Meetings

Experimental Marine Ecology

A symposium on experimental marine ecology, sponsored by the Graduate School of Oceanography of the University of Rhode Island, was held on the university campus at Kingston on 18 and 19 October. Six members of the University of Rhode Island staff and eight invited lecturers gave talks on various physiological and biochemical properties of organisms which affect their distribution and behavior in nature. About half the papers were concerned with various aspects of temperature and salinity tolerance and with algal nutrition; the others ranged more widely.

John M. Sieburth discussed a marine *Arthrobacter*, a member of a genus of bacteria which has both marine and terrestrial species. The organism in question is psychrophilic and, unlike most so-called psychrophiles, has an optimum growth rate at temperatures below 10°C. Within the general range of 0° to 16°C it is a Gram-negative mycelioid form which grows readily on sea-water agar enriched with yeast extract, dextrose, or trypticase. When it is grown on gelatin and certain other media there are small growth peaks at temperatures above 20°C, and under these conditions there is a remarkable transformation into a Gram-positive coryneform bacterium. Photographs were shown of the breaking up of low-temperature rods into coccoid forms at temperatures of 18° to 26°C. In studies of natural populations, Sieburth has isolated the low-temperature form from temperate waters and the high-temperature type from tropical waters. The latter form can be transformed into the low-temperature form in culture, and it then grows more effectively than at the higher temperature of its tropical habitat.

Carl J. Sinderman reviewed various immunogenetic and biochemical approaches to the study of subpopulations of marine fishes. These included electrophoretic separation of hemoglobins, serum studies, and blood groupings. The studies were successful in determining the geographical distribution of subpopulations, the degree of hybridization where overlap occurs, and in some cases the type of genetic difference, as indicated by ratios of the character in question.

Theodore A. Napora gave an account of experimental studies of oxygen consumption and excretion of phosphate and ammonia by the prawn *Systellaspis debilis* in relation to temperature and pressure. In the Sargasso Sea near Bermuda, where the experimental material was obtained, these prawns normally have a long diurnal migration from a daytime depth averaging about 1100 meters to about 350 meters at night. The migration involves a pressure change of more than 700×10^3 kg/m^2 (1000 lb/in.^{2}) and a temperature change of about 14°C. In preliminary experiments Napora found that most of the animals were killed by a pressure of 1400×10^3 kg/m^2. They were unaffected by 1250×10^3 kg/m^2, equivalent to a depth of about 1200 meters, at temperatures of less than 10°C; 1050×10^3 kg/m^2 was the maximum pressure they could tolerate at higher temperatures. Thus, the maximum limit of diurnal migration is near the limit of pressure that can be tolerated readily. Experiments on oxygen consumption and on excretion were conducted in the laboratory at temperatures of 0° to 20°C and pressures of 0 to 1050×10^3 kg/m^2. Within these limits there was a two- to threefold increase in all rates with an increase in either temperature or pressure. From these results it appears that diurnal migration involves compensation for the effects of increasing depth and pressure and for the decreasing temperature at lower depths, so that the activity of the animals remains essentially constant. This was corroborated by further experiments in which animals were suspended in containers for *in situ* measurements of physiological rates at depths of 350 and 1000 meters. Some biologists have postulated that the adaptive significance of diurnal migration lies in reduction of activity and conservation of food materials by the effects of low temperature at the daytime depth. Present results lend no support to this hypothesis, although clearly there will be variants in the situation, depending upon regional variations in temperature gradients and in extent of vertical migration in different species.

Robert J. Conover discussed the relation of food and nutrition in zooplankton. There is a large literature on experimentally-determined feeding rates and food requirements, which seem to indicate that phytoplankton food is often minimal for the support of animal populations in the sea. One of the difficulties is the extreme variability of phytoplankton. Conover's work demonstrated that large copepods such as *Calanus hyperboreus* are well adapted to make efficient use of brief periods of food abundance. Under such conditions there was rapid and extensive storage of fat of high calorific value (about 10,000 cal/g), and the total increase in weight of the animals due to growth and storage could be as high as 30 to 40 percent of the weight of the food ingested. Conversely, well-fed animals were able to survive starvation for as long as 80 days with only slight (8 percent) loss of body protein.

