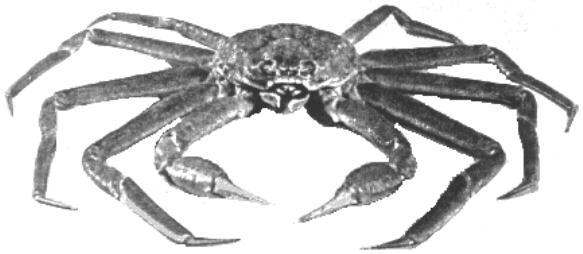

Snow Crab of the Estuary and Northern Gulf of St. Lawrence (Areas 13 to 17)

Background

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

Male snow crab stop growing after their terminal moult. The male is referred to as an adolescent (recognized by its small claws) prior to the terminal moult and as an adult afterward (large claws). Males range in size from 40 to 165 mm after the terminal moult. 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 years of low recruitment (recruitment trough). Males reach legal size at about nine years of age.

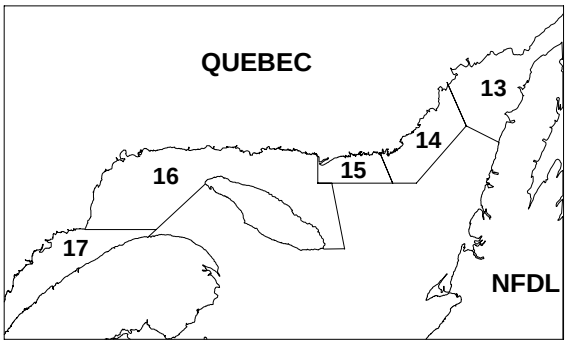

Figure 1 Snow crab management areas in the northern Gulf of St Lawrence

Summary

- The 1988 to 1992 year-classes, which are currently being harvested, form a recruitment wave. The biomass, and hence catches and catch rates, are increasing and this situation should persist at least through 2001-2002 in the west (areas 17 and 16). The recovery has not yet become sustained in the east (areas 15, 14 and 13) on account of the particular characteristics of this region, where productivity appears to be lower.
- **In Area 17,** most of the current status indicators are positive and show that the harvestable biomass is high and increased in 2000 as a result of the 1988-1992 recruitment wave. However, the indicators from the trawl survey show that recruitment has peaked or is about to, and that it should decrease in the short term.
- The mean CW of legal-size adult crab is on the rise, and this trend will continue for a few more years.

- **In Area 16,** all the current status indicators are positive and show that the harvestable biomass increased in 2000 despite increased effort concentrated mainly in the west and central part of the area. This increased biomass is

attributable to the 1988-92 recruitment wave. The postseason trap survey showed that the residual biomass of old crab is becoming depleted and that recruitment is now evident throughout the area. Recruitment will intensify in 2001 in the central and eastern parts of the area but should decline in the western sector over the short term.

- The mean CW of legal-size crab has declined sharply over the past four years both at sea and at dockside; it should stabilize and then rise in the near future.
- **In Area 15,** the fishery CPUE has been falling since 1996. This value showed a sharp decrease between 1999 and 2000, based on the postseason trap survey. In addition, the biomass of old crab nearly doubled compared with the 1999 figure.
- Indicators of the population's future status suggest that recruitment will be low in 2001 and that the biomass will continue to shrink.
- **In Area 14,** most of the current status indicators are negative and suggest that the harvestable biomass contracted in 2000. The revised CPUE has declined steadily since 1996, recruitment is low and, if the population trends in Area 14 shape up like those in the northern part of Area 13, a recovery is not likely in the short term.
- The mean CW of legal-size crab is stable and should not increase in the short term.
- **In Area 13**, recruitment was low in the north and strong in the south in 2000. Fishing effort increased appreciably in the south and declined in the north, and the catch rates rose slightly in comparison with the 1999 level. As a result, the residual biomass at the end of the 2000 season was smaller than that of 1999. Recruitment in 2001 seems low, and hence the available biomass should at best be comparable to that of 2000.
- The trawl survey indicated that recruitment will increase over the coming years and that it may remain at high levels beyond the year 2002, if the strong year-classes that are anticipated do not become too depleted before the crab reach legal size.

The Fishery

Location and historical context

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

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 in the Estuary 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 of the Estuary and northern Gulf of St Lawrence plummeted from 5,255 t to 2,622 t (Figure 2). This drop was accompanied by marked decreases in catches per unit of effort and ever greater catches of white crab, as a direct result of a recruitment trough affecting the 1977-1979 year-classes. Beginning in 1990-1991, 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 in 1998 (5,715 t) and 1999 (6,329 t). The TAC was increased in all areas in 2000, except Area 13, and it was reached in most areas. The increases ranged from 10% (areas 14 and 15) to 50% (Area 16) and generated record landings in 2000, that is, 8,211 t (as of 14/12/00).

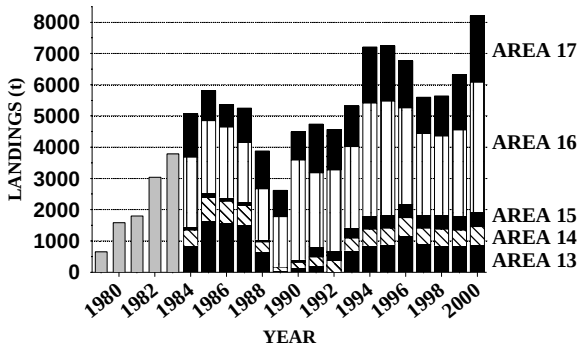

Figure 2. Snow crab landings in the northern Gulf of St. Lawrence.

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^3) for two Japanese traps (maximum volume 0.44 m^3).

