Report on May 15-27, 1980 Cruise of *F/V Sun Maiden*

D. C. Miller

Department of Fisheries and Oceans
Resource Services Branch
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

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ABSTRACT

Miller, D. C. 1981. Report on May 15-27, 1980 cruise of F/V SUN MAIDEN. Can. Data Rep. Fish. Aquat. Sci. 265: 17 p.

This report records the results of an offshore herring survey covering central and northern Hecate Straits and Dixon Entrance. The amount of herring observed was insufficient to support a commercial fishery and egg bearing female herring appeared to require several weeks further maturation before spawning.

Key words: Fishery resources, midwater trawls, echo sounding.

RÉSUMÉ

Miller, D. C. 1981. Report on May 15-27, 1980 cruise of F/V SUN MAIDEN. Can. Data Rep. Fish. Aquat. Sci. 265: 17 p.

Le présent rapport expose les résultats d'une étude sur le hareng de haute mer dans les parties centrale et septentrionale du détroit d'Hécate et de l'entrée Dixon. La quantité de hareng observée était insuffisante pour une pêche commerciale soutenue et apparemment, il fallait aux oeufs d'une femelle oeuvée plusieurs semaines de maturation de plus avant la fraye.

Mots clés: ressources halieutiques, chaluts pélagiques, échosondage.

INTRODUCTION

As a result of interest in the potential of a roe fishery on offshore stocks of late spawning herring in Hecate Straits, a commercial trawler F/V SUN MAIDEN (Capt. Frank Gale Jr.) and a commercial seiner F/V ANTE B (Capt. Joe Borovich) were chartered to locate and estimate the tonnage of commercially exploitable stocks of ripe herring in Hecate Straits between Langara Is. (north west) and Ramsay Is. (south). This report records the findings of the F/V SUN MAIDEN only.

METHODS

Fish schools were located by a 30 KH_z Kelvin Hughes MS44F dry paper recording sounder, on the SUN MAIDEN. (The ANTE B had an Ekolite Herring Special sounder.) During fishing operations the net was manoeuvered using an Ekolite wet paper sounder approximately 30 KH_z (ship's sounder) and a Furuno FNR400 Mark II 75 KH_z wet paper net sounder (net mounted sounder). Samples were caught with a midwater box trawl and equipped with aluminum Suberkrub type doors. The standard length of at least 100 herring was measured on board from each tow and some gonad weight ratios were taken volumetrically. Catch weights were estimated by eye as this was in keeping with the objectives of the trip.

Hecate Straits/Dixon Entrance was divided into 11 major search areas and these were divided between the two vessels on the basis of suitability of vessel to search area. Due to the scarcity of herring schools, the cruise tracks for the two vessels showed considerable overlap. The SUN MAIDEN followed a zig-zag search pattern along specified depth intervals and the total depth range searched in most areas was 30-70 fms (30-90 fm near Horseshoe Bank) (Fig. 1,2). The traditional fishing areas searched by the SUN MAIDEN included: Rose Spit Edge, Butterworth/Two Peaks to Warrior Rocks Edges, Freeman Pass Edge, Horseshoe Grounds, and Ramsay Edge. Inclement weather severely hampered the survey during the second week of the charter (Table 1).

The progressive changes in midwater fishing equipment since the initial cruises in 1968 of the F/V ROYAL CANADIAN are worthy of comment. The nets used at this time (1400 mesh Engel nets) had numerous floats on the headrope and large weights (600 lbs) on the lower wing tips. The nets were towed with steel Süberkrüb doors. These nets suffered frequent damage and backlashed readily because they were set and retrieved with net drums rather than fleeted as in large European vessels. The large weights were necessary to increase the stability of the trawl doors but increased net damage if the bottom was touched during fishing. The most recent developments as seen on the SUN MAIDEN are as follows:

