COMMONWEALTH OF AUSTRALIA

Commonwealth Scientific and Industrial Research Organization

Division of Fisheries and Oceanography

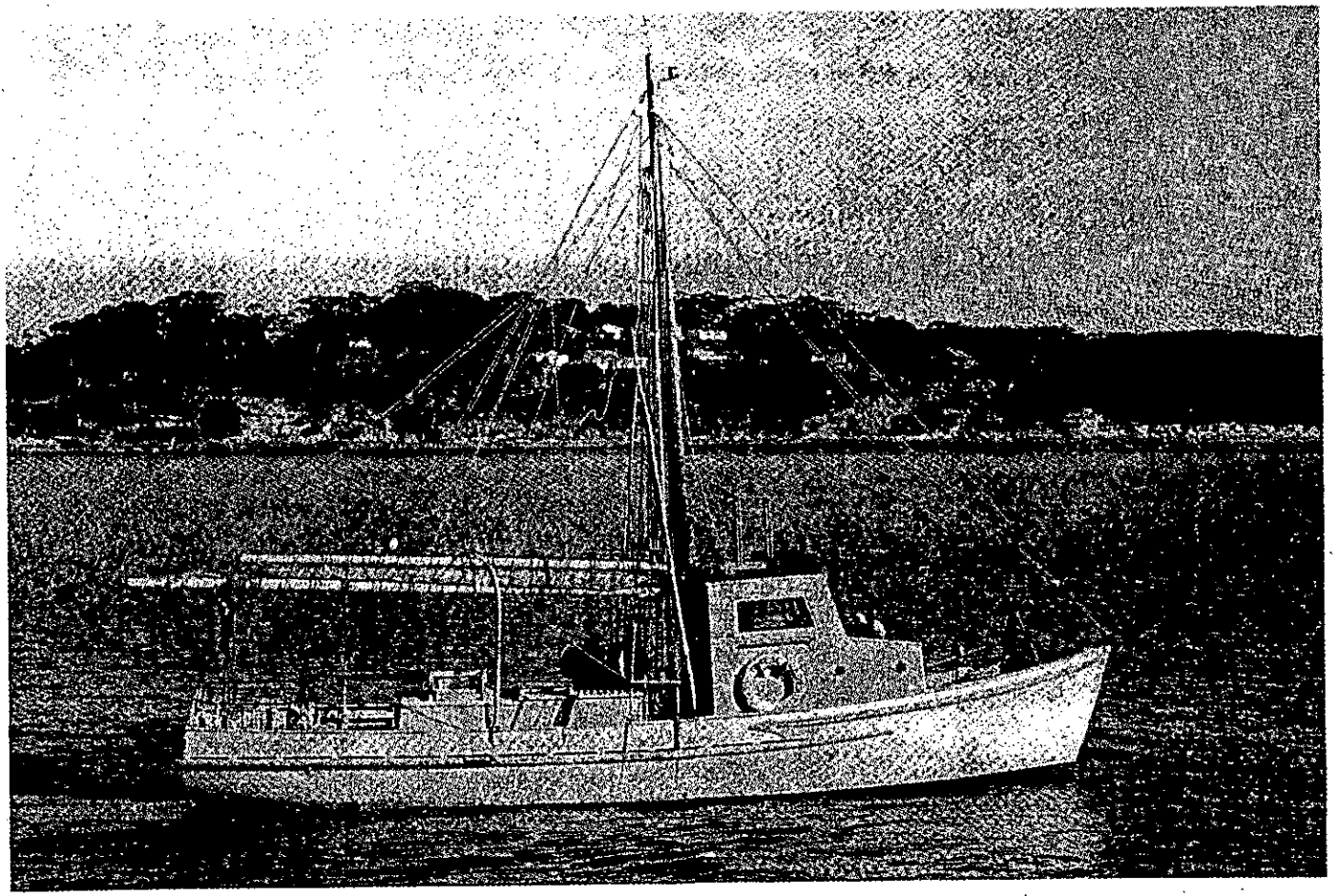
REPORT 22

F.R.V. "MARELDA"

Scientific Report of Cruises
July 1957 - May 1958

By J. P. Robins

Marine Biological Laboratory
Cronulla, Sydney
1958



F.R.V. *Marelda.*

DIVISION OF FISHERIES AND OCEANOGRAPHY

REPORTS

1. Thomson, J.M. (1956).- Fluctuations in catch of yellow-eye mullet Aldrichetta forsteri (Cuvier and Valenciennes) (Mugilidae).

2. Nicholls, A.G. (1957).- The Tasmanian trout fishery. I. Sources of information and treatment of data. (For limited circulation: not available for exchange).

3. Nicholls, A.G. (1957).- The Tasmanian trout fishery. II. The fishery of the north west rivers. (For limited circulation: not available for exchange).

4. Chittleborough, R.G. (1957).- An analysis of recent catches of humpback whales from the stocks in Groups IV and V. Prepared for the International Commission on Whaling.

5. F.R.V. "Derwent Hunter" Scientific Reports of Cruises DH3/56, DH4/56, DH5/56.

6. Cowper, T.R., and Downie, R.J. (1957).- A line fishing survey of the fishes of the south-eastern Australian continental slope.

7. Davis, P.S. (1957).- A method for the determination of chlorophyll in sea-water.

8. Jitts, H.R. (1957).- The ^{14}C method for measuring CO_2 uptake in marine productivity studies.

9. Hamon, B.V. (1957).- Mean sea level variations on the east Australian coast.

10. Nicholls, A.G. (1957).- The Tasmanian trout fishery. Part III. Rivers of the north and east. (For limited circulation: not available for exchange).

11. Nicholls, A.G. (1957).- The population of a trout stream and the survival of released fish. (For limited circulation: not available for exchange).

