R.V. FRANKLIN

NATIONAL FACILITY
OCEANOGRAPHIC RESEARCH VESSEL

RESEARCH SUMMARY

RV FRANKLIN

FR11/88

Itinerary

Sailed Hobart Fri 2 December 1988 1200hrs
Arrived Hobart Sat 17 December 1988 1100hrs

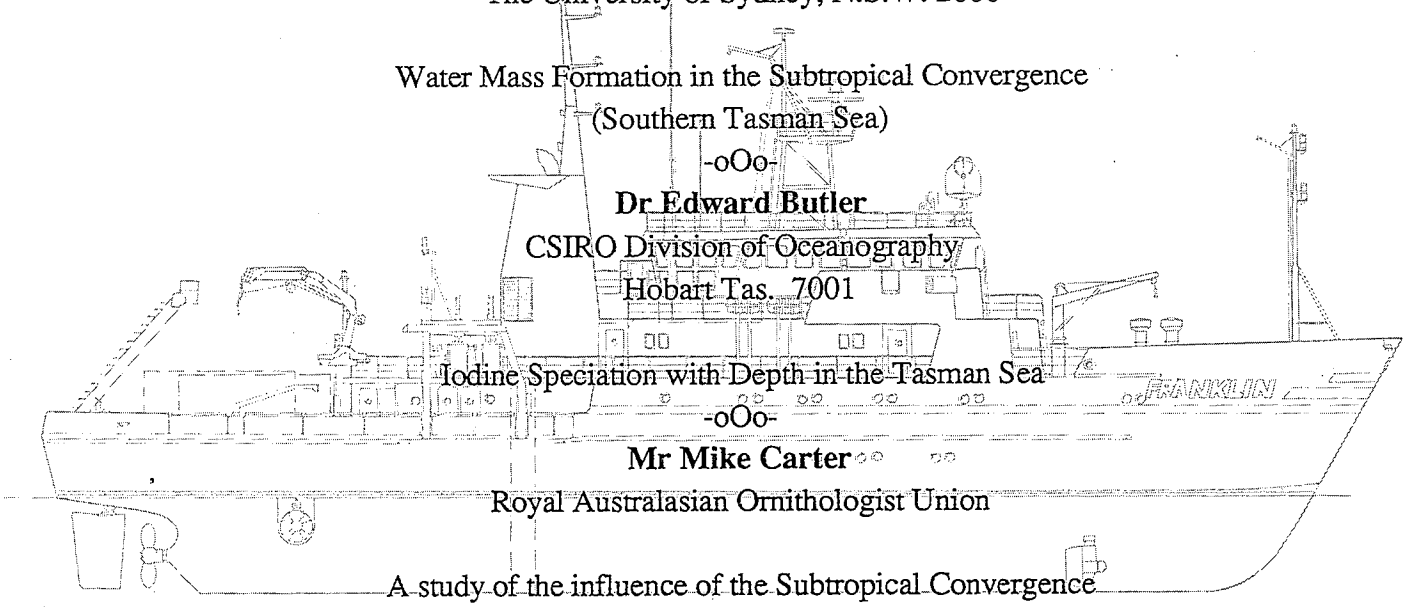
Principal Investigators

Associate Professor Matthias Tomczak
Ocean Sciences Institute
The University of Sydney, N.S.W. 2006

Water Mass Formation in the Subtropical Convergence
(Southern Tasman Sea)

-oOo-

Dr Edward Butler
CSIRO Division of Oceanography
Hobart Tas. 7001



Iodine Speciation with Depth in the Tasman Sea

-oOo-

Mr Mike Carter
Royal Australasian Ornithologist Union

A study of the influence of the Subtropical Convergence
on the Distribution and Activity of Seabirds

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For further information contact

ORV Operations Manager
c/- CSIRO Division of Oceanography
GPO Box 1538, Hobart, Tas. 7001
Telephone (002) 20 6222
Telex AA 57182

