

Rock Crab of the Inshore Waters of Québec

Background

Exploitation of the rock crab on Canada's Atlantic coast is relatively new. Experimental fishing began in the southern part of the Gulf of St. Lawrence in 1974. In Québec, markets developed later, and fishing began only in 1988. After a mere two years of operation, however, fishing practically ceased for lack of buyers, but a new start was made in 1995.

When fishing first began, DFO implemented a management plan to control development of this new fishery and maintain the population's reproductive potential. Since 1989, fishing has been regulated by a minimum legal shell width of 102 mm (4"), a ban on landing females, use of selective gear to minimize incidental lobster catches, and a limit on trap numbers. The number of licences is limited in certain areas, as are catches. We reiterate the need for slow and cautious development of this fishery because of concerns over the possible impact of rock crab harvesting on lobster stocks. The two species interact sufficiently to justify strict and cautious management of the crab fishery to prevent any overfishing.

Summary

- In 1997, Québec rock crab landings were 1,040 t, a 51 % rise from 1996. In the Gaspé, landings totalled 592 t, accounting for 57 % of Québec landings. In the Magdalen Islands, landings increased by 125 % from 1996, reaching 448 t, 43 % of Québec landings. The rock crab fishery is still expanding, and the opening of new fishing grounds in 1997 contributed to the increase in landings.
- In the Gaspé, catch rates have been falling since 1995, quite steeply in some areas. In the Magdalen Islands, 1997 catch rates were lower than in 1996 but equivalent to those of 1995.
- Declining catch rates may reflect depletion of the accumulated biomass of these virgin stocks, but they could also be due to changes in fishing patterns in space and time in relation to seasonal crab movements. At present, it is hard to detect the effects of harvesting on the populations.
- We recommend no increase in exploitation levels over those of 1997 in those areas that have been fished.

Biology

The rock crab, *Cancer irroratus*, is found all along the east coast of North America from Labrador to South Carolina. The species is

associated with various bottom types, from rock to loose material. Crabs of commercial size, and more generally those with a cephalothorax width (CW) of over 50 mm, live on sandy or muddy bottoms, while a smaller portion of the adult population cohabits with other age groups (juveniles and adolescents) on rocky bottoms, along with lobsters. Berried females show a marked preference for soft substrates in which they can bury themselves and where they form aggregations.

There is significant sexual dimorphism in terms of size; males may attain a CW of 140 mm, while females rarely exceed 100 mm. Breeding takes place in the fall, after the females have moulted and while their shells are still soft. Males moult in winter, so that in the breeding season their shells are fully hardened. Crab shells take from two to three months to harden completely. Females reach sexual maturity at a CW of about 60 mm, while males do so at a slightly larger size (CW 70 mm). The females lay their eggs and then keep them under their abdomen for nearly a year. A female with a CW of 60 mm may lay 125,000

eggs and a 90 mm specimen as many as 500,000. The eggs hatch the summer after they were laid, and the larvae remain in the water column from mid-June to mid-September. In the fall, the larvae metamorphose into tiny crabs (megalops) and begin their benthic life shortly thereafter. Juveniles (CW \leq 15 mm) are found mainly at shallow depths on bottoms which offer shelter from predators and water turbulence. Growth data for rock crab in the Gulf of St Lawrence are sparse. Data from more southerly regions suggest that the species may attain commercial size at about five years of age and live to about seven.

The rock crab is omnivorous and feeds opportunistically. There is no evidence that lobster constitutes a significant part of the rock crab's diet, but analysis of lobster stomach contents has shown the rock crab to be a major item on the lobster's menu right from its larval stage.

