

A BOTTOM TRAWL SURVEY FOR CRABS IN THE
PRINCE WILLIAM SOUND MANAGEMENT AREA,
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By

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INTRODUCTION

The department has been conducting pot surveys for Tanner (Chionoecetes bairdi) crabs in the Prince William Sound (PWS) Management Area since 1977. These surveys have served as indices of crab abundance when compared to ensuing commercial harvests. Once a history of indices and harvests was established, the indices were utilized to determine relative stock condition as well as set preseason harvest guidelines for the commercial fishery. The weaknesses of the pot surveys, such as soak variation and the relative nature of the indices themselves, caused the department to employ a survey method that would provide for direct stock enumeration as well as condition. As a result, beginning in 1991, the department incorporated a trawl survey, along with the existing pot survey, to assess Tanner crab stocks in Prince William Sound.

Historically trawl surveys have been used by the National Marine Fisheries Service (NMFS) in the Bering Sea and the department offices in Kodiak and Homer to assess crab stocks in the Westward Region and Cook Inlet Management Area, respectively. Data from these surveys have proven very satisfactory in determining stock conditions and resultant fisheries management strategies for king and Tanner crabs.

OBJECTIVES

1. Determine abundance of the Tanner crab stock in the Prince William Sound Management Area (Figure 1).
2. Document size and shell age of all Tanner, red king (Paralithodes camtschaticus), brown king (Lithodes aequispina) and Dungeness (Cancer magister) crabs captured. Determine egg condition of all female crabs caught.

3. Record size and number of Pacific cod (Gadus macrocephalus) and rockfish species.

METHODS

Trawl and Area Description

The state research vessel Pandalus, overall length 66 feet, was utilized to conduct the survey. A 400 mesh eastern trawl was fished with 800 pound, 5'x 7', Nor'Eastern Astoria V trawl doors. Headrope and footrope lengths were 70 and 95 feet, respectively. The estimated fishing height and width of the net were 9 and 40 feet, respectively. The trawl had 4.0 inch mesh in the wings and body, 3.5 inch in the intermediate and cod end, and a 1.25 inch cod end liner.

Selection of the general survey areas was based on historical pot index and commercial catch information. Geographic areas that had very limited probability of crab catch or were too deep to trawl were not selected. Historic dockside sampling data indicate that crabs caught in deeper waters by commercial fishermen were virtually all double, triple or greater skip molt postrecruits. Although these animals are part of the adult stock, their assessment is not critical in determining overall stock condition particularly in the depressed PWS Tanner crab population. As the stock recovers, however, assessment of the entire postrecruit segment of the stock will increase in importance.

General survey location areas were: 1) Northern and Hinchinbrook Districts including Orca Bay, Port Fidalgo and Hinchinbrook Entrance, 2) north end of Montague Island from Smith Island to Green Island, and 3) Western District in the 100 fathom trench east of Montague Island.

Sampling Methods

Actual station sizes were based on those dimensions utilized in both the Westward Region and the Cook Inlet Management Area. Bay stations (North Montague and Northern/Hinchinbrook Districts) were 2.5 nautical miles square (6.25 sq. m.) (Figures 2 and 3) and ocean stations (Western District) were 5.0 miles square (25.0 sq. m.) (Figures 4a and 4b). Station size and shape varied when necessary to allow for irregular coastline and depth. Depths shallower than 50 fathoms were generally precluded from station selection. Elimination of the 50 fathom or less waters was based on historical fishery data as well as the department pot surveys.

Initial goals for tow length and time were 1.0 nautical miles and 30 minutes, respectively. The 30 minute period allowed for a tow speed which would permit the trawl to fish properly for one mile. If hangups caused a reduction in tow length, data from trawls greater than 0.5 miles were used. In an instance where tows were less than 0.5 miles, they were repeated only if the vessel skipper felt a successful tow could be made thereby minimizing potential damage to the net. The trawl path was randomly selected within the station grid by the vessel skipper wherever it appeared that a good tow could be made. All tows were made during daylight hours.

Successful tows were brought aboard and weighed unless the catches were too heavy to be lifted by the vessel's deck equipment. All king, Tanner and Dungeness crabs were weighed and measured. Width measurements were used for Tanner and Dungeness crabs while length was utilized for king crabs. Shell age and egg condition data were recorded.

Pacific cod and rockfish catches were sampled. All Pacific cod and rockfish were weighed and counted. As many Pacific cod were measured as time allowed. All cod were normally measured. Rockfish were returned to the regional groundfish biologist for

further data collection. Qualitative notations only were made on other major fish and invertebrate species.

Data Analysis

Abundance estimates for Tanner crabs were made using the following area swept equation:

$T = 151.9 (A) (C)$ where 151.9 is a factor to convert catch per nautical mile towed to catch per square nautical mile.

T = the estimated total number of Tanner crabs.

A = the area of the stations in square nautical miles.

C = the average catch per tow in number of crabs.

A coefficient of variation (CV) was derived for the population estimate by dividing the standard error of the population estimate (Se) by the population estimate itself.

RESULTS

General

A total of 43 good tows were made from August 21 through August 30, 1991. The number of stations fished in the Northern/Hinchinbrook, North Montague and Western Districts were 23, 12 and 8, respectively. Total catches of all species and debris were 26,107, 18,709 and 9,188 pounds, respectively for the three previously mentioned areas. Only two of the 43 tows were less than 1.0 nautical mile. Both were in the North Montague area at 0.90 and 0.61 nautical miles, respectively (Appendices A, B and C).

Northern/Hinchinbrook Districts

Crab catches in the Northern/Hinchinbrook Districts were 487 and 37 pounds of Tanner and Dungeness crabs, respectively. No king crabs were caught. Sixty five Pacific cod weighing 512 pounds were captured. Mean length of the cod was 65 centimeters. Rockfish catch totalled 1,246 pounds for all species. Total catch of all other species and debris was 23,825 pounds (Table 1).

The total number of male Tanners caught was 566 animals. The majority (94 %) were sublegals (<135 mm). Only 32 crabs (6 %) were legal. True prerecruit ones and twos comprised 2 and 13 percent, respectively, of all males caught. The largest portion of the catch was from the prerecruit threes at 36 percent, and those animals smaller than prerecruit threes, which comprised 27 percent of the total male catch (Table 2 and Figure 5).

A total of 496 females were caught. Of these, 226 were juveniles and the remaining 270 were adults. Of the adult females, 65 (24 %) had full clutches. All eggs were uneyed. One hundred seventy eight (66 %) were newly mature (Table 3).

