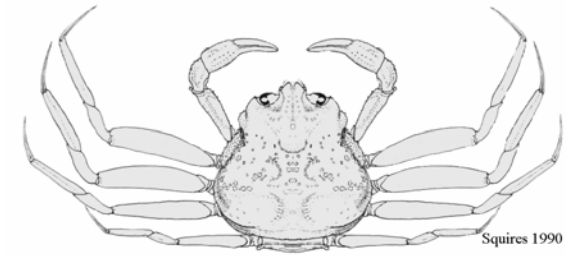
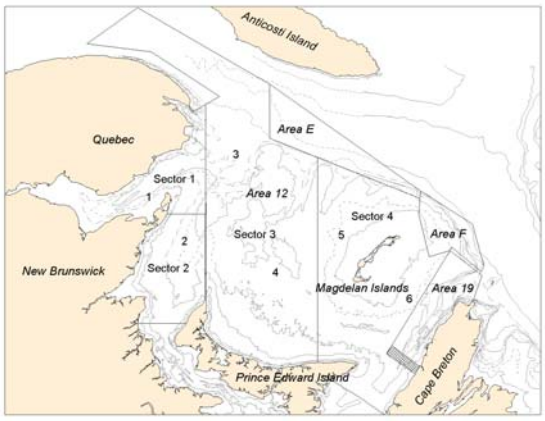


Southern Gulf of St. Lawrence Snow Crab (Areas 12, E and F)



1. Baie des Chaleurs
2. Shediac Valley
3. Orphan Bank
4. Bradelle Bank
5. Magdelan Channel
6. Cape Breton Corridor

Background

Snow crab (Chionoecetes opilio) is a crustacean like lobster and shrimp, with a flat, almost circular, body and five pairs of spider-like legs. The hard outer shell is periodically shed in a process called moulting. After moulting, crabs have a soft shell for a period of time. Soft-shelled crab is defined by shell hardness (<68 durometer units). The term "white crab" describes both new-soft and clean hard-shelled crab (conditions 1 and 2, respectively).

Unlike lobsters, snow crabs do not continue to moult throughout their lives. Females stop growing after their final moult, in which they acquire a wide abdomen for carrying eggs, which occurs at shell widths less than 95mm. Males stop growing after their final moult, in which they acquire large claws on the first pair of legs, and which can occur at shell widths between 40 and 150 mm. Females produce eggs that are carried beneath the abdomen for approximately 2 years. The eggs hatch in late spring or early summer and the tiny newly-hatched crab larvae spend 12-15 weeks floating freely in the water column. At the end of this period, they settle on the bottom. It takes at least 8-9 years for males to reach legal size.

Until 1997, the snow crab fishery in Area 12 has been exploited by 130 mid-shore fishermen from New Brunswick, Quebec and Nova Scotia. Since 1997, the PEI coastal fishery, (Area 25/26) has been integrated into Area 12 to form one management unit. In 2002, the status of Areas E and F was changed from exploratory to distinct permanent fishing area and, in 2003, Area 18 was integrated to Area 12. For the purpose of this assessment, Area 12 refers to the new management unit. Areas 12, E and F, each has separate management scheme. There is no biological basis for delimitating these management areas.

The minimum legal shell width is 95 mm, and females are not kept by industry. Baited traps, constructed of wire or tubular steel, are used to catch crab, mainly on mud or sand-mud bottoms at temperatures ranging from -0.5 to 4.5°C and depths ranging from 50 to 280m. The fishery takes place in spring and early summer in Areas 12, E and F. Neither soft-shelled nor white crabs are harvested.

Management of these fisheries is based strictly on quotas and effort controls (number of licenses, trap limits and seasons).

Summary

- Crabs in management Areas 12, E and F are part of a larger biological population, including crabs in Area 19. Any biological key events observed in the southern Gulf of St. Lawrence may have subsequent impacts on the biomass conditions in any given area.

Area 12

- The 2003 landings in Area 12 were 16,898 t (quota of 17,148 t).
- Many indicators (e.g., CPUE, mean size, discard mortality of soft-shelled crabs, high residual biomass) suggest that exploitation in Area 12 was very conservative in 2003.
- The 2003 survey biomass index of commercial-sized crabs was 53,250 t (± 13 %), 21.5 % higher than the 2002 estimate (43,840 t ± 14 %).
- This 2003 survey biomass index is composed of 67 % new recruitment (35,720 t ± 13 %).
- Since the beginning of the trawl survey in 1988, a systematic loss has been observed between the observed biomass index at year (y) and the sum of the remaining biomass index and the landings from the following year (y + 1). Even if attempts were made to quantify this loss, it was not incorporated in the commercial biomass estimates.
- The high abundance of prerecruits R-2 observed in the 2003 trawl survey could increase the level of recruitment to the fishery until 2005.
- The decline in the abundance of prerecruits (R-4 and R-3) observed in the 2003 trawl survey may be a sign of recruitment decline into the fishery starting in 2006.
- The abundance, fecundity and mean size of mature females has been decreasing, therefore, it would be prudent to leave enough commercial-sized adult males to maximize the reproductive potential of the stock.
- Using the same very conservative approach as in 2003 (i.e. an exploitation rate of 40 % of the commercial biomass index observed at the time of the survey), the 2004 quota would be 21,300 t. The history of the fishery indicates that an exploitation rate of 60 % would be too high. Considering the positive signs observed in the 2003 fishery, it is likely that the population could sustain an exploitation rate of 50 % (26,600 t) in 2004.
- Since 1999 in Baie des Chaleurs and 2001 and 2002 in Shediac Valley (sectors 1 and 2), the female-male ratio for multiparous mating has been deteriorating compared to sectors 3 (Orphan and Bradelle banks) and 4 (Magdalen Channel and Cape Breton Corridor), which could be a sign of local overexploitation.
- The high fishing effort in Shediac Valley may explain the decrease in fecundity for the multiparous females in 2003.
- It is essential to continue an annual trawl survey and a soft-shelled crab protocol to optimize the exploitation of the southern Gulf snow crab stock.

