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CRUISE REPORT

F.R.S. "Scotia"

June-July, 1951.

"SCOTIA" left Aberdeen on Monday afternoon, 11th June, and made passage to Stornoway where, according to arrangement, the Rev. E. A. Armstrong and Dr. Westall, ornithologists, were embarked the following afternoon and conveyed to St. Kilda. The intention to spend a long day of 18 hours or more in the observation of the St. Kilda wren was unfortunately frustrated by dense fog which necessitated the re-embarkation of the observers soon after 10 a.m. on Wednesday, 13th June, after only some six hours on the Island of Hirta. Messrs Armstrong and Westall were taken back to Stornoway on 14th June.

Dr. Tait joined "SCOTIA" on Friday, 15th June, and thereafter, until Friday, 6th July, when "SCOTIA" berthed in Greenock, the cruise programme with certain additions and minor omission was carried through in continuously favourable weather conditions.

En route to Faroe Bank from the Butt of Lewis, midway on the hydrographic section, two continuous and parellel echometer traces, normal to the Wyville Thomson Ridge, were taken at the request of Dr. J. D. H. Wiseman of the Mineralogical Department of the British Museum, on behalf of the British Sub-Committee (of which Dr. Wiseman is Chairman) for the Nomenclature of Ocean Bottom Features. These have been forwarded to Dr. Wiseman.

The first of the three loops into which the main part of the cruise programme was divided was completed on Wednesday, 20th June, the night of which was spent at anchor in West Loch Tarbert. The second loop via Rockall Bank to Donegal Bay was completed by the 24th of June, at Killybegs in County Donegal, where the scientific staff and ship's officers were entertained to dinner by Dr. A. E. J. Went and two colleagues on behalf of the Irish Department of Fisheries. The third loop, by way of Porcupine Bank to the mouth of the River Shannon finished at Finet, near Tralee in County Kerry, on Sunday, 1st July. Between Finet and Greenock the standard line of six hydrographic stations between Malin and Barra Heads was completed.

"SCOTIA" left Greenock on Monday, 9th July, and after refuelling at Old Kilpatrick, proceeded to the final part of the cruise programme, berthing in Aberdeen on Thursday evening, 12th July.

HYDROGRAPHY:

Surface temperature distribution over the whole region surveyed (Figure 1) indicates clearly the convergence on about latitude 59°N. of two distinct water masses, one from the westward, i.e. from the open N.E. Atlantic Ocean, and the other from the south, following the edge of the Continental Shelf from the region south-west of Ireland. The indication is confirmed by horizontal thermal distribution down to about 100 metres, below which it becomes less evident, although salinities, when they become available, will probably enhance the definition of the above water masses at even deeper levels. Vertical temperature section diagrams bear the same indication as the foregoing.

The highest temperatures (11°C to 11½°C) between the Butt of Lewis and Faroe Bank, across the Wyville Thomson Ridge, belong to the core of what has hitherto been accepted as the North Atlantic Drift Current. Under the 11°C isotherm the 9°C isotherm dips steeply to 350 metres from a general level of about 100 metres on the remainder of the section. The question raised by the present cruise is whether this so-called North Atlantic Drift Current in the Faroe-Shetland Channel does not comprise, as its major component, water which derives immediately from the south-west of Ireland, rather than water directly from the open Atlantic Ocean to the westward. Salinities should give clearer indication of this.

The great bulk of the water below 100 metres on the Butt of Lewis-Faroe Bank section, to about 800 metres on the south side of the Wyville Thomson Ridge and 300 to 600 metres on its north side, bore a remarkably uniform temperature between 8½°C/

8½°C and 9°C. Salinities again may indicate more clearly the two distinct types of water to be met with on this section, as does in fact the distribution of oxygen. Phosphate distribution on the section was fairly uniform below about 150 metres at just under 0.8 µg.a. PO_4-P/litre, with slightly greater bottom water concentrations on either side of the Wyville Thomson Ridge.

Temperature, oxygen and phosphate distributions between Lousy Bank and the Outer Hebrides, over Rosemary Bank are not specially remarkable beyond the effect of the Rosemary Bank in depressing the isolines on its western flank, indicating the pressure of water against it.

From Rockall Bank to N.W. Ireland, however, there is evidence, especially in the oxygen distribution (Figure 2), of two tongues of water below about 150 metres to 2000 metres. Until salinity figures are available, it cannot be determined whether the apparently distinctive water mass on the eastern flank of Rockall Bank may have been sinking and passing slowly southward as seems not unlikely. There is little doubt that on the other side of the channel, over against the continental shelf, the water mass there indicated was moving northward.

Southwards from the latitude of Rockall, the deepest levels, below 2000 metres, were characterised by uniform temperature of around 3°C, while the uppermost waters registered from 13°C to upwards of 15°C. A well-defined oxygen minimum layer was revealed at 800 metres depth (Figure 3) on a line north-westwards from the Shannon estuary to longitude 17°W. This layer could be traced northward to the region between Lousy Bank and the Outer Hebrides, its form becoming more complex and the oxygen diminution less marked.

The extent of phosphate depletion outside coastal influence varied over the region surveyed. West of Ireland uniform surface values averaging about 0.16 µg.a. PO_4-P/litre, increased to 0.8 at 80 to 90 metres' depth. Between Rockall and the Outer Hebrides and N.W. Ireland surface values of from 0.16 to 0.37 increased to 0.8 at 50 to 70 metres. Depletion was even less marked farther north. Eastward of Lousy and Faroe Banks surface phosphate values of 0.27 - 0.58 increased to 0.8 at 70 to 240 metres. Marked reinforcement of phosphate was found along the edge of the Continental Shelf, and again in the neighbourhood of the oceanic banks.