No king crabs were caught. Fifty six Dungeness, 20 males and 36 females, were captured in the western Orca Bay portion of the Northern/Hinchinbrook Districts. All males were sublegal (Table 4). None of the females were egg bearing (Table 5).

North Montague Area

Crab catches in the North Montague portion of the survey were 944 and 2 pounds for Tanner and Dungeness crabs, respectively. No king crabs were captured. Pacific cod catch totalled 24 fish weighing 233 pounds with an average length of 70 centimeters. Rockfish

catch was 520 pounds for all species. The total catch of all other species and debris was 11,168 pounds (Table 6).

Total male Tanner catch was 1,318 animals. Males in the prerecruit three size class and smaller dominated the catch with 68 percent (901) of the total males caught. Legal males accounted for six percent (82) of the male catch. Station number 105 accounted for 42 percent (547) of the males captured (Table 7 and Figure 6).

Female Tanner catch was 1,290 crabs. Seventy seven percent (999) were juveniles. Sixty six percent of the adults had full clutches. Sixty six percent of females with partial clutches were new shell females. Primiparous females often exhibit partial clutches. This does not indicate a reproductive problem. Eggs in all the mature females were uneyed (Table 8).

No king crabs were caught in the North Montague area. Four Dungeness, two males and two females, were captured. Both males were sublegal and neither of the females were bearing eggs.

Western District

Western District crab catches totalled eight pounds of Tanners and no king or Dungeness crabs. Eight Pacific cod were caught. The cod weighed 62 pounds and had a mean length of 71 centimeters. Rockfish catch was 69 pounds for all species. The total catch of all other species and debris was 9,049 pounds (Table 9).

Nine Tanner crabs, seven males and two females, were caught. Both females and five of the males were juveniles (Tables 10 and 11). King and Dungeness crabs were not found.

Tanner Crab Population Estimates

The Tanner crab population estimates for catchable males and females were 1,735,570 and 1,645,292, respectively for the entire sampled area excluding the Western District. The Western District was omitted from the estimate due to the very low catch of seven males and two females.

The population estimate of legal male Tanner crabs was 105,045 animals. The true recruit estimate was 20,280 crabs. The estimate of true prerecruit ones was 70,933 crabs. The largest catch of males was in the true prerecruit two and smaller size classes with a total of 1,373,522 animals (Table 12 and Figure 7).

DISCUSSION

The Tanner crab stock in all districts of the Prince Williams Sound Management Area has been in a depressed condition since the early part of the 1980's. The commercial fishery has been closed in the entire management area since 1989 with partial district closures since 1984 (Table 13).

Data from the 1991 trawl survey do not indicate any near term recovery of the Tanner stock. Although the numbers of juvenile crabs may signify a longer term recovery, the adult and legal male segments of the stock remain at very low levels.

E.E.O. STATEMENT

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U.S. Department of Interior

Washington, DC 20240

Table 1. Target species catch in pounds by station in the Northern District, Prince William Sound trawl survey, 1991.

Station no.	Tanner	Dung.	King	Pac. cod	Rock-fish sp.	Misc. invert., fish&debris	Total catch
1	8	0	0	0	185	491	684
2	34	4	0	42	52	574	706
3	14	14	0	10	19	909	966
4	20	1	0	34	3	629	687
5	16	0	0	30	118	564	728
6	5	12	0	8	7	364	396
7	28	4	0	0	80	864	976
8	64	1	0	38	33	634	770
9	26	1	0	10	36	1279	1352
10	24	0	0	56	24	742	846
11	7	0	0	34	40	641	722
12	10	0	0	0	7	563	580
14	14	0	0	10	32	1984	2040
15	6	0	0	40	300	1546	1892
16	12	0	0	18	31	965	1026
17	58	0	0	22	0	708	788
18	12	0	0	30	61	1881	1984
19	14	0	0	30	75	1141	1260
20	40	0	0	20	0	1396	1456
21	14	0	0	22	60	1624	1720
23	1	0	0	0	0	1009	1010
24	45	0	0	14	0	2838	2898
26	14	0	0	44	83	479	620
----- Northern District totals -----							
23	487	37	0	512	1246	23825	26107

Table 2. Numbers of male Tanner crabs per mile towed by station in the Northern District, Prince William Sound trawl survey, 1991.

Station	73-92		Sublegal males 93-112		113-134		135-157		>157		Total legal males	Total males
	<72	73-92	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)		
1	0	1	0	0	0	5	0	0	0	0	0	6
2	0	0	0	1	0	4	0	0	0	0	5	10
3	0	0	0	1	2	3	0	0	0	0	0	6
4	0	0	0	2	0	6	0	0	0	0	2	10
5	13	1	0	2	0	6	0	0	0	0	0	22
6	3	0	0	0	0	2	0	0	0	0	1	6
7	5	4	5	0	1	3	0	0	0	0	7	25
8	0	1	3	5	1	16	0	0	0	0	8	34
9	0	0	5	1	1	5	0	0	0	0	4	16
10	36	11	0	1	1	0	0	0	0	0	0	49
11	1	4	3	0	1	2	0	0	0	0	0	11
12	2	4	1	0	0	1	0	0	0	0	2	10
14	6	11	1	4	1	0	0	0	0	0	0	23
15	5	4	3	0	0	0	0	0	0	0	0	12
16	6	8	3	0	0	3	0	0	0	0	0	20
17	10	51	11	0	1	1	0	0	0	0	0	74
18	1	4	4	1	1	3	0	0	0	0	1	15
19	1	8	0	0	0	0	0	0	0	0	0	9
20	9	20	8	2	0	4	0	0	0	0	1	44
21	3	8	3	0	0	3	0	0	0	0	0	17
23	7	1	0	0	0	0	0	0	0	0	0	8
24	23	48	23	0	4	0	0	1	0	0	1	99
26	21	15	3	0	0	1	0	0	0	0	0	40
District total	152	204	76	20	14	68	1	31	0	0	32	566

--note- stations not listed had no male Tanner crab catch

Table 3. Numbers of female Tanner crabs per mile towed by station in the Northern District, Prince William Sound trawl survey, 1991.

