

Western Cape Breton Snow Crab (Area 18)

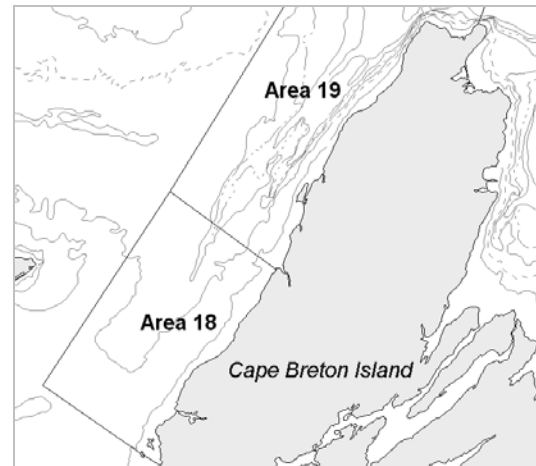
Background

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 (categories 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 wider abdomen for carrying egg. This occurs at shell widths less than 95mm. Male snow crab stop growing after their final moult, in which they acquire large claws on the first pair of legs. This can occur at shell widths as small as 40mm. Female crab 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 snow crab males to reach legal size.

The minimum legal shell width is 95mm, and female crabs 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 the late summer in Area 18. Neither soft-shelled nor white crabs are harvested.

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



Summary

- Crab in management Area 18 is part of a larger biological population, including crab in adjacent parts of Areas 12 and 19.
- There are some positive indicators: Commercial biomass and recruitment indices are increasing; the relative abundance of pre-recruits R-3 and R-2 is increasing, but it is uncertain if these crabs will remain in the area.
- There are several negative indicators: Only 53% of the 2001 quota was caught; the average CPUE was the lowest recorded level since 1986; the mean size of commercial crab is declining. The increased incidence of soft-shelled crab will be an issue in 2002 fishery.
- Based on the method used for the past decade, a commercial biomass of 1,063t is comparable to values used in previous years. This value represents a 64% increase compared to the 2000 estimate.
- It is not possible to accurately estimate an exploitation rate, but there is no reason to change the harvesting strategy.

The Fishery

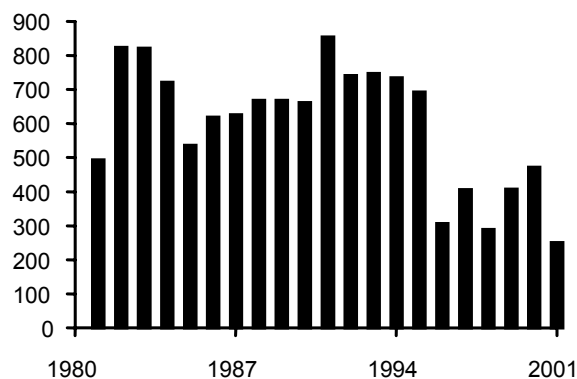
Area 18 was fished for the first time in 1979 by 14 inshore vessels with exploratory licenses and a trap limit of 30 traps per license. In 1984, Area 18 was reserved exclusively for inshore fishermen. The overall quota, which had initially been set at 835t in 1981, was reduced to 626t in 1986 and then increased to 674t in 1988, where it remained until 1990. In the spring of 1991, a quota of 200t was set to promote a spring fishery. Later that year, a quota of 674t was set for the 1991 fall fishery and 1992 spring fishery. The quota was raised to 749t for 1992-93, and remained at that level for 1993-94 and 1994-95. Since 1992-93, 30 fishermen have participated in this fishery.

In 1995, 109t of the 705t quota were allocated to 30 temporary license holders. In 1996, no temporary licenses were issued and a quota of 340t was allocated to 30 fishermen. In 1997, the quota was set at 580t, landings were 70% of the quota. In 1998, landings were 70 % of the quota. In 1999, the quota was caught for the first time since 1995. In 2000, the quota was caught. In 2001, only 53% of the quota was caught.

