

Cape Denbigh  
Herring Project, 1987

By  
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## INTRODUCTION

The Cape Denbigh test fishing crew (Gary Knuepfer, FBI, Lisa Gluth, FTII) operated from May 27 through June 12 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 1987 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 2105 herring was caught in 58 variable mesh gill net sets within the Cape Denbigh subdistrict (Table 1 and Figure 2). Pacific herring comprised 99.8% 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.

Test fish gill net sets accounted for 51.5 hours of fishing effort, yielding an overall catch per unit effort (CPUE) of 40.9 herring per gill net hour. Test fishing from June 10 to June 12 (sample period 9) yielded the highest CPUE of 321.8 (Table 2). Although test fishing efforts on the west side of Cape Denbigh yielded the highest seasonal CPUE (53.1), the east side produced a much higher CPUE during the last two sample periods (613 and 795, respectively) (Table 3).

A total of 16 daily samples were taken over three test fishing periods. 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 most sets. A 20 foot deep net was used for several sets offshore of Point Dexter on June 3. In addition, a second net was fished by another test fish crew on June 3 and 4 (Table 1). Daily catches were combined by mesh size, and a subsample weighted by mesh size taken from these. The 2-1/2 inch mesh captured the most herring (57.4%) followed by the 2 inch mesh (27.7%) (Table 5).

Of the 2105 herring captured in test fish nets throughout the field season, 673 were sampled for age, size, sex and gonad maturity index. Preliminary age analysis, employing prior years' age at length data, indicates that 9+, 5, and 8 year old herring

representing 25%, 23%, and 21% respectively, dominated the age structure of the population (Table 6).

The low percentage of female herring captured, 42.3% contributed to low sac roe recovery (7.2%) (Table 6).

### Commercial Catch Sample Results

Test fishing was conducted with commercial fishermen on several occasions previous to the established beach party to analyze roe maturity. Commercial gear was used in an attempt to sample the portion of the herring population available to the fleet. Samples were inspected by industry roe technicians.

Fish were obtained from eight separate commercial gillnet catches on June 7 for a season total of 210 herring samples. Age was estimated in the field using the 1987 Norton Sound age at length table. Older age herring dominated the commercial catch sample, with 4 age classes contributing similar proportions. Age class 6, 7, 8, and 9+ herring comprised 20.0%, 23.3%, 22.4%, and 21.4% of the commercial gillnet catch samples, respectively (Table 8). Ripe females (gonad index 6) comprised 90% of the total number of females sampled (Table 9). Green females (gonad index 4) and spent females (gonad index 7) comprised 3% and 6%, respectively, of the total number of females sampled. Fifty percent of the total number sampled were female herring and the overall roe recovery was 9.0%. The dominant mesh sizes used by commercial fishermen were 2-5/8" and 2-3/4".

A total of 210 herring was sampled from commercial beach seine catches. One sample was taken on June 7 on the east side of Cape Denhigh, and 2 samples were taken from catches on the west side on June 8. Five year old herring dominated the commercial beach seine sample, comprising an estimated 43% of the total (Table 10). Ninety-seven percent of the sampled female herring were ripe (Table 11). Green and spent females comprised 1% and 2%, respectively of the total number sampled. Forty-seven percent of the total number sampled were female herring and the overall roe recovery of the sample was 9.0%.

After the field season, the scale samples were aged and the results are presented in tables 6A, 8A, 10A, and 12. Although there is little difference in the results of the two methods of aging, the results of the scale reading method are presented here. Scale reading slightly decreased the average age by increasing the number of six year olds and decreasing the number of eight year olds and older fish.

## Spawn

Little herring spawn was observed in the Cape Denbigh area this year. Spawn surveys were limited to the site north of camp on June 11. Spawn coverage and condition was considered good in this area, averaging 3 - 4 egg layers. Mortality appeared to be about 30% from desiccation. The spawn was estimated to be 2 to 3 days old at the time of observation.

## Miscellaneous

Although sea ice was present for much of the season, it caused little problem other than confining fishing (commercial and test) to the west side of the Cape on one occasion. Air temperatures were unseasonably cold and are presented along with other climatological data in Table 14.

Thanks are due to Fred Bue and Mark Rockwell for their assistance at Cape Denbigh.

