



ASSESSMENT OF THE ESTUARY AND NORTHERN GULF OF ST. LAWRENCE (AREAS 13 TO 17 AND 12A, 12B AND 12C) SNOW CRAB STOCKS IN 2005

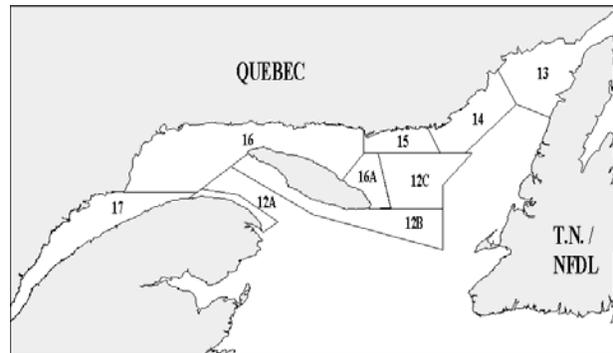
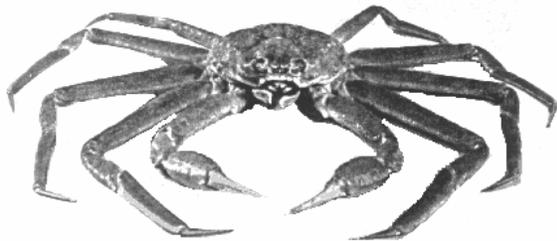


Figure 1. Snow crab management areas in the Estuary and the northern Gulf of St. Lawrence.

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 at the end of 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 have been declining since 2002 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 value 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

- Most stocks are nearing the end of their recruitment wave, as evidenced by a high commercial biomass and a decreasing recruitment, as well as a decreasing abundance of prerecruits. In addition, the 2005 fishery relied essentially on intermediate-shell crabs,

whose catchability is very high and which will disappear in the medium-term. Accordingly, the advice for the 2006 fishing season generally consists in recommending that TACs similar to those of 2005 be maintained in order to preserve a reproductive biomass of males and to avoid hindering the population recovery in some areas. Recommendations assume that the natural mortality rate will not be any different in 2005 and 2006 compared with previous years.

- In Area 17, a TAC comparable to 2005 is recommended for 2006.
- In Area 16, a TAC comparable to 2005 is recommended for 2006.
- In Area 15, a 15% increase in the TAC is recommended for 2006, which should help the biomass remain similar to 2005.
- In Area 14, it is recommended that the 2005 TAC be maintained in 2006 as to not increase fishing pressure on this stock.
- In Area 13, the stock has been under a moratorium since 2003. The re-opening of the area is subject to size and performance criteria which have not been met. It is recommended that the moratorium be maintained in 2006. Also, in light of the slow recovery of the stock, it is recommended that no harvesting be permitted in the area until the moratorium is lifted.
- In Area 12A, a TAC comparable to 2005 is recommended for 2006.
- In Area 12B, because of stock status uncertainties as well as a drop in recruitment in 2005 and 2006, a 10% decrease in the TAC is recommended for 2006.
- In Area 12C, a TAC comparable to 2005 is recommended for 2006.

INTRODUCTION

Species Biology

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. Adult males range in carapace width (CW) size from 40 mm to 165 mm after their terminal moult. Males reach legal size (CW of 95 mm) at about nine years of age. Snow crab recruitment is presumed to be either periodic or sporadic: when periodic, as in traditional areas 13 to 17, 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, CPUE and carapace condition) and effort, and confirmed by scientific trap and trawl surveys.

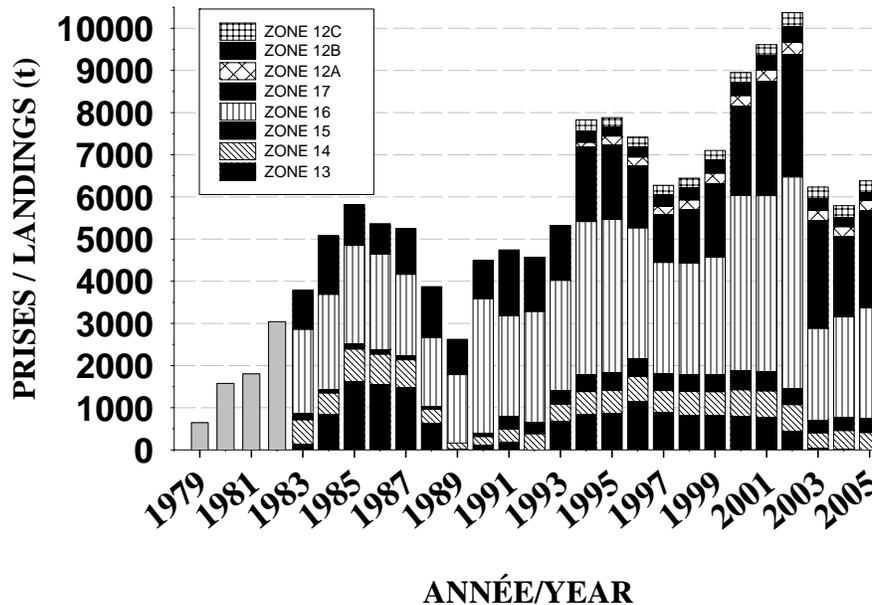


Figure 2. Snow crab landings in the Estuary and northern Gulf of St. Lawrence. The grey bars indicate the years where landings were not differentiated.

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 2005, a trap-based research survey was carried out in all fishing areas (except 12B) and the findings were incorporated into the stock status analyses. The results of the 2005 trawl surveys, done in areas 16 and 17, were also used.

The raw CPUE data for the fishery have been standardized since 2001 using a multiplicative model to take into account changes caused by the different fishing strategies employed and environmental constraints. Since recruitment is presumed to be periodic or sporadic, the recent fishery data for the traditional fishing areas have been compared with a reference period (1990–1997), corresponding to the last recruitment cycle in the fishery.

Until now, data on female insemination levels have been collected sporadically in certain areas. Beginning in 2006, an annual systematic sampling of each area is preferred in order to use this parameter for stock status assessments.

Snow Crab in Area 17

The Fishery

There are 22 active license holders in Area 17. The first total allowable catch (TAC) was set at 1,300 t in 1992 (Figure 3A). Catches increased by 20% from 2004 to 2005 following a TAC

increase to 2,310 t, of which 346 t in temporary allocations. The fishing season opened on March 23rd and closed on July 15th, 2005.

Resource Status in 2005

In the commercial fishery, the standardized CPUE rose from 2002 to 2004 and dropped slightly in 2005. Nevertheless, it remains above the mean for the reference period (Figure 3B). In 2005, around 70% of catches were made on the south shore and 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 14% in 2005. The mean CW 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 (Figure 3C). It now falls slightly below the confidence interval for the mean of the reference period.