12. F.R.V. "Derwent Hunter" Scientific Report of Cruise DH6/56.

13. Chau, Y.K. (1957).- The coastal circulation of New South Wales from drift card results 1953-56.

14. Kott, Patricia (1957).- Zooplankton of East Australian waters 1945-54.

15. F.R.V. "Derwent Hunter" Scientific Report of Cruises DH1/57 - DH4/57.

16. Rochford, D.J. (1958).- The seasonal circulation of the surface water masses of the Tasman and Coral Seas.

17. Chittleborough, R.G. (1958).- Australian catches of humpback whales 1957. Prepared for the International Commission on Whaling.

18. Australian documents prepared for the UNESCO Conference on the oceanography of the Tasman and Coral Seas held at Cronulla August 9-14, 1958.

19. F.R.V. "Derwent Hunter" Scientific Report of Cruises, DH5/57 - DH8/57.

20. F.R.V. "Derwent Hunter" Scientific Report of Cruises, DH9/57 - DH12/57.

21. F.R.V. "Derwent Hunter" Scientific Report of Cruises, DH13/57 - DH16/57.

22. F.R.V. "Marelda" Scientific Report of Cruises July 1957 - May 1958; by J.P. Robins.

F.R.V. "MARELDA"

Fisheries Research Vessel "Marelda" is the Division's research vessel based on Eden on the far south coast of New South Wales.

The specifications of the vessel are: overall length 36 ft. waterline length 29 ft. 6 in. beam 12 ft. 8 in. draft 4 ft. 2 in. forard and 5 ft. 3 in. aft.

Her main engine is a Gardner marine diesel model 4LW rated at 48 h.p. at 1200 r.p.m. and fresh water cooled; the auxiliary engine is an air cooled 5 h.p. Coventry Victor. She is rigged with an auxiliary mainsail and foresail.

The vessel is fitted with a swivel-based 5 h.p. Cummins oleodraulic winch which is used for hydrological and planktological purposes and can also be used in test longlining for tuna. A counter drive shaft, which may be driven by either the main or auxiliary engine, drives the bilge pump, bait tank pump, 12 and 24 volt generators, and hydraulic pump for driving winch.

A tank for holding livebait is used in conjunction with polefishing for tuna.

A Kelvin Hughes Fisherman's Asdic was installed in August 1958, and the vessel carries a transceiver with four transmitting frequencies. Surface temperatures are recorded on a Negretti and Zambra Thermograph, graduated from 0°C-30°C.

To date, the vessel has been maintained and operated by one man, R. Greig, who, at various times, has been accompanied on sea trips by the officer responsible for the programme.

The vessel collects data, both biological and hydrological, for ecological studies of the seasonal occurrences of tuna along the southern coast of New South Wales.

In citing this report, abbreviate as follows:
C.S.I.R.O. Aust. Div. Fish. Oceanog. Rep. No. 22.

F.R.V. "MARELDA"

SCIENTIFIC REPORT OF CRUISES JULY 1957 - MAY 1958

GENERAL

Prior to July 1957 tuna trolling traverses were carried out as often as weather conditions etc. permitted. From July 1957 to May 1958 a weekly traverse to 24 miles E.N.E. of Eden was made. Along this traverse line stations at four mile intervals (Fig. 1) were occupied and sea-water samples were collected at predetermined depths down to a maximum of 500 m (C.S.I.R.O. (1958)).

Plankton hauls with a Clarke-Bumpus sampler were made at the 16 miles and 24 miles stations.

During the period of investigations 710 southern bluefin tuna (Thunnus maccoyii), 171 striped tuna (Katsuwonus pelamis), 32 albacore (Thunnus germo), 5 yellowfin tuna (Neothunnus macropterus), 15 bonito (Sarda australis), 2 narrow barred Spanish mackerel (Cybium commersoni), 2 mackerel tuna (Euthynnus alletteratus), and 500 barracouta (Thyrsites atun) were caught by trolling.

Length and weight measurements were made on all fish caught except 267 southern bluefin tuna, which were tagged, measured for length only, and then released.

HYDROLOGY

Temperature and chlorinity values were measured on all water samples collected during the period July 1957 to May 1958 (C.S.I.R.O. (1958)).

By using the chlorinity and temperature properties defined by Rochford (1957, 1958) to identify regional water mass types, an attempt has been made (Fig. 2) to reconstruct the seasonal environmental change along the traverse lines for the period July 13, 1957 to May 5, 1958. It is possible however, that slight modification of these properties for typing water masses in this southern New South Wales region will have to be made.

It will be seen that the sequence of seasonal change closely follows that shown by Rochford (1958) for this general southern region.

