

## Snow Crab of the Estuary and Northern Gulf of St. Lawrence (Areas 13 to 17)

### Background

The commercial snow crab fishery in the Estuary and northern Gulf of St. Lawrence intensified starting in the late 1970s. The northern Gulf is divided into five management areas, numbered 13 to 17 from east to west. TAC-based management was gradually introduced in the region between 1985 and 1994. The fishery is directed exclusively at males with a carapace width (CW) of at least 95 mm.

Male snow crab stop growing after their terminal moult. The male is referred to as an adolescent (recognized by its small claws) prior to the terminal moult and as an adult afterward (large claws). Males range in size from 40 to 165 mm CW after the terminal moult. Recruitment in snow crab varies over an intrinsic cycle of about eight years, generally characterized by five years of moderate-to-high recruitment (recruitment wave) followed by three years of low recruitment (recruitment trough). Males reach legal size at about nine years of age. The 1985-1987 year-classes, which are currently being harvested, form a recruitment trough. The biomass and, hence, catches and catch rates are thus lower than the values observed between 1991 and 1995, when the last recruitment wave occurred. This situation, observed until 1998-1999 in areas 17 and 16, should persist until 2000-2001 in areas 15, 14 and 13, when the 1988-1992 year-classes, which will form the next recruitment wave, begin to be recruited to the fishery.

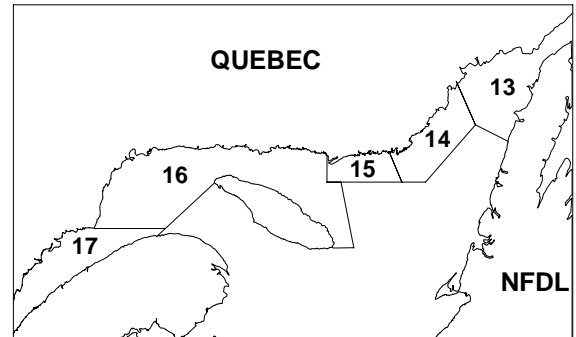


Figure 1. Snow crab management areas in the northern Gulf of St. Lawrence.

### Summary

- **In Area 17**, all the indicators are positive and show that the harvestable biomass is increasing as a result of the 1988-92 recruitment wave. Since the resource is dominated by recently moulted adult crab, natural mortality from senescence will be low over the coming years.
- Recruitment of legal-size crab should be above average until 2001, and the small size of the 1993-95 year-classes suggests that recruitment will drop off sharply starting in 2002. The 1996 year-class appears stronger and could lead to an upturn beginning in 2006.
- **In Area 16**, most current status indicators are positive and show that harvestable biomass increased in 1999.
- Recruitment should improve in 2000 for the area as a whole, with the increase becoming perceptible in the east and continuing in the west until 2001 or 2002. However, a loss of biomass can be anticipated because of natural mortality from senescence, particularly in the eastern part of the area.
- **In the areas farther east (15, 14 and 13)**, most current status indicators are mixed.

- **In Area 15**, the CPUE is declining but still high, despite the low recruitment for several years, but future status indicators for the population are negative in the short term.
- **In Area 14**, most current status indicators are positive and suggest that harvestable biomass increased slightly in 1999. Recruitment in 2000 should be up from 1999, but will still be low. It should grow in the coming years, however, and could maintain high levels well beyond 2002.
- **In Area 13**, several current status indicators are negative and suggest overall that recruitment in 1999 was low and that the abundance of legal-size crab was stable from 1998. Short-term recruitment indicators are very low, suggesting limited recruitment in 2000. In contrast, longer term population status indicators suggest that, like in Area 14, recruitment will increase starting in 2001 and could maintain high levels well beyond 2002.
- Significant warming and thinning of the cold intermediate layer that bathes the snow crab habitat were observed in 1999, and if this trend continues, the abundance and range of the snow crab could decline as a result.

## The fishery

### Location and historical context

The territory is divided into five management areas (Figure 1), corresponding to three broad geographic regions: the Upper North Shore and much of the north shore of the Gaspé Peninsula (Area 17 or Estuary), the Middle North Shore (Area 16) and the Lower North Shore (areas 15, 14 and 13).

Snow crab is fished with baited traps. Conical steel models, such as the Japanese trap measuring 1.2 m in diameter at the base,

are the most popular. Since 1990, the fishery in the Estuary and Middle North Shore areas has opened at break-up (March-April) and generally closed after 10 to 14 weeks (June-July). On the Lower North Shore, the opening of the fishery is often delayed because the ice cover stays longer, and the season generally does not begin until June, ending in October or November.

The snow crab fishery in the Estuary and northern Gulf of St. Lawrence began in the late 1960s. From 1968 to 1971, vessels from Quebec and New Brunswick landed catches of about 1,000 t from around Port Cartier on the Middle North Shore. Subsequently, a limited inshore fishery operated, with annual landings of roughly 200-300 t until the late 1970s. The fishery experienced a boom from 1979 to 1985, when the number of participants, fishing effort, geographic extent and landings increased substantially.