Conover also reviewed information indicating that the phytoplankton food supply in the sea is amply supplemented by nonliving particulate organic matter. The latter was regarded, until recently, as being largely detritus of uncertain but probably minimal food value. However, it has now been demonstrated that particulate matter is formed in abundance by adsorption of dissolved organic matter on the sea surface and on submerged bubbles (*1*), and that this material is adequate food for animals (*2*).

Gordon A. Riley presented an introductory talk of general character on the role of basic sciences in ecology, which also contained information on the particulate organic matter discussed by Conover. Data are becoming available on the natural occurrence and distribution of this material (*3*). Biochemical study of the particulate matter is in a preliminary state, but polypeptides appear to be an important constituent. The dissolved organic matter in the sea is produced by a variety of biological processes, including secretion by grow-

ing phytoplankton. Pure cultures in artificial sea water are being used to study the secretion process and experimental conversion of the material to particulate matter.

Peter J. Wangersky has recently demonstrated that particulate matter can be produced experimentally by bubbling air through artificial sea water containing traces of amino acids. The material so formed has a molecular weight in excess of 3500 and appears to be true polypeptide. In considering the organic syntheses that may have preceded the origin of life, earlier work by Miller and Abelson has shown that production of amino acids from inorganic materials is feasible under supposedly "natural" conditions, but further synthesis to polypeptides has been accomplished only with large concentrations of materials and at relatively high temperatures. Thus, Wangersky's experiment, which incidentally is effective only in a salt solution and yields negative results with an amino acid solution in distilled water, is of very considerable interest.

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References

1. W. H. Sutcliffe, E. R. Baylor, D. W. Menzel, *Deep-Sea Res.* **10**, 233 (1963).
2. E. R. Baylor and W. H. Sutcliffe, *Limnol. Oceanogr.* **8**, 369 (1963).
3. G. A. Riley, *ibid.*, p. 372.

Forthcoming Events

January

19–24. **American Chemical Soc.**, 146th natl. meeting, Denver, Colo. (ACS, 1155 16th St. NW, Washington, D.C.)

20–15. Commission for **Aeronautical Meteorology**, World Meteorological Organization, 3rd, Paris, France. (WMO, 41 Ave. Giuseppe-Motta, Geneva, Switzerland)

20–22. American Inst. of **Aeronautics and Astronautics**, aerospace sciences mtg., New York, N.Y. (R. R. Dexter, AIAA, 2 E. 64 St., New York 21)

20–23. **Cardiovascular Drug Therapy**, symp., Philadelphia, Pa. (S. Rosen, Dept. of Medicine, Hahnemann Medical College and Hospital, 230 N. Broad St., Philadelphia 2)

20–24. **American Mathematical Soc.**, Miami, Fla. (AMS, 190 Hope St., Providence 6, R.I.)

20–24. **Australian and New Zealand Assoc. for the Advancement of Science**, Canberra (J. R. A. MacMillan, Faculty of Agriculture, Univ. of Sydney, N.S.W., Australia)

20–27. **Agricultural Film Competition**, 3rd intern., Berlin, Germany. (Congress Hall, John Foster Dulles Allee, Berlin N.W. 21)

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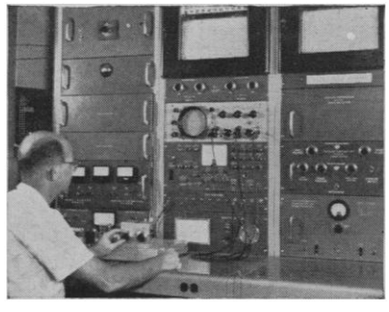

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