COMMONWEALTH OF AUSTRALIA

Commonwealth Scientific and Industrial Research Organization

Division of Fisheries and Oceanography

REPORT 33

F.R.V. "DERWENT HUNTER"

Scientific Report of Cruise 11/59
August 31 – September 17, 1959

Scientific Report of Cruise 12/59
September 23 – October 1, 1959

Scientific Report of Cruise 13/59
October 7 – 15, 1959

Scientific Report of Cruise 14/59
October 26 – November 10, 1959

Scientific Report of Cruise 15/59
November 17 – December 11, 1959

Scientific Report of Cruise 1/60
January 20 – February 8, 1960

Scientific Report of Cruise 2/60
February 16 – March 6, 1960

Scientific Report of Cruise 3/60
March 19 – April 7, 1960

Scientific Report of Cruise 4/60
May 26 – June 16, 1960

Marine Biological Laboratory
Cronulla, Sydney
1963

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Marine Biological Laboratory
Cronulla, Sydney
1963

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F.R.V. DERWENT HUNTER

F.R.V. Derwent Hunter is the Division's 72 ft research vessel operating from Sydney. She is an auxiliary schooner powered with a 68 h.p. Gardner diesel. She has two Kelvin Hughes echosounders, a Type 24D and a Type 24E. The deck winch is hydraulically operated.

The crew during the cruises discussed in this report was as follows:-

Master	-	Captain R.H. Davis
Mates	-	R.W. Spaulding
	-	W.T. Elsmore (acting 31.8.59 - 17.9.59)
	-	G. Reid (acting 21.9.59 - 16.10.59)
Engineers	-	W.K. Smith 31.8.59 - 15.1.60
		D. Shuttler 15.1.60 - 1.4.60
		J. Taylor 19.4.60 -
Deckhand	-	W.T. Elsmore
Cooks	-	R. Weston 31.8.59-4.1.60
	-	H. Lindeman 20.1.60 - 10.2.60
	-	R. Radcliffe 10.2.60

In September 1959 the cruise programme for F.R.V. Derwent Hunter was changed and cruises were planned to investigate tuna in south-east Australian waters in a much wider area than that covered by the regular coastal operations of F.R.V. Marelda. The first objective was to determine any association that might exist between the distribution of southern bluefin tuna (Thunnus maccoyii) and the type of water in which they were caught.

For these investigations a tuna longline was designed and assembled. The details of this are given in the first section of this report. A short summary follows of the length frequency data of the southern bluefin caught on these cruises, and the relation between tuna and water conditions. In the final section the hydrology and tuna longlining results of Cruises DH 11/59 - DH 15/59 and DH 1/60 - DH 4/60 are given.

The zooplankton samples taken during these cruises are not discussed in this report. The results are given in C.S.I.R.O. Aust. (1962) where the regular zooplankton samples taken by F.R.V. Marelda at selected coastal stations are discussed.

When citing this report please abbreviate as follows:
C.S.I.R.O. Aust. Div. Fish. Oceanogr. Rep. No. 33

I. TUNA LONGLINE

A. Construction of Line

The longline consists of 16 units each 125 fathoms in length. Each of these units is the mainline and to it are attached a 10 fathom buoy line and 12 snoods each 3 fathoms (Fig. 1).

(a) Mainline

This section is constructed of $\frac{1}{2}$ in. circumference 6 x 19 galvanized flexible steel wire rope. Two lead balls are swaged on the line at 10 fathom intervals, commencing $7\frac{1}{2}$ fathoms from either end. The snoods are clipped between each two lead balls. Each unit of the mainline is attached to its neighbour by an intermediate link consisting of 18 in. of $\frac{3}{4}$ in. steel wire rope with flag halyard clips at either end. The buoy lines are attached at each of the joining links.

(b) Buoy Lines

Each buoy line is made of 10 fathoms of 1 in. proofed sisal, with at one end an A/K type snap clip which is attached to the halyard clip of the mainline. The other end is whipped and is attached to the dahn pole which has a rope tail about a fathom in length attached to the buoy. The buoys are of polyvinyl chloride, but oil drums are used at the ends, centre, and additional places along the line. Hard laid $\frac{3}{4}$ in. cotton is also used for buoy lines.

(c) Snoods

Each snood consists of $16\frac{1}{2}$ ft of 5/8 in. hard laid cotton leader and $1\frac{1}{2}$ ft of $\frac{1}{4}$ in. circumference steel wire trace fastened to a 9/0 albacore hook. 12 snoods are attached between the paired lead balls on each section of mainline. Splices are not used in the longline but joins are made with Talurit ferrules. The longline is so constructed that in shallow water (between 50 and 100 fathoms) each unit is suspended between buoys, but in deeper water up to four units may be suspended between buoys.

B. Operation of Longline

With the wind fine on the starboard bow the two miles of longline are shot over the starboard side as the vessel moves ahead at about two knots. The line is contained on the drum of the hydraulic winch aft and is lead around a revolving bollard and over a line roller amidships. The snoods are clipped to the mainline and the buoy lines to the intermediate links just before the line passes over the roller. The 9/0 albacore hooks are baited with whole mullet or yellowtail between 6 in. and 9 in. long if bait of this size is obtainable. The line is shot about 7 a.m., and the line is hauled at about noon; this

takes from one to two hours depending on the catch. Sharks frequently tangle the units and these take time to clear.

C. Fishing Depths

To estimate the fishing depths of the hooks, the distance between consecutive buoys along the length of the mainline was measured with a rangefinder. By using a model, the catenary of each mainline unit was determined from these distances, and the average fishing depths of the various hooks calculated. To sample greater depths double units were shot on either side of a central buoy. The measurements with the rangefinder showed that the line was symmetrically disposed on either side of the central buoy, but that the distances between consecutive buoys became progressively shorter from the centre towards the end buoys.

The total number of hooks which could be used on this mainline unit was 192. The percentage of hooks fished at the various depth intervals averaged as follows:-

Depth (m) interval	Percentage hooks in depth interval
30-50	15
51-80	33
81-100	23
101-120	15
121-140	4
141-160	2
161-180	4
181-200	4

II. SOUTHERN BLUEFIN (Thunnus maccoyii) CAUGHT BY LONGLINE

During the nine cruises discussed in this report the tuna longline took 65 specimens of T. maccoyii. The percentage frequency of each 10 cm grouping of this catch is shown in Figure 2.

Figure 3 shows the relation between tuna occurrence and temperature-chlorinity observations. Figure 4 indicates the percentage distribution of T. maccoyii under certain conditions of (a) temperature and (b) chlorinity.

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III. ZOOPLANKTON

Zooplankton collections were made in conjunction with hydrological sampling at fishing stations. Collections were made by F.R.V. Marelda at the 100 m stations on the Jervis Bay, Bateman Bay, Bermagui, and Eden traverses at roughly monthly intervals. The biomass of each of these

hauls has been determined and all data appear in the appendices of a paper discussing zooplankton abundance by Tranter (1962).

Tranter, D.J. (1962). - Zooplankton abundance in Australasian waters. Aust. J. Mar. Freshw. Res. 13: 106-142

LEGENDS FOR FIGURES 1-4 -

Fig. 1. Diagram showing layout of longline.

Fig. 2. Percentage length frequencies of southern bluefin tuna (10 cm groupings) caught by longline.

Fig. 3. Distribution of southern bluefin tuna in relation to temperature and chlorinity.

Fig. 4. Percentage frequency distribution of tuna caught on longline in relation to a) temperature and b) chlorinity.

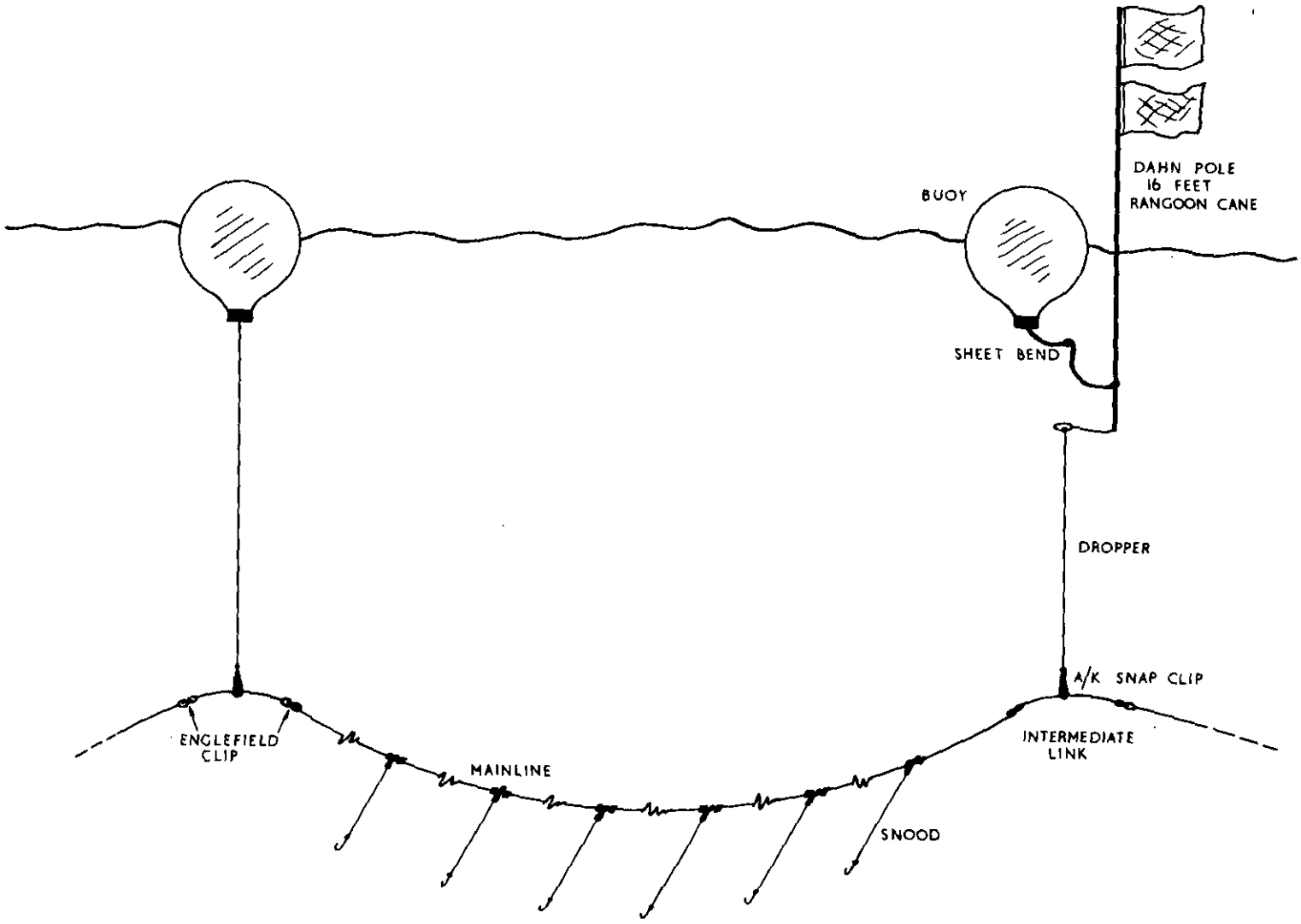

DAHN POLE
16 FEET
RANGOON CANE
BUOY
SHEET BEND
DROPPER
A/K SNAP CLIP
ENGLEFIELD
CLIP
MAINLINE
INTERMEDIATE
LINK
SNOOD

Fig. 1

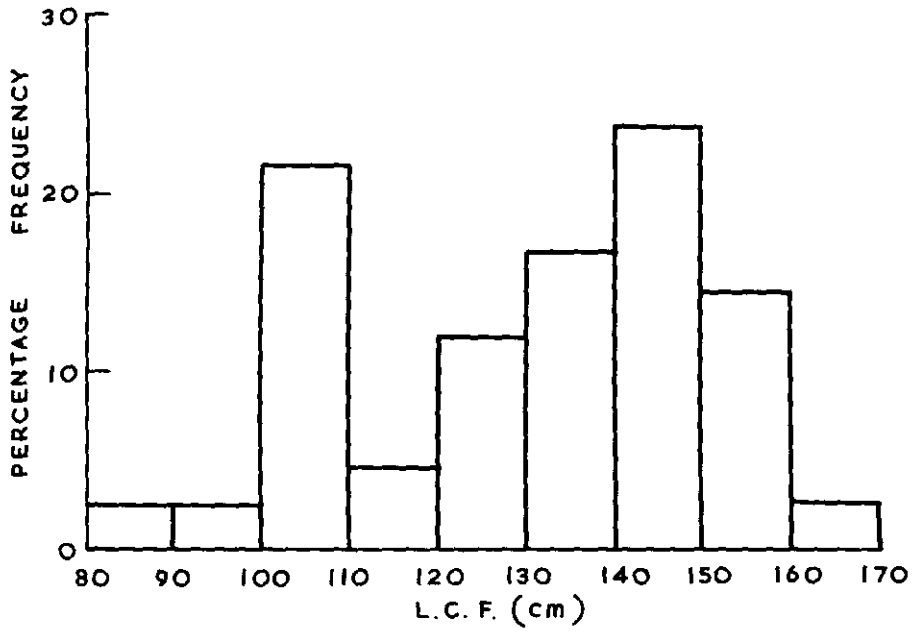

PERCENTAGE FREQUENCY
30
20
10
0
80
90
100
110
120
130
140
150
160
170
L.C.F. (cm)

Fig. 2

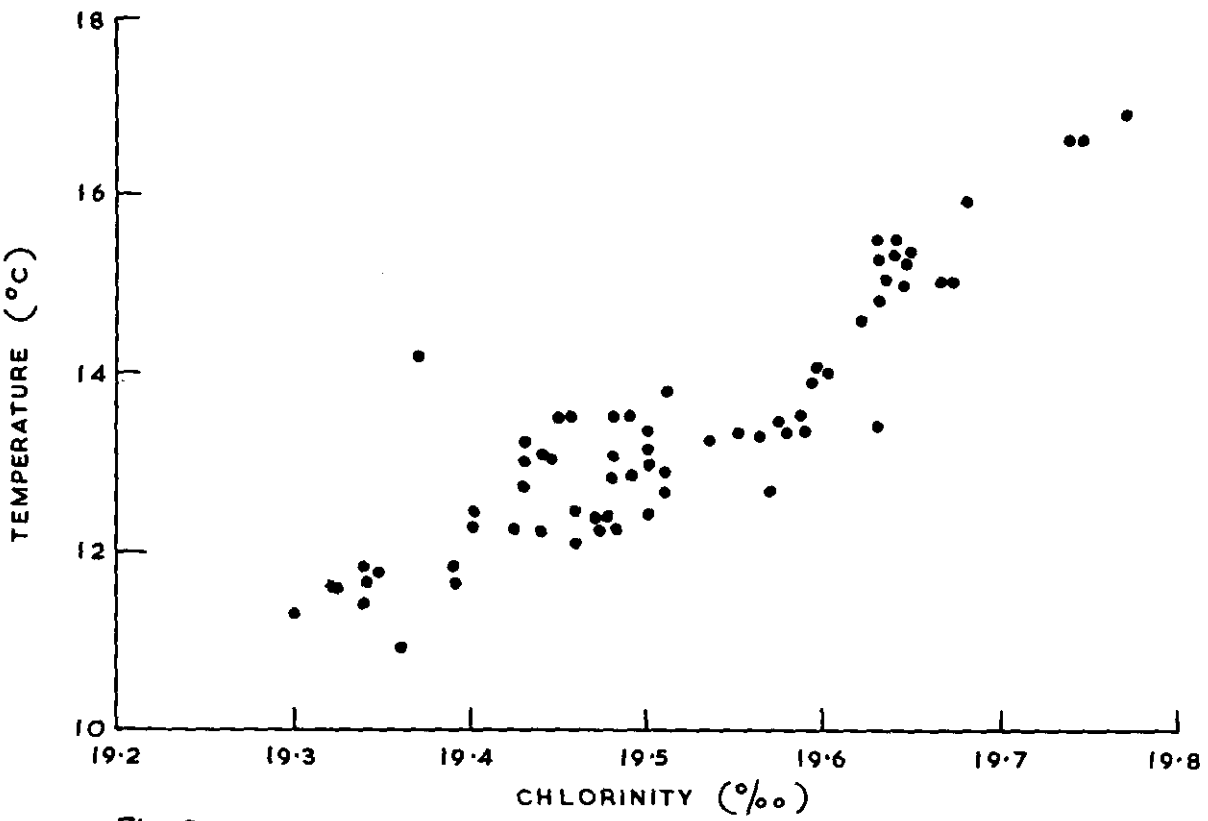

TEMPERATURE (°C)
18
16
14
12
10
19·2
19·3
19·4
19·5
19·6
19·7
19·8
CHLORINITY (‰)

Fig. 3

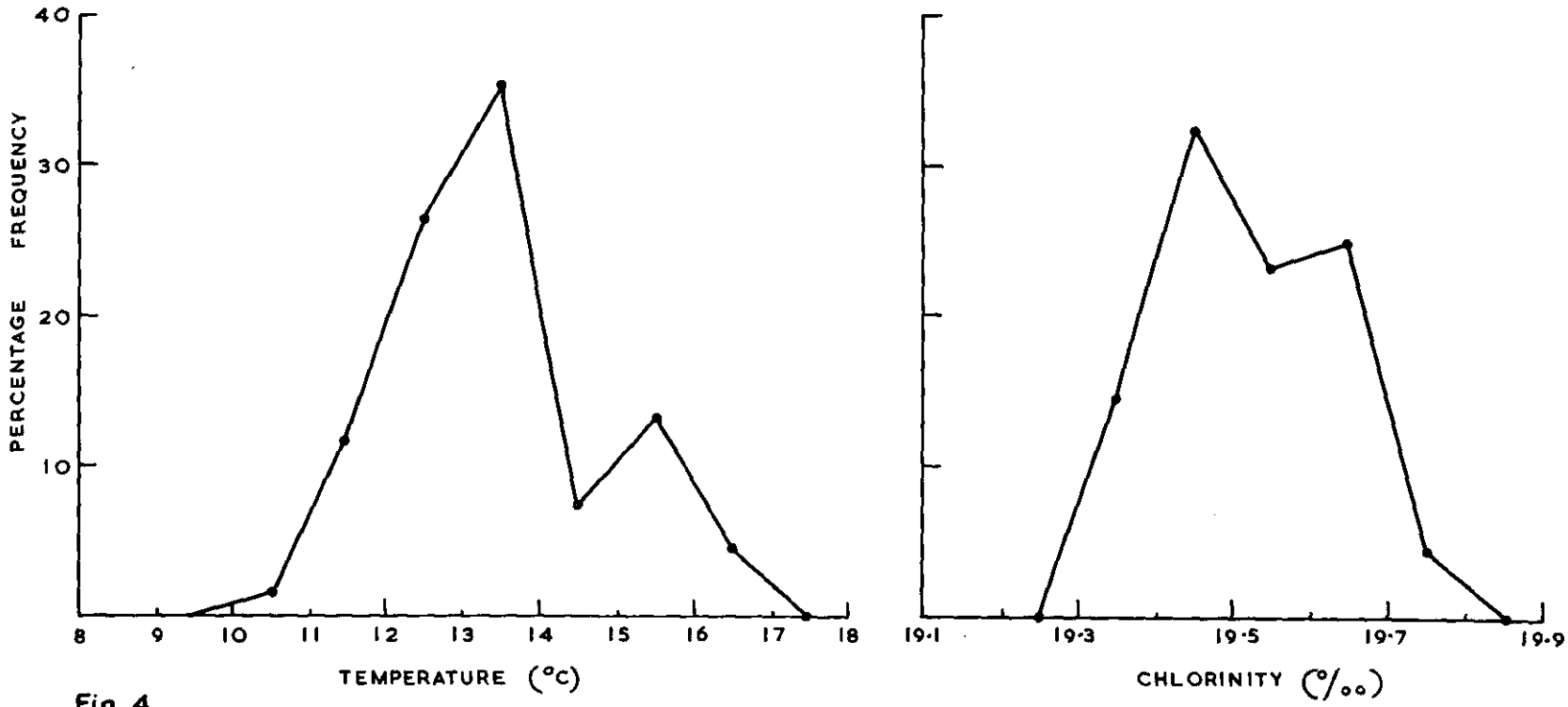

PERCENTAGE FREQUENCY
40
30
20
10
8
9
10
11
12
13
14
15
16
17
18
TEMPERATURE (°C)
19·1
19·3
19·5
19·7
19·9
CHLORINITY (‰)

Fig. 4

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH11/59

August 31 - September 17, 1959

SCIENTIFIC PERSONNEL

J.P. Robins (in charge)
B.S. Newell
R. Bradley

ITINERARY

This was the first of the tuna longlining cruises in 1959. The positions of B.T. casts, G.E.K. fixes, hydrology sampling, Clarke-Bumpus zooplankton sampling and tuna longline shots are indicated in Figure 1.