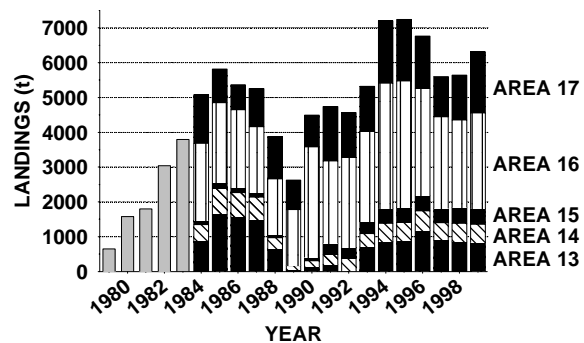


Figure 2. Snow crab landings in the northern Gulf of St. Lawrence

Between 1987 and 1989, landings for the entire region of the Estuary and northern Gulf of St. Lawrence plummeted from 5,255 t to 2,622 t (Figure 2). This drop was accompanied by marked decreases in catches per unit of effort and ever greater catches of white crab, as a direct result of a recruitment trough affecting the 1977-1979 year-classes. Beginning in 1990-91, the white crab problem gradually disappeared,

catches per unit of effort rose, and landings increased to a record level of 7,245 t in 1995, thanks to the advent of the recruitment wave made up of the 1980-84 year-classes. Landings slipped somewhat in 1996 (6,716 t) and 1997 (5,599 t) as a result of the decrease in the TAC (total allowable catch) in all areas, before rising slightly in 1998 (5,715 t). The TAC increase in areas 17 (35%) and 16 (6%) in 1999 brought catches up by 11% to total 6,329 t in all areas as of December 1.

### ***Fishery management***

Although the fishery was originally managed by controlling fishing effort, a TAC was gradually introduced in the different fishing areas between 1985 and 1994. The number of traps authorized per licence is limited to 150 Japanese traps; however, fishers may substitute one regular trap (maximum volume 2.1 m<sup>3</sup>) for two Japanese traps (maximum volume 0.44 m<sup>3</sup>).

As elsewhere in Canada, the minimum legal size is set at 95 mm, and the landing of females is prohibited. Since 1985, once the limit of 20% white crab in catches at sea has been exceeded, the fishery has automatically been closed in the area concerned to minimize mortality of these very fragile specimens that will be available to the fishery the following year. In addition, white crab may be returned to the water during the fishing season to enhance their value and give them a chance to reproduce.

### ***Resource status***

The status of the snow crab populations in areas 17 to 13 is established annually from available information. Data from statistics and sampling of the fishery provide the basis for our analyses. In 1999, fishers from all areas conducted a trap survey, and the results were incorporated into the stock status analyses. The results of three trawl

surveys conducted in areas 17, 16 and 14-13 were also used.

### ***Snow crab in Area 17***

There are 22 active licences holders in Area 17. The first TAC was set at 1,300 t in 1992 (Table 1). In 1999, the fishery opened on April 1, one week later than in 1998, and closed on July 30. The TAC was raised by 35% (1,775 t) in 1999 to take into account the increase in the abundance of crab in this area. A 50-t special allocation was set aside for non-crabbers. Catches recorded to December 1 totalled 1,758 t.

### ***Resource status in 1999***

The catch rate increase begun in 1998 grew in 1999 from 8.6 (1998) to 12.0 kg/Japanese trap, suggesting a rise in harvestable biomass. The increase was greater on the south shore (42%) than on the north shore (18%) (Table 1), despite a transfer of effort to the south shore since 1996. The proportion of catches from the north shore, in steady decline since 1995, was 38% of total landings in 1999.

The abundance of new crab (conditions 1 and 2), estimated at 26% in samples taken at sea in 1999, doubled from 1998 (12%). Intermediate-shell crab (condition 3) dominated catches at sea and dockside. Old crab (conditions 4 and 5), which had been declining since 1996, accounted for only 4.5% of catches in 1999, a historical low.

**The average CW of legal-size crab** caught at sea stabilized at 107.6 mm in 1999 after four years of decline, although the average size of landed crab, which had been dropping since 1997, fell again to 106.3 mm. In 1999, the average CW (103 mm) of new crab (conditions 1 and 2) caught at sea rose sharply from 1998 (97 mm). It is now close to the average CW of intermediate-shell (condition 3) crab (104 mm), which are

Table 1. Catch and effort data for Area 17.

Year	1983 to 1989 <sup>4</sup>	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
TAC	-	-	-	1300	1300	1820	1820 <sup>5</sup>	1547 <sup>5</sup>	1315 <sup>5</sup>	1315 <sup>5</sup>	1775 <sup>5</sup>
Catch <sup>1</sup>	1022	910	1562	1289	1305	1788	1774	1502	1156	1285	1758
Effort <sup>2</sup>	121.8	137.9	173.6	107.4	90.6	124.2	155.6	153.3	141.0	149.4	146.5
CPUE <sup>3</sup> : Total	8.5	6.6	9.0	12.0	14.4	14.4	11.4	9.8	8.2	8.6	12.0
North shore	8.4	7.7	10.0	12.4	15.2	15.7	11.7	10.3	7.7	7.4	8.7
South shore	7.4	5.3	7.8	11.5	13.2	11.4	9.7	9.3	8.5	9.2	13.1

1 Landings in metric tons, as at December 1, for 1999

2 Standardized effort in thousands of Japanese trap hauls

3 Catch per unit effort in kilograms per Japanese trap

4 Average for the period

5 Including special allocations

currently the most numerous, and greater than the average CW of old crab (conditions 4 and 5). This situation indicates that recruitment is clearly on the rise and that the marketable portion of the crab population in this area comprises increasing numbers of good-sized new crab.

**The post-season trawl survey** conducted on the north shore of Area 17 between late July and early August revealed an increase in abundance and biomass of 14% for legal-size snow crab in 1999, compared with 1998 (Figure 3). This increase, which was smaller than that in 1998, is attributed the arrival of the 1989-90 year-classes. Total mortality (including both natural and fishing mortality) was inexplicably high (65%) on the North Shore in 1999.

