

## 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 traditional management areas, numbered 13 to 17 from east to west; three other areas (A, B and C), previously classed as exploratory, were added in 2001. A management approach based on the TAC (total allowable catch) 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). Adult males range in size from 40 to 165 mm. Males reach legal size at about nine years of age. Recruitment in snow crab varies over an intrinsic cycle of eight or nine years, generally characterized by five years of moderate to high recruitment (recruitment wave) followed by three or four years of low recruitment (recruitment trough). The status of recruitment in the fishery can be detected by regular monitoring of catches (size, CPUE and shell condition) and effort, and is confirmed by scientific trap and trawl surveys.

The last abundant year-class of the previous recruitment wave was available to the fishery in 1994. Subsequently, the less abundant year-classes resulted in lower commercial yields and harvestable biomass and an ageing of the population. The more recent wave of abundant year-classes (1988 – 1992 year-classes) began to form part of the harvestable population beginning in 1997, but the impact was not the same in all fishery areas. In the west (Area 17), the biomass increased sharply and the mean CW of the crab caught decreased following the arrival of the new recruitment. However, in Area 16, a slowdown in growth and an early terminal moult of a large proportion of the males were observed, with the result that the wave had a lesser impact than in Area 17. These effects were apparently exacerbated in the more easterly sectors (Areas 15 to 13), where the wave is not yet perceptible in the fishery; indeed, recruitment is low and does not support an increase in the harvestable biomass. This difference in productivity, combined with intense harvesting in the east, means that the situation there is very critical and conservation of the resource in those sectors is compromised.

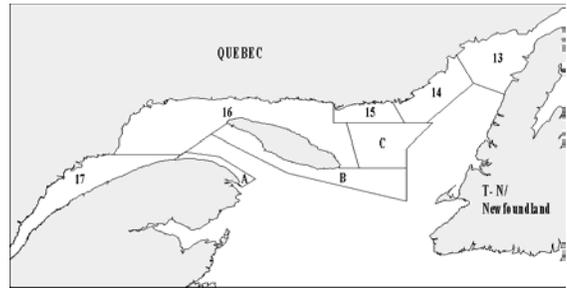


Figure 1. Snow crab management areas in the northern Gulf of St Lawrence.

### Summary

- In Area 17, the abundant 1990 and 1991 year-classes were available to the fishery in 2000 and 2001, and commercial yields increased significantly in 2000, then stabilized in 2001. Catches and natural mortality did not exceed recruitment, with the result that the harvestable biomass of legal-size crab was high at the end of these fishing seasons. The harvestable biomass will still be high in 2002 and should begin to decline in 2003.
- There is no reason to reduce the TAC in 2002, but the reduction in catches required in 2003 should be proportionally more important than the increase in catches in 2002 over 2001.
- In Area 16, recruitment to the fishery in 2000 and 2001 did not translate into higher commercial yields as anticipated, and the harvestable biomass in 2002 will be similar or slightly lower than in 2000 and 2001. The surveys indicate that there should be abundant recruitment in 2002 and possibly in 2003, which could result in an increased abundance of white crab in catches. The harvestable biomass should begin to decline in 2003 or 2004, but the magnitude of this decline is unknown because of the uncertainties surrounding recruitment.

- Keeping 2002 catches at the 2001 level should make it possible to maintain the harvestable biomass.
- **In Area 15**, since recruitment is lower than both natural and fishing mortality, the harvestable biomass has been low and in decline for several years.
- Keeping 2002 catches at the same level as in 2001 will likely further reduce the harvestable biomass with the result that the reproductive potential could be compromised.
- A significant reduction in the 2002 TAC should attenuate the negative impact of the low recruitment. It is recommended that catches be reduced by 20% to 25%, which should bring the fishing effort back down to the level of the first half of the 1990s and stabilize the harvestable biomass.
- **In Area 14**, recruitment has been low but stable since 1996. The harvestable biomass and commercial yields have decreased since 1996, but remained low and stable in 2000 and 2001. The harvestable biomass should remain low in 2002.
- In the absence of recruitment, it is recommended that the 2002 TAC be reduced to protect the reproductive potential.
- **In Area 13**, since recruitment is lower than natural and fishing mortality, the harvestable biomass is very low and has been declining for several years. Commercial yields fell sharply in 2001 and the TAC was not caught despite an increase in the fishing effort and an extension of the fishing season. The harvestable biomass should remain very low in 2002 and could even decline.
- Keeping 2002 catches at the same level as in 2001 will likely further reduce the biomass and the reproductive potential could be severely compromised. It is recommended that 2002 catches be

reduced by at least 35% to 40%, which should bring the fishing effort back down to the 1998-2000 level. This should at best stabilize the harvestable biomass at the 2000 or 2001 level.

## ***The Fishery***

### ***Location and historical context***

The territory is now divided into eight management areas (Figure 1), corresponding to three broad geographic regions: the Upper North Shore which also includes much of the north shore of the Gaspé Peninsula (Area 17), the Middle North Shore (areas 16 and 15) and the Lower North Shore (areas 14 and 13). Areas A, B and C, which have had exploratory status since 1994, were granted permanent status in 2001.

Snow crab is fished with baited traps. Conical steel models, such as the 1.2 m-diameter Japanese trap and the conical trap measuring 1.8 m in diameter at the base, are the most popular types. Since 1990, the fishery on the Upper and Middle North Shore has opened at ice 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. However, the fishery has begun earlier and earlier since 1996-97 as a result of some milder winters.