An estimate of the ship's drift (by astronomical sights) whilst the ship was hove to during fishing operations is given for Stations DH11/91-3, 95,97-9/59; the rate of drift in knots is indicated beside the arrow (Fig. 2).

(a) HYDROLOGY - B.S. NEWELL

Temperature and chlorinity data were collected at 21 stations, using either Nansen reversing bottles and/or a Spilhaus bathythermograph sea-sampler. Twenty-one stations were worked for temperature and chlorinity data. Stations 1, 2, 3, 5, 7, 8, 9, 13 and 19 were worked concurrently with longline fishing. Stations 14, 15, 16 and 21 provided chlorinity and temperature data independent of fishery, and Stations 4, 6, 10, 11, 12, 17, 18 and 20 provided temperature data only. Stations 1, 2, 3, 5, 7, 8, 9, 13, 14, 19 and 21 were carried out by sampling with Nansen bottles, but a Spilhaus bathythermograph was used for Stations 4, 6, 10, 11, 12, 15, 16, 17, 18 and 20. Observations were made at 0, 25, 50, 75, 100, 150, 200, 300 and 500 metres.

Temperature

The horizontal distribution of temperature is shown in four horizontal plots of isotherms at 0, 50, 100 and 200 m (Figs 2-5). These show a south and west invasion of the East Australian Current into the region. There is also an upwelling of Sub-Antarctic water at Station DH11/97/59 which could have been caused by divergence of the surface current, the presence of a gyral, or simply an intrusion from the south-western part of the region. The lower temperatures found towards the coast are caused by upwelling of water along the continental shelf, a common phenomenon during this time of year.

Although the isotherms have been drawn as though temperature gradients were uniform between stations, the ship's thermograph recorded numerous

"fronts" or sharp changes in surface temperature along the ship's track. Thus it must be assumed that the exact distribution of isotherms, at least at the surface, is more complex than Figure 2 indicates, and that this would have been caused by current meanders and small gyrals, the result of momentum effects of the East Australian Current, or to short term wind changes.

Chlorinity

Chlorinity values are available only from 13 stations. These do not allow the drawing of isochlors because the variation is too great between adjacent stations; a very much closer network of stations would be required.

(b) TUNA LONGLINING - J.P. ROBINS

The longline was operated at nine stations as indicated in Table 1. During the hauling of the longline at Station DH11/98/59 the line parted when only 3½ units had been hauled. It was assumed that quite a number of fish had been hooked on several of the remaining units, but that the buoys were incapable of supporting their weight. For the remainder of cruise DH11/59 the longline was worked with only four units.

The catches taken on longline hauls at the various fishing stations during this cruise are shown in Table 1. The main catch of southern bluefin (5) was made at Station DH11/97/59. It should be noted (Section (a) Hydrology) that upwelling of Sub-Antarctic water was recorded at Station DH11/97/59. The vertical distribution of isotherms between Stations DH11/95, 97,100/59 is shown in Figure 6. This indicates the upwelling of lower temperature water at Station DH11/97/59 and the depths at which southern bluefin tuna were taken at this station.

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH11/59

Station No.	Snoods Broken	Catch	Tuna	
			Catch/100 hooks	Depth of Capture m
DH11/91/59	-	1 Yellowfin		37
DH11/92/59	-	-		
DH11/93/59	3	1 lancet fish		
DH11/95/59	8	4 great blue sharks 1 lancet fish		
DH11/97/59	-	5 southern bluefin 1 lancet fish	2.61	88, 109, 152, 164, 186
DH11/98/59	1	1 southern bluefin	0.52	104
DH11/99/59		Nil (line sank)		
DH11/103/59	1	1 great blue shark 2 southern bluefin	1.1	51, 89
DH11/109/59	1	1 mako shark 3 great blue sharks		

LEGENDS FOR FIGURES 1-6 - Cruise DH11/59

Fig. 1. Chart showing station positions.

Fig. 2. Surface isotherms.

Fig. 3. Isotherms at 50 m.

Fig. 4. Isotherms at 100 m.

Fig. 5. Isotherms at 200 m.

Fig. 6. Vertical distribution of isotherms between Stations DH11/95,97,100/59 showing depths at which southern bluefin were caught.

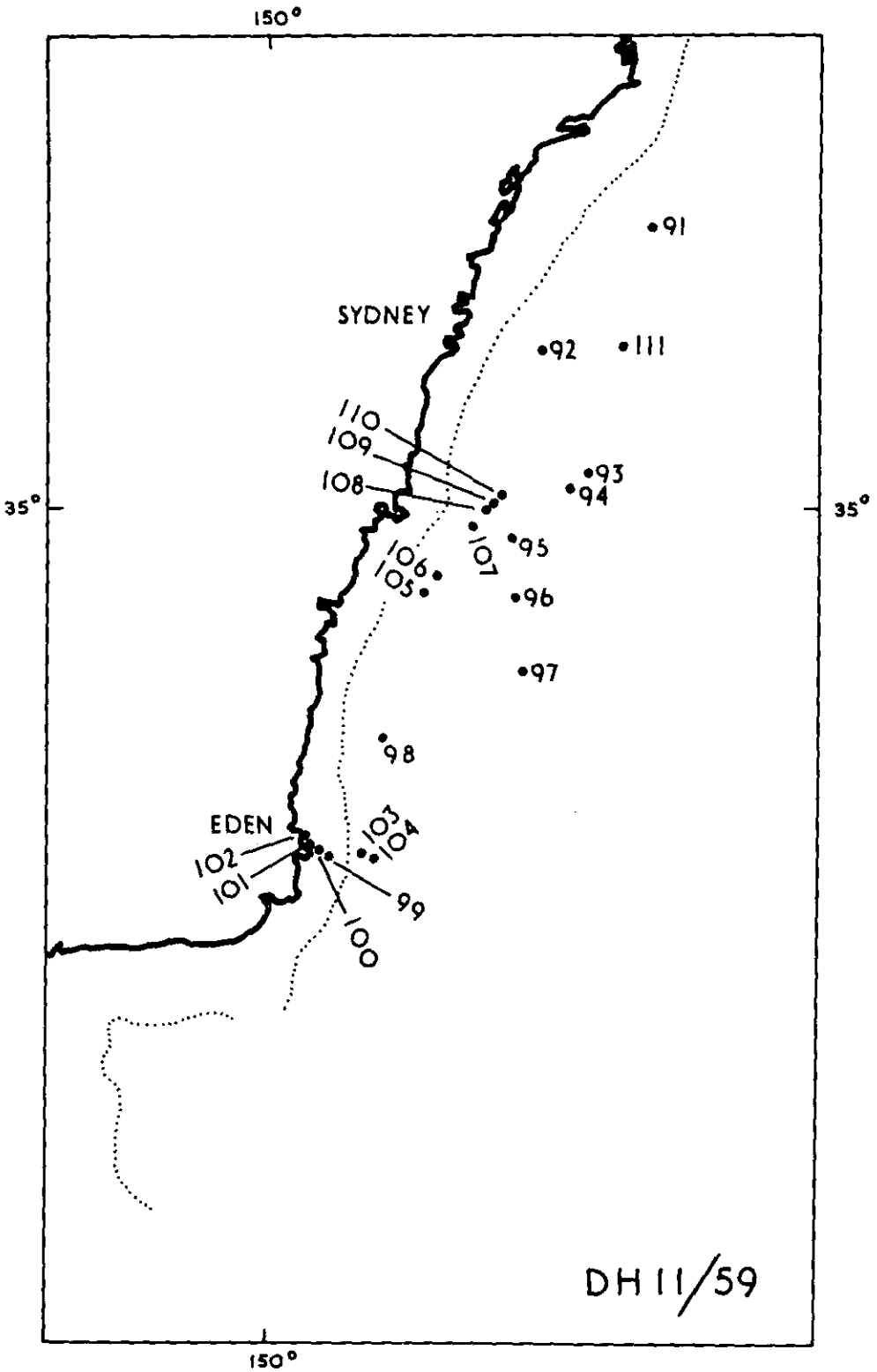
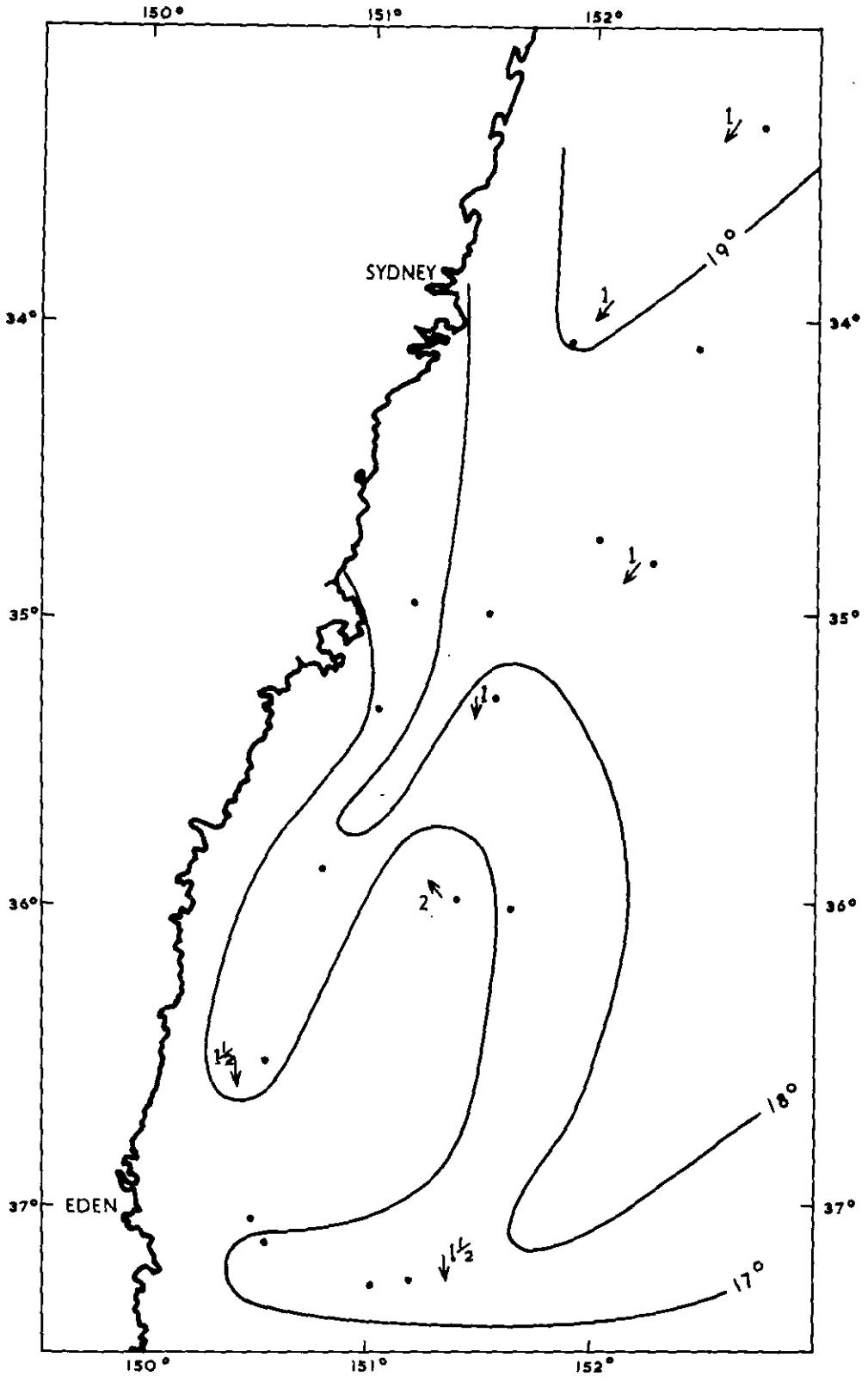
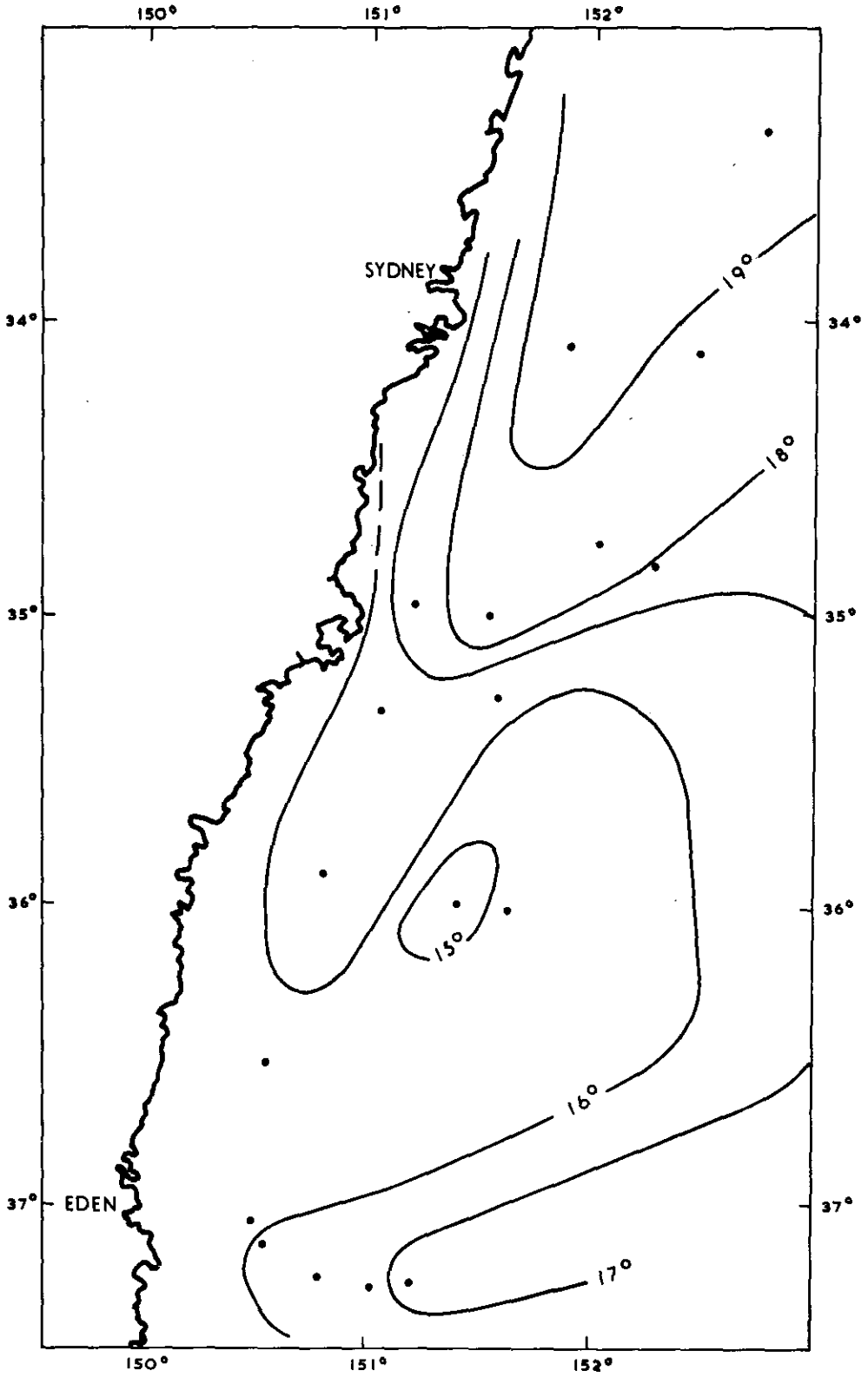

