

1988 CAPE DENBIGH HERRING
PROJECT REPORT

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Regional Information Report¹ No. 3N88-28

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Division of Commercial Fisheries
333 Raspberry Road
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August 1988

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INTRODUCTION

The Cape Denbigh test fishing crew (Gary Knuepfer, FB I; Joel Saccheus, FT II and/or Dave Behr, FT II) operated from May 20 through June 2 within the Cape Denbigh subdistrict (subdistrict 3: statistical area 333-74) of the Norton Sound herring fishing district (Figure 1). Test fishing with variable mesh gear and subsequent sampling of herring were conducted daily when possible. Commercially caught herring were also collected and sampled. Project objectives and procedures are outlined in the 1988 Bering Sea Herring operational plans for Norton Sound and the Bering Sea Herring A-W-L Sampling Manual.

SEASON SUMMARY

Test Fishing

A total of 1753 herring was caught in 26 variable mesh gill net sets within the Cape Denbigh subdistrict (Table 1 and Figure 2). Pacific herring comprised 93.9% of the total number of pelagic fish caught. Other pelagic species caught were whitefish and saffron cod. Non-pelagic fish captured consisted of starry flounder, yellow fin sole, and sculpin. Two char were also caught.

A total of 13 fishing days produced 9 daily samples over two test fishing periods. Test fish gill net sets accounted for 37.6 hours of fishing effort, yielding an overall catch per unit effort (CPUE) of 46 herring per gillnet hour (Table 2). The first and second weeks (sampling week numbers 6 and 7) produced CPUE's of 110 and 28 herring per gillnet hour, respectively. CPUE was the highest on the west side of the Cape (165) and lowest on the east side (24) (Table 3). Intense fishing effort on the east side (76% of total fishing time) contributed to the low CPUE (Table 4).

A 100 foot, four panel (1 1/2, 2, 2 1/2, and 3 inch) floating variable mesh gill net 12 feet in depth was used for all sets. One net was fished daily except during periods of decreasing abundance near the end of the season when two nets fished concurrently. Daily catches were combined by mesh size, and a subsample weighted by mesh size was taken from the catch.

Of the 1753 herring captured in test fish nets throughout the field season, 1552 were actually taken from a particular mesh. The remaining herring were either bagged in the net near the lead line or dropped from the net as it was being pulled and therefore were not sampled. The 2 1/2 inch mesh caught the most herring (69%); followed by the 2 inch (18.3%), 3 inch (12.5%) and 1 1/2 inch (0.2%) (Table 5).

A total of 453 herring were sampled for age, size, sex, and gonad maturity index. Preliminary age analysis (by scale analysis) indicates that herring age 4, 5, 6, 7, 8, 9, and 10+ represent 1, 3, 19, 18, 12, 27, and 20% of the test net catch, respectively (Table 6).

Age 9 and older herring comprised 57% and 35% of the total sampled during the first and second sampling week, respectively (Table 6). Age 7 and younger herring comprised 32% and 52% of the total sampled during the first and second sampling week, respectively.

The low percentage of female herring captured (41%) in addition to the high percentage of immature females caught during the first sampling week (24%), and the high percentage of spawn outs during the second sampling week (53%), contributed to a low average sac roe recovery of 5.3% (Table 7).

Samples of herring caught in variable mesh gillnets from three areas on May 26 were flown to Unalakleet for inspection by industry roe technicians at the districtwide beach party. The samples were from the west and east sides of Cape Denbigh and Shaktoolik.

Commercial Catch Sample Results

Fish were obtained from seven separate commercial gillnet catches during four openings for a season total of 210 herring samples.

A total of three samples of 30 herring each was obtained from three fishing boats on May 27 for a first period total of 90 fish. Two samples of 30 fish each were obtained from two different boats on May 28 for a second period total of 60 fish. One sample of 30 herring was obtained from the third opening on May 29 and one from the fourth opening on May 30. Common mesh sizes used by commercial fishermen were 2 5/8" and 2 3/4", along with a few 2 7/8".