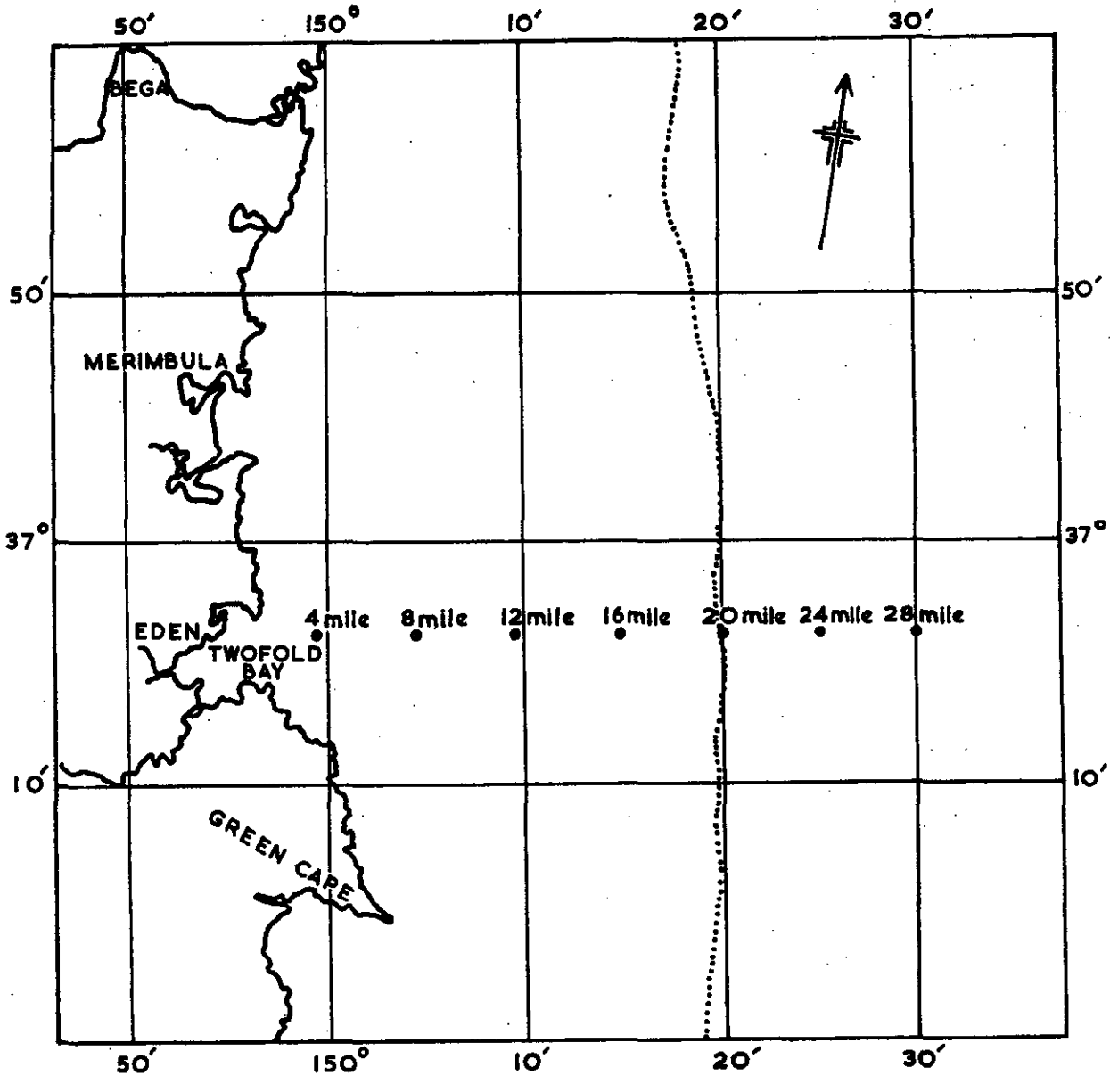


Fig. 1.- Traverse line and station positions to 24 E.N.E. of Eden.

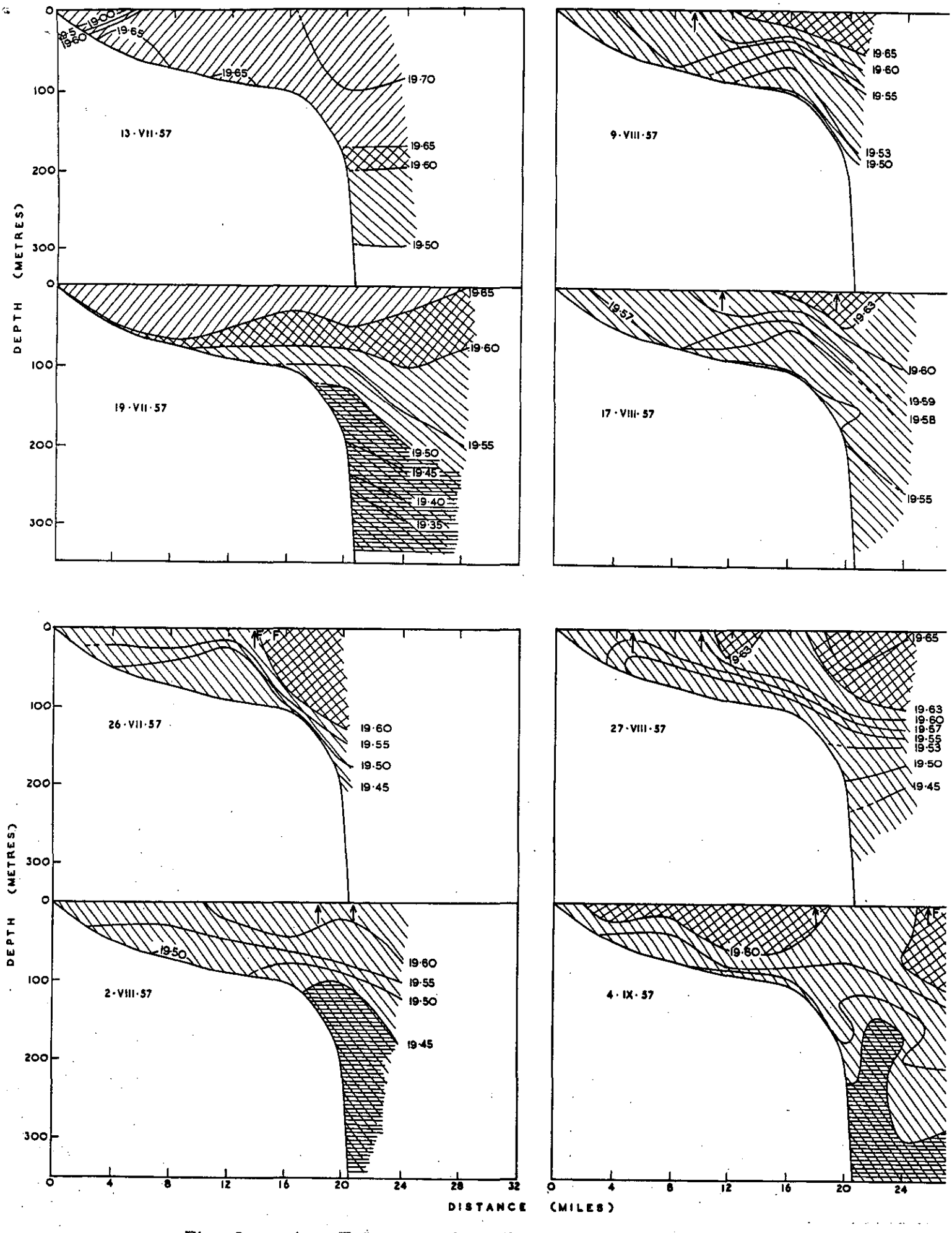


Fig. 2, p. 1.- Water mass distribution on section line to 24 miles E.N.E. of Eden for the period 13.vii.57 - 4.ix.57.

