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Review of the snow crab (Chionoecetes opilio) resource in Western Cape Breton  
Island (Areas 18 and 19) for 1988.

by

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## ABSTRACT

Biological characteristics of the snow crab populations fished on the western coast of Cape Breton , Areas 18 and 19, were monitored by sea sampling aboard commercial vessels during the 1988 fishing seasons. Assessments of the two areas are presented based on data derived from fishermen's logbooks and processor's sales slips. Initial biomass ( $B_0$ ) and exploitation level (E.L.) were estimated using Leslie analysis of catch/effort trends.

### Area 19

Due to high catch rates at the beginning of the 1988 fishing season, the TAC set at 1,150 t was increased back to 1,338 t. A total landing of 1,337 t was recorded for the season. The mean CPUE which showed a continuous decline since 1982, increased from 30.3 kg/trap haul in 1987 to 58.7 kg/trap haul in 1988. The calculated effort decreased by 40% from 37,987 trap hauls in 1987 to 22,794 trap hauls in 1988. Seasonal mean size of males in the catch increased from 97.8 mm CW in 1987 to 101.8 mm CW in 1988. The mean percentage of morphometrically immature males in the catch (13%) is similar to the 1987 value.

The past history of the fishery suggests that the area may not be able to produce more than around 1,200 t annually. At the present rate of removal, a decrease in the CPUE's may occur as it did between 1984 and 1987. A TAC of around 1200 t seems to ensure stabilization of this fishery.

### Area 18

In 1988, four new licenses were issued giving a total of 27 fishermen and the TAC was set at 674 t which allowed boat quotas of 24,946 kg (55,000 lbs). The catch increased from 626 t in 1987 to 669 t in 1988. The mean CPUE decreased from 64.1 kg/trap haul in 1987 to 62.0 kg/trap haul in 1988. This fishery is highly dependant on the morphometrically immature crabs (60% of the catch). The area has therefore a potential for producing a higher biomass if these immature individuals could reach morphometric maturity. The present TAC (674 t) seems to ensure stabilization of this fishery.

## RESUME

Les caractéristiques biologiques de la pêcherie de crabe des neiges en 1988 sur la côte ouest du Cap-Breton, régions 18 et 19, ont été extraites à partir d'échantillonnage des prises en mer. Les évaluations de la pêcherie des deux régions sont présentées à partir des carnets de bord des pêcheurs et des bordereaux d'achat des usines de transformation. La biomasse initiale ( $B_0$ ) et taux d'exploitation (E.L.) ont été estimés en utilisant l'analyse de Leslie des fluctuations de prises/effort.

### Région 19

Suite aux taux de capture élevés au début de la saison de pêche de 1988, le TPA établi à 1150 t a été augmentée à 1338 t. Des débarquements de 1337 t ont été enregistrés pour la saison. La PUE moyenne qui diminuait continuellement depuis 1982, a augmenté de 30,3 kg/casier levé en 1987 à 58,7 kg/casier levé en 1988. L'effort calculé a diminué de 40% passant de 37 987 casiers levés en 1987 à 22 794 casiers levés en 1988. La taille moyenne saisonnière des mâles a passée de 97,8 mm de largeur du céphalothorax (LAC) à 101,8 mm LAC en 1988. Le pourcentage de mâles morphométriquement immatures (M-I) dans la capture (13%) était le même qu'en 1987.

L'historique de cette pêcherie suggère que la région ne peut probablement pas produire plus qu'environ 1200 t annuellement. Au rythme actuel de prélèvement, une diminution des PUE serait à prévoir telle qu'observé entre 1984 et 1987. Un TPA d'environ 1200 t semble alors assurer la stabilisation de cette pêcherie.

### Région 18

En 1988, quatre nouvelles licences ont été émises pour un total de 27 pêcheurs et une PTA a été établie à 674 t, ce qui permet un contingent par bateau de 24 946 kg (55 000 lbs). Les prises ont augmenté de 626 t en 1987 à 669 t en 1988. La PUE moyenne a diminué de 64,1 kg/casier levé en 1987 à 62,0 kg/casier levé en 1988.

Cette pêcherie a été hautement dépendante sur les crabes M-I (60% des prises) en 1988. Cette région a alors un potentiel pour produire une plus grande biomasse si les immatures parvient atteindre la taille à maturité. Le présent TPA (674 t) semble alors assurer la stabilisation de cette pêcherie.

## INTRODUCTION

As requested by CAFSAC, a review of the history of the Western Cape Breton Island snow crab fishery was conducted and the modifications are incorporated in this document.

The snow crab grounds off Cape Breton Island were first commercially exploited in the mid 1960's by a group of fishermen based in Chéticamp. The New Brunswick and Québec offshore boats started to fish sporadically the same area soon after. With the increasing value of snow crabs in the late 1970's and early 1980's, the fishery gradually expanded to cover all the snow crab grounds off the western coast of the Island. In 1978, an inshore fishing area (Area 19) was established on the western coast of the Island to be used exclusively by inshore vessels of under 13.7m (45ft) in length. At the time, 14 inshore boats were licensed for the area with a maximum of 40 traps per license. An additional 13 licenses were issued in 1979 and the maximum number of traps per license was reduced to 30. Another 34 licenses were issued in 1984 at which time the maximum number of traps per license was set to 20 and the quota per boat reduced from 37,195 kg (82,000 lbs) to 22,680 kg (50,000 lbs). This change resulted in an increase of the TAC from 1004 t in 1982 to 1385 t in 1984. Since 1979, the catches in this fishery have been regulated by a TAC derived from Leslie analysis (Ricker, 1975) of fisheries data and by boat quotas (Davidson and Comeau, 1987). In 1986, the number of licenses was reduced to 59. In 1987, the quota per boat was lowered to 19,505 kg (43,000 lbs). The subsequent decrease of 14% in the TAC had been proposed by CAFSAC in order to decrease the fishing pressure and stabilize the catch rates (Davidson and Comeau, 1987). In 1988, good catch rates resulted in the implementation of an increased quota per boat to 22,680 kg (50,000 lbs) which had been in place from 1984 to 1986 for a TAC of 1338 t. A summary of information on seasons, TAC's, catches, licenses and trap limits is presented in Table 1.

Area 18 had first been exploited in 1979 by 14 inshore vessels which were given exploratory permits allowing them to fish a maximum of 30 traps per permit. These permits were upgraded to licenses the following year and 9 additional licenses were issued to explore an area further from shore. In 1981, all 23 entrants were issued licenses and allowed to fish anywhere in Area 18. Larger mobile vessels from New Brunswick and Québec fished in Area 18 from 1980 to 1982. In 1983, the mobile fleet did not participate in this fishery as their season closed before the opening date for the inshore area. In 1984, the offshore vessels were excluded from the zone and northwestern and southwestern boundaries were established (Figure 1). A boat quota of 36,288 kg (80,000 lbs) was put in place for Area 18 in 1981 and retained through 1985. The corresponding TAC of 835 t was a preliminary figure which was used for management purposes as biological estimates were not available because of the unknown level of participation in the area by the mobile vessels. Declining catch rates, high exploitation levels and low production estimates resulted in a decrease in the boat quotas to 27,216 kg (60,000) in 1986 for an overall TAC of 626 t. In 1988, four new licenses were issued for a total of 27 fishermen and the TAC was set at 674 t, which allowed boat quotas of 24,948 kg (55,000 lbs). Throughout the history of the fishery, white (soft shell) crabs have been a problem in Area 18. In 1981, an early spring season in addition to the fall season was tried in an attempt to avoid poor quality crabs. This experiment was not a success as the animals caught in the spring and early summer were soft shelled and had a low meat yield. Since 1982, the season has been set for late summer and early fall with the opening date being determined by the results of meat yield tests which are done on animals caught during pre-season sampling. Further information on catches, TAC's, seasons and licenses are presented in Table 3.

This document presents a review of biological characteristics and catch trends for Areas 18 and 19 snow crab fisheries for 1988 and gives advice for the 1989 fishing season for both areas.

## MATERIAL AND METHODS

### Port sampling and sea sampling

In Areas 18 and 19, sea sample data were collected during the 1988 fishing season. In Area 19, sea samples were obtained in weeks 2 to 4. In Area 18, sea samples were carried out in weeks 2,3,4 and 6. Weekly percentages of soft (white) shelled, morphometrically immature (Conan and Comeau, 1986) and undersize males were calculated from the sea sample data (Tables 5 and 6, Figures 2 and 3). Weekly and overall size distributions were generated (Figures 4 and 5). The percentages of morphometrically mature and immature male crabs in the sea samples were plotted according to their carapace size (Figures 4 and 5).

### Logbook/sales slip data

The logbook and sales slip data were acquired and compiled on computer by the Statistics and EDP Systems Division of the Department of Fisheries and Oceans. The weekly and cumulative catch statistics for use in the Leslie analysis (Ricker, 1980) and the CPUE (catch in kg for a trip/number of traps hauled during the same trip) were calculated directly from the logbook data. The calculated CPUE's were summarized into weekly intervals for both areas (Tables 7 and 8).

The sales slip data, usually more representative of the real catch (Davidson and Comeau, 1987), were not used in either area because they were not all compiled at the time of these analyses. The total catch calculated from the logbooks (1327 t in Area 19 and 666.8 t in Area 18) was higher than the catch reported in the sales slips (1137 t in Area 19 and 257 t in Area 18).

The overall distribution of fishing effort calculated from the logbooks was plotted by sub areas of 3 min. of latitude x 3 min. of longitude for Area 19 (Figure 9) and by sub areas of 2 min. of latitude x 2 min. of longitude for Area 18, (Figure 10). The fishing positions were then plotted for weeks 1-2, 3-4 and 5-7 for Area 19 (Figure 9) and for weeks 1-4 and 5-8 for area 18 (Figure 10).

## RESULTS

### Area 19

The size distribution in the sea samples show a decrease in the mean size of male crabs from 103.8 mm carapace width (CW) in week 2 to 100.9 mm CW in weeks 3 and 4 which corresponds to an increase in the percentage of undersized crabs from 21.7% in week 2 to 32.0% in week 3 and 30.3% in week 4 (Figure 4, Table 5). The seasonal mean size was 101.8 mm CW (Figure 4) and the mean percentage of undersized male crabs was 28.5%. The seasonal percentage of berried females in the sea samples was 99.5% (N=553). In the sea samples, the percentage of white/soft crabs increased from 6.6% in week 2 to 16.9% in week 3 and to 21.7% in week 4 (Figure 2, Table 5). The percentage of morphometrically immature males (MI-males) in the sea samples increased from 9.3% in week 2 to 12.0% in week 3 and to 16.8% in week 4 (Figure 2, Table 5). The mean percentage of MI-males for the season was 13.0% in the sea samples. The fishing effort spatial distribution pattern remained similar throughout the entire season (Figure 9) with effort concentrated on the southern end of the zone.

The weekly CPUE decreased from 101.4 kg/trap haul in week 1 to 13.3 kg/trap haul in week 7 for a seasonal mean of 58.7 kg/trap haul. Most of the effort was laid on the first five weeks of the season (Table 7). The total effort calculated for the season was 22794 trap hauls.