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 that the exploitable biomass on the north and south shores remains high (CPUE of 65 and 72 kg/ conical trap, respectively) (Figure 4). On the south shore, the downward trend in recruitment (legal-size adults characterized by a carapace status of 1 or 2) which has been seen since 2000, continued in 2005; on the north shore, recruitment rose between 2004 and 2005 but it remains below the values recorded from 2000 to 2002 (Figure 5). The mean CW of legal-size crabs, increasing since 2002 on both shores, remained stable from 2004 to 2005 at around 109 mm on the north shore whereas on the south shore it dropped to the 2003 level of around 110 mm in 2005. For both shores, the proportion of crabs with intermediate-size carapaces remained high whereas the proportion of old crabs dropped from 2004 to 2005. The number of adolescents between 78 mm and 95 mm CW (ADO-1) caught in traps has not really changed since 2003 and remained low on both shores (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 and 78 mm (ADO²) and for individuals of 20 to 62 mm.

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

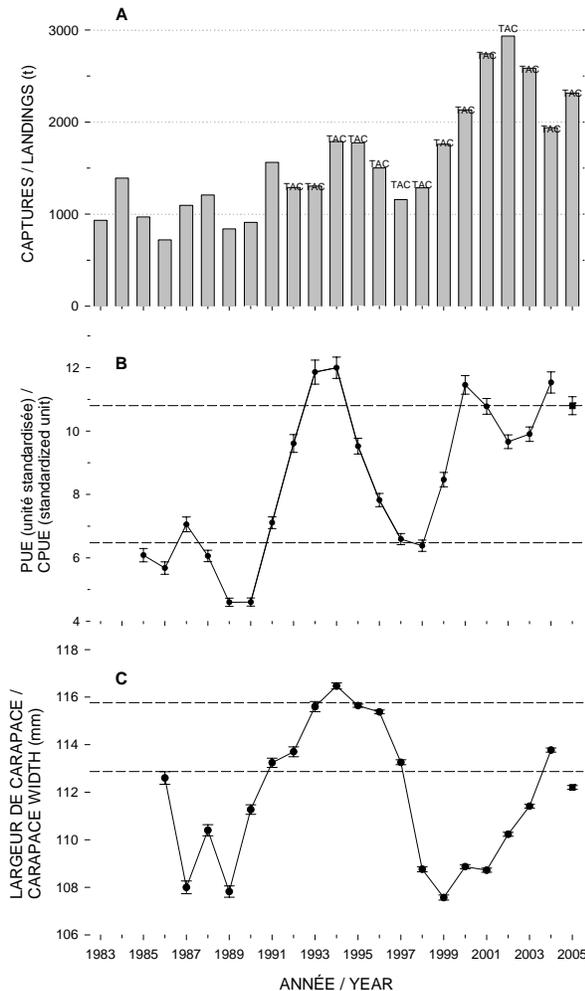


Figure 3. Main parameters estimated during the fishing season for Area 17, 1983–2005: A) landings and TAC; B) standardized CPUE (standard error ± 1); and C) mean carapace width (standard error ± 1) of commercial crabs sampled at sea. The 95% CI for the mean for the 1990–1997 reference period is indicated by dotted lines in graphs B and C.

Conclusions and advice

Catch rates from the commercial fishery indicate that the biomass available to the fishery was still very high in 2005 and the postseason survey results show that it should remain very high in 2006. The mean CW of the sampled crab as well as the proportion of crab with intermediate-size carapaces in commercial catches were also high, which indicates that recruitment into the fishery was rather low over the last few years and that exploitation was based on a biomass accumulated over recent years. The drop in recruitment is confirmed by the postseason survey

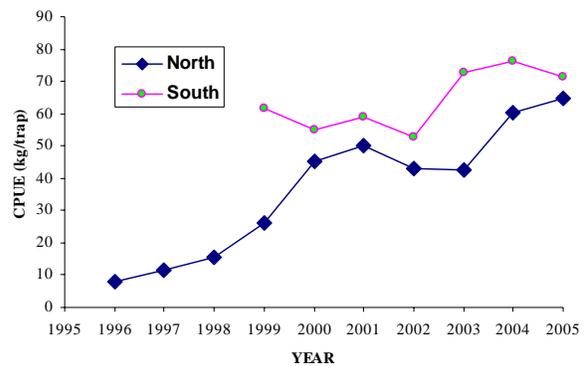


Figure 4. Catch rates (CPUEs) obtained from the postseason survey in Area 17, 1996–2005.

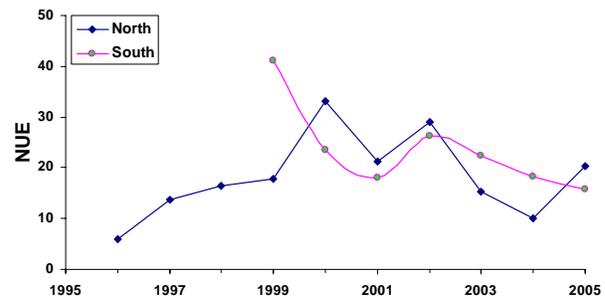


Figure 5. Catch rates (NUE) for recruits obtained from the postseason survey conducted in Area 17, 1994–2005.

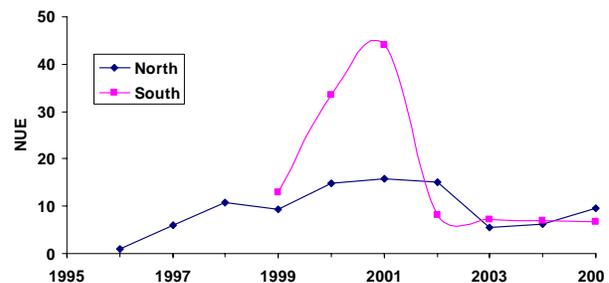


Figure 6. Catch rates (NUE) for adolescents measuring between 78 and 95 mm obtained from the postseason survey conducted in Area 17, 1994–2005.

as well as by the trawl survey. It is thus likely that the biomass available to the fishery will begin dropping as of 2007. Finally, the female insemination rate has slightly dropped in 2005, but remains at a sufficiently high level to ensure reproduction.

In these conditions, a 2006 TAC comparable to that of 2005 should help maintain the biomass at a level similar or slightly below the 2005 level. This should ensure that a sufficient number of males will remain available for reproduction while keeping an adequate biomass available to the fishery in order to lessen the consequences of a recruitment drop in the medium-term. It would be wise to target old crabs in the 2006 fishery.

Recommendations

A 2006 TAC comparable to that of 2005 should help maintain the 2006 biomass at a level similar or slightly below the 2005 level.

Snow Crab in area 16

The Fishery

A total of 39 fishers hold regular snow crab fishing licenses in Area 16. In 2005, the TAC (2,604 t) was increased by 10% or 237 t over the 2004 level (Figure 7A). A portion of this TAC allocated for Area 16A (2220 t) and for temporary allocations (108 t). The fishery opened on April 11 and closed on July 30; the TAC was met.