Areas E and F

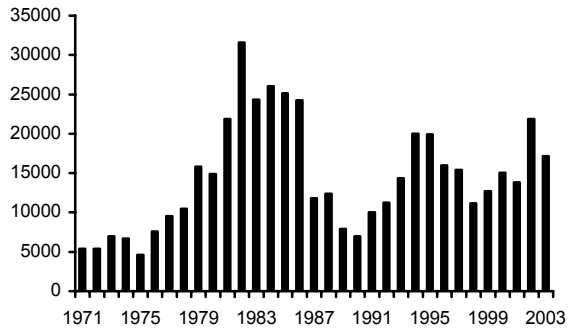
- In Area E, the landings were 345 t (quota of 350 t). The CPUE was 63.1 kilograms per trap haul (kg/th), the highest level since 1995. The 2003 survey biomass index of 450 t represents a decrease of 38 % compared to the 2002 estimate.
- Considering the decrease in commercial biomass index and the uncertainties concerning the future recruitment to the fishery, a high exploitation strategy would accelerate the decline in commercial biomass index in the near future.
- In Area F, landings were 817 t (quota of 808 t). The CPUE was 78.1 kg/th, which is the second highest level ever recorded since the beginning of this fishery in 1995. The survey biomass index of commercial-sized crabs was estimated at 1,970 t, a decrease of 27 % compared to 2002.
- The absence of prerecruits to support this area may contribute to an accelerated decline in the commercial

biomass index for the next 2-4 years. A high exploitation strategy will accelerate the decline in commercial biomass index in the near future.

The Fishery

In **Area 12**, the landings reached 16,898 t (quota of 17,148 t). The fishing season began on May 6 and ended July 17, the first landings were reported on May 23. About 95 % of the quota was landed during the first five weeks of the fishery compared to 59 % for the same period during the 2002 fishing season. Also, in 2003, 8 weeks were needed to reach the quota compared to 18 weeks during 2002.

Landings (t) in Area 12



In 2003, landings for **Areas E and F** were 345 t and 817 t (quotas of 350 t and 808 t), respectively. The fishing season in Area E began on May 6 and ended July 7, while in Area F it began May 6 to end July 17.

Quota (t), Landings (t) and Catch Performance in Area 12

	1998	1999	2000	2001	2002	2003
Quota	11,125	12,686	15,500	13,819	22,000	17,148
Landings	11,136	12,682	15,046	13,819	21,869	16,898
CPUE	45.8	43.9	34.5	42.3	40.2	50.0
Mean size (mm	114.4	112.7	109.1	112.2	109.0	110.4
Soft crab (%) in catches	2.8	4.9	12.5	6.2	4.6	3.3

Quota (t), Landings (t) and

Catch Performance in Area E

	1998	1999	2000	2001	2002	2003
Quota	163	163	163	163	163	350
Landings	161	159	150	155	165	345
CPUE	28.6	29.4	22.9	23.2	56.6	63.1
Mean size (mm	111.5	109.6	105.8	106.1	107.2	108.8
Soft crab (%) in catches	2.9	8.0	8.3	0.7	0.3	1.2

Quota (t), Landings (t) and Catch Performance in Area F

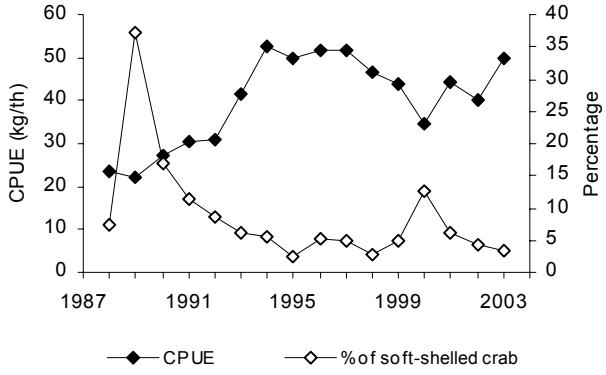
	1998	1999	2000	2001	2002	2003
Quota	288	288	288	377	378	808
Landings	290	290	291	378	378	817
CPUE	48.1	57.2	56.7	63.0	85.2	78.1
Mean size (mm	110.6	108.5	107.9	108.7	109.3	111.0
Soft crab (%) in catches	1.1	1.1	2.4	1.3	0.5	0.4

Catch rates (CPUE) are calculated from logbooks and must be viewed with caution because (1) CPUE is affected by socio-economic factors, and (2) the soft-shelled crab protocol may have an impact on the fishing performance. In Area 12, the mean CPUE increased from 40.2 kg/trap haul (th) in 2002 to 50.0 kg/th in 2003. Area E showed an increase in 2003 (63.1 kg/th) compared to 2002 (56.6 kg/th), which represents the highest level ever recorded since the beginning of this fishery in 1995. Area F showed a decrease in 2003 (78.1 kg/th) compared to 2002 (85.2 kg/th).

The **percentage of soft-shelled crabs** and the **mean size of commercial-sized crabs** are calculated using data gathered from the at-sea observer program. In Area 12, the percentage of soft-shelled crab decreased in 2003 (3.3 %) compared to 2002 (4.6 %). The discard mortality of soft-shelled crabs decreased significantly from 385,000 crabs in 2002 to 172,000 crabs in 2003. An increase of the percentage of soft-shelled crabs was observed in Area E (0.3 % in 2002 to 1.2 % in 2003) while Area F stayed practically at the same level (0.5 % in 2002 and 0.4 % in 2003). Based on the soft-shelled crab protocol used in 2003, no sector was closed in Area 12. It is important to note that the incidence of soft-shelled

crab is strongly influenced by the fishing strategy used by fishermen during the season.

CPUE and percentage of soft-shelled crab in Area 12



In Area 12, the **mean size of commercial-sized crabs** has increased from 109.0 to 110.4 mm of carapace width (CW) from 2002 to 2003. It is the first increase since 2001. In Areas E and F, the mean size of commercial-sized crabs had been decreasing from 1998 to 2000 but has increased since 2001. In 2003, the mean size of commercial-sized crabs was 108.8 mm CW in Area E and 111.0 mm CW in Area F.

Carapace condition was estimated from sea samples taken during the 2003 fishery. Crabs with carapace condition 3 comprised the bulk of the landings in all Areas.