150°
SYDNEY
91
92
111
110
109
108
93
94
35°
35°
107
95
106
105
96
97
98
EDEN
103
104
102
101
99
100
DH 11/59
150°

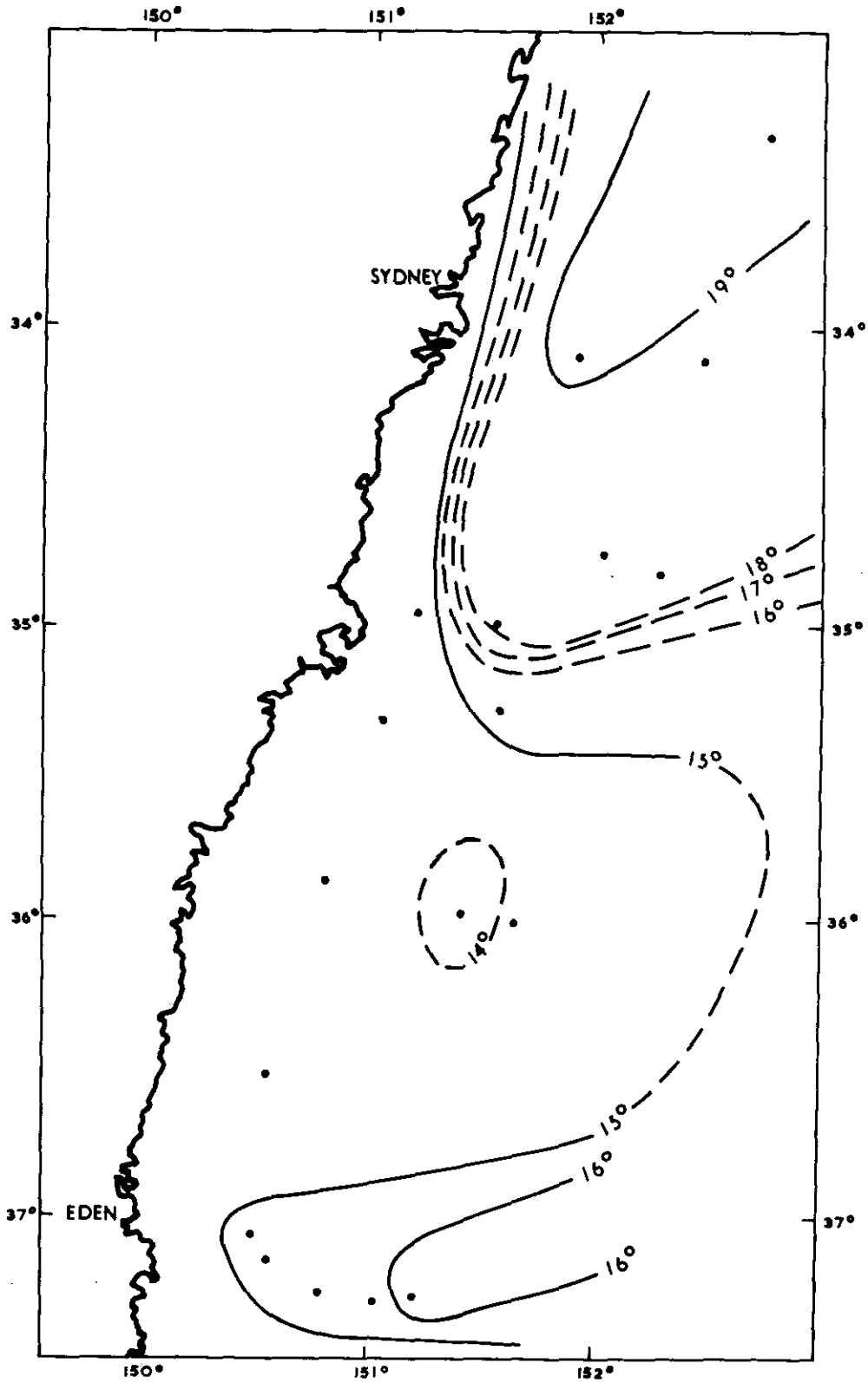
Fig. 1



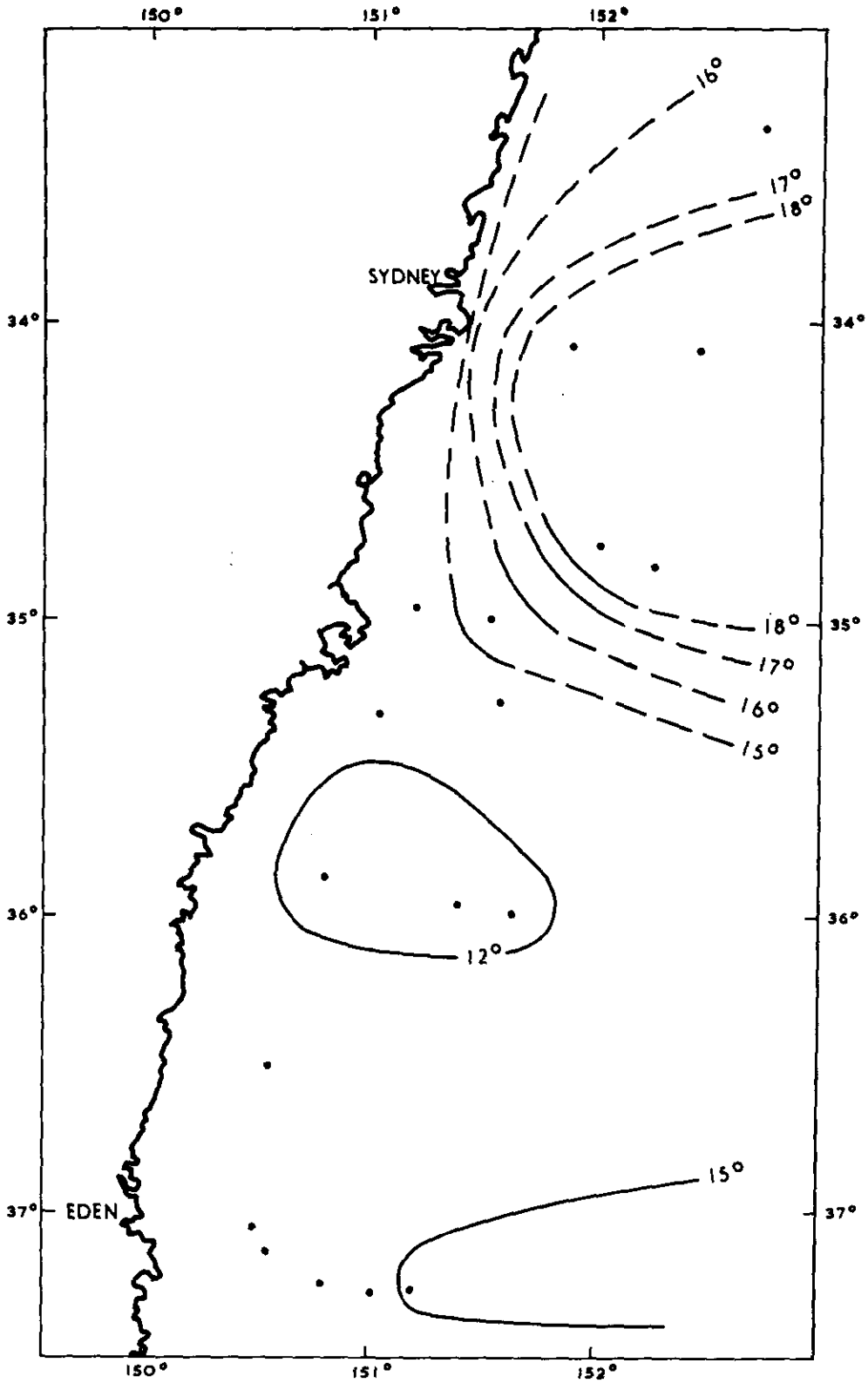
D.H.11/59 Fig. 2



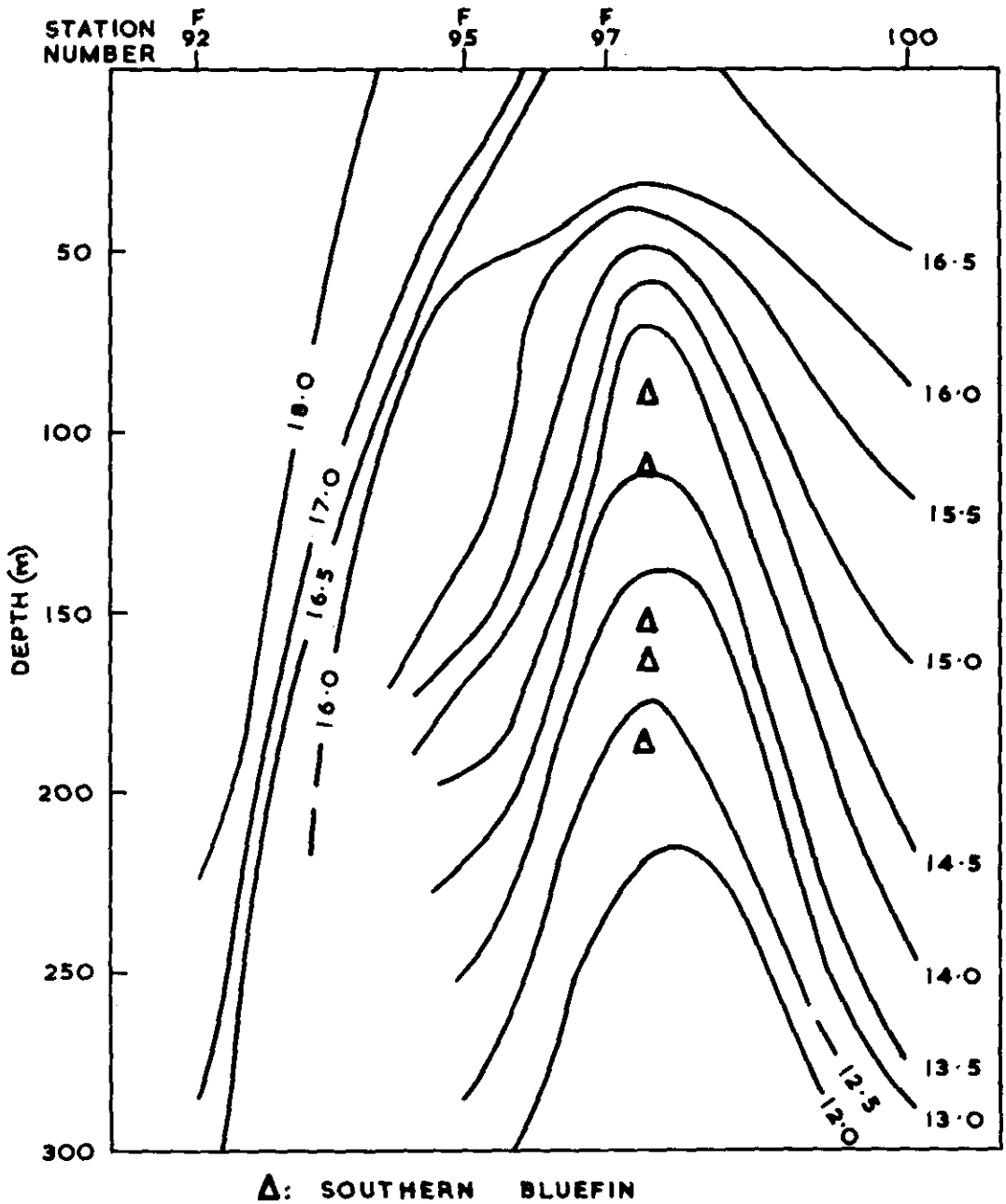
D.H.11/59 Fig. 3



D.H.11/59 Fig.4



D.H.11/59 Fig. 5


STATION NUMBER
F 92
F 95
F 97
100
DEPTH (m)
50
100
150
200
250
300
18·0
17·0
16·5
16·0
16·5
16·0
15·5
15·0
14·5
14·0
13·5
13·0
12·5
12·0
Δ: SOUTHERN BLUEFIN

D.H.11/59 Fig.6

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH12/59

September 23 to October 1, 1959

SCIENTIFIC PERSONNEL

J.P. Robins (in charge)

ITINERARY

This was the second of the tuna longlining cruises in 1959. The positions of B.T. casts, G.E.K. fixes, hydrology sampling, Clarke -Bumpus zooplankton sampling, and tuna longline shots are indicated in Figure 1.

Estimates of ship's drift show a strong southward set at Station DH12/117/59 but slight ($\frac{1}{2}$ knot) north-eastward sets at Stations DH12/112, 113, 115/59. Station DH12/115/59 is 18 miles from the coast, close enough to be influenced by the inshore counter current existing during the winter months.

(a) HYDROLOGY - B.S. NEWELL

Inclement weather prevented the full working of all stations, and data were insufficient to permit drawing horizontal distribution of temperature. However, since Stations DH12/112-118/59 were in a roughly north-south line, the distribution of chlorinity and temperature has been shown in vertical sections through these seven stations (Fig. 2).

The sections show the meandering nature of the East Australian Current in this region, with its indraughts toward the coast (at Stations DH12/114-116/59). The data collected by F.R.V. Marelda during 1959 show an indraught of offshore oceanic water to be common throughout the year on this part of the coast. Sub-Antarctic water is found only at the northernmost stations, and then at depths of 200 m or greater.

(b) TUNA LONGLINING - J.P. ROBINS

During this cruise four longline shots were made. Table 1 shows the catch from each haul.

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH12/59

Station No.	Snoods Broken	Catch	Tuna	
			Catch/100 hooks	Depth of Capture m
DH12/112/59	1	-		
DH12/115/59	3	1 great blue shark		
DH12/117/59	-	2 southern bluefin	1.05	102, 126
DH12/118/59	3	3 southern bluefin 1 albacore 5 great blue sharks	1.58	84, 109, 126

Two tuna were caught at Station DH12/117/59 at a temperature of 13.7°C and 3 at Station DH12/118/59 between temperatures of 13.3° and 14.1°C (Fig. 3).

LEGENDS FOR FIGURES 1 & 2 - Cruise DH12/59

Fig. 1. Track chart showing positions of stations.

Fig. 2. North south vertical sections showing
a) temperature*
b) chlorinity

* Symbols mark depths at which tuna were caught.

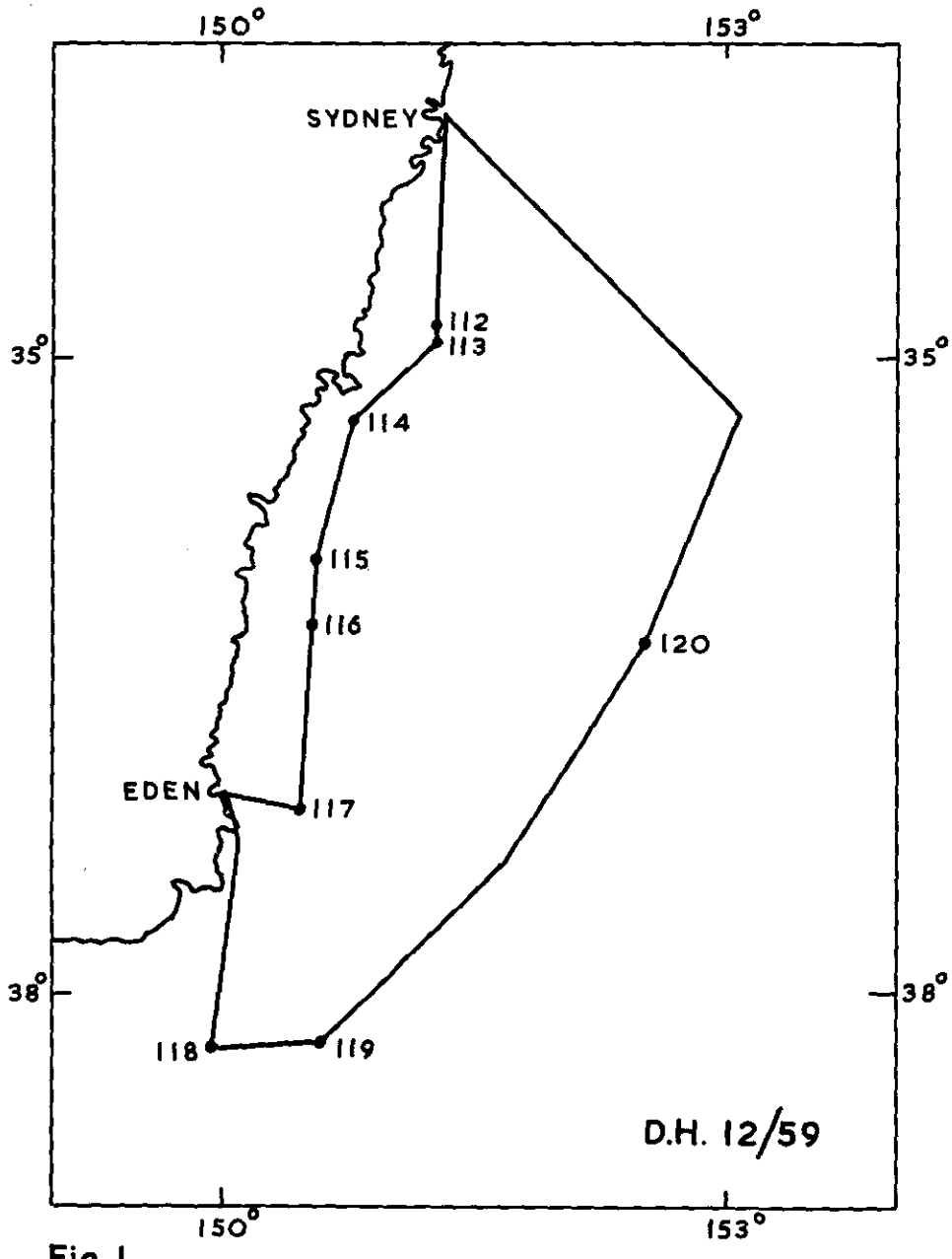
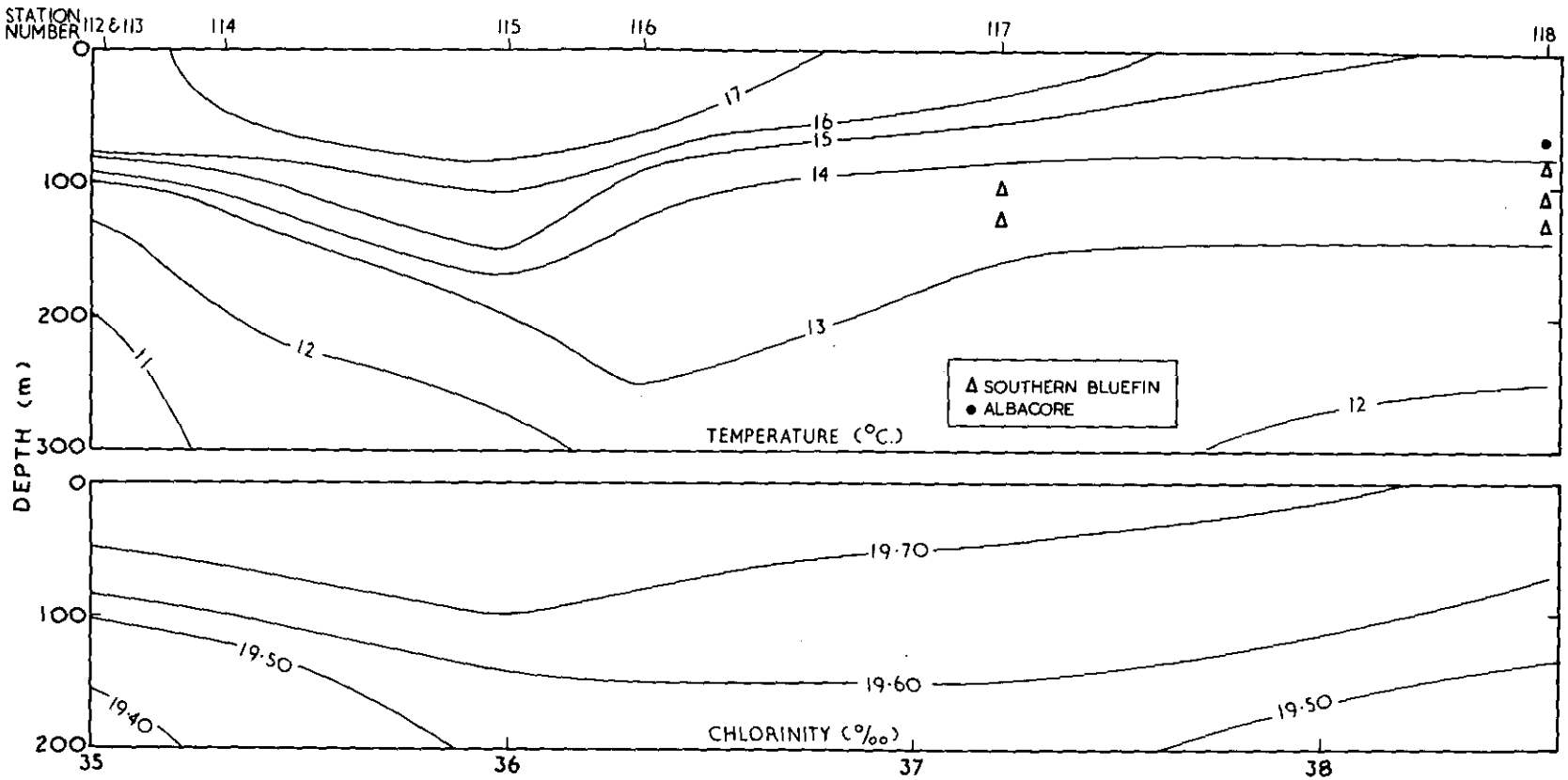

150°
153°
SYDNEY
112
113
35°
114
115
116
120
EDEN
117
38°
118
119
D.H. 12/59
150°
153°

Fig. 1


STATION NUMBER
112 & 113
114
115
116
117
118
0
100
200
300
DEPTH (m)
17
16
15
14
13
12
11
12
Δ SOUTHERN BLUEFIN
• ALBACORE
TEMPERATURE (°C.)
0
100
200
19·70
19·60
19·50
19·40
19·50
CHLORINITY (‰)
35
36
37
38
LATITUDE (°S.)

D.H. 12/59 Fig. 2

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH13/59

October 7 - 15, 1959

SCIENTIFIC PERSONNEL

B.S. Newell (in charge)
R. Bradley

ITINERARY

This is the third tuna longlining cruise for 1959. Figure 1 shows the positions of stations.

(a) HYDROLOGY - B.S. NEWELL

Fifteen of the sixteen hydrological stations worked on this cruise were situated on the western edge of the East Australian Current, where it penetrates in the spring south and west into the eastern approaches of Bass Strait and thence down the eastern Tasmanian coast.

Horizontal plots of isotherms have been drawn for surface, 50 m , and 100 m (Figs 2-4). These show the upwelling area along the southern New South Wales coast, and a belt of cold water along the eastern Victorian coast. This latter water was of moderate chlorinity ($\lesssim$19.60‰) and hence is probably not North Bass Strait water, but a mixture of surface water derived from the east and Sub-Antarctic water upwelled along the coast. An intrusion westwards into Bass Strait of East Australian Current water is clearly shown. The surface isotherms were constructed both from temperatures recorded with samples taken at the various stations, and from the ship's thermograph records. These show the usual more complex configuration than isotherms for lower levels, but no attempt has been made to construct the fine detail from the limited data. Numerous fronts, some of 2°C were encountered. These are no doubt caused by the winds accumulating light, warm surface water from the east against the cold dense water to the west, the complexity of the isotherm configuration resulting from the variable nature of the winds during this period.

(b) TUNA LONGLINING - J.P. ROBINS

The longline was shot three times during this cruise. Table 1 shows the catch taken.

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH13/59

Station No.	Snoods Broken	Catch	Tuna	
			Catch/100 hooks	Depth of Capture m
DH13/121/59	1	1 southern bluefin	0.53	37
DH13/129/59	3	1 southern bluefin	0.57	106
DH13/134/59	-	2 southern bluefin 1 great blue shark	1.06	91, 93

The vertical distribution of temperature between Stations DH13/129-136/59 is shown in Figure 5 and the depths of capture of three southern bluefin are indicated.

LEGENDS FOR FIGURES 1-5 - Cruise DH13/59

Fig. 1. Chart showing station positions.

Fig. 2. Surface isotherms.

Fig. 3. Isotherms at 50 m.

Fig. 4. Isotherms at 100 m.

Fig. 5. Vertical distribution of isotherms between Stations DH13/129/59 and DH13/136/59 showing depths at which southern bluefin were caught.