Resource Status in 2005

The standardized CPUE in the fishery dropped from 1999 to 2003, but increased in 2005 for a 2nd consecutive year. Although it was 15% higher than in 2004 (Figure 7B), its current level remains below the mean for the reference period. Nearly 90% of the crabs sampled at sea were intermediate-shell (condition 3) crabs and few new and old crabs were observed in samples. The mean CW of legal-size crab at sea, which had which began increasing in 2003 following a sharp downward trend, increased in 2004 and 2005, reaching 108.2 mm (Figure 7C). This value is nevertheless below the mean for the reference period.

The findings of the postseason trap survey, which has been conducted every fall since 1994, show that the CPUE of legal-size crab increased sharply in 2003 and remained stable at 34 kg/conical trap until 2005 (Figure 8). The mean CW of adult crab (at least 95 mm) has increased for the third consecutive year to reach 108.4 mm CW in 2005. The mean NUE for recruits has been dropping since 2003 and currently sits at 16.5 kg/conical trap in 2005 (Figure 9). The proportion of intermediate-shell crabs rose from 45% in 2004 to 58% in 2005. The proportion of old crabs is relatively low and stable since 2000 at around 10%.

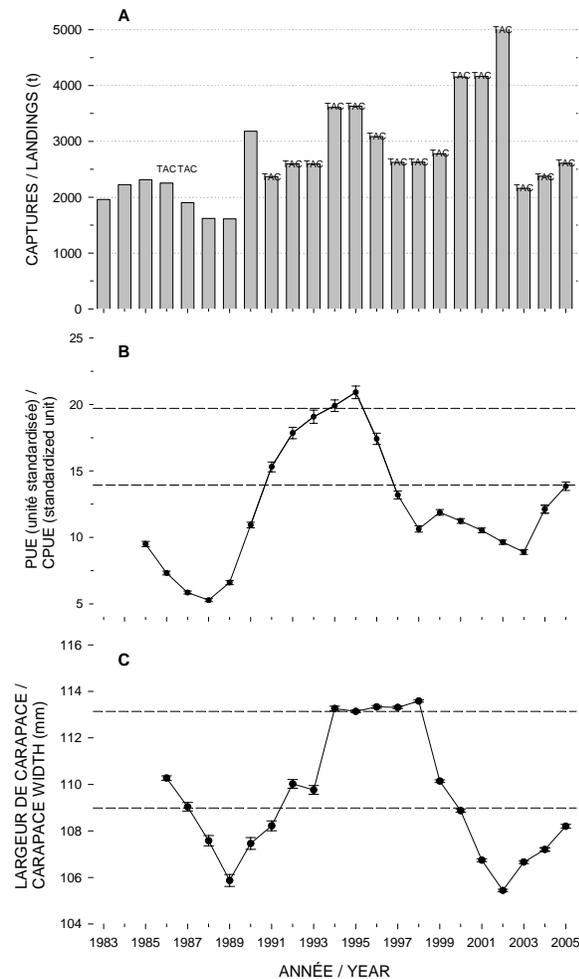


Figure 7. Main parameters estimated during the fishing season in Area 16, 1983–2005: A) landings and TAC; B) standardized CPUE (standard error ± 1); and C) mean carapace width (standard error ± 1) of commercial crabs sampled at sea. The 95% CI for the mean for the reference period (1990–1997) is indicated by the dotted lines in graphs B and C.

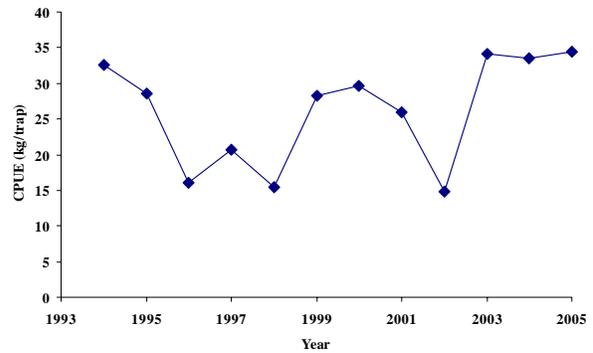


Figure 8. Catch rates (CPUEs) obtained from the postseason survey conducted in Area 16, 1996–2005

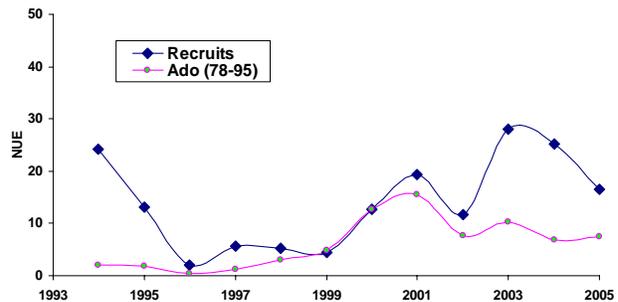


Figure 9. Catch rates (NUE) for recruits and adolescents between 78 and 95 mm obtained from the postseason survey conducted in Area 16, 1994–2005

Results from the trawl survey conducted in St. Marguerite Bay, near Sept-Îles, showed a stable abundance of legal-size crab from 2004 to 2005, and the current level is the same as the mean for the reference period. The mean CW of legal-size crab (104.9 mm) has been rising since 2002, but remains significantly below the mean for the reference period. The abundance level of immature crab and adolescents between 28 mm and 78 mm was low compared with that observed between 1994 and 1998. The abundance of adolescents larger than 78 mm has been declining since 2001, but is equal to the mean for the reference period. The spermatheca of mature females remains very full, and no sperm shortage is expected in the short term.

Conclusions and advice

Standardized catch rates of the commercial fishery indicate that the biomass available to the fishery increased between 2004 and 2005, but that it is still below the mean for the reference period. The mean CW of crab from the commercial fishery also increased but nevertheless remains below the mean for the reference period while the proportion of old crabs in the catches and in the postseason survey is rather small, which would indicate that fishermen took a significant quantity of new crabs newly recruited into the fishery. The postseason trap survey shows that the biomass available to the fishery would be at a high level in 2006, similar to 2004 and 2005. However, the postseason survey and the trawl survey conducted in St. Marguerite Bay show that the rate of recruitment into the fishery has dropped over recent years. The female insemination rate remains high, indicating that male abundance is sufficiently high to ensure reproduction.

In these conditions, a 2006 TAC comparable to that of 2005 should help maintain the biomass at a level similar to the 2005 level. However, because exploitation appears to be heavy and recruitment has dropped, the biomass available to the fishery should not increase over the short term. In the longer term, the drop in recruitment should lead to a lower biomass until the arrival of a new recruitment wave. It would be wise to target old crabs in the 2006 fishery.

Recommendations

A 2006 TAC comparable to that of 2005 should help maintain the 2006 biomass at a level similar to the 2005 level if recruitment is at the same level as in 2005.

Snow Crab in area 15

The Fishery

Area 15 has 8 regular fishers. In 2005, the TAC was 360 t, a 10% increase compared to 2004 (Figure 10A), and 31.1 temporary allocations were granted. In 2005, the fishery opened on April 11 and closed on July 30.