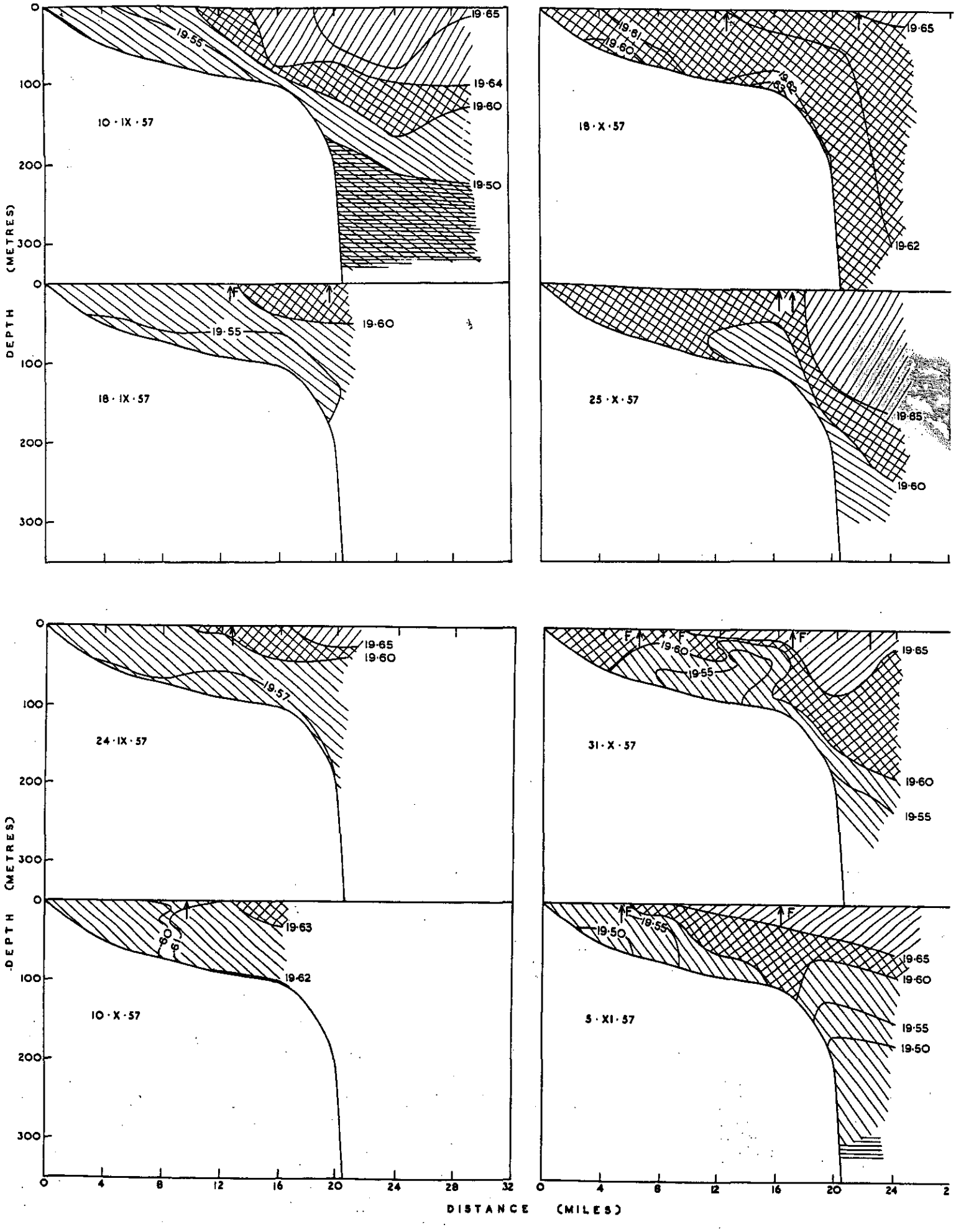


Fig. 2, p. 2.- Water mass distribution on section line to 24 miles E.N.E. of Eden for the period 10.ix.57 - 5.xi.57.