1. The need for floats on the headrope has been eliminated by making the lower sweep lines approximately 1 fm longer than the upper sweep lines. As a result net damage and backlashing during setting is now minimal and the net is easier to tow.
2. The Süberkrüb type trawl doors were made out of aluminum and approximately 300 lbs of steel plate has been bolted to the lower end (shoe) of each door. As these doors are towed in a vertical position, their stability has been markedly increased.
3. Item 2 has allowed the amount of chain on the lower wing tips to be reduced substantially. The weights (each consisting of a bundle of 3/4" chain about 70 lbs in weight) are hung from 2 fm × 3/8" chain pennants (about 50 lbs each) and are partially supported by the sea bed when the net approaches bottom during fishing operations. This appears to reduce damage to the lower wing tips if the net inadvertently hits bottom. Excessive weight appears to distort these nets in a vertical plane and reduce the spread of the trawl doors.
4. The SUN MAIDEN used as a net sounder, on this cruise, a remote transducer unconnected to the vessel and fastened to the footrope of the net. This eliminated the problem with "third wire" type net sounders fastened to the headrope, of identifying the foot rope and hence the distance off bottom of the net.

There are several methods presently used to describe herring maturity: the modified Hjort scale, the gonosomatic ratio (weight of gonad to total body weight including gonads) and the percent yield as used by Fisheries patrol officers (weight of commercially saleable roe as a percent of total body weight). Each method has its shortcomings: the interpretation of the Hjort scale varies with individuals, the gonosomatic ratio requires an electronic balance and calm weather if taken at sea, and the saleable roe yield is misleading if the sex ratio is skewed or if the gonads are not ripe and running. A combination of the gonosomatic ratio and the modified Hjort scale seemed the most descriptive method, provided the gonosomatic ratio can be taken volumetrically at sea within acceptable limits of time and accuracy. Time is a serious consideration on hydroacoustic surveys as on many charters there is only one observer and sampling time is at the expense of wheelhouse observation time.

A number of methods of volumetrically measuring weights were tried on the vessel and their accuracy later tested in the laboratory. Weights were taken either by partially filling a graduated cylinder with water and then adding the fish or gonad and measuring the increase in volume or by placing fish in a bucket with a volumetric reference line and adding a measured amount of water until the reference line was reached. In all cases the accuracy is limited by the surface area of the container, a tall thin container being the most accurate and lab tests indicated that accuracy is within 1 gradation (i.e. 5 mL on a 500 mL cylinder). In the lab about 1 minute per measurement is required, and in the field slightly longer. As a field sampling device, it would seem the most practical combination of measurements for a 100 fish sample would be a total gonad weight by sex and Hjort scale and either (a) total fish weight by sex and Hjort scale if a large graduated cylinder (5 litre × 50 mL gradations) is available or (b) sum of individual fish weights if only a smaller cylinder is available (500 mL × 5 mL gradations). The first method would give a gonosomatic ratio

at a cost of about 15 minutes additional sampling. The sum of individual fish weights would give this ratio at a cost of about 30 minutes to 1 hour. If one considered the example of a sample of 15 common sized fish each of approximately 120 gm total weight, 20 gm gonad weight, it would have a ratio of .167. An error of +5 gm gives a ratio of .16 and one of -5 gm, a ratio of .17. Were the gonad weights to be measured individually the range of ratios would increase to .12-.22 for the above fish, this latter situation would be an unacceptable error level.

RESULTS

DISTRIBUTION AND ABUNDANCE

The two vessels failed to locate commercially exploitable quantities of herring in the search area. Fig. 3 and 4 illustrate the location of all fish schools seen on the cruise. They have been separated into week 1 and week 2 because the principal fish aggregations, those off Rose Spit, appeared to become more sharply defined during week 2 (i.e. they moved shallower and occupied a narrower depth range). Tables 2, 3, 4, 5, 6 record pertinent catch data for this cruise. Age ratios based on scale reading appear to be misleading as a result of a disproportionately high scale loss on smaller fish. The laboratory sampling data have been entered in the herring program computer data bank.

Of all aggregations illustrated, those off Rose Spit were the most significant and were estimated by the biologist in charge of the ANTE B (Dennis Chalmers) as 300-400 t. The aggregation near Porcher Is. would appear to be of the same order of magnitude although they appeared to be an about equal mixture of adult herring and juvenile pollock. All remaining aggregations located would best be described as trace amounts.