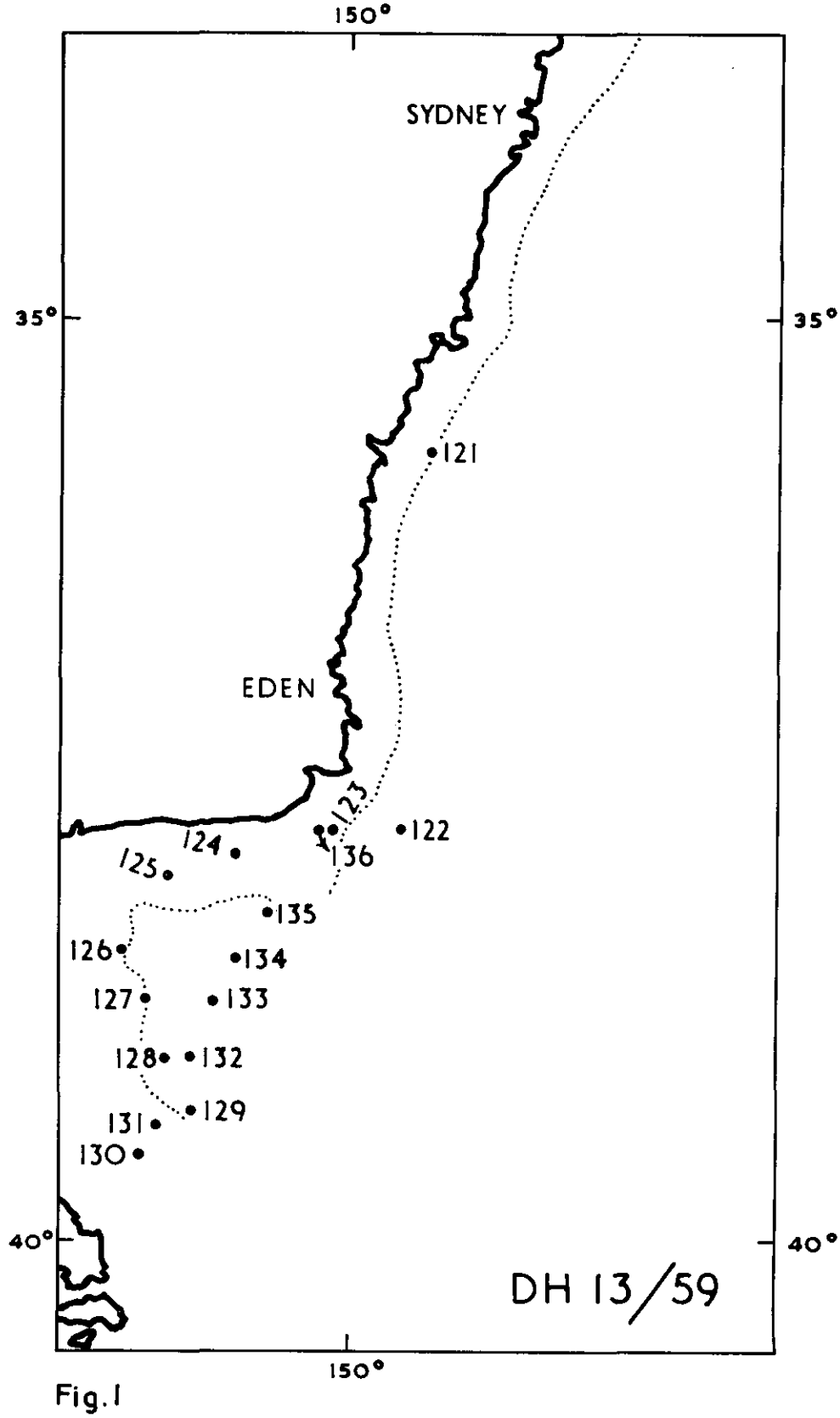
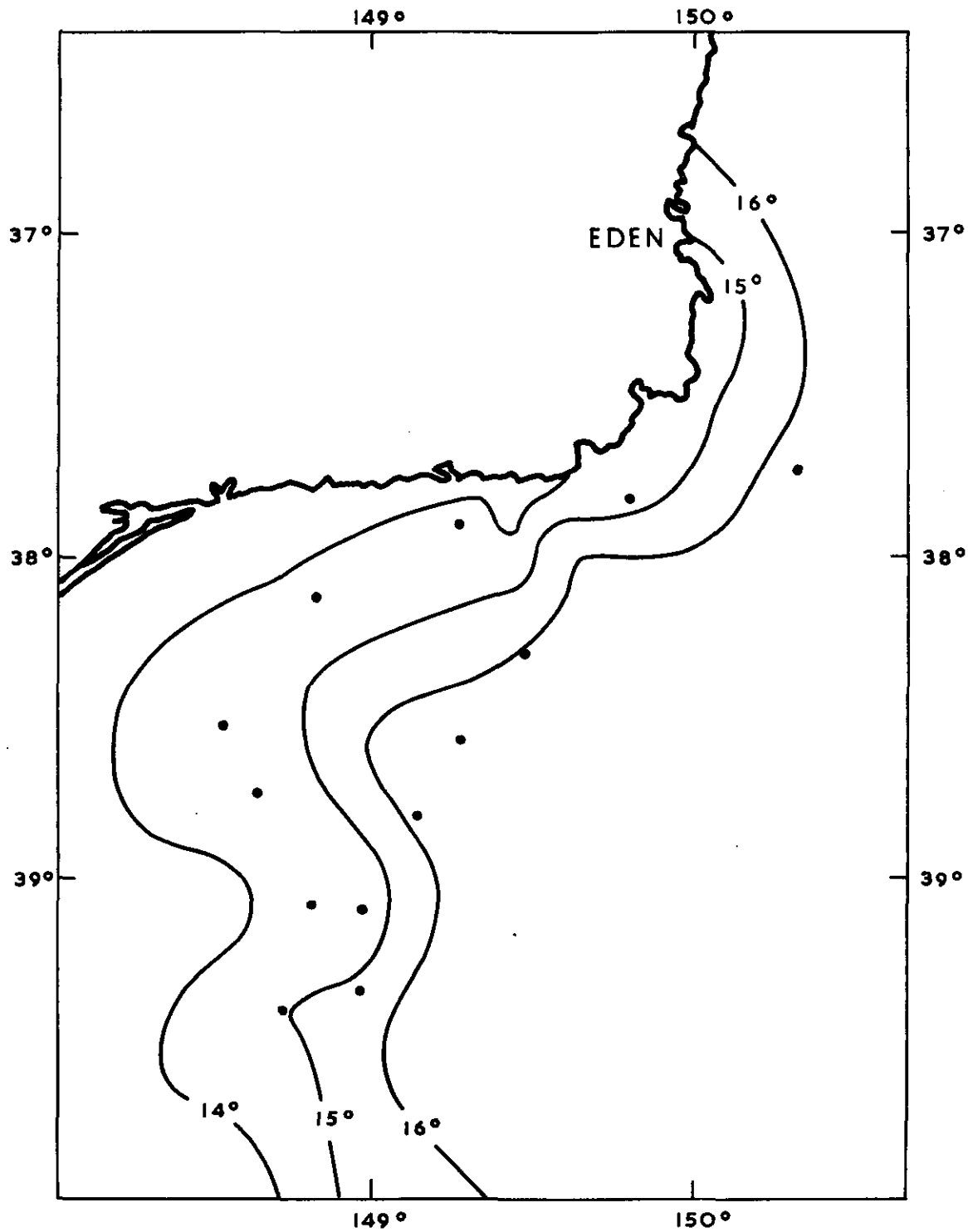
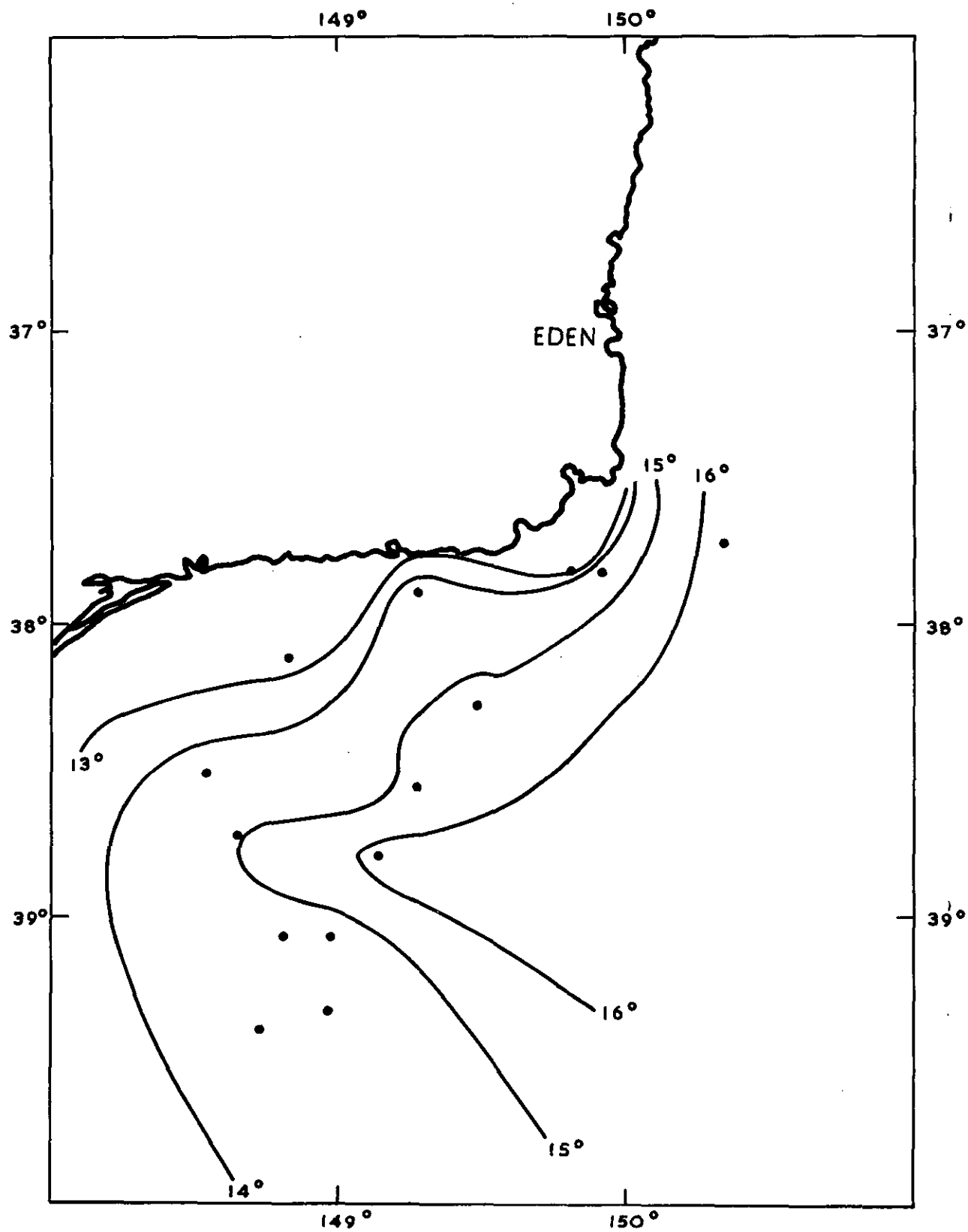

150°
SYDNEY
35°
35°
121
EDEN
123
122
124
136
125
135
126
134
127
133
128
132
129
131
130
40°
40°
DH 13/59
150°

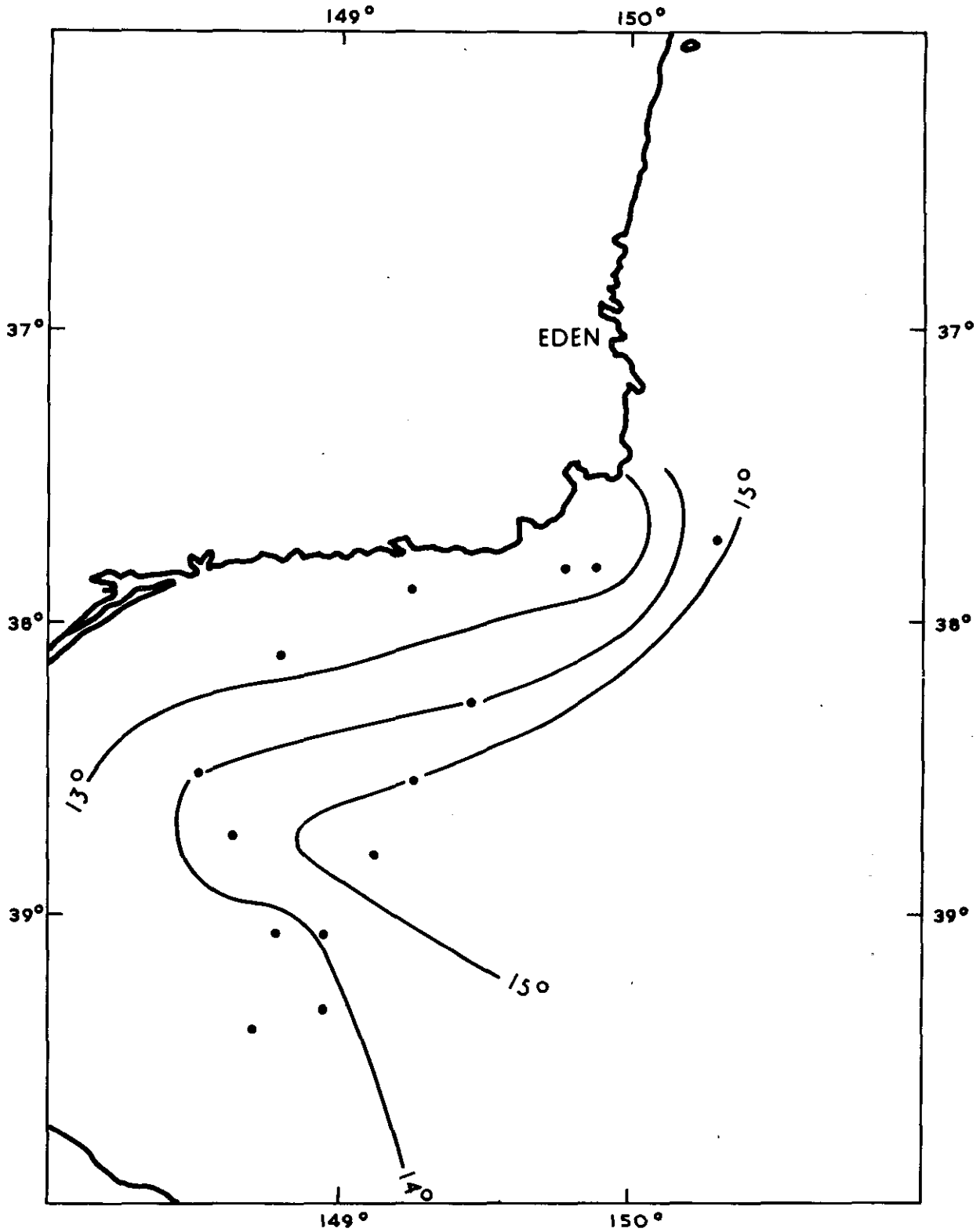
Fig.1



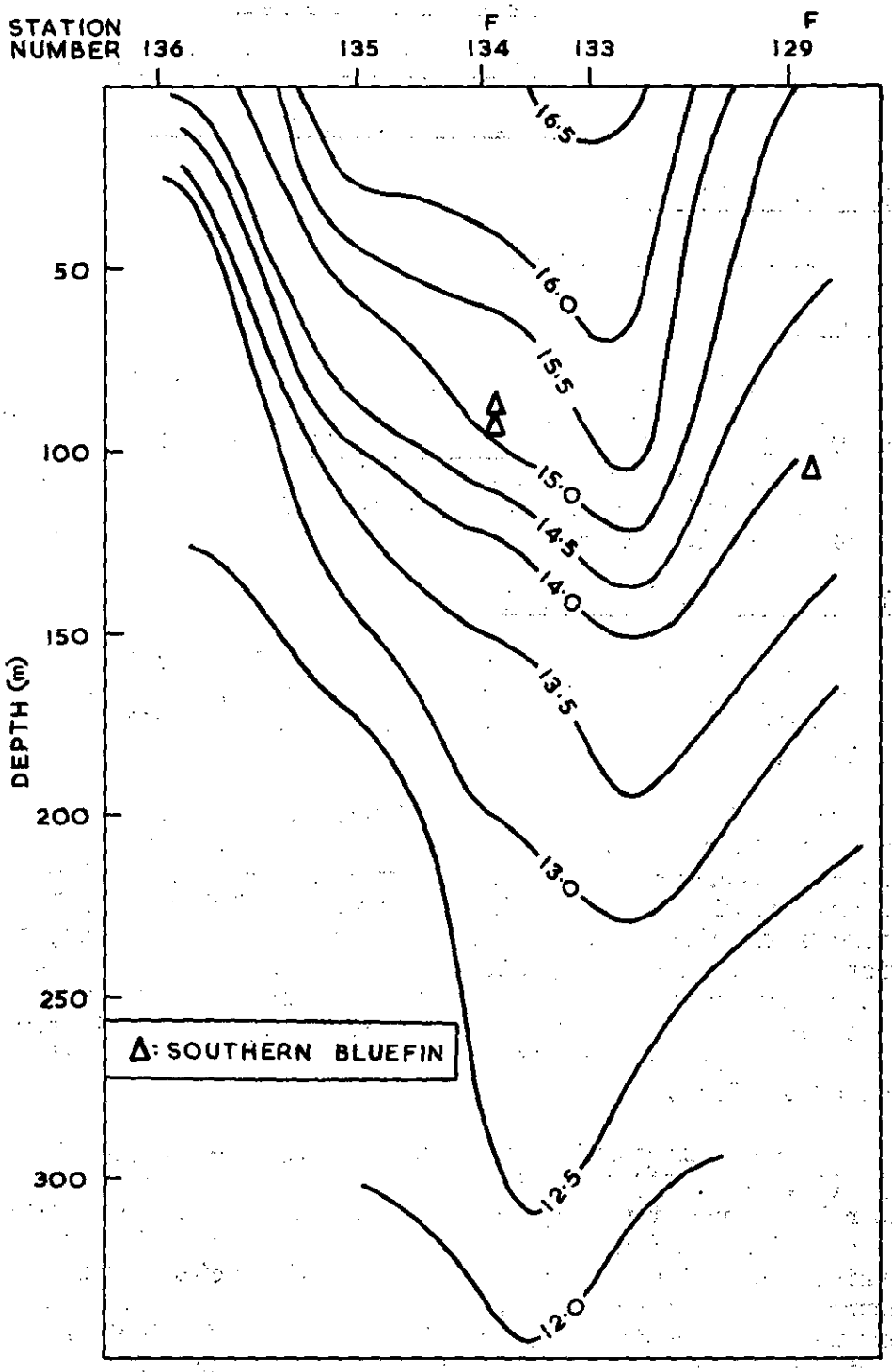
D.H.13/59 Fig.2



D.H. 13/59 Fig. 3



D.H.13/59 Fig.4


STATION NUMBER
136
135
F
134
133
F
129
16·5
16·0
15·5
15·0
14·5
14·0
13·5
13·0
12·5
12·0
50
100
150
200
250
300
DEPTH (m)
Δ: SOUTHERN BLUEFIN

D.H.13/59 Fig.5

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH14/59

October 26 - November 10, 1959

SCIENTIFIC PERSONNEL

B.S. Newell (in charge)

ITINERARY

This cruise was planned to trace the configuration of a limited section of the Subtropical Convergence and to investigate the distribution of Thunnus maccoyii in relation to the convergence. Unfortunately, bad weather prevented further work after Station DH14/146/59, and the ship had to run to Hobart for fuel. Figure 1 shows the positions of all stations.

(a) HYDROLOGY - B.S. NEWELL

Because the work of this cruise had to be curtailed, the diagrams of horizontal isotherms down to 200 m. (Figs 2-5) are drawn tentatively and may not be valid between longitudes 150° and 153°E.

The dominant feature of the distribution is the southward movement of warm East Australian Current water. On the eastern boundary of this tongue of warm water is found the convergence with west wind drift water. Whilst the resultant movement of water in this convergence zone is to the east, there exists a complex boundary with meanders and strongly developed temperature fronts. Figure 2 shows the surface isotherms; all fronts are marked in this figure by a bold line, and the letter F, and the temperature variation is marked by a figure on either side of the line.

Surface chlorinities at Stations DH14/143-4,147/59 were high (19.60-19.70‰) indicating a preponderance of East Australian Current water, but at 200 m these stations showed low chlorinities (ca. 19.40‰) suggesting that considerable sinking and northward penetration of Sub-Antarctic water occurred at the convergence. There appears to have been another northward penetration of this water along the New South Wales Coast, but it is probable that this was only part of the general northward sub-surface movement of Sub-Antarctic water, made more conspicuous at the 200 m level (Fig. 6) by upwelling along the coast. Vertical sections between Stations DH14/150 and 155/59 are given for temperature and chlorinity to illustrate the southern boundary of the tongue of East Australian Current water. This boundary moves south as summer advances.

(b) TUNA LONGLINING - J.P. ROBINS

The tuna longline was shot three times on this cruise and Table 1 shows the catch.

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH14/59

Station No.	Snoods Broken	Catch	Tuna	
			Catch/100 hooks	Depth of Capture m
DH14/143/59	2	8 southern bluefin	4.21	57, 73, 95, 97, 169, 164, 186, 191
DH14/145/59	1	7 southern bluefin	3.66	37, 84, 88, 91, 109, 117, 126
DH14/146/59	-	3 southern bluefin 1 lancet	1.57	37, 65, 164

Figure 2 indicates that a temperature front was recorded at each of the stations at which tuna were caught. Figure 7 shows the vertical distribution of temperature for Stations DH14/142-146/59 with an indication of the depths at which tuna were taken.