The proportion of new crab, on the rise since 1996, continued to grow in 1999 and reached 66%. In contrast, the proportion of old crab, falling since 1996, was down to only 6%. The average CW of legal-size crab, which had been declining since 1995, was up slightly in 1999 (105.4 mm) from 1998 (104.8 mm).

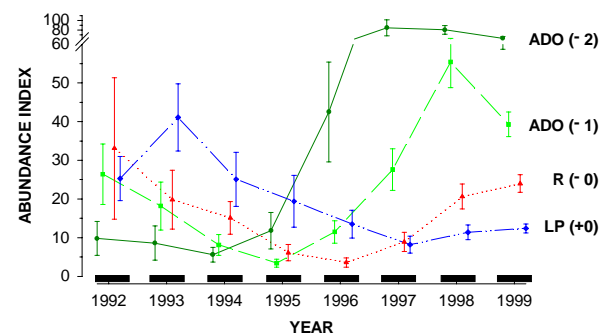


Figure 3. Abundance of male snow crab caught in trawl surveys in the Estuary between 1992 and 1999. **LP(+0)**: males left by the fishery during the survey year; **R(-0)**: males recruited to the fishery; **ADO(-1)**: adolescent males of 78–95 mm CW; **ADO(-2)**: adolescent males of 62–78 mm CW.

The abundance of legal-size crab should increase or stay at a high level until 2002, since the strength of the age-classes that will be entering the fishery in the short term, though declining, is high. The abundance index for adolescent males of 78-95 mm CW (ADO<sup>-1</sup>) is down 29% from 1998 but still high in terms of the average for the last seven years (Figure 3). The index for adolescent males of 62–78 mm CW (ADO<sup>-2</sup>) declined 22% from 1998, but it, too, is

still very high. The 1993-95 year-classes are weak and will likely form the next recruitment trough, while the 1996 and 1997 year-classes appear stronger and should yield an upturn.

Recruitment of adult females, which mature faster than males, has been declining since 1998. Because of the extensive recruitment of adult male crab, potential sperm limitation problems need not be feared in the short term.

**The post-season trap survey** showed trends consistent with those observed in the fishery and trawl survey. The average catch rate of legal-size crab, up significantly since 1996, rose sharply by 50% between 1998 and 1999 (Figure 4), reaching its highest level since

the start of the survey in 1996: 23.6 kg/trap (48 crab/trap). New crab made up 42% of catches and old crab about 5%, both down from 1998. Following a steep decrease between 1996 and 1997, the average CW of legal-size crab was 106 mm in 1999, up slightly from 1998 (105.4 mm). ADO-1 numbers dropped 19% from 1998.

**Outlook for Area 17 in 2000**

All indicators are positive and show that harvestable biomass is increasing as a result of the 1988-92 recruitment wave. This trend should hold until 2001, with recruitment starting to fall off afterward. Since the resource is dominated by recently moulted adult crab, natural mortality from senescence will be low over the coming

