



ASSESSMENT OF THE ESTUARY AND NORTHERN GULF OF ST. LAWRENCE (AREAS 13 TO 17 AND 12A, 12B AND 12C) SNOW CRAB STOCKS IN 2006

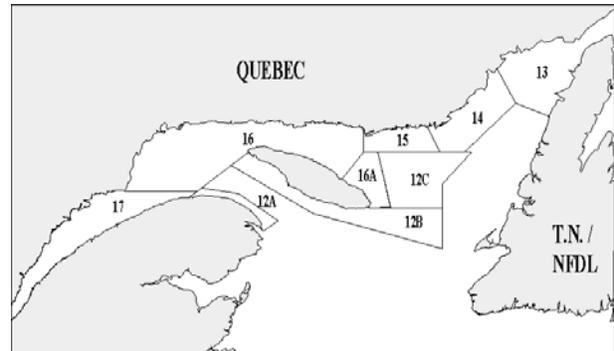
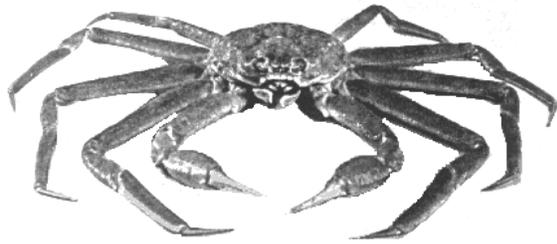


Figure 1. Snow crab management areas in the Estuary and the northern Gulf of St. Lawrence.

Context

The snow crab fishery in the Estuary and the northern Gulf of St. Lawrence began in the late 1960s. The fishery experienced a boom from 1979 to 1985, and a management approach based on the TAC (total allowable catch) was gradually introduced between 1985 and 1995. There are eight management areas (13 to 17 and 12A, 12B and 12C) (Figure 1). A new area (16A), which is adjacent to Area 16, was created in 2001 to help Area 13 fishers who were experiencing hardship.

Landings have varied depending on the recruitment waves and troughs that have affected the fishery (Figure 2), with maximum levels recorded in 1995 (7,879 t) and 2002 (10,372 t). Landings considerably dropped in 2003 owing to the lower TACs established in response to the overfishing reflected in the indices, particularly in Area 16.

The fishery is directed exclusively at males with a carapace width of at least 95 mm. White crab (crab that has recently moulted) and adolescent males may be returned to water during the fishing season to enhance their meat yield and give them a chance to reproduce. Furthermore, since 1985, the fishery has automatically been closed in the area concerned when the proportion of white crab in catches has exceeded 20%, in order to minimize the mortality of these very fragile crabs that will be available to the fishery the following year.

SUMMARY

- The last recruitment wave was fully exploited in certain management areas, while a high commercial biomass still exists in others. Most management areas are characterized by a decreasing recruitment as well as a decreasing abundance of prerecruits. The 2006 fishery relied essentially on intermediate-shell crabs whose catchability is very high and which will disappear in the short or medium term. Advices for 2007 vary, from lowering the

TAC in management areas where the recruitment wave is over, to increasing it for the areas where still exists a high commercial biomass in order to take advantage of the situation before the anticipated decreases. Advices for 2007 encourage the maintenance of an adequate reproductive biomass for males so as to not adversely affect the recovery of the population in a given area. Recommendations assume that the natural mortality rate will not differ from 2006 to 2007 compared with previous years.

In Area 17, a 25% drop in the 2006 TAC is recommended for 2007.

In Area 16, an increase not exceeding 25% of the 2006 TAC is recommended to take advantage of the accumulated biomass.

In Area 15, the TAC could be increased in 2007 up to 30% of what it was in 2006 to take advantage of the accumulated biomass.

In Area 14, it is recommended not to increase fishing pressure in 2007 and maintain the TAC at the same level as in 2006. It is recommended to target older crabs in 2007.

In Area 13, based on the re-opening criteria that were not reached, the area should remain closed in 2007.

In Area 12A, a drop of around 25% in the 2006 TAC is recommended for 2007.

In Area 12B, it is recommended that the 2006 TAC be comparable in 2007.

In Area 12C, it is recommended that the 2006 TAC be comparable in 2007.

INTRODUCTION

Species Biology

In Canada, snow crab can be found from the southern tip of Nova Scotia to midway up Labrador as well as in the Estuary and Gulf of St. Lawrence. Males of commercial size live at depths of around 60-220 m, except during their moulting and reproductive period when they migrate to shallower waters. Snow crab stop growing after their terminal moult. The male is referred to as immature or an adolescent (small claws) prior to the terminal moult and as an adult (large claws) afterward. Males range in carapace width (CW) from 40 mm to 165 mm after their terminal moult. If they do not do their terminal moult before, males reach legal size (CW of 95 mm) at about nine years of age. Snow crab recruitment is periodic. It varies over a cycle of 8 to 12 years. The recruitment situation in the fishery can be determined through the regular monitoring of catches (size, carapace condition) and effort (catch per unit effort (CPUE)), and confirmed by scientific trap and trawl surveys.

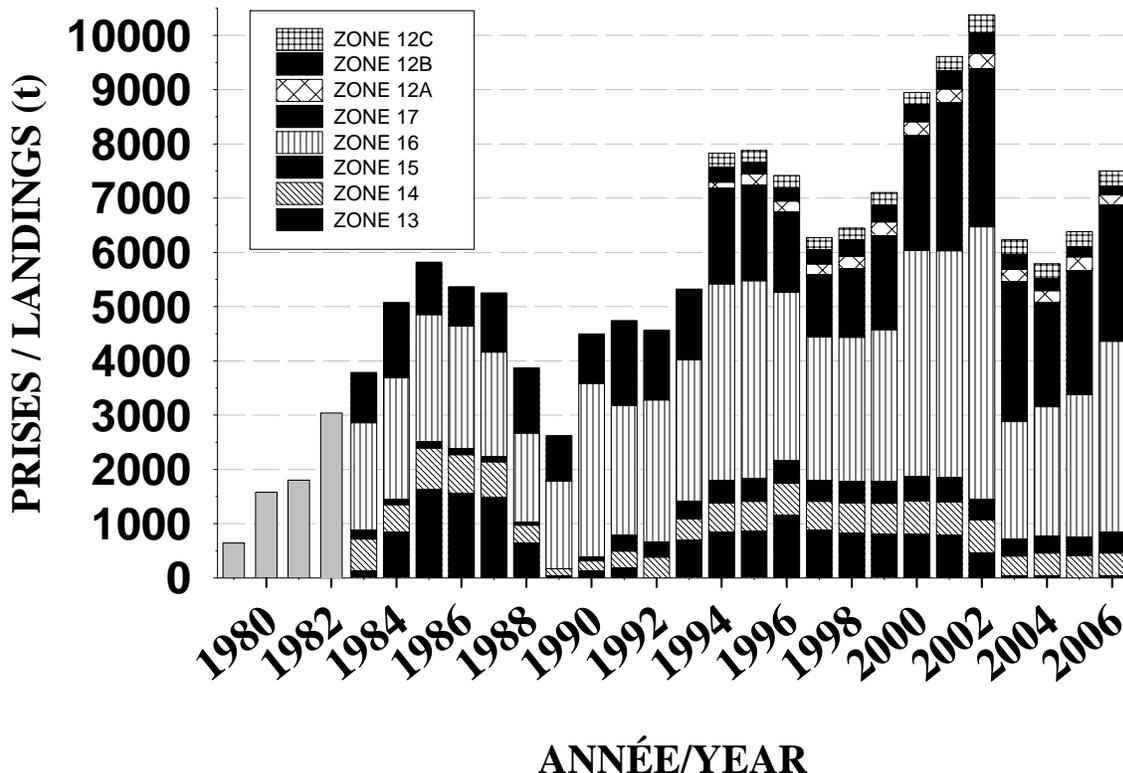


Figure 2. Snow crab landings in the Estuary and northern Gulf of St. Lawrence. From 1979 to 1982 (grey bars), landings were not differentiated per area.

ASSESSMENT OF THE RESOURCE

Fishing data derived from logbooks, processing plant purchase slips and dockside weighing summaries, along with catch sampling data obtained from the Observers Program and DFO samplers, are the basis for the analyses of all areas. In 2006, a trap-based research survey was carried out in all fishing areas (except 12C) and the findings were incorporated into the stock status analyses. The results of the 2006 trawl surveys, done in areas 16 and 13, were also used.