The nearly mature herring appeared to be mixed with recovering spent adult herring and, on a visual basis, were several weeks away from spawning. Historical records indicate spawnings as late as June on the north and east coast of the Queen Charlotte Islands and these late spawnings could account for the presence of egg bearing herring in Hecate Straits several weeks after the principal spawnings in statistical areas 1-6. These nearly mature herring were not in the ripe and running condition necessary for a conventional roe fishery.

METHODOLOGY

The gonad to total body weight ratios measured at sea on this trip were done on a trial and error basis with very limited equipment. These results were later compared with laboratory measurements on an electronic

balance (Table 4). It would appear that a 5 L, a 500 mL, and 50 mL cylinder would be useful field equipment for measuring gonosomatic indices when comparing total gonad weight by sex and Hjort stage with total fish weight by sex and Hjort stage.

ACKNOWLEDGMENTS

I would like to thank Capt. Frank Gale Jr. and the crew of the SUN MAIDEN for their assistance and cooperation on this trip.

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Table 1. Itinerary of F/V SUN MAIDEN, May 15-27, 1980.

May 15	Depart Prince Rupert and search Butterworth to Rose Spit area.
16	Search Rose Spit to Freeman Pass.
17	Search Freeman Pass to Ramsay Is. vicinity.
18	Search Ramsay Is. vicinity to Horseshoe Bank 50-70 fm and run to Gillen Hbr. due to inclement weather.
19	Remain in Gillen Hbr. due to inclement weather.
20	Depart Gillen Hbr. and search from Horseshoe north to Freeman Pass.
21	Search Freeman Pass to Butterworth rocks and pick up bottom trawling doors in Prince Rupert.
22	Search Butterworth Rocks to Langara Is.
23	Remain at Langara Is. due to weather.
24	Depart Langara Is. and search to east anchoring off Stephens Is.
25	Search Rose Spit edge again then search south to Freeman Pass.
26	Remain in Freeman pass due to inclement weather.
27	Depart Freeman Pass for Prince Rupert weather continuing inclement.

Table 2. Location, date, time, and catch by species of tows made on cruise 1 of F/V SUN MAIDEN, May 15-27, 1980.

Haul no.	1	2	3	4
Locality	Rose Spit	Rose Spit	Rose Spit	Porcher Is.
Date	May 22	May 24	May 25	May 25
Start (PDT)	0856	1414	1325	1805
Duration (min)	23	43	30	11
Start N. Lat.°	54	54	54	53
'	16.0	16.1	15.7	58.2
W. Long.°	131	131	131	131
'	33.0	30.6	33.0	03.0
Finish N. Lat.°	54	54	54	53
'	16.2	17.2	16.7	57.3
W. Long.°	131	131	131	131
'	31.0	25.3	29.0	02.6
Depth (fm) Bottom	30-50	36-38	45-33	38-44
Target	30-40	20-30	20-30	28-38
Bottom at target	40	38	40	42
Catch (lbs)				
Herring-juvenile	-	-	-	-
-adult	200	1300	1500	90
Pollock	2(2)	4(4)	14(7)	70(juv)
Pacific cod			3	
Rockfish			2	
Turbot		2	1	
Salmon			2	
Smelt				Tr
Remarks			S. melanops	

Numbers in brackets beside pounds of fish caught refer to number of individuals.

Table 3. Percent size distribution of Pacific herring caught on cruise 1 of F/V SUN MAIDEN, May 15-27, 1980 (field and lab samples).