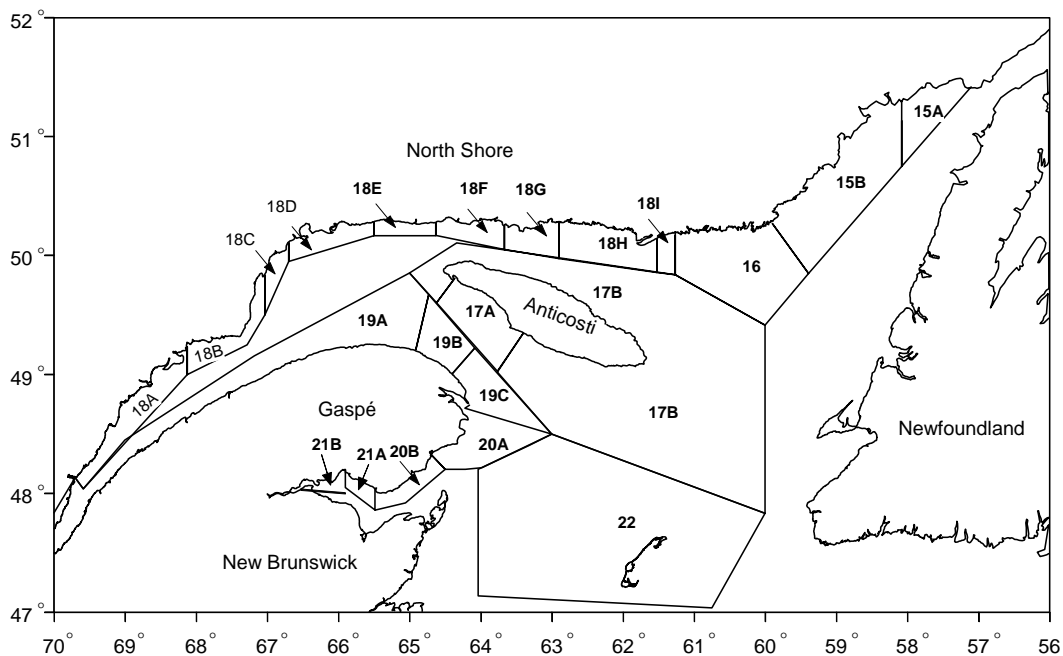


Figure 1. Rock crab fishing areas of Québec.

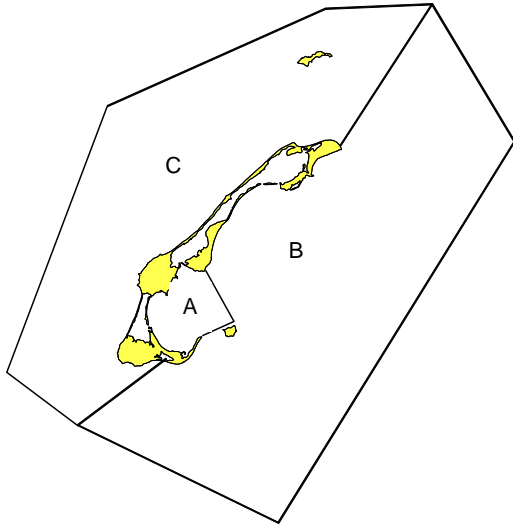


Figure 2. Location of rock crab sub-areas in the Magdalen Islands (Area 22).

Resource management

The rock crab fishery is governed by the same management areas as the lobster fishery (Figure 1). In the Magdalen Islands, however, three sub-areas were delineated in 1997 to provide for better distribution of the fishing effort, which had been concentrated almost exclusively in Plaisance Bay (22A) in 1996. Rock crab is taken by lobster fishermen during the lobster season, when crab is authorized as an incidental catch. Outside the lobster season, the rock crab fishery is reserved for crab licence holders, who then practise a directed fishery.

Because of the many applications for licences to fish rock crab submitted in the late 1980s, DFO implemented a management plan to control development of this new fishery; the plan also incorporated measures designed to maintain the population's reproductive potential. The Department issued 24 exploratory licences for a directed fishery on the south coast of the Gaspé (areas 20A, 20B, 21A and 21B), prorated in each lobster fishing area to the number of lobster li-

cences. In addition, a preventive quota was imposed. This was set empirically on the basis of crab density data in the literature and observations by divers in Chaleurs Bay. The overall quota was broken down among areas according to the relative length of coastline. The fishery was further regulated by a minimum legal carapace width of 102 mm (4"), a ban on landing females, use of selective gear to minimize incidental lobster catches, and a limit of 150 traps per licence. A season was also imposed, beginning at the close of the lobster season and running until the quota has been met. The fishery is still managed under this plan. However, the results of the 1995 fishery in the Gaspé, where some areas were shown to be more productive than others, led to a re-assignment of the overall quota among the areas. In the Magdalen Islands, fishing began in 1995, and a plan similar to the one in force in the Gaspé was introduced. A preventive quota was also imposed, based on data from an exploratory rock crab fishery in the Islands conducted in 1990.