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

Resource status

The status of the snow crab populations in areas 17 to 13 is determined annually from available information. Data from fishery statistics and catch sampling provide the basis for our analyses. In 2000, fishers from all areas conducted a trap survey, and the results were incorporated into the stock assessment analyses. The results of three trawl surveys conducted in areas 17, 16 and 13 were also used.

Snow crab in Area 17

There are 22 active licence holders in Area 17. The first TAC was set at 1,300 t in 1992 (Table 1). In 2000, the fishery opened on April 1 and ended on July 30, as in 1999. The TAC was raised by 20% (2,130 t) in 2000 to reflect the increase in crab abundance in this area. A 212-t special allocation was set aside for non-crabbers. Catches recorded as at December 14, 2000 showed that the TAC had been attained.

Resource status in 2000

In the commercial fishery, the catch rates increase which had been ongoing since 1998 and grew from 11.9 (1999) to 15.7 kg/Japanese trap in 2000, pointing to a possible rise in the harvestable biomass. Whereas a moderate increase was posted on the south shore (15%), catch rates doubled on the north shore, exceeding those of the south shore for the first time since 1996 (Table 1). The proportion of catches from the south shore (52%) declined by 7% in 2000 despite an increase in effort of 2%.

The abundance of new crab (conditions 1 and 2) declined sharply from 26% in 1999 to 5% in 2000. Intermediate-shell crab (condition 3) dominated catches at sea and dockside, and the proportion of old crab (conditions 4 and 5), in decline since 1996, remained at the low level recorded in 1999 (4%).

The mean CW of legal-size crab caught at sea increased for the first time since 1994, reaching 108.9 mm in 2000. The average size of landed crab, which had been declining since 1996, increased as well (110.2 mm). The average size (106 mm) of new crab (conditions 1 and 2) taken at sea was slightly higher than in 1999 (103 mm). The latter size is now close to the average size (107 mm) of intermediate-shell crab (condition 3), which likewise increased over the 1999 figure and is greater than the average size (95 mm) of the oldest crab (conditions 4 and 5), whose size remained the same as in 1999. The proportion of legal-size adolescent males climbed appreciably in the samples taken at sea, from 2% in 1999 to 13% in 2000. These elements indicate that the recruitment wave composed of the 1988 to 1992 year-classes is nearing its peak now and that the commercial-size segment of the crab population in this area will include more and more large crab.

The annual postseason trawl survey carried out on the north shore of the Estuary in Area 17 between late July and early August showed, for the first time since 1996, a drop of 6-7% in the abundance and biomass of legal-size crab in 2000 (Figure 3). This decrease is attributable to a marked decline (- 2%) in recruitment in 2000, despite an increase in the residual biomass on the sea bottom (+ 42%); the abundance level of the residual crab has, in spite of everything, remained lower than that of recruits. Total mortality, comprising natural and fishing mortality, was estimated at 51% on the north shore in 2000.

The proportion of new crab, on the rise since 1996, fell to 46% in 2000. The proportion of old crab, in decline since 1996, was down to only 3%. The average CW of legal-size crab, which declined from 1995 to 1998, rose between 1999 (105.4 mm) and 2000 (107.3 mm).

Table 1. Catch and effort data for Area 17.

Year	1983 to 1989[4]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
TAC	-	-	-	1300	1300	1820	1820[5]	1547[5]	1315[5]	1315[5]	1775[5]	2130[5]
Catches	1022	910	1562	1289	1305	1788	1774	1502	1156	1285	1758	2130[1]
Effort[2]	121.8	137.9	173.6	107.4	90.6	124.2	155.6	153.3	141.0	149.4	147.7	135.7
CPUE[3]: Total	8.5	6.6	9.0	12.0	14.4	14.4	11.4	9.8	8.2	8.6	11.9	15.7
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
South shore	7.4	5.3	7.8	11.5	13.2	11.4	9.7	9.3	8.5	9.2	13.1	14.9

[1] Landings in metric tonnes, as at December 14, for 2000
[2] Standardized effort in thousands of Japanese trap hauls
[4] Average for the period
[5] Including special allocations

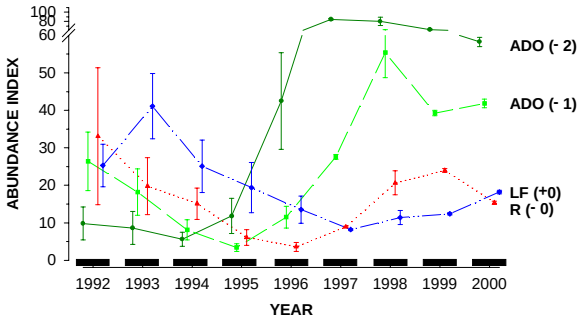

Figure 3. Abundance of male snow crab caught in trawl surveys in the Estuary between 1992 and 2000. ***LF(+0)****: males left by the fishery during the survey year;* ***R(0)****: males recruited to the fishery;* ***ADO(1)****: adolescent males of 78 to 95 mm CW;* ***ADO(2):*** *adolescent males of 62 to 78 mm CW.*

The abundance of legal-size crab should 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 declining, is high. The abundance of adolescent males of 78 to 95 mm CW (ADO^{-1}) is up 11% from 1999 and the abundance of adolescent males between 62 and 78 mm CW (ADO^{-2}) declined slightly from 1999, but still remains high. 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.