December 1988

AUSTRALIA

R.V. FRANKLIN IS OWNED AND OPERATED BY CSIRO

RV FRANKLIN

Research Summary FR11/88

Itinerary

Sailed Hobart Fri 2 December 1988 1200hrs
Arrived Hobart Sat 17 December 1988 1100hrs

-oOo-

Principal Investigators and Scientific Programs

Ass. Prof. Matthias Tomczak
Ocean Sciences Institute
The University of Sydney, N.S.W. 2006

To determine the location of the Subtropical Convergence between 148°E and 167°E for December 1988 and to develop an indicator for the position of the Subtropical Convergence which can be derived from satellite data

Dr. Edward Butler
CSIRO Division of Oceanography
Hobart Tas. 7001

To collect water samples for iodine species analysis

Mr Mike Carter
Royal Australasian Ornithologist Union

To study the influence of the Subtropical Convergence on the distribution and activity of seabirds

Results

The Subtropical Convergence (STC) was found at 47°S south-east of Tasmania (150°E), from where it extended north-eastward to 44°S:155°E then eastward to 159°E. Further east from that position it appeared to weaken and disintegrate as it reached the west coast of New Zealand at about 45°S.

The most obvious and most reliable indicator of the STC is salinity, but temperature can be used as an indicator, too, although the actual horizontal temperature gradients are much weaker than the corresponding salinity gradients and do not give an accurate picture of the front in the centre of the STC. The key temperature indicative of the position of the STC would also vary with the seasons, while judging from the published literature and the results from this cruise, the key salinity remains constant at 34.7-34.9 throughout the year.

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Water samples for iodine species analysis were collected from a 24 Niskin bottle CTD cast at 43°00'S:158°16'E.

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Sea birds seem to be more abundant on the southern side of the STC than on the northern side and concentrate along surface fronts within the STC. Prions in particular were seen along fronts in their hundreds.

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Cruise Narrative

Departure from Hobart on 2 December was delayed from 0900. to 1200 because of late bunker oil deliveries. After a CTD winch practice in the Derwent estuary for those of the crew new to the ship and a test station just off the shelf to verify that all equipment was operational, *Franklin* set out for the first station at 44°S:148°E. The first leg of CTD stations was completed and the leg terminated with station 6 at 48°S:160°E, about 60 miles south of the STC (see Figure 1 for a map of cruise track and station positions, and Figure 2 for a map of sea surface salinity). The weather, which had been fair at the start, deteriorated during the leg, causing an 8 hour wait before station 6 could be attempted. 80 m of CTD wire had to be cut at station 3 because one of the new crew members lowered the CTD at 150 m/min, which caused the wire to jump off the drum. After that experience everyone stuck to the maximum 60 m/min rule.

Stations 7 to 11 along leg 2 went well, with sea and swell following the ship on its north-eastward course. Having cut the STC again, a south-eastward course was set, however, a strong atmospheric front forced us to stop work at 45°S (station 13). The night of 6 to 7 December was spent riding out a huge swell, with waves reaching eye level on the bridge deck. On 7 December at 10 a.m., with the wind down from 50 to 30 knots and the swell down by about half, work was resumed by proceeding to 45°S:155°30'E (station 14). A high pressure system allowed good progress with CTD stations. The deep (to 4200 m) station for Dr. E. Butler was occupied at station 17/18, at the most northerly position of the cruise as instructed.

The next leg (stations 17 to 21) was on a south-easterly course to 46°S. As we expected the STC to bend southward and round the southern tip of New Zealand, the next leg (stations 21 to 24) was worked on an easterly course along 46°S. Towards the end of that leg, on 10 December, the weather deteriorated again, and we were unable to attend a CTD station at 46°S:165°20'E; so only thermosalinograph information was collected between stations 24 and 25. It indicated that the STC had disintegrated somewhere east of 160°E. We decided to find it again by following a big sweeping motion along a north-eastward course to 43°30'S and then going westward. For most of 11 and 12 December the ship did not manage much more than 5 knots, but all CTD stations could be done.