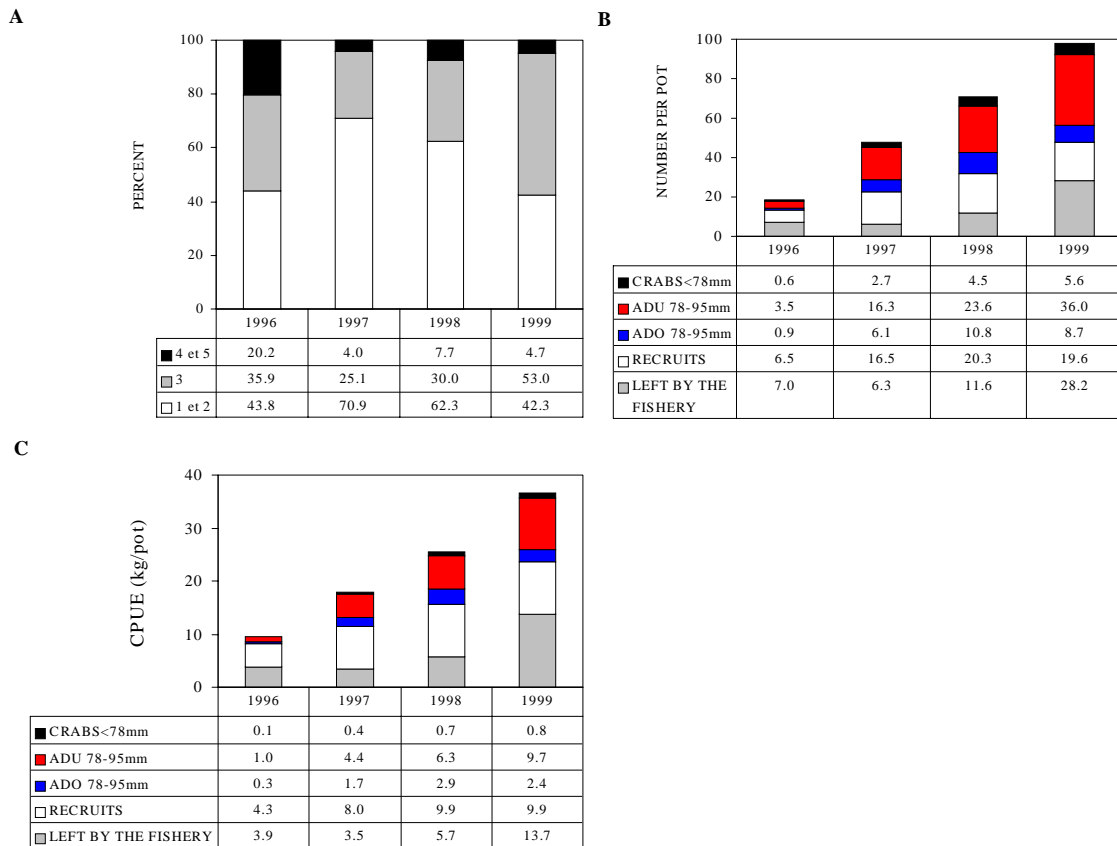


Figure 4. Results of the post-season trap survey conducted on the north shore in Area 17, from 1996 to 1999. (A) Carapace condition of legal-size males. Yields in crab/trap (B) and kg/trap (C) of the different groups of males.

years. The average CW of legal-size crab, in sharp decline for two years, began to increase in 1999, and this trend will continue for several years. Recruitment of adult females dropped sharply in 1999, and their reproductive status improved and should hold for the medium term.

On the north shore of the Estuary, the number and biomass of legal-size crab were approximately 14% higher in 1999 than in 1998, according to trawl survey data. The increase in the abundance index was smaller than expected, however, because of total mortality estimated at 62%. The post-season trap survey showed a 51% rise in CPUE in 1999 from 1998.

Approximately 60% of landings in 1999 (and 1997-98) came from the south shore of the Estuary, as opposed to about 34% prior to 1997. The size of the resource on the south shore of the Estuary is not quantified by means of comprehensive trap or trawl surveys, but data from the fishery and two trap lines set off Rimouski in 1999 suggest that crab demographic trends are the same as on the north shore and that the abundance of legal-size crab is even higher.

Assuming that the increase in abundance of legal-size crab will be the same on both shores and that the spatial distribution of fishing effort will be the same as in the past three years (60% of landings from the south shore), two harvesting scenarios are proposed:

1. Based on the post-season trawl survey, a 15% catch increase would keep the total mortality rate on the north shore at a level below or equal to that measured in 1999 and should allow for modest to strong growth in the stock, provided total mortality is equal to or less than that in 1999.
1. A 50% catch increase to reflect the CPUE growth in the post-season trap

survey. However, in this scenario there is a strong risk of having no increase in harvestable biomass and a much sharper decline in future catches.

### ***Snow crab in Area 16***

Thirty-six fishers hold regular snow crab fishing licences for Area 16. In 1999, the TAC was increased by 6% to allow for exploration of grounds that had seen limited harvesting activity. It included a temporary allocation of 151 t for non-crabbers (Table 2). The fishery opened a week later (April 12) than in 1998 and closed on August 6. The TAC was reached.

### ***Resource status in 1999***

The overall CPUE rose 22% from 10.7 kg/Japanese trap in 1998 to 13.1 kg/Japanese trap in 1999 (Table 2). The improvement in catch rates came mainly from the western (+25%) and central (+32%) parts of the area. Catch rates from the eastern part, unchanged from 1998 (14.3 kg/Japanese trap), were still the highest. Catches were greatest in the west and centre of the area. In general, intermediate-shell crab dominated catches at sea and dockside. Unlike in 1998, new crab were slightly more abundant in the east and their proportion was up, 8% higher in the east and 6% in the west. The proportion of old crab stayed at a high level (22%) throughout the area.

The average CW of legal-size crab fell for a second consecutive year, to 110 mm at sea and 112 mm at dockside. The drop was most pronounced in the east. In Area 16 as a whole, new crab were smaller than old crab, but the average size of the latter was down. The proportion of adolescents of 78-95 mm CW (ADO<sup>1</sup>), which will reach legal size at their next moult, jumped to 6% in 1999, a historical high. The increase was more strongly felt in the east (from 2 to 7%) than in the west (from 4 to 5%).

Table 2. Catch and effort data for Area 16.

Year	1983 to 1989 <sup>4</sup>	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
TAC	2,500 <sup>5</sup>	-	2,368	2,596	2,596	3,636	3,636 <sup>7</sup>	3,090 <sup>7</sup>	2627 <sup>7</sup>	2627 <sup>7</sup>	2784 <sup>7</sup>
Catch <sup>1</sup>	1,984	3,181	2,371	2,597	2,595	3,608	3,629	3085	2623	2625	2777
Effort <sup>2</sup>	257.7	250.5	137.8	137.4	127.2	178.6	177.9	153.5	195.7	245.3	212.0
CPUE <sup>3</sup>											
Total	7.7	12.7	17.2	18.9	20.4	20.2	20.4	20.1	13.4	10.7	13.1
West	6.0	8.9	14.1	17.4	18.4	21.5	19.8	21.0	13.1	10.4	12.9
Centre	7.7	12.4	18.2	22.0	23.3	19.7	21.7	18.5	12.2	9.8	12.9
East	10.1 <sup>6</sup>	15.2	18.7	17.4	19.9	18.5	19.9	21.2	16.2	14.3	14.3