The range of pH values encountered (7.9 to 8.3) was small, their distributions giving support on the whole to the oxygen and phosphate pictures.

PLANKTON:

Sampling with Hensen, Standard, oblique 1 metre and Tow nets was carried out as indicated on the programme.

From the Butt of Lewis to Faroe Bank high concentrations of Calanus and Euphausids were observed in the Tow nets and Oblique hauls. Sagitta and Aglantha were also present in large numbers. Standard collections were uniformly poor, Hensens moderate, fish and fish eggs being only sparsely represented.

The short line from Faroe Bank to Lousy Bank produced extremely rich Calanus hauls; but the Sagitta of the previous line were almost completely absent. Large numbers of pteropods appeared in the Tow nets from 20 m. to 250m. Hensen volumes were higher though the bulk of the collections was again Calanus. Standards contained only small collections with a low phytoplankton content.

From Lousy Bank to Harris the Tow nets and the Obliques continues to yield rich hauls of Calanus. One haul in particular, S51/302 & 3, taken between 0225 hours and 0405 hours contained, in 20m. and 250m. nets, an estimated volume of 20 litres.

Good hauls containing large numbers of Chaetognaths, several species of copepods, and a variety of bathypelagic fish were taken at the two deep oblique stations on this line.

The Hensens and Standards were almost identical in content and volume with those taken on the Faroe Bank to Lousy Bank line, while the numbers of young fish taken in the nets increased slightly. Tow net and Oblique collections on the outward leg of the N. Uist - Rockall - N.W. Ireland survey were still chiefly composed of Calanus finmarchicus, and Limacina was taken in every haul. Medusae increased slightly in numbers and Clione limacina continued to appear in moderate quantities.

In/

In the Oblique haul S51/324 at 250m. in area TT14d one Leptocephalus stage of the eel was taken. This station was carried out in calm weather and the surface water was noticed to contain a high concentration of young Gadus esmarkii.

The deep Oblique S51/326 at 2015m. in area SS14d contained a moderately rich plankton collection and one specimen of Gonostoha (sp).

Hensen and Standard collections were average, the former containing a fairly high proportion of young fish.

The inward leg to the N.W. Irish coast saw a considerable decrease in the Calanus concentration. The first few stations on the line being marked by good collections of Aglantha, Salps and Tomopterids.

The 1m. Closing net which failed to operate at Station TT14d was modified by a weight suspended from the bucket collar and worked again successfully at Station RR10a; where a small collection was obtained in the required depths.

Doliolids were so numerous towards the end of this line that only sub-samples of the hauls could be kept. Oikopleura was also taken in quantity at Station RR10a.

The last station on this line (area TT7b) approximately 12-15 miles off the Irish coast was characterised by the appearance of large numbers of Pleurobrachia. In the Tow nets young Onos were also taken.

Both legs of the N.W. Ireland - Porcupine Bank - S.W. Ireland survey were successfully completed.

The hauls taken in the Oblique nets and Tow nets on the outward leg continued to yield large quantities of Salps and Doliolids, while Tomopterids, Aglantha, and Sagitta were still common to almost every collection.

In the Tow net S51/360 at Station QQ7a one specimen of Velella was taken. The Closing net was worked at Stations PP7a and LL7b, and good collections were obtained. The deep oblique at PP7a required 3 jars to contain the haul.

The inward leg saw little change in the composition of the hauls, Salps, Doliolids and Aglantha continuing to be the dominant species.

At Station RR5d Anohalocero Pattersoni appeared in moderate quantities and was taken in decreasing numbers at several other stations towards the end of the line.

Station RR5d was also marked by the appearance of a moderate concentration of Cosmetira in all nets, and, as on the Rockall - N.W. Ireland leg, the Tow nets at the last station contained Pleurobrachia.

A second specimen of the Leptocephalus stage of the eel was taken in the Oblique net S51/376 at Station PP6c.

The Closing net and the deep oblique were worked as indicated on the programme good hauls being obtained from each.

Young fish were present in greater numbers on this leg than on any other previous one. Hensen and Standard collections were slightly above average for the time of year.

The hauls have not yet been examined for Siphonophores; the collection of which was one of the main objects of the cruise.

TRAWLING

In addition to the trawling stations originally laid down for the cruise, six out of the seven stations remaining over from the recent "EXPLORER" west coast cruise were carried out either at the position given or nearby when the occasion warranted. None of the catches was large in the ordinary sense. The following table shows the large variety of species taken over the whole region. Haddock were fairly plentiful on Faroe Bank and to some extent also on Rockall Bank, where Sebastes also occurred in fair numbers. The large haul of Ammodytes on Bill Bailey's Bank was notable.