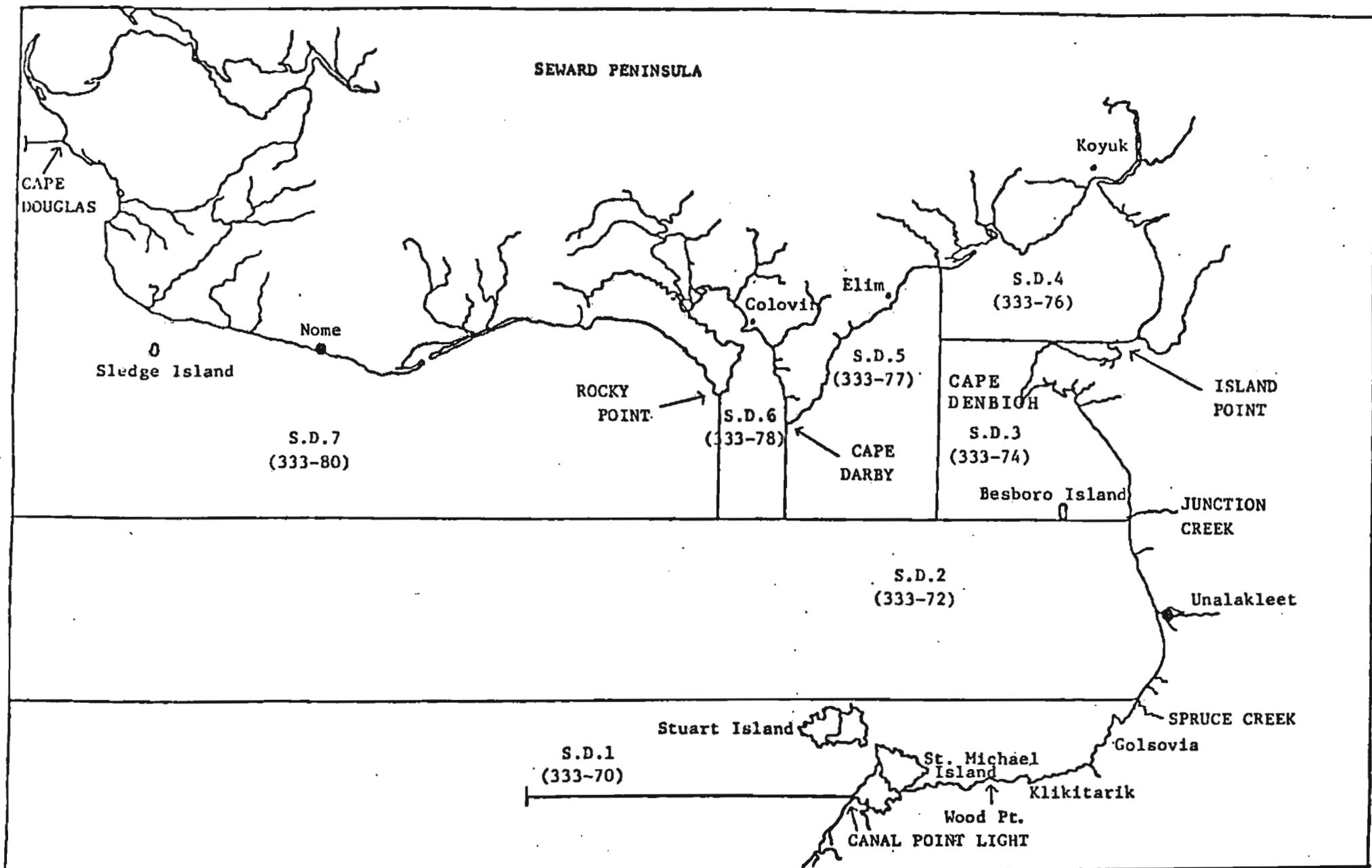


Figure 1. Norton Sound commercial herring district (333) and statistical boundaries.