1 Landings in metric tons as at December 1, for 1999

2 Standardized effort in thousands of Japanese trap hauls

3 Catch per unit effort in kilograms per Japanese trap

4 Average for the period

5 From 1986 to 1987

6 CPUE figures for Area 16 East and Area 15 were combined prior to 1990

7 Including special allocations

**The results of the trawl survey** conducted in 1999 in St. Marguerite Bay, near Sept-Iles (in Area 16 West) showed trends similar to those observed in the fishery. The abundance of legal-size crab (new- or intermediate-shell crab in 1999) was up from 1998, as was the average CW, which reached 109 mm in 1999. The survey showed a sharp increase in the number of adolescents of 78-95 mm CW, but the population of adolescents of 62-78 mm CW, while still very high, was stable in comparison with 1998. The number of undersize adults had stabilized at a high level, indicating that a large proportion of males from the 1988-92 year-classes had undergone early terminal moult before reaching legal size. The 1994-96 year-classes, which will reach legal size in 2003-05, are weak; the 1997 year-class is significantly stronger. This suggests that there will be a drop in recruitment from 2003 to 2005 and a recovery in 2006. As in Area 17, recruitment of adult females continued to drop in 1999. Their fertilization rate, which declined from 1991

to 1997, has been on the rise for two years with the growing abundance of males.

**Indices from the post-season trap survey** conducted every fall since 1994 in Area 16 are consistent with fishery and trawl survey findings and show an increase (Figure 5). The catch rate of legal-size crab was up sharply: 83% in terms of weight and 89% in terms of number from 1998. The rise in CPUE was greater in the east (+210%) than in the west (+39%). Paradoxically, the proportion of new crab in catches, which grew in 1998 in the west, dropped in 1999 to 16% in the west and 6% in the east. The proportion of old crab was stable at 26% for the area as a whole, but reached a historical high of 52% in the east. The average CW of legal-size crab was similar in the east and the west (109 mm), having declined in the west and stayed the same in the east from 1998.

The trap survey showed steady temporal and spatial growth in the number of undersize adult males caught in traps. The incidence of undersize males rose again in the west

(from 30 in 1998 to 41 crab per trap) and went way up in the east (+337%) from 3 to 13 crab per trap. These figures suggest that a significant proportion of crab from the 1988-92 recruitment wave will not reach legal size. Still, the number of adolescents of 78-95 mm CW increased from 3 to 5 crab per trap between 1998 and 1999. This increase came in large part from the east (0.8 to 3.2 crab per trap), since ADO 1 abundance was stable in the west at 5 crab per trap.

**Outlook for 2000**

Most current status indicators are positive and show that harvestable biomass increased in 1999. The rise in CPUE from 1998 is much higher in the post-season trap survey (+80%) than the commercial fishery (+20%), with the two being separated in time by approximately four months. In the western part of the area, CPUE growth is primarily attributed to the strong recruitment wave of the 1988-92 year-classes. In the eastern part of the area, recruitment was low