Recruitment of adult females, in decline since 1997, fell only slightly in 2000, heralding an upcoming reversal in the sex ratio (mature females/adult males) in their favour. In view of the extensive 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, but show trends differing from those seen in the trawl survey with regard to the abundance of the commercial-size segment of the crab caught. In contrast with the abundance index derived from the trawl survey, which indicated a decline in 2000 in this commercial segment, the

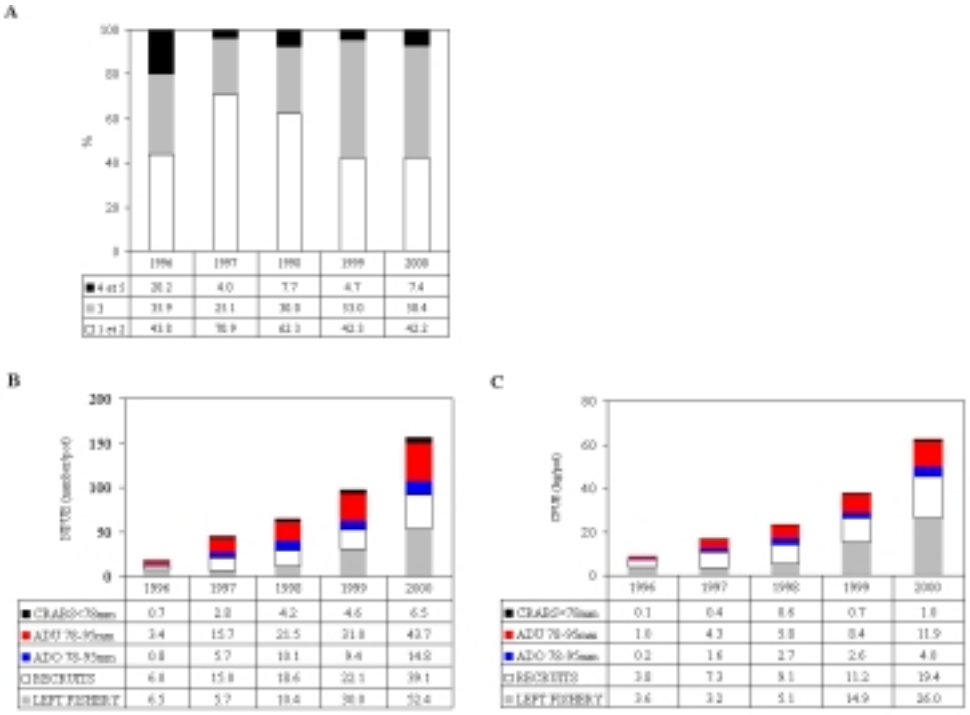

Figure 4. Results of the post-season trap survey on the north shore in Area 17 from 1996 to 2000. (A) Shell condition of legal-size males. Catch rates (B) NPUE (number/conical trap) and (C) CPUE (kg/conical trap) of the different groups of males.

average catch rate of legal-size crab, up significantly since 1996, continued its upward trend in 2000 and grew substantially in weight (+76%) and in number (+74%) compared with the 1999 results (Figure 4). In 2000, it reached its highest value since the survey began in 1996, namely 45.4 kg/trap (91 crabs/trap). New crab made up 42% of catches, as in 1999, and old crab about 7%, up slightly from 1999. Following a steep decline between 1996 and 1998, the mean CW of legal-size crab stabilized in 2000 at the 1999 level of 106 mm. The number of ADO^{-1} rose by 57% in 2000 (15 crabs/trap), reaching its highest value since monitoring began under this survey.

Outlook for Area 17 in 2001

Most of the stock status indicators are positive and show that the harvestable biomass is high and increased in 2000 as a result of the 1988-1992 recruitment wave. The indicators from the trawl survey suggest that recruitment has reached a peak and that it should decline in the short term after 2001. According to the trawl survey, the number and the biomass of commercial-size crab decreased by 6% and 7% from 1999. Total mortality was lower than in 1999, but greater than the average level for the previous 7 years. However, the commercial fishery data and the postseason trap survey respectively show an increase of 30% and 74% in CPUE values between 1999 and 2000, pointing to a possible increase in harvestable biomass. Expected recruitment was higher in 2000 than in 1999, indicating that recruitment is likely to increase in 2001. The stock has probably reach the peak of its abundance cycle, or is nearly there, and we can expect a drop in recruitment soon and a gradual move toward a population dominated by larger crab that are in poorer condition.

Landings from the south shore fell by 12% in 2000 despite a 2% increase in effort. Resource abundance is not quantified by exhaustive trawl or trap surveys; however, data obtained from six lines of traps set in the middle of the south shore after the 2000 fishery indicated that recruitment would be lower than in 1999. If this trend holds, there may be a transfer of fishing effort to the north shore and a return to the pre-1977 situation characterized by higher fishing effort and landings on the north shore versus the south shore. The mean CW of legal-size adult crab is rising and this trend should continue for a few more years. Recruitment of female adults decreased sharply in 2000; however, their reproductive status is presumed to be good and the status of the spawning stock should hold in the medium term.

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 catch rate 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.

The scenarios below are based on a catch distribution on both shores of the Estuary like that of 2000, that is, with more than 50% of landings coming from the south

shore. Here are the two recommended harvesting scenarios:

Prudent scenario: Based on the trawl survey results, catches in 2001 equivalent to those of 1999 would maintain a total mortality rate on the north shore similar to that posted in 2000, that is, about 50%, provided that there is no major transfer of fishing effort from the south to the north.

Risk scenario: Based on the trap survey, catches could be increased by about 70% to reflect the rise in the CPUE of commercial-size crab between 1999 and 2000 on the north shore. However, this scenario does not take account of resource status on the south shore, for which we have only sketchy data. If fishing effort were to be concentrated mainly on the north shore, the total mortality could be very high there and the probability of encountering white crab would be high. Furthermore, since recruitment has reached a peak, or just about, a large increase in the harvest at this stage could result in a steeper decline in short-term catch rates.