By 13 December another high pressure system was well established over the southern Tasman Sea and working conditions became good to excellent. Having crossed the area around 158°E which was covered by stations earlier, the STC was located again and all its details found virtually unchanged during the intervening six days. A detailed survey of a 80x100 mile area, with stations on a square grid at 20 mile spacing and centred on 44°S:144°E was carried out during 13-15 December.

As the weather forecast announced another front and intensive low pressure system for Friday 16 December, we decided to work CTD stations along a westward course which would bring us closer to Hobart. As it turned out, the wind increased to 25 knots but came mainly from the north and not from the south-west as expected. This allowed good progress for most of 16 December, and we were able to finish the last CTD station (station 55) at about 4 p.m. before heading home. We arrived at CSIRO Marine Laboratories the following day 11 a.m.

Summary

All scientific aims were achieved. The rather northerly position of the STC, together with the long spell of good weather during the second half of the cruise, meant that the amount of time lost due to bad weather was far less then anticipated. 55 CTD stations were completed, giving an excellent data set and making the cruise a real success.

The ship's equipment worked generally well, particularly the key instruments for the cruise, CTD and thermosalinograph. There appears to be a constant difference

between CTD and thermosalinograph salinities, the thermosalinograph reading about 0.15 units low. The ADCP had just been returned from an upgrading in the USA and took some time to set up but should hopefully produce good data for most of the cruise. A fault in the ADCP micro towards the end of the cruise could not be rectified, and the last three days were without ADCP information.

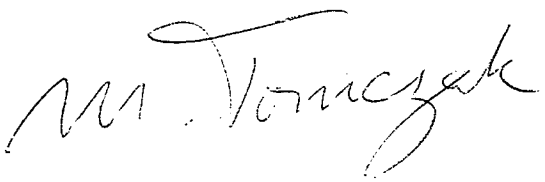
A number of observations are worth mentioning. Although the salinity is an excellent indicator for the position of the STC (34.7-34.9 indicating the position very well), a map of sea surface salinity (see Figure 2) may only give an approximate location. Over most of the area salinities higher than at the surface by up to 0.4 units are usually found at depths of between 50 and 150 m, and at those depths the boundary between what are usually called subtropical and subantarctic waters is usually 60-100 miles further south than at the surface. The level of layering and interleaving is generally very high, most stations exhibiting something like 5-10 layers in the upper 400 m depth range.

There is also some indication for strong patchiness horizontally. This came out very clearly during the detailed survey on 14 December when the wind speed dropped below 5 knots for nearly twelve hours and the thermosalinograph showed temperature variations of nearly 1°C over space scales of 10-20 miles which only disappeared when the wind speed picked up to 10 knots and more again. The variations were too large to reflect the effect of daytime heating during calm conditions, considering that the intake for the thermosalinograph is at least 2 metres from the surface. The only explanation we could think of was that the STC contains eddies of 10-20 mile diameter in the surface layer, which are usually stirred by wind and wave activity but become dominant in the thermosalinograph record during calm conditions.

Finally, it was noticed that sea birds seem to be more abundant on the southern side of the STC than on the northern side and concentrate along surface fronts within the STC. Prions in particular were seen along fronts in their hundreds. We also noticed some pilot wales on 9 December (along the leg of stations 17-21) and about 50 minke wales on 14 December during the detailed survey (stations 32-51).

Personnel

M. Tomczak	University of Sydney	Chief Scientist
K. Warmus	"	
A. Franklin	"	
R. Lee	"	
M. Carter	Royal Australasian Ornithologist Union	
K. Suber	CSIRO Marine Laboratories/ORV	Cruise Manager
P. Adams	"	
B. Baker	"	
B. Barker	"	
M. Rayner	"	
J. Dunn	"	