The snow crab fishery in the Estuary and the 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 took place, 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.

Between 1987 and 1989, landings for the entire region 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 1990-1991, 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 1980-1984 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 again from 1998 (5,715 t) to 2000 (8,169 t). In 2001, the TAC was increased only in Area 17 (+28%). This increase generated record landings in 2001 of 8,769 t (preliminary as of December 14, 2001).

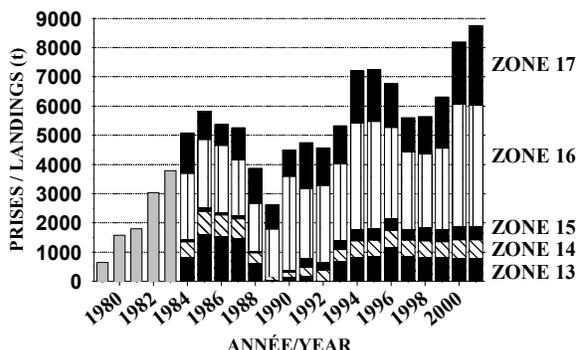


Figure 2. Snow crab landings in the northern Gulf of St Lawrence.

### 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 a carapace width of 95 mm, and the landing of females is prohibited. Since 1985, once the limit of 20% white crab (crab that have recently moulted) in catches at sea has been exceeded, the fishery has automatically been closed in the area concerned to minimize mortality of these very fragile crabs 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 determined annually from available information. The status of areas A, B and C has been monitored annually, but no formal recommendation was made by DFO until now. Data from fishery statistics and catch sampling provide the basis of the analyses for all areas. In 2001, a trap survey was conducted in all areas and the results were incorporated into the stock assessment analyses. The results of two trawl surveys conducted in areas 17 and 16 were also used.

### Snow crab in Area 17

There are 22 active licence holders in Area 17. The first total allowable catch (TAC) was set at 1,300 t in 1992 (Table 1). The fishery has opened on April 1 and ended on July 30 since 1999. The TAC was raised by 28% (2,725 t) in 2001 to reflect the large abundance of crab in this area. A 450-t special allocation, twice as high as in 2000, was set aside for non-crabbers. Catches recorded as at December 14, 2001 showed that the TAC had been caught.

**Resource status in 2001**

In the commercial fishery, the average yield, which had been rising since 1998, fell by 11% (13.9kg/Japanese trap). This decrease was attributable essentially to the south shore, where yields dropped by 14% from 14.8 (2000) to 12.8 kg/Japanese trap in 2001 (Table 1). Yields on the north shore (17.6 kg/Japanese trap) were unchanged from the 2000 level. The proportion of catches from the south shore (55%) rose by 3% and the effort on this shore increased by 8%. This increased effort on the south shore was carried out mainly by new fishers taking advantage of temporary allocations and fishing snow crab at the eastern end of the area.

The proportion of new crab (conditions 1 and 2) did not increase (4.5%). However, the proportion of old crab (conditions 4 and 5) was 7% higher than in 2000. The mean CW of legal-size crab caught at sea was stable (109 mm) and the mean CW of the males on landing was slightly smaller (109.1 mm) compared to 2000 (110.2 mm). The proportion of prerecruits between 78 and 95 mm CW ( $ADO^{-1}$ ) rose from 2% to 4% in 2001, while the proportion of commercial-size adolescents fell sharply in

2001 (6%), in contrast to the previous year, when it had increased sharply (from 2% to 13%). These data show that the recruitment wave composed of the 1988-1992 year-classes was at its peak in 2000 and, although recruitment was stronger in 2001, significant decreases are projected for the coming years.

The annual postseason trawl survey carried out on the north shore of the Estuary in Area 17 between late July and early August since 1992 showed a 10% increase (13% by weight) in the abundance of commercial-size crab between 2000 (34 crab/10,000 m<sup>2</sup>) and 2001 (37.6 crab/10,000 m<sup>2</sup>) (Figure 3). This increase is attributable to the combined impact of an increase in recruits in 2001 and of the residual biomass left on the sea bottom after the 2000 fishing season. In 2001, total mortality, comprising natural and fishing mortality, was estimated at 44% on the north shore, and remained lower than the average of the eight previous years (48%).

The abundance of new and old crab increased between 2000 and 2001 from 15.6 to 18.2 crab/10,000 m<sup>2</sup> for new crab (conditions 1 and 2), and from 1.2 to 2.8 crab/10,000 m<sup>2</sup> for old crab (conditions 4

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	2000	2001
TAC	-	-	-	1,300	1,300	1,820	1,820 <sup>5</sup>	1,547 <sup>5</sup>	1,315 <sup>5</sup>	1,315 <sup>5</sup>	1,775 <sup>5</sup>	2,130 <sup>5</sup>	2,725 <sup>5</sup>
Catches <sup>1</sup>	1,022	910	1,562	1,289	1,305	1,788	1,774	1,502	1,156	1,285	1,758	2,130	2,741
Effort <sup>2</sup>	121.8	137.9	173.6	107.4	90.6	124.2	155.6	153.3	141.0	149.4	147.7	136.5	197.2
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	11.9	15.6	13.9
North shore	8.4	7.7	10.0	12.4	15.2	15.7	11.7	10.3	7.7	7.4	8.7	17.5	17.6
South shore	7.4	5.3	7.8	11.5	13.2	11.4	9.7	9.3	8.5	9.2	13.1	14.8	12.8

1 Landings in metric tonnes, as at December 14 for 2001

2 Standardised 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

TAC Total allowable catch

and 5). This increase in the abundance of these two groups of crab contrasts with the decreases recorded in 1999 and 2000 for new crab and from 1997 to 2000 for old crab. The mean CW of legal-size crab at sea was unchanged from 2000 at 107 mm.