Station	Juveniles		Full clutches		Partial clutches		Barren		Total mature		Total females		
	New	Old	New	Old	New	Old	New	Old	New	Old		VO	
1	2	0	0	0	0	0	0	0	2	0	0	4	
2	0	3	12	1	8	1	0	0	9	4	14	27	
3	1	0	6	1	4	1	0	0	6	1	9	17	
4	1	0	3	0	1	0	0	0	4	0	7	12	
5	6	0	2	0	1	0	0	0	1	0	2	9	
6	5	0	0	0	0	0	0	0	0	1	0	6	
7	4	0	2	0	0	0	0	0	1	0	2	7	
8	1	9	11	6	23	0	0	0	32	6	14	53	
9	3	1	5	1	1	0	0	0	2	1	7	13	
10	28	0	1	0	14	0	0	0	22	0	1	51	
11	8	0	0	0	0	0	0	0	0	0	0	8	
12	1	0	1	0	2	0	0	0	3	0	1	5	
14	9	0	0	0	0	0	0	0	4	0	0	13	
15	2	1	0	0	0	0	0	0	1	0	0	3	
16	5	3	0	0	2	0	0	0	5	0	0	10	
17	27	7	7	2	27	4	0	0	34	7	11	79	
18	4	0	0	0	0	0	0	0	0	0	0	4	
19	17	0	1	0	18	0	0	0	18	0	1	36	
20	28	9	1	2	9	0	0	0	18	3	0	49	
21	8	9	0	0	0	0	0	0	9	0	0	17	
23	3	0	0	0	0	0	0	0	0	0	0	3	
24	38	5	0	0	0	0	0	0	5	0	0	43	
26	25	0	0	0	2	0	0	0	2	0	0	27	
District total	226	65	17	51	113	6	15	0	3	178	23	69	496

-note- stations not listed had no female Tanner crab catch

Table 4. Numbers of male Dungeness crabs per mile towed by station in the Northern District, Prince William Sound trawl survey, 1991.

Station	90-114		115-139		140-164		165-189		>189		Total legal males	Total males
	<89	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)			
3	0	1	1	0	0	0	0	0	0	0	0	4
5	0	0	0	0	0	0	0	0	0	0	0	1
6	0	5	1	0	0	0	0	0	0	0	0	11
7	0	0	1	0	0	0	0	0	0	0	0	1
8	0	0	2	0	0	0	0	0	0	0	0	2
9	0	0	0	0	0	0	0	0	0	0	0	1
District total	0	6	9	5	0	0	0	0	0	0	0	20

-note- stations not listed had no male Dungeness crab catch

Table 5. Numbers of female Dungeness crabs per mile towed by station in the Northern District, Prince William Sound trawl survey, 1991.

Station	Juveniles	----- Mature -----									Total mature			Total females
		Full clutches			Partial clutches			Barren			New	Old	VO	
		New	Old	VO	New	Old	VO	New	Old	VO				
2	0	0	0	0	0	0	0	5	1	0	5	1	0	6
3	0	0	0	0	0	0	0	10	4	3	10	4	3	17
4	0	0	0	0	0	0	0	0	0	1	0	0	1	1
6	0	0	0	0	0	0	0	2	2	2	2	2	2	6
7	0	0	0	0	0	0	0	3	2	1	3	2	1	6
District total	0	0	0	0	0	0	0	20	9	7	20	9	7	36

-note- stations not listed had no female Dungeness crab catch

Table 6. Target species catch in pounds by station in the NMontague District, Prince William Sound trawl survey, 1991.

Station no.	Tanner	Dung.	King	Pac. cod	Rock-fish sp.	Misc. invert., fish&debris	Total catch
101	36	0	0	58	88	966	1148
102	28	0	0	32	37	389	486
103	58	0	0	6	135	995	1194
105	404	2	0	82	0	5238	5726
106	18	0	0	0	24	92	134
107	44	0	0	6	101	428	579
108	182	0	0	20	28	740	970
109	16	0	0	0	15	551	582
110	52	0	0	6	28	530	616
111	46	0	0	11	50	753	860
112	60	0	0	12	14	486	572
----- NMontagu District totals -----							
11	944	2	0	233	520	11168	12867

Table 7. Numbers of male Tanner crabs per mile towed by station in the NMontague District, Prince William Sound trawl survey, 1991.

Station	73-92		Sublegal males 93-112		113-134		Legal males 135-157		>157		Total legal males
	<72	73-92	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	
101	116	14	0	0	1	1	0	0	0	0	0
102	34	2	0	0	1	4	0	2	0	0	2
103	24	16	8	3	4	6	1	6	0	0	7
104	89	46	11	3	5	13	3	1	0	0	4
105	136	242	101	7	40	6	13	1	1	0	15
106	15	10	0	2	0	3	0	0	0	0	0
107	5	7	5	3	0	8	0	0	0	0	0
108	75	10	7	2	0	35	1	35	0	2	38
109	2	1	8	1	1	0	1	1	0	0	2
110	3	2	4	1	4	13	0	8	0	0	8
111	20	12	5	0	6	1	1	0	0	0	1
112	3	17	9	2	1	0	1	3	0	1	5
District total	522	379	158	24	63	90	21	57	1	3	82

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--note-- stations not listed had no male Tanner crab catch

Table 8. Numbers of female Tanner crabs per mile towed by station in the NMontague District, Prince William Sound trawl survey, 1991.

Station	Juveniles	----- Mature -----									Total mature			Total females
		Full clutches			Partial clutches			Barren			New	Old	VO	
		New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	
101	147	1	0	0	7	0	0	0	0	0	8	0	0	155
102	67	1	0	0	4	0	0	0	0	0	5	0	0	72
103	24	11	5	3	7	0	2	0	1	0	18	6	5	53
104	140	6	1	0	2	0	0	0	0	1	8	1	1	150
105	386	46	0	0	14	0	0	1	0	0	61	0	0	447
106	23	3	2	1	2	0	1	0	0	0	5	2	2	32
107	28	12	1	7	13	0	3	0	0	0	25	1	10	64
108	113	1	9	17	2	0	12	0	0	1	3	9	30	155
109	4	3	1	1	1	0	0	0	0	1	4	1	2	11
110	2	1	5	4	1	0	3	0	0	0	2	5	7	16
111	49	7	9	5	2	0	0	1	0	0	10	9	5	73
112	16	9	11	10	10	0	5	0	0	1	19	11	16	62
District total	999	101	44	48	65	0	26	2	1	4	168	45	78	1290

-note- stations not listed had no female Tanner crab catch

Table 9. Target species catch in pounds by station in the Western District, Prince William Sound trawl survey, 1991.