Quotas (t) and Landings (t) in Area 18

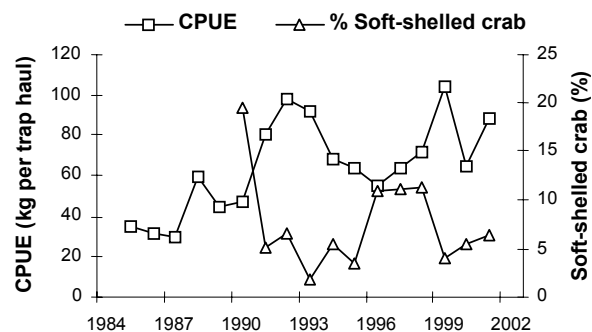
	1996	1997	1998	1999	2000	2001
Quota	340	580	411	408	476	476
Landings	306	406	289	407	472	251
CPUE	21.2	18.1	18.0	34.5	32.1	15.3
Soft crab (%)	20.5	13.1	17.1	3.2	8.4	8.6
Mean size (mm)	117.0	116.7	113.8	113.9	113.3	108.3

Landings (t) in Area 18



The average catch rate (CPUE) decreased from 32.1 kg/trap haul in 2000 to 15.3 kg/trap haul in 2001.

CPUE (kg per trap haul) and Soft-Shell Crab Percentage in Area 18



The percentage of **soft-shelled crab** in Area 18 was 8.6%. The percentage of soft-shelled crab in this Area has been increasing since 1999. The mean size of commercial-sized crabs has been decreasing since 1996.

Carapace condition was estimated from sea samples taken during the 2001 fishery. The category-4 crab was 69.5% of the catch, which is the highest percentage reached since 1994. However, it has been noted that there was a discrepancy between the trawl survey and the observer program that needs to be investigated.

Percentage of the Catch of Commercial-Sized Adult Crab by Carapace Condition

Category	Description	18
1-2	White crab	10.0
3	Intermediate	18.2
4	Old crab	69.5
5	Very old crab	2.3

Resource Status

Stock status is primarily based on a trawl survey, which provides an exploitable biomass index (hard-shelled adult males of legal size) immediately following the fishery. It also provides estimates of soft-shelled adult males larger than 95mm (R-1) that will be new recruits in the following year. Abundance is also estimated for pre-recruits (R-2 and R-3) and females (preprimiparous, primiparous, and multiparous). The term R-2 represents crabs with a carapace width larger than 83 mm. A portion of these crabs could be available to the fishery in two years. The term R-3 represents crabs with a carapace width between 69-83 mm. A portion of these crabs may be available to the fishery in three years. The term preprimiparous refers to the females with a narrow abdomen and orange gonads that will moult to morphometric maturity the following year as primiparous females (first brood). The term multiparous refers to the females, which are in their second brood or older.

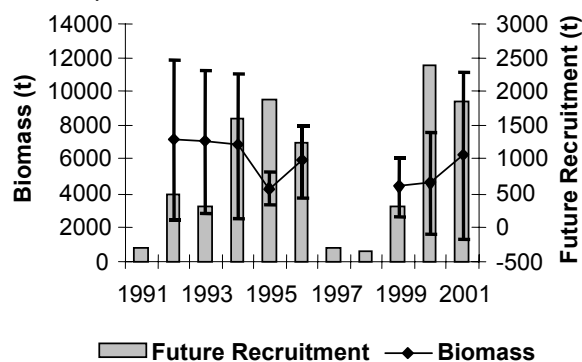
The survey has been conducted each year since 1990, except for 1997 and 1998. As the concentration of biomass straddles the boundaries of Areas 12, 18 and 19, seasonal movements of crab among these areas will affect the biomass level in any given area.

Up to now, the commercial biomass index has been interpreted as absolute. However, this is based on two important assumptions. First, except for very old crab, there was no loss (natural mortality) between the survey and the beginning of the fishing season nine

months later. Second, the catchability of the trawl was equal to 100%. Until these factors are assessed, the survey estimate should be considered as a relative index of abundance.

The commercial biomass index from the 2001 trawl survey is 1,063t ($\pm 115\%$), which represents an increase of 64% from the 2000 estimates. The recruitment to the fishery is 817t ($\pm 123\%$) constituting 77% of the total biomass index. An increasing trend in the biomass index of very old crabs has been observed since 1999.

Commercial Biomass Index (t) and Abundance Index of Future Recruitment (Adolescent Crabs ≥ 56 mm) in Area 18



Sources of Uncertainty

Research is needed to resolve uncertainties in the population model due to the unknown catchability of the trawl, movement of adult crab in and out of the surveyed area, unknown natural mortality of commercial crabs, errors in the classification of carapace condition and statistical errors in the forecast.