Resource Status in 2005

The standardized fishery CPUE, in decline from 1996 to 2002, stabilized in 2003 and was up by 37% in 2004. In 2005, it was similar to 2004 and is slightly below the mean for the reference period (Figure 10B). Most (90%) of the crabs sampled at sea were intermediate-shell crabs (condition 3), with few old crabs found in the samples taken. In 2005, the mean CW of legal-size crabs sampled at sea was similar to 2004 (Figure 10C), around 106 mm, and was equal to the mean for the reference period.

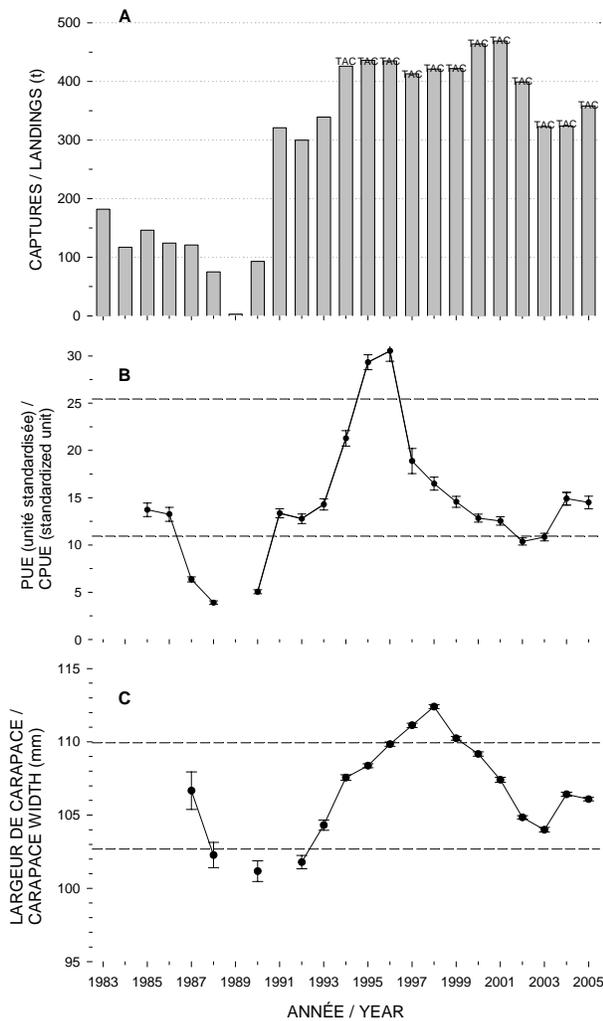


Figure 10. Main parameters estimated during the fishing season in Area 15, 1983–2005: A) landings and TAC; B) standardized CPUE (standard error ± 1); and C) mean carapace width (standard error ± 1) of commercial crabs sampled at sea. The 95% CI for the mean for the reference period (1990–1997) is indicated by the dotted lines in graphs B and C.

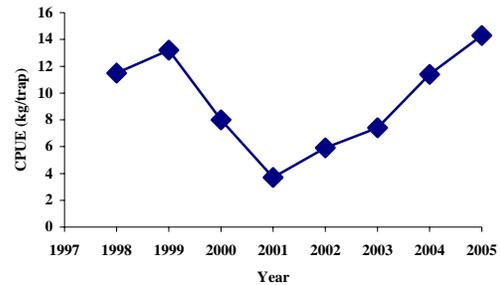


Figure 11. Catch rates (CPUE) obtained from the postseason survey conducted in Area 15, 1998–2005.

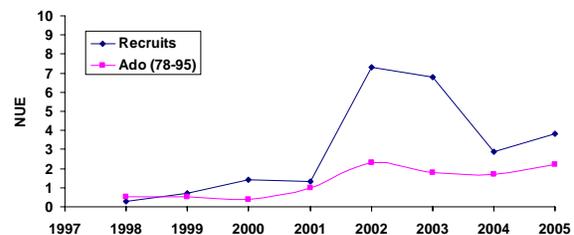


Figure 12. Catch rates (NUE) for recruits and adolescents between 78 and 95 mm obtained from the postseason survey conducted in Area 15, 1998–2005.

The scientific trap survey, conducted since 1998, showed that the CPUE of commercial-size crab, which has been rising since 2001, was up again in 2005, from 11.4 in 2004 to a record high of 14.3 kg/Japanese trap (Figure 11). The proportion of intermediate-shell crabs (condition 3) dropped from 2004 to 2005, while the proportion of old crabs (conditions 4 and 5) significantly increased during this period. However, each of these categories remains close to the mean of the 1998-2004 period. The mean CW of the harvested crab has been gradually increasing since 2002 and reached 106.3 mm in 2005. After dropping by more than 50% from

2003 to 2004, the mean NUE for adolescents between 78 and 95 mm (ADO-1) has only slightly changed since 2002 but reached a record high of 2.2 individuals per trap in 2005 (Figure 12).

Conclusions and advice

Catch rates of the commercial fishery indicate that the biomass available to the fishery increased in 2004 to reach the level of the mean for the reference period. The mean CW of crab from the commercial fishery also increased in 2004. These two indices remained stable in 2005.

The postseason survey shows that the biomass available to the fishery has been increasing since 2001, while the proportion of old crabs increased considerably in 2004 and 2005. Recruitment into the fishery was relatively stable between 2004 and 2005 at an average level.

In these conditions, the 2006 TAC could be raised by 15% to take advantage of the accumulated biomass as estimated by the postseason trap survey. This increase shouldn't reduce the exploitable biomass over the medium-term, although the total biomass may drop over the course of the winter due to natural mortality of old crabs.

Recommendations

A 15% TAC increase in 2006 shouldn't produce negative impacts on the 2006 biomass unless there is a much higher natural mortality rate than in 2005. It would be wise to target old crabs in the 2006 fishery.

Snow Crab in area 14

The Fishery

Area 14 has 21 regular fishers. In 2005, the fishing season opened on April 25 and closed on July 30. The 2004 quota of 402.5 t was renewed in 2005 and did not include any temporary allocations (Figure 13A). 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 2005 and still remained within the 95% CI for the reference period mean (Figure 13B). Nearly 70% of the crabs sampled at sea were intermediate-shell crabs (condition 3) and there was an increase in the proportion of old crabs (conditions 4 and 5) observed in the traps. The mean CW of legal-size crabs caught at sea in 2005 was similar to 2004 (104.9 mm), and this value remained within the 95% CI for the reference period mean (Figure 13C).