Composition (%) of the Catch of Commercial-Sized Adult Crabs by Carapace Condition

Condition	Description	12	E	F
1-2	White crab	3.7	2.5	0.8
3	Intermediate	87.6	92.0	92.2
4	Old crab	8.1	5.3	6.5
5	Very old crab	0.6	0.1	0.5

Resource Status

Stock status is primarily based on a post-fishing season trawl survey, which provides an index of the remaining portion of the exploitable biomass (hard-shelled adult males of legal size) immediately after the fishery. It also provides estimates of soft-shelled adult males larger than 95 mm CW (R-1) that will be new recruits to the fishery the following fishing season. Abundance indices are estimated for males as future recruitment to the fishery (R-4, R-3 and R-2) and females (pubescent and mature) as future and current spawning stock abundance. The terms R-4, R-3 and R-2 represent male crabs with a carapace width range of 56-68, 69-83, and larger than 83 mm CW, respectively. A portion of these crabs could be available to the fishery in 4, 3 and 2 years, respectively. The term pubescent refers to females with a narrow abdomen and orange gonads that will molt to maturity and mate the following year and become primiparous females (first brood). The term multiparous refers to females which are carrying their second brood or older. The term mature female refers to the spawning stock, includes primiparous and multiparous females (excluding senile females). Abundance index of total adolescent males larger than 56 mm CW (R-4, R-3 and R-2 combined) is also estimated and used as an index of the potential problem of soft-shelled crabs that may enter commercial traps the following fishing season.

Area 12:

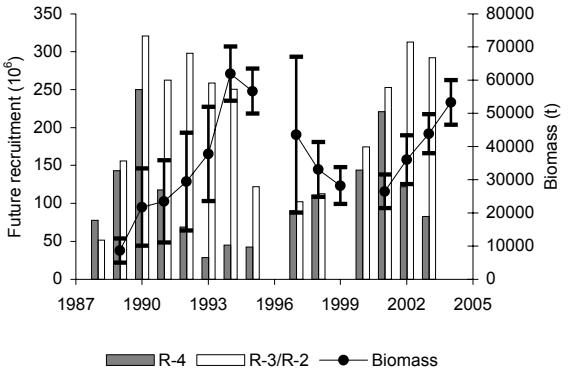
The 2003 survey biomass index in Area 12 was estimated at 53,250 t (± 13 %), which is 21.5 % higher than the 2002 estimate (43,840 t ± 14 %). The 2003 survey biomass index is composed of 67 % of new recruitment (35,720 t ± 13 %). The concentrations of commercial-sized adult crabs were located on Bradelle and Orphan banks, in Shediac Valley, and in the southeastern part of Area 12.

The abundance of **prerecruits** R-4 has increased since 1995 to reach 221.0 million crabs in 2001. In 2002 and 2003, the abundance of R-4 decreased to 122.0 and 82.9 million individuals, respectively. The abundance of R-3 had increased from 38.6 to 163.0 million crabs from 1995 to 2002. In 2003 the abundance of R-3 decreased to 148.0 million crabs. The R-2 increased from

46.2 to 149.0 million from 1998 to 2002 but decreased in 2003 to 144.0 million crabs. The abundance of prerecruits R-4, R-3 and R-2 was still high in 2003, which may indicate high incidences of soft-shelled crabs in some areas if the fishing effort is too high in 2004. Management measures, such as a comprehensive soft-shelled crab protocol, are necessary to protect the soft-shelled crabs (the future recruitment to the fishery). The main concentrations of these prerecruits in 2003 were located on Bradelle and Orphan banks, in Shediac Valley, Bank and in the southern part of Area 12.

Size frequency distributions of male crabs caught in the trawl survey have been available since 1988. The annual growth of small crabs (10 to 56 mm CW) observed in 1998-99 can be seen in subsequent annual surveys. This 1998-99 size cohort has grown to larger size categories and was the main component of the survey biomass index for the 2002 fishing season and is still contributing for the next one. However, a major concern is the scarcity of adolescent crabs of R-4 and younger observed since 2001 which may result in a decline of the recruitment to the commercial biomass after 2005. No conspicuous discontinuity of the size frequency distributions was observed between the 2002 and 2003 surveys despite of the vessel change.

Survey biomass index (t) and abundance indices of future recruitment in Area 12



Areas E and F:

Because of the unknown amount of crab movement in and out of these areas within a given year, the projected survey biomass indices may not be reliable. In both areas, the crab concentrations are near the southern boundary and may be affected by the overflow or reduction of the concentrations from other area.

In Area E, **the 2003 survey biomass index** (450 t ± 170 %) represents a decrease of 38 % compared to 2002 (720 t ± 91 %). The main concentrations were located in the southwestern part of the area. During the current increasing phase of commercial biomass observed in Area 12, the geographical distribution of adult males ≥ 95 mm CW has been shifting from the northern to the southern part of the area, which may reduce the overflow of these crabs into Area E. Although the commercial biomass index is increasing in Area 12, we cannot provide any long-term projections for this zone.

In Area F, **the 2003 survey biomass index** (1,970 t ± 70 %) represents a decrease of 27 % compared to the 2002 estimate (2,690 t ± 55 %). The main concentrations observed in the trawl survey are located in the northern and southeastern part of the zone adjacent to Areas 12 and 19. The scarcity of crabs smaller than 56 mm CW may indicate that the recruitment to the fishery will decrease for the next 2-4 years. But, given the increasing biomass indices in Areas 12 and 19, there is a possibility of migration of commercial crabs into Area F.

Survey Biomass Index (t) Including Very Old in the Southern Gulf of St. Lawrence (with 95 % Confidence Intervals)

Survey Year	12	E	F
1988	8,700 (± 42 %)	-	-
1989	21,700 (± 53 %)	-	-
1990	23,400 (± 53 %)	-	-
1991	29,400 (± 50 %)	-	-
1992	37,800 (± 38 %)	-	-
1993	62,000 (± 13 %)	-	-
1994	56,700 (± 12 %)	-	-
1995	49,500 (± 16 %)	-	-
1996[1]	-	-	-
1997	33,000 (± 25 %)	1,460 (56%)	510 (65%)
1998	28,200 (± 20 %)	220 (±125%)	900 (±99%)
1999[2]	-	-	
2000	26,500 (± 19 %)	160 (± 401 %)	1,510 (± 57 %)
2001	36,100 (± 20 %)	330 (± 205 %)	2,430 (± 59 %)
2002	43,840 (± 13%)	720 (± 91 %)	2,690 (± 55 %)
2003	53,251 (± 13 %)	450 (± 170 %)	1,970 (± 70 %)

[1] no survey in Area 12 in 1996.
[2] not reliable due to the incapacity to estimate the swept surface.