There is a discrepancy in the proportion of old crabs (category 4) found in the trawl survey and the observer program. The classification of carapace condition by observers needs to be verified.

Seasonal movement between areas may occur from the time of the trawl survey and

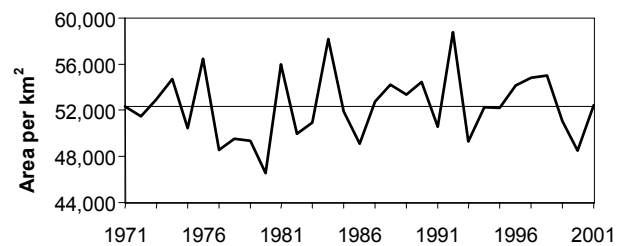
the beginning of the subsequent fishing season (especially adult crabs of commercial size that have recently moulted). Movement of crabs between Areas 12, 18 and 19 is assumed, but not explicitly taken into account in the assessment.

Ecosystem Considerations

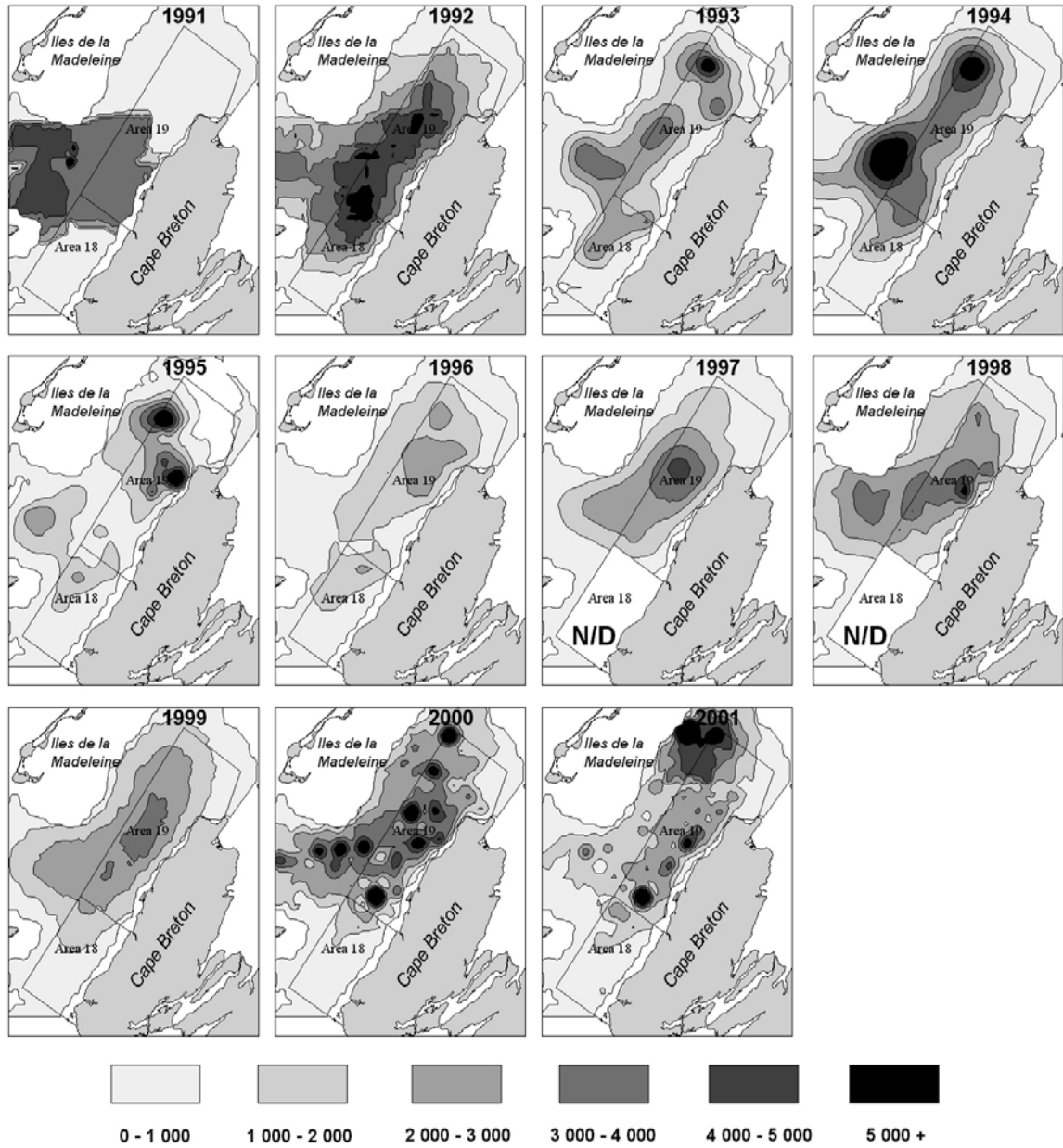
Environmental factors such as water temperature, can affect the moulting and reproductive dynamics as well as the movement of crab. Bottom temperatures in the southern Gulf of St. Lawrence and in the northern Scotian Shelf have been generally less than 3°C, which are ideal conditions for snow crab. Bottom temperatures within the snow crab areas of the southern Gulf were generally colder than the average in 2001. There was an increase in the snow crab habitat index during the September groundfish survey. This was largely due to a significant increase in area covered by