Length (mm)	Tow 1		Tow 2		Tow 3		Tow 4	
	Sea	Lab	Sea	Lab	Sea	Lab	Sea	Lab
140					0.6	1.4		
	0.8				-	-		
150	-				-	1.4		
	1.5	1.1			-	-	1.6	
160	0.8	2.2			-	-	0.8	1.4
	-	1.1	0.8		1.2	2.9	-	-
170	2.3	-	-		2.5	5.7	1.6	-
	2.3	9.9	0.8		0.6	2.9	4.0	7.0
180	5.3	6.6	1.6		7.5	4.3	6.3	7.0
	4.5	3.3	14.6	3.5	13.7	7.1	10.3	11.3
190	8.3	5.5	4.9	5.3	16.8	10.0	7.9	7.0
	8.3	8.8	5.7	8.8	12.4	10.0	7.9	11.3
200	6.0	5.5	4.1	3.5	7.4	5.7	6.3	-
	4.5	6.6	4.9	12.3	5.0	2.9	7.1	9.9
210	4.5	6.6	2.4	3.5	4.3	8.6	5.6	2.8
	5.3	7.7	7.3	7.0	7.4	4.3	4.8	16.9
220	4.5	4.4	2.4	-	5.6	5.7	7.9	4.2
	5.3	5.5	5.7	12.3	2.5	7.1	7.1	4.2
230	6.8	3.3	7.3	1.8	3.7	7.1	2.4	2.8
	6.0	9.9	7.3	5.3	1.9	2.9	2.4	5.6
240	5.3	2.2	5.7	5.3	1.2	2.9	4.8	-
	5.3	2.2	4.1	1.8	1.2	2.9	3.2	1.4
250	5.3	3.3	4.9	5.3	1.9	-	4.0	4.2
	3.0	1.1	2.4	5.3	1.2	-	0.8	1.4
260	0.8	2.2	3.3	1.8	-	1.4	1.6	1.4
	1.5	1.1	2.4	5.3	1.2	1.4	0.8	
270	0.8		3.3	10.5		1.4	0.8	
	0.8		-	-				
280	-		2.4	1.8				
	-		0.8					
290	-		-					
	0.8		0.8					
300								
N=	133	91	123	57	161	70	126	71

Table 4. Percent age frequency of Pacific herring caught on cruise 1 of F/V SUN MAIDEN, May 15-27, 1980 (lab sample scale analysis).

	Tow 1	Tow 2	Tow 3	Tow 4
II				
III	7.3	-	8.1	5.1
IV	-	-	2.7	5.1
V	4.9	3.2	5.4	10.3
VI	19.5	22.6	27.0	23.1
VII	26.8	19.4	24.3	28.2
VIII	19.5	25.8	24.3	25.6
IX	17.0	22.6	5.4	2.6
X	4.9	3.2	2.7	-
XI	-	3.2	-	-
N	41	31	37	39

Table 5. Gonosomatic indices for Pacific herring on cruise 1 F/V SUN MAIDEN, May 15-27, 1980.

	Field					Lab.		
	Cum.	Mixed	Indiv.	Cont.	N	Cum.	Indiv.	N
Tow 1 M	.237		-	Bucket +	34	.204	.208	20
F	.176		-	cyl.	33	.171	.183	23
Tow 2 M	.275			Bucket + cyl	20	.215	.188	14
F	-	.172	-	Cyl.	19	.196	.214	15
Tow 3 M	-		-		-	.195	.194	18
F	-		.157	Cyl.	15	.194	.189	32
Tow 4 M	-		-		-	.185	.189	30
F	-		.182	Cyl.	15	.198	.187	27

Cumulative values are total gonad weight divided by total body weight.

Mixed values are total gonad weight divided by sum of individual body weights.

Individual values are averages of individual gonad weights divided by individual body weights.

Field equipment was 30 cm × 30 cm × 30 cm bucket + 500 mL graduated cylinder.

Laboratory weights were taken on an electronic balance.

Table 6. Length-frequency of Pacific pollock from Tow 4 cruise 1, F/V SUN MAIDEN, May 15-27, 1980.