The raw CPUE (catch per unit effort) for the fishery were standardized using a multiplicative model to take into account changes caused by the different fishing strategies employed and environmental and economical constraints. This standardizing model was improved over the last year and went from a model with 4 independent factors to a model with 6 factors and interactions that represent much better the recorded variations.

Until now, data on female insemination levels have been collected sporadically in certain areas. An annual systematic sampling of each area is preferred in order to use this parameter for stock status assessments.

Snow Crab in Area 17

Fishery Description

There are 22 active license holders in Area 17. The TAC increased by 10% between 2005 and 2006 and totalled 2,541 t (Figure 3A), of which 381 t in temporary allocations. The fishing season opened on March 29th and closed on July 15th, 2006, and the TAC was met.

Resource Status in 2006

In the commercial fishery, the standardized CPUE was maintained at high values from 2000 to 2004 and dropped by 30% between 2004 and 2006 (Figure 3B). In 2006, it is near the 1985-2005 mean. In 2006, around 60% of catches were made on the south shore; 10% less than 2005. More than 80% of the crabs sampled at sea were intermediate-shell (condition 3) crabs. The proportion of old crabs (conditions 4 and 5) during the commercial fishery was 13% in 2006. The mean of legal-size crab caught at sea, which the trend rose from 1999 (107.6 mm) to 2004 (113.8 mm), dropped to 112.2 mm in 2005 and to 110.2 mm in 2006 (Figure 3C).

The findings of the postseason trap survey, a data series that began in 1996 on the north shore and in 1999 on the south shore, indicate a large drop in the exploitable biomass on the north and south shores between 2005 and 2006 (38% and 51% respectively) (Figure 4). On the south shore, the decrease in recruitment (legal-size adults characterized by a carapace status of 1 or 2) perceived between 2002 and 2005, was interrupted between 2005 and 2006; on the north shore, recruitment was stable between 2005 and 2006 but it remains below the values recorded from 2000 to 2002 (Figure 5). The mean size of legal-size crabs increased from 2001 to 2004 on both shores. It then remained stable on the north shore from 2004 to 2005 and dropped in 2006, whereas on the south shore, it has been dropping since 2005. For both shores, the proportion of crabs with intermediate-size carapaces decreased between 2005 and 2006, whereas crabs with new carapaces (conditions 1 and 2) were proportionately more abundant. Between 2005 and 2006, the proportion of old crabs slightly increased on the north shore and remained stable on the south shore. The mean number of adolescents between 78 mm and 95 mm CW (ADO^{-1}) caught in traps (NUE) has increased slightly since 2003 on the north shore but remains below the strong recorded values between 2000 and 2002. On the south shore, this number remains stable and relatively low (Figure 6).

The findings of the trap survey carried out on the Estuary's north shore in 2005 indicated a small abundance of prerecruits, both for adolescents measuring between 62 mm and 78 mm (ADO_{-2}) and for individuals of 20 mm to 62 mm.

The 2003, 2005 and 2006 verification of the average amount of sperm stored in the female's spermatheca showed a drop between 2003 and 2006, but the quantity remains above the level required for a high success rate of fertilizing eggs.

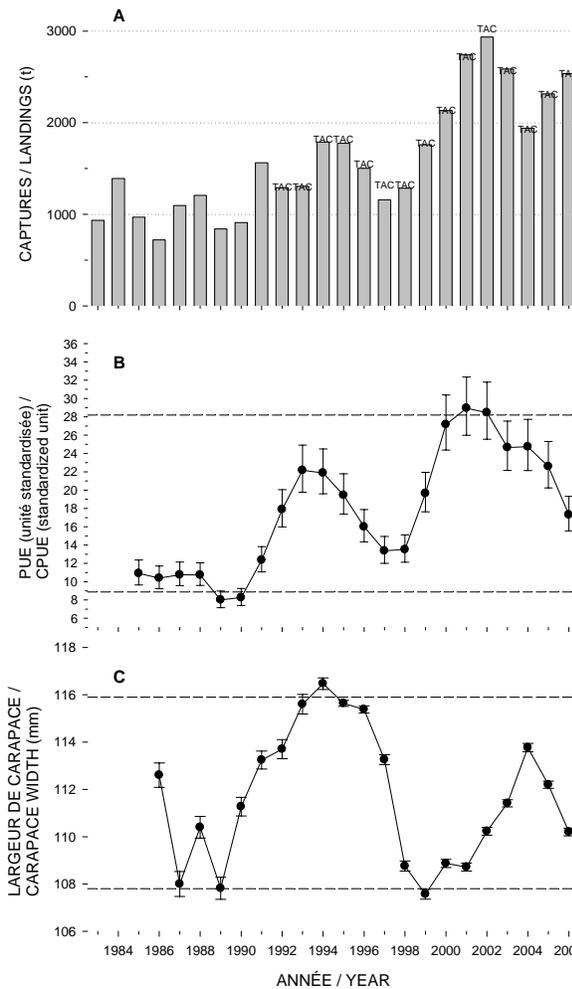


Figure 3. Main parameters estimated during the fishing season for Area 17, 1983–2006: A) landings and TAC; B) standardized CPUE \pm confidence interval; and C) mean carapace width \pm confidence interval for commercial crabs sampled at sea. The mean of the 3 lowest values and the mean of the 3 highest values are indicated by dotted lines in graphs B and C.

Conclusions and Advice

Landings and TAC increased by 10% between 2005 and 2006, totalling 2,541 t.

Catch rates and crab size from the commercial fishery and the postseason survey dropped heavily between 2005 and 2006, indicating a marked decrease in the biomass available to the

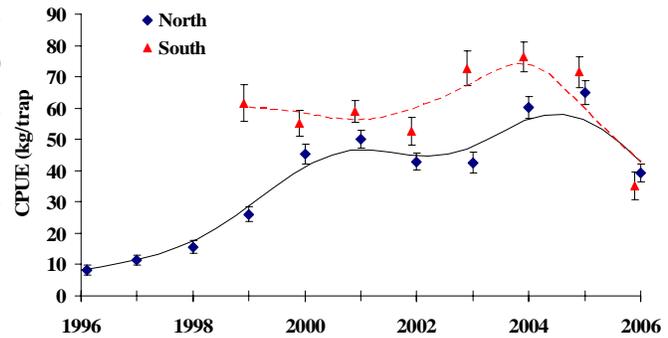


Figure 4. Catch rates (CPUEs) of adult crabs ≥ 95 mm with confidence interval and trend line (Lowess type) from the postseason survey in Area 17, 1996–2006.

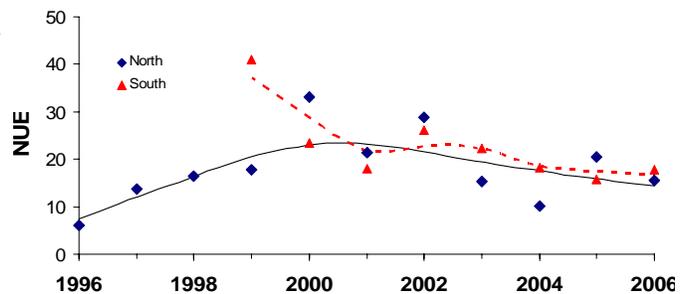


Figure 5. Catch rates (NUE) with trend lines (Lowess type) for recruits from the postseason survey conducted in Area 17, 1996–2006.

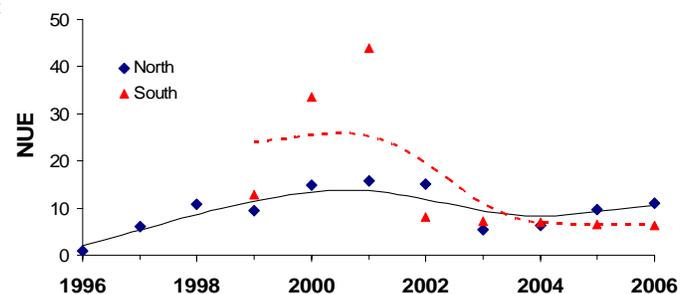


Figure 6. Catch rates (NUE) with trend lines (Lowess type) for adolescents measuring between 78 mm and 95 mm from the postseason survey conducted in Area 17, 1996–2006.

fishery. The drop was higher in the south-eastern part of the area. Crab size will be smaller in 2007.