temperatures of 0-1°C and more crabs were caught in the annual snow crab survey at these temperatures. In spite of the generally colder conditions, there was a decrease in the area of the bottom covered by temperatures less than 0°C compared to 2000. Lower water temperatures in 2001 are possibly due to cold water advected into the Gulf of St. Lawrence from Labrador Shelf through the Strait of Belle Isle. The present temperature conditions are considered favorable for snow crab.

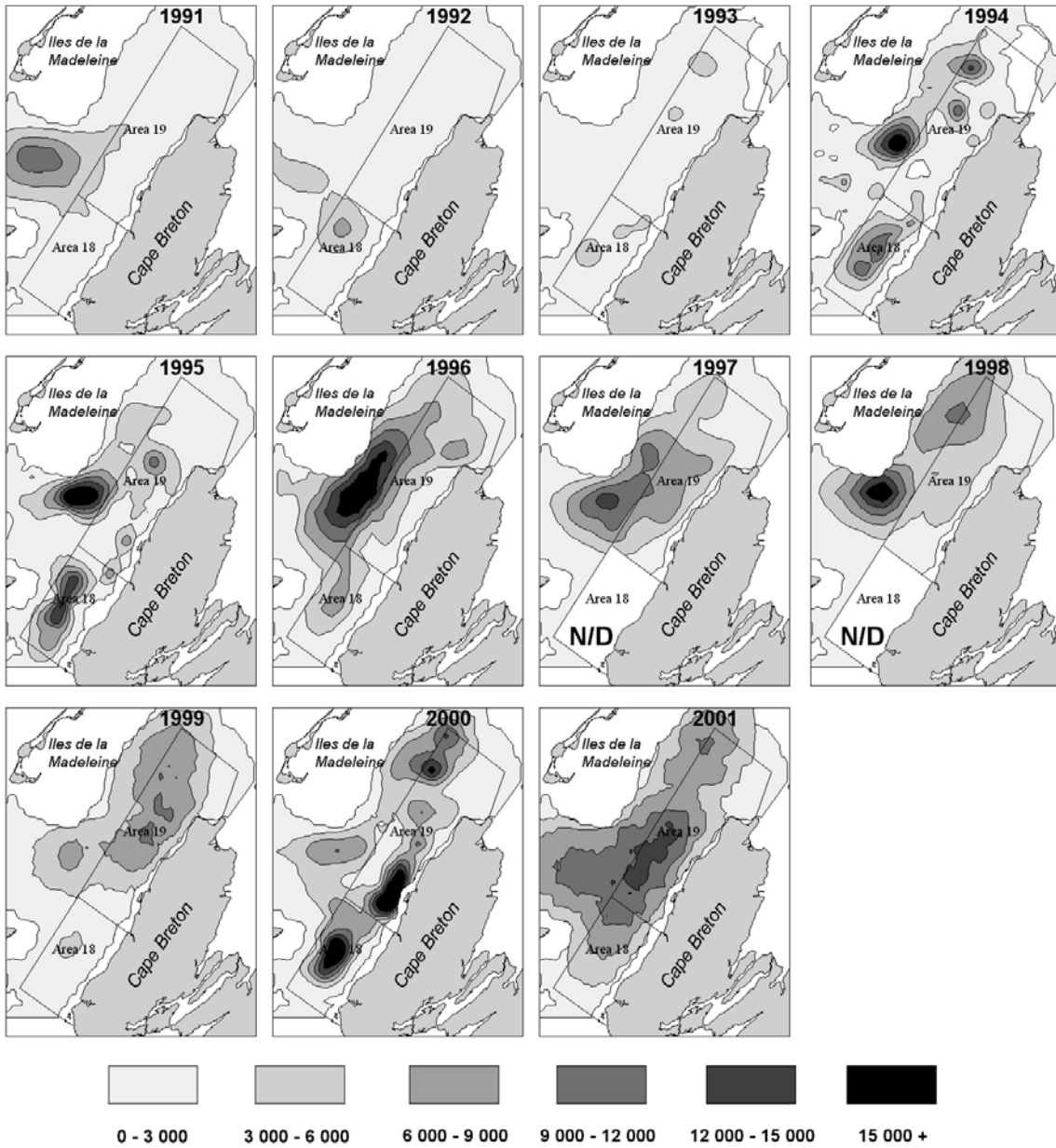
Snow Crab Habitat Index



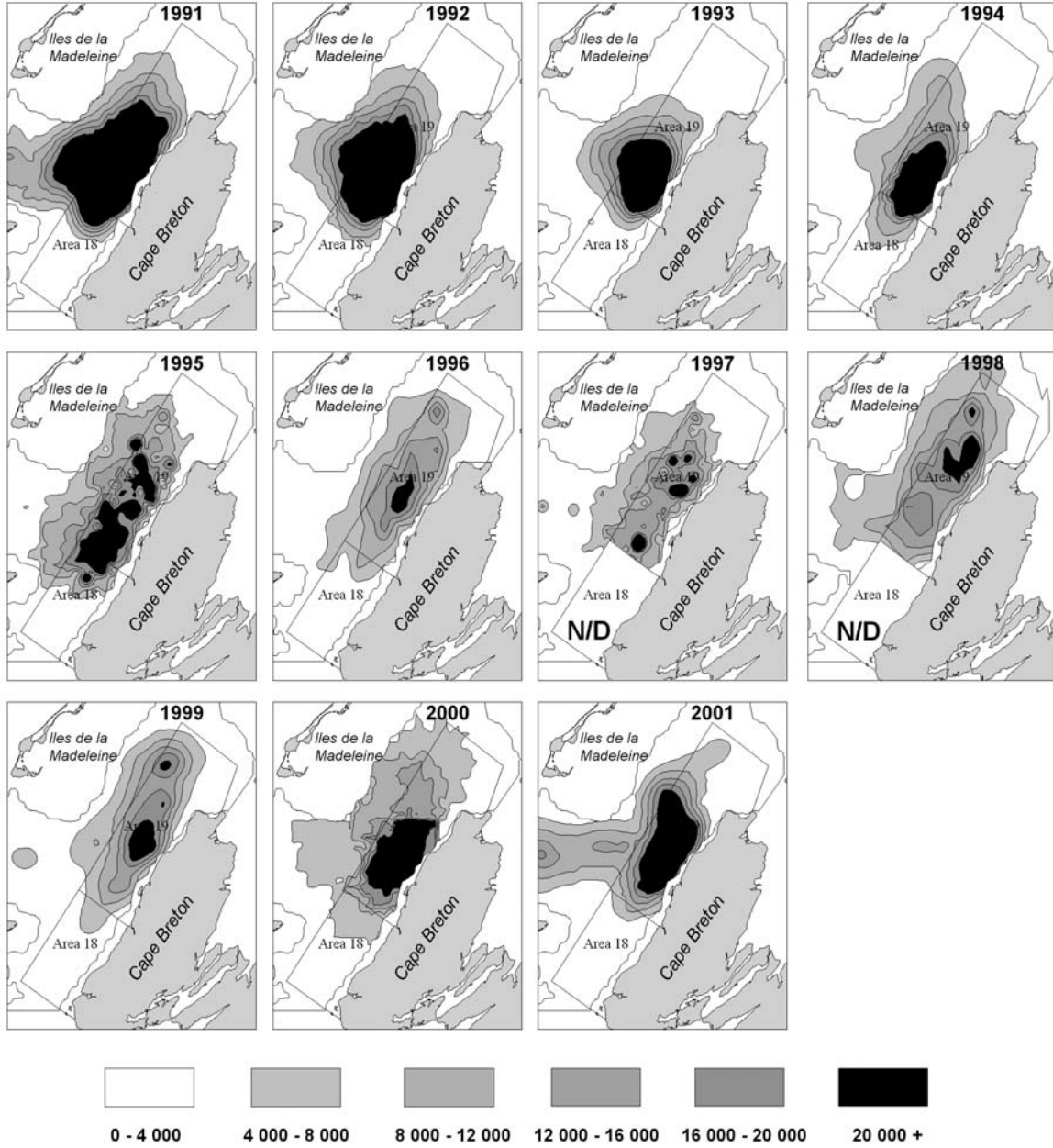
Density (crab/km²) Contours of Adult Male Crab ≥ 95 mm CW



