ABSTRACTS OF MEMOIRS

RECORDING WORK DONE AT THE PLYMOUTH LABORATORY

BONE, Q., 1963. The central nervous system. In BRODAL, A. & FÄNGE, R. (ed.): *The Biology of Myxine*, pp. 50–91. Oslo, Universitetsforlaget.

A general account is given of the spinal cord and brain of *Myxine glutinosa* L.: the account of the former is based upon original observations, whilst the account of the brain is largely based upon previous work. In the spinal cord, different cell types are identified, and compared with those found in petromyzontids. Three types of neuron send their axons out of the ventral roots; two of these are tentatively identified as the motor neurons supplying the fast and slow muscle fibres of the myotomes; the third is regarded as viscero-motor. The system of giant cells is described and their similarities to the giant Rohde neurons of amphioxus pointed out; their axons, and those of the so-called 'Müller' neurons are the largest found in the cord. Q.B.

BUSH, B. M. H., 1963. A comparative study of certain limb reflexes in decapod crustaceans. *Comp. Biochem. Physiol.*, Vol. 10, pp. 273–90.

Passive movements of the dactylus and propus of pereiopods of decapod crustaceans elicit reflex responses in the motor and inhibitor axons innervating the muscles controlling these joints. Typically, the dominant motor axon of the antagonistic muscle responds, together with the specific inhibitor—if present—of the synergist, thus tending to resist the imposed movement.

In walking legs and chelipeds of *Maia squinado* and *Portunus puber* (Brachyura), and of *Eupagurus bernhardus* (Anomura), these efferent responses are similar to the homologous ones in *Carcinus maenas*. Passive extension of the dactylus, for example, elicited a reflex discharge in the 'slow' motor axon innervating the dactylus flexor, and in the specific inhibitor of the extensor; rapid extension also activated the flexor 'fast' motoneurone. Each axon's response frequency increased with speed of joint movement.

The corresponding reflexes in walking legs of *Homarus vulgaris* and chelipeds of *Astacus pallipes* (Astacura), however, were generally of lower frequency and less specific to particular axons. The 'fast' motor axon was here the main responding flexor axon. The common motoneurone of the dactylus extensor and propus reductor responded only occasionally to passive flexion. The flexor–reductor inhibitor responded weakly to flexion, but like the reductor inhibitor in other species, strongly to reduction.

The significance of these proprioceptive reflexes and of the differences between species, the roles of the inhibitors, and the synaptic relays and chordotonal afferents mediating the reflexes, are discussed. Certain claw reflexes of tactile origin, also investigated, are contrasted. B.M.H.B.

CALDWELL, P. C. & WALSTER, G., 1963. Studies on the micro-injection of various substances into crab muscle fibres. *J. Physiol.*, Vol. 169, pp. 353–72.

A preparation consisting of a cannulated single muscle fibre from the leg muscles of the crab *Maia squinado* is described. Solutions can be injected into the fibre and any resultant shortening measured. Contractions were produced when $CaCl_2$, $SrCl_2$,

$BaCl_2$, and caffeine were injected, the contraction produced by caffeine becoming weaker during a rapid series of injections of the same quantity. At lower concentrations the injections of the same quantity, in moles, of $CaCl_2$, $SrCl_2$, $BaCl_2$ and of caffeine (if this was the first injection of caffeine into the fibre) produced contractions with similar time courses. Contractions were only very slight or absent after the injection of distilled water, KCl, NaCl, $MgCl_2$, ATP, AMP, EDTA, potassium phosphate and arginine hydrochloride. The external application of 5 mM caffeine caused the single fibre preparation to go into a maintained contraction without, in the early stages, causing any significant change in the membrane potential. Caffeine contractions were obtained while fibres were depolarized by high external potassium and also with previously depolarized fibres when they were simultaneously repolarizing as a result of being transferred from a solution of high potassium concentration containing no caffeine to a low potassium crab saline containing caffeine. $CaCl_2$ and caffeine were injected into fibres depolarized by high external potassium and were found to cause contraction. The results are discussed in terms of hypotheses which seem likely in the light of present knowledge about muscular contraction and relaxation, the important role which the release and removal of ionized calcium may play being particularly emphasized. P. C. C.

KEYNES, R. D., 1963. Chloride in the squid giant axon. *J. Physiol.*, Vol. 169, pp. 690–705.

