

influenced by the replacement of herring by pilchard, which has apparently led to increased stocks of pelagic fish, and perhaps a higher level of predation throughout the year. It is suggested that the plankton production cycle may have become slightly smoother, and possibly a little more efficient, with less 'wastage' to the bottom-fauna, the biomass of which may also have suffered indirectly from the increased stocks of pelagic fish.

Some theories consider that the decline in winter maximum of phosphate-phosphorus that was observed in the 1920-1930's represented a loss of fertility of the sea water, and was therefore the cause of the decline in herring and macroplankton. Such theories, of course, do not explain the other biological changes, and an alternative explanation is that the lower phosphate maxima are merely indices to the changed biological system, the difference being in circulation in the organisms, with less returning to solution each winter. This does not imply a lower level of primary production, which is not necessarily closely related to the winter phosphate content of the water.

At the moment we cannot determine the extent to which the difference in winter phosphate is directly connected with increased stocks of pilchard, as suggested in other theories. All the hypotheses suffer from lack of basic data, and only further work or further changes will show which if any is the correct solution of the problem.

SOUTHWARD A. J. and E. C. SOUTHWARD, 1963. Notes on the biology of some Pogonophora. *J. Mar. Biol. Ass., U.K.*, 43 (1): 57-64.

Observations have been made on living pogonophores obtained from the continental slope to the south-west of the British Isles and from the continental shelf off the west coast of Ireland.

The blood of five species examined contains haemoglobin in solution. The tube appears to be freely permeable to water, but less so to electrolytes and small molecules.

The appearance and behaviour of living embryos is noted and the spermatozoon of one species figures. Possible feeding and other behaviour is discussed and it is concluded that the best line of future investigation lies with the shallow-water forms found in the Arctic Ocean.

SRIDHARAN PILLAI R., 1961. Studies on the shrimp *Caridina laevis* (Heller). III. The respiratory system. *J. Mar. Biol. Ass. Ind.*, 3 (1 and 2): 137-145.

The morphology and anatomy of the branchiae are described. The mechanism and course of the respiratory current were studied. The flattened exopod of the first maxilliped has no function other than closing the prebranchial cavity from below. The branchial circulation, studied in living animals is quite different from that postulated by Patwardhan (1937) in *Palaemon*. An attempt was made to study the functional role of nephrocytes by blacking them with India ink. An apparatus for the study of the relation between oxygen pressure of the water and the numbers of scaphognathite beat was devised. For any particular pressure, variation in the frequency of the beat was observed in different animals and even between two animals of the same sex at the same stage of development, collected from two different environments. Suggestions are given for these variations.

STEELE J. H., J. R. BARRETT and L. V. WORTHINGTON, 1962. Deep currents south of Iceland. *Deep-Sea Res.*, 9 (5): 465-474.

Direct current measurements with neutrally-buoyant floats and routine hydrographic observations were made south of Iceland to study the deep current resulting from overflow of Norwegian Sea water into the Atlantic. The highest velocities (20-30 cm/sec) were found close to the continental slope. Calculations of volume transport combined with T-S analyses indicated that the total transport of $5.4 \cdot 10^6$ m³/sec contained only $1.4 \cdot 10^6$ m³/sec of 'pure' Norwegian Sea water and the remainder of the flow was formed by entrainment of 'Atlantic' water into the current.

STUMPF F. B. and P. M. KENDIG, 1963. Determination of the power radiated by a piston-like under-water sound transducer from near field axial pressure measurements. *J. Acoust. Soc. Amer.*, 35 (2): 254-255.

This letter describes a method for obtaining the acoustic power radiated from a piston-like under-water sound transducer, where only near-field measurements are possible due to boundaries. This method can be applied, for example, in the determination of the power radiated from underwater sound transducers being calibrated in small pressure tanks. It involves measurements of the acoustic pressure along the axis of the source.

SUGAWARA K., K. TERADA, S. KANAMORI, N. KANAMORI and S. OKABE, 1962. On different distribution of calcium, strontium, iodine, arsenic and molybdenum in the north-western Pacific, Indian and Antarctic Oceans. *J. Earth Sci., Nagoya Univ.*, 10 (1): 34-50.

1. Calcium, strontium, iodine, arsenic and molybdenum were determined in sea water samples collected at more than 200 stations in the northwestern Pacific, Indian and Antarctic Oceans by the Japanese teams which participated in the Norpac, Equapac and Antarctic Expedition programmes and other expeditions.

2. At a number of the northwestern Pacific Oceans the vertical distribution of these elements was determined, while in other ocean areas only surface samples were obtained. Naturally comparison was made of the surface distribution of the elements in question.

3. It was found that the values obtained for each of these elements differ to a smaller or greater

degree from one sea area to another and the differences chemically characterize the three Oceans : the northwestern Pacific, Indian and Antarctic.

TAKANO K., 1962. Circulation generale permanente dans un ocean. *Rec. Oceanogr. Wks., Jap., n.s.*, 6 (2): 59-155.