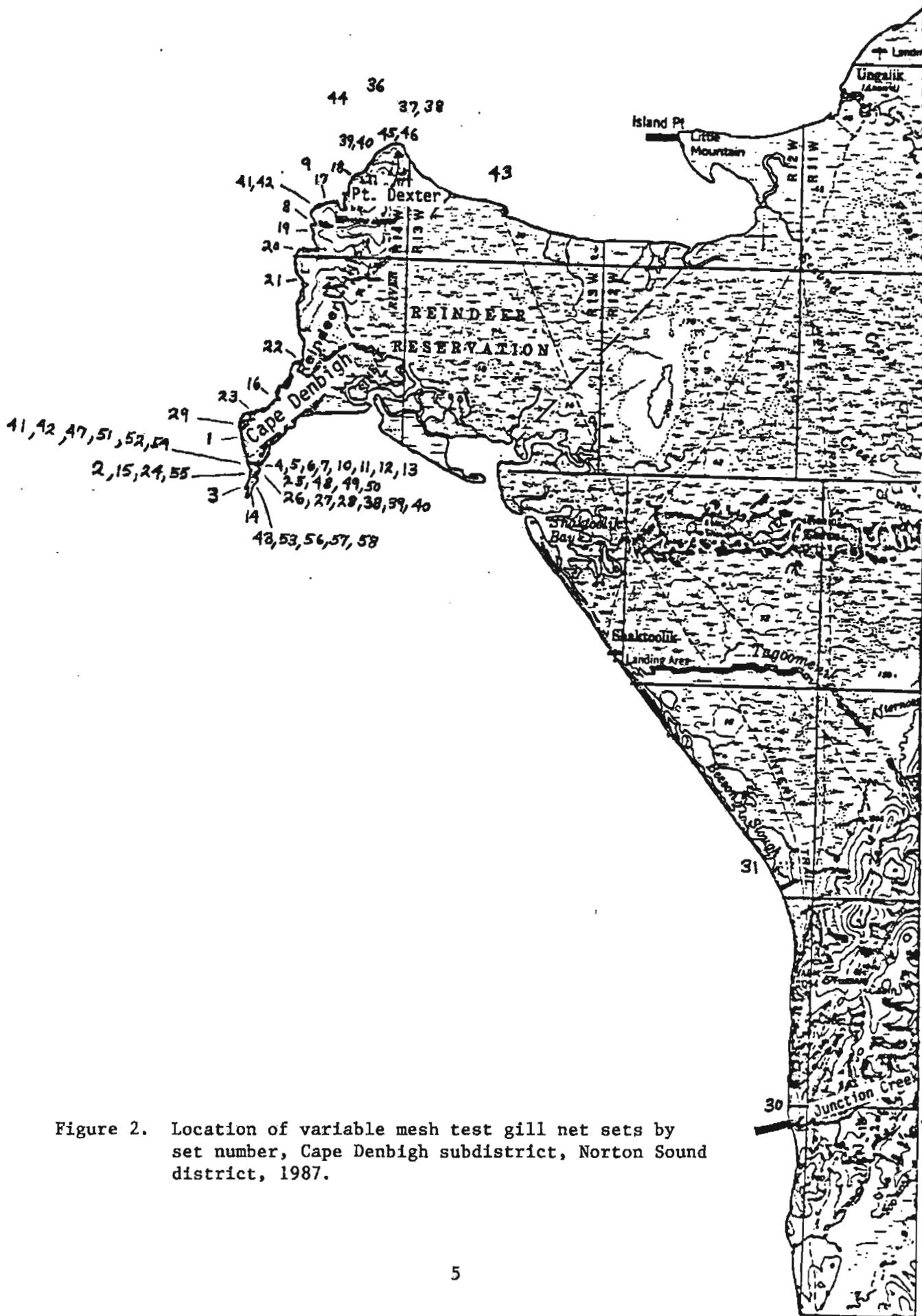


Figure 2. Location of variable mesh test gill net sets by set number, Cape Denbigh subdistrict, Norton Sound district, 1987.