The abundance, mean size and fecundity of the spawning stock and female-male ratio were studied to provide indications on **the reproductive potential of the stock** in the southern Gulf of St. Lawrence.

Since 1988, two periods (1989-1992 and 1999-2002) of high **spawning stock** abundance were observed in the trawl surveys. The results showed that the abundance of spawning stock during the second period decreased by 35 % compared to the abundance of the first period.

Regarding **female abundances**, high concentrations of pubescent females were observed in the northeastern and southeastern parts of Area 12, mostly on American Bank and in the Cape Breton Corridor. The annual **mean size** of these females has been decreasing for the last three years to reach 53.2 mm CW in 2003. Observed concentrations of primiparous females have been reduced in 2002 and 2003. The annual mean size of primiparous females has been increasing since 1998 to reach 59.5 mm CW in 2003. Concentrations of multiparous females were located mostly on Bradelle Bank, in Shediac Valley, Baie des Chaleurs, and in the Magdalen Channel. Their annual mean size has been increasing since 2001 to reach 56.8 mm CW in 2003.

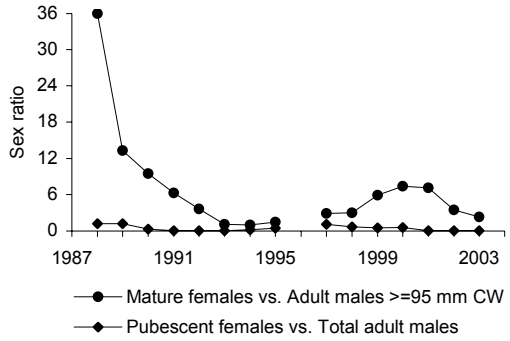
The **fecundity** using a size-fecundity relationship (relation between the amount of eggs and the carapace width) was estimated for primiparous and multiparous females. The results showed a higher fecundity for the multiparous females during the second period (1999-2002) compared to those observed during the first period (1989-1992), while no difference was found for the primiparous females between both periods. Results from the 2003 samples collected from Shediac Valley, showed that the fecundity of primiparous females was higher compared to the two previous periods while the fecundity for the multiparous females has been deteriorated in 2003 compared to the two previous periods indicating overexploitation in Shediac Valley in the past 2-4 years.

Assuming a relationship between the spawning stock and stock recruitment abundance, the scarcity of the new recruits with CW between 15 and 30 mm observed during the 2000 to 2003 trawl surveys may be mainly due to the low abundances of mature females during the 1993 to 1998 periods. The relatively high abundance of mature females observed during 1999-2002 (second period) is likely to produce a new

generation of crabs that should appear in our trawl survey in 2-3 years (CW between 15 and 30 mm). This new generation of crabs should constitute the next pulse of recruitment to the fishery in years 2010-2015.

A **female-male ratio** can be estimated by comparing the abundance of female to male categories. For Area 12, the global ratio between the mature females (F) and the adult males (M) ≥ 95 mm CW varied from 36-6.3F:1M for the first period (1989-1992) but was around 7.4-3F:1M for the second period (1999-2002). For 2003, the global ratio was 2.3F:1M. The global ratio between the pubescent females and the adult males ≥ 95 mm CW was 0.2F:1M for 2003.

Female-male ratio in the southern Gulf of St. Lawrence



The female-male ratio was also estimated per sectors (sectors 1 to 4). The ratios for the multiparous mating in sectors 1 and 2 were at much higher levels than those observed in sectors 3 and 4, which may be an indicator of local overexploitation in these sectors. The low abundance of males able to mate with females may affect the future reproductive potential of the stock.

Sources of Uncertainty

Since the beginning of the trawl survey in 1988, a systematic loss has been observed between the observed commercial biomass index at year (y) and the sum of the remaining biomass index and the landings from the following year (y + 1). Even if preliminary attempts were made to quantify this discrepancy, more study is needed to estimate the loss of commercial-sized crabs between the time of the trawl survey and the fishing season in order to adequately incorporate this loss in the stock assessment.

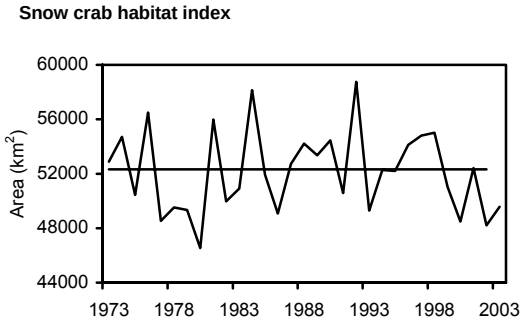
Also, a change of survey vessel for the 2003 trawl survey showed that the swept area, the opening of the trawl and the speed of the boat were significantly different compared to the previous vessel. Without a comparative study to evaluate the catch efficiency between the two vessels, the biomass and abundance estimates have to be interpreted with caution. These estimates are still based on the assumption that the trawl catch efficiency is 100 % for crabs larger than 40 mm CW. Further investigations are needed to verify this assumption. Despite these uncertainties, the survey biomass indices are closely correlated with the catch rates.

Within season fishing strategy may have an impact on prerecruit mortalities. The selective removal of a large amount of good male reproducers may also adversely affect the reproductive potential of the stock.