Snow crab in Area 16

Thirty-eight fishers, that is, two more than in 1999, hold regular snow crab fishing licences for Area 16. In 2000, the TAC (4,176 t) was raised by 50% compared with the 1999 level (Table 2) to reflect the increase in the available biomass and permit increased harvesting of old crab (conditions 4 and 5) that are present in large numbers, particularly in the eastern part of the area. A temporary allocation of 244 t was available for non-crabbers. The fishery began on April 8 and ended on August 12, or almost at the same dates as in 1999, and the TAC was caught.

Resource status in 2000

The CPUE for the commercial fishery as a whole rose by 5%, from 13.1 kg/Japanese trap in 1999 to 13.8 kg/Japanese trap in 2000 (Table 2). The increase in catch rates came mainly from the centre (+ 21%) of the area (12.9 to 15.6 kg/Japanese trap). The catch rates from the west increased by 2% (12.8 to 13.1 kg/Japanese trap) and those from the east dropped by 13% (14.2 to 12.4 kg/Japanese trap) from 1999. Catches were greatest in the centre and west of the area (representing 40% and 33% of the catches in Area 16). In general, intermediate-shell crab dominated catches at sea and dockside. New crab, present in larger numbers than in 1999, accounted for 11% of crab sampled at sea, and the proportion of old crab, in decline

Table 2. Catch and effort data for Area 16.

Year	1983 to 1989[4]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
TAC	2,500[5]	-	2 368	2 596	2 596	3 636	3 636[7]	3 090[7]	2627[7]	2627[7]	2784[7]	4176[7]
Catches	1984	3 181	2 371	2 597	2 595	3 608	3 629	3085	2623	2625	2777	4156[1]
Effort[2]	257.7	250.5	137.8	137.4	127.2	178.6	177.9	153.5	195.7	245.3	212.0	301.2
CPUE[3] Total	7.7	12.7	17.2	18.9	20.4	20.2	20.4	20.1	13.4	10.7	13.1	13.8
West	6.0	8.9	14.1	17.4	18.4	21.5	19.8	21.0	13.1	10.4	12.8	13.1
Centre	7.7	12.4	18.2	22.0	23.3	19.7	21.7	18.5	12.2	9.8	12.9	15.6
East	10.1[6]	15.2	18.7	17.4	19.9	18.5	19.9	21.2	16.2	14.3	14.2	12.4

[1] Landings in metric tonnes as at December 14, 2000
[2] Standardized effort in thousands of Japanese trap hauls
[3] Catch per unit effort in kilograms per Japanese trap
[4] Average for the period
[5] From 1986 to 1987
[6] CPUE figures for Area 16 East and Area 15 were combined prior to 1990
[7] Including special allocations

since 1997, continued to decrease and reached 17% in 2000.

The mean CW of legal-size crab has been declining since 1998 and now stands at 109 mm at sea and 111 mm at dockside. The decrease in size was more pronounced in the east. In Area 16 as a whole, new crab whose size had increased since 1999 were smaller than old crab. The proportion of adolescents from 78 to 95 mm CW (ADO^{-1}) which will reach legal size at the next moult slipped 5% in 2000. This decline is attributable to the situation of crab in the eastern part of the area.

The results of the trawl survey conducted in 2000 in Sainte-Marguerite Bay, near Sept-Îles, west of Area 16, show trends similar to those observed in the fishery. The abundance of legal-size crab (new- or intermediate-shell crab) was up sharply from 1999, and their mean CW was 109 mm, on a par with 1999. The survey shows a steep drop in the number of adolescents with a CW of 78 to 95 mm (ADO^{-1}) and 62 to 78 mm (ADO^{-2}), in comparison with 1999, and, correspondingly, a strong increase in the abundance of undersize adult males. The 1994-1997 year-classes, which will reach legal size in 2003-2006, are weak but the 1998-1999 year-classes appear stronger and should support a recovery in recruitment. As in Area 17, recruitment of adult females has been declining since 1997 and continued to move downward in 2000. Their fertilization rate, which declined from 1991 to 1997, has been on the rise for three years given the growing abundance of adult males.

Indices from the postseason trap survey conducted every fall since 1994 in Area 16 are also on the rise (Figure 5). The catch rate of legal-size crab increased by 15% in number and 5% in weight over 1999. As in 1999, CPUE values rose more in the east (+ 14%) than in the west (+ 1%). Recruits were twice as abundant in the west and six times more abundant in the east as compared with 1999. The proportion of new crab is on the rise everywhere, particularly in the east where these crab had been declining since 1997 and, conversely, the proportion of old crab fell throughout the area, especially in the east where a figure of 26% was recorded in 2000, in contrast with 52% in 1999. The mean CW of legal-size crab (106 mm in 2000) has declined sharply throughout the territory.

The trap survey shows an increase in both time and space of the number of undersize adult males caught in traps. The number of undersize males rose again in relation to 1999 in the west (from 41 to 60 crabs per trap) and continued to increase in the east (+ 135%), going from 13 to 31 crabs per trap in 2000. These results suggest that a large proportion of crab from the 1988-1992 recruitment wave will not reach legal size. Nonetheless, the number of adolescents with a CW of 78 to 95 mm (ADO^{-1}), which has been rising since 1997, climbed from 5 crabs per trap in 1999 to 13 crabs per trap in 2000.

Outlook for 2001

All current status indicators are positive and show that the harvestable biomass increased in 2000 in spite of the increased effort concentrated mainly in the west and centre of the area. This increase is attributable to the 1988-1992 recruitment wave, which is supplying the fishery at present. The postseason trap survey indicates that the residual biomass of old crab is becoming depleted and that recruitment is now evident throughout the area. Recruitment will intensify in the centre and the east, but should decline in the west in the short term. There could be problems in 2001 in connection with a rise in the number of white crab.