Ground/

Species \ Ground	XX16d	Faroe Bank VV20b	Bill Bailey's Bank TT20d	WW15d	St. Kilda VV14c	Rockall QQ14a	TT7b	Porc. Bank QQ5a	TT4c	VV13d	WW13d	Moonen Bank XX16a	XX
Plaice	1			1								3	
L. Sole					1			1					
Megrim	3				17	4		15	4	2	3		
Witch											4		
C. Dab	1	2											
L. R. Dab		1									23		
Ria									1		1		
Cod		6									4	5	
Haddock	12	343	53	35	7	138		15		10	11	5	
Whiting	2			1								2	19
Hake	1				6				5	6	2		
Ling								2			1		
Saithe		5									1	1	
Torsk		1											
Lythe									1	4	2		
Gurnard	7			13	3	2	11	7	1	1		15	19
Red Gurnard							1			1			
Squal. Acan.				2	1			1	3	6			
Scyll. can.				1				1	1	2		2	12
C. Lyra	2												
Solea Var.	1												
G. Esmarkii	4	27	4	1	3					26	19		1
G. Minutus	1	3			2	66		17	8	5	64		6
G. Poutassou						2		2		1			
Sebastes viv.		1	31			163		9		5			
Caranx tr.	1				1				1	2	2		1
Conger eel											4		
Argentina	1				7		43						
Ammodytes			587									1	
Arnoglossus						1							
Pristiurus										1	2		
Herring										4			
Mackerel										1	1		
Callion mac.											1		
Physis blen											1		
Zeug punc.													1
Agonus cat.													1

J. B. TAIT

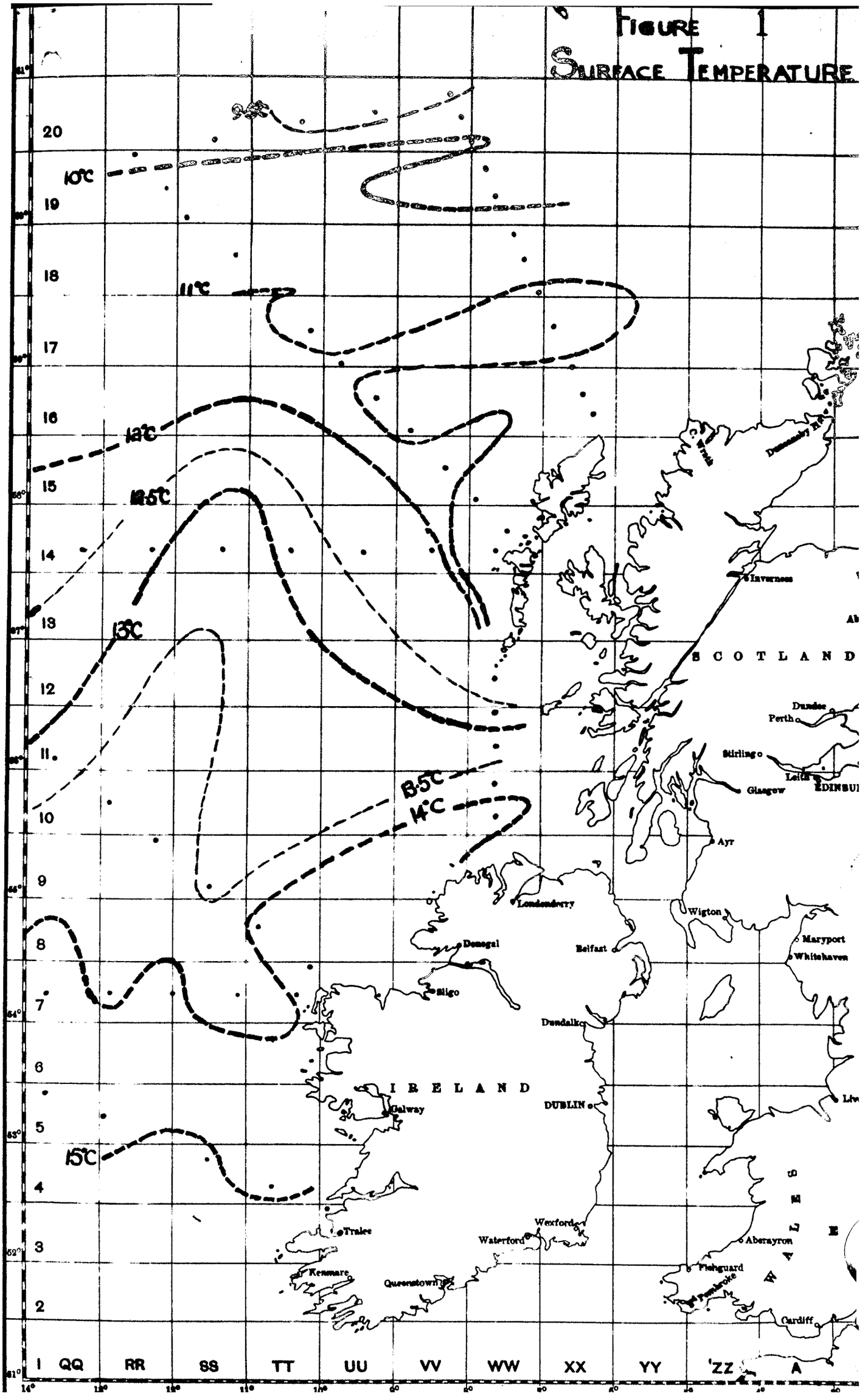
25th July, 1951.

CIRCULATION/

CIRCULATION:

Mr. W. Russell
Mr. M. Graham
Dr. C. E. Lucas
Dr. J. N. Carruthers
Mr. A. H. Stride
Dr. G. E. R. Deacon
Dr. A. V. Taning
Mr. R. S. Wimpenny
Dr. L. H. N. Cooper
Dr. A. P. Orr
Dr. H. Wood
Dr. J. B. Tait
Dr. J. H. Fraser
Capt. Bruce
Dr. R. Johnston
Spare 5.