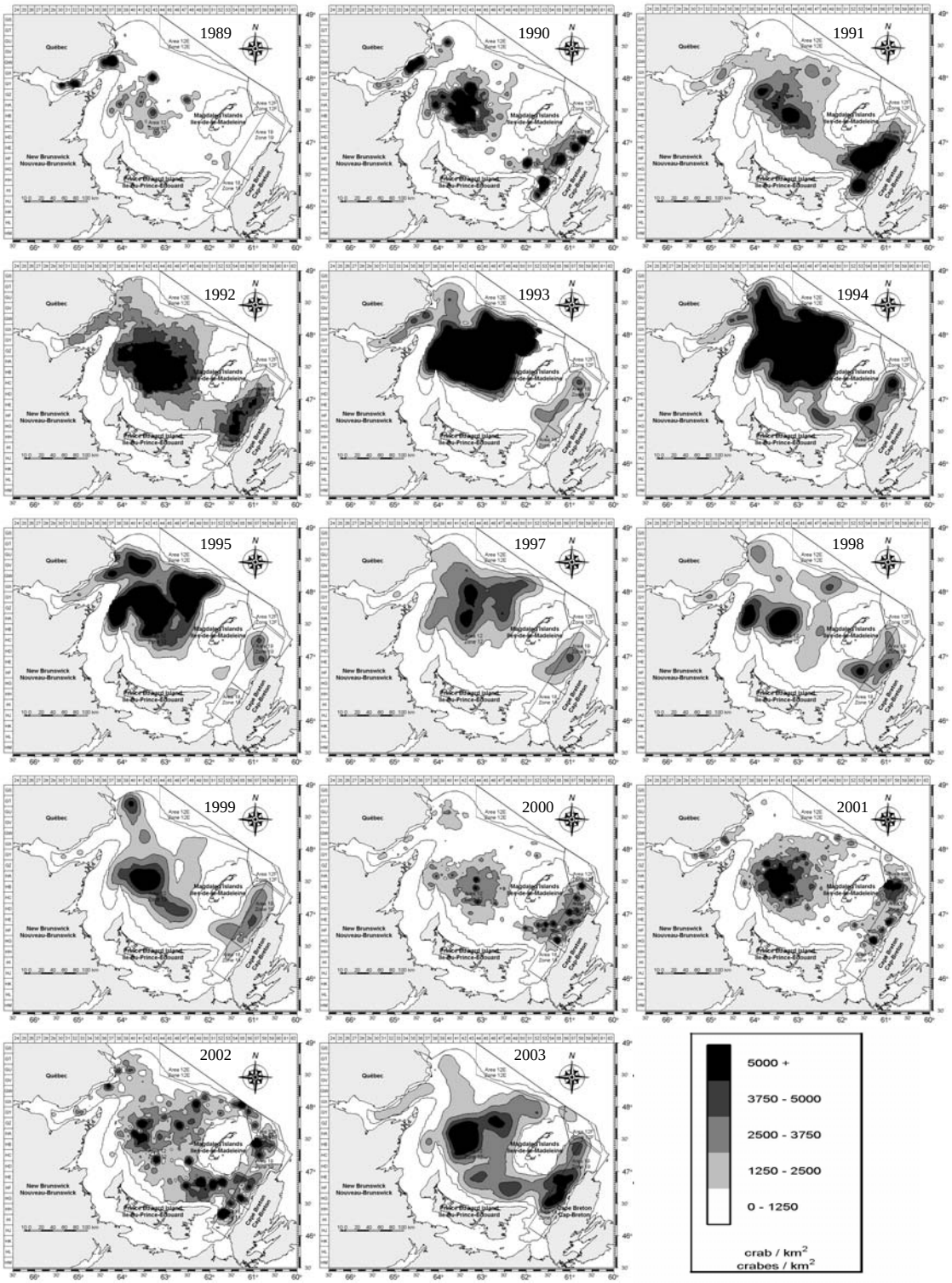
Ecosystem Considerations

Environmental factors, such as water temperature, can affect the molting and reproductive dynamics as well as the movement of crab. Chassé et al. (2004) reported that the bottom temperatures over most of the southern Gulf of St. Lawrence are less than 3 °C, which is considered ideal thermal habitats for snow crab. Water temperature data collected by Swain (1993) revealed that the bottom temperatures in deeper waters of Area E are higher (1 to 5 °C) than traditional crab grounds (-1 to 0 °C) in Area 12 (50 to 100 m). Chassé et al. (2004) reported that the bottom temperatures in Area 19 are typically 1°-2 °C warmer than the traditional crab grounds in Area 12. For example, approximately 80 % of the trawled area during the snow crab survey in Area 12 in 2003 was covered by water of temperatures of < 1.0 °C whereas in Area 19, it was < 2.5 °C. Near bottom

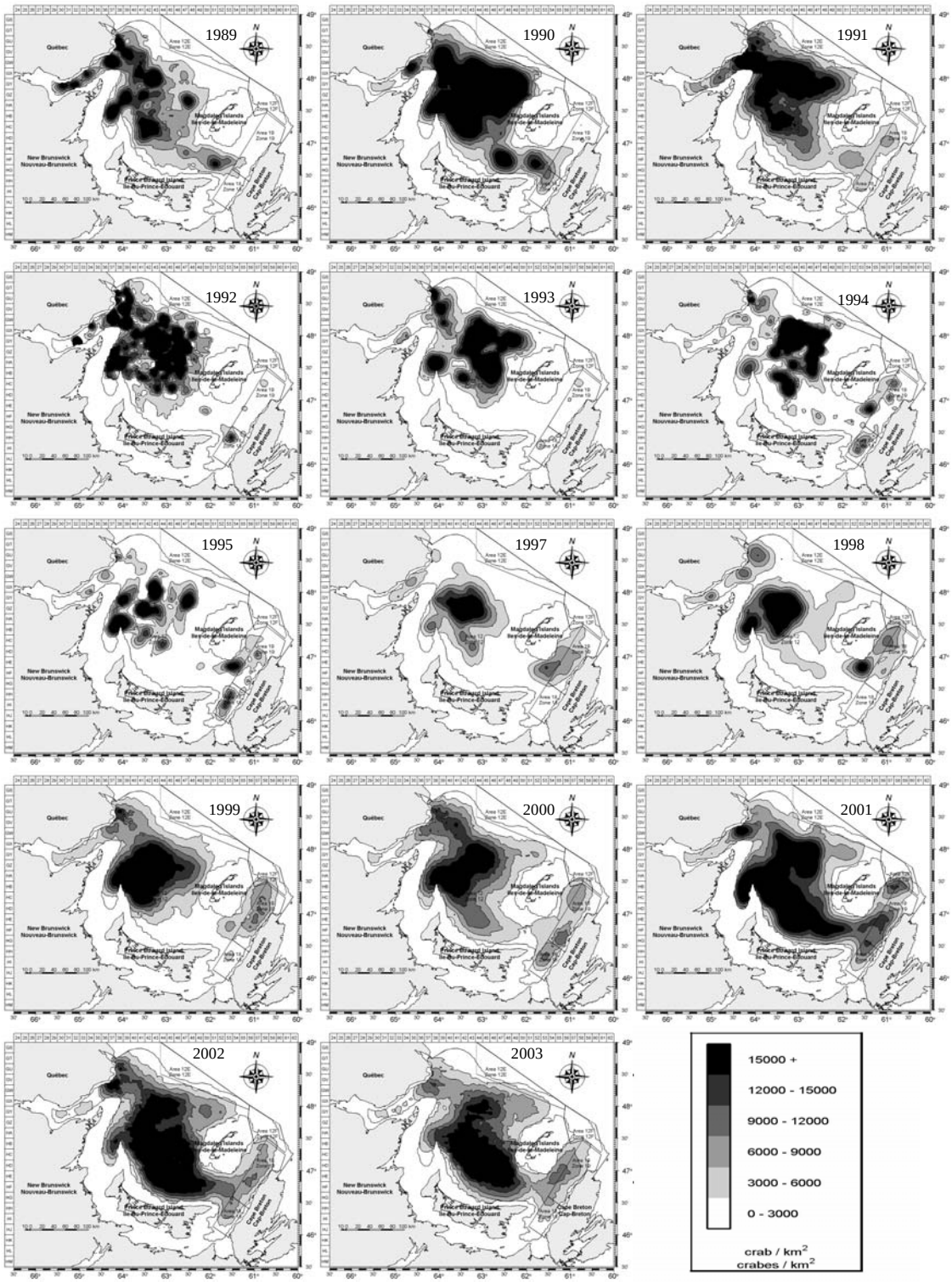
temperatures over a large portion of the deeper part of Area 12 were below (colder) the long-term (1971-2000) average and decreased relative to 2002 while the shallower parts exhibit warmer than normal conditions. This is consistent with the increase in the Gulf wide snow crab habitat index (area of the bottom covered by water temperatures between –1 and 3 °C) and the decrease in the average temperature within this area which show the lowest value of the last five years. With this decrease, the temperature conditions are considered more favorable for snow crab than in 2002, although the habitat index is still below normal.