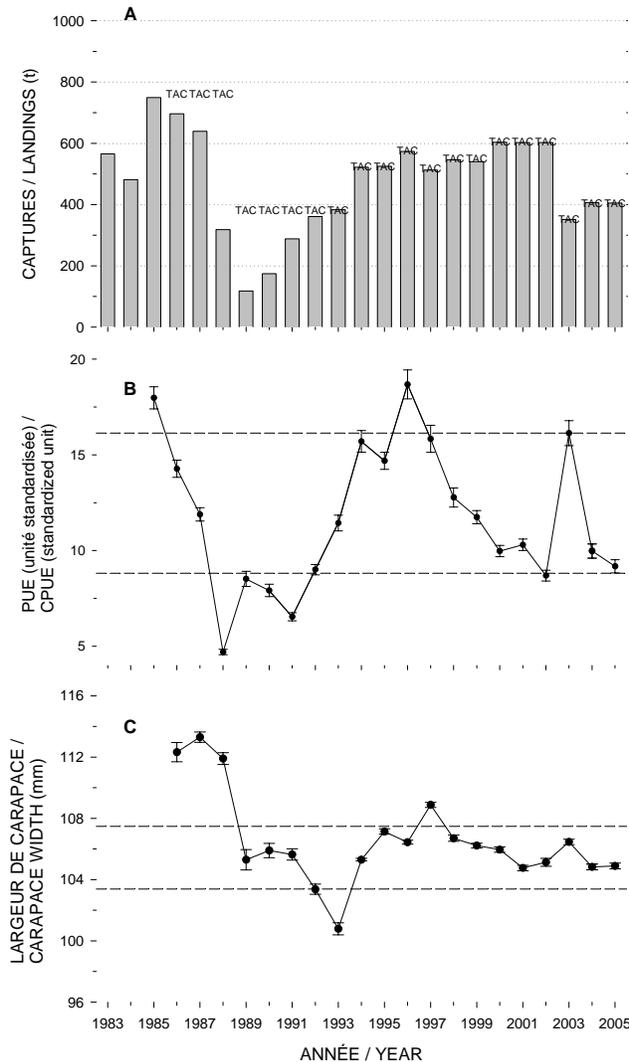


Figure 13. Main parameters estimated during the fishing season in Area 14, 1983–2005: A) landings and TAC; B) standardized CPUE (standard error ± 1); and C) mean carapace width (standard error ± 1) of commercial crabs sampled at sea. The 95% CI of the mean for the reference period (1990–1997) is indicated by the dotted lines in charts B and C.

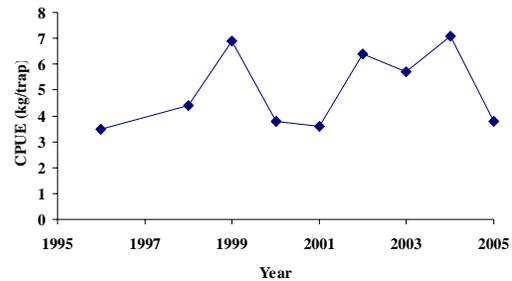


Figure 14. Catch rates (CPUE) obtained from the postseason survey conducted in Area 14, 1996–2005.

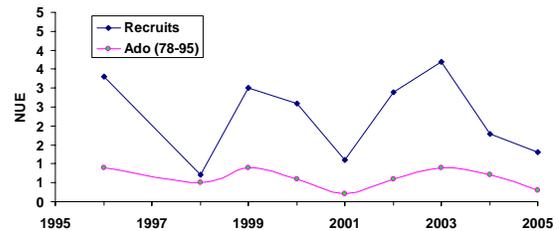


Figure 15. Catch rates (NUE) for recruits and adolescents between 78 and 95 mm obtained from the postseason survey conducted in Area 14, 1996–2005.

The scientific trap survey, conducted since 1996, showed that the CPUE for commercial-size crab dropped by 46% between 2004 and 2005 (Figure 14). According to fishers, this drop was caused by the increase of the ground fish fishery at the time of the survey. There was a sharp drop in the proportion of intermediate-shell crab (condition 3) who accounted for only 36% of catches in 2005, whereas the proportion of old crabs (conditions 4 and 5) increased considerably and reached 46%. The mean CW of legal-size crabs rose from 104.3 mm in 2004 to 105.7 mm in 2005. The mean NUE for recruits has been dropping since 2003 and only reached 1.3 individuals per trap in 2005, nearing an all-time low (Figure 15). The mean NUE for

adolescents between 78 and 95 mm has also dropped and remains at less than 1 individual per trap since trap surveys began in this area (Figure 15).

Conclusions and advice

Catch rates of the commercial fishery indicate that the biomass available to the fishery was rather low in 2004 and 2005. The mean CW of crab from the fishery remained at the mean of the reference period while the proportion of old crabs increased. The commercial fishery catch rates increased suddenly in 2003, which may have resulted from a pulse of recruitment. However, the post-season trap survey showed an increase in the proportion of old crabs and a decrease in the recruitment to the fishery during the last two years, which suggests that the available biomass in 2006 will be less abundant than in 2005.

In these conditions, a TAC in 2006 comparable to that of 2005 should help take advantage of the abundance of old crabs in the population. However, due to lower recruitment, the biomass available to the fishery should not increase over the short term. In the longer term, the lower expected recruitment should lead to a lower biomass until the arrival of a new recruitment wave.

Recommendations

It is recommended not to increase the fishing pressure in 2006 and to renew the 2005 TAC in 2006. It would be wise to target old crabs in the 2006 fishery.

Snow Crab in area 13

The Fishery

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.

The mean NUE for legal-size crabs obtained from the scientific trap survey has been low and stable since 2001 on the northern side (2 crabs/Japanese trap in 2005) whereas on the southern side, this number increased from 3.4 crabs in 2004 to 9 crabs in 2005 (Figure 16). However, it should be noted that the research protocol was modified on the southern side in 2005. In 2005, on the northern side, the proportion of intermediate-shell crab (condition 3) in the traps was 76% and very few old crabs were caught whereas on the southern side, only new crabs (conditions 1 and 2) were reported. The mean and median CW of adult legal-size crab increased from 2002 to 2004 in both sectors, and remained stable in 2005 on the northern side and decreased on the southern side. The median CW of legal-size adults was 101 mm in the north and 103 mm in the south in 2005, which is below the targeted median of 104 mm (Figure 17). The mean NUE for recruits increased in both sectors and numbered 1.6 crabs on the northern side and 8.3 crabs on the southern side. Adolescents between 78 and 95 mm were practically absent from catches on the northern side in 2005 whereas numbers remained low on the southern side; a mean NUE of 0.5 crabs. Furthermore, primiparous female insemination levels have shown a noticeable drop since 2003 and in 2005, reaching only 0.024 g per spermatheca, the lowest value ever recorded for a population of this species. These numbers are considered limiting and fecundity problems were obvious in females.