The abundance of legal-size crab should

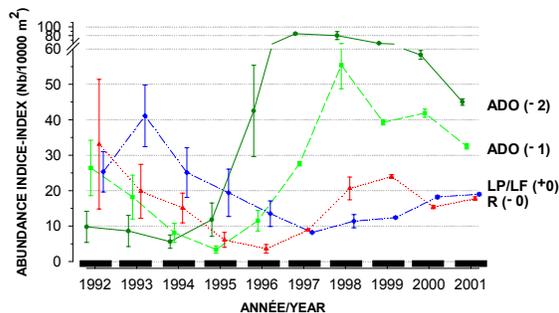


Figure 3. Abundance of male snow crab caught in trawl surveys in the Estuary between 1992 and 2001.  $LP/LF(+0)$ : males left by the fishery in the year of the survey;  $R(-0)$ : males recruited to the fishery;  $ADO(1)$ : adolescent males of 78 to 95 mm CW;  $ADO(2)$ : adolescent males of 62 to 78 mm CW.

increase or stay at a high level until 2002, since the strength of the year-classes that will enter the fishery in the short term, although lower than in previous years, is high. Adolescent males of 78 to 95 mm CW ( $ADO^{-1}$ ) and of 62 to 78 mm CW ( $ADO^{-2}$ ) are down 24% and 26% respectively compared to 2000, but their level of abundance still remains higher than the average of the last eight years. The 1993-1996 year-classes appear to be weak and will likely form the next recruitment trough, whereas the 1997 and 1998 year-classes appear to be stronger and should generate a recovery.

Adult females, particularly those that have spawned more than once (multiparous), are present in large numbers on the bottom and, given the current volumes of recruitment of adult males, potential sperm limitation problems need not be feared in the short term.

The results of the postseason trap survey are generally consistent with those observed in the fishery and in the trawl survey and showed an increase of 11% in the catch per unit effort (CPUE) of commercial males on the north shore in 2001 (Figure 4). The value of 50.2 kg/conical trap is the highest recorded since the survey began in 1996.

The average CPUE of commercial-size crab on the south shore (59.1 kg/conical trap in 2001) also increased by 7% over 2000. This upward trend of the CPUE on the south shore in 2001 stood in contrast to the results observed in the fishery, which indicated a decrease in CPUE on this shore. This difference could be explained by the fact that the trap survey covered only part of the south shore (6 transects in the centre), while during the 2001 fishing season a significant effort was made in the more easterly sectors of the south shore, which may have negatively impacted the CPUE of the entire shore. Catches of new crab were down by 28% and 19%, while catches of old crab were up by 200% and 63% on the north and south shores respectively in 2001. The abundance of old crab on both shores reached the highest levels recorded since the surveys began. The mean CW of legal-sized crab (106 mm) has been stable since 1999 on the north shore and declining since 1999 on the south shore (104 mm in 2001). The number of  $ADO^{-1}$  has been stable (4 kg/conical trap) on the north shore since 2000 and increased by 31% on the south shore to 12.2 kg/conical trap in 2001. These values are the highest recorded since these surveys began in Area 17.

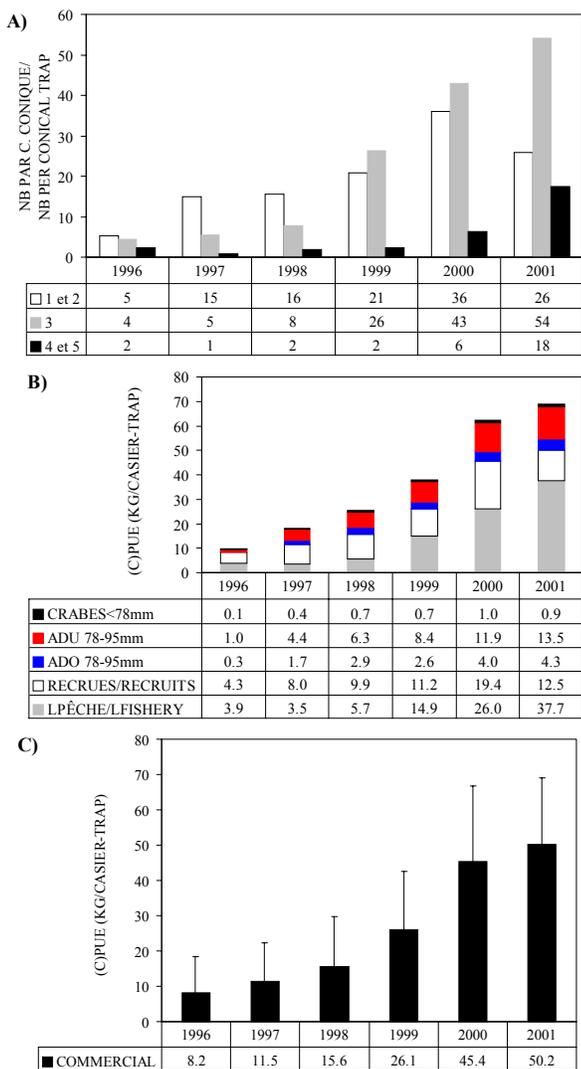


Figure 4. Results of the postseason trap survey on the north shore of Area 17 from 1996 to 2001. (A) Shell condition of legal-size males. (B) CPUE (kg/conical trap) of the different groups of males and (C) CPUE + 1 standard deviation of legal-size males.