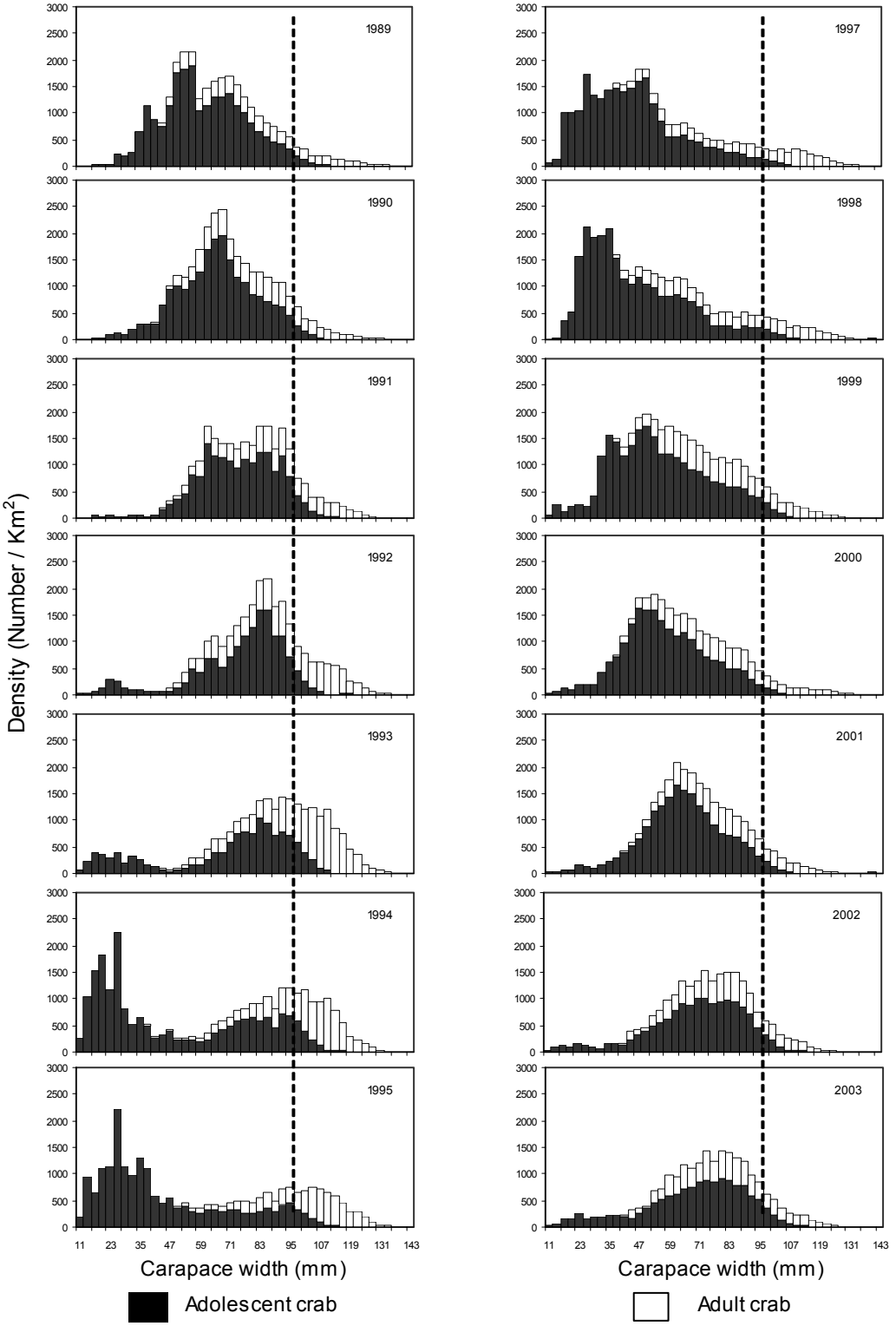
Density (crabs per km^2) Contours of Adult Male Crab ≥95 mm CW based on the Trawl Survey between 1989 and 2003 in the Southern Gulf of St. Lawrence