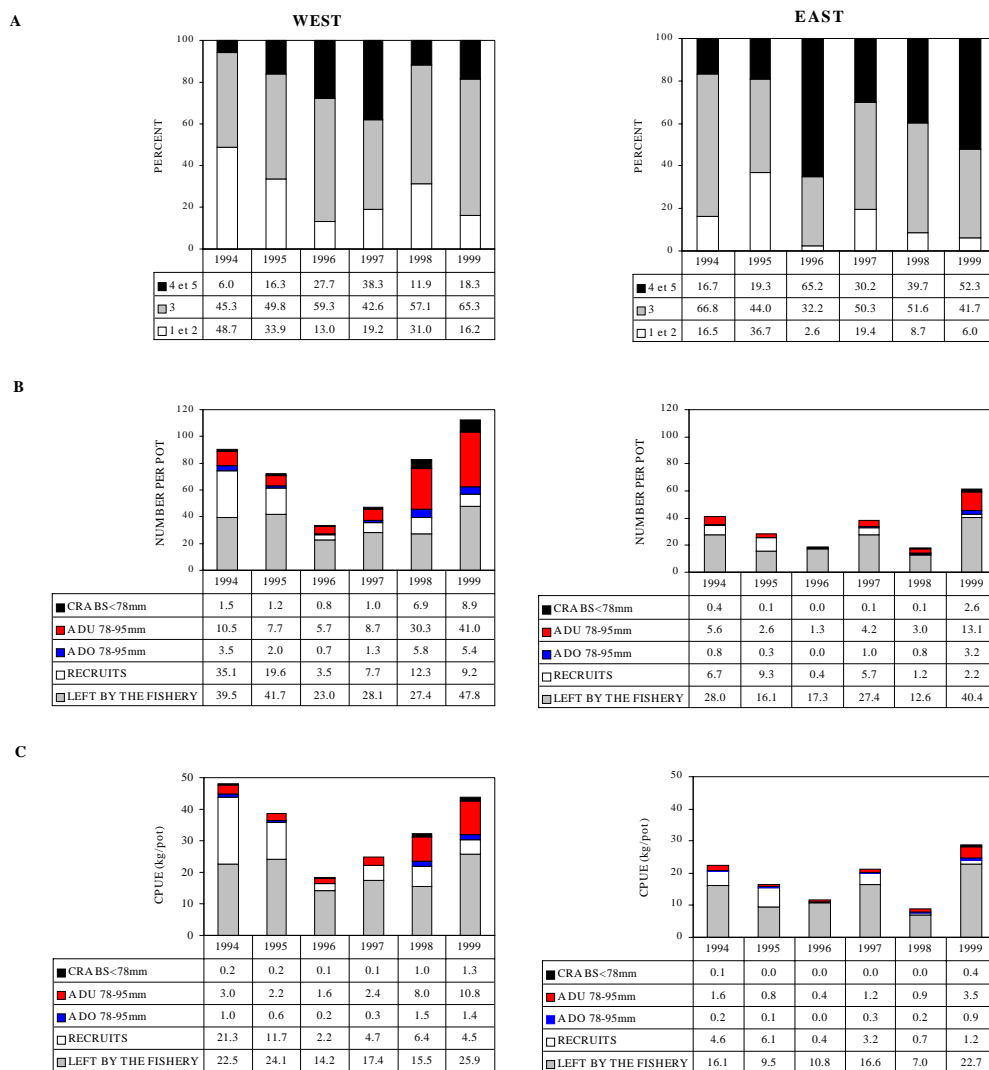


Figure 5. Results of post-season trap surveys in Area 16 from 1994 to 1999. (A) Carapace condition (%) of legal-size males. Yields in crab/trap (B) and kg/trap (C). Only the western portion (Pointe-des-Monts to Rivière-au-Tonnerre) and eastern portion (Mingan to Natashquan) of Area 16 are shown.



and the CPUE increase recorded in the post-season trap survey was mainly due to a rise in the number of intermediate-shell (condition 3) or old (conditions 4 and 5) crab.

Recruitment should improve in 2000 for the area as a whole, with the increase becoming noticeable in the east and continuing in the west until 2001 or 2002. An increase in the number of white crab could occur in 2000. However, a reduction in biomass can be anticipated because of natural mortality from senescence, particularly in the eastern part of the area.

The average CW of legal size crab, which has dropped sharply for three years, will start to rise in the western part of the area in 2000 and the new trend will continue for several years. In the eastern part of the area, the average CW should drop again in 2000 and then begin to improve.

In view of the high proportion of old crab (approximately 25%), many of which will not be available to the fishery in 2000, two scenarios are proposed for Area 16:

- 1) A 20% catch increase to reflect the rise in CPUE in the commercial fishery.
- 2) A 60% catch increase to reflect the rise in CPUE in the post-season trap survey, adjusted downward for the proportion old males in catches. This is a higher risk scenario, since the increase recorded in the post-season survey is difficult to explain in the absence of recruitment. Moreover, a sharp rise in catches will greatly increase the probability of high white crab percentages (local or widespread).

### ***Snow crab in areas 15, 14 and 13***

Areas 15, 14 and 13 have 8, 21 and 49 regular fishers respectively. In 1999, the fishery opened on the same dates as in 1998

in areas 14 (May 24) and 13 (June 1) and one week later in Area 15 (April 12). Just in Area 13, the TAC was amended in 1999 with the addition of 10 t to allow for the conduct of two post-season trap surveys (Table 3). Temporary allocations of 24 t were assigned to non-crabbers in areas 15 and 14. Judging from the balance of quotas remaining in early December, cumulative catches were near the ceiling in all areas.

### ***Resource status in 1999***

In Area 15, the CPUE fell 9% between 1998 (18.6 kg/Japanese trap) and 1999 (16.9 kg/Japanese trap), continuing the trend begun in 1996 (Table 3). The CPUE rose slightly, by 5%, in Area 14 (11.2 to 11.8 kg/Japanese trap) and was stable at 6.7 kg/Japanese trap in Area 13 for 1999. All the same, a more detailed examination of statistics from the fishing grounds along the two shores in Area 13 catch rates a different picture. Trap soak time was up again in 1999, with over 56% of traps being in the water for three days or more, as opposed to approximately 33% in 1996-97. These longer soak times caused an increase in trap catch rate. Catch rates and catches from the southern grounds (near the Newfoundland shore) rose sharply between 1998 and 1999, while catch rates were stable from 1998 in the northern grounds (near the Quebec shore). The average CPUE for the southern grounds climbed from 4.0 to 6.4 kg/Japanese trap in 1999, and catches amounted to 43% of the total for the area, as opposed to an average of 24% from 1996 to 1998. This seems to indicate that the situation was less favourable in the northern grounds (near the Quebec shore).

Table 3. Catch and effort data for areas 15, 14 and 13.

Year		1983 to 1989 <sup>4</sup>	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
TAC:	Area 15	--	--	--	--	--	435	435	435	413	422 <sup>7</sup>	422 <sup>7</sup>
	Area 14	667 <sup>5</sup>	381	381	381	381	524	524 <sup>6,7</sup>	576 <sup>7</sup>	518.4 <sup>7</sup>	548 <sup>7</sup>	548 <sup>7</sup>
	Area 13	1,642	889	889	889	889	889	889	1241 <sup>7</sup>	931 <sup>7</sup>	838	848
Catch <sup>1</sup>	Area 15	109.7	93	321	300	339	426	436	435	413	421	422
	Area 14	509.4	174 138	288	361	383	522	525	573	512	546	540
	Area 13	918.4		201	19	703	859	883	1121	795	838	832
Effort <sup>2</sup>	Area 15	--	15.2	22.9	22.1	22.3	21.2	17.1	16.0	21.5	22.6	25.0
	Areas 13+14	165.6	76.1	116.4	53.5	193.9	212.5	154.7	281.1	242.0	184.5	161.4
CPUE <sup>3</sup>	Area 15	--	6.1	14.0	13.6	15.2	20.1	25.5	27.1	19.2	18.6	16.9
	Area 14	5.2	4.3	4.8	7.3	9.7	11.2	11.6	12.5	10.7	11.2	11.8
	Area 13	5.7	3.9	3.1	5.3	4.2	4.5	8.0	5.1	4.3	6.5	6.7

- 1 Landings in metric tons as at December 1, for 1999
- 2 Standardized effort in thousands of Japanese trap hauls
- 3 Catch per unit effort in kilograms per Japanese trap
- 4 CPUE in areas 14 and 13 was combined prior to 1987
- 5 Average for the period
- 6 Not in effect in areas 14 and 13 until 1986
- 7 Including special allocations

Intermediate-shell crab dominated catches at sea. New crab, declining in areas 15, 14 and 13 since 1996, were still scarce (2%) in Area 15 and 13 catches in 1999, but much more numerous in Area 14, where they accounted for 9% of catches. The proportion of old crab in catches at sea ranged from 35% (Area 15) to 43% (Area 13), up sharply from 1998.