Length (mm) -- Tow 4	
10	
1	
2	
3	
4	
15	4
6	25
7	39
8	57
9	52
20	38
1	22
2	11
3	3
4	1
25	-
6	-
7	-
8	-
9	-
30	-
1	1
2	
3	
4	
35	
N	252

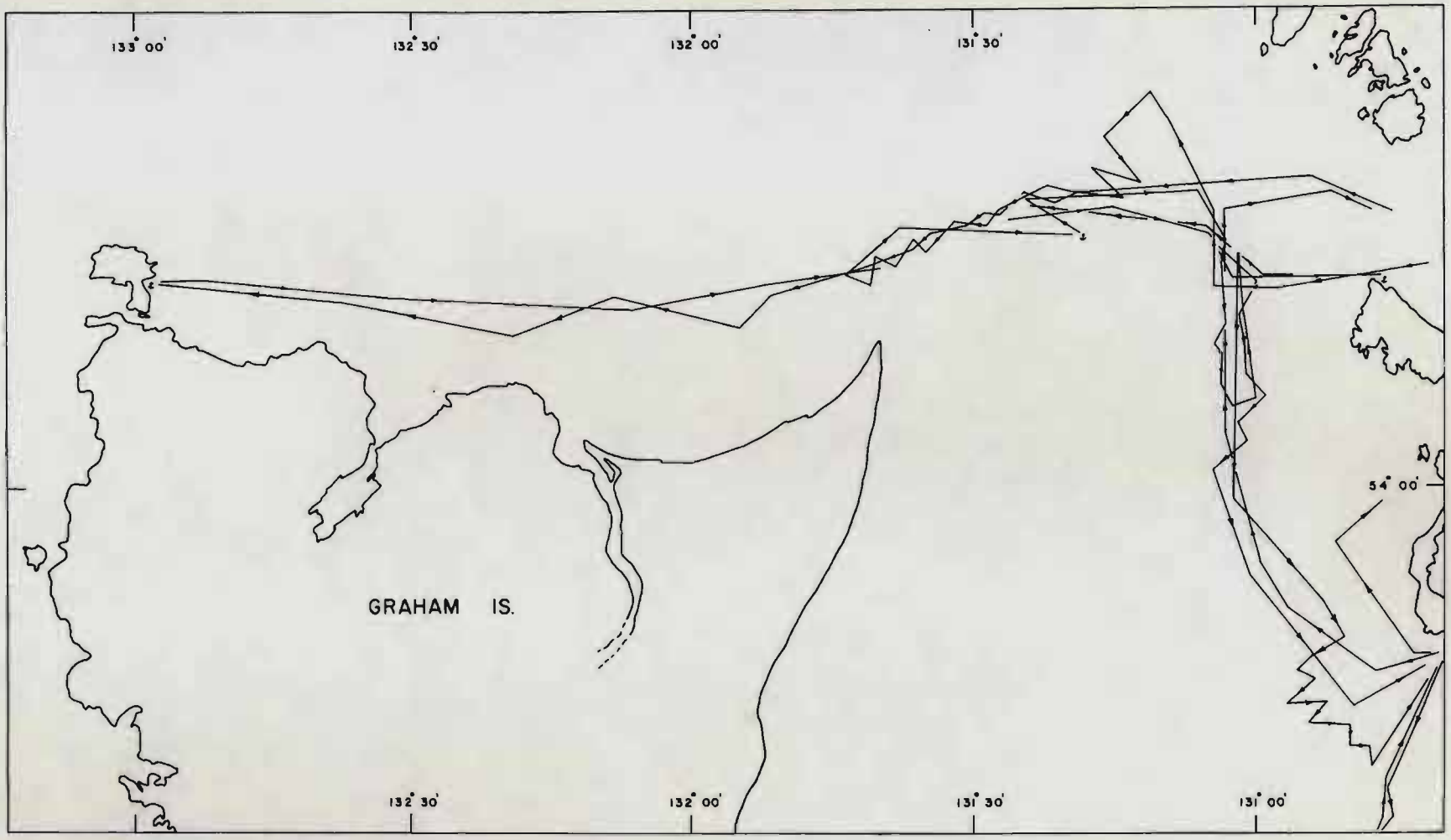

Fig. 1. Cruise track (northern portion) of May 15-27 cruise of SUN MAIDEN.