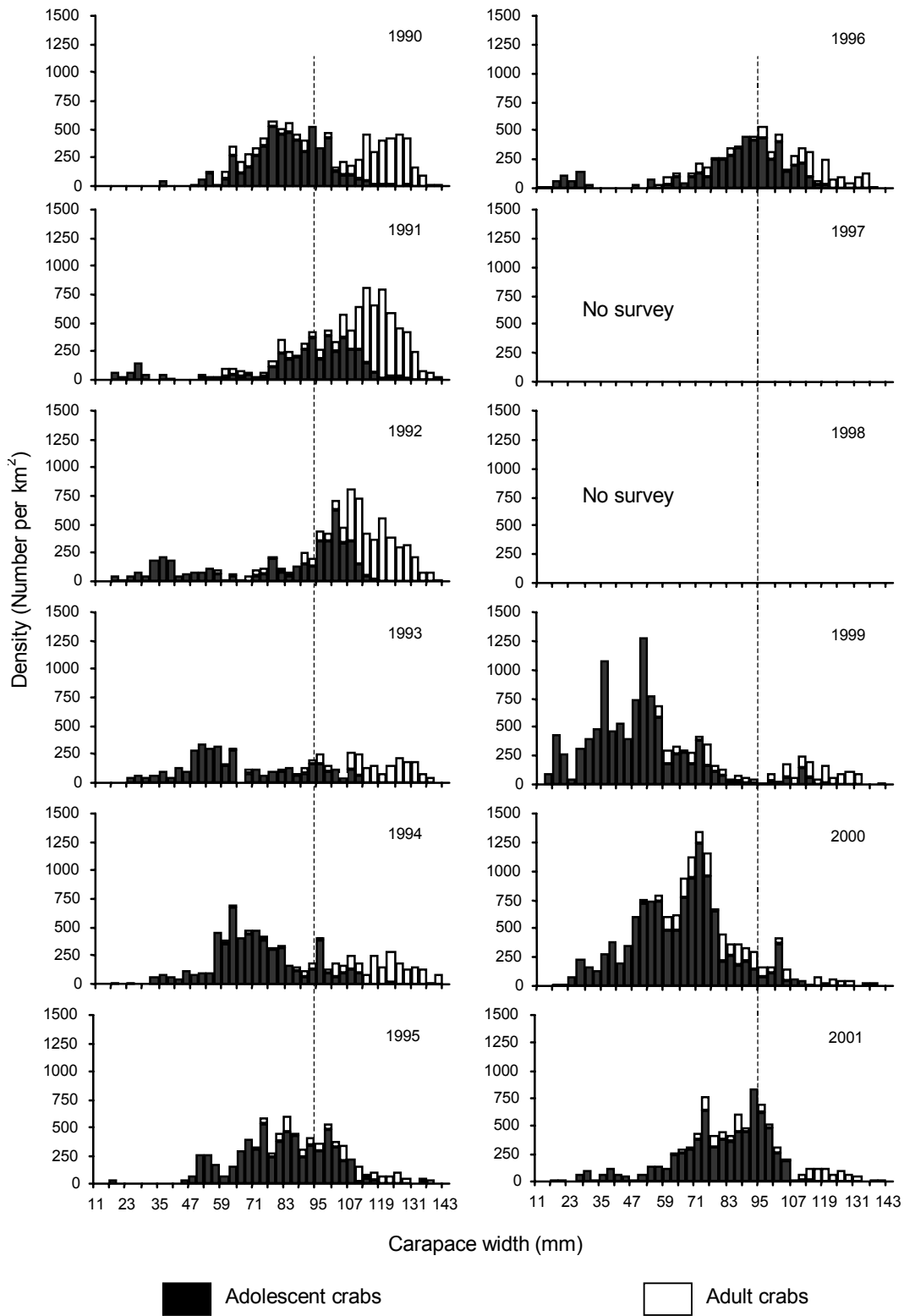
Density (crab/km²) Contours of Adolescent Male Crab $\geq 66\text{mm CW}$