Numbers of licences issued and quotas set for the various fishing areas of the Gaspé and the Magdalen Islands in 1995, 1996 and 1997 are shown in tables 1 and 2 respectively. In the Gaspé, overall quotas were set by fishing area, whereas in the Magdalen Islands they were broken down into individual quotas. For the time being, licences are not permanent but exploratory. In areas 21A and 21B in the Gaspé, fishing effort increased from 1995 to 1997. Fishermen had asked for access to this new fishery for all lobster fishermen in these two areas. The number of fishermen gradually rose, from 4 in 1995 to 7 in 1996 and 14 in 1997. Although the number of participants has more than tripled, effort in terms of number of traps authorized has grown by only 20 %.

Table 1. Quotas in tons and licences issued for a directed rock crab fishery in Gaspé fishing areas, 1995 to 1997. Number of traps per licence is shown in parentheses.

	1995	1996	1997
19	-	-	-
		7 licences (100)	16 licences (100)
20A	555 t	375 t	375 t
	11 licences (150)	7 licences (150)	7 licences (150)
20B	433 t	375 t	375 t
	8 licences (150)	10 licences (150)	4 licences (150)
			5 licences (100)
21	87 t	375 t	375 t
21A		4 licences (100)	4 licences (75)
			3 licences (40)
	4 licences (150)		1 licence *
21B		3 licences (100)	3 licences (75)
			2 licences (40)
			1 licence*

* aboriginal licence

Fishermen with 150 traps in 1995 agreed to halve their number to accommodate new participants.

Description of the fishery

Landings

Fishing for rock crab along Canada's Atlantic coast is relatively new. Experimental exploitation began in the southern Gulf of St Lawrence in 1974. The fishery grew quite slowly between 1974 and 1982, with landings varying from 6 t to 227 t (Figure 3). Starting in 1983, interest in the rock crab grew as markets developed. Since 1994, recorded landings in Québec and the Maritimes have exceeded 4,000 t and were 5,739 t in 1997.

In Québec, markets developed later, and the fishery really only began in 1988. After a mere two years of exploitation, however, operations practically ceased because of a dearth of buyers. There was a revival of the fishery in 1995, when 829 t of crab were landed (Table 3). In 1997, landings reached 1,040 t, an increase of 51 % over 1996. In 1997, rock crab was fished in the Gaspé and the Magdalen Islands, but no landings were recorded on the North Shore or Anticosti

Table 2. Quotas in tons and licences issued for a directed rock crab fishery in the fishing areas of the Magdalen Islands from 1995 to 1997. Each licence authorizes 100 traps.

	1995	1996	1997 ³
22	272 t	318 t	
	incidental catch 136 t	4 licences x 56.8 t ¹	
		2 licences x 45.5 t ²	
	directed fishing 6 licences x 22.7 t		
22A			136 t 6 licences x 22.7 t
22B			182 t or more* 6 licences x 22.7 t *(+ unused portion in 22A) 1 temporary allocation of 45.5 t
22C			182 t 4 licences x 45.5 t

¹:11.4 t,

² 22.7 t per licence issued to lobster fishermen (incidental catch)

³ Quotas include 91 t set aside for lobster fishermen (incidental catch)

Island.

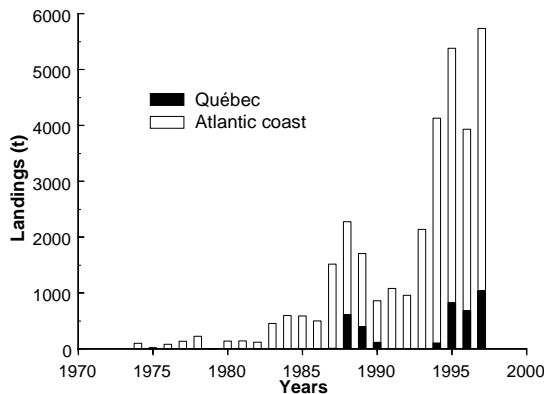


Figure 3. Landings (t) of rock crab in Québec and on the Atlantic coast from 1974 to 1997.

Table 3. Rock crab landings (t) in Québec, 1994 to 1997.

	94	95	96	97*
19			6	59
20A		39	21	55
20B		221	148	182
21A		162	163	157
21B		148	151	139
Total Gaspé	105	570	489	592
22A				96
22B				218
22C				134
Total Magdalen Islands		260	199	448
Total Québec	105	829	688	1 040

* preliminary data

In the Gaspé, 1997 rock crab landings were 592 t, accounting for 57 % of the Québec total. They were up 21 % from 1996. A new fishery in Area 19 (Gaspé North) is part of the reason for this increase. Although 16 licences were issued, however, only three fishermen were particularly active, accounting for 93 % of the Area's landings. Landings grew in areas 20A and 20B in 1997, but in 20A they were well below the quota (55 t

vs 375 t). Landings in Area 20B were slightly higher than in 20A, but thus far they remain below the quota (182 t vs 375 t); landings were drawn almost solely from the sectors between Paspébiac and Bonaventure (20B7 and 20B8). Areas 21A and 21B are the most productive in the Gaspé, and there landings have been fairly constant over the the past three years, varying between 140 and 160 t. Landings in both areas are roughly equal.