Abundance indices for recruits and adolescents between 78 mm and 95 mm are similar to 2005, indicating that the arrival of new crabs will not be higher in 2007 than in 2006. Results from the last trawl survey did not show any recovery of recruitment in the short term.

The passage of the recruitment wave is over in this area. If the fishing pressure remains high, it could therefore result in another significant drop in biomass available to the 2008 fishery and the proportion of white crab in catches could increase. A significant drop in the number of legal-size adult males compared to primiparous females is likely to reduce their insemination success, which had remained good in 2006.

Recommendations

A drop of around 25% of the 2006 TAC is recommended for 2007.

Snow Crab in Area 16

Fishery Description

A total of 39 fishers hold regular snow crab fishing licenses in Area 16. In 2006, the TAC was 3,480 t, a 34% increase or 876 t over the 2005 level (Figure 7A). A portion of this TAC was allocated for Area 16A (275 t). The fishery opened on April 19 and closed on August 4; the TAC was met.

Resource Status in 2006

In the fishery, the standardized CPUE dropped from 2000 to 2003, but increased subsequently and reached high values in 2005 and 2006, while showing a ceiling trend (Figure 7B). Nearly 87% of the crabs sampled at sea were intermediate-shell (condition 3) crabs and few new (conditions 1 and 2) and old (conditions 4 and 5) crabs were observed in samples. The mean CW of legal-size crab at sea, which had begun increasing in 2003 following a sharp downward period, increased by more than 2 mm between 2005 and 2006, reaching 110.4 mm (Figure 7C).

The postseason trap surveys, which have been conducted every fall since 1994, show that the CPUE of legal-size crab increased sharply in 2003 and remained between 34 and 36 kg/conical trap until 2006 (Figure 8). The mean size of adult crab (at least 95 mm) has increased for the fourth consecutive year to reach 110.1 mm CW in 2006. The mean NUE (number per unit effort) for recruits has been dropping since 2003 and sits at 7.8 crabs/conical trap in 2006 (Figure 9). The mean NUE for adolescent crabs between 78 mm and 95 mm CW has been slowly dropping since 2002, reaching 5.5 crabs/conical trap in 2006 (Figure 9). The proportion of intermediate-shell crabs rose from 2004 to 2006, reaching 77% in 2006. The proportion of old crabs is relatively low and stable since 2000 at around 10%.

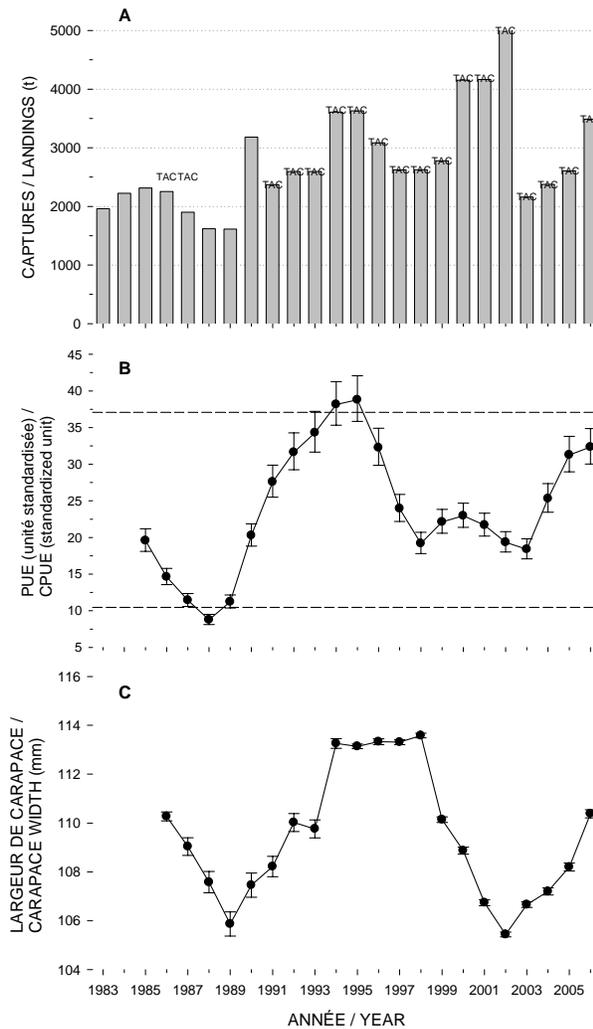


Figure 7. Main parameters estimated during the fishing season in Area 16, 1983–2006: A) landings and TAC; B) standardized CPUE ± confidence interval; and C) mean carapace width ± confidence interval of commercial crabs sampled at sea. The mean of the 3 lowest values and the mean of the 3 highest values are indicated by dotted lines in graphs B and C.

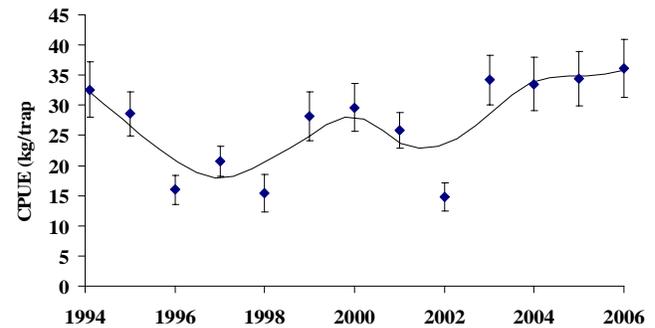


Figure 8. Catch rates (CPUEs) of adult crabs ≥ 95 with confidence interval and trend line (Lowess type) from the postseason survey in Area 16, 1994–2006.

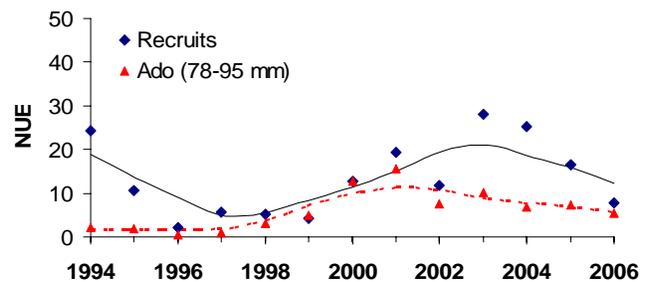


Figure 9. Catch rates (NUE) with trend line (Lowess type) for recruits and adolescents between 78 mm and 95 mm from the postseason survey conducted in Area 16, 1994–2006.

Results from the trawl survey conducted in St. Marguerite Bay in 2006, near Sept-Îles, showed a high abundance of small individuals that could represent the next recruitment wave as of 2010. The capture of males between 40 and 95 mm was low during this survey, which possibly confirms the absence of a short term recruitment wave. The survey also showed that the proportion of legal-size adults is dropping in the population, but that average size individuals were increasing.

The spermatheca of mature females remains very full, and no sperm shortage is expected in the short term.

Conclusions and Advice

Following a TAC increase, catches increased from 2,608 t in 2005 to 3,489 t (including 16A) in 2006, a 34% increase.

Between 2005 and 2006, catch rates from the commercial fishery and postseason survey slightly increased and are at high values. Crab sizes increased during this period.

The recruitment index which was still relatively high in 2005 showed a decrease in 2006. The abundance index of adolescent crabs between 78 mm and 95 mm has been slowly dropping since 2002.

Results suggest that the biomass available to the fishery, yield and crab size will still be high in 2007. There will then be a gradual drop of this biomass based on the fishing pressure and recruitment. A slightly higher TAC would help take advantage of the accumulated biomass without leading to any major drop of biomass indices as long as recruitment and mortality remains at the same level as in 2006.

Recommendations

An increase not exceeding 25% of the 2006 TAC is recommended in order to take advantage of the accumulated biomass.

Snow Crab in Area 15

Fishery Description

Area 15 has 8 regular fishers. In 2006, the TAC was 414 t, a 15% increase compared to 2005 (Figure 10A), of which 35.7 t were temporary allocations granted. In 2006, the fishery opened on April 17 and closed on August 5 and the TAC was met.

Resource Status in 2005

The fishery's standardized CPUE, in decline from 1996 to 2002, stabilized in 2003 and has gone up by 96% since 2003, 39% between 2005 and 2006 (Figure 10B). Most (80%) of the crabs sampled at sea were intermediate-shell crabs (condition 3), and 14% were old crabs (conditions 4 and 5). Between 2005 and 2006, the mean CW of legal-size crabs sampled at sea increased from 106.1 mm to 1008.9 mm (Figure 10C).

