ABSTRACTS OF MEMOIRS

RECORDING WORK AT THE PLYMOUTH LABORATORY

BOALCH, G. T., 1975. The Lauder species of the diatom genus *Bacteriastrum* Shadbolt. *Nova Hedwigia*, Beiheft, **53**, 185–189.

An account is given of material of *Bacteriastrum varians* Lauder and *B. hyalinum* Lauder collected from Hong Kong close to the time of the original description. *Bacteriastrum varians* is shown to be synonymous with *Bacteriastrum furcatum* Shadbolt. *Bacteriastrum hyalinum* is considered to be a distinct species. Lauder's original illustrations are designated as types for the two species as no material examined by Lauder is known to exist.

CLARKE, M. R., MACLEOD, N. & PALIZA, O., 1976. Cephalopod remains from the stomachs of Sperm whales caught off Peru and Chile. *Journal of Zoology*, **180**, 477–493.

One thousand cephalopod lower beaks from random samples of the stomach contents of four Sperm whales caught off Peru and Chile are identified and/or described. Non-random samples of stomach contents from 10 whales were also examined. The size of the lower beaks is used to estimate the mean and the total weight of the cephalopods of each taxon identified. The three most numerous species are *Histioteuthis* sp. A_1 (50 %), *Chiroteuthis* sp. A (16 %) and *Octopoteuthis* sp. (9 %) while the greatest weight of flesh is contributed by *Histioteuthis* sp. A_1 (56 %), *Dosidicus gigas* (32 %) and *Vampyroteuthis infernalis* (3 %). Lower rostral length frequency distributions are compared with those that have been constructed for other regions. Antarctic species of cephalopods represented by beaks show that two female and one male whale probably moved north from much further south immediately prior to being shot off Peru in November, December and February.

DAVISON, W. & WHITFIELD, M., 1977. Modulated polarographic and voltammetric techniques in the study of natural water chemistry. *Journal of Electroanalytical Chemistry*, **75**, 763–789.

Modulated polarographic and voltammetric techniques are of particular importance in natural water chemistry because of their sensitivity not only to very low concentrations of electroactive components but also to their chemical form. Direct polarographic techniques are most useful for the analysis of non-metallic components at low concentrations since metal levels are only rarely high enough for the analysis of untreated samples. Preconcentration by chemical or electrochemical techniques have both been employed. Potentially the most productive field of application of polarographic and voltammetric methods is in determining the chemical speciation of electroactive components in natural waters. Some clarification is required of the chemical and biological significance of operational classifications currently employed. Intermetallic interferences and the influence of surface films on electrode behaviour need to be more thoroughly investigated before analyses or speciation studies on untreated samples can be routinely undertaken. Chemical and electrochemical understanding rather than increased sophistication in the instrumentation is required at this stage if full advantage is to be taken of the capabilities of modulated polarographic and voltammetric methods in natural water chemistry.

MANLY, R., 1976. The larval development of *Tricolia pullus* (L.). *Journal of Molluscan Studies*, **42**, 361–369.

Fertilized eggs, obtained as a result of natural spawnings by adult *Tricolia pullus*, were kept in the laboratory in sea water held at 15 °C. Early cleavage was of the typical spiral pattern and gastrulation, which occurred 4–5 h after fertilization, was by epiboly. The larvae, which hatched as trochophores after 10–11 h, were positively phototactic and swam continuously. Shell formation was initiated after 11–12 h by the eversion of the shell gland and at 16 h the larvae, now at the pre-torsional veliger stage, were able to withdraw partially into bowl-shaped shells.

Torsion was accomplished in two distinct phases. The first 90° was achieved through the contraction of the velar retractor muscle and was completed after 19–26 h. The second phase, which was brought about by the hypertrophy of a second shell muscle on the right side of the veliger, was not completed until the fifth day of development.

Up to 68 h, when they were last observed to swim, the veligers became increasingly benthic as their velar cells were gradually cast off, although the velum did not disappear entirely until they were $4\frac{1}{2}$ days old. After 7 days, when these studies were terminated, the veligers had well-developed digestive systems, but they were not observed to feed.

MURALT, A. VON, WEIBEL, E. R. & HOWARTH, J. V., 1976. The optical spike. Structure of the olfactory nerve of pike and rapid birefringence changes during excitation. *Pflügers Archiv*, **367**, 67–76.

Electron microscope studies on the olfactory nerve of the pike revealed a population of 4·2 million, densely packed unmyelinated nerve fibres; 95 % are small fibres (average diameter 0·19 μm, narrow modal class), 5 % are larger (average diameter 0·6 μm). Each fibre is bounded by an axonal membrane with a bilayer structure (80 Å thickness).