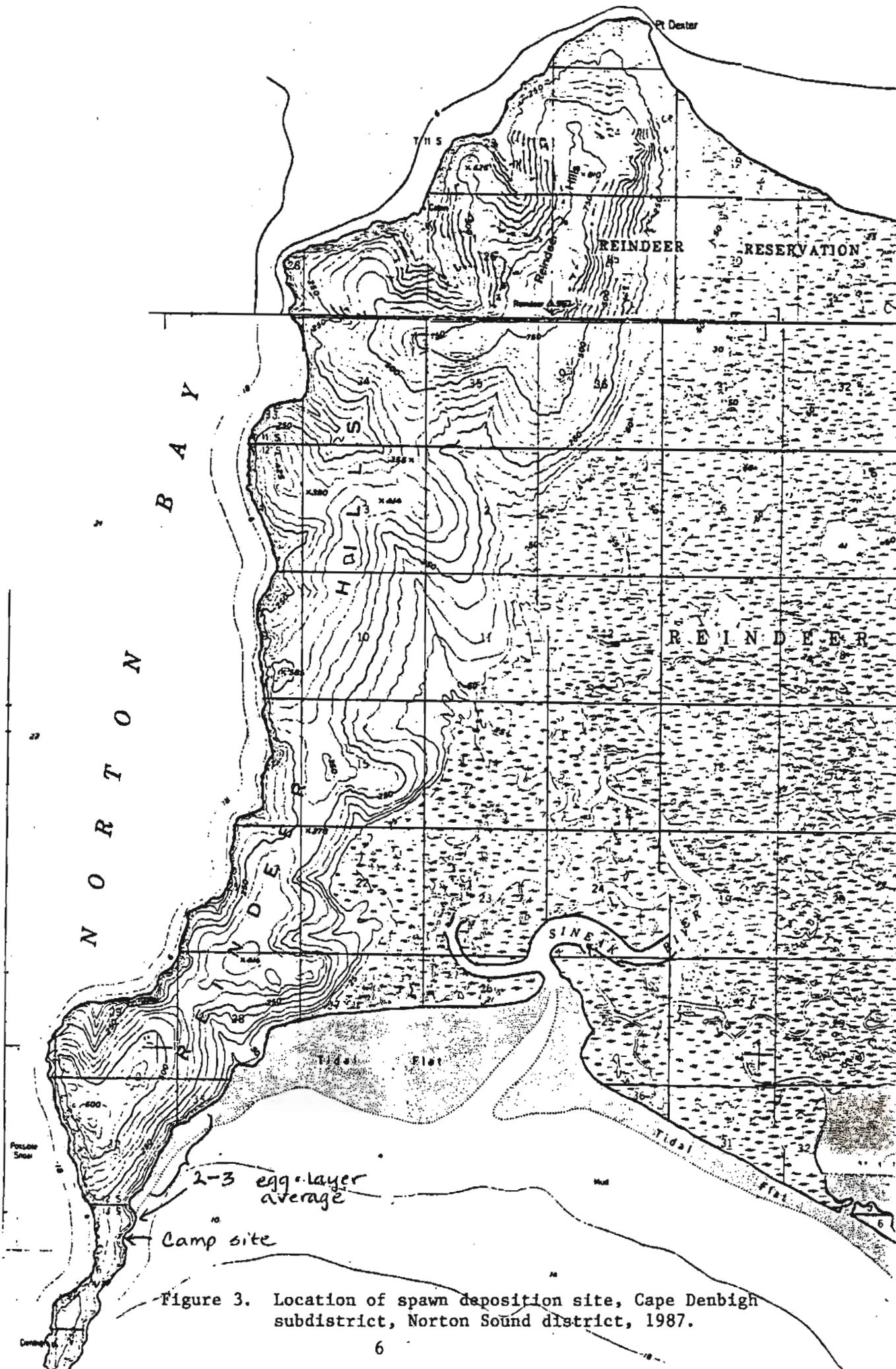


Figure 3. Location of spawn deposition site, Cape Denbigh subdistrict, Norton Sound district, 1987.

Table 1. Variable mesh gillnet catch composition, Cape Denbigh subdistrict (s.d. 3), Norton Sound district, 1987.

Date	Set 1/ No	Side of Cape	Time Set	Hrs. Fished	Water		Aerial Support	% Comp of Herring	Number Herring Sampled	Ph	Catch 3/				
					Temp F	Depth Feet					SC	SF	Yfb	Scu	
5/27	1	E	1125	0.8	36	22	no			0					
5/27	2	W	1155	2.7	36	16	yes	100	60	138					
5/27	3	W	1225	2.3	36	20	yes			0					
5/28	4	E	1129	4.3	37	20	no			0					
5/28	5	E	1154	3.8	37	14	no			0					
5/28	6	E	1600	3.9	37	9	no			0					
5/28	7	E	1612	3.6	38	14	no	100	13	13					
5/29	8	W	1228	0.3	39	11	no	100	60	182				1	
5/29	9	W	1335	0.6	39	14	no			0					
5/29	10	E	1603	0.5	40	11	no			0					
5/29	11	E	1628	3.3	40	12	no			0					
5/30	12	E	1104	4.1	40	14	no			0		2			
5/30	13	E	1138	3.4	40	10	no	100	30	42					
5/31	14	E	1212	0.5	41	29	no			0					
5/31	15	W	1229	1.1	40	20	no			0					
5/31	16	W	1314	0.8	41	8	no	100	30	189					
6/01	17	W	1209	1.0	42	7	no	100		22			1		
6/01	18	W	1220	0.6	43	9	no			0					
6/01	19	W	1342	0.5	42	10	no	100		21					
6/01	20	W	1345	0.6	42	12	no		15	12					
6/01	21	W	1436	0.2	42	12	no			0					
6/01	22	W	1456	0.1	42	8	no			0					
6/01	23	W	1512	0.1	43	8	no	100	15	13					
6/01	24	W	1537	0.1	42	13	no	100		12					
6/01	25	E	1929	0.3	43	7	no	99		93	2/	1			
6/01	26	E	2002	0.3	43	9	no	99		86	2/	1			
6/02	27	E	1223	0.6	42	8	no	91	30	10		1		1	
6/02	28	E	1307	1.7	42	8	no	100		183					
Totals (this page)				42.1					253	1016		3	2	1	2

Table 1. Variable mesh gillnet catch composition, Cape Denbigh subdistrict (s.d. 3), Norton Sound district, 1987.  
(continued)