For the first time since 1992, the average CW of legal-size crab declined in areas 15 and 14 in 1999, falling to 110 and 107 mm respectively at sea. It was stable at approximately 103 mm (at sea and dockside) in Area 13. In 1999, new crab were similar in size to old crab in areas 15 and 14 and smaller than old crab in Area 13. The proportion of adolescents of 78-95 mm CW in catches was small (1 to 2%) and approaching historical lows in the three areas.

**Comprehensive trap surveys were conducted for the first time in 1999 in the southern grounds of Area 13, for the third time since 1996 in Area 14 and for a second consecutive year in Area 15 (Figure 6).**

In Area 15, the survey CPUE (13.2 kg/Japanese trap) was up by 15% from 1998. The proportion of new crab (3%), though still low, was also climbing, while that of old crab held at 34% in 1999. The average CW of legal-size crab, approximately 104 mm, was the same as in 1998.

In Area 14, the CPUE (6.9 kg/Japanese trap) was up 60% from 1999, but lower than the figures from the commercial fishery. The proportion of new crab was 22%, much higher than in 1998, and old crab still accounted for 28% of catches. The average CW of legal-size crab stayed at the 1998 level of 105 mm.

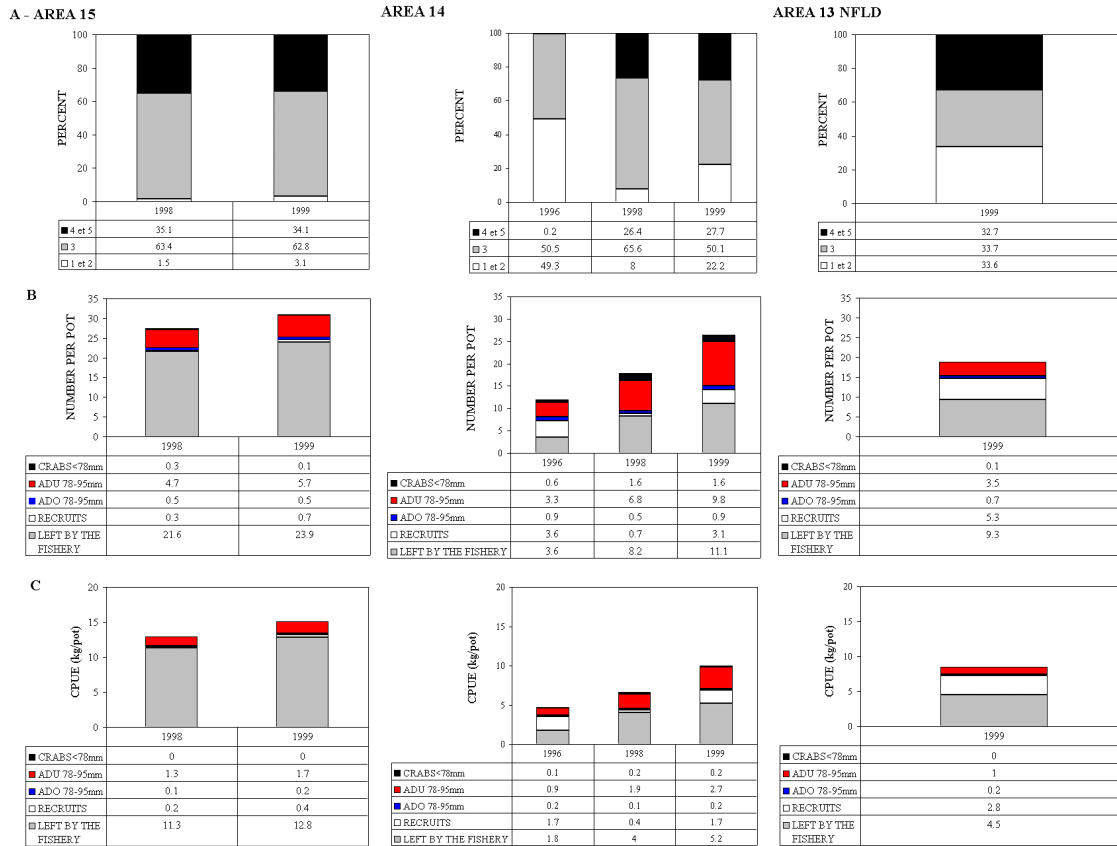


Figure 6. Results of post-season trap surveys in areas 15, 14 and 13 (southern grounds) in 1996, 1998 and 1999. (A) Carapace condition (%) of legal-size males. Yields in crab/trap (B) and kg/trap (C) of the different groups of males.

For the southern grounds of Area 13, first surveyed in 1999, the CPUE (7.3 kg/Japanese trap) was higher than it had been in the fishery. The proportion of new crab was 34% and old crab contributed 33%. The average CW of legal-size crab (106 mm) was greater than during the fishing season.