The olfactory nerve is birefringent (negative with respect to fibre axis) and shows at 20 °C an average retardation $R = 23$ nm. The birefringence becomes more negative on lowering the temperature.

With the passage of an action potential a rapid, transient increase of retardation – the optical spike – occurs; $\Delta R = 0{\cdot}04$ nm. The optical spike corresponds to the time course of structural changes in the axon membrane during excitation; it begins later, peaks earlier and decays more quickly than the voltage changes as recorded externally in the present study.

PAUL, D. H. & ROBERTS, B. L., 1977. Studies on a primitive cerebellar cortex. I. The anatomy of the lateral-line lobes of the dogfish, *Scyliorhinus canicula*. *Proceedings of the Royal Society* (B), **195**, 453–466.

The lateral-line lobes of the dogfish hind-brain were examined with the light microscope. The anterior and posterior lobes, which are the projection sites of the lateral-line nerves, comprise a complex neuropil covered by a molecular layer that consists of unmyelinated axons, dendrites and small stellate-like interneurones. The second order neurone is a large, elongate cell which has ventrally-directed smooth dendrites that extend throughout the neuropil and connect with the lateral-line afferent fibres, as well as spiny dendrites that run dorsally into the molecular layer. The molecular layer has the same organization as the cerebellar molecular layer, but in other features the lateral-line lobes are quite unlike the true cerebellum.

PAUL, D. H. & ROBERTS, B. L., 1977. Studies on a primitive cerebellar cortex. II. The projection of the posterior lateral-line nerve to the lateral-line lobes of the dogfish brain. *Proceedings of the Royal Society* (B), **195**, 467–478.

Field potentials and unit responses generated by electrical stimulation of the posterior lateral-line nerve were recorded from the dogfish hindbrain. The field potentials were largest on the surface of the ipsilateral posterior lateral-line lobe and were smaller on or absent from adjacent regions. They were positive in the molecular layer but reversed to become negative in the lobe neuropil where unit responses from afferent fibres and secondary neurones were recorded. A large negative deflexion, which superimposed on the positive field and whose latency decreased linearly with depth was sometimes recorded in the molecular layer; this potential was interpreted as being an active response of the molecular-layer dendrites of the secondary neurones conducting at about 0·3 m s^{-1}. The secondary neurones were monosynaptically excited by the lateral-line input and discharged up to three spikes for a single stimulus; they showed considerable latency variation and were unable to follow stimulation above 100 Hz.

PAUL, D. H. & ROBERTS, B. L., 1977. Studies on a primitive cerebellar cortex. III. The projection of the anterior lateral-line nerve to the lateral-line lobes of the dogfish brain. *Proceedings of the Royal Society* (B), **195**, 479–496.

Field potentials and unit discharges generated by electrical stimulation of the anterior lateral-line nerves were recorded from the ipsilateral lateral-line lobes of the hindbrain of decerebrate dogfish. They were absent from the cerebellar corpus and the contralateral hindbrain.

The field potentials were positive-going within the molecular layer and negative-going in the underlying dorsal nucleus. They were preceded by compound action potentials of sensory fibres and of antidromically activated lateral-line efferent neurones. The earliest part of the main field probably represents the monosynaptic activation of second-order afferent cell bodies. It was closely followed by the antidromic invasion of the cell bodies and dendrites of the efferent neurones. Later portions of the potentials were created by repetitive activity of the second order afferent cells and of the efferent neurones. It is thought that the dendrites of the second order cells propagated active potentials from the cell body into the molecular layer at velocities of about 0·5 m s^{-1}.

The unit discharges were identified as arising from: (i) primary afferent fibres, (ii) second order afferent neurones, and (iii) efferent neurones. Primary afferent fibres, which frequently discharged in phase with respiratory movements, responded vigorously to natural stimulation of the lateral lines of the head. Secondary afferent cells did not show a respiratory rhythm, probably because lateral-line stimulation was followed by a sharp fall in excitability which began 15 ms after the stimulus and lasted for at least 30 ms. Complete recovery from a single lateral-line stimulus took as long as 100 ms.

Some nerve cells, which could follow high-frequency stimulation at short latency without 'jitter', also discharged up to 4 later spikes to a single stimulus if stimuli were applied at rates of $< 0{\cdot}3$ Hz. This discharge was evidently synaptically derived and would follow higher stimulation frequencies (1 Hz) if presented with paired stimuli. Such neurones must be efferent cells of the lateral-line system.

PURDOM, C. E., THOMPSON, D. & DANDO, P. R., 1976. Genetic analysis of enzyme polymorphism in plaice (*Pleuronectes platessa*). *Heredity*, **37**, 193–206.