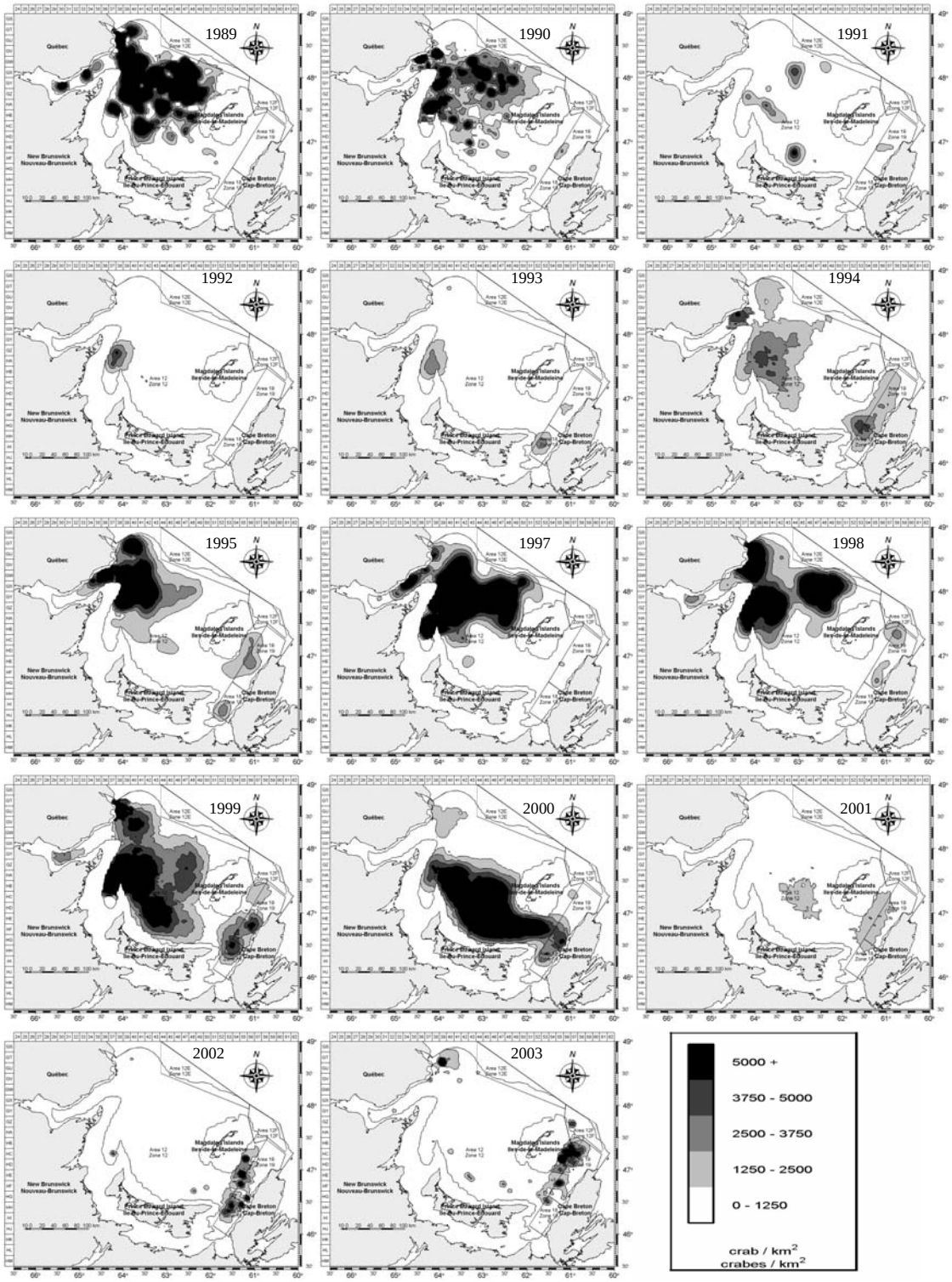
Density (crabs per km^2) Contours of Adolescent Male Crab ≥56 mm CW based on the Trawl Survey between 1989 and 2003 in the Southern Gulf of St. Lawrence



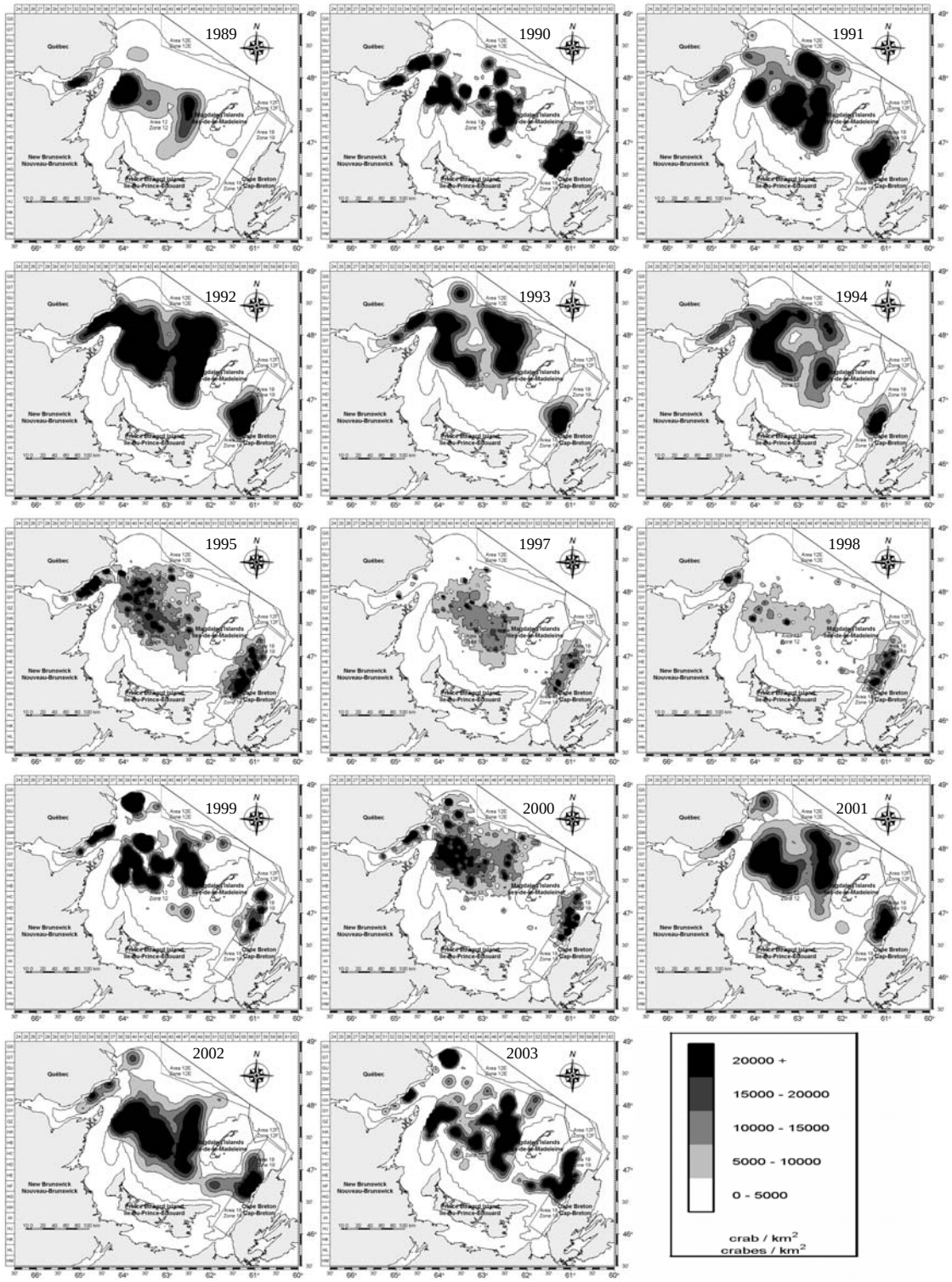
Size Frequency Distributions (number per km^2) of Male Crab Sampled during the Trawl Survey in Area 12 after the Fishing Season