Age was estimated in the field using the 1988 Norton Sound age at length table. The table was based on past year's length at age data. The preliminary composition included in this report is by scale analysis (Table 8). Age 6, 7, 8, 9, and 10+ comprised 10, 24, 15, 28, and 23 percent of the commercial gillnet catch samples, respectively. Ripe females (gonad index 6) comprised 49% of the total number of females sampled (Table 9). Green females (gonad index 4) and spent females (gonad index 7) comprised 2% and 49% respectively, of the total number of females sampled. Fifty-two percent of the total number of fish sampled were female herring and the average roe recovery was 5.8%.

A herring sample from commercial beach seine catches in subdistrict 3 was analyzed in Unalakleet. However, results were not available at the time of this report.

Spawn

Spawn was first observed on May 25 at the point north of the test fish camp, half way to the tip from camp, and near Gorilla Head on the west side of Cape Denbigh. For the next several days spawn was observed more extensively on both sides of the Cape (Figure 3). Spawn extended from about 1/4 mile south of camp, down around the tip, and north just past Gorilla Head.

A spawn deposition survey was conducted at low tide on the evening of May 31, from camp north to the mud flats (Table 10, Figure 4). Overall spawn coverage appeared to be less than normal in this area. The density of *Fucus* appeared to be less than the previous year also. Egg coverage on bare rock was more extensive here, as well as south of camp. Two to four egg layers was common with as many as 8 in some places. Near the tip spawn was found subtidally to a depth of 5 feet or more. Estimated mortality at the time of survey was approximately 50%. However, many of the eggs on rocks had already broken away. Although those that were examined appeared to be in good shape, the survival rate of the free floating eggs is unknown.

The west side of the Cape from the tip to Point Dexter was surveyed for spawn deposition on June 3. There was very little *Fucus* remaining at Point Dexter and no eggs present. Other known spawning areas were spot checked and essentially no eggs were found.

In areas of the first cove where milt was observed, almost no eggs were found.

Local subsistence spawn on kelp harvesters had to search a little more this year, although some good spawn was found at the point just north of camp, and near the southern cape. This activity began on May 26.

Commercial Fishery

Herring were first observed on the west side of the Cape on May 21, and schooling by camp on May 22. The local fishing fleet began to arrive on the evening of May 24. Commercial gillnet and beach seine openings are outlined in Table 11.

Only one tender was on the grounds when the first opening began at 8:00 a.m. on May 27. Although two more tenders had arrived by the closure at 10 a.m., the tendering capacity was not enough

to alleviate the long delivery lines produced by 45 boats. In addition, it was reported that a very inefficient pump on the first tender caused unexpected delays. These conditions may have been partially the reason that approximately 20 nets were still in the water after the period closure. Plugged nets, rough water, and a few swamped boats, as well as small skiffs fishing more gear than could be tended under the circumstances, all contributed to the violations. Procedures and responsibilities for Department personnel need to be more clearly outlined for these and related situations.

There were six tenders and approximately 70 fishing boats during the second opening on May 27-28. For the third opening on May 29 there were 10 tenders (1/3 the normal fleet) on the grounds. By the last opening on May 30, six tenders remained and the fishing fleet diminished as catches rapidly declined. Commercial fishing activity concentrated on the east side of the Cape.

Miscellaneous

Climatological data for the test fishing season are shown in Table 12.

A solar panel was used to charge the 12 volt battery for the single side band radio. It works well in maintaining a charged battery, but must be disconnected when the radio is in use.

Gasoline consumption was low due to minimal boat travel. One purchase was made from a tender, and approximately 150 gallons was used during the season. One 5 gallon can of blazo and 2 cans of kerosene are adequate for camp use.