**Outlook for Area 17 in 2002**

The harvestable biomass in 2001 remained similar to the 2000 level on the north shore. However, heavy fishing pressure for the past two years on the south shore, particularly in the less productive eastern sectors, could be responsible for the decrease in CPUE observed in 2001 on this shore. The abundant 1990 and 1991 year-classes were

available to the fishery in 2000 and 2001 and commercial yields increased significantly in 2000, then stabilized in 2001. Catches and natural mortality did not exceed recruitment, with the result that the harvestable biomass of legal-size crab was high at the end of these fishing seasons. The harvestable biomass will still be high in 2002 and should decline beginning in 2003.

*There is no reason to reduce the TAC in 2002, but a reduction in 2003 catches, which will be particularly important since 2002 catches will be higher than in 2001, will have to be contemplated.*

Given that recruitment appears to have peaked in Area 17, we are reiterating the recommendations issued for the first time in 1995 regarding the harvesting strategy that should be applied to lessen the impact of an upcoming decline in recruitment. The recommendation was as follows: Harvesting of old-shell males can help to lessen the effect of a recruitment trough, while maximizing the yield per recruit. These males will die of natural causes in the very short term if they are not caught, whereas males with a clean shell may remain available to the fishery for another 2-3 years, although their appearance and condition will deteriorate. Furthermore, adolescent males should not be landed, because after moulting they will reach a much larger size and weight and so could support a faster and stronger recovery of the biomass once the recruitment trough has ended.

**Snow crab in Area 16**

Thirty-eight fishers hold regular snow crab fishing licences for Area 16. In 2001, the TAC (4,184 t) was slightly higher than in 2000 (Table 2). A temporary allocation of 314 t was available for non-crabbers. The fishery began on April 9 and ended on August 3 and the TAC was caught.

**Resource status in 2001**

The overall CPUE was down by 12% compared to 2000, from 13.9 kg/Japanese trap to 12.3 kg/Japanese trap (Table 2). The CPUE fell in the west (13.1 to 11.5 kg/Japanese trap) and the centre (15.7 to 13.2 kg/Japanese trap), while it rose in the east (12.6 to 13.3 kg/Japanese trap). The proportion of new crab and old crab sampled at sea decreased by 2.9% and 2.4% respectively compared to 2000 in favour of intermediate-shell crab, generally the most abundant.

The mean CW of legal-size crab, which has been declining since 1998, continued to decrease at sea (109 to 106.7 mm) and at dockside (110.8 to 107.5 mm) throughout the area. Just like last year, the decrease in size was more pronounced in the east. The proportion of catches of adolescents from 78 to 95 mm CW ( $ADO^{-1}$ ) which will reach legal size at the next moult was slightly higher in 2000 and reached a record level since the beginning of the fishery (6%). The proportion of prerecruits ( $ADO^{-1}$ ) was 7% higher in the west and stable in the east compared to 2000.

**The results of the trawl survey conducted**

in 2001 in St Marguerite Bay, west of Area 16, showed trends similar to those observed in the fishery. The abundance of legal-size crab was down from 2000, and their mean CW also fell sharply from 109 mm in 2000 to 103.6 mm in 2001. The survey also showed a strong increase in new crab in 2001 relative to old crab, which have been declining now for three years. The number of prerecruits with a CW of 78 to 95 mm ( $ADO^{-1}$ ) has been rising for three years and recruitment will probably still be high in 2002 and 2003. However, the recruitment of legal-size crab in 2000 and 2001 was weaker than expected because of an erosion of the strong 1990-1992 year-classes due to an early terminal moult in 1998 and 1999 and a delayed moult in 2001.

The recruitment of primiparous females has been very low since 1999 and in 2001 the abundance of multiparous females fell sharply after a period of steady increases from 1996 to 2000. The analysis of the spermatophores showed that the females are very well inseminated owing to a sex ratio heavily biased in favour of males.

**Indices from the postseason trap survey,** conducted every fall since 1994 in Area 16,

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	2000	2001
TAC	2,500 <sup>5</sup>	-	2,368	2,596	2,596	3,636	3,636 <sup>7</sup>	3,090 <sup>7</sup>	2,627 <sup>7</sup>	2,627 <sup>7</sup>	2,784 <sup>7</sup>	4,176 <sup>7</sup>	4,184 <sup>7</sup>
Catches <sup>1</sup>	1,984	3,181	2,371	2,597	2,595	3,608	3,629	3,085	2,623	2,625	2,777	4,164	4,164
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	298.8	338.5
CPUE <sup>3</sup>													
<b>Total</b>	7.7	12.7	17.2	18.9	20.4	20.2	20.4	20.1	13.4	10.7	13.1	13.9	12.3
<b>West</b>	6.0	8.9	14.1	17.4	18.4	21.5	19.8	21.0	13.1	10.4	12.8	13.1	11.5
<b>Centre</b>	7.7	12.4	18.2		23.3	19.7	21.7	18.5	12.2	9.8	12.9	15.7	13.2
<b>East</b>	10.1 <sup>6</sup>	15.2	18.7	17.4	19.9	18.5	19.9	21.2	16.2	14.3	14.2	12.6	13.3