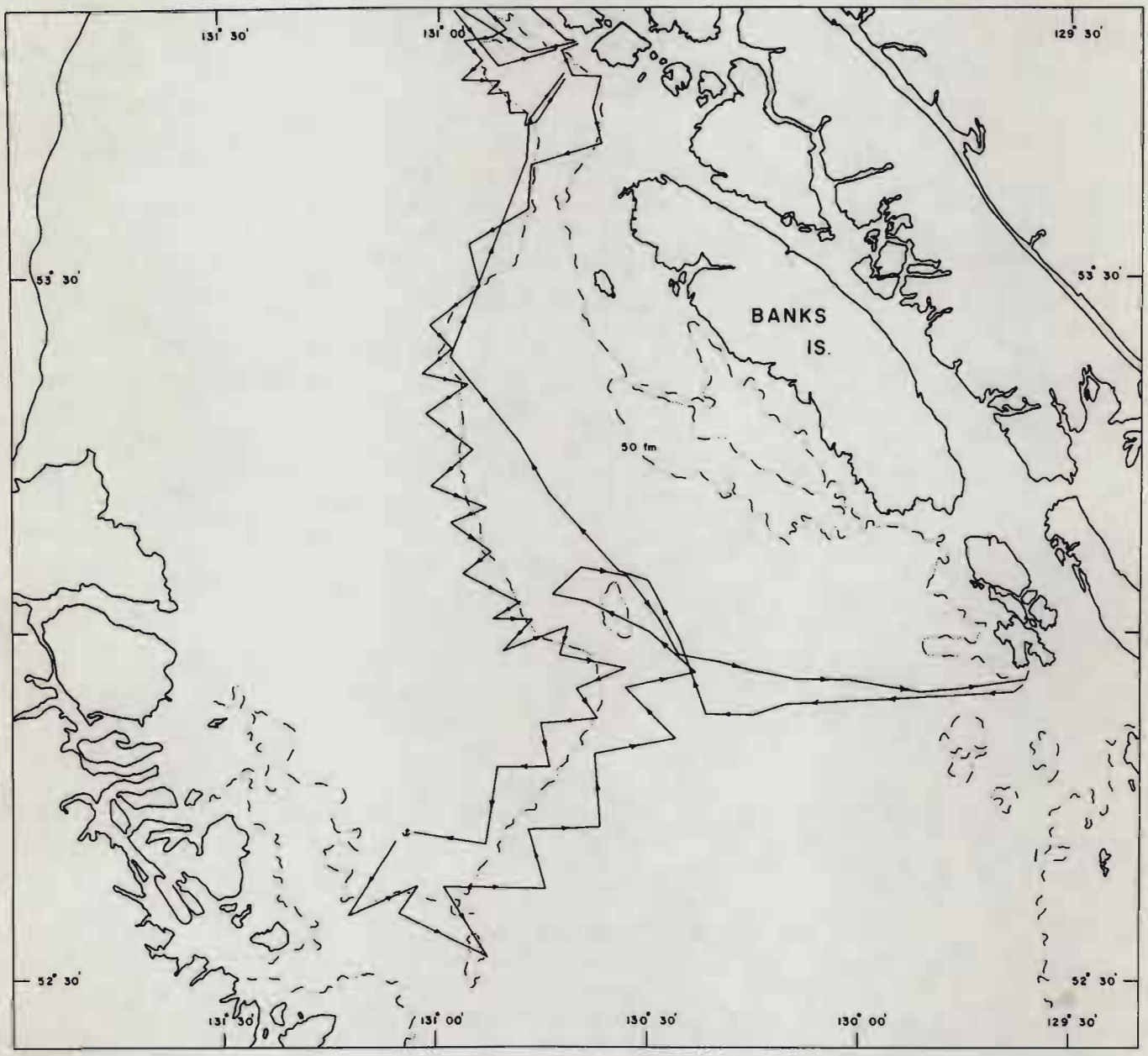

Fig. 2. Cruise track (southern portion) of May 15-27 cruise of SUN MAIDEN.