LEGENDS FOR FIGURES 1-7 - Cruise DH14/59

Fig. 1. Chart showing station positions.

Fig. 2. Surface isotherms, temperature fronts and GEK currents.

Fig. 3. Isotherms at 50 m.

Fig. 4. Isotherms at 100 m.

Fig. 5. Isotherms at 200 m.

Fig. 6. Vertical north south section Stations DH14/150-155/59
a) Temperature
b) Chlorinity.

Fig. 7. Vertical distribution of isotherms between Stations DH14/142/59 and DH14/146/59 showing depths at which tuna were caught.

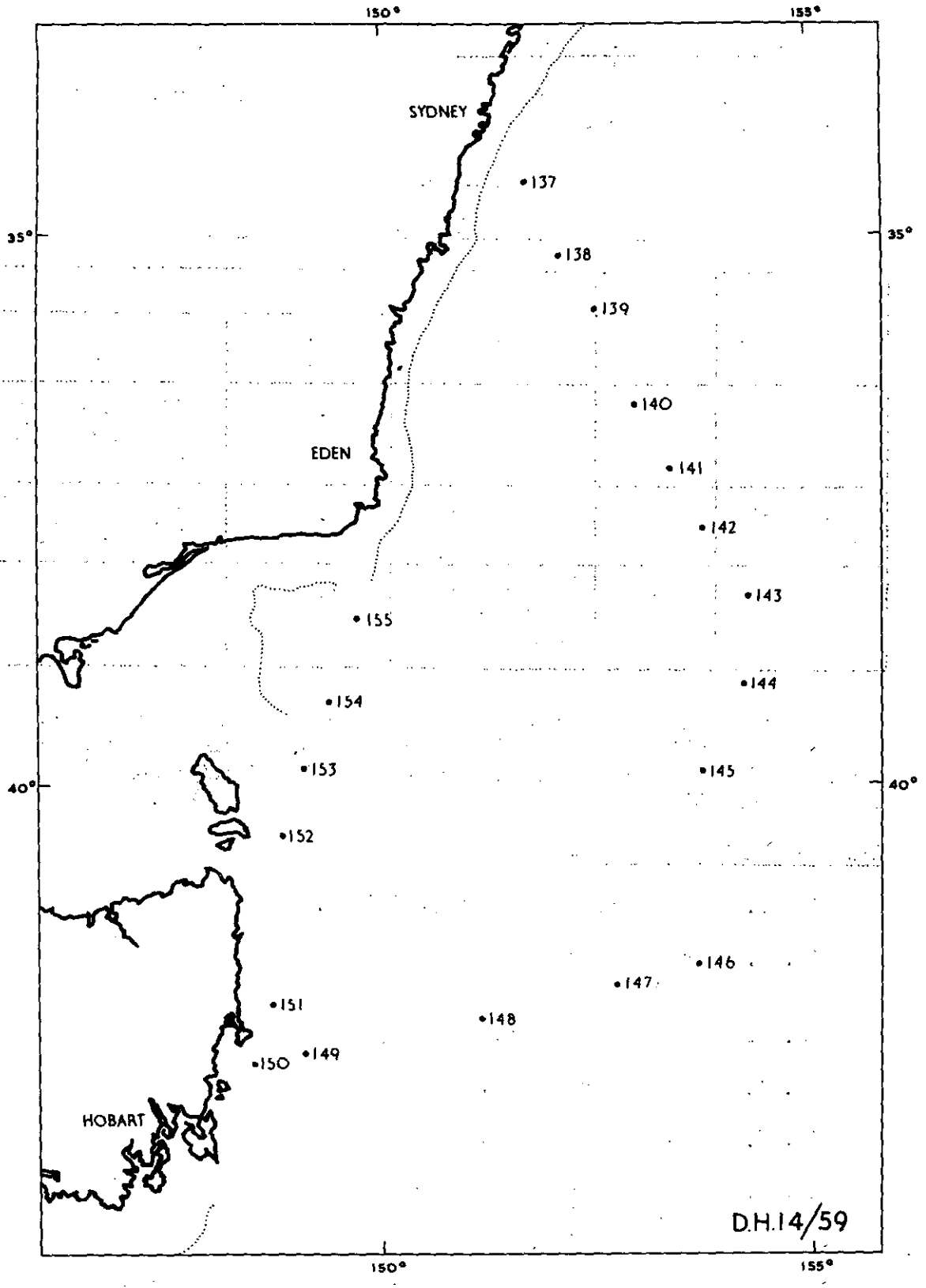
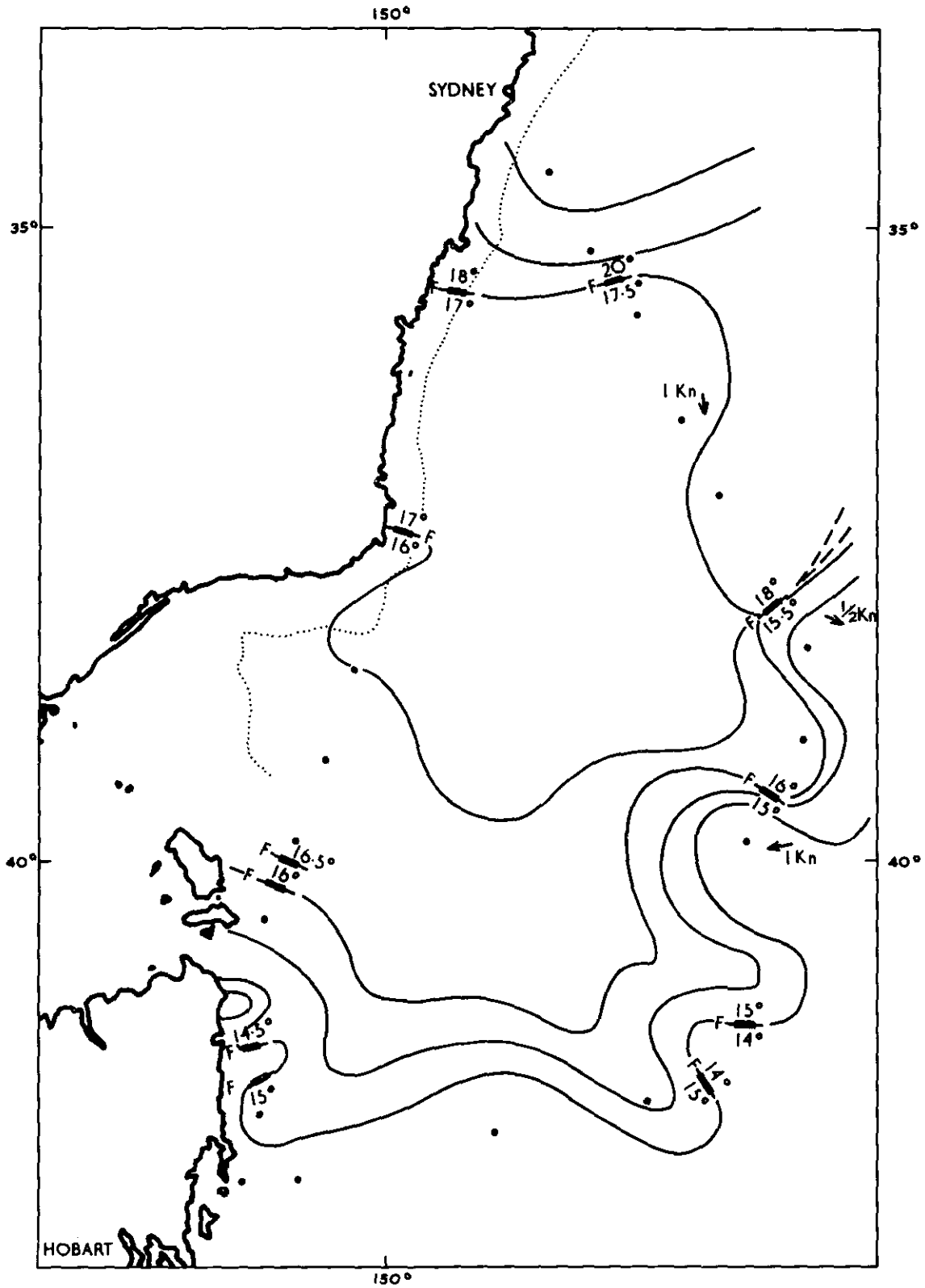
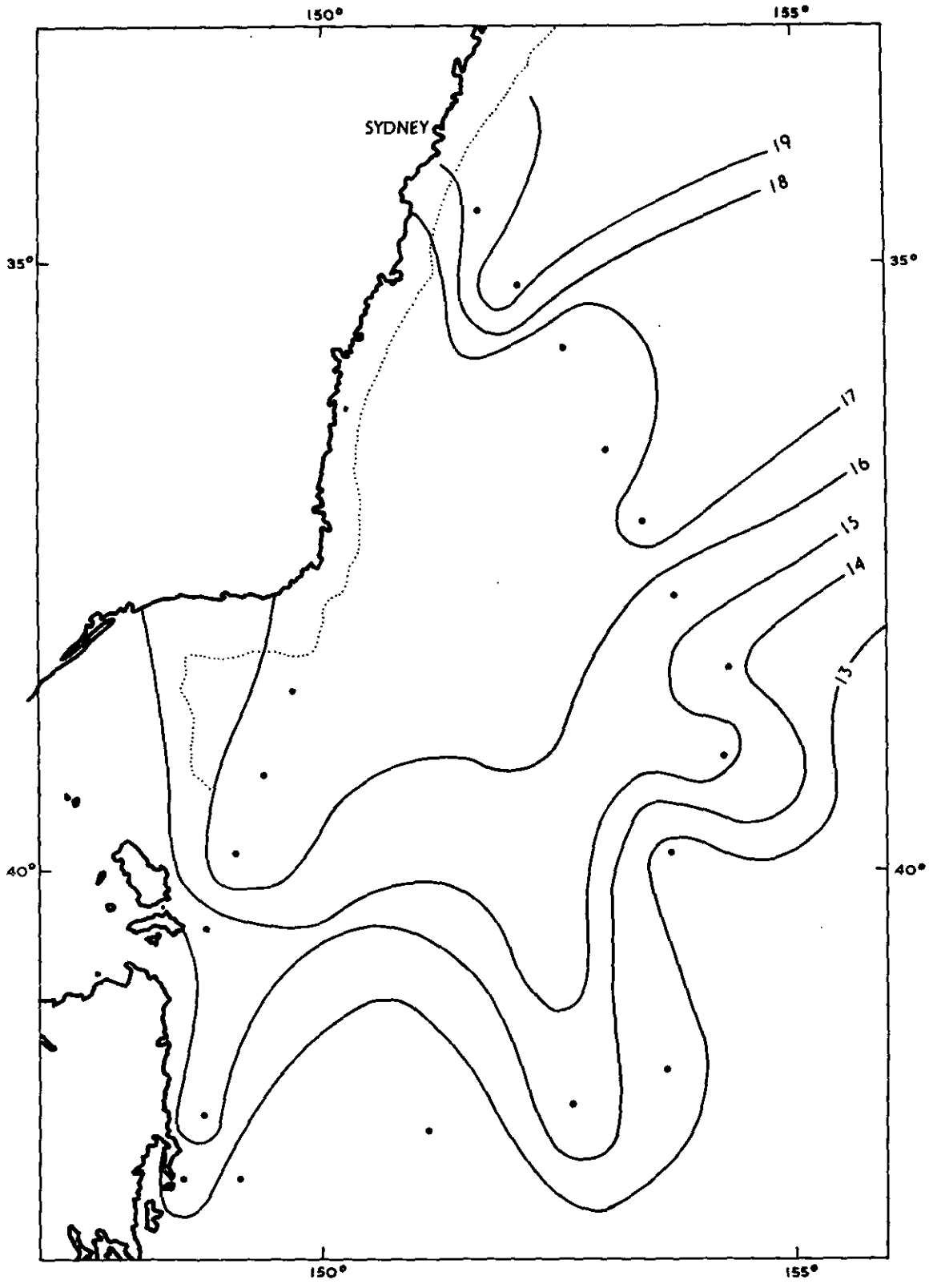

150°
155°
SYDNEY
137
35°
138
139
140
EDEN
141
142
143
155
144
154
153
145
40°
152
146
147
151
148
149
150
HOBART
D.H.14/59
150°
155°

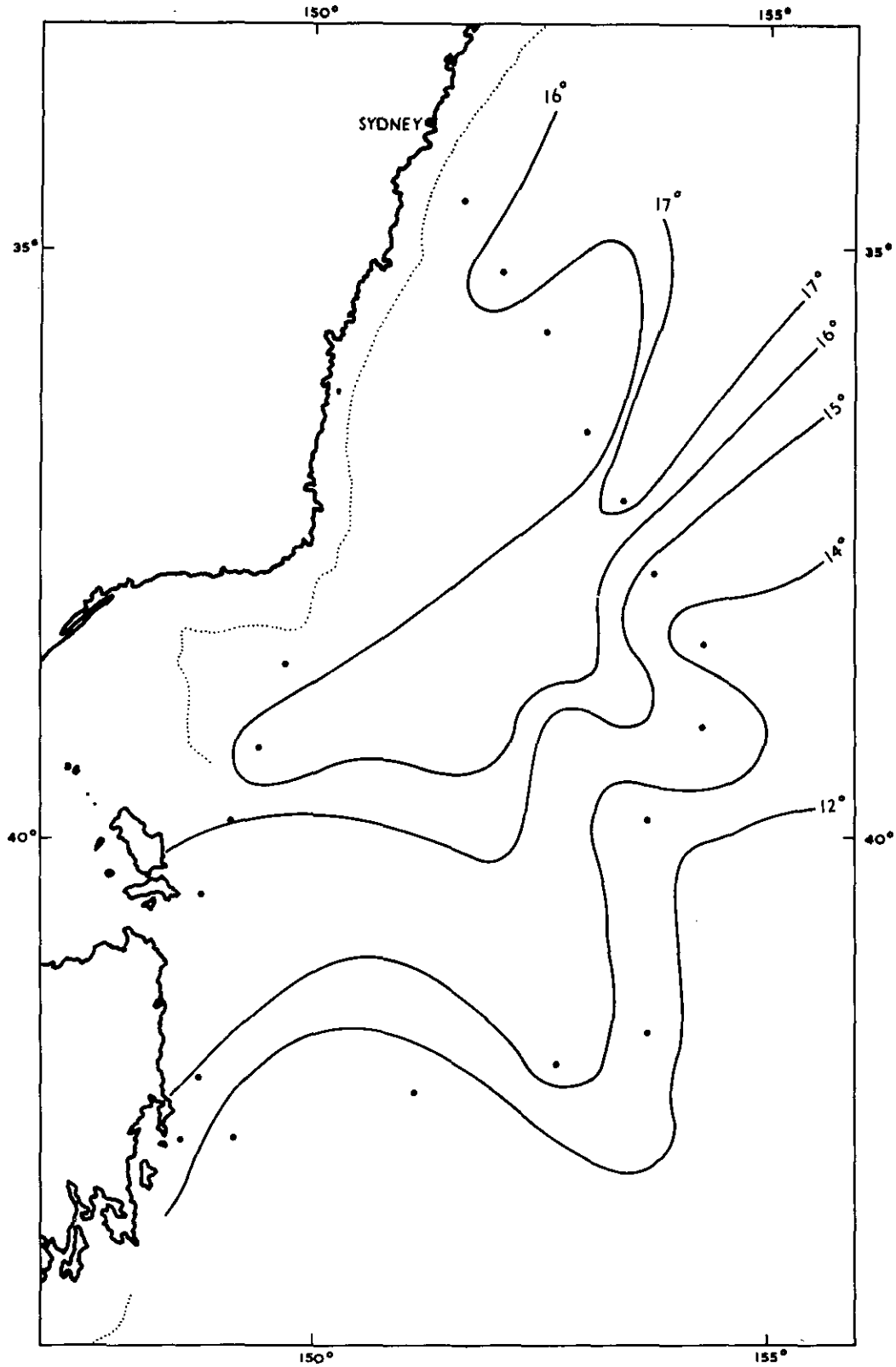
Fig.1


150°
SYDNEY
35°
18°
17°
F
20°
17·5°
1 Kn
17°
16°
F
18°
15·5°
F
½Kn
F
16°
15°
1 Kn
40°
F
16·5°
F
16°
F
14·5°
F
15°
F
15°
14°
F
14°
15°
HOBART
150°