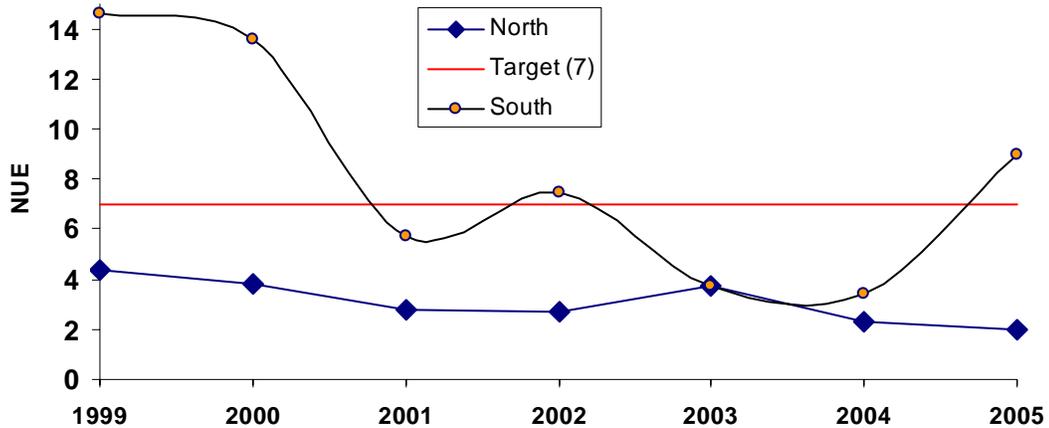


Figure 16. Catch rates (NUE) for 95+ mm crabs obtained from the postseason survey conducted in Area 13, 1999–2005.

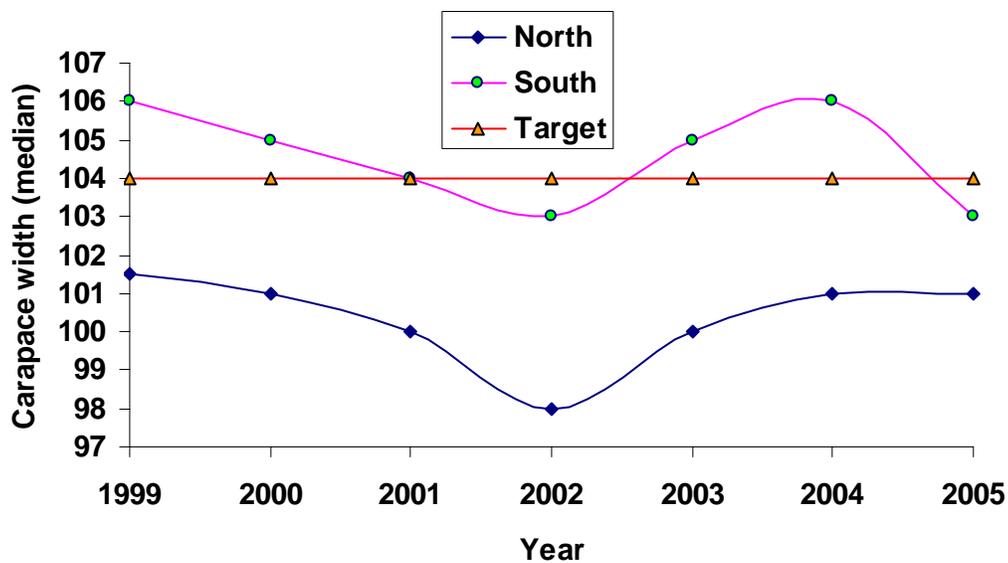


Figure 17. Median carapace width of 95+ mm crabs obtained from the postseason survey conducted in Area 13, 1999–2005.

The findings of a beam trawl survey covering the northern part of Area 13 and the eastern part of Area 14 in 2004 showed that the abundance of legal-size crab (4.4 crab/10,000 m²) was three times smaller than in 2003. However, this decrease in the commercial portion could be partly explained by the difference in spatial coverage of the two surveys, with the 2003 survey extending farther west in Area 14 and covering only the northwestern sector of Area 13 up to St. Augustin. The mean CW of legal-size crab (102.3 mm in 2004) was unchanged from 2003 and similar to that recorded in 1999–2000 (103.0 mm). The abundance of adolescents between 78 mm and 95 mm (5.7 crab/10,000 m²) was down by 64% from 2003. Furthermore, the 1997, 1998 and 1999 cohorts were not very abundant in 2003–2004, which suggests low recruitment over the longer term.

Conclusions and advice

The fishery has been closed since 2003 in order to protect the stock which is at a very low abundance level. Criteria to reopen the fishery have been established and targets are set at a mean CW of 104 mm for adult male crabs available to the fishery and a mean catch rate of 7 commercial-size crabs per trap. These parameters are estimated according to the trap survey.

Targets were not met in 2005 and the fishery should remain closed in 2006. The mean catch rate from the survey as well as the mean size of crab is still low. Furthermore, recruitment remains low, indicating that the biomass available to the fishery will not substantially increase in the medium-term. Female insemination levels are very low which confirms the low abundance of spawning males.

Recommendations

This stock's situation has not improved sufficiently in 2005 for the moratorium to be lifted. Reopening the area is based on reaching the 2003 reopening criteria; a median CW of legal-size adults of 104 mm and a mean NUE of legal-size crabs of 7 crabs/trap during postseason surveys for both areas.

The moratorium should therefore be maintained in 2006.

Snow Crab in area 12A

The Fishery

Area 12A has had 10 regular fishers since it was created in 1994. The TAC was 227 t in 2005, 28 t higher than in 2004 but 33 t lower than its 2002 high (Figure 18A) and no temporary allocations have been granted since then. In 2005, the fishery opened on March 23 and closed on June 30 and the TAC was met.

The standardized CPUE for the commercial fishery, which has been falling since 2002, stabilized in 2005 (Figure 18B). Intermediate-shell crabs (condition 3) accounted for 75% of catches made at sea whereas old crabs accounted for 13%. The mean CW (Figure 18C) of legal-size crabs sampled at sea remained stable in 2005 (109.2 mm), and neared the record high value in 2003 (109.6 mm).

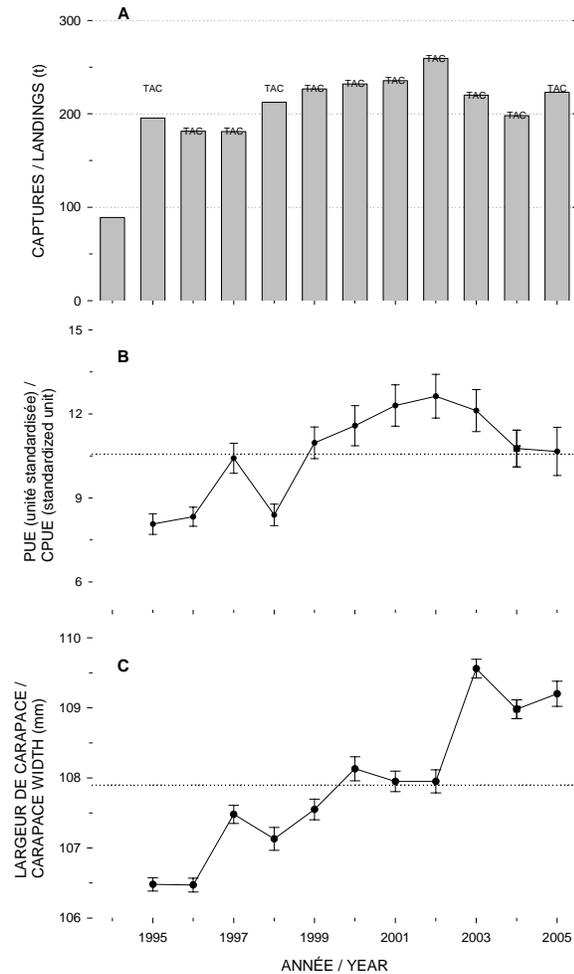


Figure 18. Main parameters estimated during the fishing season in Area 12A, 1995–2005: A) landings and TAC; B) standardized CPUE (standard error ± 1); and C) mean carapace width (standard error ± 1) of commercial crabs sampled at sea. The mean for the 1995–2004 period is indicated by the dotted lines in graphs B and C.