1 Landings in metric tonnes, as at December 14, 2001

2 Standardised 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

also showed trends similar to those observed in the fishery and the beam trawl survey (Figure 5). The CPUE of legal-size crab, which has been rising since 1998, decreased by 13% in 2001 to 25.9 kg/Japanese trap. Commercial yields fell sharply in the west (27%) and the centre (12%), but increased by 13% in the east. The abundance of new crab remained high and stable in the west (21 crab/trap), while they were nine times more numerous in the centre (27.6 crab/trap) and 66% more numerous in the east (23.4 crab/trap) in 2001. Conversely, old crab almost doubled in the west (2.5 to 4.8 crab/trap) while they fell sharply in the centre (9.3 to 4.2 crab/trap) and in the east

(13.9 to 5.3 crab/trap) in 2001. The mean CW of legal-size crab, which has been declining for five years, was 104.3 mm in 2001.

The number of undersize adult males between 78 and 95 mm CW ( $ADO^{-1}$ ) decreased for the first time since 1997 in the west (16.0 to 13.4 kg/trap), but their level of abundance remains higher than the annual average estimated since the beginning of the survey in this sector (7.2 kg/trap). Nonetheless, their numbers continued to increase in the centre (4.1 to 4.9 kg/trap) and in the east (8.2 to 9.4 kg/trap) in 2001. The number of adolescents between 78 and 95 mm CW ( $ADO^{-1}$ ), on the rise

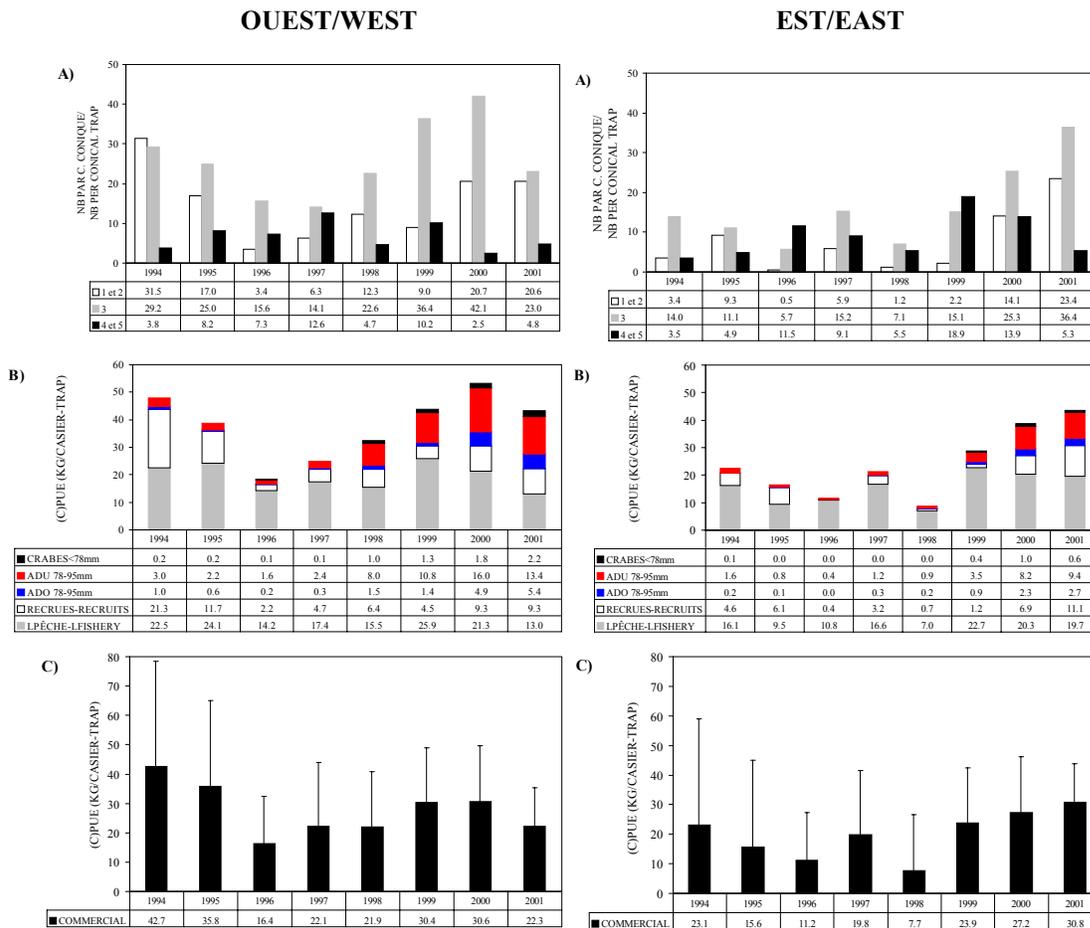


Figure 5. Results of postseason trap surveys in Area 16 from 1994 to 2001. (A) Shell condition of legal-size males. (B) CPUE (kg/conical trap) of the different groups of males and (C) CPUE + 1 standard deviation of legal-size males. Only the western section (Pointe des Monts to Rivière au Tonnerre) and eastern part (Mingan to Natashquan) of Area 16 are shown.

since 1997, continued to increase throughout the territory, from 3.3 to 4.2 kg/trap in 2001.