The estimation of initial biomass ( $B_0$ ) and exploitation level (E.L.) according to the logbook data using the Leslie analysis (Figure 7) are as follows:

$$\text{CPUE} = 108.9 - 0.07 Kt$$

$$r = -0.98$$

$$B_0 = 1662 \text{ (1491 t - 1927 t, } p < 0.05)$$

$$\text{E.L.} = \frac{I_c}{B_0} = 80.4\%$$

### Area 18

The mean carapace size of male crabs in the sea samples increased from week 2 to week 4 and decreased slightly in week 6 with a seasonal mean of 103.4 mm CW (Figure 5) for the four weeks sampled. The percentage of undersize crabs decreased from 26.6% in week 2 to 1.8% in week 6 for a seasonal mean of 20.4%. The seasonal percentage of berried females in the sea samples was 100% (N=69). The percentage of white/soft crabs increased from 7.3% in week 2 to 12.5% in week 4 and then decreased to 5.4% in week 6 (Figure 3) for a seasonal mean of 9.3%. The proportion of MI-males in the sea samples decreased from 74.2% in week 2 to 33.8% in week 4 and then increased to 46.5% in week 6 (Figure 3, Table 6). An overall seasonal percentage of 60.1% was calculated from the four samples. The fishing effort seems to have been evenly distributed throughout the area during the first four weeks of the season (Figure 10) and concentrated on the northern end of the zone for the remaining of the season. The weekly CPUE fluctuated from week 1 to 4 with the highest value (65.7 kg/trap haul) in week 4 (Table 8). It then decreased every week from weeks 4 to 7, with its lowest value (43.8 kg/trap haul) during week 7, and increased to 69.2 kg/trap haul in week 8. The seasonal CPUE was 62.0 kg/trap haul. The total effort calculated for the season was 10790 trap hauls.

The estimation of initial biomass ( $B_0$ ) and exploitation level (E.L.) according to the logbook data using the Leslie analysis (Figure 8) are as follows:

$$\text{CPUE} = 65.8 - .01 Kt$$

$$r = -0.34$$

$$B_0 = 5428 \text{ t (1779 t - 2358 t, } p < 0.05)$$

$$\text{E.L.} = \frac{I_c}{B_0} = 12.3\%$$

## DISCUSSION

### Area 19

Due to high catch rates at the beginning of the season, the TAC set at 1150 t was increased to 1338 t during the season. The total catch was 1238 t according to the sales slip data, 1327 t according to the logbook data and 1337 t according to the quota report. That quota report is generated almost entirely from the sales slips and represents the total landings (100% of the TAC).

The Leslie analysis gives an estimated  $B_0$  of 1662 t, 21.8% lower than the 1987 value (Table 2, Figure 7). The calculated exploitation level increased from 52.5% in 1987 to 80.4% in 1988 which is the highest level ever recorded in that fishery.

The mean CPUE which has been declining continuously since 1982, increased from 30.3 kg/trap haul in 1987 to 58.7 kg/trap haul in 1988 (Table 2, Figure 6). That mean CPUE for 1988 remains lower than the values present before the expansion of the fishery in 1984 (Tables 1 and 2). A possible explanation for high catch rates in Area 19 in 1988 (Figure 6) would be the migration of a large number of immature crabs molting to maturity from shallow water (Area 18) to deeper water (Area 19). This would explain the differences in the percentage of morphometrically immature crab found in the sea samples between the two areas. The total number of trap hauls (22,794) in 1988 is 38% lower than 1987 (37,987) and is the lowest effort since the expansion of the fishery in 1984 (Table 2). The mean percentage of MI-males for the season (13.0%) is similar to the 1987 value (14.6%). The mean size of males from the sea samples (101.8 mm CW) is larger than the 1987 value (97.8 mm).

In summary, the high exploitation level of 80.4% which was generated by the Leslie analysis suggests that the fishing pressure is too high and that exploitation exceeds production. However, the CPUE (58.7 kg/trap haul) which was higher than it has been since 1983, the mean size of male crabs which increased in 1988 and the fact that approximately 80% of the TAC was landed in the first three weeks of the season are factors indicative of a healthy resource. The drop in CPUE during the fishing season is probably caused by a decrease in the fishing pressure by the fishermen (less shifting of gear, lower level of baiting and longer periods between hauls) after the second week of the season rather than a decrease in the available biomass. The drop in fishing pressure would have been caused by the fact that the fishermen kept their traps in the water until they received the increase in their boat quota and because they wanted to profit from a longer fishing season.

The past history of the fishery shows that this Area may not be able to produce more than around 1,200 t. At the present rate of removal, a decrease in the CPUE's may occur in future years as it did between 1984 and 1987. Therefore, a TAC of around the 1,200 t level seems to ensure stabilization of this fishery.

### Area 18.

In 1988, the fishery expanded to include 4 new licenses for a total of 27 fishermen and an increased TAC from 626 t to 674 t. The total catch was 667 t according to the logbook data and 669 t according to the quota report. The quota report is more representative of the real catch and represents 99% of the TAC.

The estimation of initial biomass and exploitation level using Leslie analysis are not realistic (Figure 8). The stable catch rates throughout the season are attributed to rough weather (less shifting of gear and longer soak-over time) at the start of the fishery and probably the influx of recruitment to the fishery which was reported to be good in 1986

(Davidson and Comeau, 1987). It is also possible that the catch rates have been influenced by changes in the catchability (presence of high proportion of immature male crabs in the catch) due to the later start of the season since most of the fishermen started fishing on September 5th.

The mean CPUE decreased from 64.1 kg/trap haul in 1987 to 62.0 kg/trap haul in 1988 which is similar to the 1982 level. The total number of trap hauls (10790) increased by 9.5% over the 1987 value (9766, Table 4).

The seasonal proportion of MI-males in the catch from the sea samples (60.1%) is higher than the 1987 value (34.3%) and indicates that the fishery is highly dependant on recruitment and as a consequence, a high proportion of the male population is not able to contribute to the reproductive potential of the stock. A high proportion of immature crabs in the catch is also an indication that the area has a potential for producing a higher biomass if the immature crabs could undergo the molt to maturity (Conan and Comeau, 1986).

Since the effort increase in 1982, the CPUE's have shown a downward trend until 1985 at which time the TAC was decreased to 626 t for the 1986 season. In 1986 and 1987, catch rates improved but decreased slightly in 1988. Although, under the present management regime, the fishery is recovering from the 1982-1985 downward trend, the effects of the high proportion of morphometrically immature crabs (60%) in the commercial catch on the reproductive potential of the stock is unknown.

In summary, the present TAC (674 t) seems to ensure stabilization of this fishery as evidence to date suggests that the population is able to support that level of removal.

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**Table 1:** Number of participants, trap quotas, seasons, TAC regulations and total catch for the Area 19, Cape Breton Island snow crab, *Chionoecetes opilio*, fishery: 1978-1988.

Year	# of Licensed boats	# of traps per boat *	Season	TAC (kg/license) (t)	catch (t)
1978	14	40	May 13 - Sept. 30	-	1941
1979	27	30	June 16 - Sept. 16	1406 (52164)	1390
1980	27	30	June 15 - Sept. 15	1225 (45360)	1158
1981	27	30	July 15 - Sept. 15	1004 (37195)	913
1982	27	30	July 15 - Sept. 15	1004 (37195)	953
1983	27	30	July 15 - Sept. 15	1004 (37195)	906
1984	61	20	July 15 - Sept. 15	1385 (22680)	1315
1985	61	20	July 15 - Sept. 15	1385 (22680)	1234
1986	59	20	July 15 - Sept. 15	1338 (22680)	1235
1987	59	20	July 15 - Sept. 15	1150 (19505)	1151
1988	59	20	July 15 - Sept. 15	1338 (22680) **	1337 ***

\* Standard box trap 1.5m x 1.5m x 1.5m or 1.8m x 1.8m x 1.8m x 0.6m

\*\* Originally set at 1150 t, the TAC has increased to 1338 t during the season.

\*\*\* Preliminary data

**Table 2 :** Trends in exploitation level, initial ( $B_0$ ) and final ( $B_f$ ) biomass estimates, and initial (CPUE<sub>0</sub>), final (CPUE<sub>f</sub>) and mean (CPUE) catch per unit effort for the Area 19 snow crab, Chionoecetes opilio, fishery: 1978-1988.

Year	Exploitation level (%)	$B_0$ (t)	$B_f$ (t)	Estimated production*	Trap hauls***	CPUE <sub>0</sub> (kg/trap haul)	CPUE <sub>f</sub> (kg/trap haul)	CPUE (max.-min.) (kg/trap haul)
(1) 1978	64	3016	1075	-	26301	86.4	55.0	73.8 (86.4-51.8)
(1) 1979	62	2239	848	1164	20436	69.3	45.2	68.0 (75.1-45.2)
(1) 1980	60	1838	733	990	12953	112.0	52.6	89.4 (112.0-52.6)
(1) 1981	47	1690	894	957	15396	-	-	59.3 <sup>10</sup>
(1) 1982	44.7	2282	1329	1388	9927	114.0	45.0	96.0 (114.0-45.0)
(1) 1983	54.7	1654	748	325	11076	98.5	36.3	81.8 (98.5-32.8)
(1) 1984	67.2	2240	925	1492	26040	93.2	51.5	50.5 (93.2-33.9)
(1) 1985	34.8	3291	2057	2366	35460	47.1	26.3	34.8 (47.1-26.3)
(1) 1986	52.7	2343	1108	286	38594	49.8	22.1	32.0 (49.8-22.1)
(2) 1987	52.5	2126	1010	1018	37987	51.6	29.8	30.3 (134.8-1.7)
** 1988	80.4	1662	325	652	22794	101.4	13.3	58.7 (202.5-4.0)

(1) Davidson and Comeau, 1987

(2) Chiasson et al, 1988

\*  $B_0^t - B_f^{t-1}$  where  $t$ =year

\*\* Preliminary data

\*\*\* Total catch/mean CPUE

**Table 3:** Number of participants, trap quotas, seasons, TAC regulations and total catch for the Area 18, Cape Breton Island snow crab, Chionoecetes opilio, fishery: 1979-1988.

Year	# of Licensed boats	# of traps per boat *	Season	TAC (kg/license) (t)	catch (t)
(1) 1979	14	30	July 1 - Sept. 30	-	213
(1) 1980	23	30 **	July 15 - Sept. 15	-	519
(1) 1981	23	30	April 15 - June 15	835 (36288)	494
			Sept. 1 - Nov. 30		
(1) 1982	23	30	Aug. 20 - Nov. 30	835 (36288)	824
(1) 1983	23	30	Aug. 15 - Nov. 3	835 (36288)	822
(1) 1984	23	30	Aug. 25 - Nov. 10	835 (36288)	722
(1) 1985	23	30	Aug. 3 - Oct. 31	835 (36288)	537
(1) 1986	23	30	Aug. 4-8 ; 28 - Oct. 28	626 (27216)	618
(2) 1987	23	30	Aug. 16 - Oct. 10	626 (27216)	626
1988	27	30	Aug. 26 - Oct. 26	674 (24948)	669 ***

(1) Davidson and Comeau, 1987

(2) Chiasson et al. , 1988

\* Standard box traps - 1.5m x 1.5m x 1.5m x 0.6m or 1.8m x 1.8m x 1.8m x 0.6m

\*\* 9 or 10 new exploratory permit holders were allowed 20 traps.