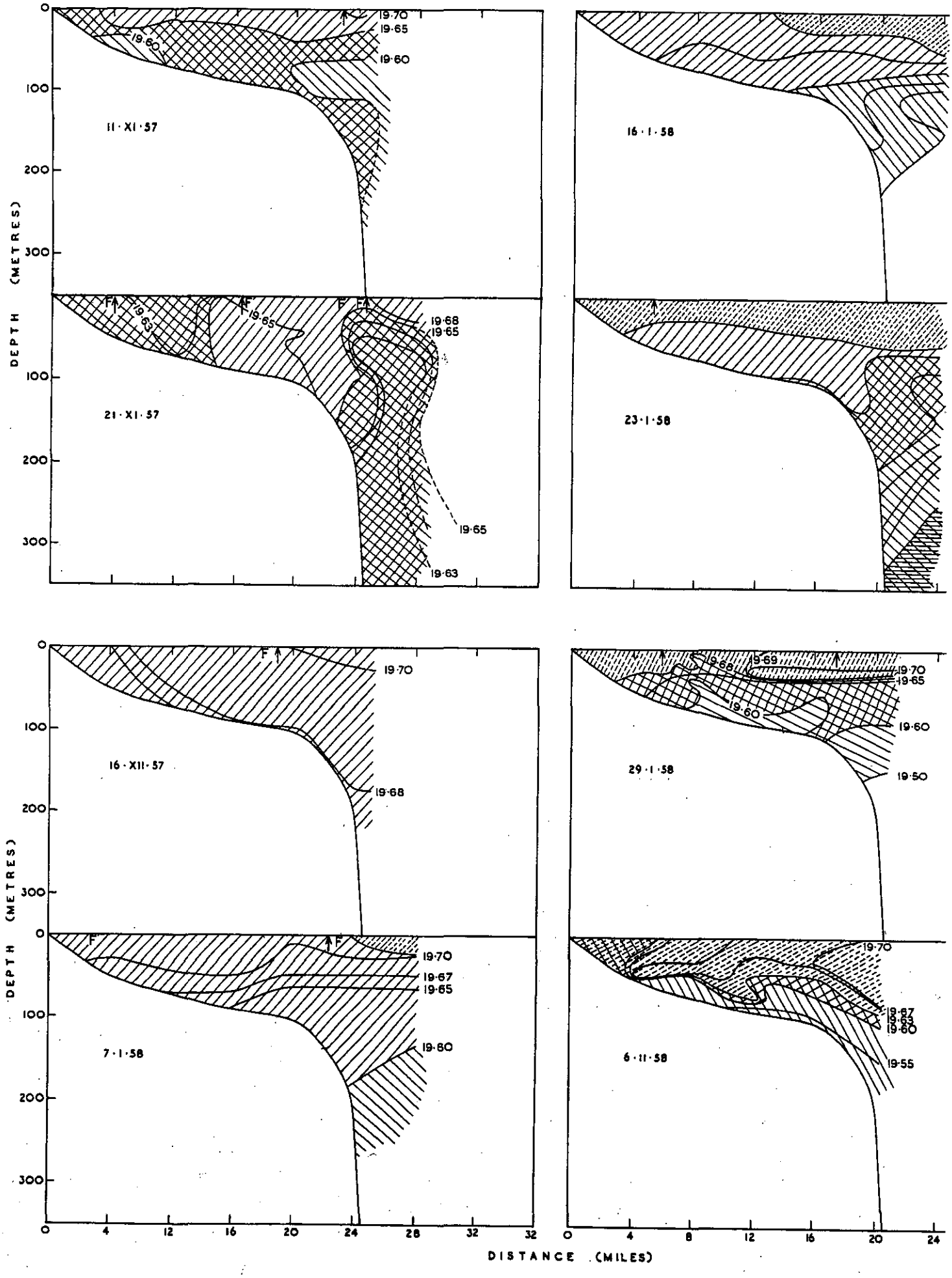


Fig. 2, p. 3.- Water mass distribution on section line to 24 miles E.N.E. of Eden for the period 11.xi.57 - 23.i.58.