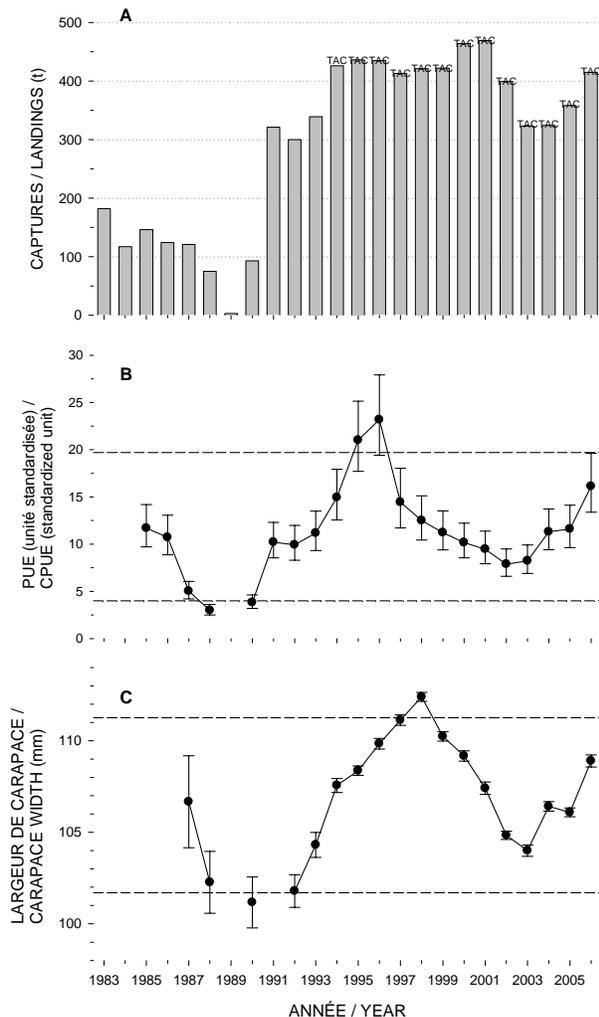


Figure 10. Main parameters estimated during the fishing season in Area 15, 1983–2006: A) landings and TAC; B) standardized CPUE \pm confidence interval; and C) mean carapace width \pm confidence interval of commercial crabs sampled at sea. The mean of the 3 lowest values and the mean of the 3 highest values are indicated by dotted lines in graphs B and C.

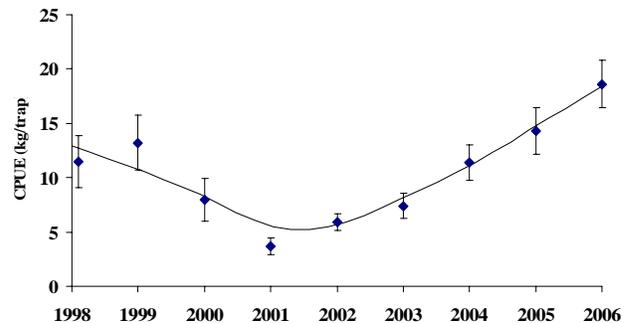


Figure 11. Catch rates (CPUEs) of adult crabs ≥ 95 with confidence interval and trend line (Lowess type) from the postseason survey in Area 15, 1998–2006.

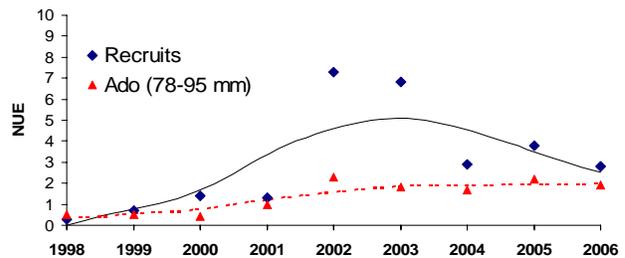


Figure 12. Catch rates (NUE) with trend line (Lowess type) for recruits and adolescents between 78 mm and 95 mm from the postseason survey conducted in Area 15, 1998–2006.

The **scientific trap survey**, which has been conducted since 1998, showed that the CPUE of commercial-size crab, which has been rising since 2001, was up again from 14.3 kg/Japanese trap in 2005 to a record high of 18.6 kg/Japanese trap in 2006 (Figure 11). In 2006, the proportion of intermediate-shell crabs (condition 3) remained at the same level as 2005 at a little less than 50%, whereas the proportion of old crabs (conditions 4 and 5) increased during this period and accounted for almost 43% of the catches. However, each of these categories remains close to the mean of the 1998-2005 period. The mean size of the harvested crab has been gradually increasing since 2002 and reached 108.1 mm in 2006. After dropping by more than 50% from 2003 to 2004, the mean NUE for recruits varied only slightly up to 2006, and

reached 2.8 crabs per trap (Figure 12). The mean NUE for adolescents between 78 mm and 95 mm has only slightly changed since 2002 and has reached, in 2006, 1.9 individuals per trap, which is near the all-time high of 2.3 individuals per trap recorded in 2002 (Figure 12).

Conclusions and Advice

TAC and catches have increased by 15% between 2005 and 2006, totalling 415 t.

During this period, catch rates and the mean CW size of crabs in the commercial fishery and postseason survey have considerably increased, which indicates a higher biomass available to the fishery.

According to the postseason surveys, recruitment has been table since 2004 but weaker than in 2002 and 2003, whereas the abundance index of adolescent crabs between 78 mm and 95 mm has remained stable and high since 2002.

Results suggest that the biomass available to the fishery, the yield and size of the crab will remain high in 2007. A slightly higher TAC would help take advantage of the accumulated biomass without leading to any major drop, as long as recruitment and mortality remain at a similar level as in 2006.

Recommendations

The 2007 TAC could be increased up to 30% higher than in 2006 in order to take advantage of the accumulated biomass.

Snow Crab in Area 14

Fishery Description

Area 14 has 21 regular fishers. The 2005 quota of 405 t was renewed in 2006 and did not include any temporary allocations (Figure 13A). In 2006, the fishing season opened on May 1 and closed on July 31. The TAC was met.

The standardized CPUE for the commercial fishery, which had risen sharply in 2003, plummeted by 38% in 2004, and varied only slightly in 2006 and was a little below the mean for the 1985-2005 period (Figure 13B). Nearly 80% of the crabs sampled at sea were intermediate-shell crabs (condition 3) and there was a small decrease in the proportion of old crabs (conditions 4 and 5) which remained at an average level (20%) in the traps. The mean size of legal-size crabs caught at sea in rose from 104.9 mm in 2005, to 108.5 mm in 2006; one of the highest values since 1989 (Figure 10C).

The **scientific trap survey** conducted since 1996 indicated, following a CPUE drop for commercial-size crab of 46% between 2004 and 2005, another much weaker decrease between 2005 and 2006 (Figure 14). There was a sharp drop in the proportion of intermediate-shell crab (condition 3) between 2004 and 2005 and it remained similar in 2006, accounting for only 41% of catches. The proportion of old crabs (conditions 4 and 5) was high in 2005 and 2006, reaching 46% and 49% of catches respectively. The mean size of legal-size crabs remained

stable between 2005 and 2006 around 106 mm. The mean NUE for recruits has been dropping since 2003 and only reached 0.5 individual per trap in 2006, which represents an all-time low (Figure 15). The mean NUE for adolescents between 78 mm and 95 mm has also dropped and remains at less than 1 individual per trap since trap surveys began in this area (Figure 15).