### ***Outlook for 2002***

The harvestable biomass decreased in the entire area, except in the east, where it has been rising. Recruitment to the fishery in 2000 and 2001 of the strong year-classes of the 1988-1992 recruitment wave did not translate into an increase in commercial yields as anticipated. Furthermore, the stock has been subject to heavy fishing pressure for two years. Consequently, the harvestable biomass in 2002 will be similar or slightly lower than in 2000 and 2001. However, the surveys indicate that there should be abundant recruitment in 2002 and possibly in 2003, which could also cause an increased abundance of white crab in catches.

*Keeping 2002 catches at the 2001 level should make it possible to maintain the harvestable biomass.*

### ***Snow crab in Area 15***

Area 15 has eight regular fishers. In 2001, the fishery began on April 9 and ended on August 3. The TAC (469 t), unchanged from 2000, was caught (Table 3). Temporary allocations of the same level as in 2000 (52 t) were granted to non-crabbers.

### ***Resource status in 2001***

The commercial fishery CPUE, in decline since 1997, stabilized at the same level as in 2000 (15.1 kg/Japanese trap). The proportion of new crab, up slightly from 2000, was 15.3%. The proportion of old crab decreased by 15% in 2001.

The mean CW of legal-size crab at sea, which has been declining since 1998, decreased slightly in 2001 (from 108.8 to 107.6 mm), while the dockside value was sharply lower (from 108.7 to 106.1 mm). New crab were smaller than old crab. The

proportion of adolescents between 78 and 95 mm CW in catches at sea was low (1% to 2%) and has been stable since 1994.

The results of the **trap survey** conducted since 1998 (Figure 6) showed a sharp drop (54%) in CPUE in 2001 (3.7 kg/trap) compared to 2000 (8.0 kg/Japanese trap). In 2001, the number of new crab (1.4 crab/trap), low and stable since the beginning of the survey, was unchanged from 2000, and the number of old crab fell sharply (60%) in 2001 (9.5 to 3.8 crab/trap). The mean CW of legal-size crab (105.1 mm in 2001) has been declining since 2000. The abundance of prerecruits between 78 and 95 mm CW ( $ADO^{-1}$ ) in the traps has been very low since 1998 (0.2 crab/trap on average) and was unchanged in 2001 (0.3 crab/trap).

### ***Outlook for 2002***

Since recruitment is low and lower than natural and fishing mortality, the harvestable biomass has been low and in decline for several years. The results of the trap survey showed that the harvestable biomass fell by half in 2001 and no recovery is expected in the short term.

*Keeping 2002 catches at the same level as in 2001 will likely further reduce the biomass, and the reproductive potential could be compromised. A significant reduction in the 2002 TAC should attenuate the negative impact of the low recruitment. It is recommended that catches be reduced by 20% to 25%, which should bring the fishing effort back down to the level of the first half of the 1990s and stabilize the harvestable biomass.*

### ***Snow crab in Area 14***

Area 14 has 21 regular fishers. In 2001, the fishing season began on May 1 and ended on August 15, a week later than in 2000. The quota of 603 t, the same as in 2000, included temporary allocations slightly lower than the

2000 figure of 23.5 t (Table 3). The TAC was caught.

### Resource status in 2001

The commercial fishery CPUE was 11.8 kg/Japanese trap, which is comparable to the 2000 value. The standardized mean CPUE, which takes into account changes in fishery dynamics that take place every year (type of trap, soak time, various fishing dates, etc.), has been declining regularly since 1996 following a change in the fishing strategies used (longer soak time, earlier fishing season and limitation of fishing effort and of weekly landings by processing plants), but it recovered somewhat in 2001 to reach a level similar to 1999.

The proportion of new crab at sea was low (2.6%) and down slightly from 2000. The proportion of old crab (13%) was also lower than in 2000. The mean CW of crab caught at sea (104.8 mm) and those measured at dockside (102.5 mm) were below the 2000

level. New crab were smaller than old crab. The proportion of prerecruits between 78 and 95 mm CW ( $ADO^{-1}$ ) was 4%, a low value but higher than 2000.

The trap survey conducted since 1998 in this area (Figure 6) showed a low CPUE (3.6 kg/trap) unchanged from 2000. The abundance of new crab (1.2 crab/trap) and of old crab (1.5 crab/trap) in 2001 was as low as in 2000 and has now been declining for two years. The size of legal-size crab (105.2 mm) was unchanged from 1999-2000. The number of adolescent crab between 78 and 95 mm CW ( $ADO^{-1}$ ) was 0.1 crab per trap in 2001, a low value that has been stable since 1996.

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

Year		1983 to 1989 <sup>5</sup>	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
TAC:	Area 15	--	--	--	--	--	435	435	435	413	422 <sup>7</sup>	422 <sup>7</sup>	464 <sup>7</sup>	469 <sup>7</sup>
	Area 14	667	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>	603 <sup>7</sup>	603 <sup>7</sup>
	Area 13	1,642	889	889	889	889	889	889	1,241 <sup>7</sup>	931 <sup>7</sup>	838	848	848	848
Catches <sup>1</sup>	Area 15	109.7	93	321	300	339	426	436	435	413	421	422	464	469
	Area 14	509.4	174 138	288	361	383	522	525	573	512	546	540	602	602
	Area 13	918.4		201	19	703	859	883	1,121	795	838	832	819	793
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	31.1	31.1
	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	167.3	225.0
CPUE <sup>3</sup>		--	6.1	14.0	13.6	15.2	20.1	25.5	27.1	19.2	18.6	16.9	14.9	15.1
	Area 14	5.2 <sup>4</sup>	4.3	4.8	7.3	9.7	11.2	11.6	12.5	10.7	11.2	11.8	11.8	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	6.9	4.2