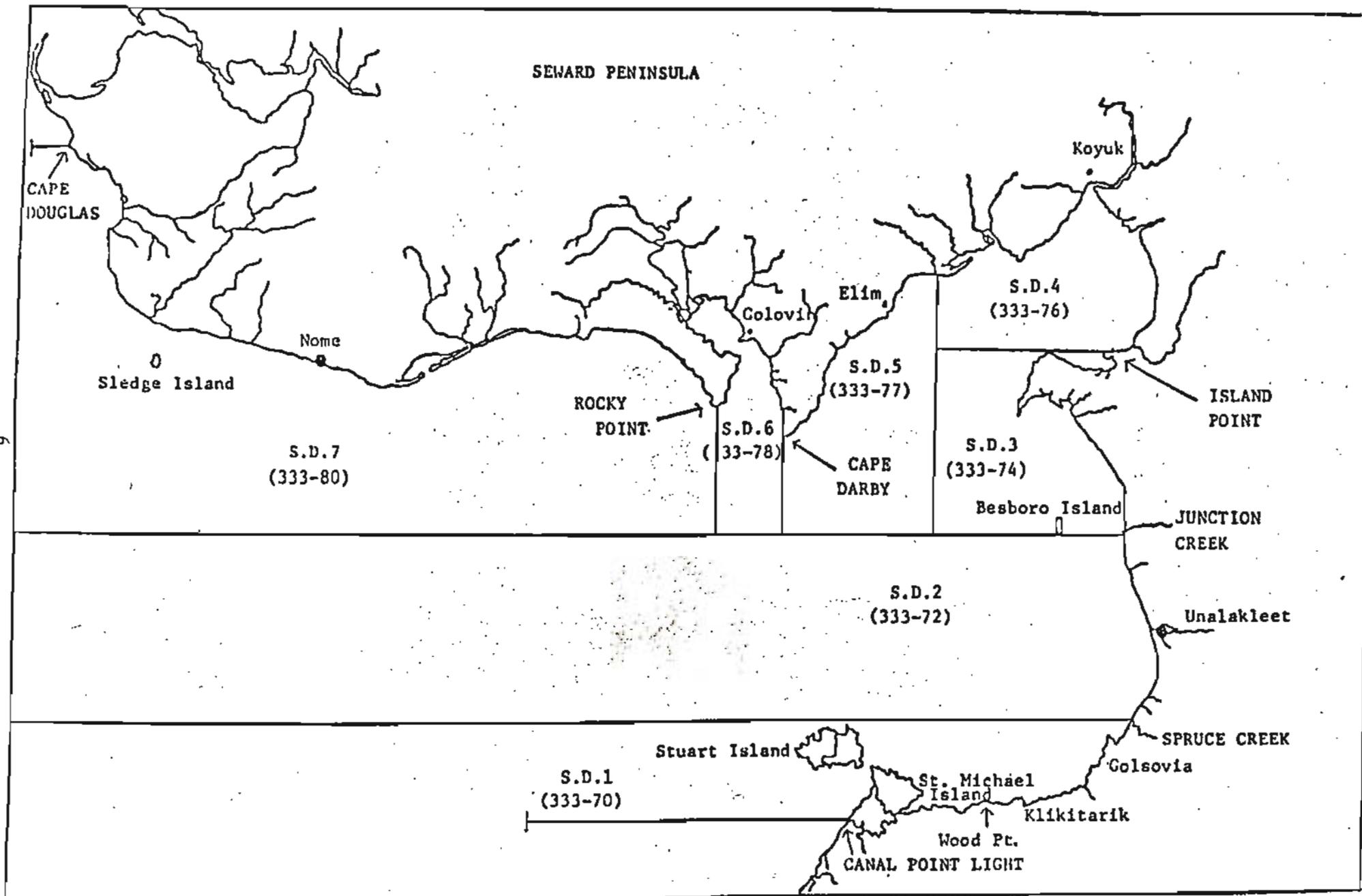


Figure 1. Norton Sound commercial herring district (333) and statistical boundaries.

