

ABSTRACTS OF MEMOIRS

RECORDING WORK AT THE PLYMOUTH LABORATORY

DENTON, E. J. & GRAY, J. A. B., 1979. The analysis of sound by the sprat ear. *Nature, London*, **282**, 406-407.

In the acoustico-lateralis systems of vertebrates the individual hair cells are usually polarised in their responses to displacements of the liquid in which they lie, and are often arranged in back-to-back pairs or groups with different polarities. A simple example to investigate, mechanically as well as electrically, is the utriculus of the sprat (*Clupea sprattus* L.). The acoustico-lateralis system of the sprat and other clupeids has two partly gas-filled bony bullae which transform pressure changes into liquid displacements capable of stimulating the sense organs of the ear and lateral line¹⁻³. With its related structures the utriculus is a very sensitive sound-pressure detector which has one population of receptors that respond to the compressions and another that respond to the decompressions of a sound wave. We now give additional evidence that this type of organisation is unlike that of the mammalian cochlea in being specialised more for the detection of phase/time relationships than for frequency analysis.

GATTEN, R. R., CORNER, E. D. S., KILVINGTON, C. C. & SARGENT, J. R., 1979. A seasonal survey of the lipids in *Calanus helgolandicus* Claus from the English Channel. In *Cyclic Phenomena in Marine Plants and Animals: Proceedings of the 13th European Marine Biology Symposium, Isle of Man, 27 September-4 October 1978* (ed. E. Naylor and R. G. Hartnoll), pp. 275-284. Pergamon Press.

Total lipid, lipid class composition, body nitrogen and dry weight of male, female and Stage V *Calanus helgolandicus* Claus from the English Channel were surveyed at approximately fortnightly intervals over 18 months. Similar analyses, including Chlorophyll *a*, were made of the particulate material from the same sea area.

The total lipid levels of males and Stage V animals, which ranged from 20-40 μg /animal in winter to 100-130 μg /animal in summer, were very similar during spring and, at most times of the year, were higher than those of females which ranged from 10 μg /animal in winter to 55 μg /animal in summer. Dry weights varied from 105 to 244 μg (females), 117 to 273 μg (males) and 103 to 246 μg (Stage V), generally reflecting body lipid and nitrogen levels in males and Stage V and body nitrogen levels in females.

Studies carried out during the two spring periods (1977 and 1978) indicated that a high level of lipid in the particulate material was accompanied by a high level of lipid in Stage V: however, at other times of the year there was little correlation between lipid levels in the phytoplankton and the copepods.

Quantitative TLC analysis of lipid classes showed that wax esters remained the dominant class throughout the year in males and Stage V copepods. By contrast, females showed a much more variable lipid composition with wax esters dominant only during midsummer and late autumn, and polar lipids and free fatty acids the main components at all other times.

The results are discussed with particular reference to the relationship between body lipids and development, feeding and reproduction by the animals.

GILLESPIE, J. I., 1979. The effect of repetitive stimulation on the passive electrical properties of the presynaptic terminal of the squid giant synapse. *Proceedings of the Royal Society (B)*, **206**, 293-306.

The resting electrical properties of the presynaptic terminal of the squid giant synapse have been determined by using constant current pulses. After short periods of repetitive stimulation,

the terminal resistance, time constant and capacitance are found to be increased. These changes are absent in terminals bathed in artificial sea water containing no calcium, and sea water containing 5 mM cobalt. It seems likely that these changes are associated with transmitter release.

PAUL, D. H. & ROBERTS, B. L., 1979. The significance of cerebellar function for a reflex movement of the dogfish. *Journal of Comparative Physiology*, **134**, 69–74.

An elevation of the pectoral fin generated reflexly by electrical stimulation of the fin was studied in decerebrate dogfish (*Scyliorhinus*) by recording the electromyogram from the levator muscle. This pectoral fin reflex had two components: a phasic lift of the fin lasting for 70–100 ms, followed by a sustained (tonic) elevation lasting for 500–1000 ms or more. Ablation of the cerebellum resulted in a pronounced depression of the reflex which particularly affected the tonic component. Division of the brainstem at the level of the obex restored both components to the reflex and frequently led to spread of activity to other muscles. It is suggested that in this animal the brainstem generates a powerful tonic inhibitory drive directed at spinal motor circuits and that the cerebellum modulates precisely this inhibitory influence to permit effective and efficient movement.

SOUTHWARD, A. J., 1979. Cyclic fluctuations in population density during eleven years recolonisation of rocky shores in west Cornwall following the 'Torrey Canyon' oil-spill in 1967. In *Cyclic Phenomena in Marine Plants and Animals: Proceedings of the 13th European Marine Biology Symposium, Isle of Man, 27 September–4 October 1978* (ed. E. Naylor and R. G. Hartnoll), pp. 85–92. Pergamon Press.

The large-scale mortalities caused by the toxic dispersants used to clean-up the 'Torrey Canyon' oil-spill were followed by cycles of dominance of a few abundant species which interacted with each other. The dominants, in order of appearance, were: ephemeral green algae: species of *Fucus*; the limpet *Patella vulgata*; and the barnacles *Chthamalus* spp. and *Balanus balanoides*. Return to a more normal pattern of diversity, a small-scale mosaic of competing species of many different age-groups, took 8–10 years or more. Changes in the limpet population during the transition from algal dominance to greater diversity suggest the latter system has greater permanent 'stocking' capacity for grazers. The apparent stability of the open coast rocky intertidal community in Cornwall is illusory, and better regarded as a state of dynamic equilibrium built-up over many years, and easily disturbed by human interference.

TURNER, D. R. & WHITFIELD, M., 1979. The reversible electrodeposition of trace metal ions from multi-ligand systems. Part I. Theory. *Journal of Electroanalytical Chemistry and Interfacial Electrochemistry*, **103**, 43–60.

A general method of treating the reversible electrochemical reduction of metal ions at a mercury surface from a multi-ligand system is described and illustrated by application to electrode systems commonly used in anodic stripping voltammetry. A mathematical definition of electrochemical availability is proposed and compared with current methods of estimating 'electrochemically available metal' in natural waters.

TURNER, D. R. & WHITFIELD, M., 1979. The reversible electrodeposition of trace metal ions from multi-ligand systems. Part II. Calculations on the electrochemical availability of lead at trace levels in seawater. *Journal of Electroanalytical Chemistry and Interfacial Electrochemistry*, **103**, 61–79.

A general method for calculating the electrochemical availability of a trace metal in a multi-ligand system is illustrated by calculations on lead in an artificial seawater. The procedure adopted assumes that the metal is accumulated at a mercury-coated rotating disc electrode during the plating process by the reversible reduction of metal ions. Although uncertainties in the rate constants and

stability constants employed prevent the model from being used predictively, qualitative relationships between chemical speciation and electrochemical availability are discussed. The sensitivity of the calculated electrochemical availability to uncertainties in the stability constants and rate constants and variations in diffusion layer thickness and pH is considered in some detail. The results of the calculations are used to formulate recommendations for the electrochemical analysis of untreated natural samples.