ABSTRACTS OF MEMOIRS

RECORDING WORK DONE AT THE PLYMOUTH LABORATORY

BAKER, P. F., HODGKIN, A. L. & MEVES, H., 1964. The effect of diluting the internal solution on the electrical properties of a perfused giant axon. *J. Physiol.*, Vol. 170, pp. 541–60.

Squid nerves perfused with an isotonic solution of KCl had a resting potential of about −60 mV and on stimulation gave action potentials of about 100 mV. Progressive replacement of K by Na, Cs or choline decreased the resting potential and at about −40 mV the action potential failed. On the other hand, when isotonic KCl was partially replaced by isotonic sucrose, action potentials of up to 100 mV could be obtained with resting potentials of only 0 to −20 mV. With very low K concentrations, the action potential was considerably prolonged and when all the K was removed from the system by perfusing an axon immersed in K-free sea water with isotonic sucrose containing 6 mM-NaCl or 6 mM-choline Cl, the ordinary type of action potential was eventually replaced by one lasting 1–3 sec. This very prolonged action potential was still dependent on external sodium and was converted back to the normal type of response by increasing the internal potassium concentration.

The marked difference between the effects of diluting internal K with sugar or salt solutions appears to be explained by the observation that the critical potentials for activating and inactivating the Na mechanism varied with the internal concentration of salt. The reason for the greatly prolonged action potentials obtained in the complete absence of K is not clear, although it is possible that K ions are involved in making the Na-carrying system refractory. P. F. B.

BONE, Q., 1964. Patterns of muscular innervation in the lower chordates. *Internat. Rev. Neurobiol.*, Vol. 6, pp. 99–147.

The sensory and motor innervation of the striated muscles of mammals and amphibia are first briefly considered, and these are then contrasted with the patterns of innervation of the striated myotomal musculature in different groups of fish. In all fish groups, except Acrania, there are two types of muscle fibre, each type receiving a different motor innervation. Only in hagfish and in elasmobranchs is there evidence for sensory terminations in, or associated with, the swimming musculature; in no fishes are there neuromuscular spindles. The histology of the myotomal innervation is considered with especial reference to the question of the role of the two types of muscle fibre during swimming, and the question of the gradation of these systems. Q. B.

CALDWELL, P. C., HODGKIN, A. L., KEYNES, R. D. & SHAW, T. I., 1964. The rate of formation and turnover of phosphorus compounds in squid giant axons. *J. Physiol.*, Vol. 171, pp. 119–31.

Using paper chromotography the phosphate compounds in the axoplasm of the giant axons of *Loligo* were separated and their amounts determined by analysis. The indigenous ATP was broken down in axons which had been maintained in cyanide, but injections of arginine phosphate into such poisoned fibres restored the ATP almost

to its original levels within some five minutes. Injections of phosphoenolpyruvate into poisoned fibres caused a restoration of both ATP and arginine phosphate.

Radioactive phosphate was injected into unpoisoned fibres and the distribution of label between the ATP and the arginine phosphate and inorganic phosphate was measured after various intervals. The results suggested that within 20 min the terminal phosphate of ATP and the phosphagen phosphate came into equilibrium with the inorganic phosphate.

CRISP, D. J. & SOUTHWARD, A. J., 1964. South and south-west coast. In 'The effects of the severe winter of 1962–63 on marine life in Britain', ed. by D. J. Crisp. *J. anim. Ecol.*, Vol. 33, pp. 179–83.

The distribution and abundance of some marine invertebrates and algae along the coast from Sussex to Somerset as observed in April and May 1963, compared with previous surveys.

A. J. S.

GORDON, I., 1964. On the larval genus *Problemacaris* Stebbing, and its probable identity (Crustacea, Decapoda). *Zool. Meded.*, Vol. 39, pp. 331–47.

For almost 40 years the larval genus *Problemacaris* was known from one specimen from off Table Mountain, South Africa. Then a second specimen, obtained by the 'Discovery' in 1954, over deep water in the North Atlantic, proved to belong to a second species and was described in 1960. While this paper was in the press, a somewhat older larva, obtained by the 'Sarsia' in 1957, was sent to the author. Though caught by trawl it had presumably entered the trawl on its way to the surface. It proved to be a somewhat older stage of the North Atlantic species. Recently seven other specimens were sent for examination but all were younger than the 'Sarsia' specimen. Of the total of nine larvae, seven are from the North Atlantic, off south-west Ireland or Finisterre. One from Tristan da Cunha, the youngest, is nearer to the North Atlantic species than to the South African one. But the one from off Christchurch, New Zealand, is very near to, probably identical with, the South African species. The very asymmetrical second pair of peraeopods of the oldest 'Sarsia' larva is perhaps sufficiently well developed to afford a clue to the probable identity of the parent genus. Dr D. I. Williamson and the author think that the adult genus may well be the rare *Leontocaris*; and oddly enough only two species of this genus are known namely, *Leontocaris paulsoni* Stebbing from South Africa and *L. lar* Kemp from off south-west Ireland. *Leontocaris lar* has only been found twice, on ground where *Antipatharia* and *Lophohelia* are abundant. The supposed 'nest-building' habit of these larvae is discussed.