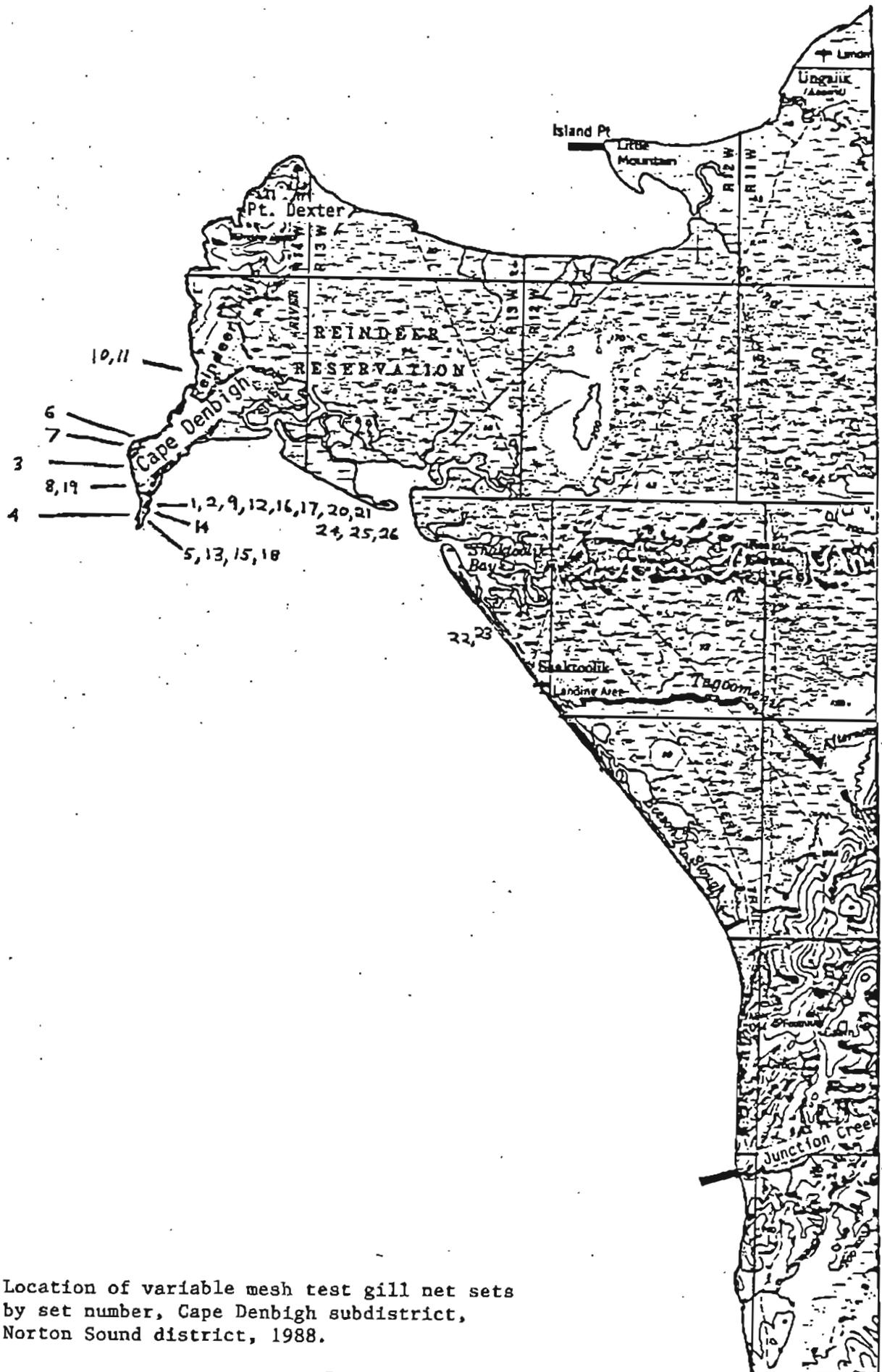


Figure 2. Location of variable mesh test gill net sets by set number, Cape Denbigh subdistrict, Norton Sound district, 1988.

Figure 3. Spawning observations beginning May 25, 1988.