Le présent mémoire est consacré à l'étude théorique de la circulation générale permanente dans un océan, établie par la force d'entraînement du vent et la variation de la densité à la surface, entretenue par la chaleur que reçoit effectivement la surface de l'océan. On suppose que les équations du mouvement soient linéarisées, que les coefficients de frottement turbulent et de diffusion turbulente soient constants partout et que la profondeur de l'océan soit également constante. Dans le chapitre I^{er} il est montré que se trouve faible l'effet de la précipitation de l'évaporation et des échanges thermiques à la surface sur l'équation de continuité qui est fréquemment utilisée dans la théorie relative au transport de masse (intégrale de la vitesse horizontale depuis la surface jusqu'au fond) et que les courants de convection ne produisent pratiquement aucun transport de masse, à condition que le frottement soit nul au fond. Le chapitre II présente un modèle de la circulation dans un océan rectangulaire, en négligeant tous les termes non linéaires dans l'équation de densité. La composante méridienne des courants de convection établis par la variation de la densité donnée a priori à la surface se trouve aussi intensifiée le long de la frontière est que le long de la frontière ouest. L'intensification ouest n'a pas lieu d'une manière satisfaisante. Il se manifeste ainsi un net désaccord entre la réalité et le résultat théorique. Dans les chapitres suivants, je tiens compte d'un des termes non linéaires dans l'équation de densité, en remplaçant le gradient vertical de la densité par une constante. Ce remplacement s'appuie sur l'hypothèse : la stabilité verticale ne s'écarte pas trop d'une constante donnée comme stabilité verticale fondamentale. Dans le chapitre III, j'obtiens ainsi une solution dans un canal de longueur indéfinie et précise le rôle joué par la stabilité verticale fondamentale. La condition cinématique au fond a de l'importance capitale. Le chapitre IV montre que les courants superficiels établis par la force du vent ne sont pas essentiellement importants, au moins dans un océan de longueur indéfinie, à la distribution de la densité en surface et qu'elle est déterminée principalement par la quantité de chaleur que reçoit effectivement la surface de l'océan. Dans le dernier chapitre je construis un modèle de la circulation générale dans un océan rectangulaire toujours stabilisée par une stabilité verticale fondamentale, en supposant que le frottement soit nul au fond. Il semble que, contrairement à l'idée courante, la force d'entraînement du vent ne soit pas indispensable pour obtenir l'aspect général de la circulation réelle, sauf dans la région équatoriale; par exemple, le Kuroshivo et le Gulf Stream sont dûs principalement aux courants de convection, le courant se dirige vers l'équateur au-dessous du Kuroshivo ou du Gulf Stream, toujours grâce aux courants de convection, et l'ordre de grandeur de leur vitesse théoriquement obtenues s'accorde bien avec celui de la vitesse mesurée. La comparaison des résultats théoriques avec les observations permet de mettre en évidence l'importance capitale des courants de convection dans la circulation générale. Il paraît que la supériorité du vent est tombée.

TAKAHASHI T., 1962. Temperature and humidity profiles over the sea. *J. Oceanogr. Soc., Jap.*, 20th Ann. Vol.: 257-264.

Observed data of temperature and vapour pressure at five levels above the sea surface up to the 400 cm, obtained at Kagoshima Bay during 1953-1956, were analysed. Assuming that the logarithmic profile of the average gradient of temperature within the layer observed, increases (in absolute value) with increasing absolute difference of temperatures between 400 cm and the sea surface, the specific gradient, defined here by the average gradient divided by the absolute difference between numerical values at 400 cm and at the sea surface, decreases with increasing instability, except for the humidity gradient under neutral and stable conditions. The deformed temperature profile, showing a weaker gradient in the upper part and stronger in the lower part than the logarithmic profile, is attributed to the effect of the increasing progressive time of sweeping over the sea surface from the coast and the deforming effect is intensified with increasing instability; while the deformed humidity profile showing similar character seems to be attributed mainly to the unstable condition. Applying the $-1/3$ power law of profile for the unstable condition, slightly better agreements with the observed profile can be found than is the case with the logarithmic law. These agreements are hardly acceptable because of exceptions including the serious case with calms.

TANNER W. F., 1963. Spiral flow in rivers, shallow seas, dust devils and models. *Science*, 139 (3549): 41-42.

Spiral flow has been observed in meandering rivers, braided rivers, very shallow sea water, model experiments, and dust devils. Experimental work also produced standing spiral waves and spouts of water. Many observed spirals reversed direction from time to time. Geometry of the system, roughness, and turbulence are perhaps dominant in the control of spiral flow.

TERAMOTO T., 1963. Simple tsunami-recorder. *J. Oceanogr. Soc., Jap.*, 20th Ann. Vol.: 251-256.

A shore-based tsunami-recorder constructed with U-Tubes and capillary tubes is described. No underwater array is necessary for a conducting tube. This instrument can be operated in parallel with a tide gauge and seasonal sea level meter, both of which are of similar type with a common conducting tube. It is not difficult to make them work at more than 10 m above the sea surface with a simple attachment, but with the output signal reduced. The calibration is simple.