The average CW of legal-size crab has been declining sharply for four years both at sea

and at dockside; however, it should stabilize and then increase in the near future. Recruitment of adult females dropped substantially in 2000. Their reproductive condition has improved and should stay at the same level for a few more years.

In 2000, the TAC included a 20% increase in the regular quota from the 1999 level (i.e. totalling 3,340 t), and a supplementary quota of 835 t of old crab was issued for the area. The proportion of old crab declined markedly in 2000. Since the recruitment indicators are up throughout the area and since resource abundance rose in 2000, the 2001 TAC could be increased over the regular quota of 2000 without compromising conservation of the resource in the short term.

Snow crab in Area 15

Area 15 has 8 regular fishers. In 2000, the fishery began on April 8, or 4 days earlier than in 1999, and ended on August 12, or 6 days later than in 1999. The TAC (464 t), which was 10% higher than in 1999, was caught (Table 3). Temporary allocations of 52 t were granted to non-crabbers.

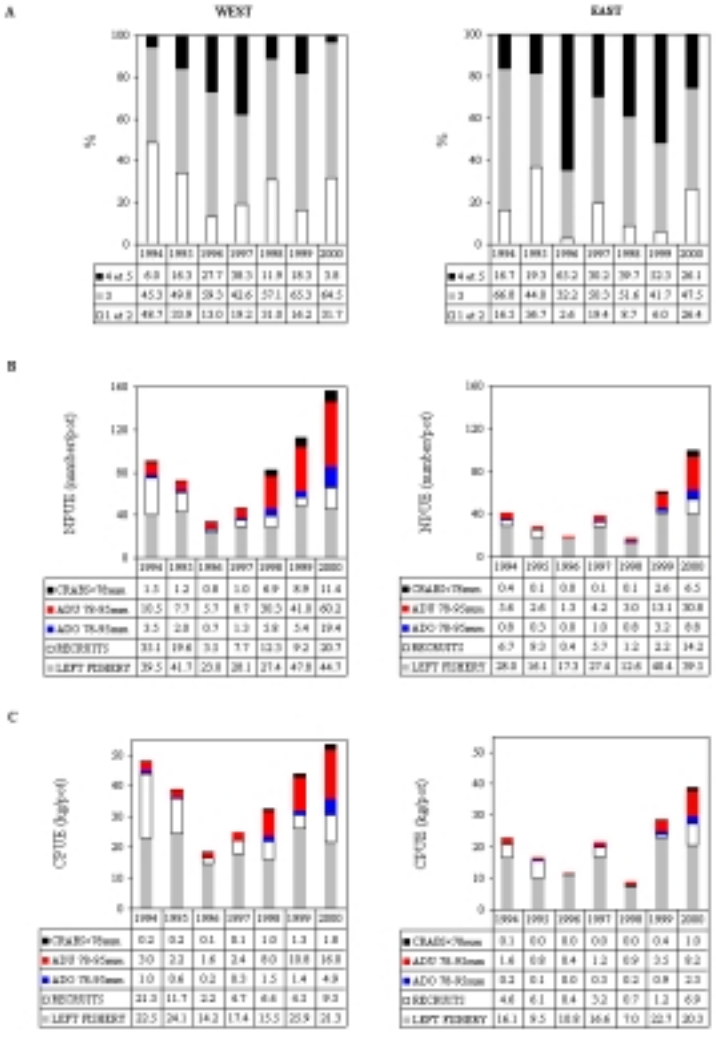

Figure 5. Results of post-season trap surveys in Area 16 from 1994 to 2000. (A) Shell condition (%) of legal-size males. Catch rates (B) NPUE (no./conical trap) and (C) CPUE (kg/conical trap). Only the western section (Pointe-des-Monts to Rivière-au-Tonnerre) and eastern part (Mingan to Natashquan) of Area 16 are shown.

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

Year		1983 to 1989[4]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
TAC:	Area 15	--	--	--	--	--	435	435	435	413	422[7]	422[7]	464[7]
	Area 14	667[5]	381	381	381	381	524	524[6,7]	576[7]	518.4[7]	548[7]	548[7]	603[7]
	Area 13	1 642	889	889	889	889	889	889	1241[7]	931[7]	838	848	848
Catches	Area 15	109,7	93	321	300	339	426	436	435	413	421	422	464[1]
	Area 14	509.4	174	288	361	383	522	525	573	512	546	540	603[1]
	Area 13	918.4	138	201	19	703	859	883	1121	795	838	832	858[1]
Effort[2]	Area 15	--	15.2	22.9	22.1	22.3	21.2	17.1	16.0	21.5	22.6	25.0	30.9
	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	171.9
CPUE[3]	Area 15	--	6.1	14.0	13.6	15.2	20.1	25.5	27.1	19.2	18.6	16.9	15.0
	Area 14	5.2	4.3	4.8	7.3	9.7	11.2	11.6	12.5	10.7	11.2	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

[1] Landings in metric tonnes as at December 14 for 2000
[2] Standardized effort in thousands of Japanese trap hauls
[3] Catch per unit effort in kilograms per Japanese trap
[4] CPUE in areas 14 and 13 was combined before 1987
[5] Average for the period
[6] Not in effect in areas 14 and 13 until 1986
[7] Including special allocations

Resource status in 2000

The commercial fishery CPUE, in decline since 1996, continued to fall in 2000 (15 kg/Japanese trap) and was down 11% from 1999 (16.9 kg/Japanese trap). Intermediate-shell crab dominated catches at sea, and new crab, which had posted a sharp drop since 1996, increased in 2000 and accounted for 12% of catches. The proportion of old crab was slightly lower than in 1999 and made up 38% of catches in 2000.