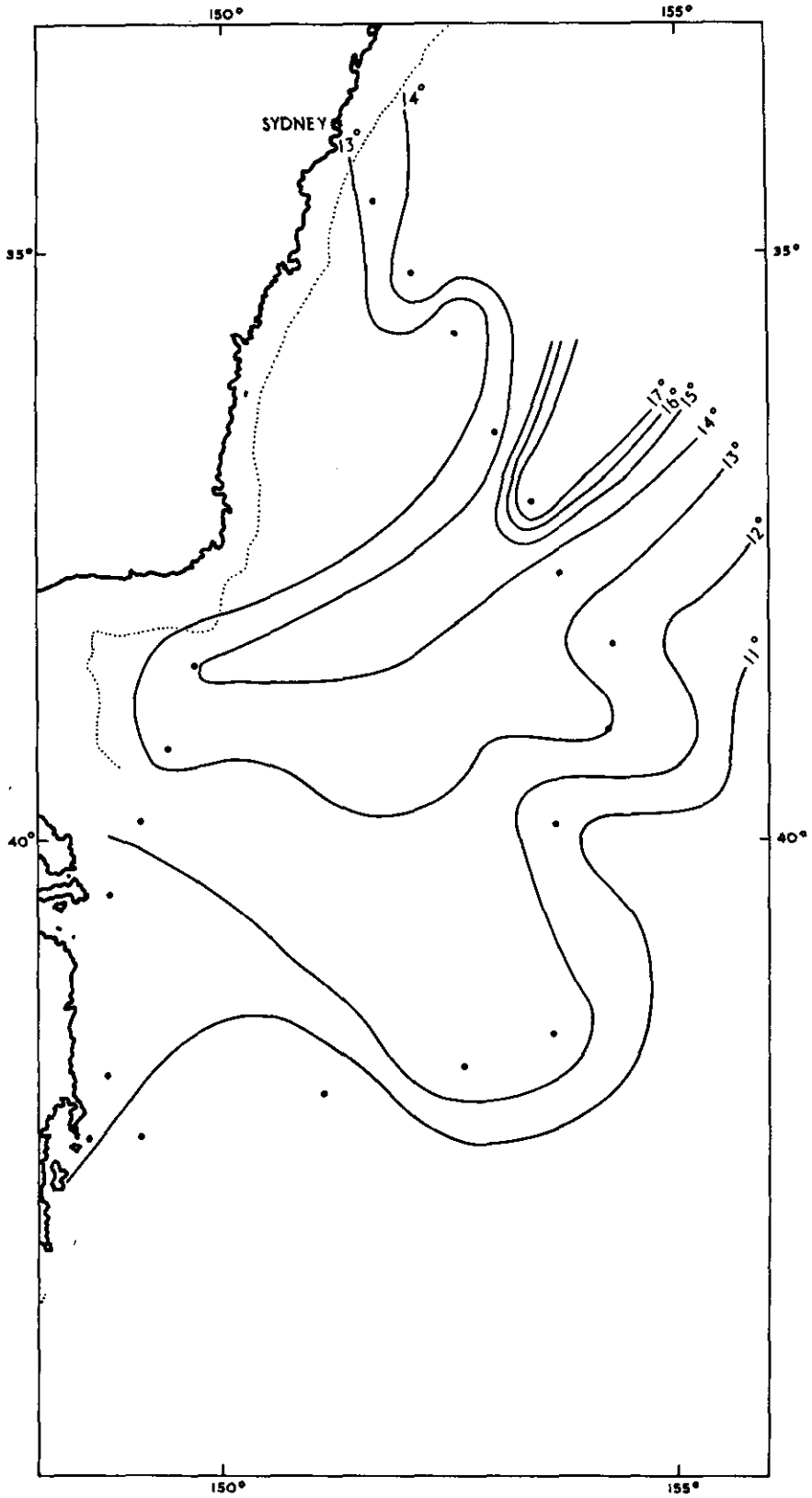
D.H. 14/59 Fig. 2



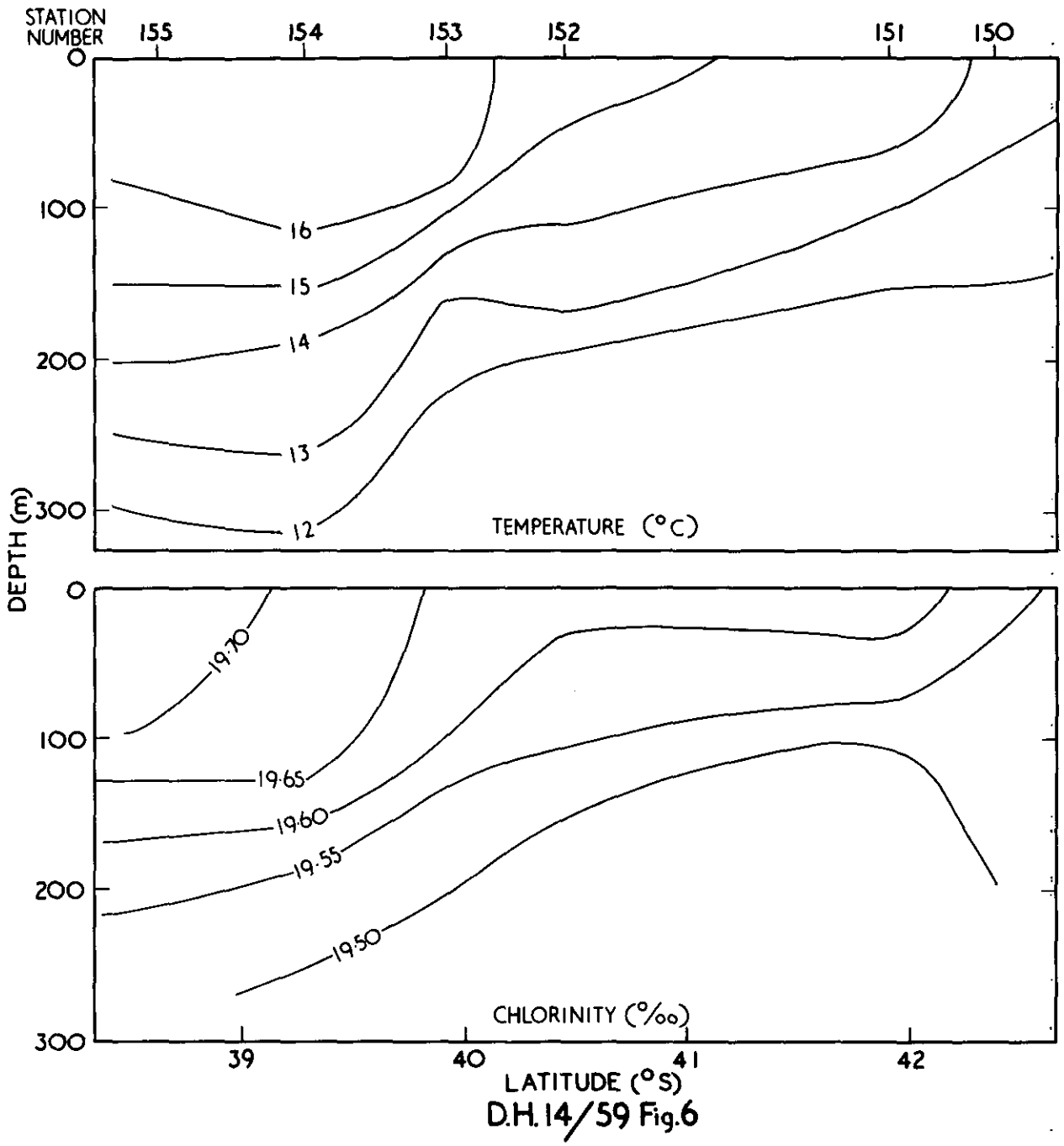
D.H.14/59 Fig. 3



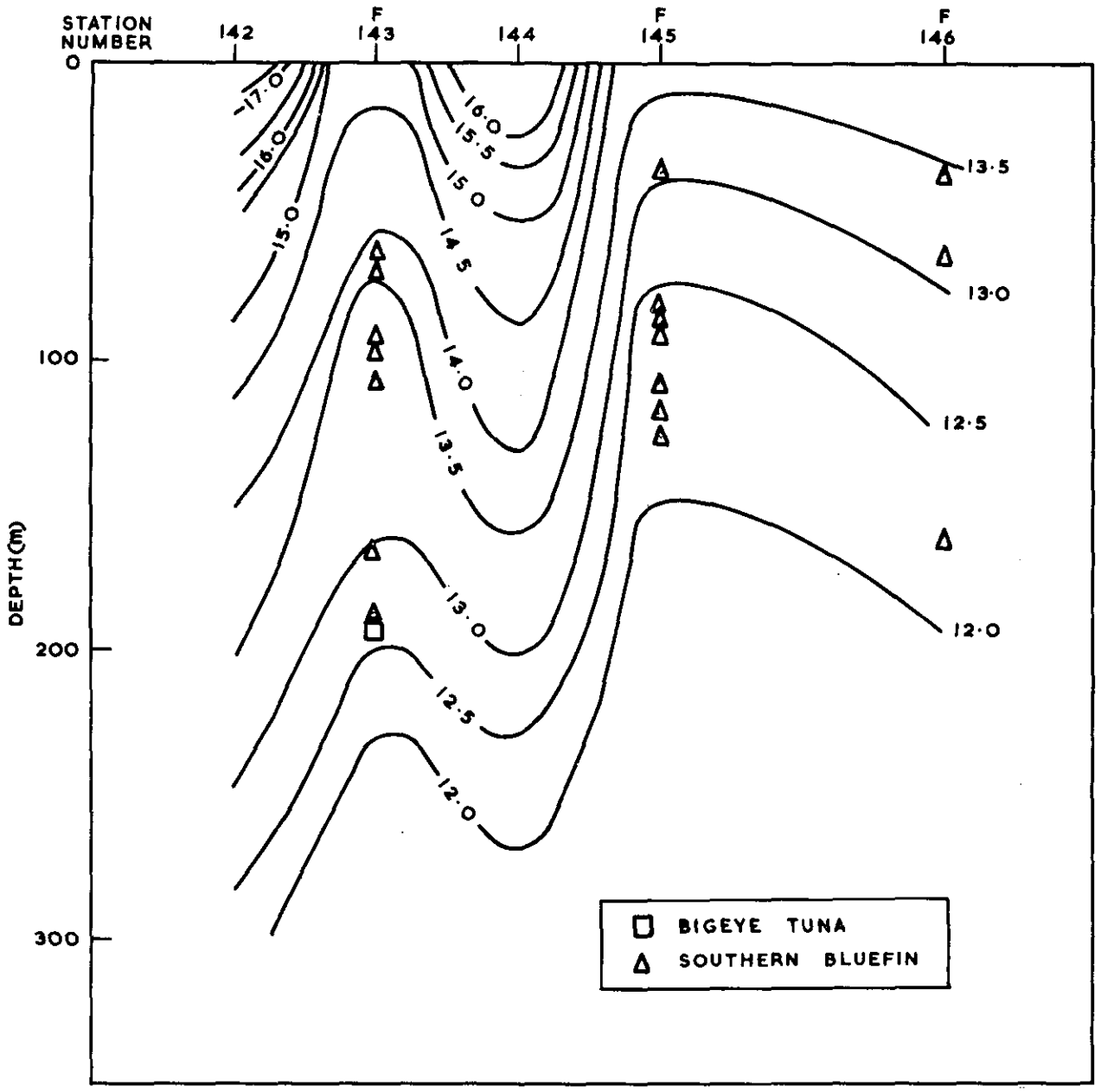
D.H.14/59 Fig.4



D.H.14/59 Fig.5


STATION NUMBER
155
154
153
152
151
150
0
100
200
300
16
15
14
13
12
TEMPERATURE (°C)
DEPTH (m)
0
100
200
300
19·70
19·65
19·60
19·55
19·50
CHLORINITY (‰)
39
40
41
42
LATITUDE (°S)

D.H. 14/59 Fig.6


STATION NUMBER
142
F 143
144
F 145
F 146
0
100
200
300
DEPTH (m)
17·0
16·0
15·0
16·0
15·5
15·0
14·5
14·0
13·5
13·0
12·5
12·0
13·5
13·0
12·5
12·0
BIGEYE TUNA
SOUTHERN BLUEFIN

D.H. 14/59 Fig. 7

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH15/59

November 17 - December 11, 1959

SCIENTIFIC PERSONNEL

B.S. Newell (in charge)

ITINERARY

Cruise DH15/59 was planned to repeat the programme outlined for Cruise DH14/59. Again bad weather interrupted work and a broken rudder chain near Station DH14/163/59 made a visit to Hobart obligatory. On the return trip work was concentrated in the Fortescue Bay area. Figure 1 shows the positions of stations.

(a) HYDROLOGY - B.S. NEWELL

On the return trip Fortescue Bay area was selected as a base because the warm front of East Australian Current water had moved south from the latitude of Station DH15/166/59 on November 24, 1959 to that of Station DH15/174/59 by December 6.

Vertical sections showing temperature and chlorinity are shown in Figure 2 being data from Stations DH15/170-172/59 (averaged), DH15/173/59, DH15/167-174/59 (averaged), DH15/175-178/59. The 19.65‰ isohaline, which was located at about latitude 40°S on Cruise DH14/59, had by this time moved south to about latitude 42°S.

Figure 3, using the surface data for Stations DH15/156-163/59 shows that the vessel was again (as on Cruise DH14/59) working across a tongue of Sub-Antarctic water, part of the boundary of the Sub-tropical Convergence. The G.E.K. values obtained at Stations DH15/156, 158-160, 162/59 were of sufficient magnitude to be considered reliable, and have been included. They suggest that the tongue of Sub-Antarctic water was moving north-west but curving off to the south-west at the boundary with the south-westward moving East Australian Current water to the north.

(b) TUNA LONGLINING - J.P. ROBINS

The positions of stations at which fish were caught are shown in Figure 1. The catch is shown in Table 1.

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH15/59

Station No.	Snoods Broken	Catch	Tuna	
			Catch/100 hooks	Depth of Capture m
DH15/156/59	2	1 yellowfin tuna 1 bigeye tuna 1 albacore 1 mako shark 1 bronze whaler shark 1 great blue shark		104 191 80
DH15/158/59		2 great blue sharks 1 lancet fish		
DH15/160/59	6	4 southern bluefin	2.11	51, 65, 80, 93
DH15/168/59	2	4 southern bluefin 3 great blue sharks	2.11	51, 53, 71, 126
DH15/170/59	2	5 southern bluefin 1 albacore	2.65	53, 55, 65, 109, 120 53
DH15/172/59	1	1 southern bluefin 1 great blue shark	0.52	191
DH15/179/59		1 yellowfin tuna 1 mako shark		73

Figure 4 shows the vertical distribution of temperature at Stations DH15/156-162/59, and at Stations DH15/165-180/59 and the depths at which all species of tuna were caught.

LEGENDS FOR FIGURES 1-4 - Cruise DH15/59

Fig. 1. Chart showing station positions.

Fig. 2. North south vertical section (Stations DH15/171-179/59)
a) Temperature
b) Chlorinity.

Fig. 3. Surface isotherms, temperature fronts and GEK currents.

Fig. 4. Vertical distribution of isotherms between Stations DH15/156/59 and DH15/162/59 showing depths at which tuna were caught.

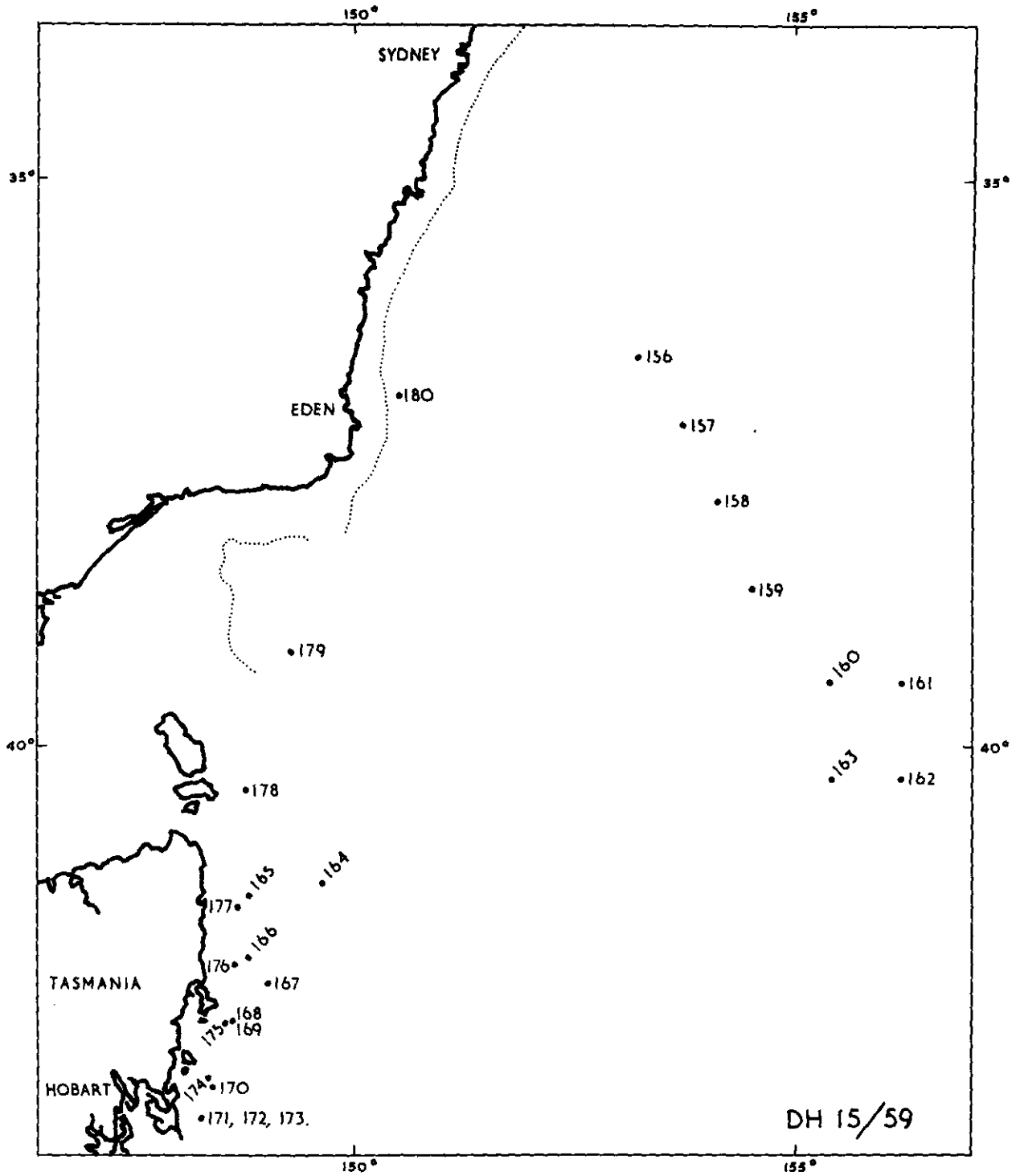
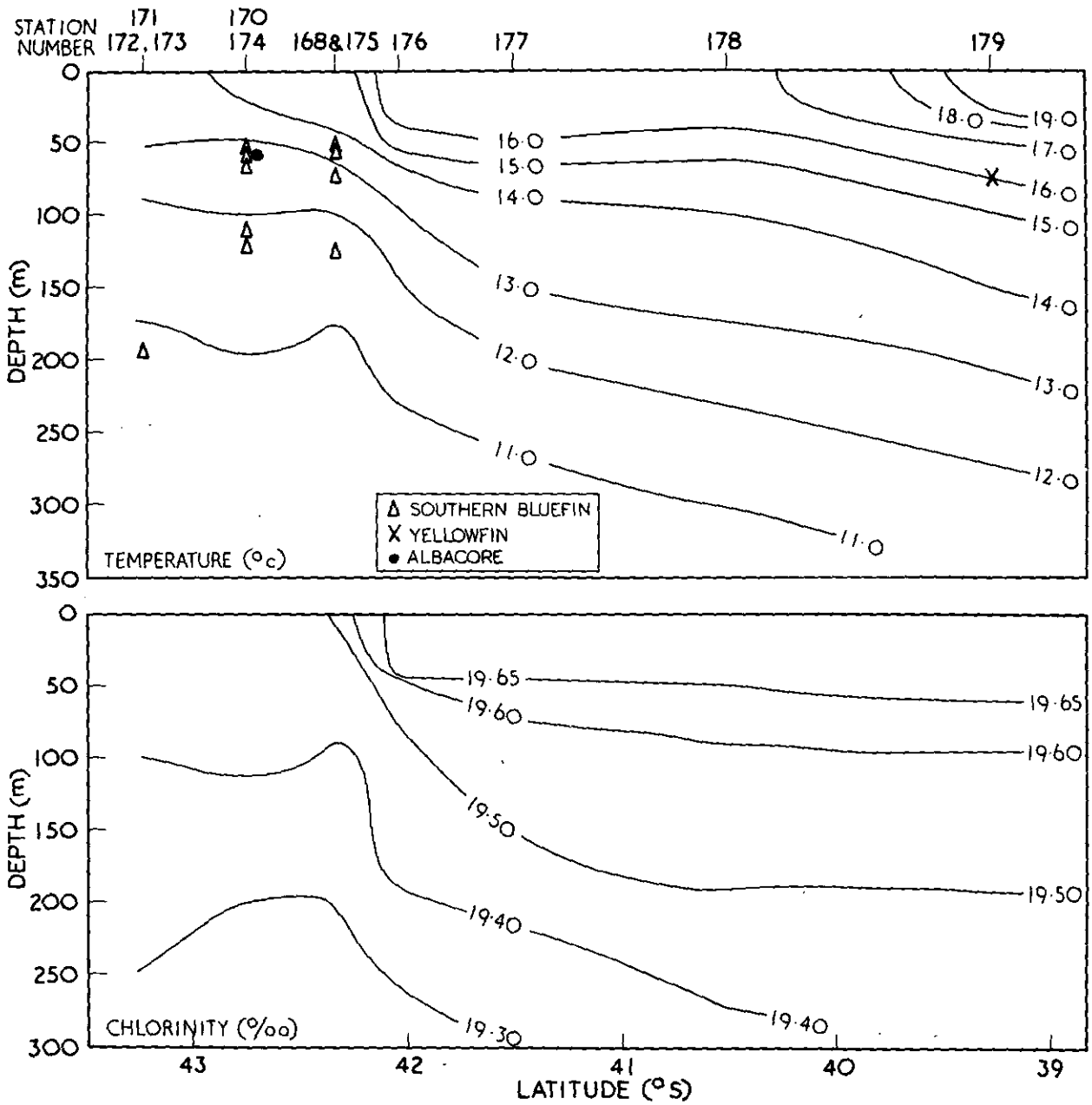
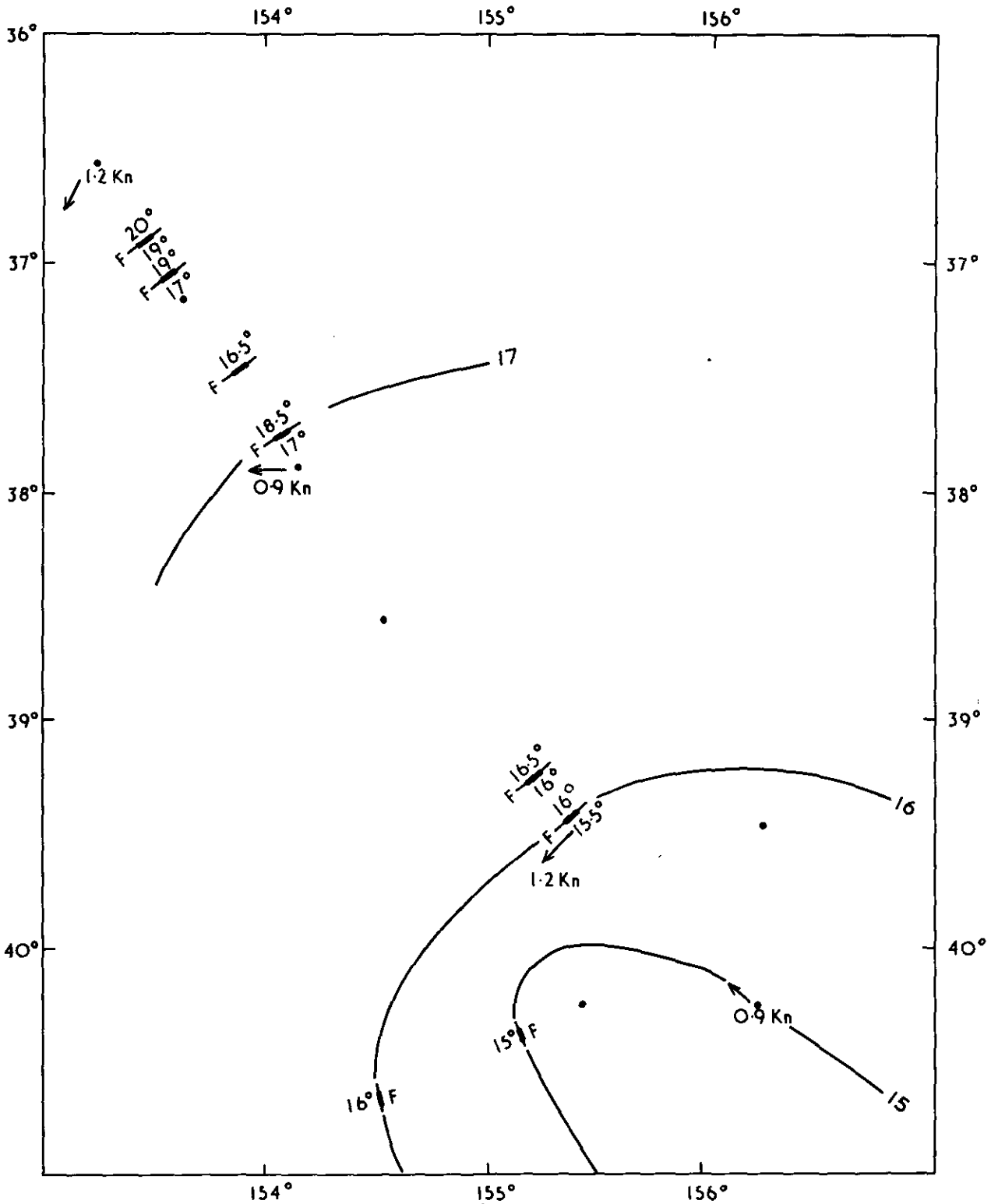