1 Landings in metric tonnes, as at December 14 for 2001

2 Standardised 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 before 1987

5 Average for the period

6 Not in effect in areas 13 and 14 until 1986

7 Including special allocations

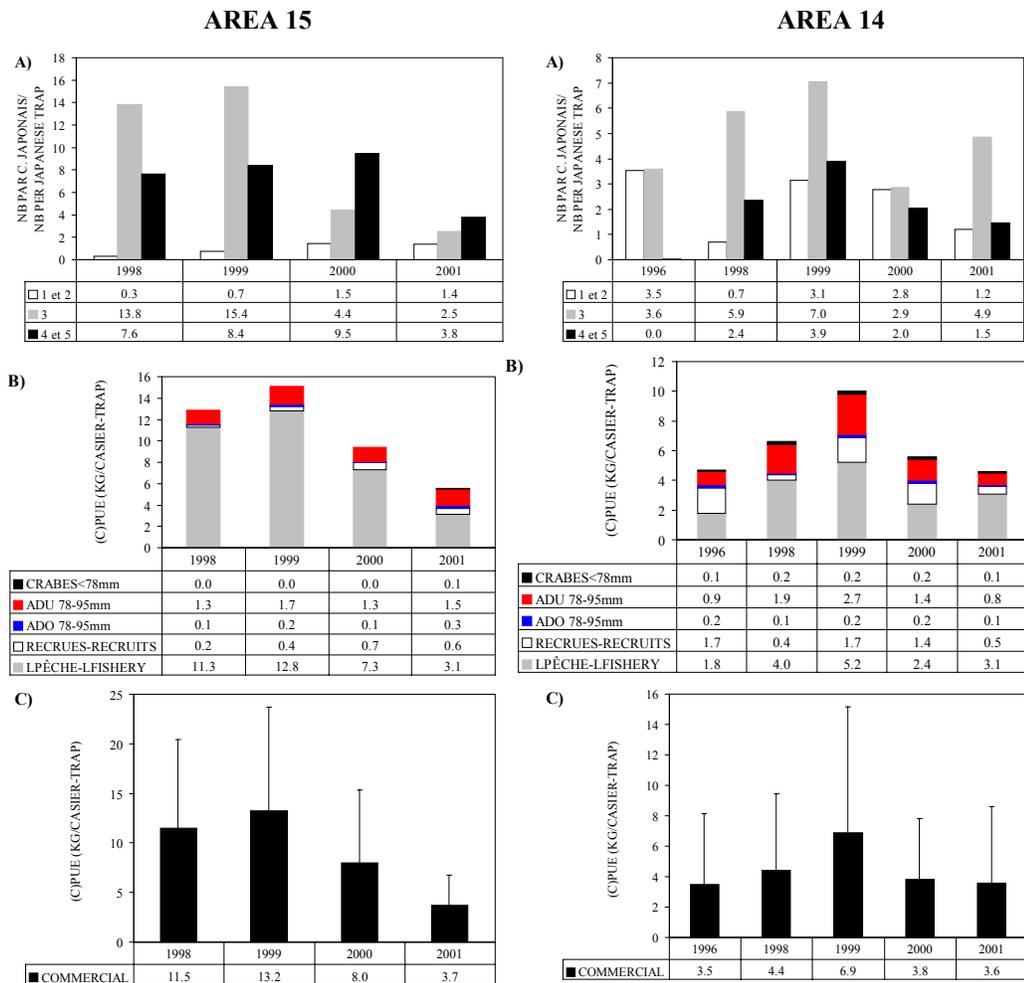


Figure 6. Results of postseason trap surveys in areas 15 and 14 between 1996 and 2001. (A) Shell condition of legal-size males. (B) CPUE (kg/Japanese trap) of the different groups of males and (C) CPUE + 1 standard deviation of legal-size males.

### Outlook for 2002

Recruitment is low but essentially stable since 1996. The harvestable biomass and commercial yields decreased from 1996 to 1999, but appear to have stabilized in 2000 and 2001. The harvestable biomass will likely remain low in 2002.

*In the absence of recruitment, it is recommended that the 2002 TAC be reduced to protect the reproductive potential.*

### Snow crab in Area 13

Forty-three fishers from Quebec and six from Newfoundland share the regular quota in this area and no temporary allocations have been granted since 1999. In 2001, the TAC of 848 t was unchanged from 1999 (Table 3). However, as at December 14, 2001, landings totalled only 793 t and the TAC was not caught despite an extension of the fishing season from August 9 to September 9. The fishery began on May 1 in 2001.

**Resource status in 2001**

The commercial fishery CPUE fell sharply (39%) in the entire area, from 6.9 (2000) to 4.2 kg/Japanese trap despite a substantial increase (59%) in the fishing effort compared to 2000 (Table 3). Unlike last year, when only the northern sector experienced a decrease, both sectors were affected negatively in 2001, with a 21% decrease in the north (5.2 to 4.1 kg/Japanese trap) and a larger decline (47%) in the south (8.5 to 4.5 kg/Japanese trap). The trend toward increased effort in the south to the detriment of the northern part of the area, which began in 1999, reversed in 2001 and a more intensive fishery was observed in the more northerly sectors and in those near the boundary with Area 14.