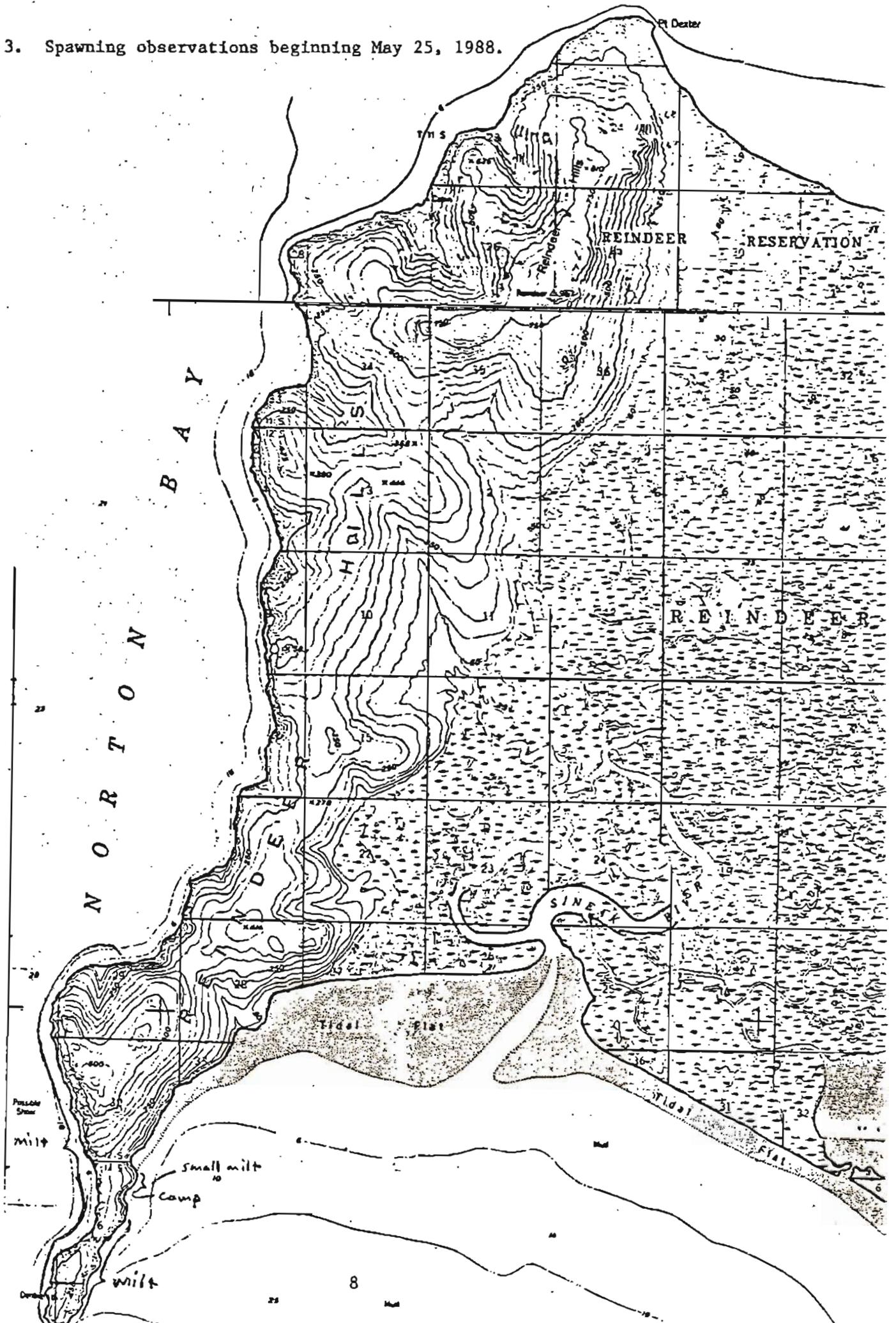


Figure 4. Location of spawn deposition, Cape Denbigh subdistrict, 1988.