150°
155°
35°
40°
SYDNEY
EDEN
TASMANIA
HOBART
180
156
157
158
159
179
160
161
163
162
178
164
165
177
166
176
167
168
169
175
174
170
171, 172, 173.
DH 15/59

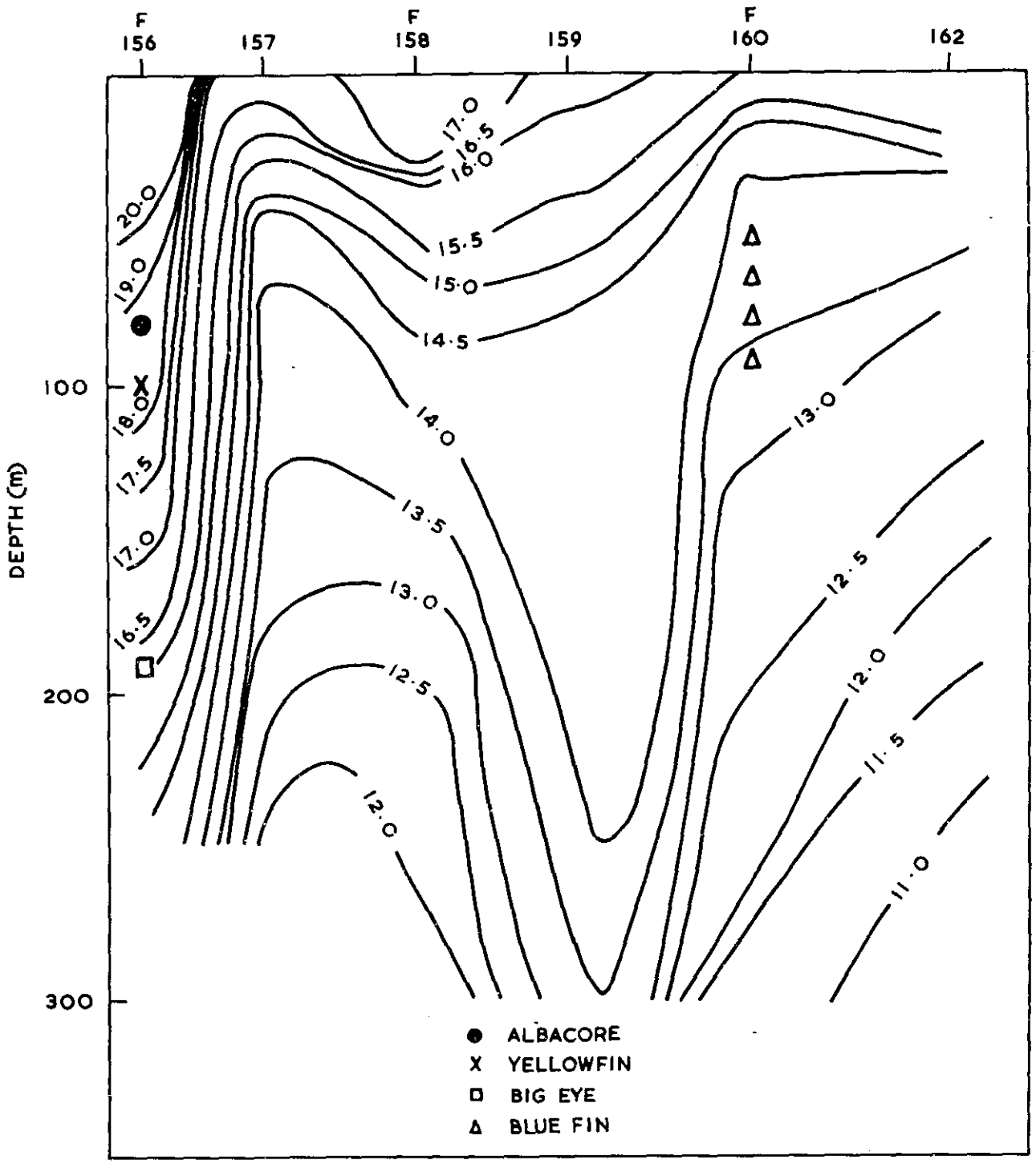
Fig. 1


STATION NUMBER
171
172, 173
170
174
168 & 175
176
177
178
179
DEPTH (m)
0
50
100
150
200
250
300
350
16·0
15·0
14·0
13·0
12·0
11·0
18·0
19·0
17·0
16·0
15·0
14·0
13·0
12·0
11·0
Δ SOUTHERN BLUEFIN
X YELLOWFIN
• ALBACORE
TEMPERATURE (°c)
19·65
19·60
19·50
19·40
19·30
CHLORINITY (‰)
43
42
41
40
39
LATITUDE (°S)

D.H.15/59 Fig.2


154°
155°
156°
36°
37°
38°
39°
40°
1·2 Kn
F 20°
19°
F 19°
17°
F 16·5°
17
F 18·5°
17°
0·9 Kn
F 16·5°
16·5°
F 16°
15·5°
16
1·2 Kn
0·9 Kn
15° F
16° F
15

D.H.15/59 Fig. 3


F 156
157
F 158
159
F 160
162
DEPTH (m)
100
200
300
17·0
16·5
16·0
15·5
15·0
14·5
14·0
13·5
13·0
12·5
12·0
11·5
11·0
20·0
19·0
18·0
17·5
17·0
16·5
13·0
12·5
12·0
ALBACORE
YELLOWFIN
BIG EYE
BLUE FIN

D.H. 15/59 Fig. 4

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH1/60

January 20 - February 8, 1960

SCIENTIFIC PERSONNEL

J.P. Robins (in charge)
M. Wootton

ITINERARY

This cruise was planned to continue the work done on Cruise DH15/59 along the eastern Tasmanian coast, and to follow the southward extension of warm East Australian Current water and to note its effect on the distribution of Thunnus maccoyii. Figure 1 shows the positions of stations.

(a) HYDROLOGY - B.S. NEWELL

A vertical section showing chlorinity and temperature distribution (Fig. 2), extending from Gabo I. to latitude 43° 46'S illustrates the rapid southward advance of the warm front since November. Water of chlorinity 19.65‰ was found on this cruise as far south as Station 6 (42° 40'S).

(b) TUNA LONGLINING - J.P. ROBINS

Table 1 shows the catch of the longline hauls during this cruise. Figure 2 shows the vertical distribution of temperature and the depths at which tuna were caught.

LEGENDS FOR FIGURES 1 & 2 - Cruise DH1/60

Fig. 1. Track Chart for cruise.

Fig. 2. North south vertical section
a) Temperature*
b) Chlorinity

* Symbols mark depths at which tuna were caught.

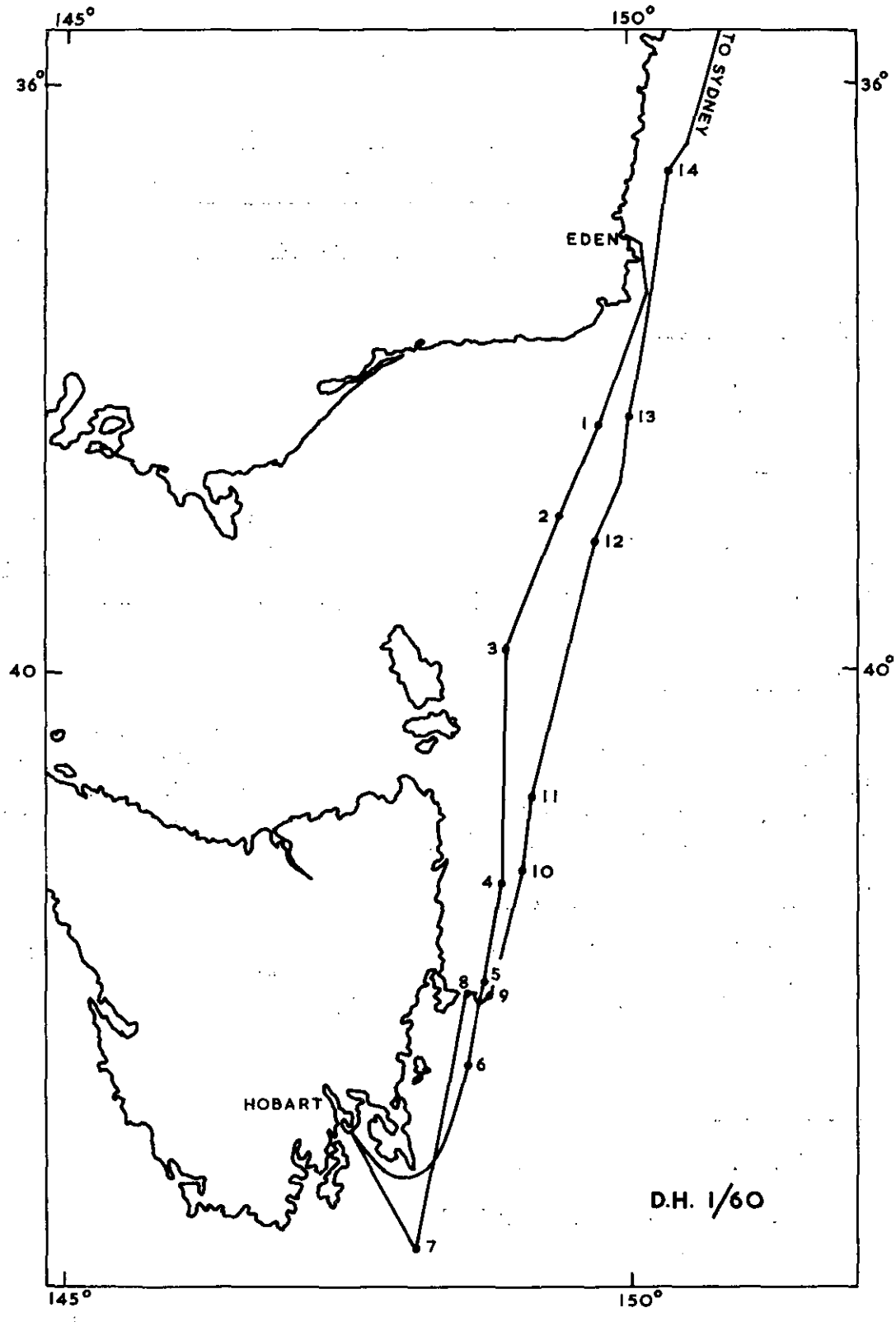
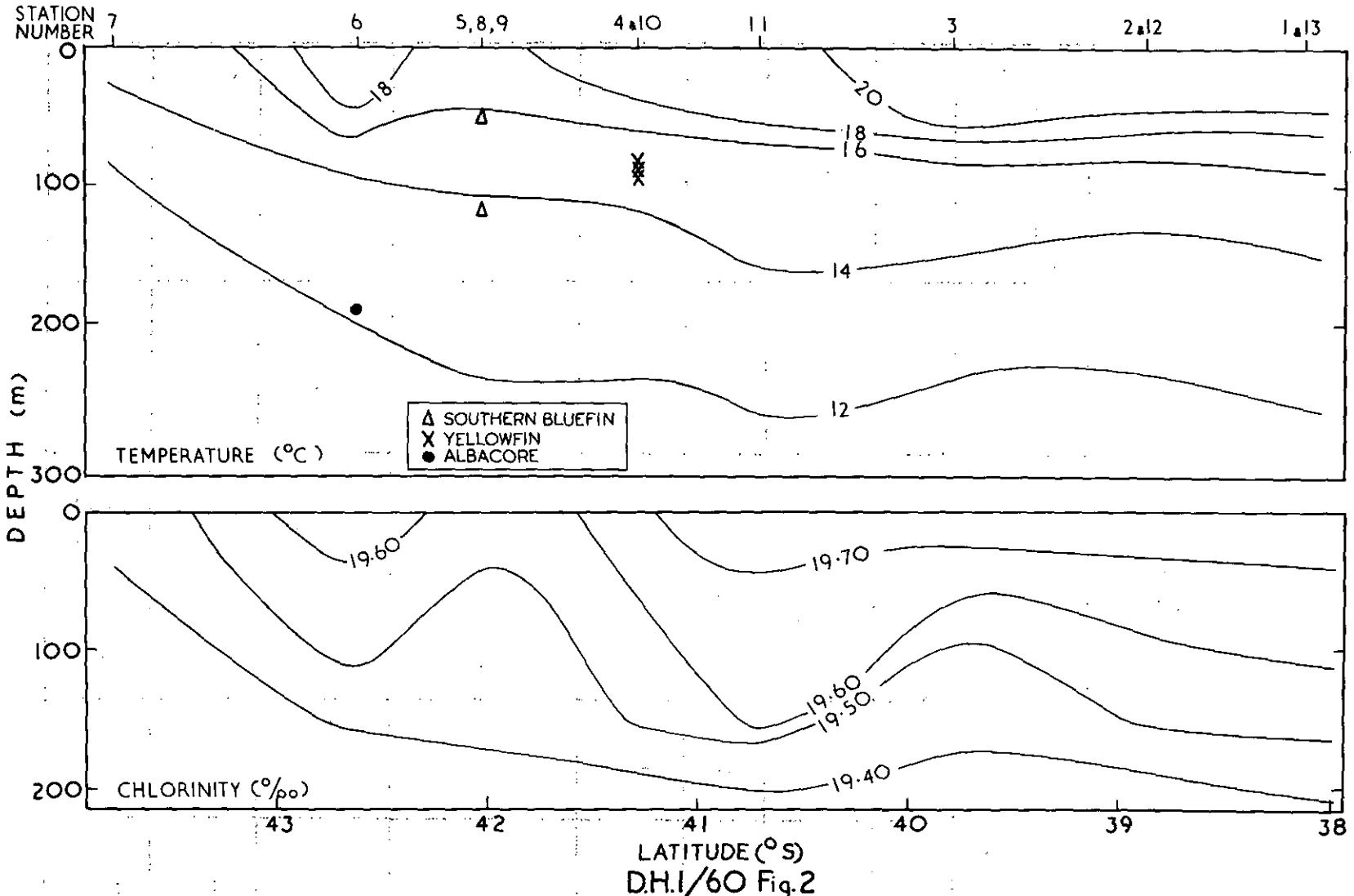

145°
150°
36°
40°
TO SYDNEY
EDEN
HOBART
1
2
3
4
5
6
7
8
9
10
11
12
13
14
D.H. 1/60

Fig.1


STATION NUMBER
7
6
5,8,9
4&10
11
3
2&12
1&13
DEPTH (m)
0
100
200
300
18
20
18
16
14
12
Δ SOUTHERN BLUEFIN
X YELLOWFIN
● ALBACORE
TEMPERATURE (°C)
0
100
200
19·60
19·70
19·60
19·50
19·40
CHLORINITY (°/oo)
43
42
41
40
39
38
LATITUDE (° S)

D.H.1/60 Fig.2

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH1/60

Station No.	Snoods Broken	Catch	Tuna	
			Catch/100 hooks	Depth of Capture m
DH1/1/60	1	Nil		
DH1/4/60	13	3 yellowfin 1 thresher shark		84, 88, 95
DH1/6/60	4	1 albacore		191
DH1/7/60	9	3 great blue sharks		
DH1/8/60	3	1 southern bluefin 1 blue marlin 1 school shark 1 barracouta	0.53	120
DH1/9/60	2	1 southern bluefin 1 mako shark	0.52	51
DH1/11/60	3	1 great blue shark		
DH1/14/60	6	2 lancet fish 1 bronze whaler		

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH2/60

February 16 - March 6, 1960

SCIENTIFIC PERSONNEL

G. Janovsky
G. Reid

ITINERARY

Figure 1 shows the positions of stations occupied. On this cruise no hydrological sampling was done. The cruise was planned to trace the distribution of southern bluefin off the south-west coast of Tasmania. Figure 1 shows the positions of stations.

TUNA LONGLINING - J.P. ROBINS

Table 1 gives details of the catch taken with the longline.

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH2/60

Station No.	Snoods Broken	Catch	Tuna	
			Catch/100 hooks	Depth of Capture m
DH2/15/60	4	-		
DH2/17/60	7	1 southern bluefin 1 porbeagle shark	0.52	37
DH2/18/60	6	3 porbeagle sharks		
DH2/20/60	-	2 porbeagle sharks		

LEGEND FOR FIGURE - Cruise DH2/60

Fig. 1. Track chart showing positions of stations.

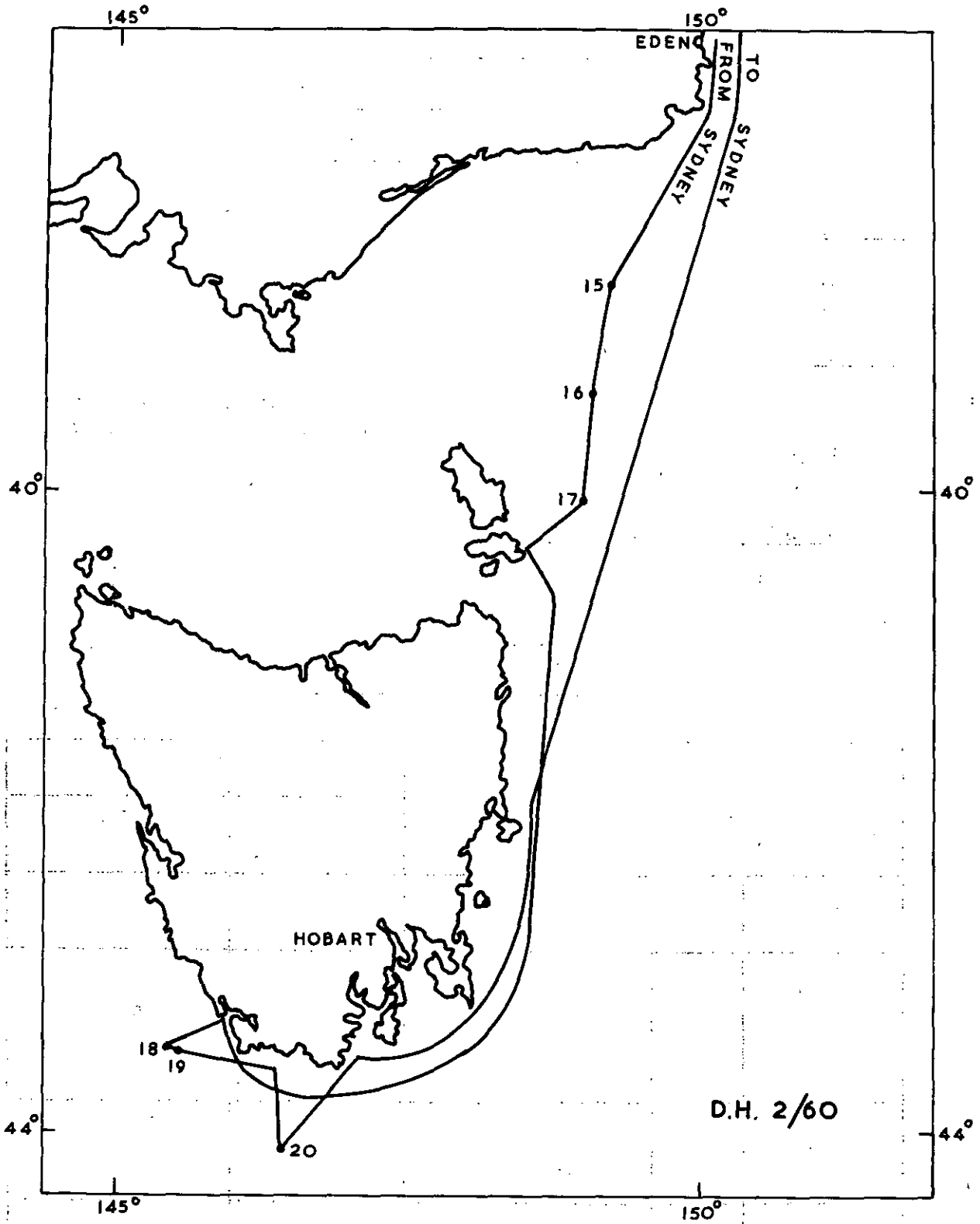

145°
150°
EDEN
TO SYDNEY
FROM SYDNEY
15
16
17
40°
HOBART
18
19
20
D.H. 2/60
44°
145°
150°

Fig.1

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH3/60

March 19 - April 7, 1960

SCIENTIFIC PERSONNEL

J. Robins (in charge)
G. Reid

ITINERARY

This cruise was planned to locate the position of the Sub-tropical Convergence off the east coast of Tasmania. Figure 1 shows the positions of the stations worked.