Analyses of extruded squid axoplasm showed that even in the freshest material the chloride content was over 100 m-mole/kg wet weight. The over-all mean and its S.E. for 17 samples were 108 ± 2 m-mole/kg. This intracellular concentration of chloride is well over twice that expected for a simple passive distribution between axoplasm and body fluids. This discrepancy could be explained either by binding of chloride in the axoplasm or by the occurrence of an 'active' uptake of chloride by the axon. The activity coefficient for the chloride in axoplasm samples was determined with Ag-AgCl electrodes as being in the neighbourhood of 0·7. This seems close enough to the free solution value to rule out any substantial binding. The existence of a mechanism for uphill inward transport of chloride was supported by the demonstration that treatment with 0·2 mM dinitrophenol halved the influx of labelled chloride. The action of 2 mM cyanide was also tested, but the results were excessively scattered. The influx of chloride does not seem to be linked to the transport of cations by the sodium pump, since it was not affected by 10^{-5} M ouabain and was raised rather than lowered in a K-free solution. The average rate constant for the efflux of labelled chloride was 0·00062 $min.^{-1}$. The efflux was unaltered by treatment with dinitrophenol, cyanide or K-rich solutions. R. D. K.

SOUTHWARD, E. C., 1964. On three new cyclopoid copepods associated with deep-water polychaetes in the north-east Atlantic. *Crustaceana*, Vol. 6, pp. 206–19.

Descriptions are given of *Serpulidicola placostegi*, *S. omphalopomae* and *Rhabdopus salmacinae*, both genera being new. The three species are closely related, and are tentatively assigned to the family Clausiidae. The females are vermiform, with reduced legs and crawling habit, but the males (in *Serpulidicola* at least) are much smaller than the females and retain the swimming habit right up to maturity. The three species have been found in tubes occupied by living serpulid polychaetes of the genera *Placostegus*, *Omphalopoma* and *Salmacina*, collected from depths of 275 to 1450 m to the west of the British Isles and France. E. C. S.

SOUTHWARD, E. C., 1963. Haemoglobin in barnacles. *Nature, Lond.*, Vol. 200, pp. 798–9.

Haemoglobin is recorded for the first time from a non-parasitic cirripede, *Balanus perforatus*. Certain of the muscles of this barnacle are pale pink in colour and produce the characteristic absorption lines of haemoglobin when viewed through an eyepiece spectroscope. Treatment of fresh specimens with benzidine and hydrogen peroxide produces a blue or brown coloration in these muscles and in some other tissues, which probably also contain haemoglobin. It is possible that a trace of haemoglobin is present in the blood, but this is not yet proven. Two other barnacles, *Balanus crenatus* and *Elminius modestus*, appear to have a small amount of haemoglobin in their muscles.

E. C. S.

WICKSTEAD, J. H., 1963. Estimates of total zooplankton in the Zanzibar area of the Indian Ocean with a comparison of the results with two different nets. *Proc. zool. Soc. Lond.*, Vol. 141, pp. 577–608.

Three stations were chosen near Zanzibar: P.S. 1, depth 12 m, *ca.* $\frac{1}{4}$ mile off-shore; P.S. 2, depth 40 m, *ca.* 7 miles off-shore; P.S. 3, total depth 750 m, *ca.* 20 miles off-shore. Vertical plankton samples were taken, day and night, at each station throughout thirteen months using both a 50 cm 58 m.p.i. and a 70 cm 74 m.p.i. net clamped together. At P.S. 1 and P.S. 2 sampling was from bottom to surface; at P.S. 3 it was from both 200 m and 50 m to the surface, i.e. from both below and above the thermocline to the surface. Total plankton is estimated as numbers, volume and dry weight per m^3; all results are presented graphically. P.S. 1 and P.S. 2 showed maximum plankton during the north-east monsoon; the P.S. 3 maximum was during the south-east monsoon. At P.S. 1 and P.S. 2 differences between day and night plankton were balanced out over a period of time; at P.S. 3 an increase of more than 100 % was shown for the night plankton (dry weight). Some comparison of numbers is made with plankton from other areas. Some relevant hydrographic data are shown. The mean monthly catches of the 74 m.p.i. net are shown as a percentage increase or decrease above or below the catch of the 58 m.p.i. net at each station. At oceanic stations volumes and dry weights from the one net can be compared directly with those from the other; this cannot be done at coastal stations. Numerically the 74 m.p.i. net catches about 70 % more than the 58 m.p.i. net at coastal stations, about 60 % more at oceanic stations.

J. H. W.