Station no.	Tanner	Dung.	King	Pac. cod	Rock-fish sp.	Misc. invert., fish&debris	Total catch
201	0	0	0	0	1	937	938
202	4	0	0	10	1	1097	1112
203	1	0	0	16	0	1305	1322
204	0	0	0	36	5	1779	1820
205	1	0	0	0	0	1509	1510
206	0	0	0	0	49	891	940
207	0	0	0	0	13	483	496
208	2	0	0	0	0	1048	1050
----- Western District totals -----							
8	8	0	0	62	69	9049	9188

Table 10. Numbers of male Tanner crabs per mile towed by station in the Western District, Prince William Sound trawl survey, 1991.

Station	73-92		Sublegal males		113-134		Legal males		Total legal	Total males
	<72	73-92	93-112 (new)	(old)	113-134 (new)	(old)	135-157 (new)	>157 (old)		
202	1	0	0	0	0	2	0	0	0	3
203	2	0	0	0	0	0	0	0	0	2
208	2	0	0	0	0	0	0	0	0	2
District total	5	0	0	0	0	2	0	0	0	7

-note- stations not listed had no male Tanner crab catch

Table 11. Numbers of female Tanner crabs per mile towed by station in the Western District, Prince William Sound trawl survey, 1991.

Station	Juveniles	Full clutches		Partial clutches		Barren		Total mature		Total females
		New	Old	New	Old	New	Old	New	Old	
205	1	0	0	0	0	0	0	0	0	1
208	1	0	0	0	0	0	0	0	0	1
District total	2	0	0	0	0	0	0	0	0	2

-note- stations not listed had no female Tanner crab catch

Table 12. Tanner crab population estimates in numbers by sex, size and age class, 1991 Prince William Sound survey, excluding stations 201-208^a

	Population estimate (No.)	Coefficient of variation (%)
<u>MALES</u>		
<u>Sublegal</u>		
<73 mm	620,890	29
73-92 mm	537,060	42
93-112 mm		
new	215,572	43
old & vo	40,529	22
113-134 mm		
new	70,933	52
old & vo	145,542	25
135-157 mm		
new	20,280	60
old & vo	81,057	41
≥158 mm		
new	935	100
old & vo	2,773	73
Total Legal Males	105,045	36
Total Males	1,735,570	25
<u>FEMALES</u>		
Juveniles	1,128,480	35
Adults	516,811	18
Total females	1,645,292	27

^a Stations in the Western District outside Montague Island.

Table 13. Prince William Sound Area historical Tanner crab catch in pounds, by season.

Season	Inside	Outside	Total	Vssls.	Lndgs.	% Re-cruit	Avg. wt.	Number Crab
1968-69			1,235,613					
1969-70			1,284,597					
1970-71			4,159					
1971-72			7,788,498					
1972-73			13,927,868					
1973-74	1,658,000	8,500,000	10,158,000					
1974-75	1,187,000	2,667,000	3,854,000					
1975-76	3,322,482	3,810,262	7,132,744					
	Northern	Hinchinbrook	Western	Eastern				
1976-77 ^a	782,048	766,650	701,725	70,925	23	316	2.2	2,184,852
1977-78	994,721	1,161,831	2,079,549	570,573	38	591	2.1	3,357,408
1978-79	649,977	708,562	2,248,545	3,443,471	51	783	2.0	2,996,359
1979-80	140,228	332,583	1,462,059	4,057,847	49	561	2.1	1,321,824
1980-81	152,196	812,352	1,561,207	250,076	30	304	---	---
1981-82	351,139	722,834	1,503,253	288,425	29	216	2.1	699,924
1982-83	471,422	31,447	921,663	45,308	40	304	---	---
1984 ^b	Closed	Closed	Closed	No Effort	0	0	---	---
1985	Closed	Closed	No Effort	No Effort	0	0	---	---
1986	137,720	236,241	160,829	587	14	35	2.1	254,941
1987	152,834	222,052	196,246	0	23	65	2.1	271,968
1988	55,929	226,509	191,654	0	21	46	2.1	225,758
1989	Closed	Closed	Closed	Closed	0	0	---	---
1990	Closed	Closed	Closed	Closed	0	0	---	---
1991	Closed	Closed	Closed	Closed	0	0	---	---

^a New districts established and first season of the minimum legal size.

^b Calendar year season established.