FIGURE 1
SURFACE TEMPERATURE



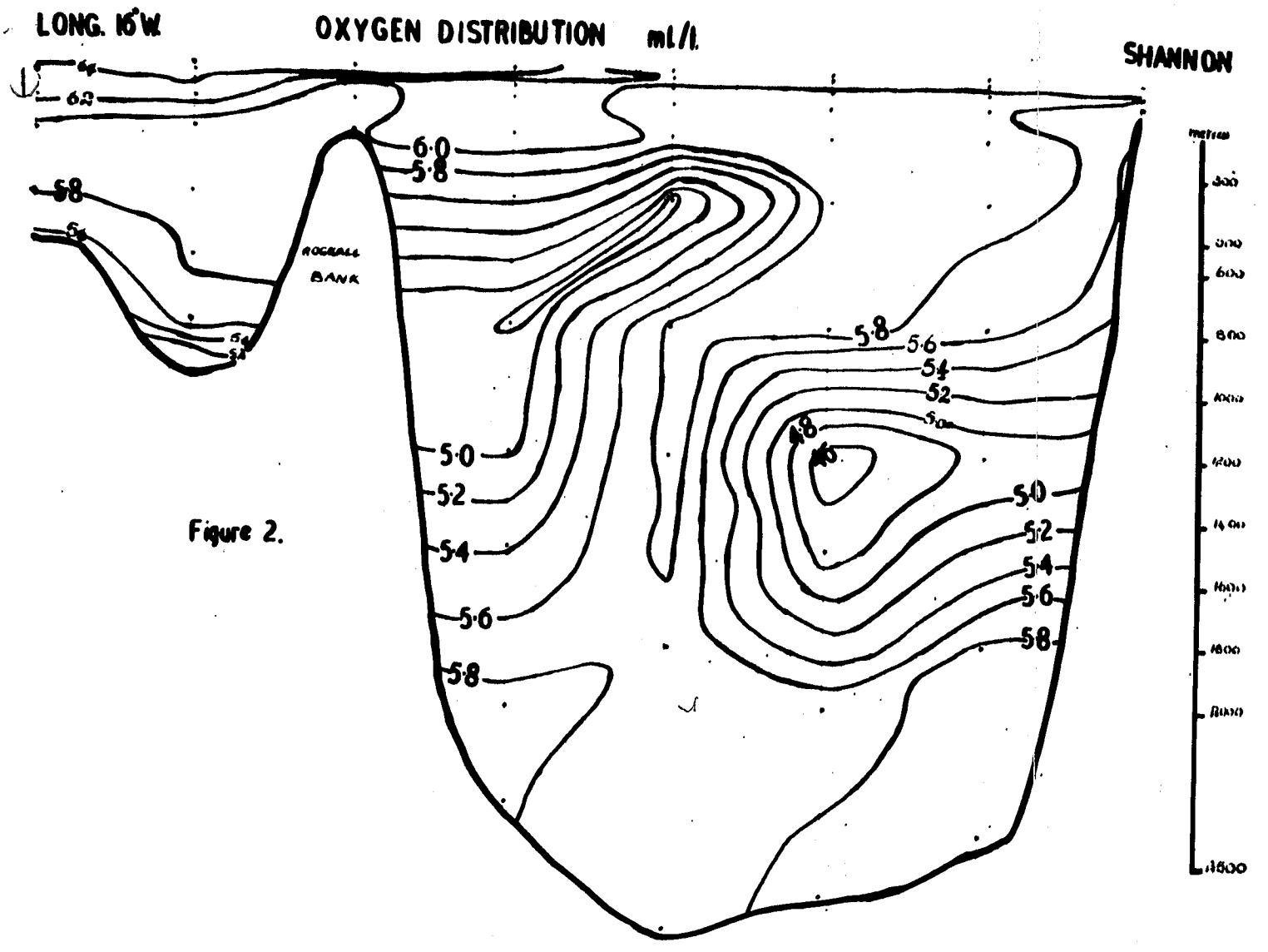
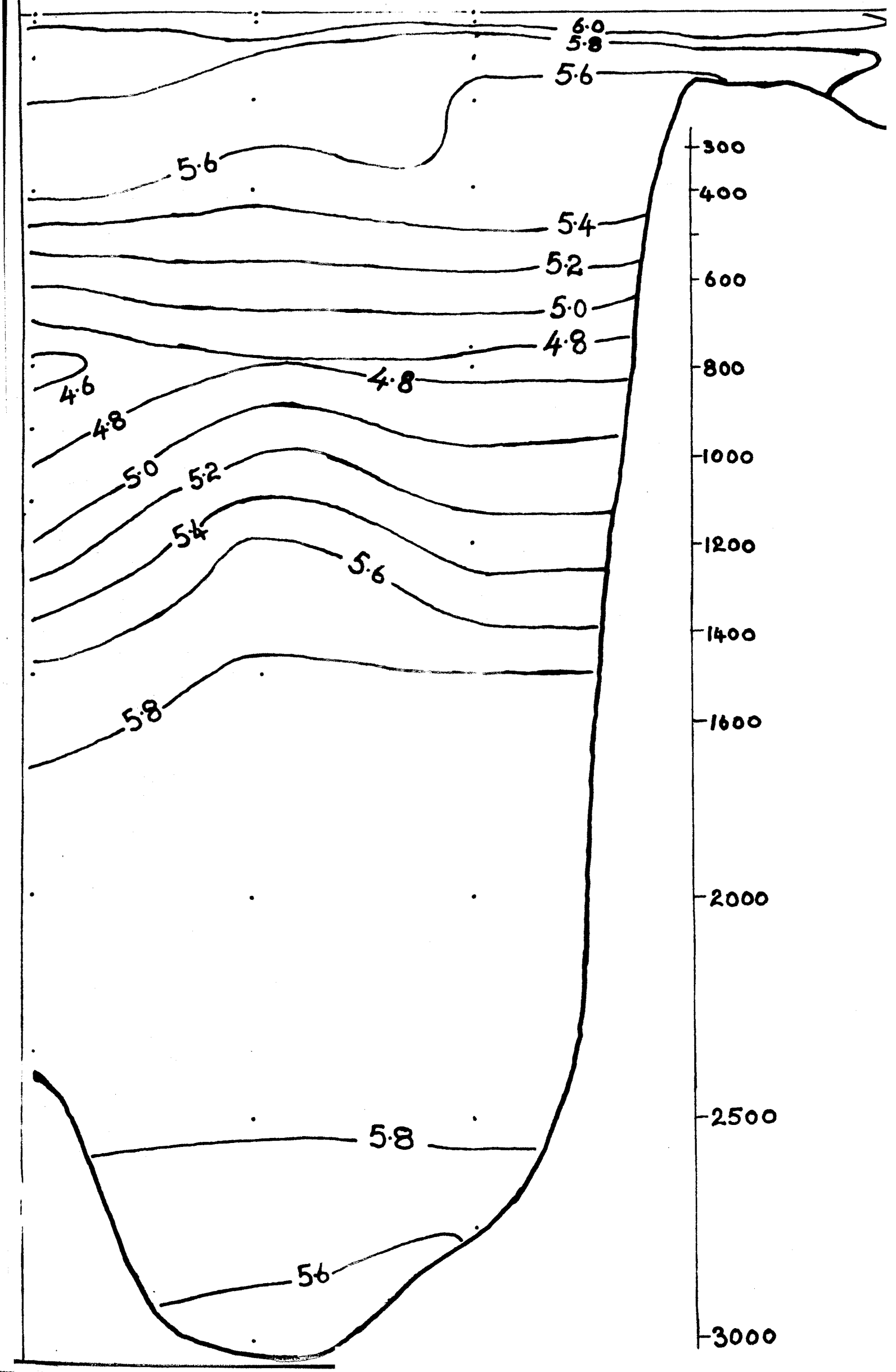