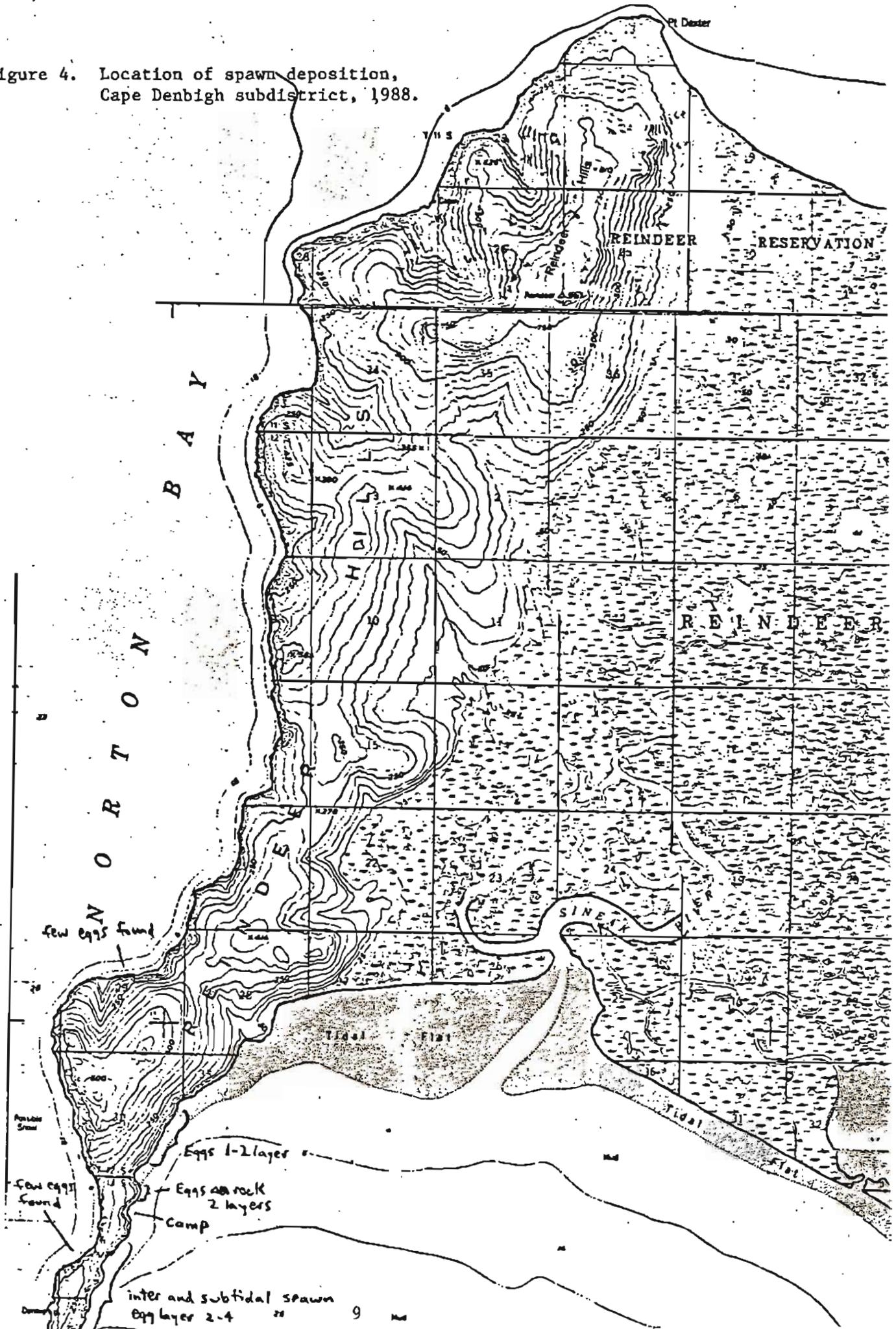


Table 1. Variable mesh gillnet catch composition, Cape Denbigh subdistrict (s.d. 3), Norton Sound district, 1988.

Date	Set No	Side of Cape	Time Set	Hrs. Fished	Water		Aerial Support	% Comp of Herring	Number Herring Sampled	Ph	Catch 1/						
					Temp F	Depth Feet					SC	WF	SF	Yfs	Scu		
5/20	1	E	2036	1.8	44	8	no	75	3	3	1		2	1			
5/21	2	E	1348	3.8	44	10	no	100	60	275		1	1		1		
5/23	3	W	1045	0.6	41	8	no	92		12							
5/23	4	W	1125	0.6	41	12	no	100	60	214					1		
5/24	5	E	0932	0.5	43	10	no	100	30	85							
5/25	6	W	0958	0.2	43	14	no	0		0		1					
5/25	7	W	1017	0.1	43	10	no	0		0							
5/25	8	W	1027	0.1	42	8	no	100	30	137							
5/25	9	E	1106	0.2	46	8	no	100	30	85							
5/26	10	W	0940	0.2	46	8	no	94		15			2				
5/26	11	W	1007	0.5	46	13	no	100	30	118							
Subtotals				8.6				99.7	243	944	1	2	5	1	2		
CPUE = 110 herring/hr.																	
5/27	12	E	2125	0.1	46	6	no	100	30	54							
5/28	13	E	2000	0.2	46	22	no	0	0	0							
5/29	14	E	1305	0.5	44	10	no	0	0	0							
5/29	15	E	1340	0.2	44	11	no	98.7	60	161	2						
5/30	16	E	1100	4.9	44	8	no	0.9	0	1	107		49	23	1	1 char	
5/31	17	E	1700	2.0	44	13	no	0	0	0							
6/01	18	E	1028	1.7	42	18	no	100		3			1			1 char	
6/01	19	W	1100	0.7	41	12	no	0		0							
6/01	20	E	1220	2.2	42	13	no	0		0							
6/01	21	E	1220	1.9	42	9	no	100		16			2	1	7		
6/01	22	S	1457	3.2	42	9	no	99.7		345	1						
6/01	23	S	1507	2.7	42	6	no	100	120	229							
6/02	24	E	1207	3.4	43	14	no			0							
6/02	25	E	1212	3.5	43	9	no			0							
6/02	26	E	1549	1.8	43	9	no			0							
Subtotal				29.0				87.9	210	809	110		52	24	8	2 char	
CPUE = 28 herring/hr																	