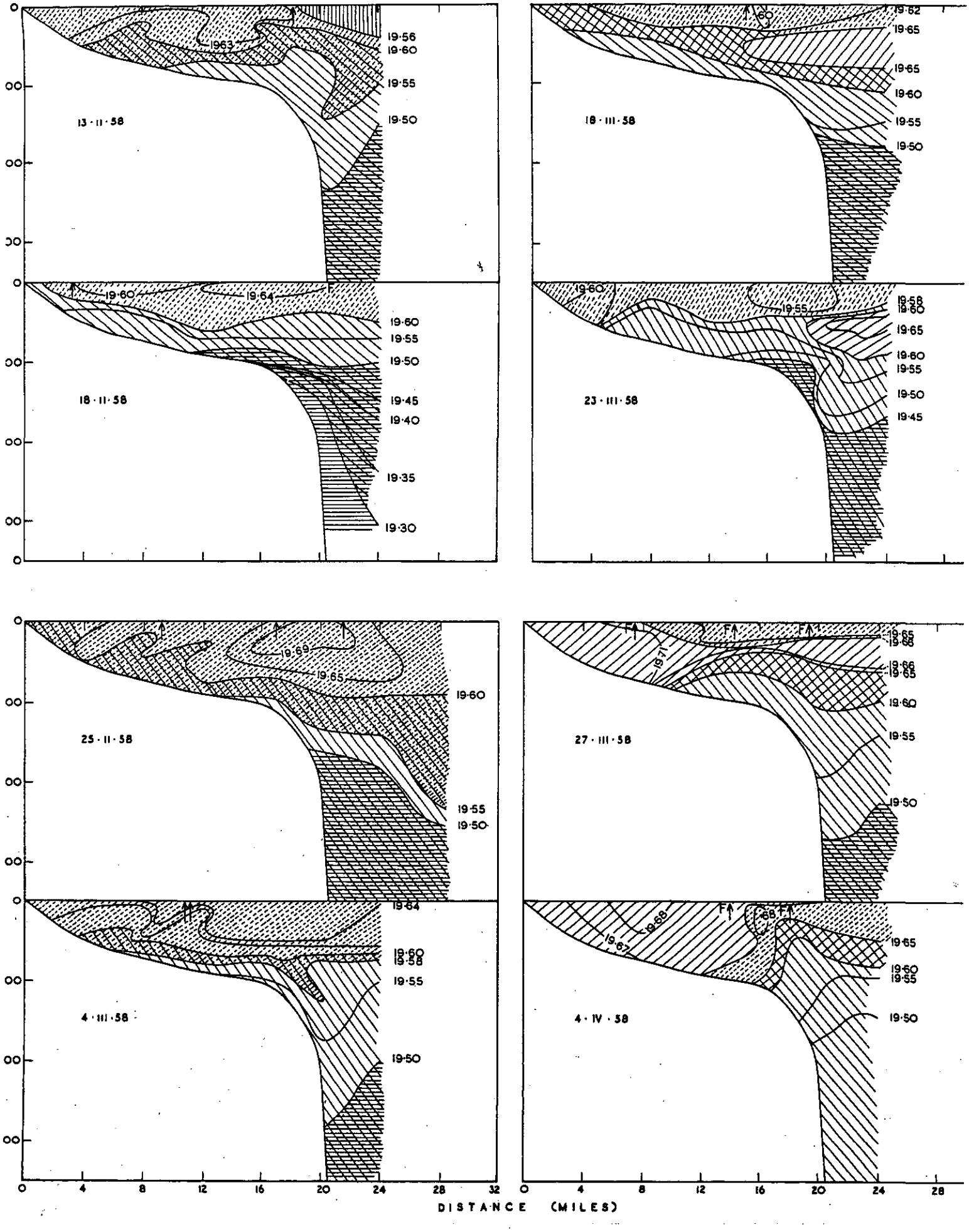


Fig. 2, p. 4.- Water mass distribution on section line to 24 miles E.N.E. of Eden for the period 16.xii.57 - 4.iv.58.

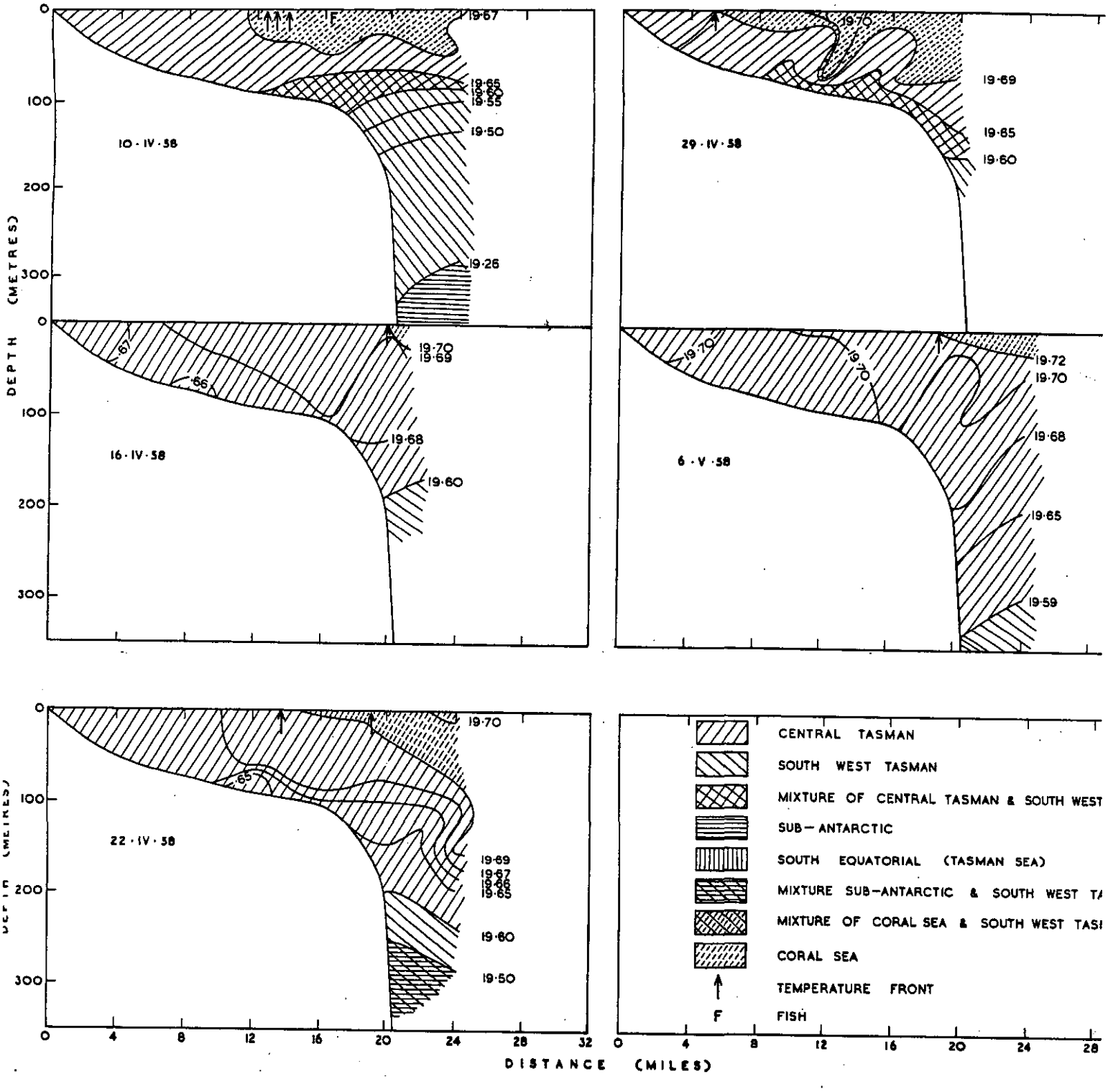


Fig. 2, p. 5.- Water mass distribution on section line to 24 miles E.N.E. of Eden for the period 10.iv.58 - 22.iv.58.

For the period July-December the continental shelf region off Eden was dominated by the water masses typed as South West Tasman and Central Tasman, with the respective temperature-chlorinity characteristics of 12°C-16°C, 19.50‰-19.60‰ and 15°C-20°C, 19.65‰-19.75‰ (Rochford 1958).

In January, intrusion of the Coral Sea type mass (20°C-26°C, 19.60‰-19.70‰) into the area commenced, and due to its density was superimposed on the Central Tasman and South West Tasman water masses.