The mean CW of legal-size crab at sea has declined since 1998 and stood at 109 mm in 2000. The corresponding value at dockside is now 109 mm, up slightly from 1999. In 1999, new crab were smaller in size than old crab. The proportion of adolescents between 78 and 95 mm CW in catches was low (1 to 2%), but up slightly from 1999.

In 2000, despite a slight increase in recruits (Figure 6), **the CPUE of the commercial segment of crab taken in the trap survey** (8 kg/Japanese trap) conducted since 1998 shrank considerably (39%) in comparison with 1999 (13.2 kg/Japanese trap). The proportion of new crab (9%) is increasing but remains small, and the proportion of old crab was up substantially (81%) over the 1999 level. The mean CW of legal-size crab (107 mm) rose markedly in comparison with the figure for 1999. The abundance of adolescents from 78 to 95 mm CW (ADO^{-1}) in traps was very low (0.4 crab per trap) but stable versus 1999.

Outlook for 2001

The CPUE, which has been declining since 1996 in the snow crab fishery, fell sharply between 1999 and 2000 in the postseason trap survey. In addition, the biomass of old crab nearly doubled in relation to 1999. Future population status indicators suggest that recruitment will be low in 2001 and that the biomass will continue to shrink.

In view of: 1) the steady decrease in the commercial CPUE since 1996 and the sharp decline recorded in the postseason survey in 2000, 2) the weak recovery of recruitment and 3) the composition of the harvestable biomass, which consists primarily of intermediate-shell crab (condition 3) and old crab (conditions 4 and 5), a cautious approach is in order to ensure the rebuilding of a harvestable biomass of quality.

Consequently, it is recommended that catches be reduced from the 2000 level.

Snow crab in Area 14

Area 14 has 21 regular fishers. In 2000, the fishing season began on May 1, or 3 weeks earlier than in 1999 (May 24), and ended on August 7, or 3 weeks earlier than in 1999 (August 30). The quota of 603 t, which represented an increase of 10% over 1999, was attained. This quota included temporary allocations equivalent to those in 1999, or 26 t (Table 3).

The commercial fishery CPUE was 11.8 kg/Japanese trap in 2000, which is comparable to the 1999 value and slightly higher than in 1997-1998 (Table 3). However, when a correction factor is applied to take account of changes in the fishery dynamics, it can be seen that the mean CPUE has declined steadily since 1996. The fishery data show a marked trend toward ever-longer soak times since 1996, which generally promotes larger catch rates. In addition, the fishing season has gotten off to an increasingly early start in this area between 1996 (June 30) and 2000 (May 1), thereby targeting the snow crab concentrations that form in spring during the spawning period. According to analyses based on commercial fishery data, these changes in fishing strategy and season may have kept catch rates at a stable or slightly increasing level since 1997, whereas the true situation on the seabed is one of declining commercial biomass.

The proportion of new crab at sea was low (3%) and lower than in 1999. Old crab (19%) were present in a much smaller proportion than in 1999. The mean CW of crab caught at sea (106 mm) was the same as in 1999, but the corresponding value for those measured at dockside (104 mm) was up slightly from 1999. New crab were larger than old crab. The proportion of crab with a CW of 78 to 95 mm was 2%, a value which is close to that of 1999 and represents a record low level.

The trap survey conducted since 1998 in this area (Figure 6) shows a large drop in the NPUE (-46%) and the CPUE (-45%) between 1999 (14.2 crab or 6.9 kg/Japanese trap) and 2000 (7.7 crab or 3.8 kg/Japanese trap). The average CPUE derived from this survey is much lower than the values obtained during the commercial fishery in 2000 (11.8 kg/Japanese trap). The proportion of new crab (36%) rose whereas the proportion of old crab (26%) held steady in relation to 1999. The CW of legal-size crab (105 mm) was the same as in 1999. The abundance of adolescent crab with a CW of 78 to 95 mm (ADO^{-1}) was 0.6 crab per trap in 2000, a low and stable value in comparison with 1999.

Most current status indicators are negative and suggest that the harvestable biomass decreased in 2000. The revised CPUE has declined steadily since 1996, recruitment is low and, if the population trends in Area 14 are similar to those in Area 13, a recovery is not likely to be felt in the short term. The mean CW of legal-size crab is stable and should not increase over the short term.

A prudent approach is in order until the signs of a recovery are apparent and herald a major expansion of the harvestable biomass. Consequently, a reduction in catches to the level in effect prior to 1996 (about 524 t) would be wise to limit fishing pressure and allow the resource to maintain itself until recruitment increases and a more solid recovery occurs.

Snow crab in Area 13

Forty-three fishers from Quebec and six from Newfoundland share the regular quota in Area 13 and no temporary allocations