1/ Catch key: Ph = Pacific herring Yfs = Yellow fin sole
 Sc = Saffron Cod Scu = Sculpin
 Sf = Starry flounder WF = Whitefish

Table 2. Variable mesh test net catches of herring
by period, Cape Denbigh subdistrict, 1988.

Date	Sample Period	Number of Sets	Hours Fished	% of Total Catch	CPUE
5/20-5/26	6	11	8.6	54	110
5/27-6/02	7	15	29.0	46	28
Total		26	37.6	100	46

Table 3. Cape Denbigh variable mesh CPUE for herring
by sample period and area, 1988.

Area	Sample period		
	6	7	Total
East	71	10	24
West	216	0	165
Shaktoolik	-	97	97
Total	110	28	46

Table 4. Cape Denbigh variable mesh test net catches by area, 1988.

Area	Number of Sets	Hours Fished	% of Total Time	Number Herring	% of Total Catch	CPUE
Junction Creek - Shaktoolik	2	5.9	16	574	33	97
Shaktoolik - Cape Denbigh	16	28.7	76	683	39	24
Cape Denbigh - Pt. Dexter	8	3.0	8	496	28	165
Total	26	37.6	100	1753	100	46

Table 5. Cape Denbigh subdistrict variable mesh test net catch of herring by mesh size, 1988.

Date	1.5"	2"	2.5"	3"	Bagged or Dropouts
5/20	0	0	3	0	
5/21	1	13	215	46	
5/23	0	23	168	35	
5/24	0	20	65	0	
5/25	0	23	93	43	63
5/26	0	21	83	21	8
<hr/>					
7-day period					
subtotals (%)	1(0.1%)	100(11.4%)	627(71.8%)	145(16.6%)	71
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5/27	0	18	36	0	
5/29	0	59	67	0	35
5/30	0	0	1	0	
6/01	2	107	340	49	95
<hr/>					
7-day period					
subtotals (%)	2(0.3%)	184(27.1%)	44(65.4%)	49(7.2%)	130
<hr/>					
Total	3	284	1071	194	201
%	0.2	18.3	69.0	12.5	

Table 6. Percent age composition of herring sampled from the Cape Denbigh variable mesh test nets (scale analysis), 1988.

Date	Number Herring Sampled	Age/year						
		4	5	6	7	8	9	10+
5/20	3	0	0	0	0	0	33	67
5/21	60	0	0	5	24	7	28	36
5/23	60	0	0	13	12	13	45	17
5/24	30	0	3	17	10	7	43	20
5/25	60	0	0	20	20	12	32	17
5/26	30	0	0	27	13	17	13	30
subtotal	243	0	0	15	17	11	33	24
5/27	30	0	0	17	30	20	20	13
5/29	60	5	7	40	27	5	7	10
6/01	120	0	8	18	14	15	27	18
subtotal	210	1	7	24	20	13	20	15
Total	453	1	3	19	18	12	27	20

Table 7. Gonadal maturity of herring sampled from the Cape Denbigh variable mesh test net catches, 1988.

Date	Herring Captured	Herring Sampled	Percent Females	Gonad maturity index (females only)			Percent roe recovery
				green	ripe	spent	
5/20	3	3	100	100	0	0	0.0
5/21	275	60	20	75	25	0	0.9
5/23	214	60	37	27	73	0	8.1
5/24	85	30	33	30	70	0	4.7
5/25	222	60	45	0	100	0	10.5
5/26	133	30	50	0	100	0	8.9
sub-totals	932	243	37%	24%	76%	0	6.6
5/27	54	30	63	5	16	79	2.8
5/29	151	60	27	0	50	50	2.2
6/01	592	120	53	7	48	45	4.7
sub-totals	797	210	47%	5%	42%	53%	3.2
Totals	1729	453	41%	14%	58%	28%	5.3

Table 8. Percent age composition of herring caught by commercial gill net, Cape Denhigh subdistrict (scale analysis), 1988.