LONG. 16°W
OXYGEN DISTRIBUTION ml/l.
SHANNON
ROCKALL BANK
6·0
5·8
5·8
5·6
5·4
5·2
5·0
5·0
5·2
5·4
5·6
5·8
metres

Figure 2.

OXYGEN DISTRIBUTION ml./l.

LONG. 17° W, SE to Shannon.



S.16 3 S.R.G 51.

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SUMMARY CRUISE REPORT

F.R.S. "SCOTIA"

June - July, 1951.

GENERAL:

The essential object of the cruise was a hydrographic-plankton survey of the region between latitudes 61°N and 52°30'N, eastward of longitude 17°W. This embraced practically all the well-known fishing banks in this region from Faroe Bank to Porcupine Bank, and was fully carried out in fine weather between 15th June (departure from Stornoway) and 6th July (arrival at Greenock). Secondary purposes were served both before and after the above interval.

HYDROGRAPHY:

Interesting large-scale hydrographic features were revealed. Former indications from both plankton and hydrography of two distinct water masses converging in the upper layers in the Faroe-Shetland Channel, were clearly substantiated. Convergence occurred, approximately on latitude 59°N, of a warm northward flowing mass of water from somewhere south-west of Ireland, and an easterly directed movement of slightly cooler water from the North-East Atlantic Ocean. (Figure 1)

Between Rockall Bank and the north-west of Ireland two water masses could be distinguished between 200 and 2000 metres, especially by their oxygen content. (Figure 2). That centred in about 600-700 metres on the eastern flank of Rockall Bank may have been sinking and tending southward. There seems little doubt that the other mass, centred in approximately 1200 m. over against the Continental shelf, was moving North.

A well-defined oxygen-minimum layer was discovered at 800 metres on a line approximately N.W. from the Shannon estuary. (Figure 3)

PLANKTON:

Calanus collections were very large north of the Rockall latitude, with Sagitta, Euphausids, some Aglantha, and a very few fish and fish-eggs. Sagitta were almost entirely absent, however, along the line of banks from Faroe Bank to Lousy Bank, where upper water temperatures tended to keep below 9°C.

A variety of bathypelagic fish were taken in deep townet hauls between Lousy Bank and the Outer Hebrides, over Rosemary Bank. While Calanus decreased, Medusae increased and Limacina also, from the Rockall latitude southward, and fairly high proportions of young fish marked the Hensen hauls. Salps and Tomopterids began also to appear. Doliolids were caught in immense quantities off N.W. Ireland. Nearer the coast these were replaced by large numbers of Pleurobrachia.

Salps, Doliolids and Aglantha dominated catches south of 54°30'N, and young fish were more prevalent than further north.

Two/

Two specimens of the Leptocephalus stage of the eel were caught, one between the Outer Hebrides and Rockall, the other immediately west of Porcupine Bank. Near the latter also a specimen of Velella was taken by townet.

Plankton hauls have yet to be examined for Siphonophores the collection of which was one of the main plankton objectives on the cruise.

TRAWLING:

Fourteen trawl catches were made but most of these were relatively poor. Fair numbers of haddock were caught on Faroe Bank and Rockall Bank. Sebastes were abundant also on Rockall Bank. A large haul of Ammodytes was taken on Bill Bailey's Bank.

JOHN B. TAIT.

25th July, 1951.