Date	1/ Set No	Side of Cape	Time Set	Hrs. Fished	Water Temp F	Depth Feet	Aerial Support	% Comp of Herring	Number Herring Sampled	Ph	Wf	Catch 3/ Sf Yfs	Scu	
6/03	29	W	1309	0.2	44	-	no	100	30	53				
6/03	30 4/	S	1130	0.3	42	13	no	100	30	22			(1/4 mi. north of Junction Cr.)	
6/03	31 4/	S	1205	0.2	42	13	no	100		18			(Beeson Slough)	
6/03	32 4/	W	2015	0.5	42	13	no			0				
6/03	33 4/	-	2100	0.5	34	10	no			0			(East of Dexter, 1 mi.)	
6/03	34 4/	W	2145	0.5	42	13	no			0				
6/03	35 4/	W	2238	0.5	42	16	no			0				
6/03	36	W	2025	0.4	41	11	no			0				
6/03	37	W	2105	0.3	41	11	no			0				
6/03	38	W	2129	0.3	41	11	no			1				
6/03	39	W	2153	0.3	41	10	no		0	5				
6/03	40	W	2216	0.2	41	12	no			0				
6/03	41	W	2240	0.3	41	20	no			0				
6/03	42	W	2301	0.3	41	18	no			1				
6/04	43 4/	-	1200	0.3	46	10	yes	100		11			(East of Dexter)	
6/04	44 4/	W	1230	1.2	46	-	yes	100	30	30			(1.5 mi off Dexter)	
6/04	45 4/	W	1402	0.2	46	9	no	100		13			(100' offshore)	
6/04	46 4/	W	1420	0.5	46	-	no	100		1				
6/05	47	W	2215	0.2	47	8	no	100	30	161				
6/06	48	E	2100	0.1	47	4	no	100	30	51		2	3	
6/08	49	E	2144	0.1	45	5	no	100		15				
6/08	50	E	2152	0.1	45	5	no	100	30	118		1	2	
6/09	51	W	2010	0.2	43	6	no	100	30	42				
6/10	52	W	1312	0.3	45	8	no	98	32	52	1			
6/10	53	E	1342	0.2	44	7	no	100	30	63				
6/11	54	W	1707	0.5	48	7	no	100		18				
6/11	55	W	1757	0.3	48	7	no		70	0				
6/11	56	E	1835	0.2	46	6	no			0				
6/11	57	E	1847	0.1	46	6	no	100		157			1	
6/12	58	E	1347	0.1	42	6	no		70	257				
Totals (this page)				9.4					420	1089	1	2	1	6

1/ Sample periods 5/27-6/02, 6/03-6/09, 6/10-6/16 are included.

2/ Sampled by industry roe technicians.

3/ Catch key: Ph = Pacific herring Yfs = Yellow fin sole  
Sc = Saffron Cod Scu = Sculpin  
Sf = Starry Flounder Wf = Whitefish

4/ Sets made by a second test fish crew.

5/ Grand Totals:

Hours fished = 51.5

Catch

Ph = 2105 Yfs = 2

SC = 3 Scu = 8

Sf = 4 Wf = 1

Table 2. Variable mesh test net catches by period,  
Cape Denbigh subdistrict, 1987.

Date	Sample Period	Number of Sets	Hours Fished	Number of Herring	% of Total Catch	CPUE
5/27-6/02	7	28	42.1	1016	48.3	24.1
6/03-6/09	8	23	7.7	542	25.7	70.4
6/10-6/16	9	7	1.7	547	26.0	321.8
Total		58	51.5	2105	100.0	51.5

Table 3. Cape Denbigh variable mesh CPUE by sample period and area, 1987.

Area	Sample period			Total
	7	8	9	
East	13.7	613.0	795.0	34.0
West	53.5	50.3	63.6	53.1
Shaktoolik	-	80.0	-	80.0
Island Point	-	13.7	-	13.7
Total	24.1	70.4	321.8	40.9

Table 4. Cape Denbigh variable mesh test net catches by area, 1987.

Area	Number of Sets	Hours Fished	Number Herring	% of Total Catch	CPUE
Junction Creek - Shaktoolik	2	0.5	40	1.9	80.0
Shaktoolik - Cape Denbigh (east side)	21	32.0	1088	51.7	34.0
Cape Denbigh - Pt. Dexter (west side)	33	18.2	966	45.9	53.1
Point Dexter - Island Point	2	0.8	11	0.5	13.7
Total	58	51.5	2105	100.0	40.9

Table 5. Cape Denbigh subdistrict variable mesh test net catch by mesh size, 1987.