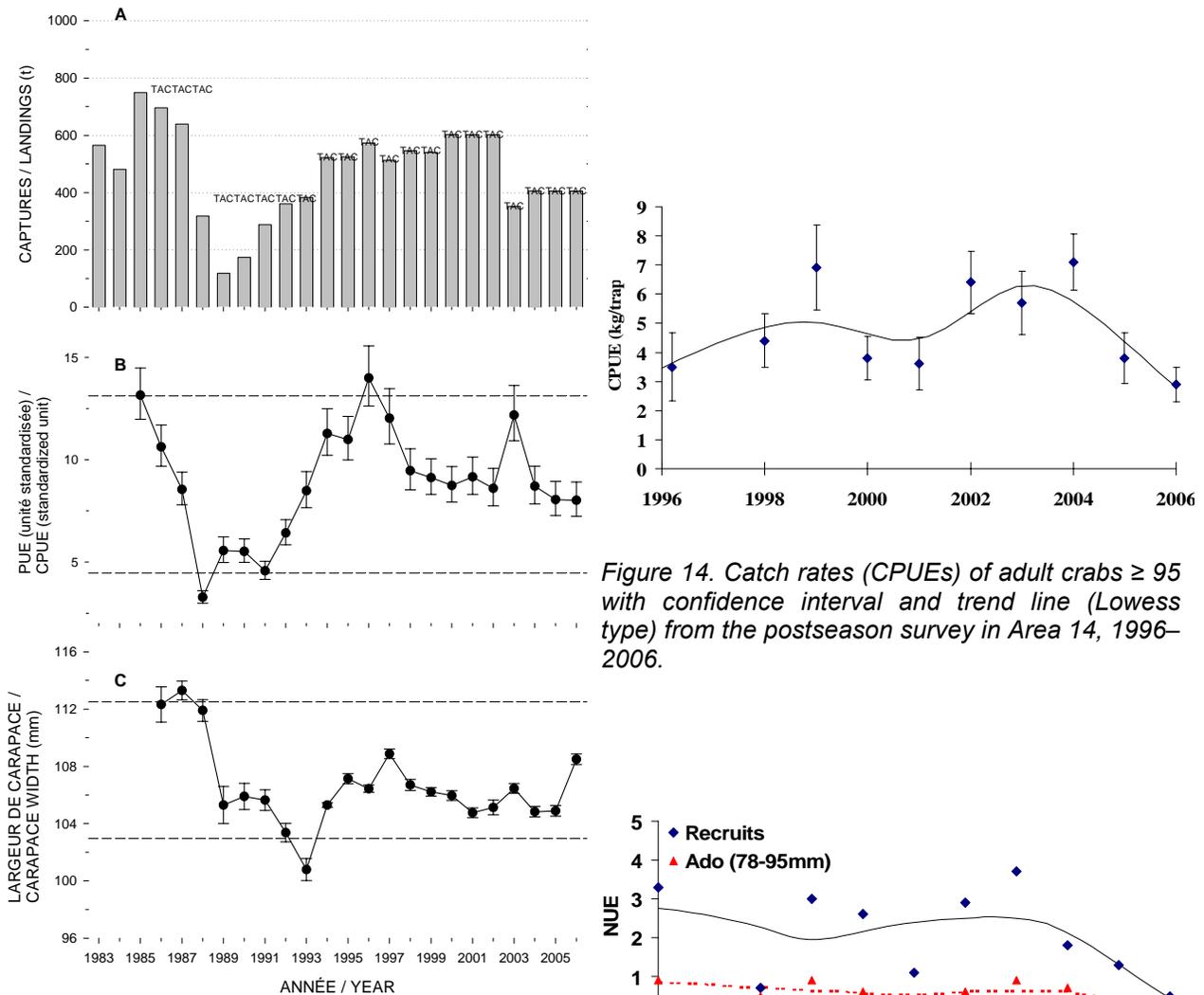


Figure 14. Catch rates (CPUEs) of adult crabs ≥ 95 with confidence interval and trend line (Lowess type) from the postseason survey in Area 14, 1996–2006.

Figure 13. Main parameters estimated during the fishing season in Area 14, 1983–2006: A) landings and TAC; B) standardized CPUE \pm confidence interval; and C) mean carapace width \pm confidence interval of commercial crabs sampled at sea. The mean of the 3 lowest values and the mean of the 3 highest values are indicated by dotted lines in graphs B and C.

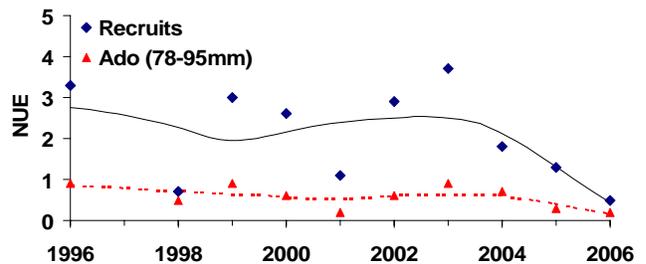


Figure 15. Catch rates (NUE) for recruits and adolescents between 78 mm and 95 mm with trend line (Lowess type) from the postseason survey conducted in Area 14, 1996–2006.

Conclusions and Advice

The TAC and landings have been stable at 405 t since 2004.

Catch rates have been relatively stable since 1997, but have been dropping since 2004 during the postseason surveys. Catches during the postseason surveys of 2005 and 2006 included a large proportion of old crabs. The mean size of crab from the commercial fishery increased between 2005 and 2006 and, according to the postseason survey, should remain as high in 2007.

The abundance indices for recruits and adolescents between 78 mm and 95 mm have been dropping since 2004.

The biomass available to the fishery only varied a little between 2005 and 2006 and could remain at a similar or slightly lower level in 2007. However, the low recruitment and pre-recruitment indices suggest that it will drop over subsequent years.

Recommendations

It is recommended not to increase the fishing pressure in 2007 and to maintain the same TAC as in 2006. It would be wise to target old crabs in the 2007 fishery.

Snow Crab in Area 13

Fishery Description

Forty-three fishers from Quebec and six fishers from Newfoundland shared the regular quota allocated for this area until 2002. Since 2003, the area has been under moratorium. An index fishery of 50 t was nevertheless authorized in 2003, 2004 and 2006.

In 2006, during **the index fishery**, the standardized CPUE were higher than in 2003 and 2004, which suggests a biomass improvement. However, the 2006 fishery was conducted over a very small portion of the area. Therefore, results cannot be compared during the period when the commercial fishery was fully active.

The mean NUE for legal-size crabs obtained from **the scientific trap survey** has been low and stable since 2001 on the northern side (3 crabs/Japanese conical trap in 2006) whereas on the southern side, this number increased from 3.4 crabs/trap in 2004 to 9 crabs/trap in 2005 and 10 crabs/trap in 2006 (Figure 16). However, it should be noted that the sampled area was modified on the southern side in 2005 in order to concentrate the effort mostly on traditional fishing sites (analysis are being conducted to obtain an unbiased index). In 2006, on the northern side, the proportion of intermediate-shell crab (condition 3) in the traps was 73%, and 17% were old crabs (conditions 4 and 5). On the southern side, only new crabs (conditions 1 and 2) were reported in 2005 while in 2006, 41% of the catches were intermediate-shell crab. The mean and median sizes of adult legal-size crab increased from 2002 to 2004 in both sectors, and remained stable on the northern side until 2006, whereas on the southern side they dropped in 2005 but increased again in 2006. The median size of legal-size adults in 2006 was 101 mm in

the north and 105 mm in the south; the value is above the targeted median size of 104 mm (Figure 17). The mean NUE for recruits dropped in both sectors between 2005 and 2006 and numbered 0.3 crab per trap on the northern side and 5.1 crabs per trap on the southern side. The mean NUE for adolescent crabs between 78 mm and 95 mm was weak and stable in both sectors from 2003 to 2006.

Primiparous female insemination levels showed a noticeable drop between 2003 and 2005, reaching only 0.024 g per spermatheca, the lowest value ever recorded for a natural population of this species. These numbers are considered limiting and fecundity problems were obvious in females. However, between 2005 and 2006, this reproductive success index increased considerably and was not considered limiting.

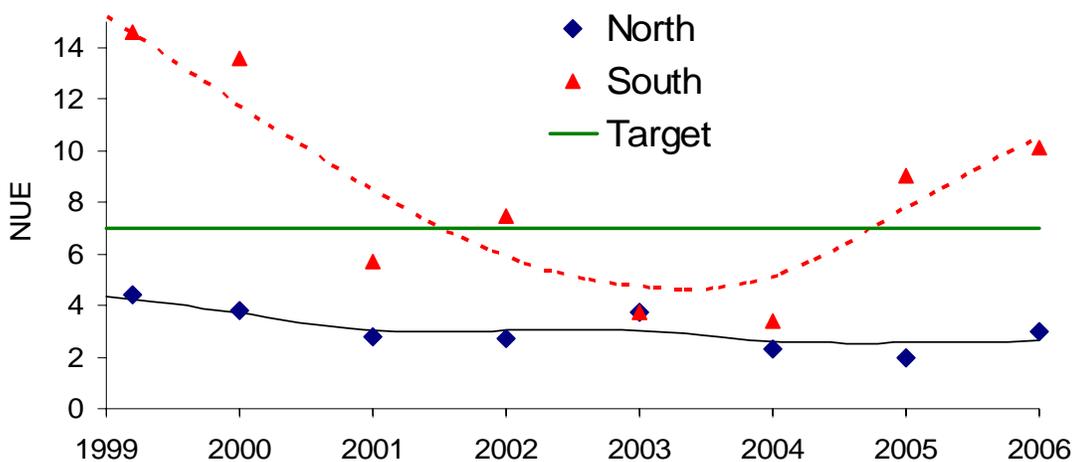


Figure 16. Catch rates (NUE) for 95+ mm crabs with trend lines (Lowess type) from the postseason survey conducted in Area 13, 1999–2006.