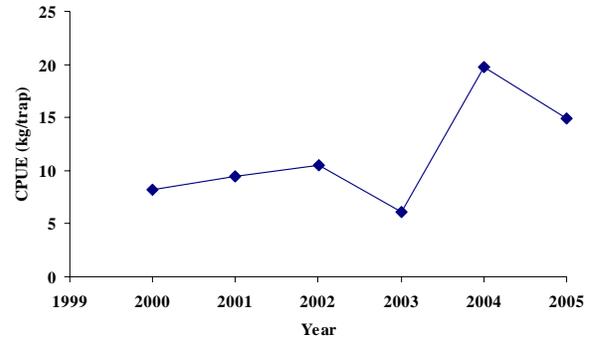


Figure 19. Catch rates (CPUE) obtained from the postseason survey conducted in Area 12A, 2000–2005.

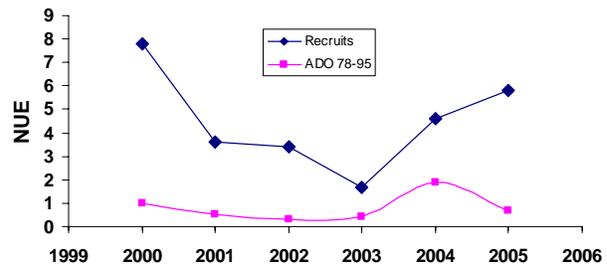


Figure 20. Catch rates (NUE) for recruits and adolescents between 78 and 95 mm obtained from the postseason survey conducted in Area 12A, 2000–2005.

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) from the previous year, followed by a 25% drop in 2005; 14.9 kg/conical trap (Figure 19). During the 2005 survey, the proportion of intermediate-shell crab (condition 3) was 63% and old crabs (conditions 4 and 5) was 15%. The mean CW of legal-size crab caught was similar in 2004 and 2005 (109.2 mm) and remains relatively high. The mean NUE for recruits has been increasing since 2003 and reached 5.8 individuals/conical trap in 2005 (Figure 20). The mean NUE for adolescents between 78 and 95 mm was less than 1 individual per trap in 2005, which represents a drop from the 2004 record (Figure 20).

Conclusions and advice

Catch rates from the commercial fishery indicate that the biomass available to the fishery was relatively high in 2005. The size of the sampled crab in the fishery as well as the proportion of crab with intermediate-size carapaces in catches was also high. The postseason survey indicates that the biomass available to the fishery should remain high in 2006. It seems that exploitation was based on a biomass accumulated over recent years but it is likely that the biomass available to the fishery will begin dropping as of 2007 on account of an expected recruitment decline beginning in 2006.

In these conditions, a 2006 TAC comparable to that of 2005 should help maintain the biomass at a level similar to the 2005 level. This should ensure that a sufficient number of adult males will remain available for reproduction while keeping an adequate biomass available to the fishery in order to lessen the consequences of a recruitment drop in the medium-term.

Recommendations

A 2006 TAC comparable to that of 2005 should help maintain the biomass at a level similar to the 2005 level if natural mortality remains stable and recruitment doesn't drop in any noticeable way.

Snow Crab in area 12B

The Fishery

Area 12B has had eight regular fishers since 1995 (it had five fishers in 1994). The TAC was reduced by 30% in 2003 (Figure 21A) and by another 30% in 2004 (198.2 t). However, an additional 40 t was allocated in 2004 to explore the eastern part of the area, where little fishing was done. The total TAC was 238.2 t in 2004 (Table 4) and this total was carried over to 2005. The TAC could not be reached in 2005 because one of the fishers quit operations prior to reaching his individual quota. Total catches in 2005 reached 209 t. The fishery opened on March 21 and closed on June 30 and no temporary allocations were granted.

The standardized CPUE for the commercial fishery, which had been declining since 2000, rose by 40% in 2004 (Figure 21B) and dropped slightly in 2005. Intermediate-shell crab (condition 3) accounted for a proportion of 76% of samples taken during the fishing season, with few old (conditions 4 and 5) crabs. The mean CW of legal-size crab measured at sea (Figure 21C) increased slightly between 2004 and 2005 reaching 109.4 mm, which is slightly higher than the average since 1995.

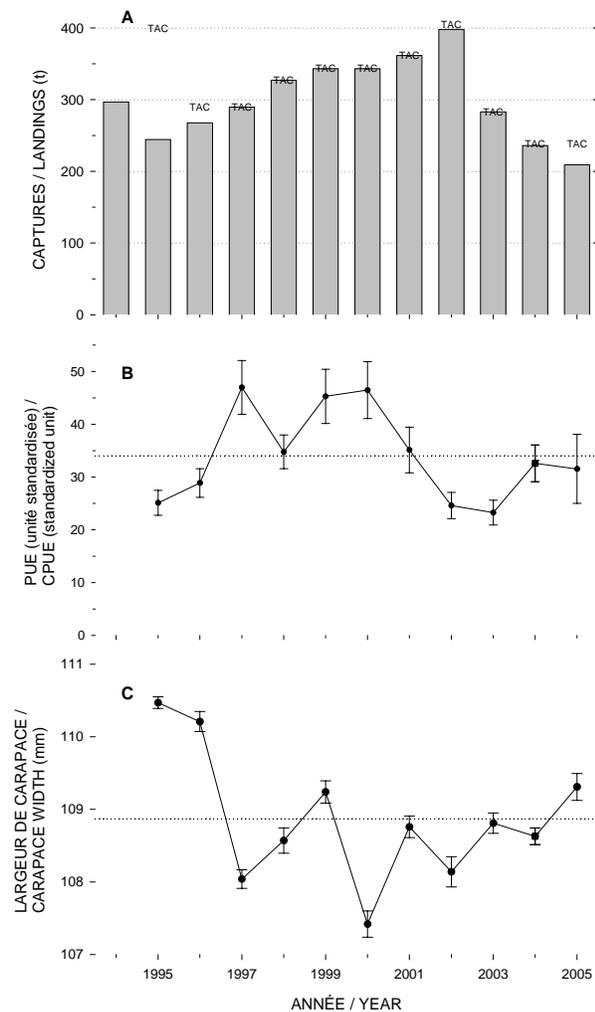


Figure 21. Main parameters estimated during the fishing season in Area 12B, 1994–2005: A) landings and TAC; B) standardized CPUE (standard error ± 1); and C) mean carapace width (standard error ± 1) of commercial crabs sampled at sea. The mean for the 1995–2004 period is indicated by the dotted lines in graphs B and C.