During most of February and for the greater part of March, Central Tasman water was absent from the area which was dominated by the South West Tasman and Coral Sea water. The Coral Sea water mass occupied the upper 50 m, and about the 50 m level a thermocline was developed between the two water mass types.

In April, Central Tasman water re-entered the area and the Coral Sea water began to diminish over the shelf, as did South West Tasman water, which appeared to sink to levels below 200 m.

CORRELATION OF TUNA DISTRIBUTION AND WATER MASS TYPE

Results of tuna catch by trolling related to water mass type indicate that the general distribution of the tuna species occurring off Eden was as follows:-

(i) Southern bluefin tuna: South West Tasman and Central Tasman water masses.

(ii) Striped tuna and yellowfin tuna: Coral Sea and Central Tasman water masses.

(iii) Albacore: Central Tasman and mixtures of Central Tasman and Coral Sea water masses.

(iv) Bonito: Central Tasman and Coral Sea water masses.

For all species of surface schooling tuna the most remarkable feature of their distribution is their predilection for temperature 'fronts' or discontinuities, for they are almost always trolled in these regions or very close to them. Southern bluefin tuna have been found to congregate on the side of the 'front' which has the lower temperature. Predilection for 'fronts' by striped tuna was also noted by Robins (1952).

When Coral Sea water enters the Eden area the surface schools of southern bluefin tuna disappear, although during the period when the Coral Sea water dominates the upper laye (i.e. 0-50 m) it is possible to catch this species when the underlying mixture of Central and South West Tasman water rises to the surface. To date this spasmodic surface occurrence of the underlying colder denser water has been found only in very close inshore regions during the summer months.

Surface occurring southern bluefin tuna have been caugl in the temperature-chlorinity ranges of 13.5°C-19.0°C, 19.6 19.70‰.

SOUTHERN BLUEFIN TUNA

Figure 3 shows the length frequency distribution of fi caught for the period November 1956 - January 1958. Compared with the length frequency distribution diagrams constructed from measurements of fish caught in previous years (Fig. 4), it will be seen that the two major size gro samples were the 53 cm and 73 cm groups. These are the 6½ lb and 17 lb groups respectively and are, according to Serventy (1956), the groups at the end of their second and third growing seasons.

FOOD OF SOUTHERN BLUEFIN TUNA

The main items in the varied diet of the tuna trolled during the period of investigation are, in decreasing order of abundance, small squid (mainly Notodarus gouldi), unidentified digested small fish remains, pilchards, anchovy, bellowsfish, yellowtail, postlarval barracouta, small leatherjackets, large amphipods (Phrosina sp.) and occasior paper nautilus. 'Krill' (Nyctiphanes australis) was not a major item of diet and occurred only occasionally.

TAGGING

The tags consist of an inch long, dart-shaped silver plate head to which is attached a sealed P.V.C. plastic tul containing a tape bearing the message "Reward C.S.I.R.O. Cronulla, Australia, Date, Length, Serial Number." They were used on 267 southern bluefin tuna (see Fig. 3 for siz groups tagged).

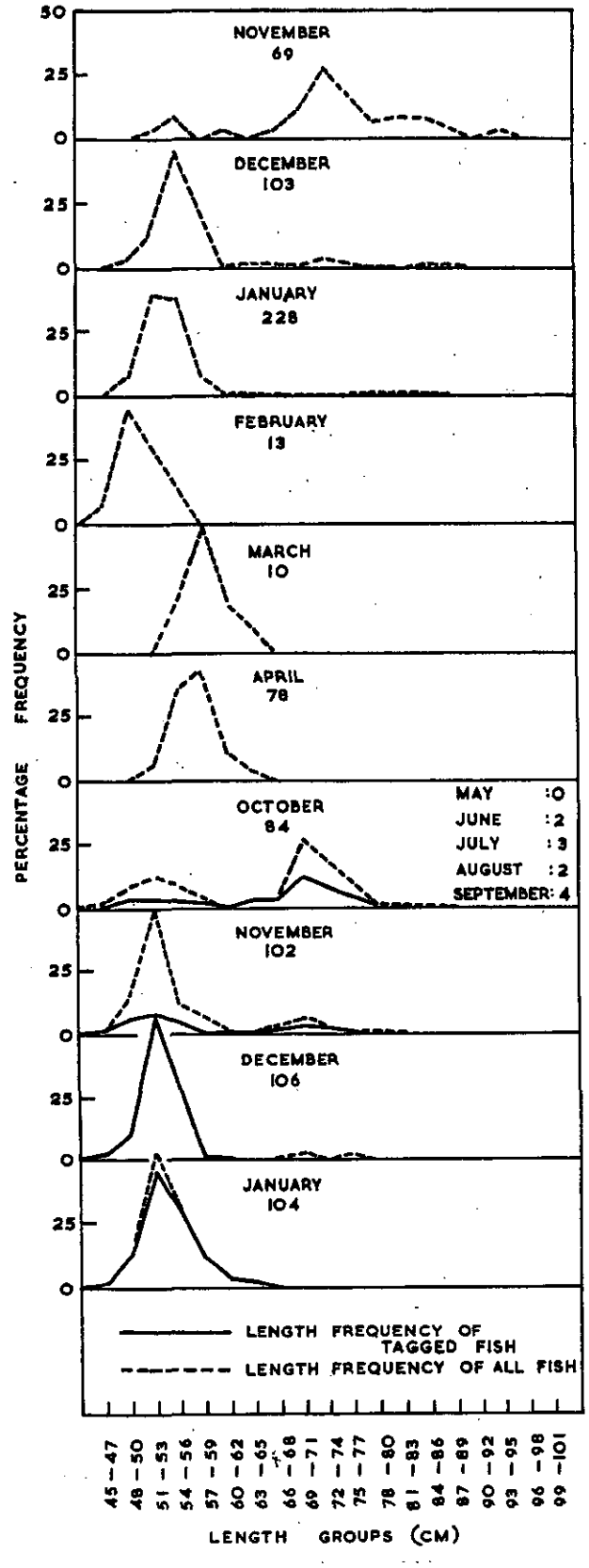


Fig. 3.- Length frequency distribution of southern bluefin tuna trolled for the period November 1956 - January 1958.