Density (crab/km²) Contours of Mature Females



Size Frequency Distributions of Male Crab Sampled During the Trawl Survey in Area 18 after the Fishing Season



Outlook

The indicators provide both positive and negative outlooks for the 2002 fishery. There has been an increase in the commercial biomass and recruitment indices. The relative abundance of pre-recruits R-3 and R-2 is increasing, but it is uncertain if these crabs will remain in the area. In the 2001 fishery, only 53% of the quota was caught. The mean CPUE was the lowest level on record since 1986, while the mean size of commercial crab is declining. An increase of soft-shelled crab in the commercial catches is expected in the 2002 fishery.

Based on the method used for the past decade, a commercial biomass of 1,063t is comparable to values used in previous years. This value represents a 64% increase compared to the 2000 estimate.

The migration of crabs among Areas 12, 18, and 19 make it impossible to project a fishable biomass with certainty, though there is no reason to change the harvest strategy of previous years for the 2002 fishery.

Management Considerations

The area is not based on a biologically differentiated stock. Movement of crabs between the survey and the following fishery could affect the exploitable biomass in these small areas.

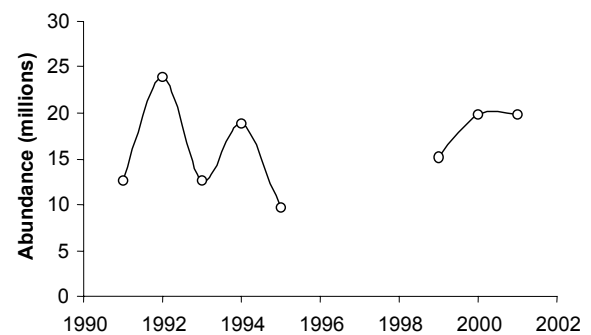
It is difficult to suggest a long-term fishing strategy because the main fishing activities in this area occur in about a quarter of the area available and a seasonal movement of crabs towards deeper waters is suspected.

It would be appropriate to follow the soft-shelled crab protocol in order to protect the future recruitment to the fishery.

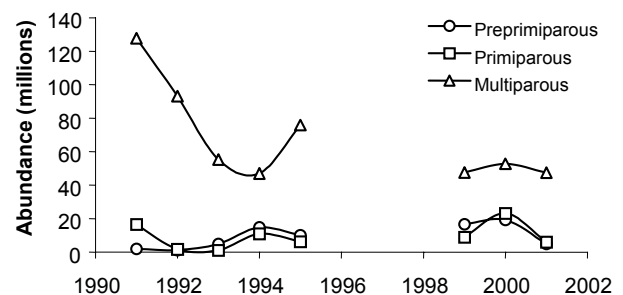
Biological Considerations

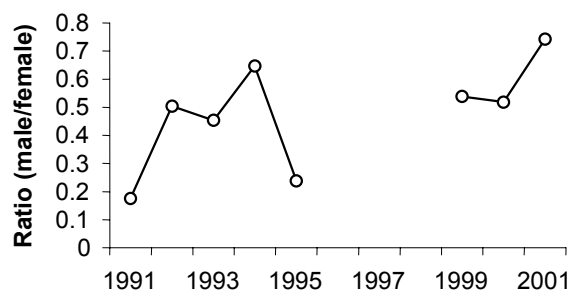
The abundance of preprimiparous, primiparous and multiparous females have been estimated through the years using data gathered during the trawl survey in the southeastern unit of the southern Gulf (Areas 18 and 19). Compared to the abundance of males $\geq 95\text{mm CW}$, this allows assessment of the reproductive potential of the stock. Close monitoring of the parental stock is necessary during the periods when an increase in the abundance of preprimiparous females will be observed.

Adult Male $\geq 95\text{mm}$



Female Abundance



Adult Males ($\geq 95\text{mm}$) vs. Mature Females**For more Information**

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References

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