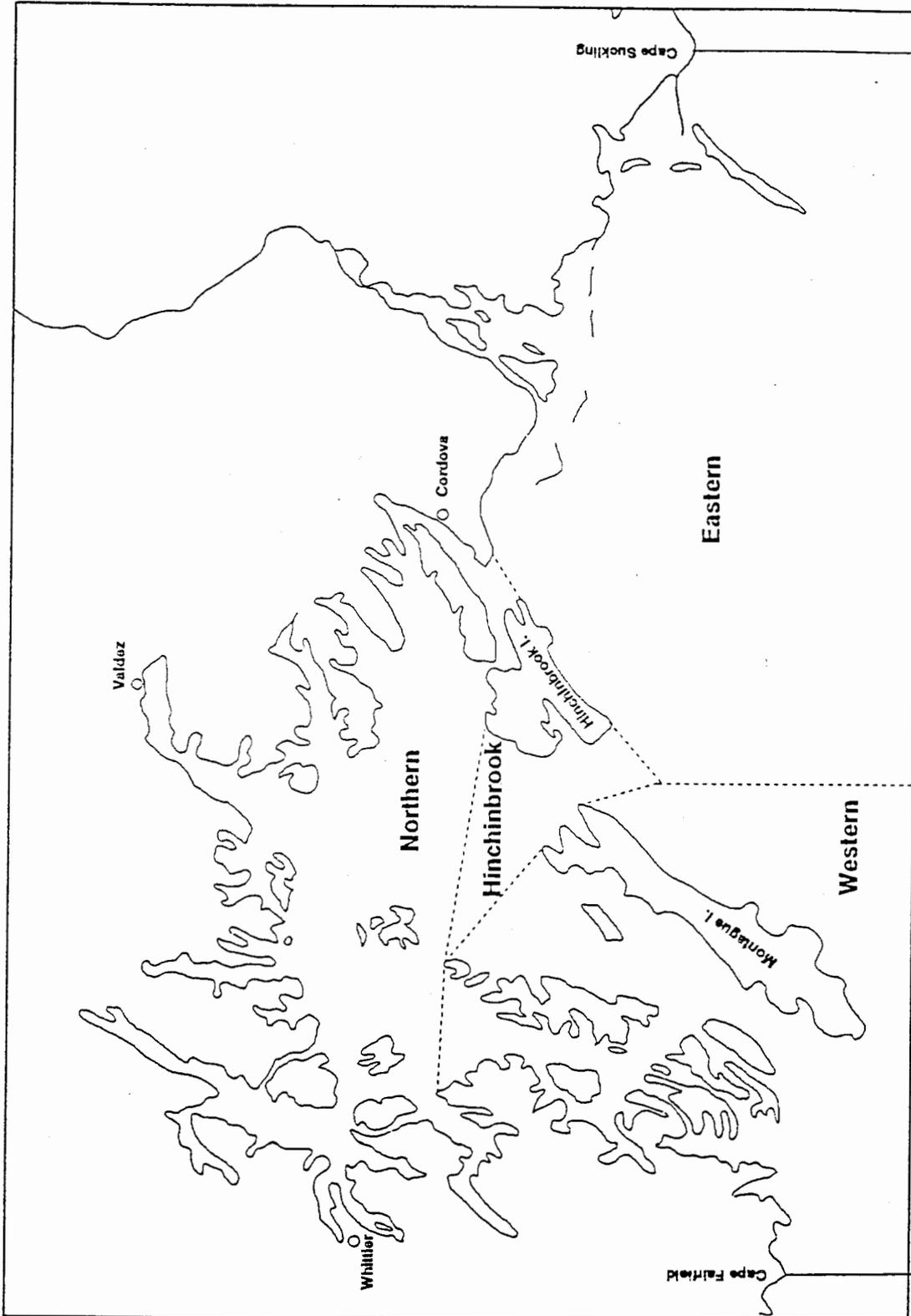


Figure 1. Prince William Sound Tanner Crab Fishing Districts

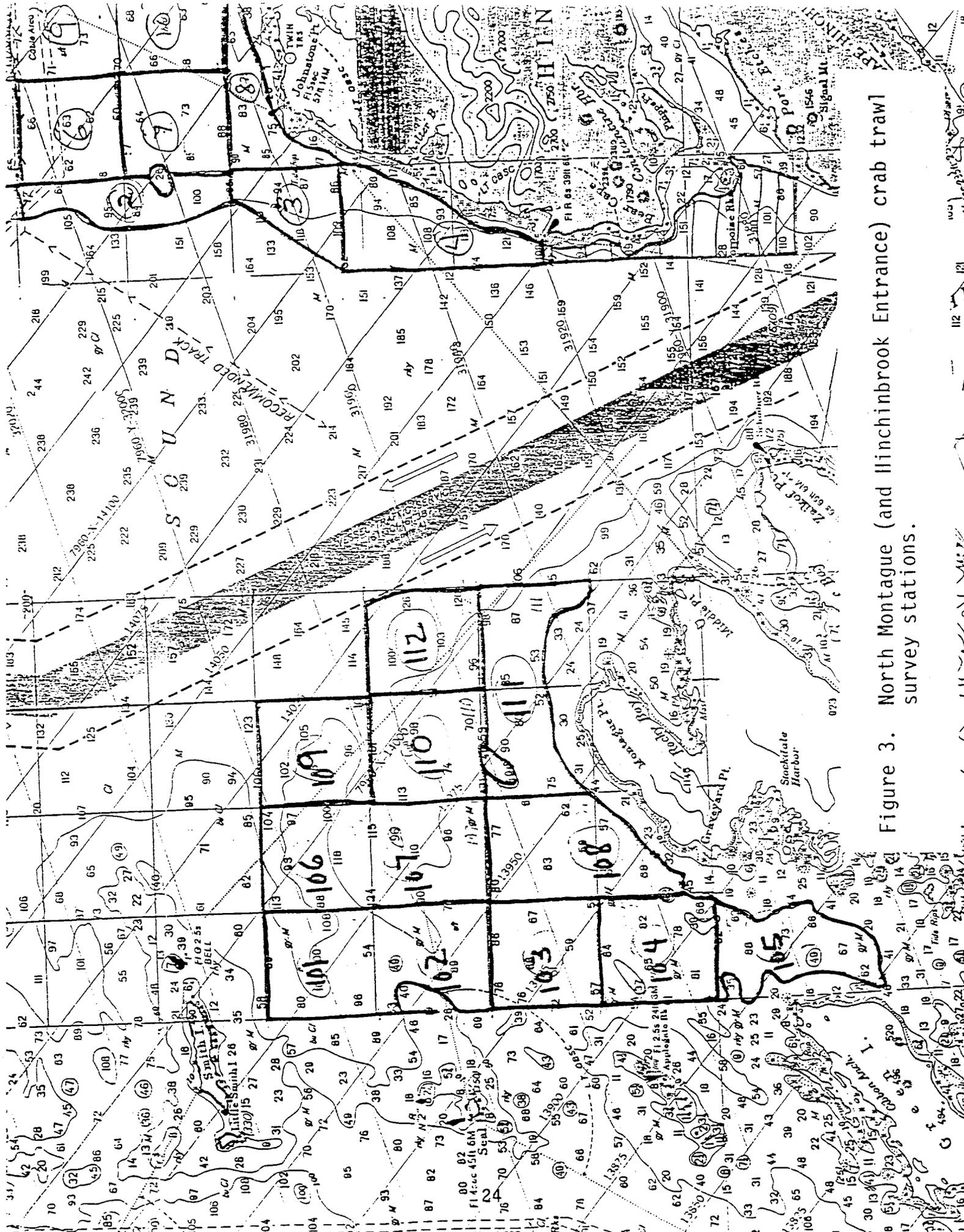
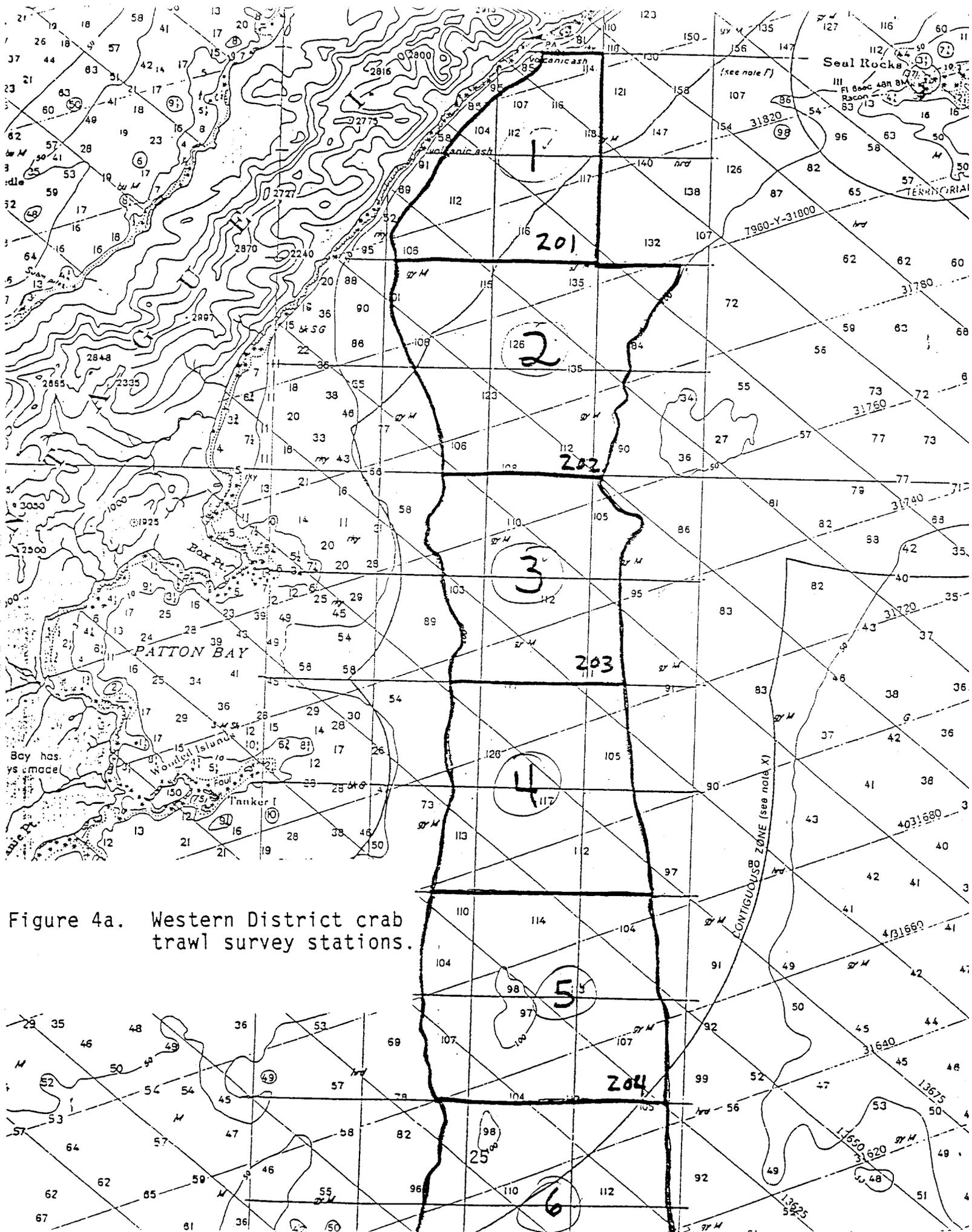