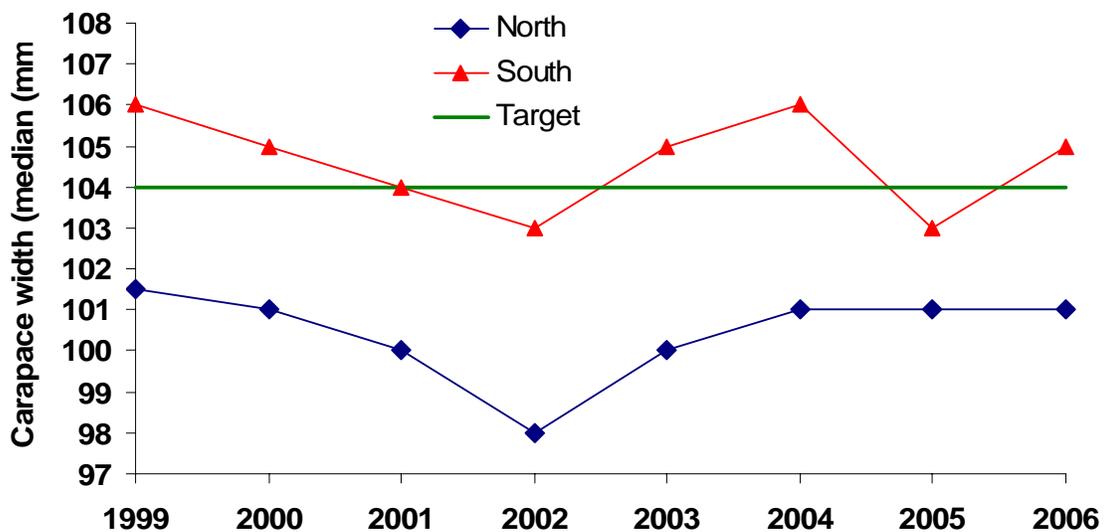


Figure 17. Median carapace width of 95+ mm crabs from the postseason survey conducted in Area 13, 1999–2006.

The **trawl survey** covering the northern part of Area 13 and the eastern part of Area 14 in 2006 showed that the abundance of adult legal-size crab (7.7 crab/10,000 m²) increased compared to 2004 (3.6 crabs/10,000 m²). The abundance of adolescents between 78 mm and 95 mm was slightly higher in 2006 (7.4 crabs/10,000 m²) than in 2004 (6.1 crabs/10,000 m²). Conversely, adolescents between 62 mm and 78 mm experienced a drop in abundance of around 50% between these two years. Males under 62 mm increased considerably between 2004 and 2006, and particularly those under 40 mm, which increased from 191 crabs/10,000 m² in 2004 to an all-time high of 800 crabs/10,000 m² in 2006. These strong cohorts (crabs under 40 mm) will not be apparent in the fishery until 2010 if the natural mortality level isn't too high and if growth is regular. The abundance of primiparous females also increased considerably between 2004 and 2006. Females under 40 mm were also very abundant during the 2006 trawl survey, which provides hope for a strong productivity over the next 3 or 4 years if reproductive success is good.

Conclusions and Advice

The fishery has been closed in Area 13 since 2003 but a TAC of 50 t was authorized in 2003, 2004 and 2006 to collect data on the stock.

In 2006, catch rates during the fishery improved but remain low and the effort was concentrated on a small part of the area. Results from the postseason survey suggest a more pronounced progression of the biomass in the south part of the area than in the north. However, the postseason survey in the southern part became increasingly concentrated on traditional fishing sectors from 2004 to 2006, which could provide a more positive perception of the status of the stock than it actually was.

The mean size in 2006 remained weak in the northern part and increased slightly in the southern part.

Between 2005 and 2006, recruitment indices remained low in the northern part and dropped in the south while remaining slightly above the overall mean of the series. Abundance indices of adolescent crabs between 78 mm and 95 mm have been weak and stable since 2003 for the overall area. Results from a trawl survey conducted in 2006 in the northern part show a strong abundance of crab under 40 mm, which would indicate the arrival of an important recruitment in a few years (4-7 years). The reproductive success of females increased between 2005 and 2006 after two years of marked drops.

The commercial biomass index was still weak in 2006 but higher than 2004 and 2005, based on a very localized fishery. The commercial biomass in 2007 should resemble 2006.

Recommendations

Based on the reopening criteria that were not met, the area should remain closed in 2007.

Snow Crab in Area 12A

Fishery Description

Area 12A has 9 regular fishers and a community license. The TAC was 229.1 t in 2006, 2.3 t higher than in 2005 (Figure 18A). In 2006, the fishery opened on March 25 and closed on June 30. The TAC wasn't met, mostly due to a weaker availability of the resource. Landings totalled 170 t.

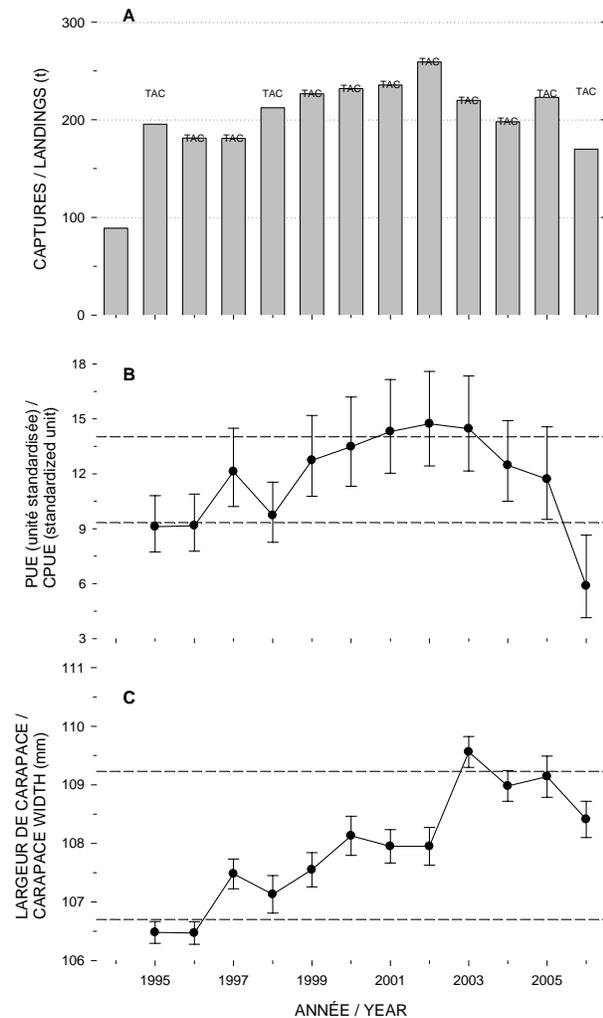


Figure 18. Main parameters estimated during the fishing season in Area 12A, 1995–2006: A) landings and TAC; B) standardized CPUE \pm confidence interval; and C) mean carapace width \pm confidence interval of commercial crabs sampled at sea. The mean of the 3 lowest values and the mean of the 3 highest values are indicated by dotted lines in graphs B and C.

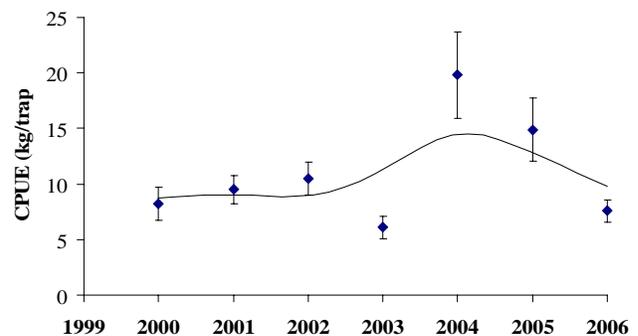


Figure 19. Catch rates (CPUEs) of adult crabs ≥ 95 mm with confidence interval and trend line (Lowess type) from the postseason survey in Area 12A, 2000–2006.