The proportion of new crab (24%) measured at sea during the fishery increased substantially in Area 13 from 2000, while conversely, the proportion of old crab fell sharply to 17% in 2001. The mean CW of legal-size crab measured at sea (102.1 mm) and at dockside (101.1 mm) was down from 2000. The size structures of crab measured at sea show a continuous decline of the harvestable biomass on the bottom since 1998. The proportion of prerecruits between 78 and 95 mm CW was 6%, a strong increase over 2000.

The commercial crab CPUE from the trap surveys conducted since 1999 in the north and south of the area is low and down from the 2000 level (Figure 7). The CPUE has been declining since the survey began

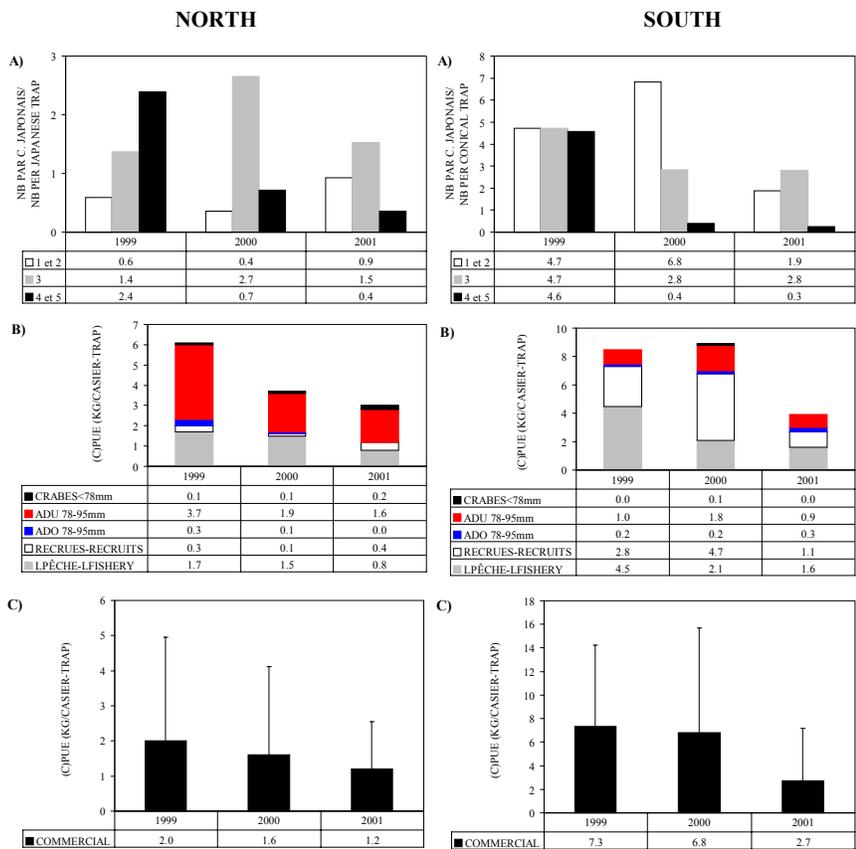


Figure 7. Results of postseason trap surveys in Area 13 (north and south) from 1999 to 2001. (A) Shell condition of legal-size males. (B) CPUE (kg/Japanese trap) of the different groups of males and (C) CPUE + 1 standard deviation of legal-size males.

and fell to 1.2 kg/trap in the north and 2.7 kg/trap in the south in 2001. The number of new and old crab remained stable and low in the entire area compared to 2000. The size of legal-size crab stood at 101.2 mm in the north and 104.6 mm in the south in 2001, representing respectively a decrease and an increase relative to 2000. The level of abundance of prerecruits between 78 and 95 mm CW (ADO<sup>-1</sup>) has been very low throughout the area since the survey began. No ADO<sup>-1</sup> were caught in the traps fished in the north and virtually none in those from the south (0.3 crab/trap) of the area in 2001.

**The beam trawl survey** conducted in the northern sector of Area 13 in 2000 indicated, for adolescent crab between 62 and 78 mm CW (ADO<sup>-2</sup>), a high level of abundance (39 crab per 10,000 m<sup>2</sup>), higher than the level recorded in 1994-95. Furthermore, the 1994, 1995 and 1996 year-classes which will reach commercial size beginning in 2003 appear to be stronger than the previous year-classes. A potential recovery of recruitment could therefore become evident in the short term if the strength of the upcoming year-classes is not attenuated by an early terminal moult or by environmental conditions preventing these year-classes from growing to commercial size.

### **Outlook for 2002**

Commercial yields fell sharply throughout the area in 2001 and the TAC was not caught despite a significant increase in the fishing effort and a one-month extension of the fishing season.

The size structures at sea show a steady decline in the commercial biomass over several years and, consequently, fishing success has become increasingly dependent on new recruits. Since recruitment was lower than natural and fishing mortality during the same period, the harvestable biomass is therefore very low since it has

not been renewed. Furthermore, the surveys conducted in the area show that the harvestable biomass should remain very low in 2002 and could even decline.

Keeping 2002 catches at the same level as in 2001 will likely further reduce the biomass of commercial-size males and reproductive potential could be severely compromised. It is recommended that 2002 catches be reduced by at least 35% to 40%, which should bring the fishing effort back down to the 1998-2000 level. This should at best stabilize the harvestable biomass at the 2000 or 2001 level.

*For more information:*

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 1999 à 2001. DFO Atlantic Fisheries, Research Document (in preparation).

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