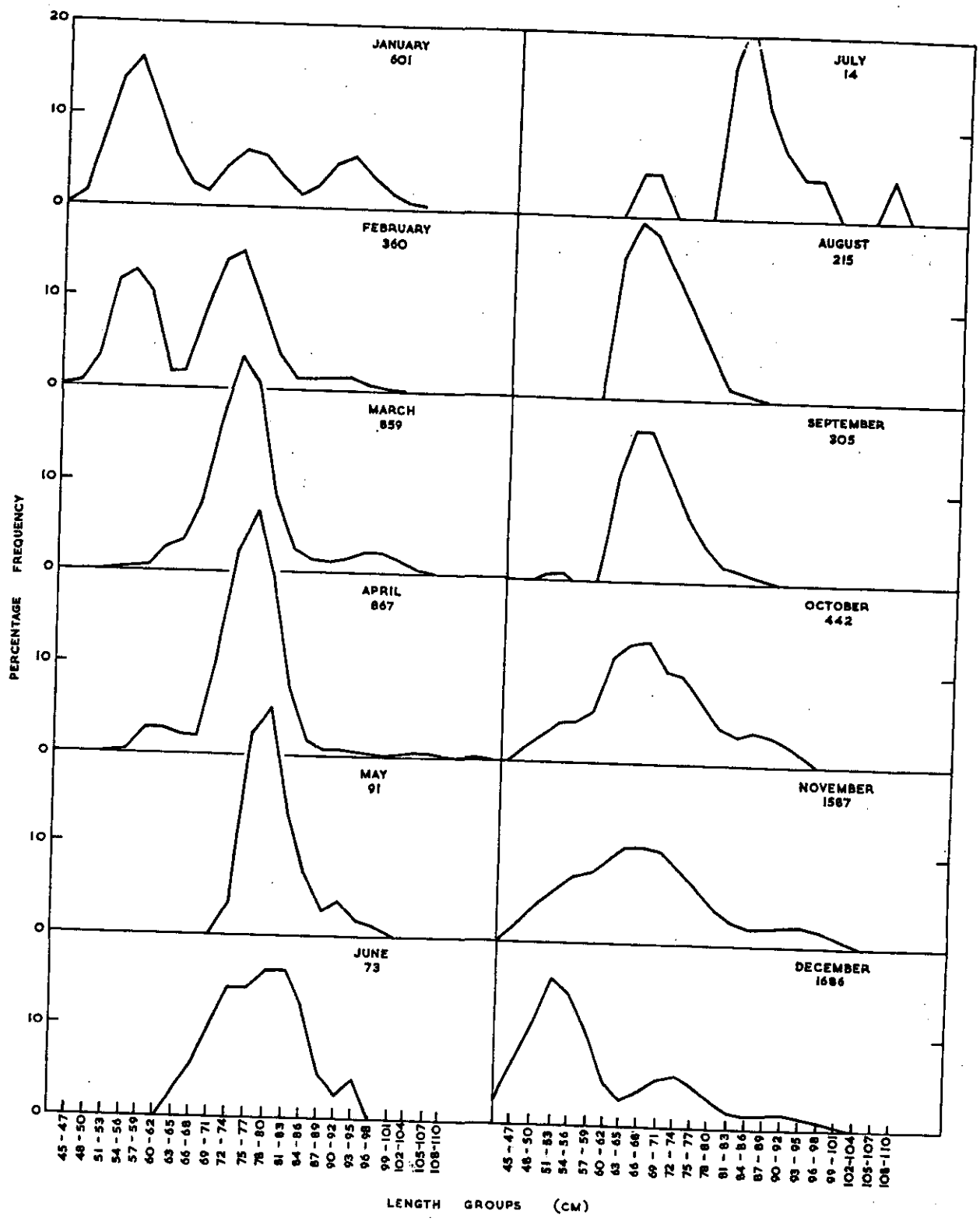


Fig. 4.- Percentage length frequency distribution of southern bluefin tuna caught in seasons previous to November 1956.

The tag is applied to the body of the fish in the region of the second dorsal fin about one inch below the base of the fin.

The main objects of tagging are to check the annual growth as determined from length frequency distribution, to determine whether the fish which occur along the east Australian coast are from the same population as that which occurs in the Western Victorian and South Australian waters, and to determine intraseasonal movements.

PLANKTON

On most traverses Clarke-Bumpus plankton net hauls were made at the 16 miles and 24 miles stations to depths of 100 m and 200 m respectively. These hauls await analysis.

REFERENCES

C.S.I.R.O. Aust. (1958).- Coastal hydrological investigations at Eden, N.S.W., 1957. C.S.I.R.O. Aust. Oceanogr. Sta. List. 35.

Robins, J.P. (1952).- Further observations on the distribution of striped tuna, Katsuwonus pelamis L., in eastern Australian waters, and its relation to surface temperature. Aust. J. Mar. Freshw. Res. 3: 101-110.

Rochford, D.J. (1957).- Identification and nomenclature of the surface water masses in the Tasman Sea (data to the end of 1954). Aust. J. Mar. Freshw. Res. 8: 369-413.

Rochford, D.J. (1958).- The seasonal circulation of the surface water masses of the Tasman and Coral Seas. C.S.I.R.O. Aust. Div. Fish. Oceanogr. Rep. No. 16.

Serventy, D.L. (1956).- The southern bluefin tuna, Thunnus thynnus maccoyii (Castelnau) in Australian waters. Aust. J. Mar. Freshw. Res. 7: 1-43.