CIRCULATION:

Capt. C.H. Champness
Dr. H. Blegvad
Dr. F. Devold
M. P. Desbrosses
Dr. B. Havinga
Dr. A.R. Molander
Dr. H. Thomsen
Prof. Ch. Gilis
Mr. F.S. Russell
Mr. E. Ford
Mr. K.N. Rao
Dr. G. Reay
Dr. A. Ritchie
Dr. B.B. Rao
Mr. B.B. Parrish
Capt. G.B. McLaren
Mr. R.B. Burns
Mr. J.H. Lamont
Mr. D.D. Seaton
Spare 5.

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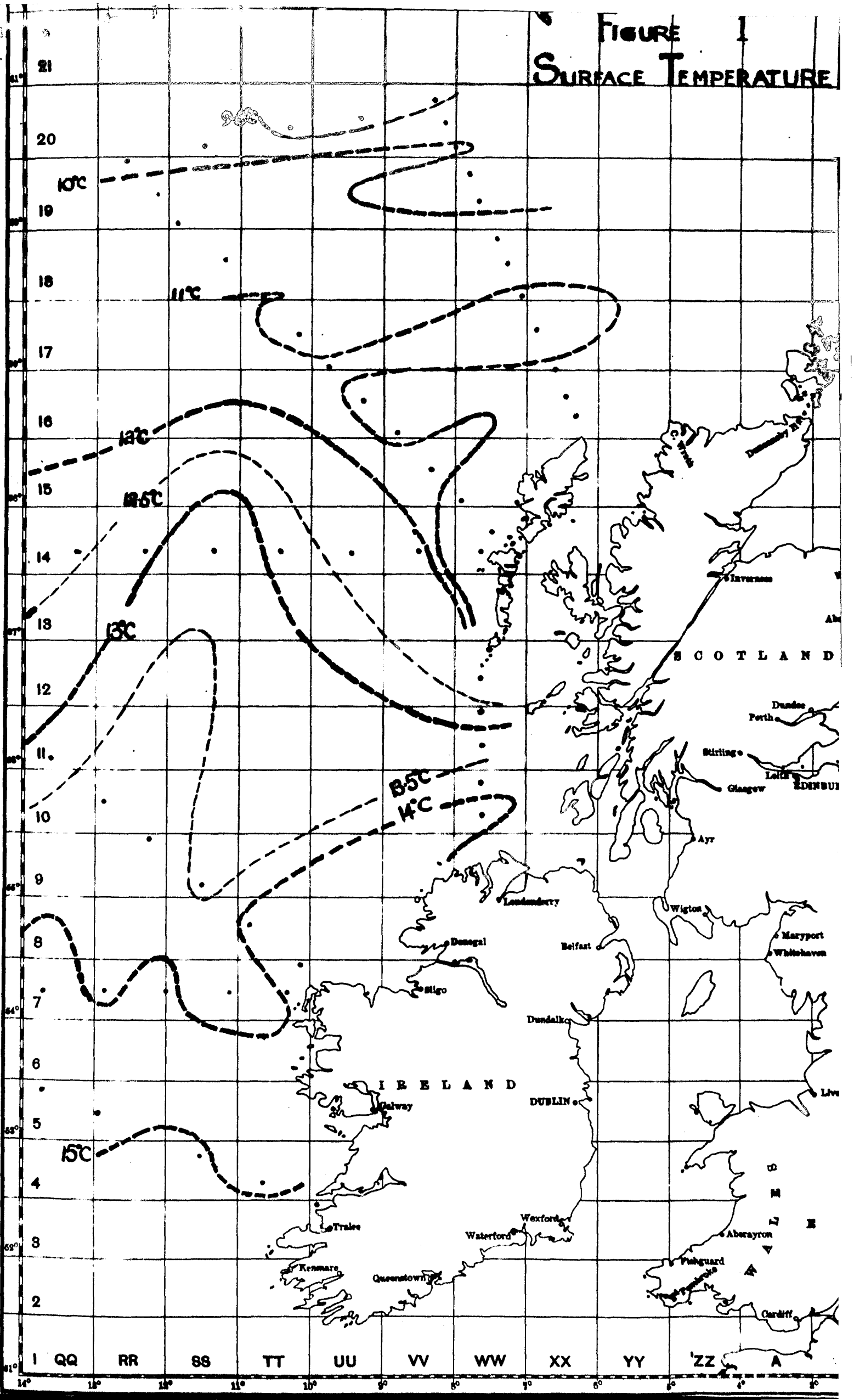
FIGURE 1
SURFACE TEMPERATURE



