Description of Observations

SIGNIFICANCE OF REPORTED OCEANOGRAPHIC DATA

Routine field measurements of oceanographic parameters by conventional methods are usually subject to at least the following random errors:

- **depth**: ±4 m (in the upper 1000 m)
- **temperature**: ±0.02°C
- **salinity**: ±0.03‰
- **oxygen**: ±0.04 ml/L
- **phosphate**: ±0.05 to 0.1 µg at/L

A recent analysis of the precision of field measurements of temperature and salinity is that of Wooster and Taft (1958). It should be noted that the above estimate of salinity precision refers to analyses by Knudsen titration.

Interpolated values at standard depths are known with less precision, and the resulting uncertainty in specific volume anomaly and thermosteric anomaly at standard depths due to random errors in field measurements of temperature, salinity and depth is of the order of three centiliters per ton. Therefore, in this publication series it is the practice to report specific volume anomaly and thermosteric anomaly to no more than one part in 10^6 (one cl/ton) and geopotential anomaly to no more than the nearest dynamic centimeter.

It should be noted also that computations of salinity (from measured chlorinity) and density (σ-t, specific volume anomaly and thermosteric anomaly) reported in this volume have all been based on the empirical equations and tables by Knudsen (1901) and Eckman (1908). Because of the inadequacy of our present knowledge of the equation of state of sea water (Eckart, 1958) and the uncertainty of the relationship between chlorinity and salinity (Carritt and Carpenter, 1959), it is possible that these computed values differ systematically from the absolute values. However, in the upper thousand meters at least, Reid (1959) has shown that the influence of such systematic errors on the accuracy of computed geostrophic flow is significantly smaller than the influence of errors in the determination of temperature, salinity, pressure and position.

NOTES ON PARTICULAR CRUISES

California Cooperative Oceanic Fisheries Investigations

All of the CCOFI salinity samples, except those collected on Cruise 5312, were titrated by an automatic device which determined the end points by measuring electrical potential. Random errors were higher than in manual titration. When the 197 samples of an entire cruise were titrated a second time the root-mean-square difference was about 0.050%; the mean difference was 0.0091‰. On Cruise 5312 the nominal accuracy of ±0.025‰ was achieved.

Magdalena Bay Cruise

This cruise was made by RV Paolina-T concurrently with CCOFI Cruise 5307, but it has been given a separate designation because the purpose of the cruise was primarily biological in nature and much of the work was done close to shore. Serial temperature, salinity and phytoplankton data were collected in Magdalena and Almejas Bays in conjunction with the marine life observations.

Expedition Transpac

The RV Spencer F. Baird steamed nearly 15,000 miles for almost five months in the North Pacific Ocean and deep Bering Sea during Expedition Transpac. The main scientific program of the expedition was a study of the relationship between the major circulation features of the North Pacific, the distribution of physical and chemical properties, and the distribution of plankton and nekton.

Cruises HMS-20 and HMS-21

No correction of depths for Cruise 20 of RV Hugh M. Smith has been necessary since no error was made in the original computations at the time of processing. However, the data collected on Cruise 21 have been corrected for an error in depth calculation reported by Thomas S. Austin (1962). (This error had been made in the calculation of all data of the RV Hugh M. Smith and RV Charles H. Gilbert reported in Special Scientific Reports, U. S. Fish and Wildlife Service, Fisheries Nos. 168, 180, 201, 217, 238, 252, 315, 358 and part of 164.) The recalculations of the HMS-21 data were made through the facilities of the IGY World Data Center A, Oceanographic Archive, Agricultural and Mechanical College of Texas. Interpolation for values at standard depths was performed by a machine program that fitted a parabola to the four observed values surrounding the desired standard depth (two above and two below), to pass through the two inner observed values and to be a least-squares fit to the two outer observed values. Re-editing by the Bureau of Commercial Fisheries, Honolulu, of these machine calculations was done by comparing them with characteristic curves and then making adjustments for any peculiarities introduced by the machine interpolations where points were widely scattered.
USCGSS Pathfinder and USCGSS Pioneer Cruises BB-26, BB-29, BB-31 and BB-33

The interpolation for values at standard depths and determination of calculated depths were carried out by machine programs at the U. S. Naval Oceanographic Office, Washington, D. C. Interpolations were made by the three-point Lagrange method (U. S. N. Hydrogr. Off., 1960; Nat. Oceanogr. Data Center, 1962).

Interpolation of values at standard depths was performed by the IBM Type 650 Magnetic-Drum Data-Processing Machine in the Research Computer Laboratory of the University of Washington, using the three-point Lagrange curve based upon one point above and two points below the desired depth. Corrections were made for any peculiar interpolations which resulted from use of this method in the upper layers.