In the Magdalen Islands, 1997 landings were up by 125 % over 1996, from 199 to 448 t (Table 3), accounting for 43 % of the Québec total. The increase in landings is due in part to the opening of new fishing territories on the north side of the Islands (Bassin to Pointe de l'Est) (Area 22C), where 134 t were landed. In Area 22A, 1997 landings dropped because of the quota imposed there. The purpose of this restriction was to reduce fishing pressure in the sector and force fishermen to explore other territories. In 1997, 96 t of a possible 137 t were landed in this Area, compared to 192 t in 1996. On reaching their Area 22A quota, fishermen had to shift their fishing effort to 22B, where 1997 landings were 213 t, as opposed to 7 t in 1996. The Magdalen Islands fishing season ran from August 24 to November 1, 1997. The 1996 season had been somewhat shorter and later (October 11 to November 20).

Between 1995 and 1997, incidental catches during the lobster season dropped considerably, accounting for a mere 4 % of all 1997 landings. They had been 21 % in 1995 and 3 % in 1996. Since 1996, there has been no recorded incidental fishing by lobstermen in the Magdalen Islands.

Catch rates

An abundance index for commercial-size rock crab can be derived from catches per unit effort (CPUE), obtained from dockside and at-sea sampling of commercial catches (directed fishing). In the Gaspé, analysis of

1995 CPUE revealed a gradient in catch rates, increasing toward the head of Chaleurs Bay (Table 4). In 1996, the same gradient was apparent, though catch rates in Area 20A had nearly doubled from the previous year and were close to those seen in 20B. In 1997, this gradient was rather less pronounced because of a sharp drop in fishing effort in some areas. In Area 20B, CPUE fell from 10.6 to 4.1 kg per trap, a decline of 61 %. In areas 21A and 21B, rates fell by 21 % and 14 % respectively. In Area 19, catch rates were found to be lower than elsewhere in the Gaspé, with a downward gradient toward the west. However, they grew from 1996 to 1997, probably reflecting a better understanding of crab distribution.

Table 4. Rock crab CPUE (kg per trap) obtained from catch sampling (dockside and at sea). Number of samples (total catch from one vessel) is shown in parentheses.

	1994	1995	1996	1997
19A				0.9 (1)
19C				3.7 (3)
20A		4.1 (10)	8.6 (1)	6.5 (6)
20B	9.4 (6)	6.9 (19)	10.6 (4)	4.1 (3)
21A	13.0 (2)		11.8 (9)	9.3 (4)
21B		20.8 (1)	14.7 (5)	12.7 (6)
22		14.5 (6)	14.0 (1)	12.3 (10)

Catch rates were also calculated from logs kept by some Gaspé fishermen in areas 20B, 21A and 21B (Table 5). The data thus obtained are more representative, since they cover the entire fishing season. These data also show a fall in CPUE in 1997, though in some cases not so severe as reported above. In Area 20B, for instance, CPUE for the entire season slid from 7.2 kg per trap in 1996 to 5.6 kg in 1997, a 22 % decline. In areas 21A and 21B, reductions were 13 % and 34 % respectively.

Day-to-day trends in CPUE for areas 20B, 21A and 21B show a 50 % falling-off of catch rates from the beginning to the end of

the season. No such drop was seen in 1995 or even in 1996.

In the Magdalen Islands, CPUE fell slightly, from 14.5 kg per trap in 1995 to 12.3 kg in 1997 (Table 4). Data taken from logs, which are mandatory in the Islands and completed by all fishermen, also show a decline, from 17.9 kg per trap in 1996 to 13.6 kg in 1997 (Table 5). However, 1997 yields are similar to those for 1995 (13.5 kg per trap). There was nonetheless a fall in catch rates in Plaisance Bay (Area 22A) from 1996 to 1997, from 17.9 kg per trap to 12.3 kg, having been 13.7 kg in 1995. Yields were also down in Area 22B from 1996 to 1997, though comparable to those of 1995 (15.2 kg per trap). 1997 yields in Area 22C, at 12.5 kg per trap, were slightly above 1995 figures.