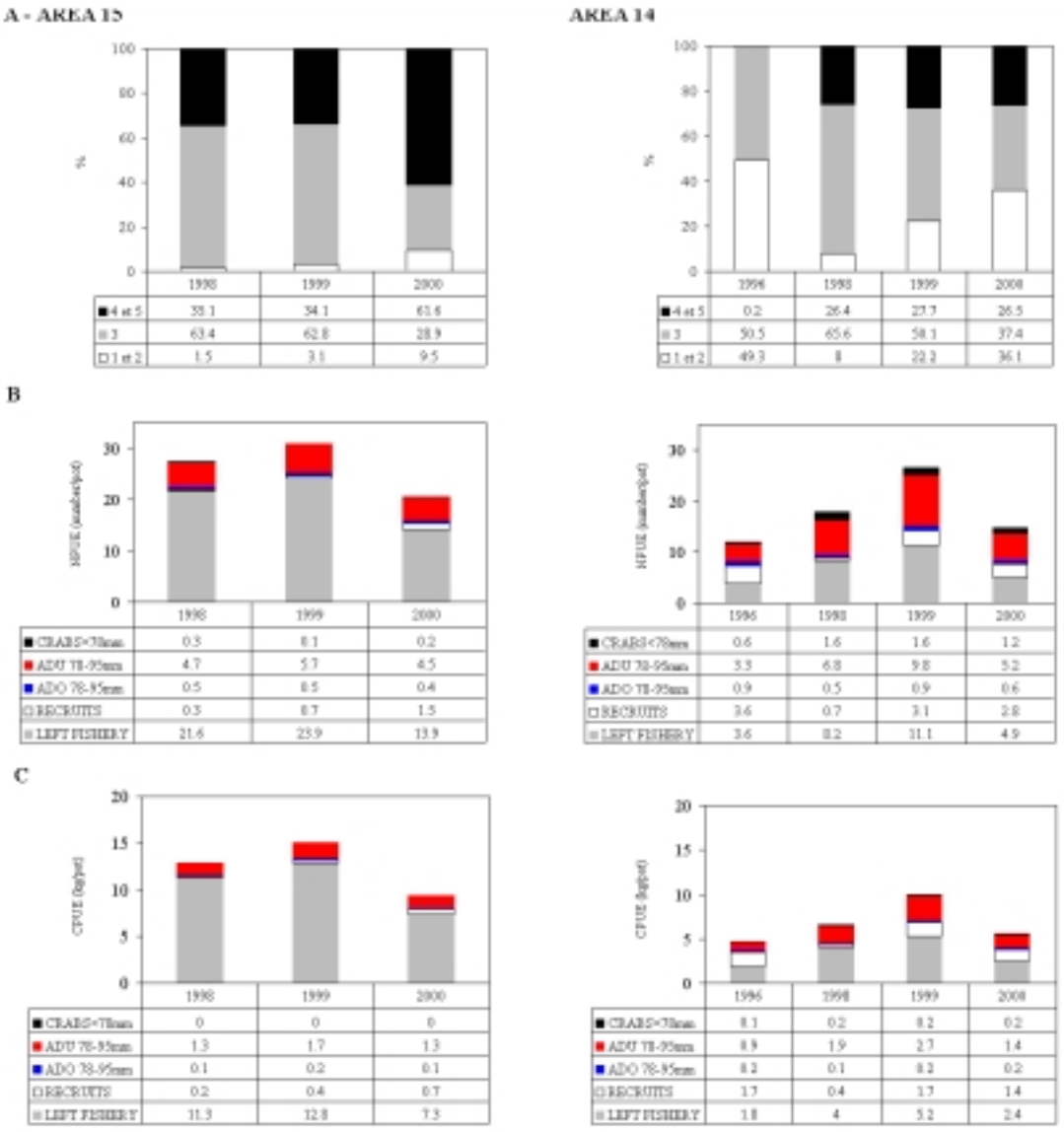

Figure 6. Results of post-season trap surveys in Areas 15 and 14 between 1996 and 2000. (A) Shell condition (%) of legal-size males. Catch rates (B) NPUE (number/Japanese trap) and (C) CPUE (kg/Japanese trap) of the different groups of males.

have been granted since 1999. In 2000, the TAC of 848 t was caught; it was the same as in 1999 (Table 3).

The commercial fishery CPUE rose slightly throughout the area in 2000, from 6.7 kg/Japanese trap in 1999 to 6.9 kg/Japanese trap (Table 3). However, when the area is divided into northern and southern sectors, it can be noted that the CPUE increase comes from the southern sector, where the CPUE climbed from 6.4 to 8.5 kg/Japanese trap. By contrast, the CPUE of the northern sector declined from 6.8 to 5.2 kg/Japanese trap. The trend toward increased effort in the south, which began in 1999, intensified in 2000. The proportion of the total number of traps hauled went from 11 to 51% and the proportion of landings went from 43 to 70% between 1999 and 2000, in the south.

The proportion of new crab (13%) measured at sea during the fishery increased substantially in Area 13 over 1999, whereas conversely the proportion of old crab fell sharply between 1999 (43%) and 2000 (27%). In 2000, the CW of legal-size crab was 104 mm both at sea and at dockside, which represented respectively an increase and a stable level compared with 1999. New crab were larger than old crab. The proportion of crab with a CW of 78 to 95 mm (ADO^{-1}) stood at 3% in 2000, representing a stable but low level throughout the area in relation to 1999.

The trap surveys, conducted since 1999 in the north and south of the area, showed a drop of 14% in the NPUE and 20% in the CPUE for the north and a decline of 7 % in the NPUE and the CPUE in the south (Figure 7). By contrast, the number of recruits, which was up in the south, went from 5 to 9 crabs per trap between 1999 and 2000 in this sector, whereas the corresponding figure remained low (0.1 crab/trap) and at the 1999 level in the north. In the north, the proportion of new crab held steady at 10% while the proportion of old individuals (19%) dropped sharply. In the south, the proportion of new crab (68%) rose significantly (+102%) over 1999, while the proportion of old individuals (4%) declined sharply. The CW of legal-size crab was 102 mm in the north and 106 mm in the south, levels comparable to those of 1999. The number of adolescents with a CW of 78 to 95 mm (ADO^{-1}) remained stable in relation to 1999, but this number was low in the north (0.2 crab/trap) and the south (0.7 crab/trap).