\*\*\* Preliminary data

**Table 4:** Trends in exploitation level, initial (Bo) and final (Bf) biomass estimates, and initial (CPUEo), final (CPUEf) and mean (CPUE) catch per unit effort for the Area 18 snow crab, Chionoecetes opilio, fishery: 1979-1988.

Year	Exploitation level (%)	Bo (t)	Bf (t)	Estimated production *	Trap hauls **	CPUEo (kg/trap haul)	CPUEf (kg/trap haul)	CPUE (max.-min.) (kg/trap haul)
(1) 1979	49.7	428	215.7	-	4449	37.3	30.7	47.9 (61.0-37.3)
(1) 1980	-	-	-	-	10745	61.2	47.7	48.3 (61.2-39.4)
(1) 1981	-	-	-	-	10207	-	-	48.4
(1) 1982	-	-	-	-	13290	98.0	23.0	62.0 (122.0-23.0)
(1) 1983	45.8	1577	854	-	18940	41.4	34.0	43.4 (49.9-33.8)
(1) 1984	40.1	1147	687	293	20168	41.9	27.2	35.8 (41.9-27.2)
(1) 1985	71.3	753	216	66	17102	49.1	24.1	31.4 (49.1-17.2)
(1) 1986	59.7	1153	465	937	14372	61.8	55.3	43.0 (61.8-26.6)
(2) 1987	47.4	1315	691	850	9766	64.5	26.4	64.1 (140.2-11.0)
1988	-	-	-	-	10790	64.2	69.2	62.0 (190.0-2.7)

(1) Davidson and Comeau, 1987

(2) Chiasson et al, 1988

\*  $B_0^t - B_{t-1}$  where t=year

\*\* Preliminary data

\*\*\* Total catch/mean CPUE

**Table 5:** Biological characteristics of snow crab *Chionoecetes opilio*, present in the sea samples taken during the Cape Breton Island, Area 19 snow crab fishing season 1988.

Week	Total # of observations	Mean Size (mm)	% of immature crabs (N)	% White crabs	% Undersized crabs
1- July 10-16	-	-	-	-	-
2- July 17-23	561	103.8	9.3 (560)	6.6	21.7
3- July 24-30	890	100.9	12.0 (888)	16.9	32.0
4-July 31-Aug. 6	323	100.9	16.8 (322)	21.7	30.3
Total	1774	101.8	13.0 (1770)	14.5	28.5

**Table 6:** Biological characteristics of snow crab *Chionoecetes opilio*, present in the sea samples taken during the Cape Breton Island, Area 18 snow crab fishing season 1988.

Week	Total # of observations	Mean Size (mm)	% of immature crabs (N)	% White crabs	% Undersized crabs
1- Sept. 4-10	-	-	-	-	-
2- Sept. 11-17	1256	100.5	74.2 (1251)	7.3	26.6
3- Sept. 18-24	1190	102.2	59.9 (1177)	11.7	24.6
4-Sept. 25 - Oct.1	440	109.7	33.8 (438)	12.5	10.0
5- Oct. 2 - 8	-	-	-	-	-
6- Oct. 9 -15	443	108.6	46.5 (439)	5.4	1.8
Total	3329	103.4	60.1 (3305)	9.3	20.4

**Table 7:** The 1988 Cape Breton Island, Area 19 snow crab, *Chionoecetes opilio*, fishery CPUE and cumulative catch (K) statistics used in Leslie analysis.

Week	CPUE (kg/trap haul)	# Trap hauls*	Weekly logbook catch, Ct <sub>1</sub> (kg)	Ct <sub>1</sub> /2 (kg)	K <sub>t</sub> (t)	% of total (Ct <sub>1</sub> /C <sub>total</sub> )
1- July 10-16	101.4	2141	239230	119615	119.6	19.74
2- July 17-23	71.8	7361	564029	282014	521.2	41.47
3- July 24-30	49.3	5259	268909	134454	937.7	20.15
4- July 31-Aug. 6	40.8	3135	132673	66336	1138.5	9.34
5- Aug. 7-13	34.7	3179	116582	58291	1210.7	8.70
6- Aug. 14-20	26.9	195	5243	2621	1271.6	0.57
7- Aug. 21-27	13.3	30	399	199	1274.4	0.03
Total	mean=58.7	21300	1327065			

\* Reported in the logs

**Table 8:** The 1988 Cape Breton Island, Area 18 snow crab, Chionoecetes opilio, fishery CPUE and cumulative catch (K) statistics used in Leslie analysis.

Week	CPUE (kg/trap haul)	# Trap hauls*	Weekly logbook catch, C <sub>t1</sub> (kg)	C <sub>t1</sub> /2 (kg)	K <sub>t</sub> (t)	% of total (C <sub>t1</sub> /C <sub>total</sub> )
1- Sept. 4-10	64.2	2154	142086	71043	71.0	21.3
2- Sept. 11-17	61.6	2413	160848	80424	222.5	24.1
3- Sept. 18-24	62.6	2282	154579	77289	380.2	23.2
4- Sept. 25-Oct. 1	65.7	1804	122598	61299	518.8	18.4
5- Oct. 2-8	59.0	644	40816	20408	600.5	6.1
6- Oct. 9-15	54.7	330	22098	11049	632.0	3.3
7- Oct. 16-27	43.8	426	22083	11041	654.1	3.3
8- Oct. 23-29	69.2	17	1177	588	665.7	0.2
Total	mean=62.0	10070	666285			

\* Reported in the logs



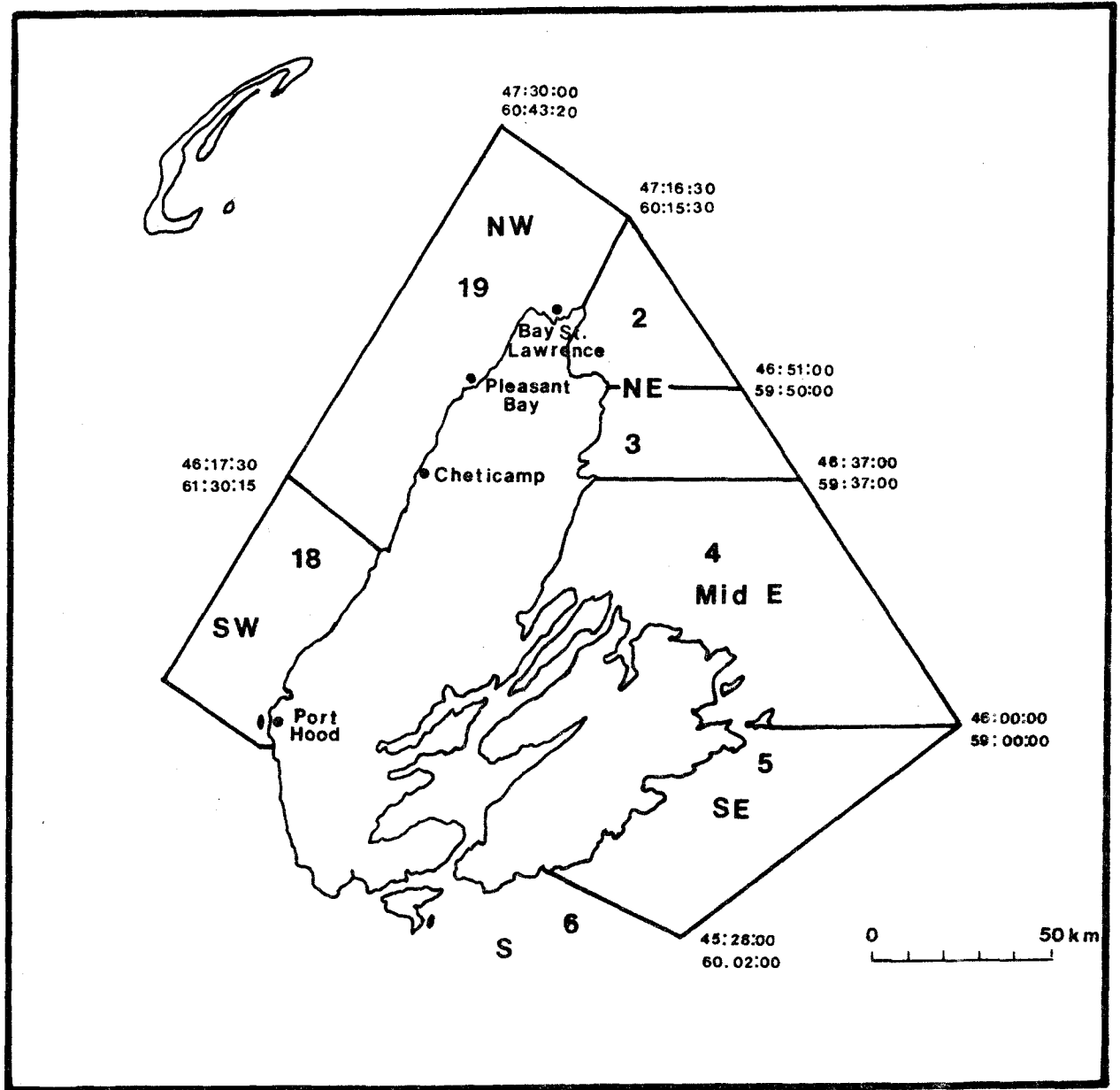


Figure 1. Cape Breton Island snow crab management areas.