Date	2"	2.5"	3"	Bagged or Dropouts
5/27	2	78	29	29
5/28	0	13	0	
5/29	12	106	27	37
5/30	6	35	1	
5/31	16	109	53	
6/01	48	139	67	5
6/02	49	137	6	
7-day period				
subtotals (%)	133(14.3%)	617(66.1%)	183(19.6%)	
6/03	48	52	0	
6/04	32	22	1	
6/05	63	87	11	
6/06	26	19	0	6
6/08	46	55	11	21
6/09	0	27	15	
7-day period				
subtotals (%)	215(41.7%)	262(50.9%)	38(7.4%)	
06/10	23	71	21	
6/11	69	38	5	
6/12	68	65	26	
7-day period				
subtotals (%)	160(41.5%)	174(45.0%)	52(13.5%)	
Total	508	1053	273	
%	27.7	57.4	14.9	

Table 6. Percent age composition of herring sampled from the Cape Denbigh variable mesh test nets (length frequency analysis), 1987.

Date	Number Herring Sampled	Age/year						
		3	4	5	6	7	8	9+
5/27	60	0	0	0	7	8	32	53
5/28	13	0	0	8	8	15	8	61
5/29	60	0	0	3	12	18	30	37
5/30	30	0	0	3	13	13	27	43
5/31	30	0	0	7	7	17	23	47
6/01	30	0	0	3	13	13	27	43
6/02	30	0	0	7	17	13	27	37
7-day period subtotals (#7) 253		0	0	3	11	14	27	45
6/03	60	0	2	48	20	8	17	5
6/04	30	3	20	47	17	3	10	0
6/05	30	0	0	33	17	13	13	23
6/06	30	0	3	30	37	10	10	10
6/08	30	0	0	33	10	10	20	27
6/09	30	0	0	7	23	10	30	30
7-day period subtotals (#8) 210		1	4	35	20	9	17	14
6/10	70	0	3	19	17	14	26	21
6/11	70	4	11	51	11	6	11	4
6/12	70	7	11	30	20	10	13	9
7-day period subtotals (#9) 210		4	9	33	16	10	17	11
Total	673	1	4	23	15	11	21	25

Table 6A. Age, sex and size composition of Pacific herring captured by variable mesh gill nets in Cape Denhigh Subdistrict, Norton Sound District, 1987.

Sample Period	Age (years)	Sex			Percent of Total	Weight			Std. Length			
		Male (No.)	Female (No.)	Unknown (No.)		Mean (gm)	Std. Dev.	Number Weighed	Mean (mm)	Std. Dev.	Number Measured	
5/27- 6/ 2	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-
	5	3	3	-	6	2.4	178	32.9	6	234	7.4	6
	6	17	12	-	29	11.5	230	23.9	29	251	7.7	29
	7	16	11	-	27	10.7	262	36.8	27	260	9.9	27
	8	49	34	-	83	32.8	296	39.8	83	267	8.9	83
	9	26	21	-	47	18.6	318	32.9	47	274	7.8	47
	10	26	30	-	56	22.1	336	40.4	56	276	7.5	56
	11	3	1	-	4	1.6	328	38.0	4	277	6.0	4
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	1	-	1	.4	430	-	1	301	-	1
Period total		140	113	-	253	100.0	296	53.0	253	267	12.8	253
6/ 3- 6/ 9	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	5	3	-	8	3.8	131	20.4	8	217	11.5	8
	5	35	28	-	63	30.0	171	20.7	63	232	7.1	63
	6	37	17	-	54	25.7	209	26.2	54	245	8.5	54
	7	17	4	-	21	10.0	250	33.6	21	258	9.0	21
	8	9	17	-	26	12.4	293	40.2	26	267	7.8	26
	9	10	7	-	17	8.1	297	35.3	17	272	7.7	17
	10	9	9	-	18	8.6	318	40.9	18	273	10.0	18
	11	1	1	-	2	1.0	417	52.3	2	297	9.2	2
	12	-	1	-	1	.5	486	-	1	249	-	1
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		123	87	-	210	100.0	229	68.0	210	249	19.4	210

Table 6A. Age, sex and size composition of Pacific herring captured by variable mesh gill nets in Cape Denhigh Subdistrict, Norton Sound District, 1987. (continued)