Figure 3. North Montague (and Hinlinbrook Entrance) crab trawl survey stations.



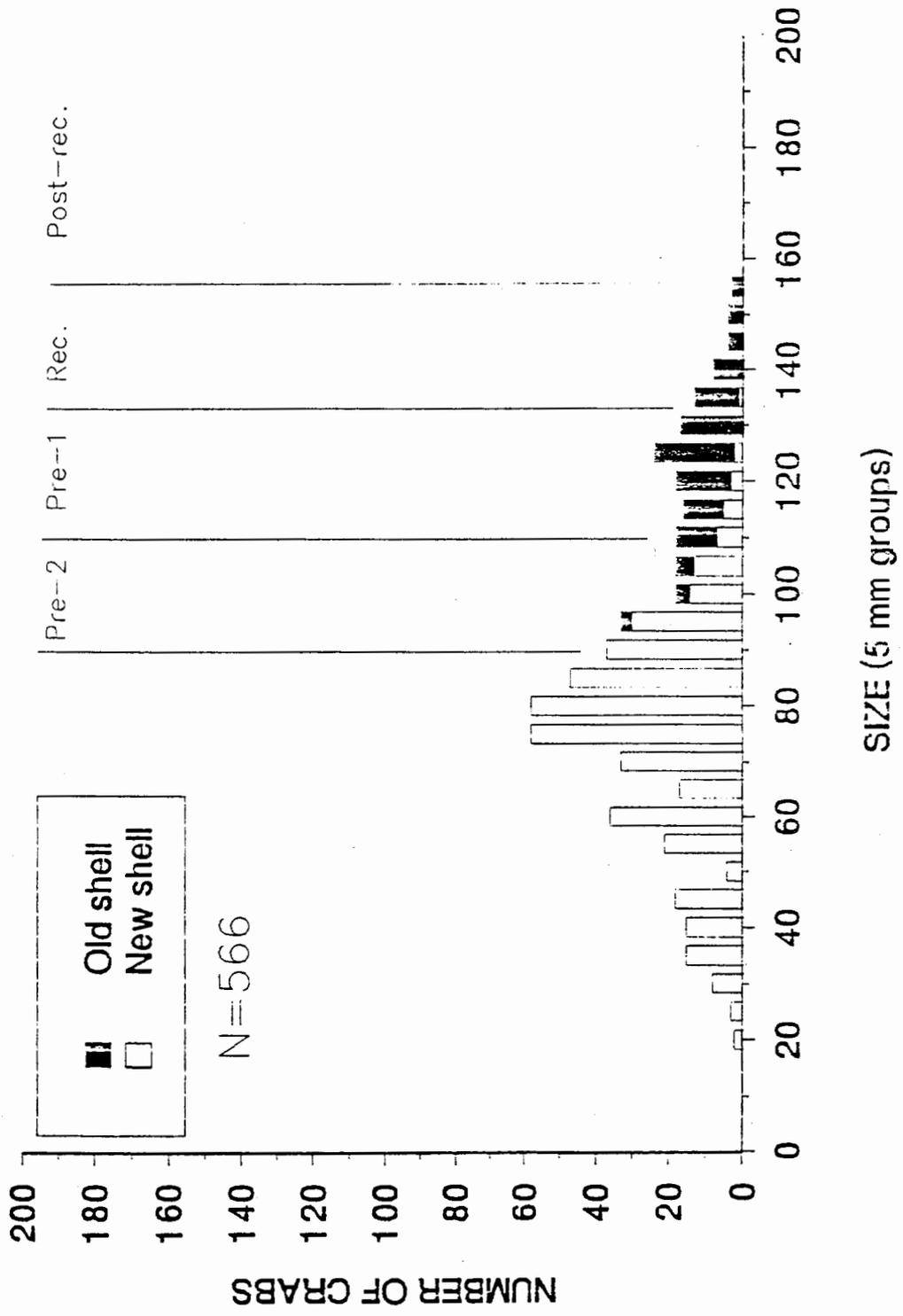


Figure 5. Male Tanner size freq., Northern Distr., 1991 PWS trawl survey.

