are drawn and described. The pigmentation of the free veliger stage differs from that described by Thorson (1946) for animals at Copenhagen.

The Plymouth population shows complete suppression of any pelagic phase. The veliger is free-living for a brief period of up to 3 days, but the velar cilia are incapable of lifting the animal off the bottom and are soon lost. No food is ingested, there is no evidence of a food groove and during this period the animals show no increase in shell length. Although these larvae are well adapted to rafting on the surface film of water, there is no evidence from plankton hauls to suggest that this phase is important in dispersing the species.

Larvae taken in plankton hauls at Copenhagen may be pelagic and represent a distinct population distinguishable from the Plymouth one in both pigmentation of the veliger and other aspects of general biology.

M.C.P.

ROBERTS, B. L., 1972. Activity of lateral-line sense organs in swimming dogfish. *J. exp. Biol.*, Vol. 56, pp. 105–18.

The problem of whether the lateral-line system is stimulated by a fish's own locomotory movements was studied in swimming spinal dogfish by recording from the lateral-line nerve in an anterior immobile portion of the fish, while the rest of the fish was free to move. In the swimming fish the sense organs discharged in bursts at the same frequency as the swimming rhythm.

It was concluded that the receptors could provide information useful for locomotory co-ordination as the burst length, frequency, discharge frequency and number of impulses in the rhythmical discharge could all be correlated with the swimming movements.

B.L.R.

SOUTHWARD, E. C., 1971. Recent researches on the Pogonophora. *Oceanography mar. Biol. Ann. Rev.*, Vol. 9, pp. 193-220.

Publications which appeared between 1963 and 1970 are reviewed. During this period the literature on Pogonophora has almost doubled and 27 new species have been described, bringing the total of named species to about 100. The posterior end, previously unknown and unsuspected, has been found and described. It is multi-segmented, septate and provided with small setae. This discovery, together with new ideas about the segmentation of the embryo and adult, has raised doubts about the accepted theory of deuterostome affinity of the Pogonophora, and indicates a relationship to the Annelida.

E.C.S.

SOUTHWARD, A. J. & SOUTHWARD, E. C., 1972. Observations on the role of dissolved organic compounds in the nutrition of benthic invertebrates. II. Uptake by other animals living in the same habitat as pogonophores, and by some littoral Polychaeta. *Sarsia*, Vol. 48, pp. 61-70.

New observations on uptake of ¹⁴C-labelled amino acids, glucose, and fatty acids by polychaetes and an echinoderm from the same habitats as pogonophores are compared with results already published for uptake by the pogonophores. Comparison is also made with new and published data on uptake by estuarine polychaetes. There is no great difference between the pogonophores and the other animals in the maximum rate of uptake found per unit weight per hour, but the pogonophores seem better adapted to take up from lower external concentrations.

A.J.S., E.C.S.

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