

REPORT ON OCEANIC SURVEY IN THE WESTERN PART OF THE NORTH PACIFIC CARRIED OUT BY H. I. J. M. S. "MANSYU" FROM APRIL 1925 TO MARCH 1928.

(Abstract communicated by the Japanese Hydrographic Department, Tokyo, 1932).

During the three years from April 1925 to March 1928, H. I. J. M. S. *Mansyu* was engaged in the oceanographical observations in the western part of the North Pacific Ocean. The principal object in view was to study the ocean currents in this region where it is well known that the Japan stream prevails throughout the year, but little is known about the feature of that stream.

The works carried out were the determination of the temperature and salinity of the sea water and the direct observation of the ocean currents, and in addition, many soundings were obtained by deep sea sounding machine.

The *Mansyu*, the former *Manchuria*, was built in Genoa dockyard in about 1900, and her displacement is some 4000 tons. Since she was first commissioned as a man of war in 1904, services as a special transporter or submarine depot ship were her principal duties, and for about recent ten years she was employed from time to time as a surveying ship. For the oceanographical observations, she was equipped with the latest devices such as two SIGSBEE'S deep sea sounding machines and two THOMSON'S sounding machines, both driven by electric motor.

From the beginning of the observation to November of the second year the ship was under the command of Captain R. SIGEMATU. During this period Hydrographic Assistant Engineer S. SUZUKI joined in the oceanographical works. All kinds of observations, especially the measurement with thermometer and hydrometer, were accomplished by his ability. Since December, 1926, to the time when the work was at an end the ship was under the command of Captain H. SATO, while Mr. S. SUZUKI continued his work on board till September, 1927.

TEMPERATURE AND SALINITY.

The surface temperature was observed with KAMIYA'S water bottle and ordinary thermometer. Temperature of sub-surface layer was observed with KITAHARA'S insulating water bottle and the ordinary thermometer.

The KITAHARA'S insulating water bottle could not be perfectly protected from temperature-changes while being hauled up to the surface, therefore these readings have been corrected for the temperature-change of water,

investigating thermal conductivity of the bottle and also the adiabatic change of water in that bottle. Of these observations, those obtained from the beginning to July of the first year, however, have not been subjected to such corrections, but these have been corrected by comparison with the reading of the reversing thermometer for the locality in question.

Salinity was determined by means of chlorine titration in the laboratory of the Oceanographical Service in the Imperial Fisheries Institute, Tokyo, and all samples were also tested by means of AKANUMA'S hydrometer in the temporary laboratory on shore while the ship was at anchor. Comparing these results of the two kinds of determination we found some difference rather systematic. This difference seems to arise chiefly from the inaccuracy of determining specific gravity by hydrometer, and therefore, when the salinity was derived from specific gravity by AKANUMA'S hydrometer, we adopted the difference in neighbouring station for the correction.

OCEAN CURRENTS.

Information regarding surface currents can be obtained by means of the drift of a current float. The current float was made of a bamboo-pole and crossed wooden blades, and was kept vertical by weight so as to give the current at about 4 metres below the sea surface. Sub-surface currents were observed with the EKMAN-MERZ strong-current meter.

Two methods of observing sub-surface currents were used, viz., (1) the observation on a boat anchored, (2) the observation on board ship drifting freely under wind and current. In the first method, the reading of the current meter gives the velocity of current directly, but in the second method we measure the current of the observed layer relative to the drifting ship.

The determination of ship's drift by land objects is very favourable near the coast, but this cannot be applied in mid-ocean. The determination of ship's drift by astronomical observations is not favourable when the distance to be measured is too short, on account of inaccuracy. On the other hand, the velocity of current at the depth of about 800 metres below the surface was found to be practically zero in the western part of the North Pacific, and that of about 400 metres depth to be generally so in the tropical region, so that the observed relative velocity at these depths gives the velocity of the drifting ship. From the ship's velocity thus obtained and the observed relative velocity of the current at a certain depth we can determine the actual velocity at that depth.

The results of current observations of this kind are tabulated in the report as the following example :

St. 191, XI-14-1925, Lat. 29° 55' N., Long. 132° 21' E., wind NW 4-5 m/s, Mag. Varn. 4° W.

No	Time -9 Z.T.	OBSERVED RELATIVE VELOCITY.		Depth.	SUB-SURFACE CURRENT (600 m. ZERO)		REMARKS.
		Direction	Magnitude		Direction	Magnitude	
1	13 h. 25 m.	310°	0.89 kt.	50 m.	345°	0.55 kt.	1. Sub-surface currents are determined with the ship's drift assuming velocity at 600 metres depth to be zero. 2. All directions of current are magnetic. 3. No of current meter 38A.
2	13 39	300	1.04	100	325	0.60	
3	13 47	311	1.01	200	340	0.66	
4	13 59	306	0.87	300	340	0.50	
5	14 03	288	0.79	400	314	0.30	
6	14 30	274	0.54	600	—	0	

SOUNDINGS.

During the three years of the oceanographical observation, the *Mansyu* obtained about 770 soundings. The results are tabulated in Part 3 of the Report. They are inserted in the new or revised charts and bathymetric chart published by the Japanese Hydrographic Department.

The classified number of soundings with regard to depth is as follows :

Soundings of less than 1000 metres	66
from 1000 to 2000 »	60
from 2000 to 3000 »	99
from 3000 to 4000 »	133
from 4000 to 5000 »	179
from 5000 to 6000 »	180
from 6000 to 7000 »	42
from 7000 to 8000 »	6
from 8000 to 9000 »	3
over 9000 »	4

Of these soundings, the following table gives some remarkable depths recorded :

Station.	Date.	Depth.	Lat. N.	Long. E.	Region.
154	X - 3 - 1925	9814	11°13'5	142°09'5	S. W. of Guam.
628	XII - 4 - 1927	9818	11°13'	142°09'5	» » »
419	X - 22 - 1926	7575	23°02'	144°57'5	S. E. of Ogasawara.
425	X - 25 - 1926	9435	30°49'	142°18'	N. » »

Mr. S. HANZAWA, of the Tōhoku Imperial University, Sendai, joined in the oceanographical works during the periods from September to October 1925, May to July 1927 and last voyage to the South Sea Islands, for study of marine deposits. His preliminary report on marine deposits is published in the *Records of the Committee on Oceanography* of the National Research Council of Japan for 1928.

Mr. K. Itō, of the Fishery Department, Tokyo Imperial University, was engaged in some researches on board the *Mansyu* in summer 1926 and studied hydrogen-ion concentration and oxygen gas content in sea water. The results of his research are published in the *Records of the Committee on Oceanography* of the National Research Council.

Many samples of plankton were collected in many stations of the observed area, and sent to Oceanographical Service, Imperial Fisheries Institute, Tokyo, for investigation.