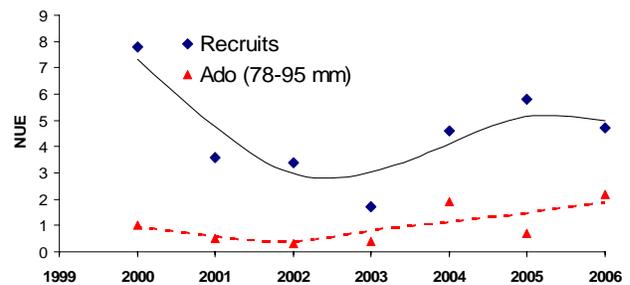


Figure 20. Catch rates (NUE) for recruits and adolescents between 78 mm and 95 mm with trend line (Lowess type) from the postseason survey conducted in Area 12A, 2000–2006.

In the commercial fishery, the standardized CPUE, which had been stable between 2004 and 2005, dropped by 50% in 2006 (Figure 18B). Intermediate-shell crabs (condition 3) accounted for 73% of catches made at sea, whereas old crabs accounted for 20%. The mean size (Figure 18C) of legal-size crabs sampled at sea decreased in 2005 (109.2 mm) and 2006 (108.4).

The findings of the **scientific trap survey**, conducted since 2000, indicate that the CPUE of legal-size crab tripled in 2004 (19.8 kg/conical trap) compared to 2003, followed by a 25% drop in 2005 (14.9 kg/conical trap) and a 49% drop in 2006 (7.6 kg/conical trap) (Figure 19). During the 2006 survey, the proportion of intermediate-shell crab (condition 3) was only 36% and old crabs (conditions 4 and 5) represented 30%. The mean size of legal-size crab dropped severely, from 109.2 mm in 2005 to 105.1 mm in 2006. The mean NUE for recruits has been stable since 2004, at a higher level than from 2001 to 2003 (Figure 20). The mean NUE for adolescents between 78 mm and 95 mm has been rather stable since 2004, but shows a slight increase compared to 2003 (Figure 20). It would be important to note however that the considerable drop in catches of intermediate CW crab in this area can increase the amount of adolescent crabs caught and recruits in the area, which could lead to a perception of a higher abundance than there actually is.

It is important to note that a study revealed that the crab abundance in Area 12A is partly due to the overlapping adjacent Area 17 in the west, and Area 12 in the east. Thus, the abundance indices of these two last areas are decreasing.

Conclusions and Advice

In 2006, landings were 170 t. The 229 t TAC was not met.

Catch rates from the commercial fishery dropped by almost 50% between 2005 and 2006. Similar results were recorded during the postseason survey in 2006, indicating a sharp decline of the biomass available to the fishery.

The mean size of crab dropped both during the commercial fishery and during the postseason survey, indicating that it will be lower in 2007 than in 2006.

Abundance indices have shown stability since 2004 for recruits and for adolescent crab between 78 mm and 95 mm CW.

The number of crabs that are emigrating from areas 12 and 17 appear to be dropping.

Even though recruitment seems stable in Area 12A, the arrival of new crabs would be insufficient to compensate for the drop in biomass available to the fishery. The TAC will have to be lowered in 2007 to avoid another significant drop of the biomass available to the fishery.

Recommendations

A drop of around 25% of the 2006 TAC is recommended for 2007.

Snow Crab in Area 12B

Fishery Description

In 2006, Area 12B had 6 commercial fishing licenses and 2 community licenses. The 238 t TAC introduced in 2004 and 2005 was reduced to 214 t in 2006 (Figure 21A). The fishery opened on March 25 and closed on June 30. The TAC was not met in 2005 and 2006. Total catches in 2006 reached 169 t.

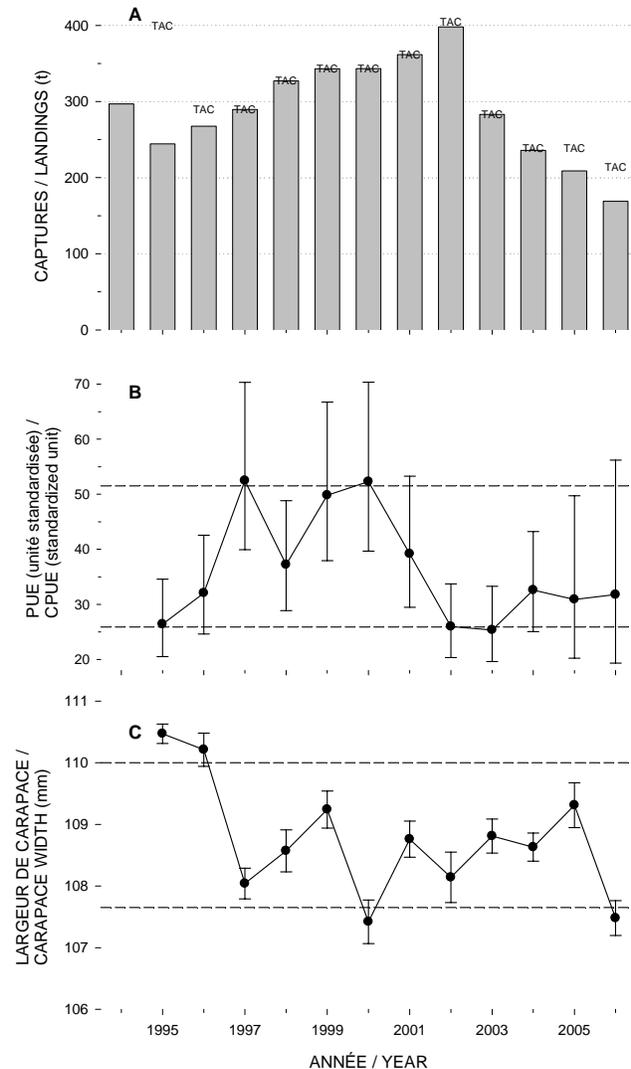


Figure 21. Main parameters estimated during the fishing season in Area 12B, 1994–2006: A) landings and TAC; B) standardized CPUE \pm confidence interval; and C) mean carapace width \pm confidence interval of commercial crabs sampled at sea. The mean of the 3 lowest values and the mean of the 3 highest values are indicated by dotted lines in graphs B and C.

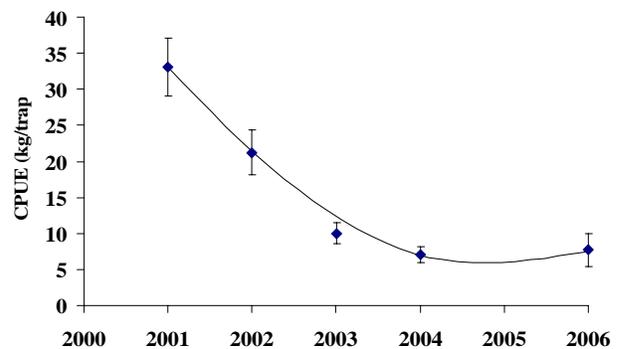


Figure 22. Catch rates (CPUEs) of adult crabs ≥ 95 with confidence interval and trend line (Lowess type) from the postseason survey in Area 12B, 2001–2006 (except for 2005).

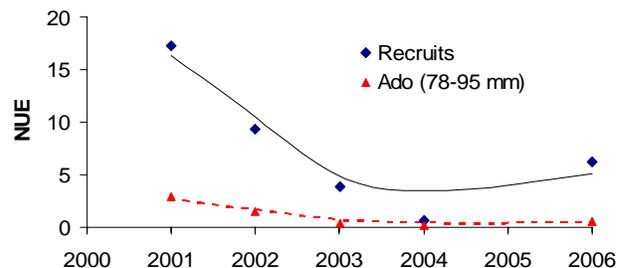


Figure 23. Catch rates (NUE) for recruits and adolescents between 78 mm and 95 mm with trend line (Lowess type) from the postseason survey conducted in Area 12B, 2001–2006 (except for 2005).