The abundance of adolescents of 78-95 mm CW (ADO1) in traps was very low in the three areas: 0.5, 0.9 and 0.7 crab/Japanese trap for areas 15, 14 and 13 respectively. However, use of a limited number of small-mesh traps in Area 14 in 1999 indicated the presence of three fairly strong year-classes that will provide for recruitment until 2002.

**A trawl survey was conducted in areas 14 and 13 in late July and early August 1999.**

The abundance of legal-size crab (6 crab/10,000 m<sup>2</sup>) was low in comparison with values obtained through similar surveys in Area 17 in 1999 (36.5 crab/10,000 m<sup>2</sup>) and areas 14 and 13 in 1994 (12.2 crab/10,000 m<sup>2</sup>) and 1995 (13.4 crab/10,000 m<sup>2</sup>). The proportion of new crab was 38% and old crab accounted for 27%. The average CW of legal-size crab (105 mm) was comparable with the figure obtained during the fishing season. The abundance of ADO1 crab (11 crab/10,000 m<sup>2</sup>) was similar to that recorded in 1994-95. Meanwhile, the abundance of adolescents of 62-78 mm CW, those that will be recruited to the fishery in 2 to 3 years, was high (41 crab/10,000 m<sup>2</sup>) and up from the values recorded in 1994-95. Further, the survey indicated the presence of at least two more fairly strong year-classes.

**Outlook for 2000****Area 15**

The current stock status indicators are mixed: the increases in the CPUE and the proportion of new crab in the post-season trap survey are positive signs, while the decline in the CPUE, high proportion of old crab and weak recruitment noted in the commercial fishery in 1999 are negative signs. Recruitment should be low in 2000. However, the commercial CPUE is still higher than in the other areas.

The declining commercial CPUE, the rather low recruitment observed in 1999 and expected in 2000, and the high proportion of old crab, many of which will not be available to the fishery in 2000, argue in favour of a catch reduction. However, the fishery CPUE, still higher than in the other areas, and the CPUE increase in the post-season survey suggest that the harvesting rate is relatively low and that there has actually been a slight rise in abundance. *It is therefore recommended that catches be maintained at the same level as in 1999.*

**Area 14**

Most current status indicators are positive and suggest that harvestable biomass increased slightly in 1999. The only negative factor is the relatively high proportion of old crab, many of which will not be available to the fishery in 2000. Year 2000 recruitment should be up from 1999, but still limited. However, the post-season trap survey and trawl survey indicate that recruitment will recover in the coming years and that it could stay strong beyond 2002. Problems associated with a high incidence of white crab could be encountered in 2000 and 2001. The average CW of legal-size crab, down sharply for three years, could stabilize and begin to rise in 2000 or 2001.

*The prudent approach would be to maintain the status quo until the recovery is stronger and produces a sizable increase in the CPUE and the abundance of pre-recruits in the fishery and the trawl and trap surveys.*

**Area 13**

Several current status indicators are negative and suggest overall that recruitment in 1999 was low and that the abundance of legal-size crab was stable from 1998. However, the area exhibits a certain amount of spatial heterogeneity. The abundance of crab has declined on the Quebec side and likely risen on the Newfoundland side. The high percentage of new crab and the higher CPUE in the post-season trap survey than in the commercial fishery on the Newfoundland side suggest an upturn in recruitment or emigration. The proportion of old crab rose, and many of these animals will not be available to the fishery in 2000. It is most unfortunate that there was no comprehensive post-season survey of the north shore of Area 13 (along the Quebec shore) in 1999.

Pre-recruit CPUE figures are very weak, indicating low recruitment in 2000. In contrast, the trawl survey suggested that recruitment will grow in the coming years and could stay at high levels beyond 2002, meaning that there could be an increase in the number of white crab.

The pre-recruit size structures and abundance patterns are similar in areas 14 and 13. They differ from those of areas 17 and 16, but are similar to those of the Labrador shore (Division 2J). This suggests that areas 14 and 13 depend on supplies of larvae from the Labrador shore. *In view of the mixed signals with respect to the current status of the stock and the limited recruitment prospects for 2000, it is recommended that the status quo be maintained.*

***Environmental considerations***

In 1999, there was apparent warming of the cold intermediate layer, which thinned by approximately 10-20 m in terms of the 3°C threshold. Continuation of this trend in the coming years could cause a significant decline in the range and abundance of snow crab, particularly if environmental conditions once again become favourable to the species' natural predators.

***Conservation measures***

Since the recruitment wave will crest in 2000, from this point on the practice of culling at sea or avoidance to reduce the number of less desirable adult crab (specimens that are smaller, not as clean, or missing one or two legs) will have the effect of increasing losses due to natural mortality and furthering the decline in harvestable biomass as we enter the next recruitment trough. In contrast, landing of the full range of adult crab accessible to the fishery will serve to limit the accumulation of old crab and lessen the biomass decline.

Fishers should be authorized to discard legal-size adolescent (small claw) crab, and they should do so carefully, just as with white crab, to ensure the animals' survival.

***References:***

Dufour, R. 1995. *Le crabe des neiges de l'estuaire et du nord du golfe du Saint-Laurent: État des populations en 1994*. DFO Atlantic Fisheries, Research Document No 95/96.

Dufour, R. and J.- P. Dallaire 1999. *Le crabe des neiges de l'estuaire et du nord du Golfe du Saint-Laurent: État des populations de 1995 à 1998*. DFO Atlantic Fisheries, Research Document No 99/19.

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