Density (crabs per km^2) Contours of Pubescent Females based on the Trawl Survey between 1989 and 2003 in the Southern Gulf of St. Lawrence



Density (crabs per km^2) Contours of Mature Females based on the Trawl Survey between 1989 and 2003 in the Southern Gulf of St. Lawrence



Outlook

The stock status in Area 12 is generally positive in the short term. The 2003 survey commercial biomass index was estimated at 53,250 t. This index was composed of new recruitment (67%) and residual biomass of the 2003 fishery (33%) while the biomass of very old crabs is very low. The high abundance of prerecruits R-2 observed in the 2003 trawl survey would increase the level of recruitment to the fishery until 2005. However, the abundance of prerecruits R-4 and R-3 is decreasing which may indicate a decline in recruitment to the fishery starting in 2006. Some indicators, such as the annual CPUE, the mean size of commercial-sized adult crabs in commercial catches and the mortality of soft-shelled crabs, suggest that the exploitation level was very conservative in 2003.

The fishery indicators in Area E were positive in 2003. The CPUE and the mean size of commercial-sized adult crabs in commercial catches increased while the percentage of soft-shelled crabs was low during the 2003 fishing season. However, the commercial biomass and recruitment indices, estimated from the 2003 trawl survey, decreased while the abundance of prerecruits R-3 and R-2 increased in that zone. This fishery depends totally on stock condition in Area 12.

The current indicators for Area F are generally positive. The mean annual CPUE was still high and the percentage of soft-shelled crab was low in 2003. The mean size of commercial-sized adult crabs in the commercial catches increased compared to 2002. However, the commercial biomass index is decreasing and the absence of prerecruits to support this zone may contribute to an accelerated decline of commercial biomass in the near future. This fishery is highly dependent on Areas 12 and 19 biomass conditions.

Biological Considerations

Close monitoring of the key events on population reproductive output (e.g., fecundity, spermathecal load, recruitment to the early benthic stages) is necessary to detect any anomalies on the quality and quantity of the spawning stock and subsequent recruitment.

Management Considerations

Fishery indicators suggest that the exploitation level was conservative in 2003. However, a long term harvesting strategy is not in place at the present time. The stock is now in a phase of increasing recruitment into the commercial biomass until 2005 and a decline in recruitment is expected afterwards. A variable exploitation index should be set in accordance to the strength of the recruitment, as well as the stock reproductive capacity. The decline in the spawning stock observed during the 1999-2002 period may affect the subsequent recruitment pulse expected for the 2010-2015 period. A long-term negative impact on the spawning stock abundance and subsequent future recruitment is foreseen unless adjustments to the exploitation regime are taken in 2004 to ensure the reproductive output during the next high abundance of spawning stock in the 2009-2012 period. The future target exploitation level should be considered based on the female-male ratio, especially during the high reproductive phase with a close monitoring of the reproductive output (fecundity). High exploitation during the present increasing phase of recruitment to the fishery would accelerate the decline of biomass after 2005. Moreover, a high exploitation level would not allow an accumulation of larger-sized adult males of carapace conditions 3 and 4, the most fertile males to mate with females. Using the same very conservative approach as in 2003 (i.e. an exploitation rate of 40 % of the commercial biomass index observed at the time of the survey), the 2004 quota would be 21,300 t. The

history of the fishery indicates that an exploitation rate of 60 % would be too high. Considering the positive signs observed in the 2003 fishery, it is likely that the population could sustain an exploitation rate of 50 % (26,600 t) in 2004.

The female-male ratio in sectors 1 and 2 for the multiparous mating was skewed toward females in a much higher level than what was observed in sectors 3 and 4. This may explain the decline in multiparous fecundity in sector 2 in 2003. The low abundance of commercial-sized hard-shelled adult males available to mate with mature females during the multiparous mating may indicate local overexploitation in these sectors. A change in the present management approach is necessary to protect the reproductive output of the stock.

In Area E, considering the decrease in commercial biomass index and the uncertainties concerning the future recruitment to the fishery, a high exploitation strategy would accelerate the decline in commercial biomass index in the near future. We consider this area totally dependent on the overflow of harvestable crabs coming from the main fishing ground (Area 12).

In Area F, a high exploitation strategy will accelerate the decline in commercial biomass index in the near future. It will be difficult to maintain the current exploitation level and stabilize the fishery in the long term for this area, as it seems to be influenced by recruitment from the adjacent areas (Areas 12 and 19).

Basic Requirements

The handling of new hard-shelled postmolt males and mortality of soft-shelled crabs in Areas 12, E and F would be reduced substantially by implementing a common opening and closing date. To protect the future recruitment to the fishery and the reproductive potential of the stock, management measures, such as a comprehensive soft-shelled protocol, are necessary.

The continuation of the trawl survey is essential to provide annual abundance and commercial biomass indices, detect any anomalies in reproductive potential of the stock and estimate the annual loss of commercial-sized crabs between the survey and the following fishing season due to natural mortality, emigration and immigration. The trawl survey is considered as the major tool in assessing the snow crab stock in the southern Gulf of St. Lawrence.

For more Information

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