Sample Period	Age (years)	Sex			Percent of Total	Weight			Std. Length			
		Male (No.)	Female (No.)	Unknown (No.)		Mean (gm)	Std. Dev.	Number Weighed	Mean (mm)	Std. Dev.	Number Measured	
	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	1	-	1	.5	90	-	1	193	-	1
	4	8	4	-	12	5.7	111	22.0	12	205	12.3	12
6/10- 6/16	5	30	31	-	61	29.0	150	22.7	61	225	9.5	61
	6	35	19	-	54	25.7	204	27.1	54	242	8.6	54
	7	10	4	-	14	6.7	245	39.9	14	257	9.9	14
	8	25	20	-	45	21.4	274	35.4	45	264	8.1	45
	9	11	2	-	13	6.2	276	35.4	13	270	5.6	13
	10	6	4	-	10	4.8	335	44.1	10	276	6.3	10
	11	-	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		125	85	-	210	100.0	211	67.5	210	244	21.6	210
	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	1	-	1	.1	90	-	1	193	-	1
	4	13	7	-	20	3.0	119	23.1	20	210	13.2	20
All periods	5	68	62	-	130	19.3	161	24.8	130	229	8.9	130
	6	89	48	-	137	20.4	211	27.6	137	245	8.9	137
	7	43	19	-	62	9.2	254	36.5	62	258	9.5	62
	8	83	71	-	154	22.9	289	39.7	154	266	8.5	154
	9	47	30	-	77	11.4	307	37.2	77	273	7.5	77
	10	41	43	-	84	12.5	332	41.1	84	275	8.0	84
	11	4	2	-	6	.9	357	59.6	6	283	12.0	6
	12	-	1	-	1	.1	486	-	1	254	-	1
	13+	-	1	-	1	.1	430	-	1	301	-	1
Total		388	285	-	673	100.0	249	73.0	673	254	20.7	673

Table 7. Gonadal maturity of herring sampled from the Cape Denbigh variable mesh test net catches, 1987.

Date	Herring Captured	Herring Sampled	Percent Females	Gonad maturity index (females only)			Percent roe recovery
				green	ripe	spent	
5/27	138	60	43	0	100	0	8.3
5/28	13	13	77	40	60	0	10.8
5/29	182	60	37	14	86	0	6.4
5/30	42	30	53	62	25	13	3.1
5/31	189	30	33	0	100	0	7.1
6/01	80	30	50	13	87	0	11.0
6/02	193	30	47	7	93	0	9.7
				18	80	2	
6/03	93	60	37	14	86	0	7.0
6/04	41	30	47	50	50	0	4.1
6/05	161	30	57	0	100	0	10.1
6/06	45	30	27	0	100	0	6.2
6/08	133	30	43	0	92	8	8.7
6/09	42	30	43	0	92	8	8.7
				11	86	3	
6/10	115	70	39	0	96	4	7.6
6/11	175	70	37	0	61	35	3.9
6/12	257	70	46	0	97	3	8.0
				1	86	13	
Totals	2105	673	42	11%	84%	5%	7.2

Table 8. Percent age composition of herring caught by commercial gill net, Cape Denbigh subdistrict (length frequency analysis), 1987.

Date	Number Sampled	Age						
		3	4	5	6	7	8	9+
6/87	210	0	0.5	12.4	20.0	23.3	22.4	21.4

Table 8A. Age, sex and size composition of Pacific herring captured by commercial gill nets in Cape Denbigh Subdistrict, Norton Sound District, 1987.

Sample Period	Age (years)	Sex			Total	Percent of Total	Weight			Std. Length		
		Male (No.)	Female (No.)	Unknown (No.)			Mean (gm)	Std. Dev.	Number Weighed	Mean (mm)	Std. Dev.	Number Measured
	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	1	-	-	1	.5	148	-	1	217	-	1
	5	5	8	-	13	6.2	196	21.5	13	240	6.0	13
6/ 3- 6/ 9	6	25	37	-	62	29.7	220	23.2	62	247	8.5	62
	7	25	15	-	40	19.1	257	25.2	40	259	7.6	40
	8	32	22	-	54	25.8	280	30.3	54	265	7.8	54
	9	10	11	-	21	10.0	311	53.2	21	273	11.8	21
	10	7	10	-	17	8.1	305	39.3	17	276	7.0	17
	11	-	1	-	1	.5	362	-	1	290	-	1
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		105	104	-	209	100.0	257	48.0	209	259	14.1	209

Table 9. Gonadal maturity of herring caught by commercial gill net, Cape Denbigh subdistrict, 1987.

Date	Number Sampled	Females	Percent Gonad Maturity			Percent Roe Recovery
			green	ripe	spent	
6/07	210	50	3	90	6	9.0

Table 10. Percent age composition of herring caught by commercial beach seine, Cape Denbigh subdistrict (length frequency analysis), 1987.

Date	Number Sampled	Age						
		3	4	5	6	7	8	9+
6/07	210	1.4	8.6	43.3	24.8	8.1	10.9	2.9

Table 10A. Age, sex and size composition of Pacific herring captured by commercial beach seines in Cape Denbigh Subdistrict, Norton Sound District, 1987.