The trawl survey conducted in the northern sector of Area 13 in 2000 showed a low level of abundance for legal-size crab (4 crabs per 10,000 m^2) and a declining level in relation to 1999 (about 6 crabs per 10,000 m^2). This abundance level is markedly lower than the results obtained with the same gear type in areas 13 and 14 in 1994-1995 (12-13 crabs per 10,000 m^2) and, since 1992, in Area 17. The NPUE for new crab (2 crabs per 10,000 m^2) was low and stable, whereas the value for old crab (0.1 crab per 10,000 m^2), down from 1999, remained very low in 2000. The CW of legal-size crab stood at 101 mm, down from 1999. The number of adolescents measuring between 78 and 95 mm CW (ADO^{-1}) was 7 crabs per 10,000 m^2, which represents a slight decline from 1999, and the number measuring between 62 and 78 mm CW (ADO^{-2}) was high (39 crabs per 10,000 m^2) and greater than the values recorded in 1994-1995 but slightly smaller than in 1999. The 1994, 1995 and 1996 year-classes, which will reach commercial size as of 1993, appear larger than the previous ones.

Outlook for 2001

Recruitment was weak in the north and strong in the south in 2000. Effort rose appreciably in the south but declined in the north, and the catch rates for the entire area increased slightly over 1999. Consequently, the residual biomass at the end of the 2000 season is smaller than in 1999. Recruitment looks weak for 2001, and the available biomass should be, at best, on a par with that of 2000. However, the trawl survey suggests that recruitment will increase over the coming years and it may remain at high levels beyond 2002, if the strong year-classes that are anticipated do not become depleted before the crab reach legal size.

All the stock status indicators call for status quo in relation to catches until the harvestable biomass increases significantly in the entire area.

Specific concerns of the Science sector

The warming trend of the cold intermediate layer (CIL) could cause a contraction in the

geographic range of snow crab and changes in the growth and reproductive patterns.

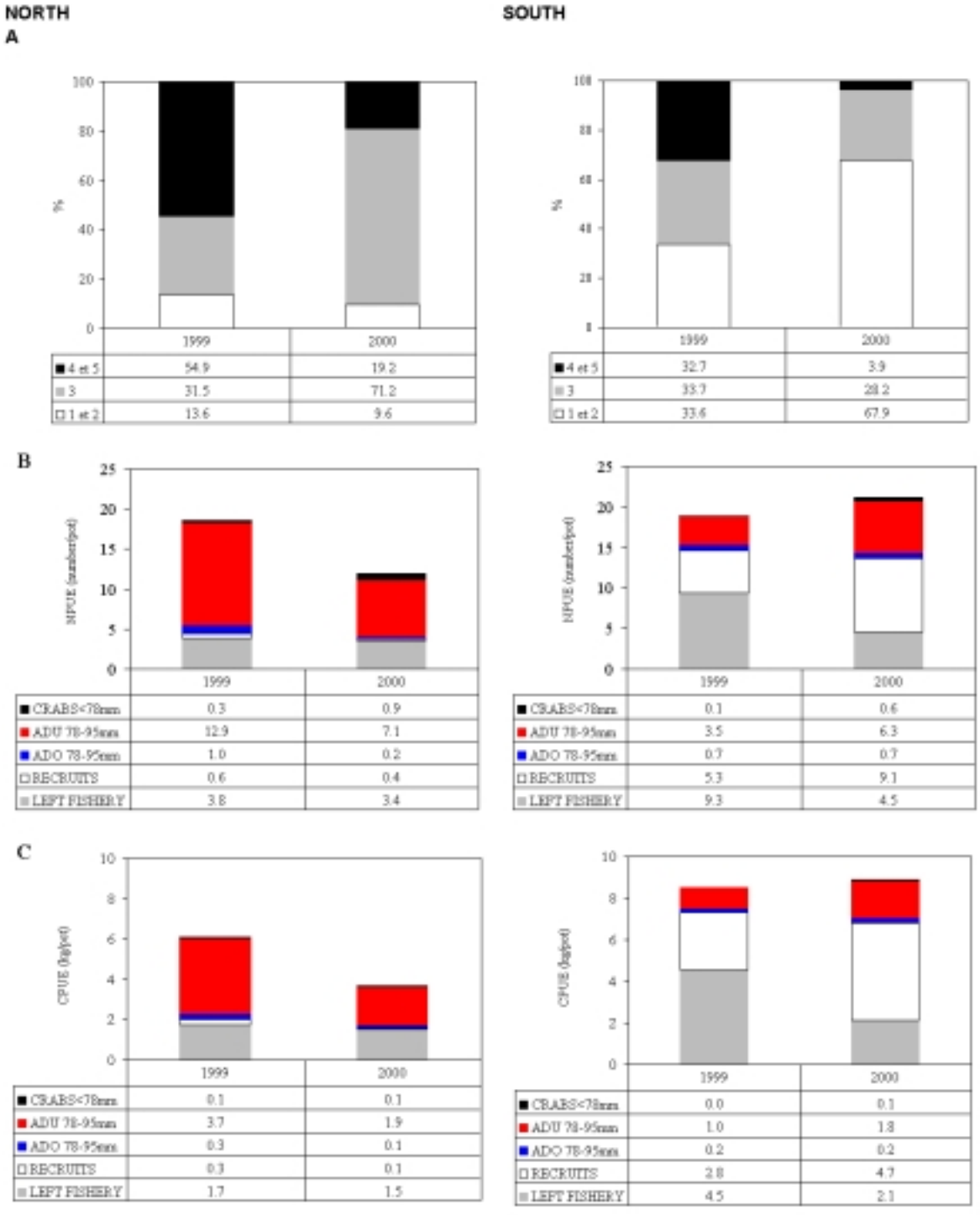

Figure 7. Results of the post-season trap surveys in Area 13 (north and south) in 1999 and 2000. (A) Shell condition (%) of legal-size males. Catch rates (B) NPUE (number/Japanese trap) and (C) CPUE (kg/Japanese trap).

References:

Dufour, R. et J-. P. Dallaire 1999. Le crabe des neiges de l'estuaire et du nord du golfe du Saint-Laurent: État des populations de 1995 à 1998. MPO Pêches de l'Atlantique, Document de recherche no 99/19.

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