(a) HYDROLOGY - B.S. NEWELL

Vertical sections for chlorinity and temperature (Fig. 2) using data from Stations DH3/22,25,40,26-40 (averaged), 29-36 and 28,37,39 (averaged) have been drawn. The convergence is clearly visible at latitude 43°S but the frontal structure is very complex.

Stations DH3/35,29,36,28,37,38/59, at the frontal zone, are spread over a period of nine days.

(b) TUNA LONGLINING - J.P. ROBINS

Table 1 shows the catch taken by the longline.

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH3/60

Station No.	Snoods Broken	Catch	Catch/100 hooks	Depth of Capture m
DH3/21/60	1	-		
DH3/22/60	3	2 bigeye tuna		186, 177
DH3/25/60		-		
DH3/26/60	7	1 great blue shark		
DH3/28/60	9	-		
DH3/29/60	4	1 mako shark		
DH3/36/60	1	-		
DH3/37/60	3	-		
DH3/38/60	4	-		

LEGENDS FOR FIGURES 1 & 2 - Cruise DH3/60

Fig. 1. Chart showing station positions.

Fig. 2. North south vertical section
a) Temperature*
b) Chlorinity

* Symbols mark depths at which tuna were caught.

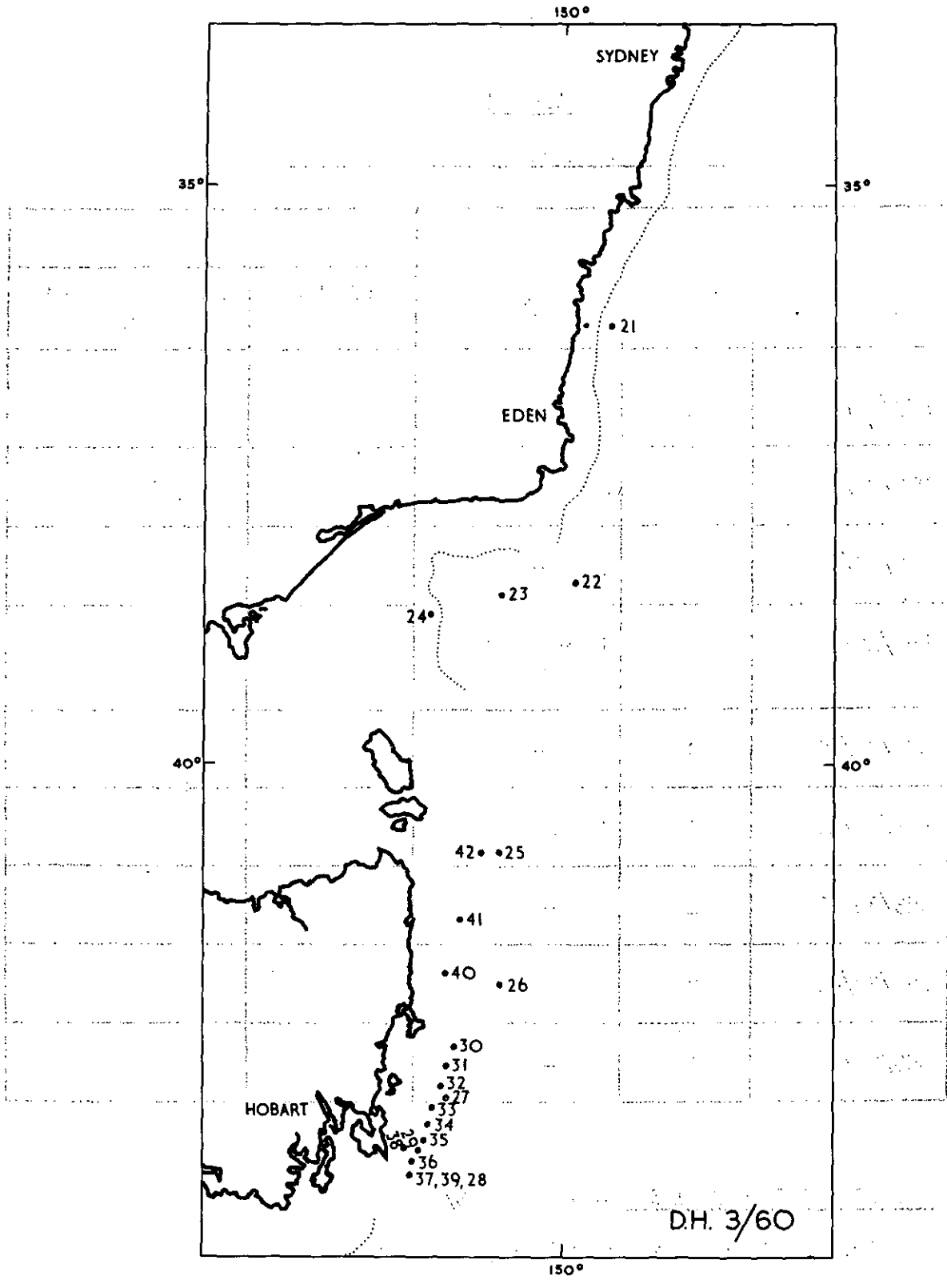
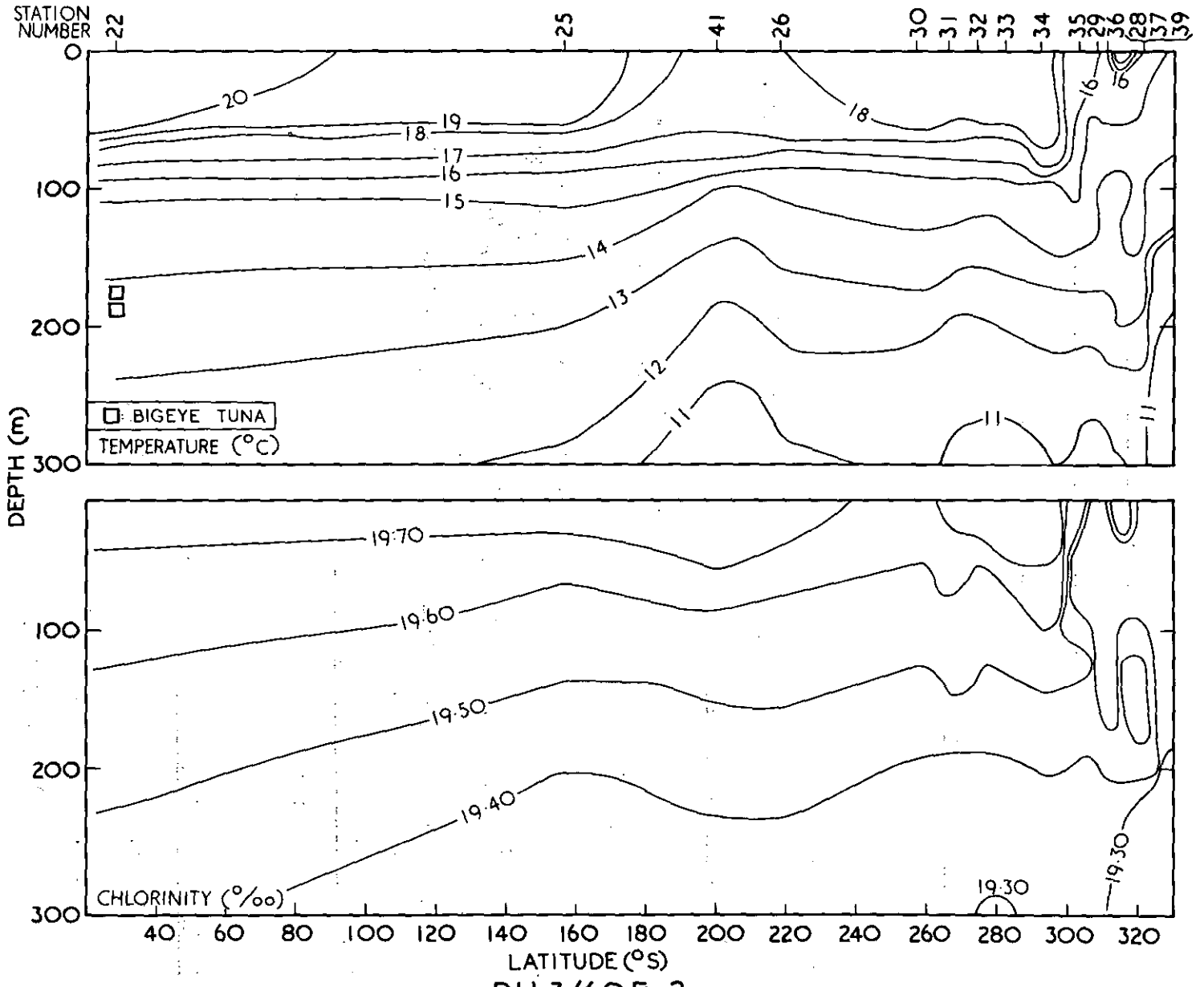

150°
SYDNEY
35°
35°
21
EDEN
23
22
24°
40°
40°
42
25
41
40
26
30
31
32
27
33
34
35
36
37, 39, 28
HOBART
D.H. 3/60
150°

Fig. 1


STATION NUMBER
22
25
41
26
30
31
32
33
34
35
29
36
28
37
39
DEPTH (m)
0
100
200
300
20
19
18
17
16
15
14
13
12
11
BIGEYE TUNA
TEMPERATURE (°C)
19·70
19·60
19·50
19·40
19·30
CHLORINITY (°/oo)
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
LATITUDE (°S)

D.H. 3/60 Fig.2

F.R.V. DERWENT HUNTER

SCIENTIFIC REPORT OF CRUISE DH4/60

May 26 - June 16, 1960

SCIENTIFIC PERSONNEL

J.P. Robins (in charge)
G. Reid

ITINERARY

Figure 1 shows the positions of stations worked on this cruise.

(a) HYDROLOGY - B.S. NEWELL

Seventeen hydrology stations were worked during this cruise. Data were used to draw north-south vertical sections for temperature and chlorinity (Fig. 2).

The front between the Sub-Antarctic water and sub-tropical water presents a complex structure as in Cruise DH3/60 and is still situated well to the south (between 42° and 43°S latitude). In the region of the front (between Stations DH4/48/60 and DH4/53/60) a few miles difference in position results in quite different preponderances of either Sub-Antarctic or sub-tropical water in the water column from surface to 300 m.

(b) TUNA LONGLINING - J.P. ROBINS

Table 1 indicates the longline catches made on this cruise.

LEGENDS FOR FIGURES 1 & 2 - Cruise DH4/60

Fig. 1. Chart showing station positions.

Fig. 2. North south vertical section
a) Temperature*
b) Chlorinity.

* Symbols mark depths at which tuna were caught.

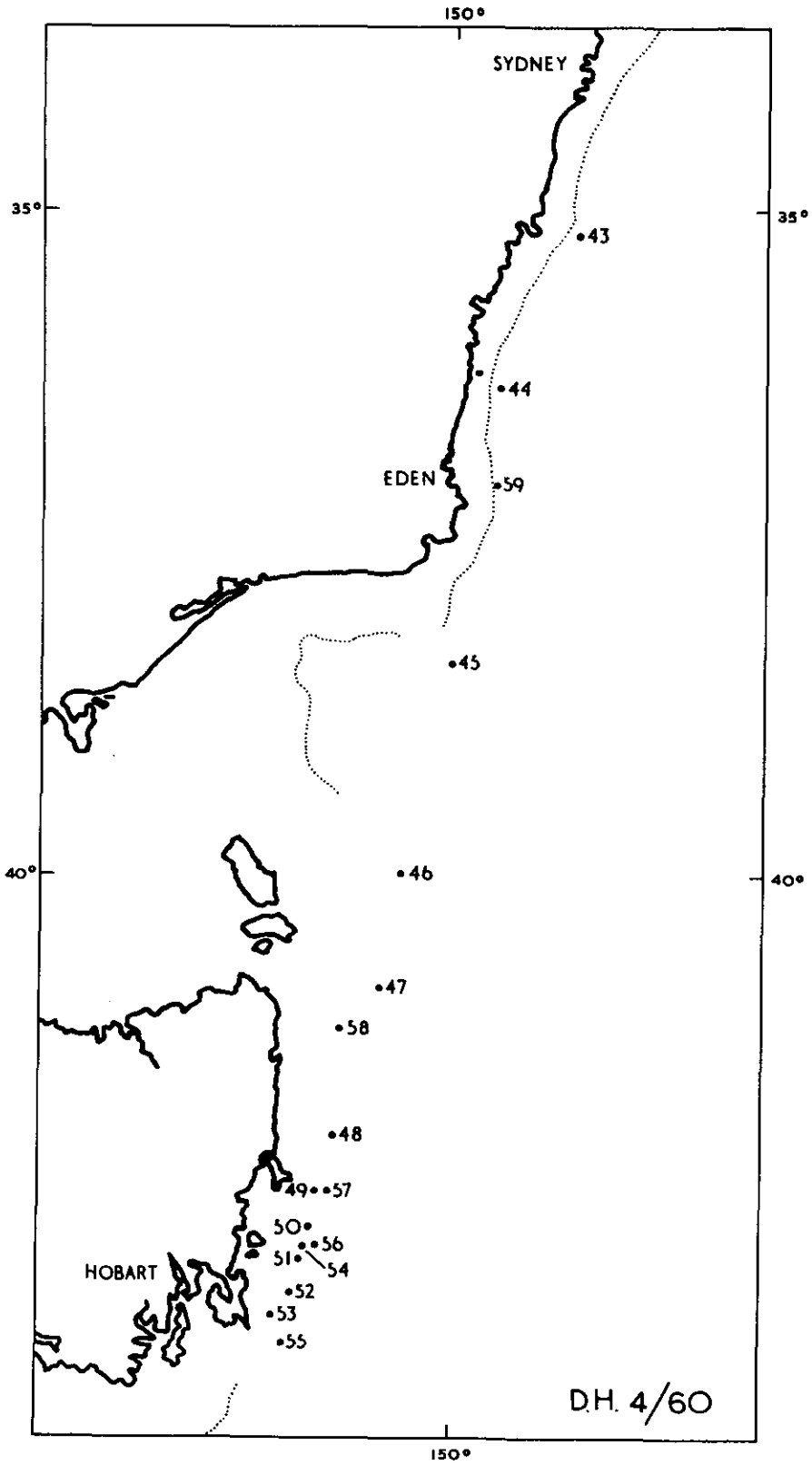
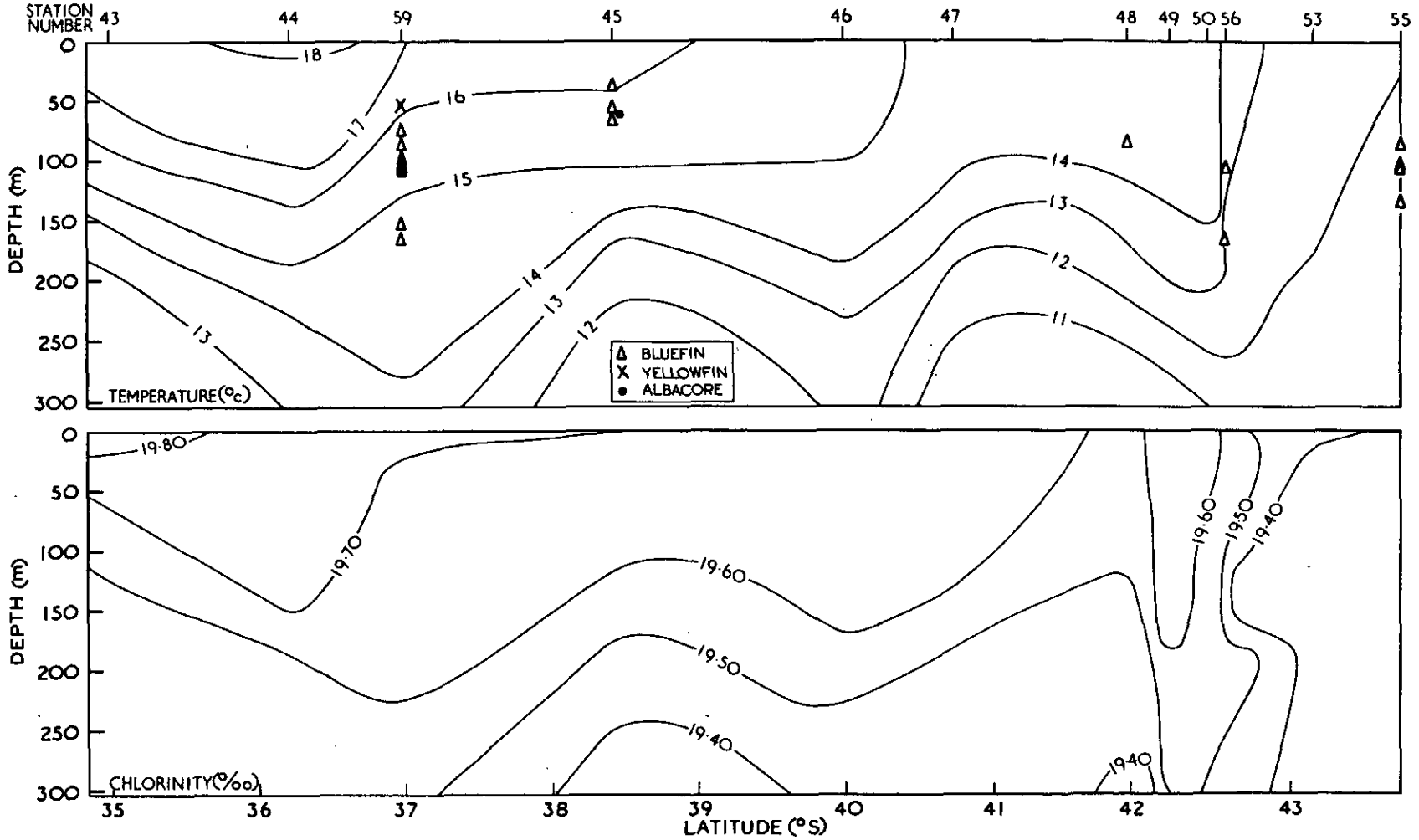

150°
SYDNEY
35°
35°
43
44
EDEN
59
45
40°
40°
46
47
58
48
49
57
50
56
51
54
HOBART
52
53
55
D.H. 4/60
150°

Fig. 1


STATION NUMBER
43
44
59
45
46
47
48
49
50
56
53
55
DEPTH (m)
TEMPERATURE(°c)
BLUEFIN
YELLOWFIN
ALBACORE
CHLORINITY(‰)
LATITUDE (°S)
35
36
37
38
39
40
41
42
43

D.H. 4/60 Fig.2

TABLE 1

TUNA LONGLINE CATCH - CRUISE DH4/60

Station No.	Snoods Broken	Catch	Tuna	
			Catch/100 hooks	Depth of Capture m
DH4/44/60	3	-		
DH4/45/60	3	3 southern bluefin 1 albacore 1 great blue shark	1.67	37, 71, 89 80
DH4/48/60	2	1 southern bluefin 1 great blue shark	0.52	84
DH4/49/60	3	1 mako shark		
DH4/53/60	-			
DH4/54/60	2	-		
DH4/55/60	1	4 southern bluefin	2.13	88, 102, 109, 137
DH4/56/60	3	2 southern bluefin	1.04	109, 164
DH4/57/60	1	1 great blue shark		
DH4/59/60	5	8 southern bluefin 1 yellowfin 1 mako shark	4.16	73, 87, 97, 106, 109, 102, 164, 152, 53

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