Date	Number Sampled	Age				
		6	7	8	9	10+
5/27	90	9	28	19	30	14
5/28	60	12	18	13	22	35
5/29	30	13	27	13	27	20
5/30	28	7	18	11	36	28
Total	208	10	24	15	28	23

Table 9. Gonadal maturity of herring caught by commercial gill net, Cape Denbigh subdistrict, 1988.

Date	Number Sampled	Percent Females	Percent Gonad Maturity			Percent Roe Recovery
			green	ripe	spent	
5/27	90	51	0	52	48	5.3
5/28	60	50	7	33	60	3.4
5/29	30	53	0	81	19	8.9
5/30	30	60	0	45	55	5.6
Total	210	52%	2%	49%	4%	5.8%

Table 10. Description of spawn and spawn substrates, Cape Denbigh subdistrict, 1988.

Date	Time	Location	Tide Stage	Inorganic Substrate Type	Fucus Conc. 1/	% Egg Mortality	Spawn Patch Length	Width	Average Number of Egg Layers	Subtidal or inter-tidal	Remarks
5/31	2200	C. Denbigh East side mud flats	low	Rock/stone	1	50%	0.5 mi.)	2 m	1 - 2	inter	
					2	50%	25	2	2 - 4	inter	
				boulder/rock	0	50%	50	1	4 - 6	inter	
6/03		South of camp to tip	low	boulder/rock	0	50%	1 mi.	5 m	4	sub	water depth to at least 5 feet
				rock/stone	0	50%	1 mi.	2 m	1	inter	
				boulder/rock	1	50%	150 mi.	2 m	2 - 4	inter	
		Pt. Dexter		boulder/rock	0-1				no eggs		
		1st & 2nd cove west	low	boulder/rock	0-1				a few eggs	inter	

1/ Qualitative assessment; 1 - very light, 2 - light, 3 - medium, 4 - heavy.

Table 11. Commercial gillnet and beach seine openings,
Cape Denbigh Subdistrict, Norton Sound
commercial herring district, 1988.

Date	Gill net		Beach seine	
	Time	Hours	Time	Hours
5/27	0800-1000	2	1400-1700	3
5/27-28	1800-1200	18	(5/28) 1900-2200	3
5/29	0600-1200	6	1400-1700	3
5/30	0000-1200	12	1400-1900	3
5/31			1000-1800	8
Total		38		22

Table 12. Climatological observations, one-fourth mile offshore east tip of Cape Denhigh, 1988.

Date	Time	Temp F		Secchi Reading (m)	1/ Cloud Cover	2/ PPT	3/ Wind (K)	Camp temp. (F)	
		Air	Water					High	Low
5/21	1400		44	2.5	4-5	7-1	S 10	46	35
5/22	2130		45	2.0	1	7	WNN 10	54	33
5/23	1015	40	43	3.0	3	7	N 10-15	58	36
5/24	0915	45	43	4.0	1	7	NNW 5-10	66	40
5/25	0936	49	46	4.0	3	7	ENE 5	65	39
5/26	0920	49	50	2.5	3	7	NNE 10-15	65	45
5/27	2000	49	46	4.5	1	7	N 15-20	65	43
5/28	1000	47	45	4.0	1	7	N 20	64	42
5/29	1310	51	44	4.0	3	7	N 20	60	44
5/30	1100	44	44	5.0	4	7	NNW 15	63	43
5/31	1630	49	44	3.5	2	7	NW 15-20	60	39
6/01	1030	40	42	2.5	3	7	N 10	59	37
6/02	1200	44	43	3.0	1	7	SW 10-15	56	33

1/ Cloud cover:
 0 - No observation
 1 - Clear sky; less than 1/10 cloud cover
 2 - Cloud cover not more than 1/2
 3 - Cloud cover more than 1/2
 4 - Completely overcast
 5 - Fog or thick haze

2/ Precipitation (PPT)
 0 - No observation
 1 - Intermittent rain
 2 - Continuous rain
 3 - Snow
 4 - Snow and rain mix
 5 - Hail
 6 - Thunderstorm
 7 - No precipitation

3/ Velocity (in knots) and direction