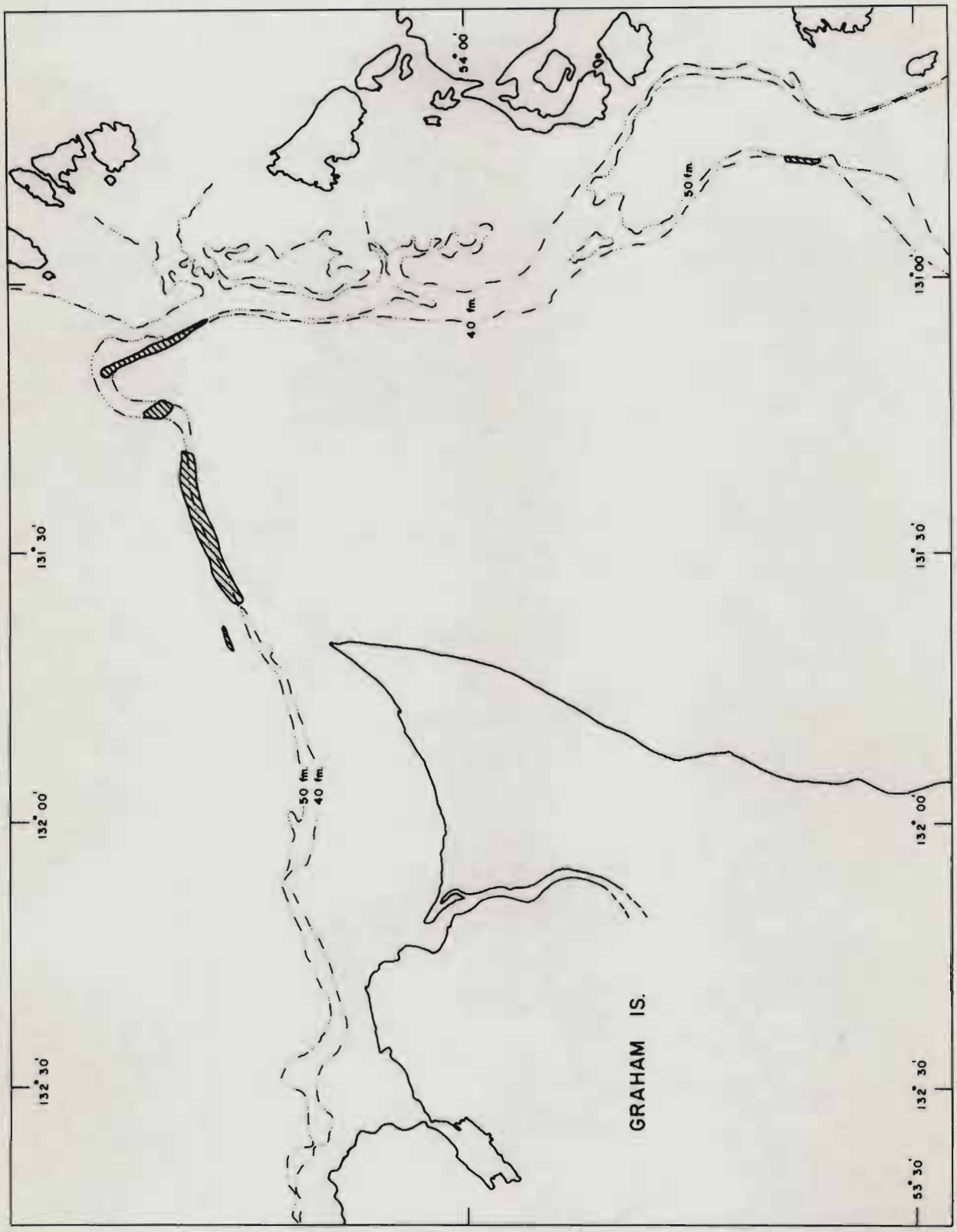

Fig. 3. Fish aggregation positions during week 1 of May 15-27 cruise of SUN MAIDEN.