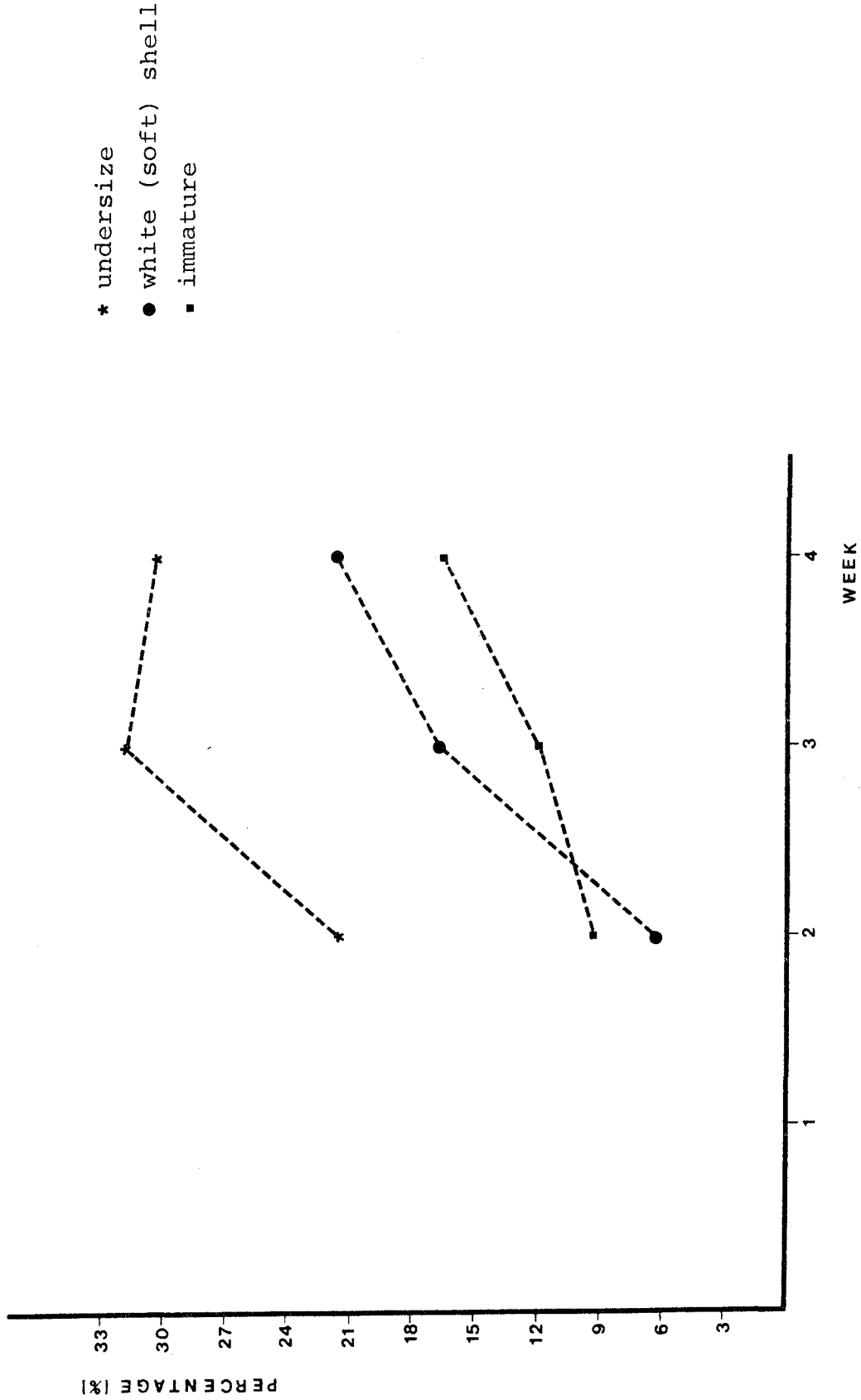


Figure 2. Weekly fluctuations in the percentage of immature male, undersize male and white/soft shelled male snow crab, Chionoecetes opilio, present in the sea samples taken during the 1988, Area 19 Cape Breton Island snow crab fishery.

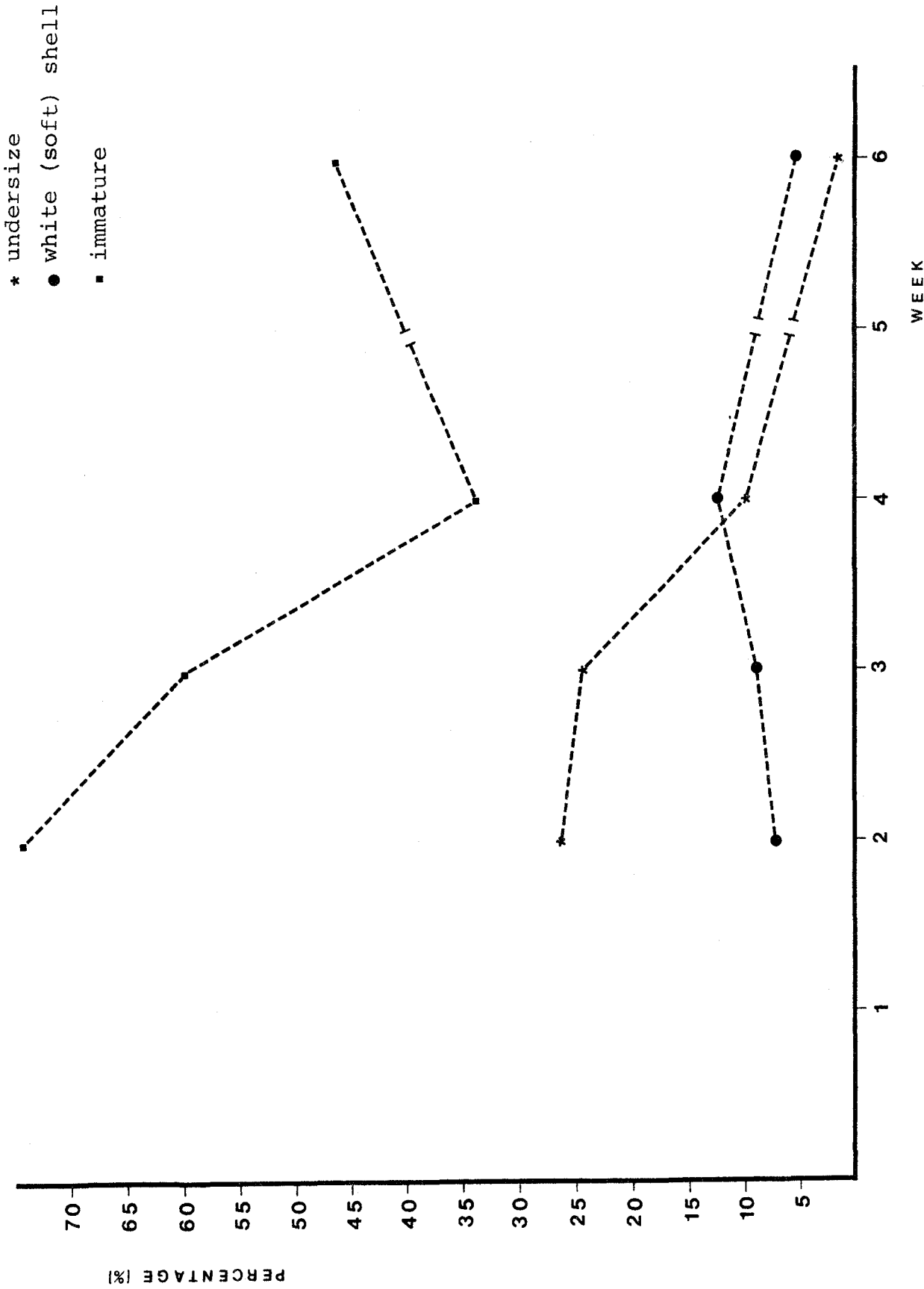


Figure 3. Weekly fluctuations in the percentage of immature male, undersize male and white/soft shelled male snow crab, *Chionoecetes opilio*, present in the sea samples taken during the 1988, Area 18 Cape Breton Island snow crab fishery.

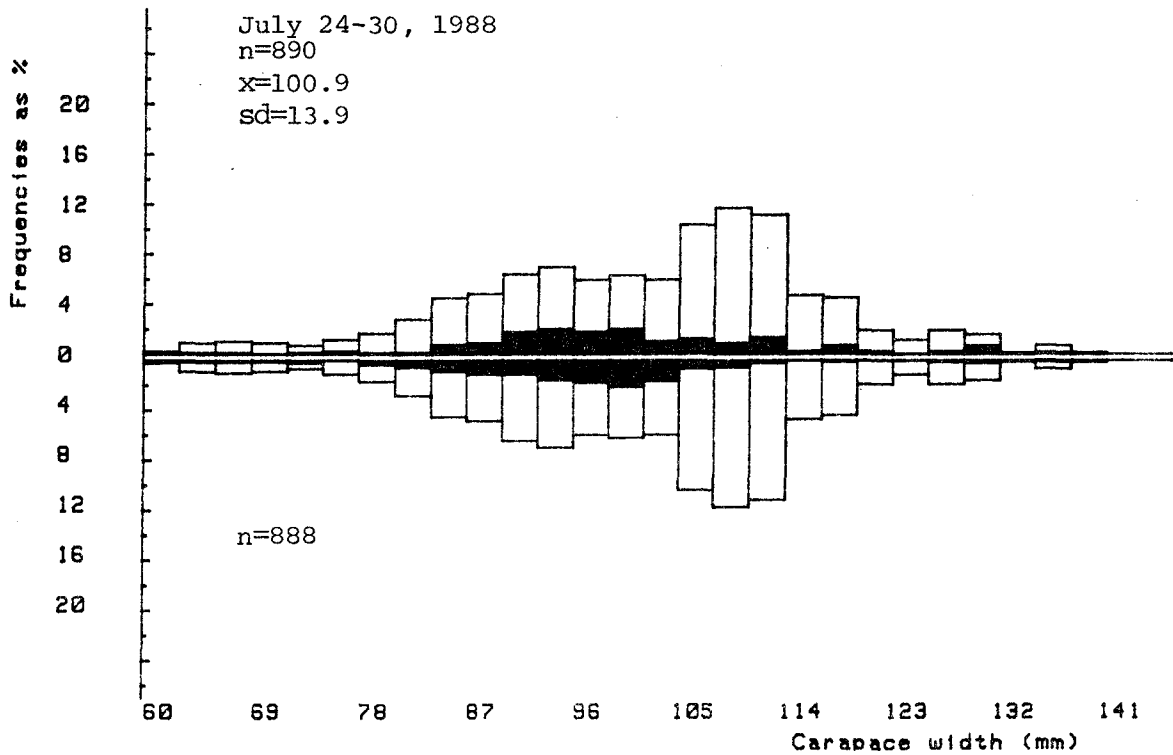
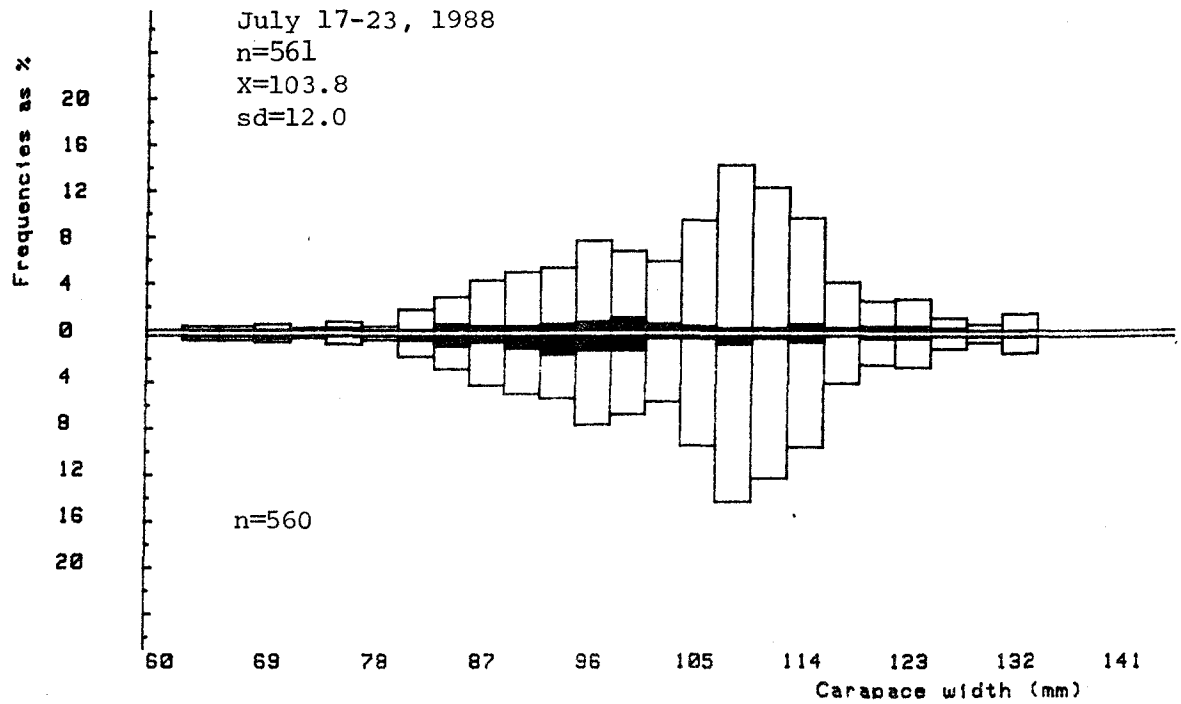


Figure 4. Weekly size distributions of male snow crabs, *C. opilio*, present in sea samples taken during the 1988, Area 19 Cape Breton Island snow crab fishery.