Sample Period	Age (years)	Sex			Total	Percent of Total	Weight			Std. Length		
		Male (No.)	Female (No.)	Unknown (No.)			Mean (gm)	Std. Dev.	Number Weighed	Mean (mm)	Std. Dev.	Number Measured
	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	3	6	-	9	4.3	126	22.6	9	210	12.3	9
	5	48	39	-	87	41.4	169	21.5	87	229	7.9	87
6/ 3- 6/ 9	6	34	28	-	62	29.5	207	26.6	62	243	8.9	62
	7	11	12	-	23	11.0	255	33.0	23	255	8.7	23
	8	9	10	-	19	9.0	274	35.7	19	264	6.8	19
	9	3	2	-	5	2.4	274	25.7	5	264	6.4	5
	10	3	2	-	5	2.4	315	60.9	5	271	9.1	5
	11	-	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		111	99	-	210	100.0	203	51.4	210	240	16.5	210

Table 11. Gonadal maturity of herring caught by commercial beach seine, Cape Denbigh subdistrict, 1987.

Date	Number Sampled	Females	% Gonad Maturity			Percent Roe Recovery
			Green	Ripe	Spent	
6/07-08	210	47	1	97	2	9.0

Table 12. Age, sex and size composition of Pacific herring captured by test purse seines in Cape Denbigh Subdistrict, Norton Sound District, 1987.

Sample Period	Age (years)	Sex			Percent of Total	Weight		Std. Length				
		Male (No.)	Female (No.)	Unknown (No.)		Mean (gm)	Std. Dev.	Number Weighed	Mean (mm)	Std. Dev.	Number Measured	
	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	1	3	-	4	2.5	183	36.5	4	241	11.5	4
	5	40	47	-	87	54.0	175	19.5	87	240	7.5	87
5/27- 6/ 2	6	18	21	-	39	24.2	208	35.9	39	252	11.8	39
	7	11	4	-	15	9.3	245	35.5	15	264	10.6	15
	8	6	6	-	12	7.5	269	53.5	12	268	12.7	12
	9	1	2	-	3	1.9	296	67.9	3	281	14.4	3
	10	-	1	-	1	.6	278	-	1	289	-	1
	11	-	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		77	84	-	161	100.0	200	44.9	161	248	14.6	161

Table 13. Description of spawn and spawn substrates, Cape Denbigh subdistrict, 1987.

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
6/11	2200	C. Denbigh East side	low (-4)	Rock/stone	1 - 2	30% desic.	(1-1 1/4)	3 m	2 - 3	inter	<---Total Broken down
		Pt. north of camp next 100'		boulder rock	1 1	30%	100' 100'	2 m 1 m	3 - 4 3		on fucus-some (1-2) on rock, good condition on fucus only
		Just north of Shak. camp cove -		rock/stone	5 - 1		1000'	4 m	3 - 4		on rocks only
		continuing north		rock/stone	2		15'	1 m	8		
				rock/stone	<1		1000'	4 m	2 - 4		
				rock/stone	2		1000'		4 (up to 15)		
				rock/stone	1	40%	1/4 mi	2 m	2 - 3 (up to 6)		
approx. 2-3 days after spawning				overall estimate this area:			3 egg layer avg. on fucus 2 egg layer avg. on rock		10% coverage of fucus on substrate (rock) 80% coverage of eggs on fucus and substrate		
				smaller patches-			6-12 egg layers on fucus 4-8 egg layers on rocks 100% coverage of eggs on rocks				
1/ Qualitative assessment; 1 - very light, 2 - light, 3 - medium, 4 - heavy.											

Table 14. Climatological observations, one-fourth mile off tip of Cape Denbigh - East, 1987.

Date	Time	Temp F		Secchi Reading (m)	Salinity 0/00 Hydrometer	1/ Cloud Cover	2/ PPT	3/ Wind(K)	Camp temp. ( F)	
		Air	Water						Low	High
5/27	1100	38	37	4.0	68	4	1	N 15-20		
5/28	1136	38	37	3.8	66	4	1	N 15	33	
5/29	1145	40	38	5+	66	3	7	N 10-15	30	
5/30	1115	39	40	5+	68	4	1	N 5-10		49
5/31	1202	46	41	3.5	69	3	7	0		
6/01						4	7	5-15	36	45
6/02	1210	38	42	1.5	70	4	7	SW 15	35	42
6/03	1116	45	44	1.5	80	4-5	7	0	33	
6/04	1121	52	45	1.5	73	1	7	ENE 10-12	39	62
6/05	2300		47	2.7	70	1	7	N 5-10	48	
6/06									48	70
6/08	1900		43	3.5		4	1	S 5-10		65
6/09	2000	50	46	5+	77	4	7	NE 5	43	63
6/10	1255	45	44	5.0	77	4	1	S 2-5	44	54
6/11	1821		46	5+		3	0	NW 10-12	40	55
6/12	1330	47	42	5.0	75	4	1	SW 5	41	51
6/13							4	SW 20	32	
6/14									34	

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