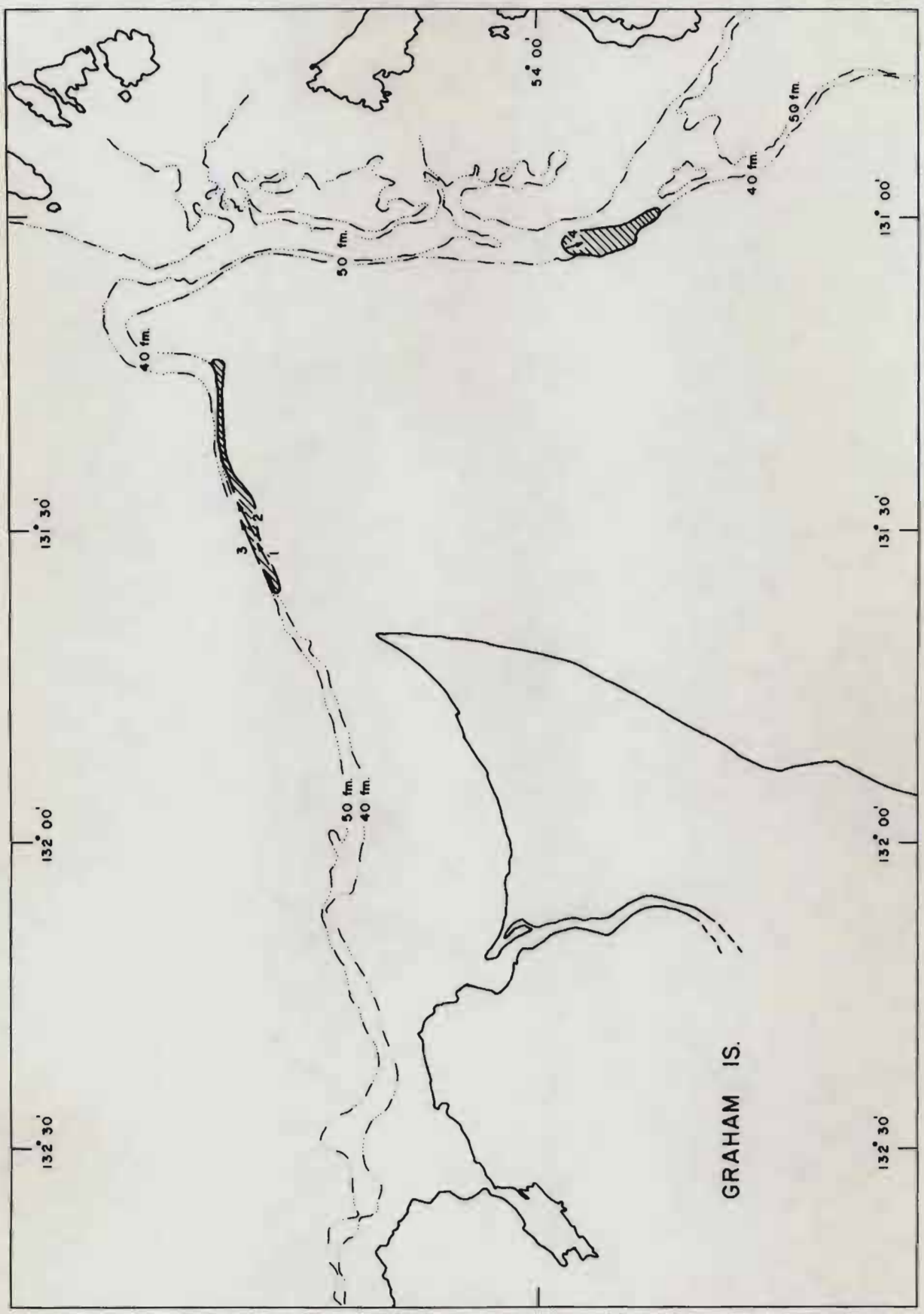

Fig. 4. Tow positions and fish aggregation positions during week 2 of May 15-27 cruise of SUN MAIDEN.