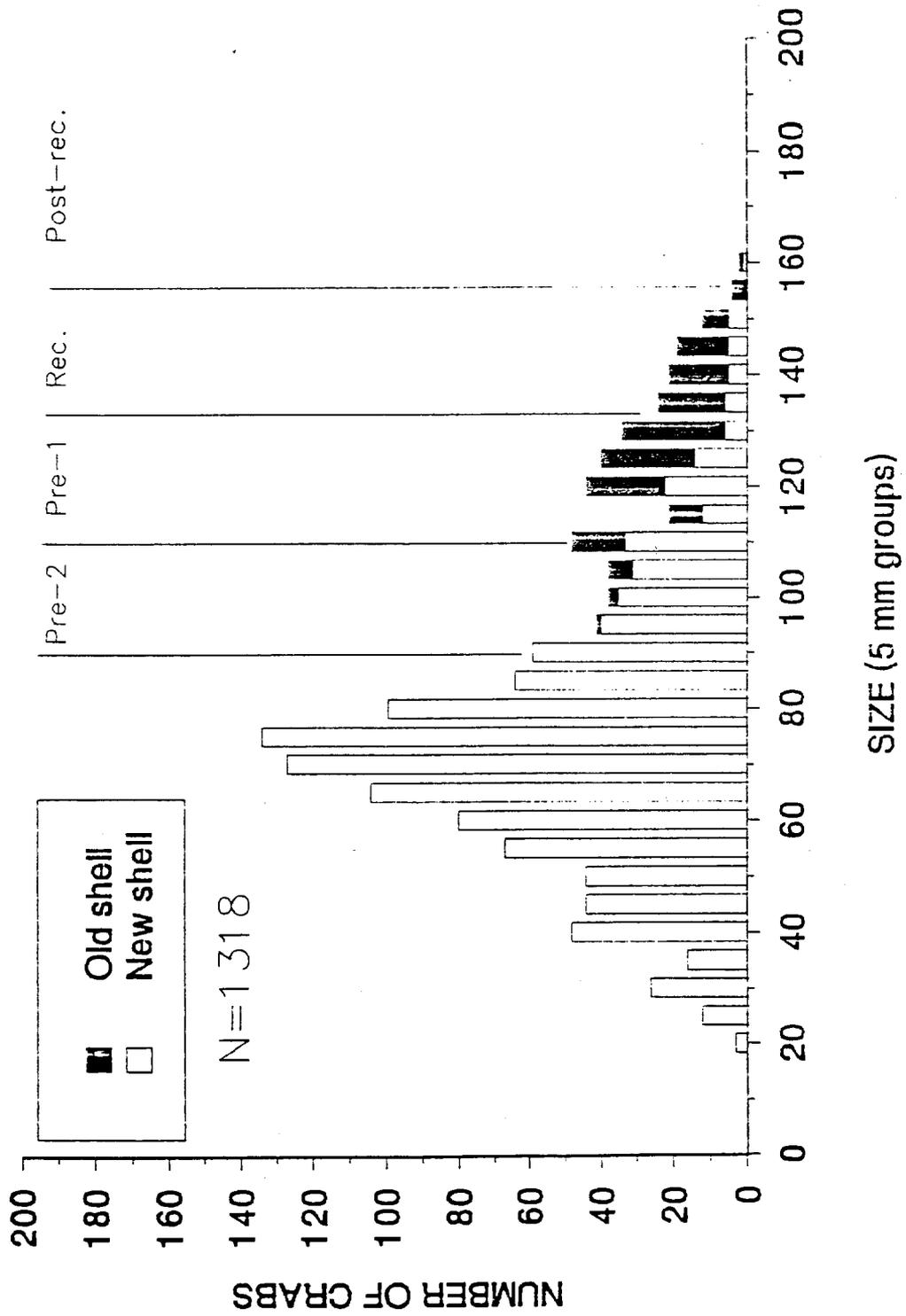


Figure 6. Male Tanner size freq., North Montague, 1981 PWS trawl survey.