Matthias Tomczak
Chief Scientist

December 1988

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Fig. 1

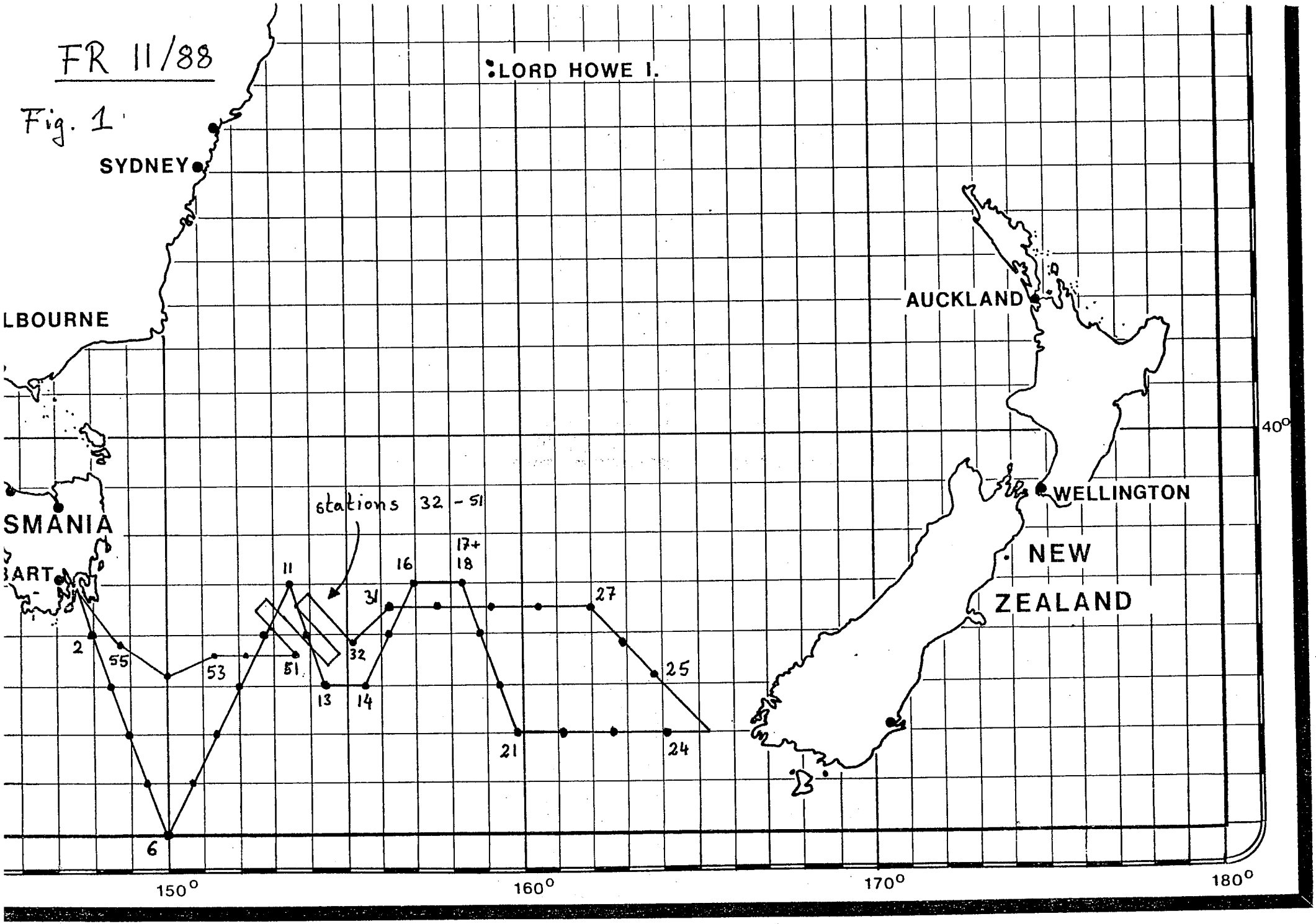
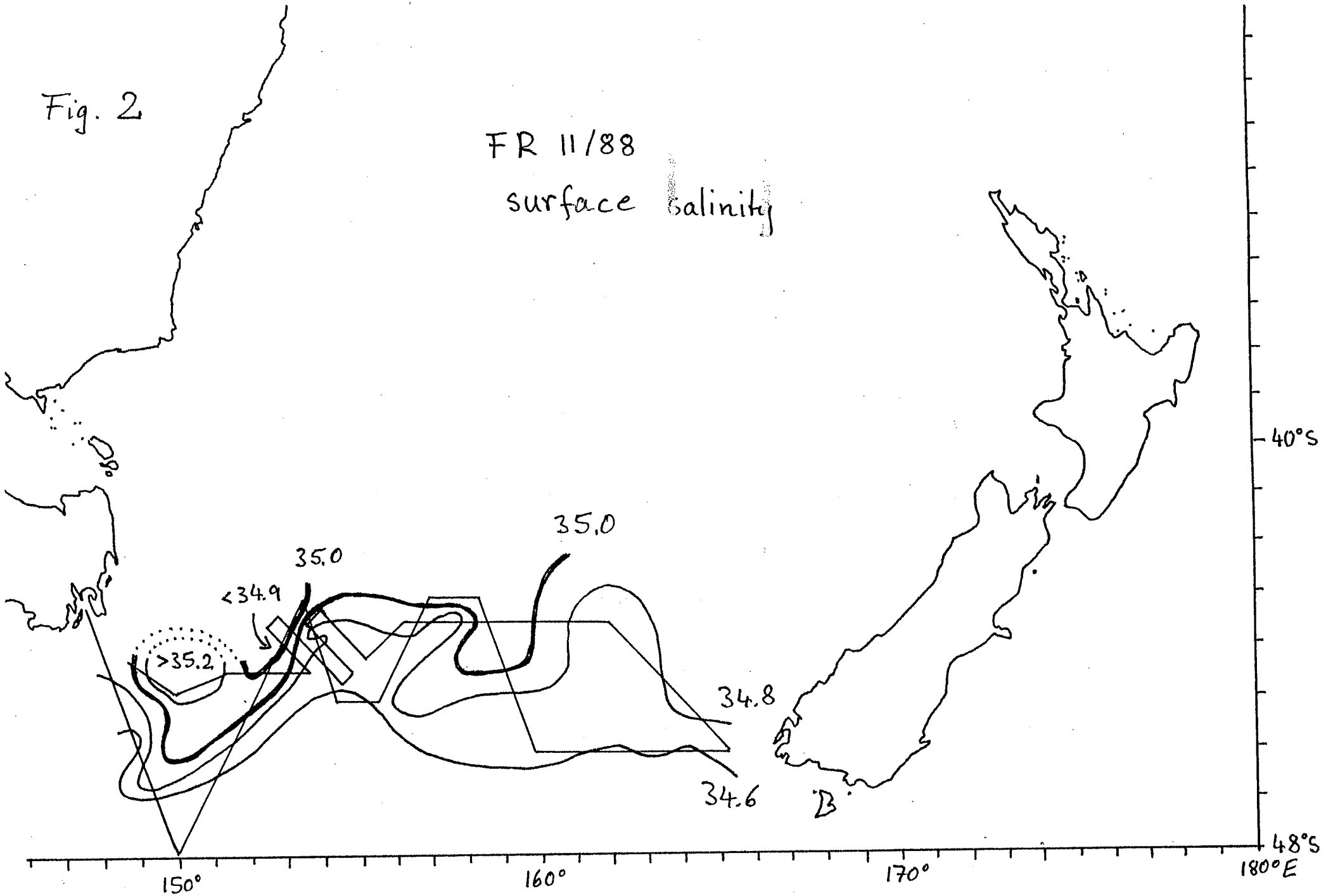

LORD HOWE I.
SYDNEY
LBOURNE
SMANIA
ART
AUCKLAND
WELLINGTON
NEW
ZEALAND
stations 32 - 51
2
55
53
51
11
13
14
32
31
16
17+
18
27
25
24
21
6
40°
150°
160°
170°
180°

Fig. 2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surface salinity
35.0
35.0
<34.9
>35.2
34.8
34.6
B
40°S
48°S
150°
160°
170°
180°E