I. G.

LOWENSTEIN, O., F.R.S., OSBORNE, M. P. & WERSÄLL, JAN, 1964. Structure and innervation of the sensory epithelia of the labyrinth in the Thornback ray (*Raja clavata*). *Proc. Royal Soc.*, Ser. B, Vol. 160, pp. 1–12.

A description is given of the general architecture of the sensory epithelia of the labyrinth of the elasmobranch fish *Raja clavata*, including an electron-microscopic study of the ultrastructural organization of the sensory hair cells and their hair processes, as well as of the supporting cells. The innervation of the hair cells and the associated synaptic structures are also described.

The hair cells are found to be of uniform shape and cytological appearance. However, there exists a pronounced dimorphism so far as the sensory hair processes are concerned. These consist in each cell of a varying number of stereocilia with which

a single kinocilium is associated. This has the typical structure of a cilium with 9+2 longitudinal filaments. Two widely different diameters of stereocilium are encountered in neighbouring hair cells, and it is suggested that this may point to a fundamental dimorphism among the sensory cells.

The topographic arrangement of the kinocilia appears to be of functional significance, and it is postulated that their position within each hair bundle is related to the direction of excitatory and inhibitory displacement of the hair bundle in the course of mechanical stimulation of the sensory cell. This situation is explored and analysed for all sensory epithelia of the labyrinth, and the findings are related to what is known about their mode of function. The root structures of the kinocilia are described and it is shown that they, too, appear to be functionally polarized. O. L.

RIMINGTON, C. & KENNEDY, G. Y., 1962. Porphyrins: structure, distribution, and metabolism. In FLORKIN, M. & MASON, H. S. (ed. by): *Comparative Biochemistry*, Vol. 4, Chapter 12, pp. 557–614. New York and London: Academic Press.

This chapter deals with the chemistry and metabolism of porphyrin pigments; the chlorophylls are briefly touched on, and the bile pigments hardly at all, since these are outside the scope of the work. A prominent feature of the chapter is the table of the occurrence of the porphyrins and haemoglobins in the animal kingdom, and it will be seen that marine animals are excellent sources of porphyrins. There is some discussion of taxonomic and of evolutionary problems of pigments, metal complexes, and a good bibliography which includes many references which are normally very difficult to find. G. Y. K.

SOUTHWARD, A. J., 1964. On the European species of *Chthamalus* (Cirripedia). *Crustaceana*, Vol. 6, pp. 241–54.

From details given of differences in their distribution, behaviour, breeding and morphology, it appears that there are two valid species in Europe. One, *Chthamalus stellatus*, is widely distributed, and slight differences in appearance and morphology observed do not seem to be of systematic importance. The other, *C. depressus*, is known with certainty only from the Mediterranean and Black Seas; it may be a species evolved to suit conditions in these almost tideless seas, or may be an outlier of a hitherto unrecognized species of more tropical distribution. A. J. S.

SOUTHWARD, A. J. & CRISP, D. J., 1963. Barnacles of European waters. *O.E.C.D. Catalogue of main Marine Fouling Organisms (found on Ships coming into European Waters)*, Vol. 1, Barnacles, 46 pp.

After a brief introduction to the subject, a newly devised key for identification is presented, making use of external features of the living barnacles. The commoner species are then described individually, with ecological notes and colour photographs of each. A. J. S.

WICKSTEAD, J. H., 1963. The Cladocera of the Zanzibar area of the Indian Ocean, with a note on the comparative catches of two plankton nets. *E. Afr. agric. For. J.*, Vol. 29, 164–72.

Three species are recorded, *Penilia avirostris*, *Evadne tergestina* and *Podon polyphemoides*; this last species was rarely taken. Two vertical nets were used simultaneously, the International Coarse Silk Net, aperture 50 cm, length 2 m, 58 m.p.i.

(23 m.p.cm), mesh apertures 0·288 μ, open area of mesh 47 %, and a modified Currie & Foxton Net, aperture 70 cm, length 2·5 m, 74 m.p.i. (29 m.p.cm), mesh apertures 0·205 μ, open area of mesh 34 %. The two nets were worked at three stations of different characteristics for 13 months, day and night.

The incidence, day and night, of *P. avirostris* and *E. tergestina* at the three stations is shown as numbers per cubic metre and as a percentage of the total plankton numbers. Temperature conditions at the three stations are shown.

'Explosive' populations of *P. avirostris* are discussed, with the suggestion that a combination of the O_2 content of the water and inherent progressive degeneration of parthenogenetic females are the limiting factors of a population. The coincidence of heavy diatom and *Penilia* populations is noted, with the suggestion that the former supplies O_2 for the latter.

Catches of the two nets are compared. As used the coarser net is 10–20 % more efficient.

J. H. W.

WICKSTEAD, J. & KRISHNASWAMY, S., 1964. On *Ivellopsis elephas* (Brady), a rare calanoid copepod. *Crustaceana*, Vol. 7, pp. 27–32.

A re-description of *Ivellopsis elephas* (Brady), male and female, is given. First described as *Pontella elephas* in 1883, from the Challenger Expedition collections, this species was not reported again until 1961, when it was found in the Singapore area. A short note is given on the ecology. It appears that this species is associated with floating patches of *Sargassum* weed, living in the water directly underneath. Feeding is possibly on the film of 'dirt' found on the *Sargassum* fronds; this film was rich in diatoms, some representatives of which were found in the gut of some of the copepods.

J. H. W.