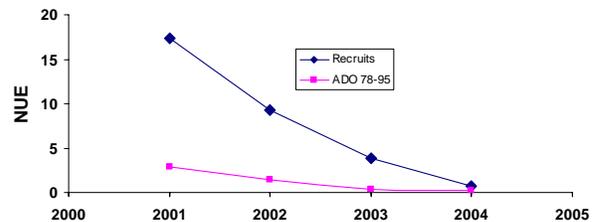


Figure 22. Catch rates (NUE) for recruits and adolescents obtained from the postseason survey conducted in Area 12B, 2001–2004

There was no scientific trap survey conducted in 2005. However, from 2001 to 2004, there was a clear downward abundance trend for recruits and adolescents between 78 and 95 mm (Figure 22).

Conclusions and advice

Catch rates from the commercial fishery indicate that the biomass available to the fishery was close to mean values. The size of the sampled crab in the commercial fishery increased in 2005 but the proportion of old crab in the catches was rather low, which indicates a low abundance of

recruitment and relatively heavy exploitation. There was no postseason survey in 2005 but results from previous years indicate a drop in recruitment.

Because there was no postseason survey, there are strong uncertainties as to the biomass available to the fishery in 2006. Because available indicators show that recruitment was dropping over recent years, it is recommended that the TAC be reduced by 10% in 2006 compared to 2005 in order to lessen the consequences of a recruitment drop in the medium-term.

Recommendations

On account of uncertainties regarding the status of the stock and the recruitment level in 2005 and 2006, a 10% TAC drop is recommended for 2006.

Snow Crab in area 12C

The Fishery

Area 12C has five regular fishers and features two banks (north and south sectors) separated by a deep channel that is part of the Jacques-Cartier Strait. The TAC (Figure 23A) was reduced by 15% in 2003 and remained unchanged in 2004 (261.8 t). In 2005, the fishery opened on April 18 and closed on August 6. Temporary allocations totalling 81.1 t were granted in 2005 and the TAC was met.

The standardized CPUE for the commercial fishery plummeted between 1996 and 1997 but has remained below the mean for 1994–2004. It dropped slightly between 2004 and 2005 (Figure 23B). Intermediate-shell crab (condition 3) and old crab (conditions 4 and 5) respectively accounted for 88% and 9% of the crab sampled at sea in 2005. The mean CW of legal-size crab measured at sea has been increasing since 2002 and reached 108.3 mm in 2005 (Figure 23C).

The findings of the scientific trap survey, conducted since 2000, indicate a clear increase of the CPUE of legal-size crab in 2005 (9.1 kg/Japanese trap) compared to 2004 (3.5 kg/Japanese trap) (Figure 24). The mean CW of legal-size crabs was increased to 106.6 mm in 2005, compared to 105.6 mm in 2003 and 2004. The 2005 survey did not provide reliable indices on the abundance of recruits and adolescents between 78 mm and 95 mm.

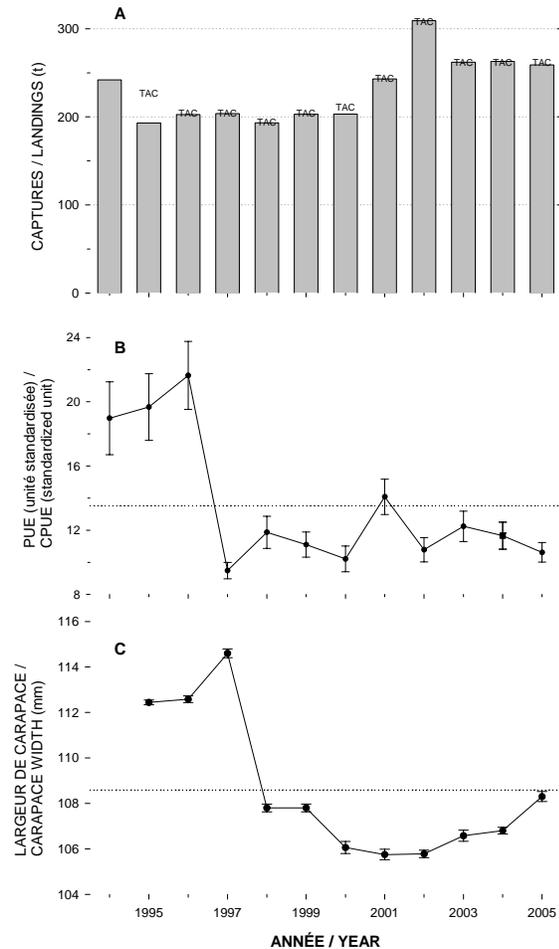


Figure 23. Main parameters estimated during the fishing season in Area 12C, 1994–2005: A) landings and TAC; B) standardized CPUE (standard error ± 1); and C) mean carapace width (standard error ± 1) of commercial crabs sampled at sea. The mean for the period from 1994–1995 to 2004 is indicated by the dotted lines in graphs B and C.

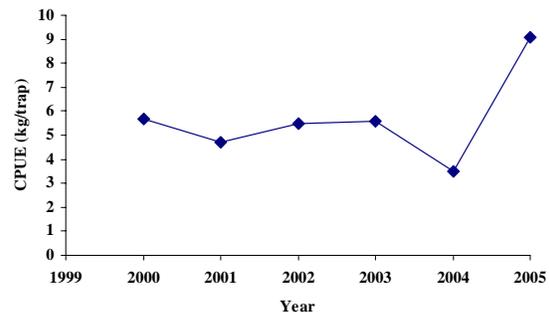


Figure 24. Catch rates (CPUE) obtained from the postseason survey conducted in Area 12C, 2000–2005.

Conclusions and advice

Catch rates from the commercial fishery indicate that the biomass available to the fishery has been low since 2002. The mean size of the sampled crab in the fishery has been increasing since 2002 and the proportion of old individuals in the catches was low, which would indicate that recruitment was stable but low over recent years. The postseason trap survey indicates that the biomass available to the fishery in 2006 should be higher than in 2005, but there are no estimates of recruit abundance to explain this sudden increase.

In light of the uncertainties concerning recruitment, the 2006 TAC should be maintained at the same level as 2005 in order to minimize the risks associated with heavy exploitation of an aging biomass.

Recommendations

A 2006 TAC at the same level as that of 2005 should help keep a total biomass in 2006 at a similar or higher level than 2005 if recruitment and natural mortality remain stable.

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 for analysis. For instance, abundance indices and fishing effort calculations may include errors that will affect the data on which science advice is based. 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 trap immersion (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 achieved. 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.

SOURCES OF INFORMATION

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