Genetic analysis was performed on five enzyme systems (G3PDH; GPI-A; GPI-B; PGM; MDH-A) in plaice (*Pleuronectes platessa*) collected in spawning condition from the North Sea. Conventional crosses, induced gynogenesis and induced triploidy were performed. The data conclusively demonstrated the inheritance of isozymes by co-dominant alleles at individual loci for each system. No linkage was observed but tests did not include MDH nor the possibility of linkage between G3PDH and GPI-A. Some anomalous segregation ratios were observed, particularly a deficiency of heterozygotes for GPI-A, but the data were largely in conformity with Mendelian expectations. At the PGM locus, five independent anomalous individuals were scored and interpreted as mutations with a mutation rate of $1{\cdot}1 \times 10^{-3}$ per gamete. Recombination with the centromere was assessed and induced triploidy and cross-over values of 41 % for PGM, 19 % for MDH-A and 9 % for GPI-B were derived on the assumption of complete interference. Amongst the parent fish, genotypic and phenotypic frequencies were largely consistent with the expectations of the Hardy–Weinberg Law, and allelic frequencies were not significantly different between year of collection or location of collection ground.

SMITH, J. E., 1976. Early invertebrate zoology: men and their animals. *Symposia of the Zoological Society of London*, No. 40, 67–83.

The foundation of the Zoological Society in 1826 and the decision 4 years later to hold fortnightly meetings to receive and prepare reports on all matters connected with zoology proved to have a powerful and beneficial influence on the progress of invertebrate zoology both in Britain and overseas.

The zoologists who regularly supported the scientific meetings over a number of years were almost all, whether amateurs or professionals, good field naturalists. Many were actively engaged in research, and some in the preparation of monographs on the taxonomy and natural history of animals, including a number of the invertebrate groups. Many were influential in public affairs,

while their scientific interests seem to have brought them in frequent communication with the leading amateur zoologists in various parts of Britain, with whom they exchanged information and specimens in the creation over the country of a web of active and close working relationships.

This essay reviews the contributions of the London and provincial zoologists to invertebrate zoology over the period from about 1830 to 1860, discusses some of the major scientific communications and discussions, and examines through selected examples the role of the Society in the early development of invertebrate zoology in Britain and overseas.

WICKSTEAD, J. H., 1975. Chordata: Acrania (Cephalochordata). In *Reproduction of Marine Invertebrates*, vol. 2 (ed. A. C. Giese and J. S. Pearse), pp. 283–319.

This is a review chapter bringing together knowledge of all aspects of acraniate reproduction available up to the data of publication. Some original research is included, including the author's idea of the structure of an amphioxus spermatozoön. There is a comprehensive bibliography.

WILSON, D. P., 1977. The stability during many years of the mid-tidal shore at Penrhyn Bay, North Wales, and a note on the peat beds at Rhos-on-Sea. *Estuarine and Coastal Marine Science*, **5**, 209–213.

Although there is a published statement implying the contrary it is here shown that the shore level at Penrhyn Bay, North Wales, seaward of the shingle slope at the foot of the promenade wall, has not changed appreciably within the last half century and more. This is shown not only by reference to old photographs but is also substantiated by the author's knowledge of this shore and of its major structures, natural and man-made, which have remained virtually unchanged since he first came to know them very well almost 60 years ago. Storms have little effect on the almost level boulder-strewn mid-tidal area and human interference apart there is no reason to anticipate any major change in its topography for many years to come. Similarly, peat beds at Rhos-on-Sea, reported to have long since been lost by erosion, still exist.

WILSON, D. P., 1977. *Modiolus modiolus* (L.) in small mid-tidal rock pools at Penrhyn Bay, North Wales. *Estuarine and Coastal Marine Science*, **5**, 215–222.

The shore at Penrhyn Bay, North Wales is strewn with glacial boulders. Many are of limestone, their surfaces often pitted and hollowed, the hollows often retaining water at low tide. On one particular boulder, at approximately mid-tide level, two such rock pools have been inhabited by *Modiolus modiolus* (L.) continuously, or almost so, since the early 1920s, although the species has only once been found elsewhere on this shore, in similar rock pools nearby. Age and growth rate determinations from the shell valves of a few specimens show that for the first two or three years they grew at much the same rate as a Norwegian sub-littoral population, thereafter markedly slowing down compared with the latter. The ages of the few specimens examined ranged from 10 to possibly 15 years. In these pools the horse-mussels are usually well concealed by seaweeds growing on their shells and are only occasionally found and eaten by predators, presumably birds. Some possible reasons for the presence of horse-mussels in these two pools are suggested, as is the manner in which the populations are maintained.