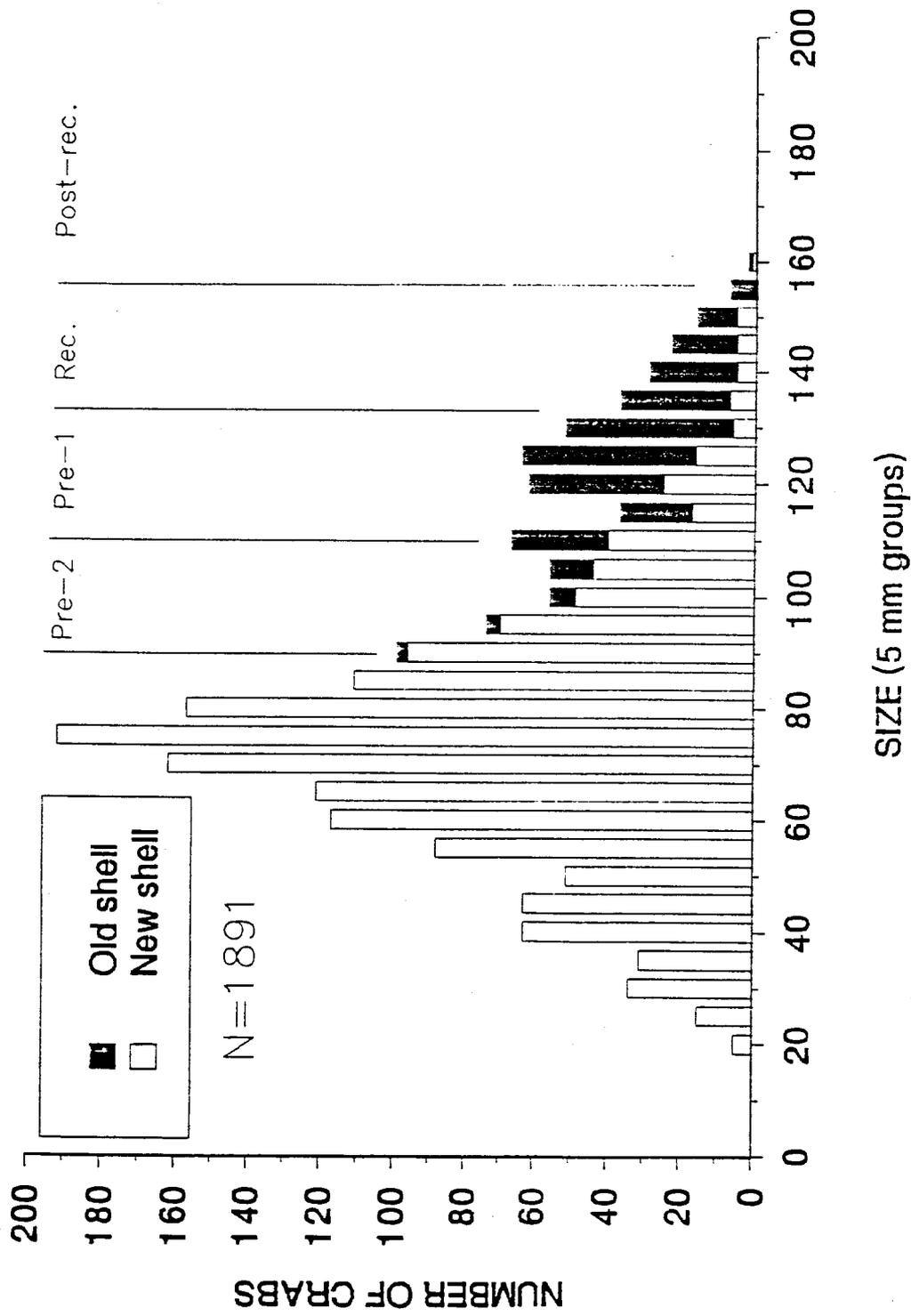


Figure 7. Male Tanner crab size freq., PWS Mgt. Area, 1991 trawl survey.

Appendix A. Fishing log and catch (lbs.) by station in the Northern District, Prince William Sound
trawl survey, 1991.

Station	Area (sqnm)	Date	Latitude (start)	Longitude (start)	Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
1	5.99	08/27/91	60 37.38	146 41.88	312	30	1.00	91	95	684
2	5.91	08/28/91	60 30.20	146 40.59	320	26	1.00	100	103	706
3	4.13	08/28/91	60 28.99	146 40.65	342	26	1.00	92	94	966
4	5.95	08/28/91	60 25.58	146 44.20	330	26	1.00	119	123	687
5	7.44	08/27/91	60 35.97	147 32.70	212	26	1.00	67	67	728
6	6.13	08/29/91	60 32.86	147 38.80	40	26	1.00	38	52	396
7	6.13	08/28/91	60 31.95	146 38.78	50	25	1.00	62	63	976
8	2.83	08/28/91	60 30.02	146 36.14	225	25	1.00	80	88	770
9	6.13	08/29/91	60 33.86	147 30.75	210	26	1.00	73	73	1352
10	6.28	08/29/91	60 31.61	146 33.15	42	25	1.00	64	64	846
11	6.4	08/27/91	60 36.80	146 28.68	80	26	1.00	54	60	722
12	8.97	08/29/91	60 33.05	147 26.66	210	27	1.00	64	65	580
14	6.99	08/21/91	60 41.39	146 15.84	210	26	1.00	72	75	2040
15	6.65	08/27/91	60 39.16	146 20.13	190	26	1.00	69	70	1892
16	5.3	08/27/91	60 35.75	146 24.37	60	26	1.00	62	66	1026
17	4.64	08/30/91	60 33.25	147 23.57	340	27	1.00	59	68	788
18	6.71	08/21/91	60 35.71	146 11.96	235	26	1.00	75	76	1984
19	5.01	08/30/91	60 33.97	147 15.36	230	26	1.00	68	72	1260
20	5.55	08/30/91	60 34.01	147 11.84	225	28	1.00	74	75	1456
21	4.79	08/21/91	60 35.50	146 07.25	257	26	1.00	70	77	1720
23	6.99	08/21/91	60 34.39	146 02.66	40	26	1.00	100	109	1010
24	4.86	08/20/91	60 36.19	145 53.57	270	29	1.00	99	100	2898
26	5.74	08/29/91	60 47.64	146 28.99	240	27	1.00	107	108	620

Number of stations: 23
 Total area (sqnm): 135.52
 Total catch (lbs): 26107

Appendix B. Fishing log and catch (lbs.) by station in the NMontague District, Prince William Sound
trawl survey, 1991.

Station	Area (sqnm)	Date	Latitude (start)	Longitude (start)	Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
111	7.7	08/24/91	60 24.92	147 03.32	215	27	1.00	88	91	860
112	5.99	08/24/91	60 26.42	147 01.76	125	28	1.00	117	126	572
109	6.13	08/24/91	60 27.94	147 06.89	310	27	1.00	103	105	582
110	6.13	08/24/91	60 26.44	147 06.98	325	29	1.00	98	109	616
105	5.55	08/25/91	60 17.43	147 17.24	345	29	1.00	64	72	5726
104	6.13	08/25/91	60 20.48	147 18.13	15	29	1.00	77	78	5842
103	6.13	08/25/91	60 23.73	147 16.00	355	29	1.00	66	78	1194
102	6.03	08/25/91	60 26.44	147 15.68	355	25	0.90	111	121	486
108	8.56	08/26/91	60 21.68	147 12.93	10	29	1.00	56	58	970
107	6.13	08/26/91	60 25.14	147 13.63	42	28	1.00	89	90	579
101	6.13	08/26/91	60 28.32	147 18.69	30	27	1.00	101	113	1148
106	6.13	08/26/91	60 28.81	147 13.03	30	18	0.61	85	93	134

Number of stations: 12
 Total area (sqnm): 76.74
 Total catch (lbs): 18709

Appendix C. Fishing log and catch (lbs.) by station in the Western District, Prince William Sound trawl survey, 1991.

Station	Area (sqnm)	Date	Latitude (start)	Longitude (start)	Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
201	18.57	08/22/91	60 07.51	147 08.50	8	26	1.00	117	118	938
202	25.79	08/22/91	60 03.35	147 06.02	340	29	1.00	145	152	1112
203	20.64	08/22/91	59 57.60	147 07.95	324	28	1.00	112	112	1322
204	27.85	08/22/91	59 49.89	147 05.49	220	30	1.00	115	115	1820
205	29.02	08/23/91	59 40.55	147 07.11	50	27	1.00	110	110	1510
206	20.44	08/23/91	59 35.68	147 02.59	20	28	1.00	114	114	940
207	24.96	08/23/91	59 32.81	147 08.82	190	32	1.00	115	118	496
208	27.91	08/23/91	59 27.49	147 00.10	195	26	1.00	116	118	1050

Number of stations: 8
 Total area (sqnm): 195.18
 Total catch (lbs): 9188