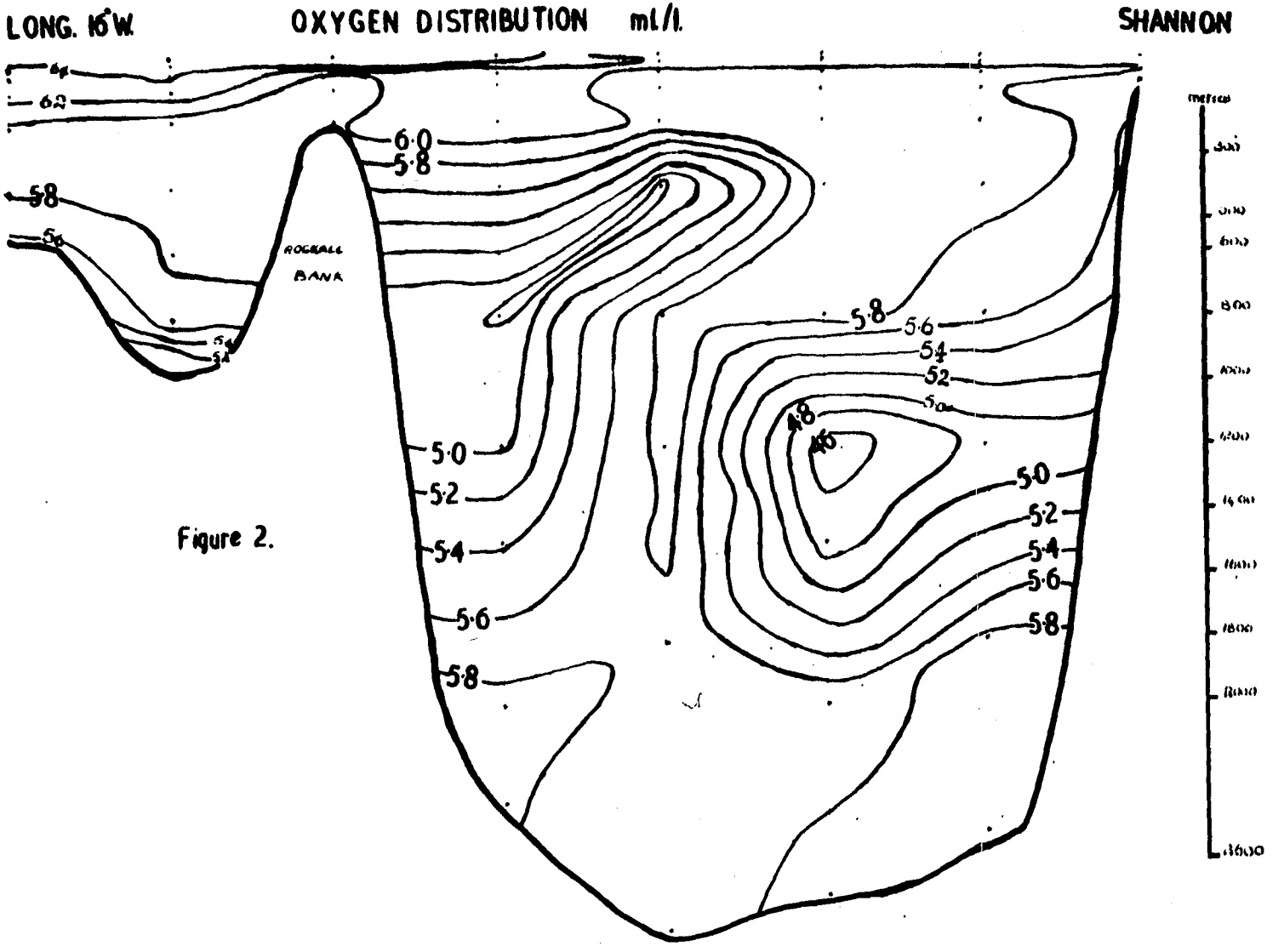
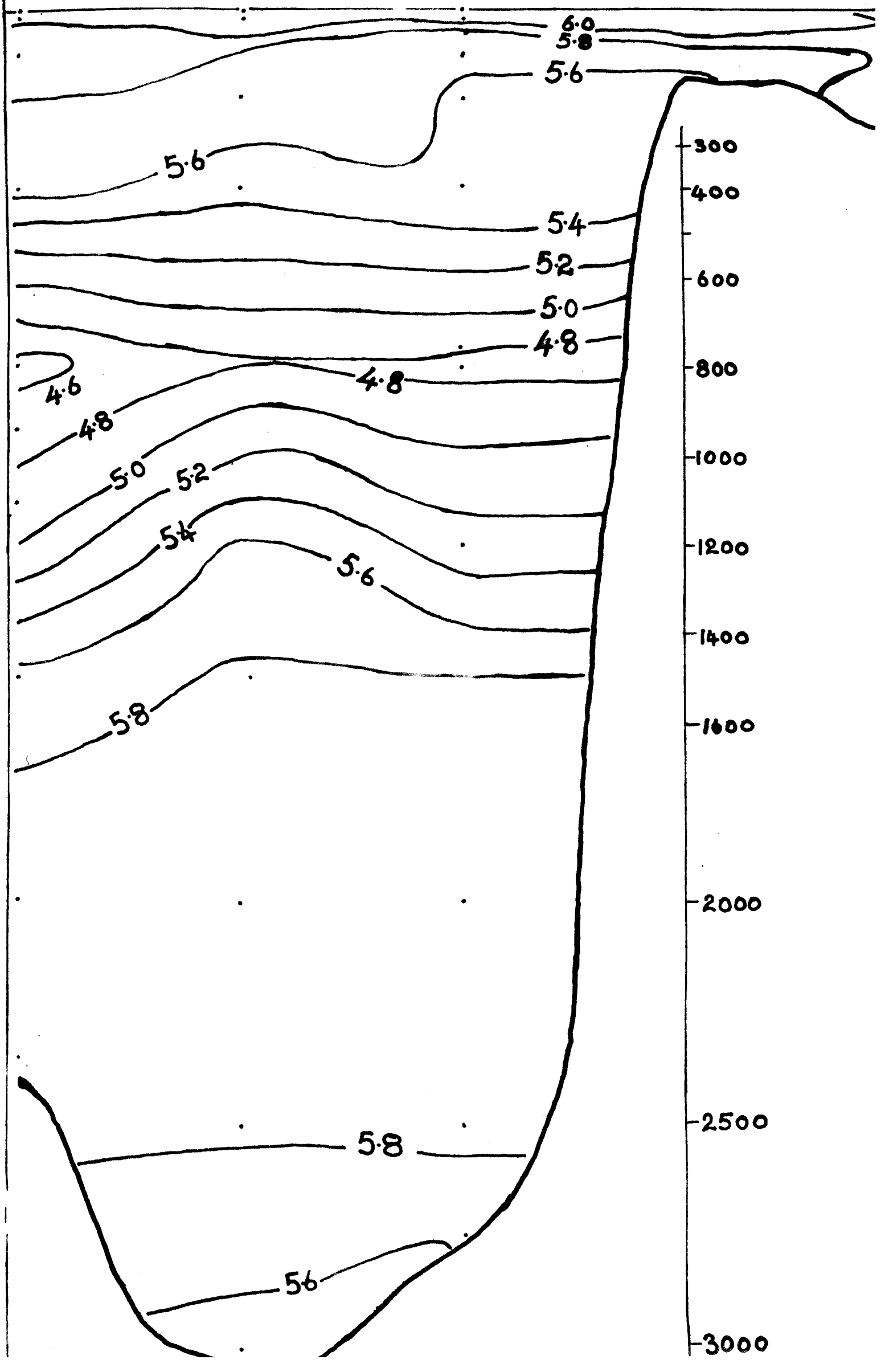