Positive field: Total number of observations (%), white/soft shelled crabs in black.

Negative field: Percentage of mature crabs in white, percentage of immature crabs in black.

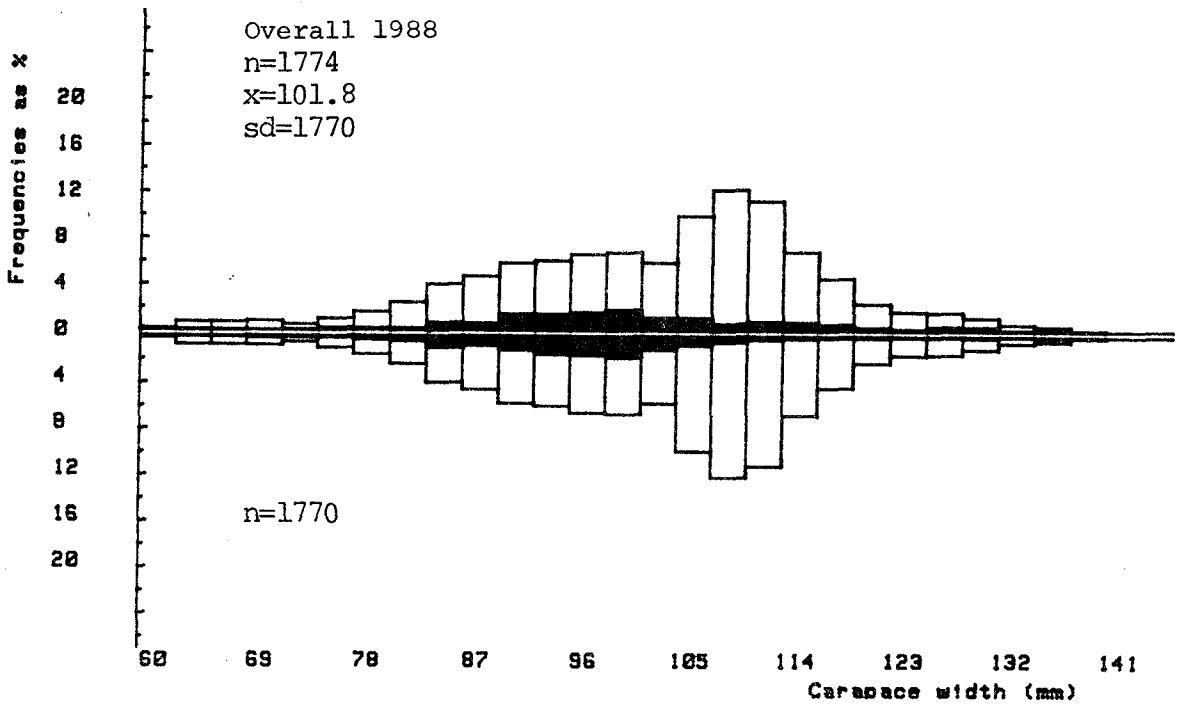
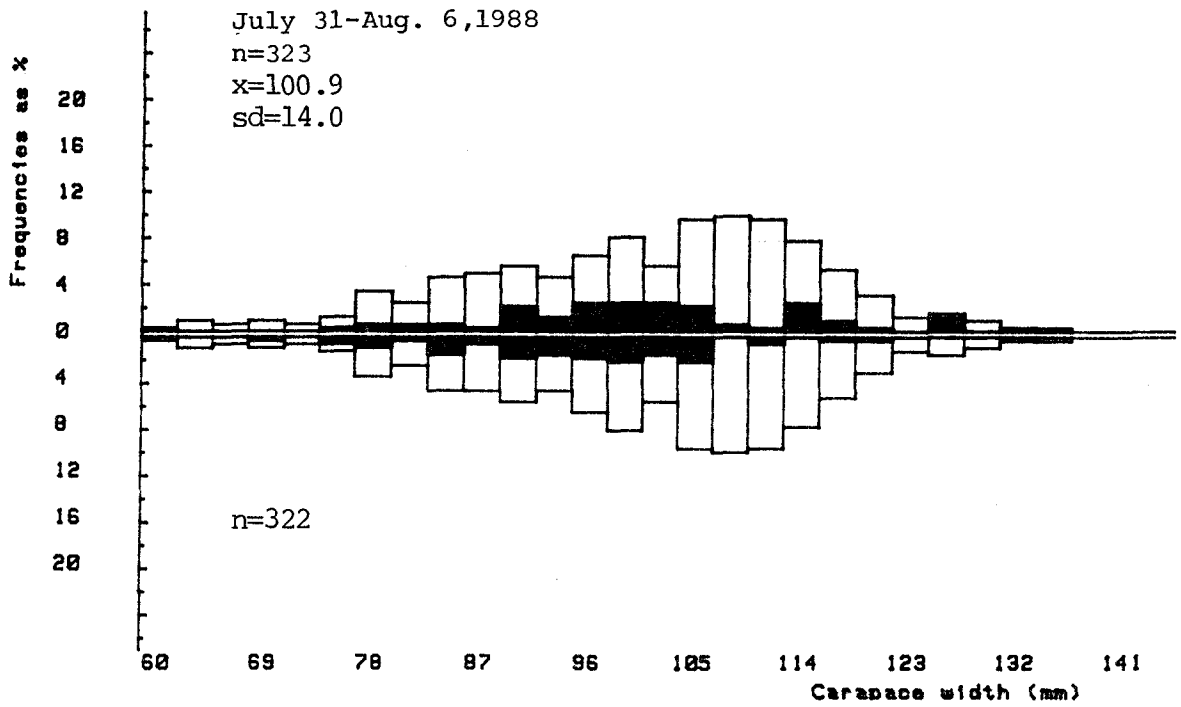


Figure 4. Cont.

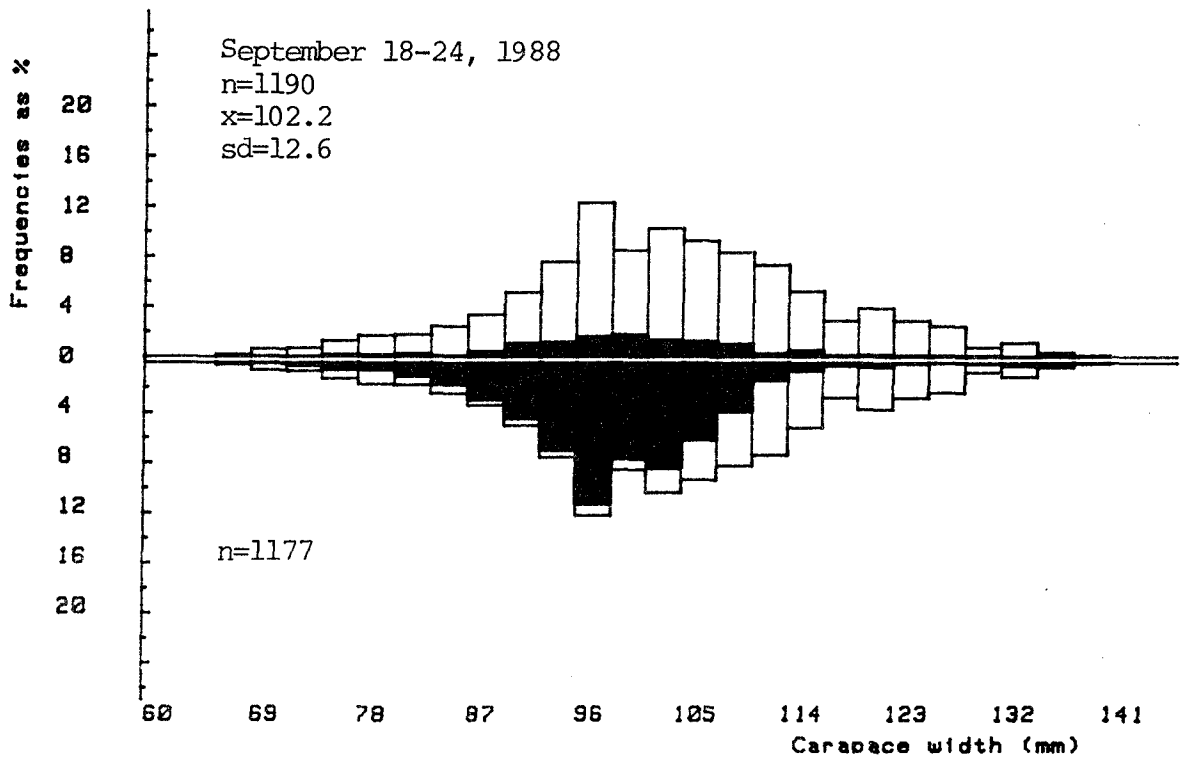
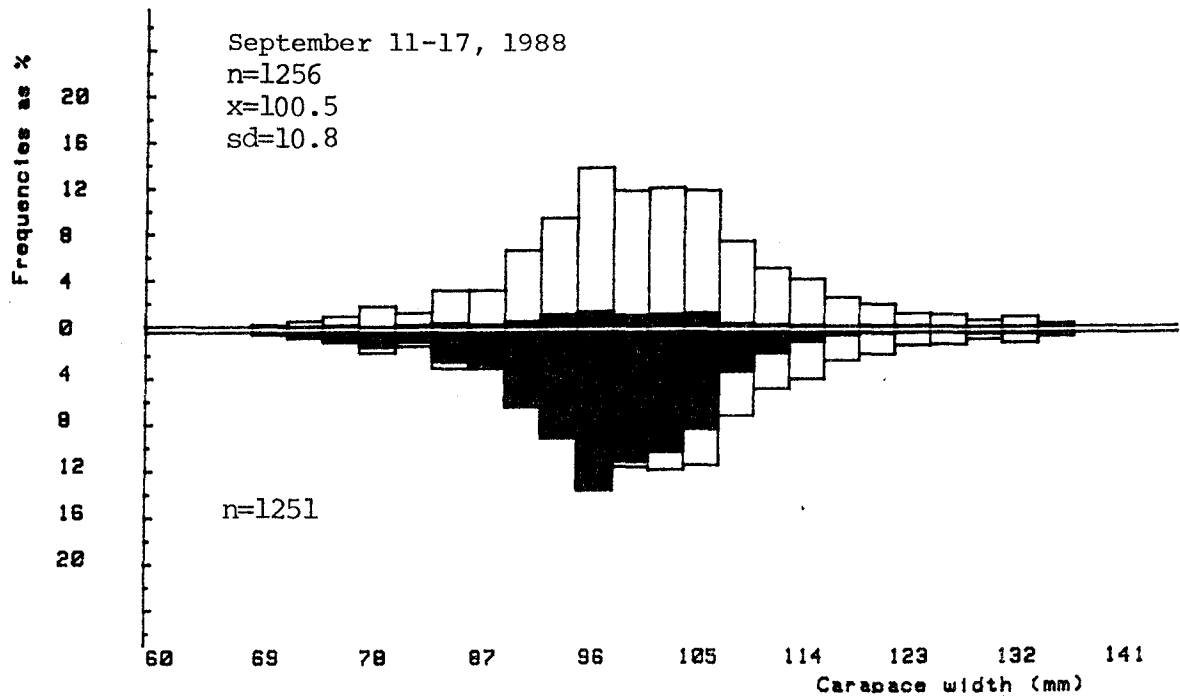


Figure 5. Weekly size distributions of male snow crabs, *C. opilio*, present in sea samples taken during the 1988, Area 18 Cape Breton Island snow crab fishery.