The standardized CPUE for the commercial fishery has been weak but stable since 2004 (Figure 21B). This stability could be attributed to reduced landings since 2002. In 2006, the samples collected during the fishery included a proportion of 81% of intermediate-shell crab (condition 3) with few old (conditions 4 and 5) crabs. The mean size of legal-size crab measured at sea (Figure 21C) dropped from 109.3 mm in 2005 to one of the lowest values in the same series, 107.5 mm in 2006.

The scientific trap survey conducted since 2001 (except in 2005) showed a drop of the CPUE of legal-size crab from 2001 to 2004 and in 2006, the CPUE remained similar to 2004, year of the last survey (Figure 22). During the 2006 survey, the proportion of intermediate-shell crab was of only 29% whereas old crabs (conditions 4 and 5) accounted for 24% of catches. The mean size of legal-size crab dropped slightly to 107.3 mm in 2006. The recruit abundance index (NUE) rose from 0.7 crab per trap in 2004 to 6.2 crabs per trap in 2006. The mean NUE for adolescents between 78 mm and 95 mm has been low and stable since 2003 (Figure 23).

Conclusions and Advice

In 2006, catches totalled 169 t, which corresponds to a 19% drop compared to 2005. The 214 t TAC in 2006 was not met.

Catch rates from the commercial fishery remained stable from 2004 to 2006 and those from the 2006 postseason survey were similar to 2004, the year the survey was last conducted. The mean size of crab was weaker in 2006 than 2004 and 2005. In 2006, the proportion of intermediate-CW crab was low in the postseason survey.

The abundance index for recruits has been rising slowly but remains low, whereas adolescents between 78 mm and 95 mm have been weak since 2003.

The successive drops in catches over the last four years should have stabilized the biomass available to the fishery. Because the fishing pressure and landings in 2006 did not lower the biomass, it would be wise to maintain a similar fishing pressure in 2007.

Recommendations

It is recommended to have the same TAC in 2007 as in 2006.

Snow Crab in Area 12C

Fishery Description

Area 12C has five regular fishers and features two banks (north and south sectors) separated by a deep channel of the Jacques-Cartier Strait. The TAC (Figure 23A) was reduced by 15% in 2003 and remained similar until 2006 (264.3 t). Temporary allocations totalling 81.1 t were granted in 2006. The fishery opened on April 17 and closed on August 5. In 2006, the fishing effort was more concentrated in the northern part of the area compared to previous years. The TAC was met.

The standardized CPUE for the commercial fishery plummeted between 1996 and 1997 and has not really changed since. It increased between 2005 and 2006 but at a value similar to that recorded from 2002 to 2004 (Figure 24B). Intermediate-shell crab (condition 3) and old crab (conditions 4 and 5) respectively accounted for 85% and 14% of the crab sampled at sea in 2006. The mean size of legal-size crab measured at sea has been increasing since 2002 and reached 110.9 mm in 2006 (Figure 24C).

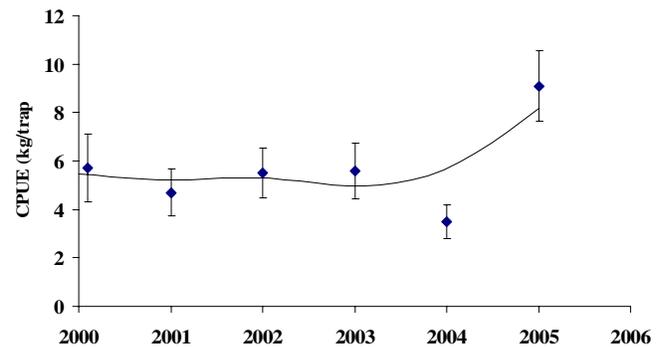
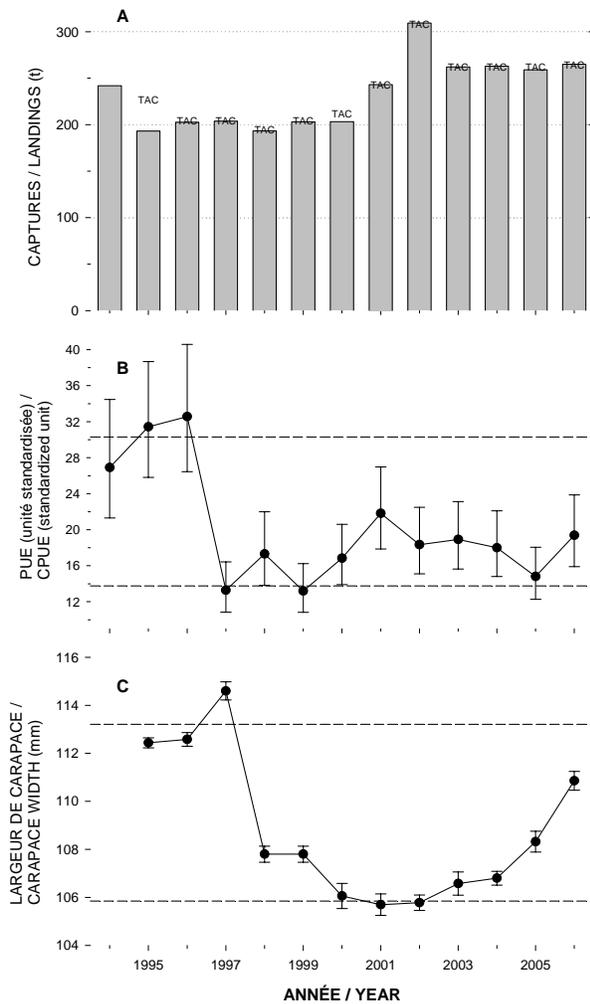


Figure 25. Catch rates (CPUEs) of adult crabs ≥ 95 with confidence interval and trend line (Lowess type) from the postseason survey in Area 12C, 2000–2005.

Figure 24. Main parameters estimated during the fishing season in Area 12C, 1994–2006: A) landings and TAC; B) standardized CPUE \pm confidence interval; and C) mean carapace width \pm confidence interval of commercial crabs sampled at sea. The mean of the 3 lowest values and the mean of the 3 highest values are indicated by dotted lines in graphs B and C.

In 2006, no trap survey was conducted due to a failure of the chartered ship for the operation. The surveys conducted since 2000 showed a clear increase of CPUE for legal-size crab in 2005 (9.1 kg/Japanese trap) compared with 2004 (3.5 kg/Japanese trap) (Figure 25). The mean size of adult legal-size crab had increased to 106.6 mm in 2005 compared with 105.6 mm in 2003 and 2004. The 2005 survey did not provide reliable indices on abundance of recruits and adolescents between 78 mm and 95 mm.

Conclusions and Advice

Catches and the TAC have been constant since 2003 at 265 t approximately.

Catch rates in the commercial fishery increased between 2005 and 2006 as well as the mean size of crab.

There was no postseason survey in 2006 and the 2005 survey did not include any reliable recruitment and pre-recruitment indices.

Results from the commercial fishery suggest that the biomass available to the fishery was higher in 2006 than in 2005. The lack of information on adult legal-size and recruit abundance at the end of the 2006 fishing season adds to the uncertainty concerning the biomass available to the fishery in 2007. With these circumstances, it would not be timely to increase the fishing pressure in 2007.

Recommendations

It is recommended to have the same TAC in 2007 as in 2006.

Sources of Uncertainty

The quality of science advice depends mainly on the accuracy of the parameters obtained through sampling and the subsequent analyses. Information obtained from logbooks and purchase slips during the fishing season affects the accuracy of the parameters that are derived from these documents. For instance, abundance indices and fishing effort calculations may include errors that will affect the science advice provided. The selectivity and catchability of traps can vary depending on the type of trap used and trap volume and mesh size, the amount and quality of bait used and soak time, which can vary with the fishing strategies employed and the prevailing environmental conditions. The selective sorting of catches can also affect the quality of the data obtained.

The abundance and condition indices and the estimates of crab size that are obtained from the trawl and trap surveys depend on the type of gear used and are affected by uncertainties related to catchability variations in the different crab groups targeted. Some types of fishing gear are better suited to given seafloor areas than are other gear types and this factor influences the spatial coverage that is ultimately sampled. The biological characteristics of snow crab can in themselves create sources of uncertainty that impinge on the science advice. For instance, the terminal moulting phase, which occurs at various sizes, will affect crab condition and catchability. Natural mortality can also vary with the life stage and condition of the crabs.

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