In general, the year-to-year yield differences in areas 22B and 22C are more likely to reflect geographic variances in crab concentrations than the effects of harvesting. The fishing season may also affect yields. It has already been noted that rock crab tend to be more concentrated in the fall. This may even account for the higher yields in Plaisance Bay in 1996, when fishing took place between mid-October and late November. In 1995 and 1997, fishing ended in mid-October. In 1997, daily CPUE were fairly stable throughout the season in areas 22A and 22C. In Area 22B, there was a drop in yields in the second half of the season, from close to 20 kg per trap to around 10 kg.

Table 5. Rock crab CPUE (kg per trap) according to logs.

	1995	1996	1997
19A		2.6	3.7
19C		4.8	8.9
20A			
20B		7.2	5.6
21A		9.3	8.1
21B	14.8	16.1	10.6
22A	13.7	17.9	12.3
22B	15.2	17.6	15.3
22C	10.5	-	12.5
22total	13.5	17.9	13.6
	(A+B+C)	(A+B)	(A+B+C)

In the Gaspé as in the Magdalen Islands, there seems generally to have been no significant change in size composition over the last three seasons of fishing. The average size of Gaspé commercial crabs (≥ 100 mm carapace width) fluctuated between 111 and 117 mm in 1997, similar to 1995 and 1996 figures. In the Magdalen Islands in 1997, average crab size was between 119 and 126 mm, slightly above 1995 figures.

Conclusions and recommendations

The rock crab fishery is still growing. In 1997, new areas were opened to fishing, notably on the north shore of the Gaspé (Area 19) and on the north side of the Magdalen Islands (Area 22C). Moreover, within some areas, new fishing grounds have been discovered or exploited (south side of the Magdalen Islands, 22B). In other areas, it emerges that fishing has been conducted thus far in a rather limited territory, as for instance in Area 20B, stretching from Chandler to Bonaventure, where fishing has been concentrated in the west, between Paspébiac and Bonaventure. The same is true of Area 20A, where harvesting has been centred on Gaspé Bay and off Grande-Rivière. There are thus territories to be explored, which the opening of new markets will surely encourage over the next few years. Other areas, in contrast, seem to have been already fully

explored. This is certainly the case in areas 21A and 21B.

Analysis of abundance indices derived from directed fishing shows that there are cases where catch rates have fallen from those recorded in the early years of the fishery. Such changes may reflect an actual depletion of the accumulated biomass of virgin stocks. When a new stock is fished, an aggregate biomass is being exploited, and fishermen move around frequently to maintain high catches, and it is normal for yields to decline after a while, though in the longer term they adjust to the stock's production level. It is when this balance is struck that we can determine whether effort should be increased or reduced in a specific area.

It is important to note that falling yields may be due to other factors than exploitation as such. The rock crab is mobile and moves seasonally between deep and shallow waters. The species generally concentrates in shallow waters in the fall. This means that fishing locations and times may affect yields, and it is possible that the variations in CPUE seen in recent years reflect spatial-temporal changes in fishing patterns. Yields may also be directly affected by crab catchability, which depends on water temperature and the crab's moult cycle.

For this reason, it is hard to be sure, after such a short observation period, what the effects of exploitation are. We therefore recommend no increase in exploitation levels from those of 1997 in those sectors that have been fished. We recommend keeping to the *statu quo* for another two years to allow for a better assessment of the effects of fishing. We recommend very close monitoring of all areas which have experienced a drop in CPUE. To this end, it is imperative that all participants in the directed fishery complete their daily logs.

We reiterate the importance of a slow and cautious development of this fishery, given

the worries voiced by many of the people concerned as to the possible impact of the crab fishery on lobster. Harvesting of the rock crab will have the effect of reducing the local abundance of large specimens. This should have no immediate adverse impact on lobster, as the latter do not prey on crabs of this size. Negative consequences could be expected only if the quantity of small crabs, which are lobster prey, diminishes to the point where lobster find them harder to come by. Such a situation could arise in a case of recruitment overfishing. Protecting breeding potential by maintaining a minimum legal size greater than sexual maturity size and by controlling development of this young fishery to hold exploitation rates in check should help prevent such overfishing. The two species interact sufficiently to justify tight and cautious management of the rock crab fishery to prevent any overfishing.

For more information:

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