LONG. 16°W.
OXYGEN DISTRIBUTION ml/l.
SHANNON
6·2
6·0
5·8
5·8
5·6
ROCKALL
BANK
5·4
5·2
5·0
4·8
4·6
5·0
5·2
5·4
5·6
5·8
metres

Figure 2.

FIGURE 3

OXYGEN DISTRIBUTION ml./l.

LONG. 17° W, SE to Shannon.



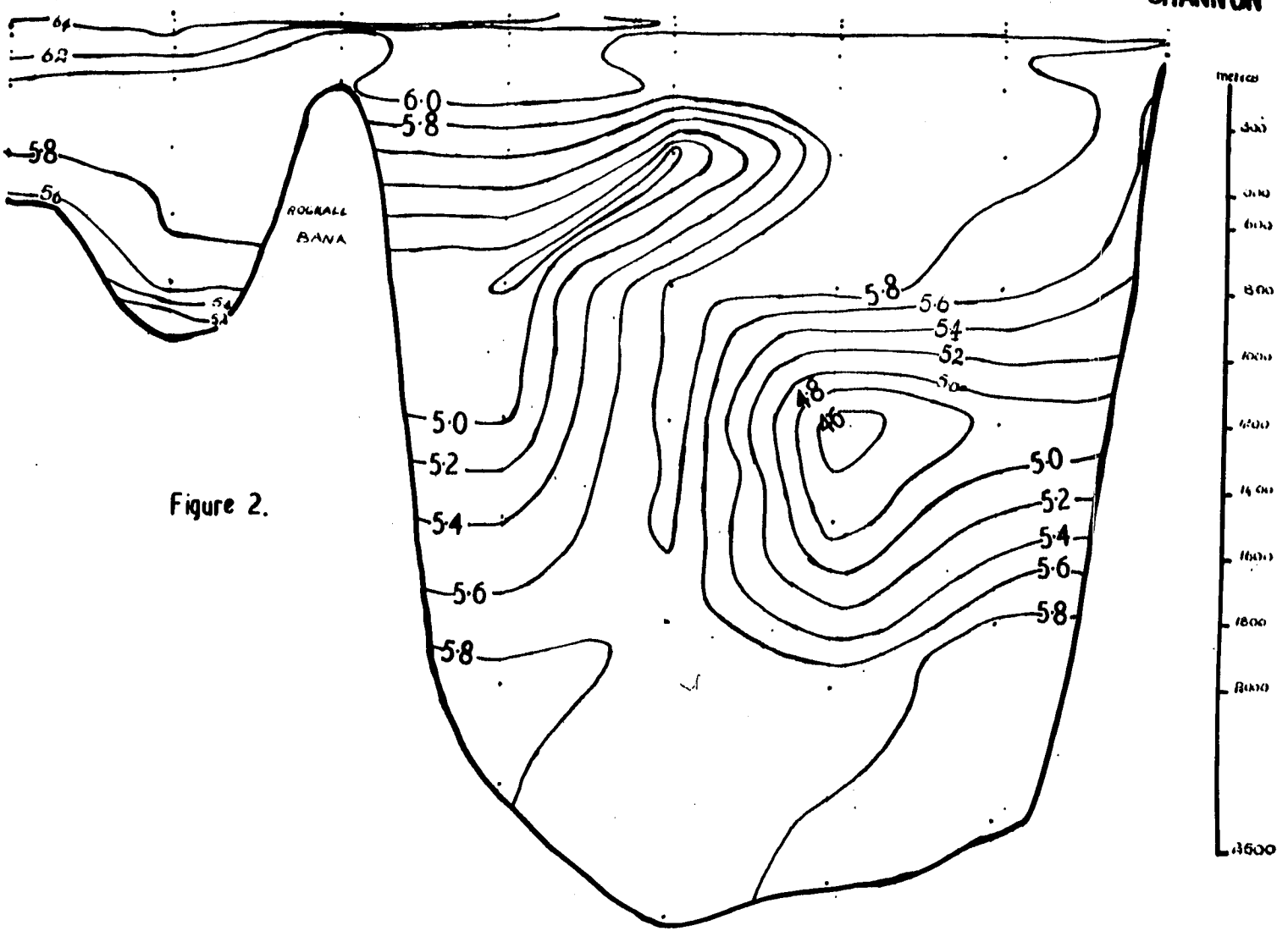

LONG. 16°W.
OXYGEN DISTRIBUTION mL/l.
SHANNON
ROCKALL
BANK
6·4
6·2
6·0
5·8
5·6
5·4
5·2
5·0
4·8
4·6
metres
3500

Figure 2.