Positive field: Total number of observations (%), white/soft shelled crabs in black.

Negative field: Percentage of mature crabs in white, percentage of immature crabs in black.

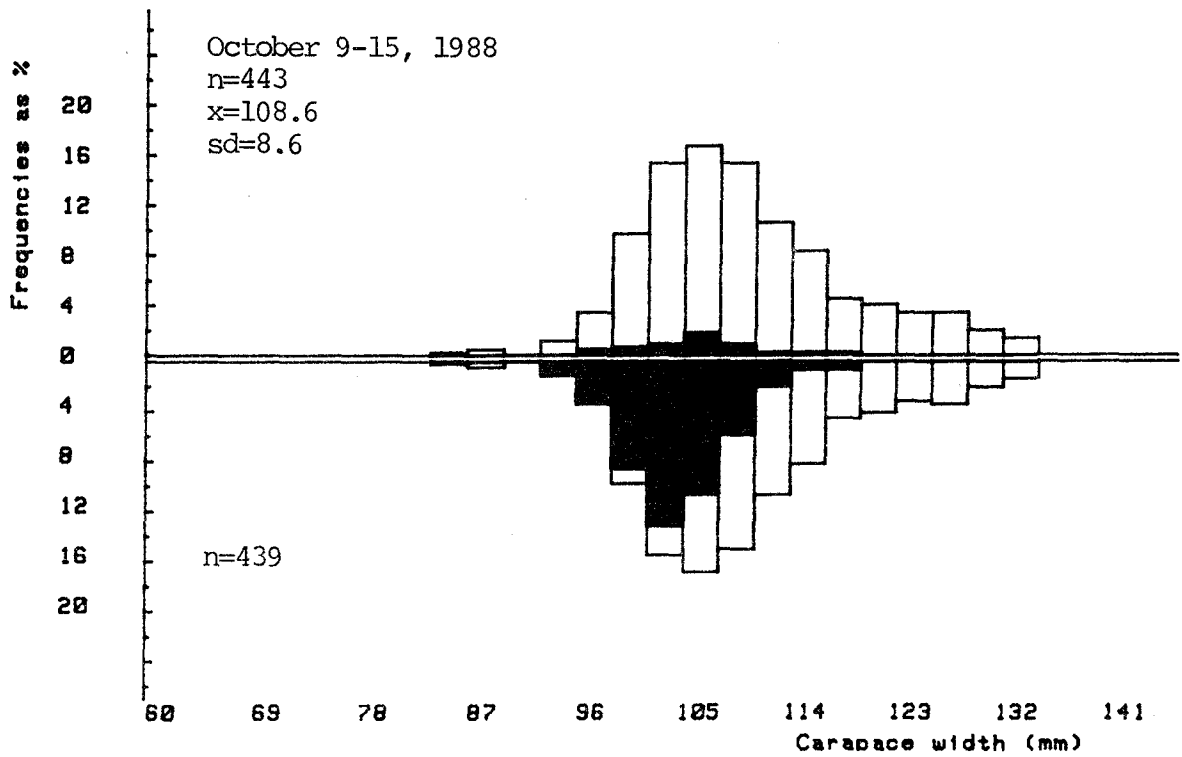
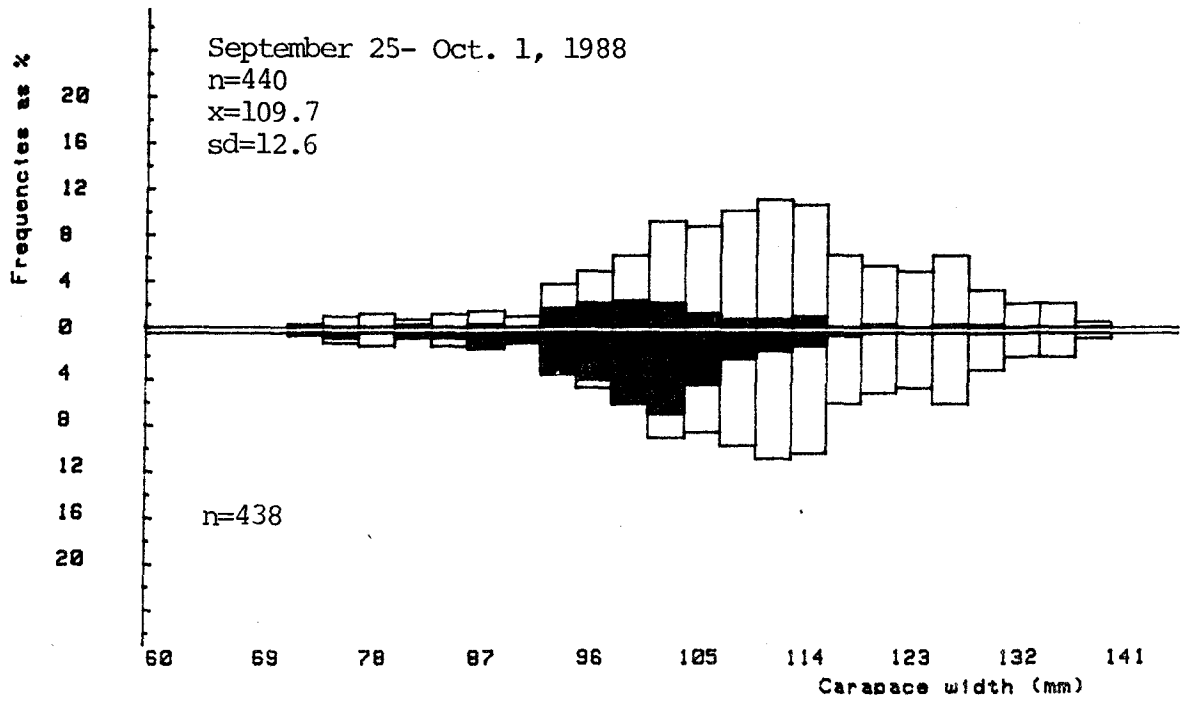


Figure 5. Cont.

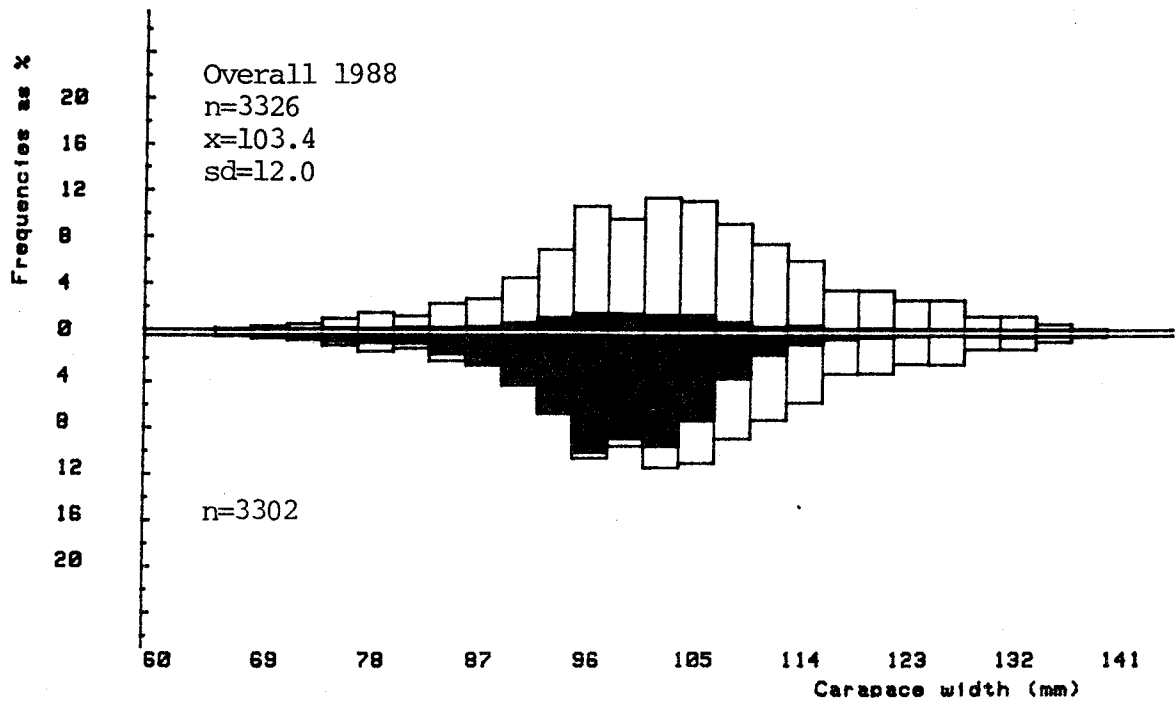


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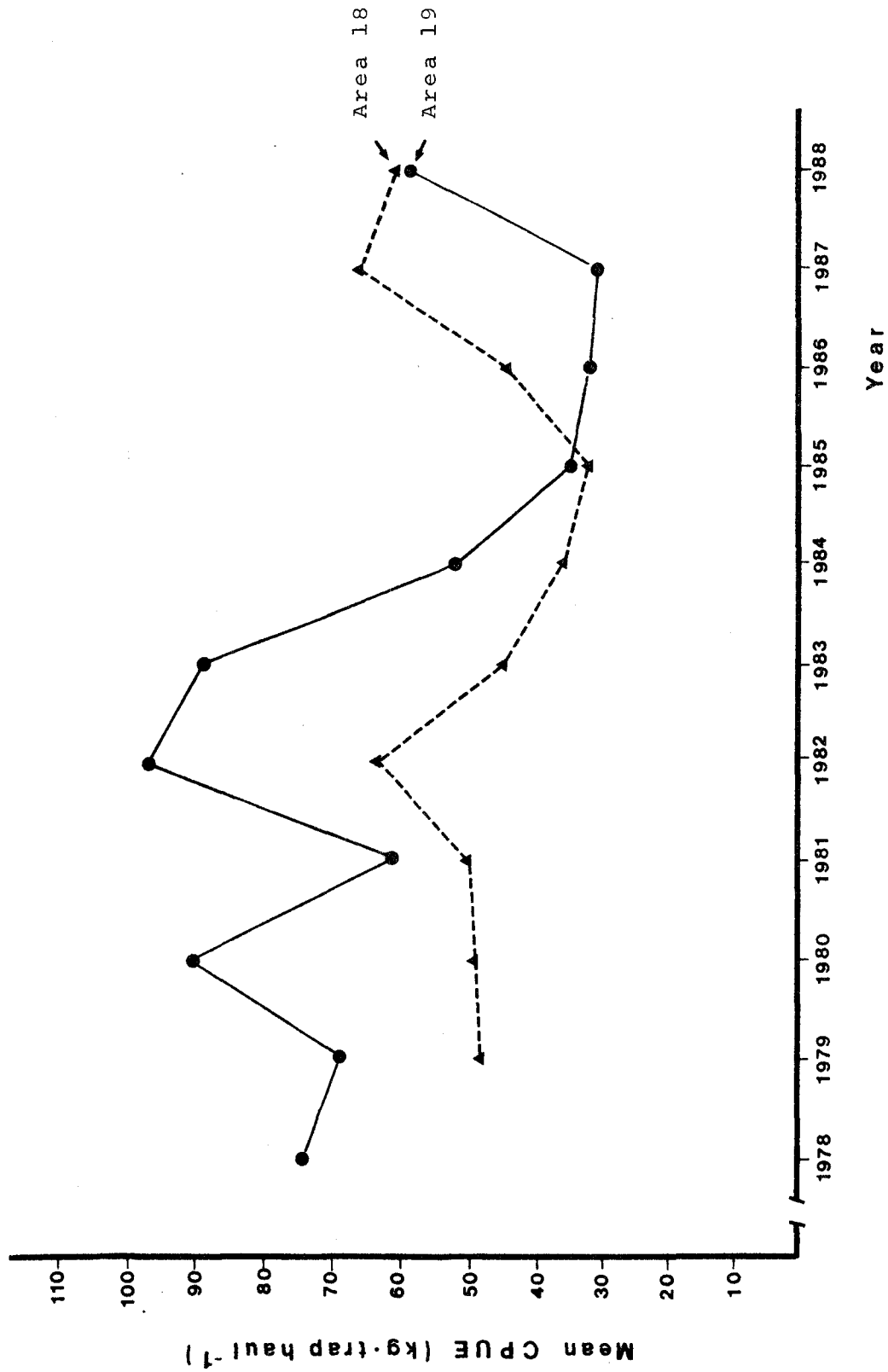


Figure 6. Trends in mean CPUE (kg/trap haul) for the snow crab, *Chionoecetes opilio*, fishery off Western Cape Breton Island (Areas 18 and 19) from 1978 to 1988.

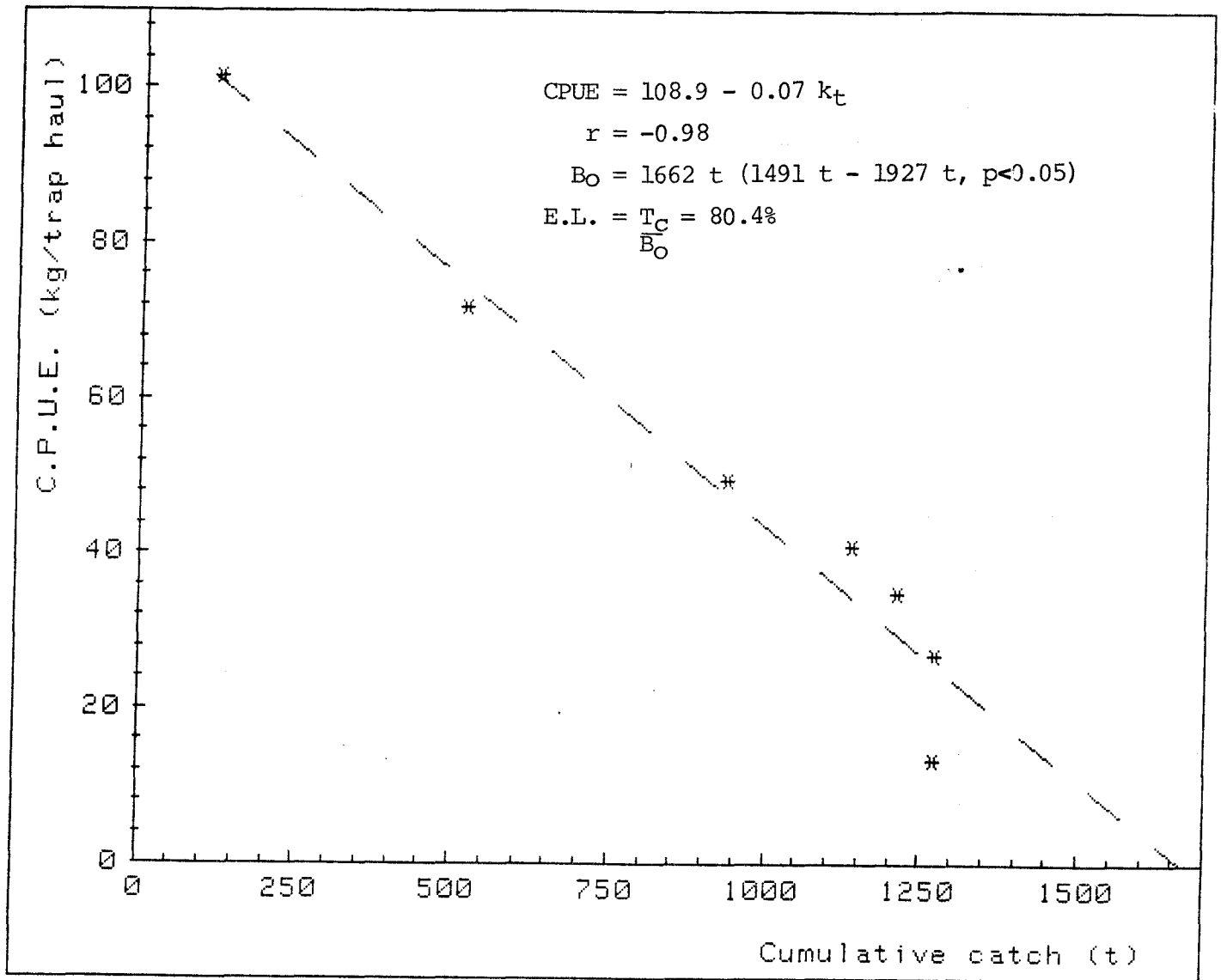


Figure 7. Cumulative logbook catch (t) versus mean weekly catch per unit effort (kg/trap haul) and Leslie analysis results for the 1988 Area 19 Cape Breton Island snow crab, Chionoecetes opilio, fishery.

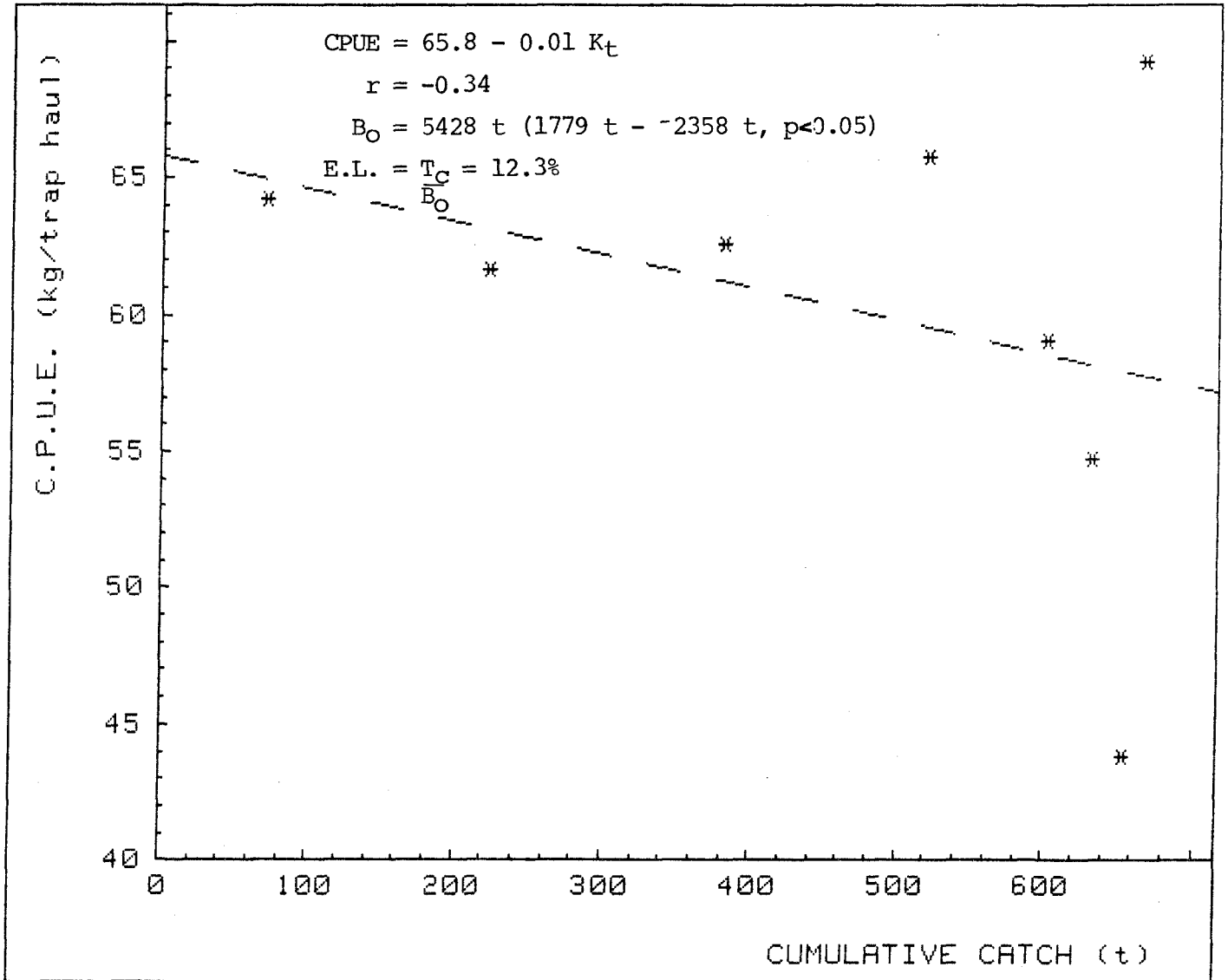


Figure 8. Cumulative logbook catch (t) versus mean weekly catch per unit effort (kg/trap haul) and Leslie analysis results for the 1988 Area 18 Cape Breton Island snow crab, Chionoecetes opilio, fishery.

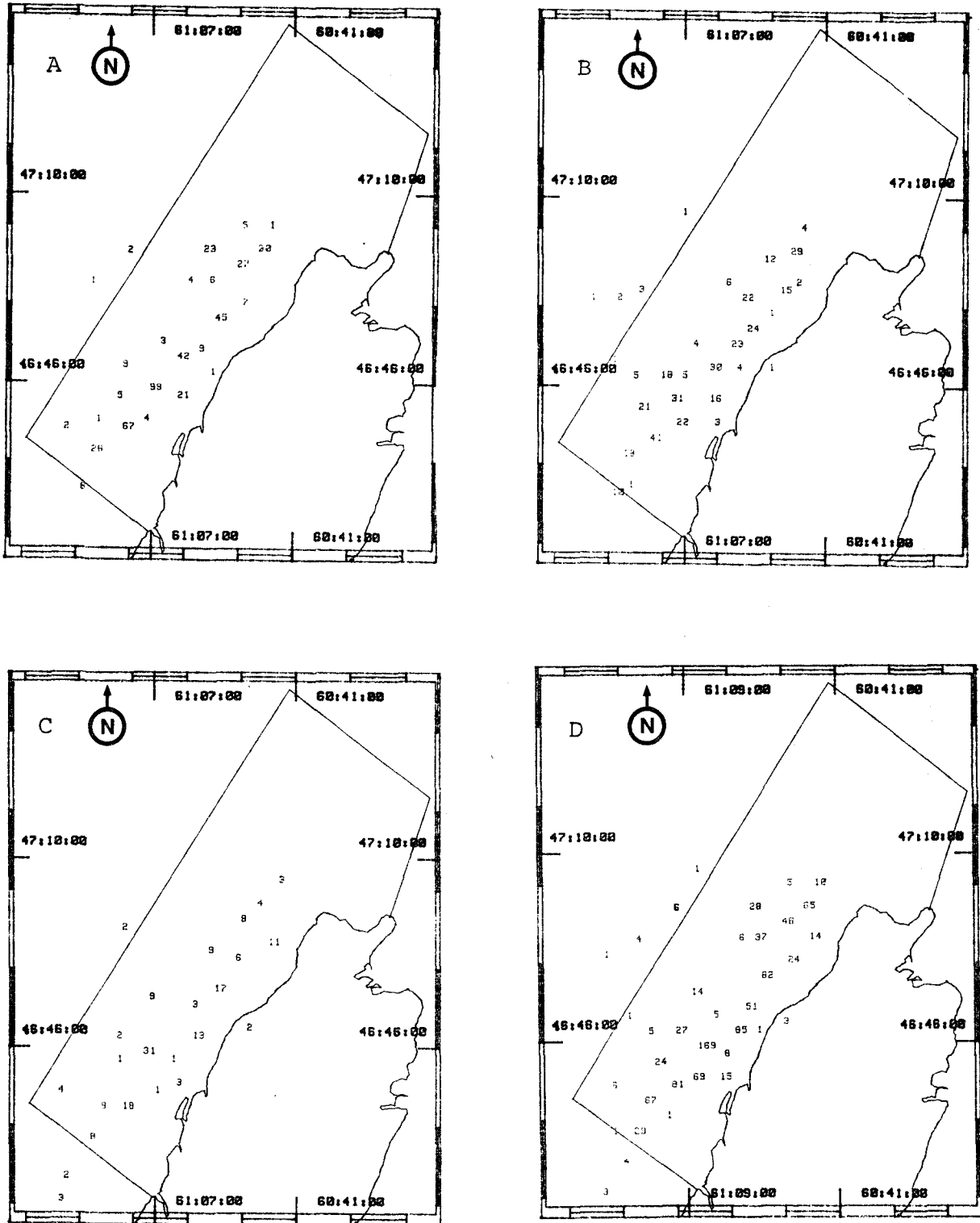


Figure 9. Distribution of fishing effort for the Area 19 Cape Breton Island snow crab, *Chionoecetes opilio*, fishery - 1988.

A:Weeks 1-2, B:Weeks 3-4, C:Weeks 5-7, D:Overall

Numbers indicate number of positions reported by the fishermen.

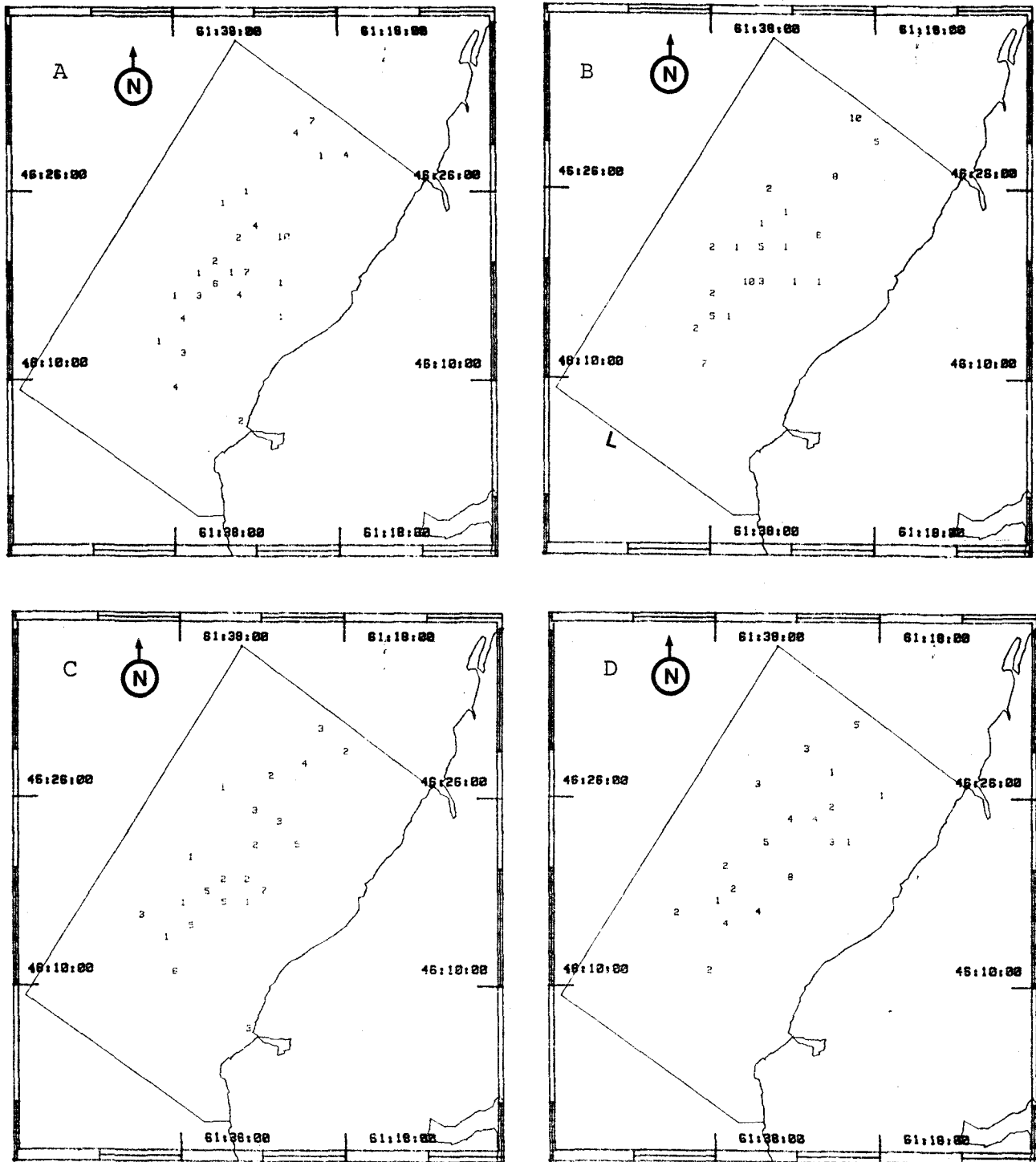


Figure 10. Distributions of fishing effort for the Area 18 Cape Breton Island snow crab, *Chionoecetes opilio*, fishery - 1988.

A:Week 1, B:Week 2, C:Week 3, D:Week 4

Numbers indicate number of positions reported by the fishermen.

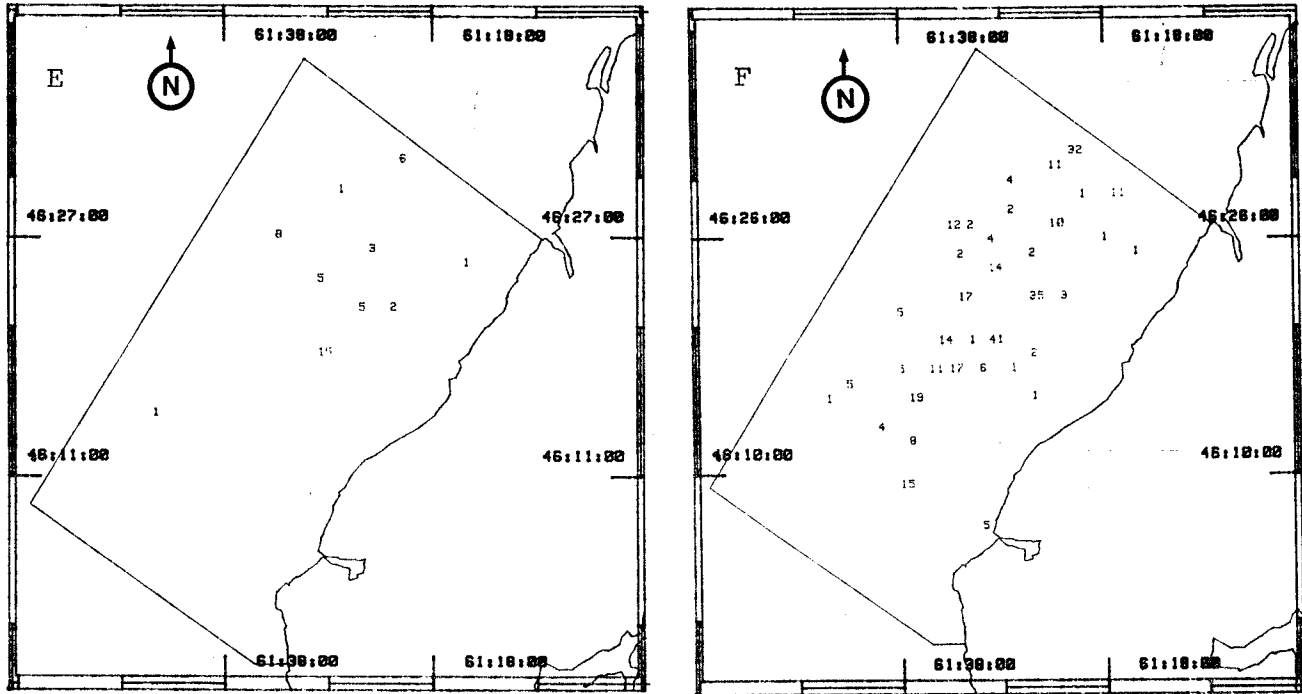


Figure 10. Cont.

E:Weeks 5-8, F:Overall

Numbers indicate number of positions reported by the fishermen.