

Newfoundland and Labrador Snow Crab

Background

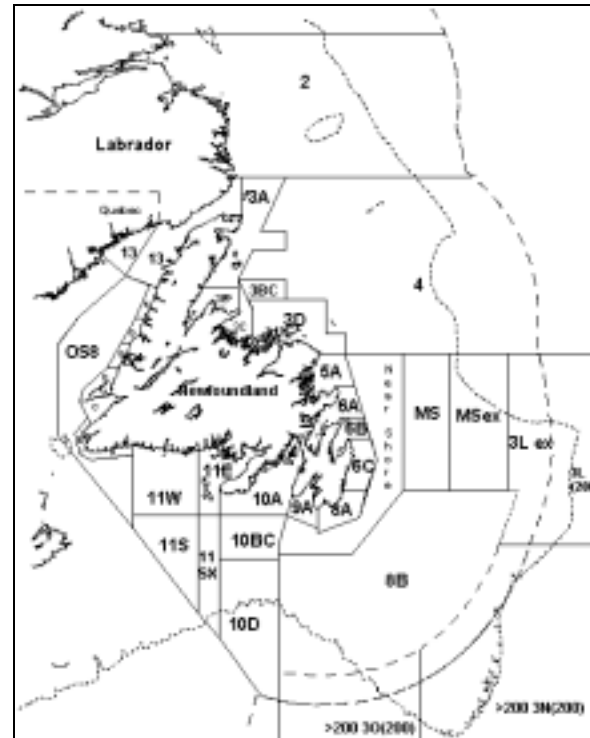
Snow crab occur over a broad depth range in the Northwest Atlantic from Greenland to the Gulf of Maine. Distribution in waters off Newfoundland and southern Labrador is widespread but stock structure is unclear. Commercial sizes are most common on mud or mud/sand, while smaller crabs are also common on harder substrates. Snow crab diet includes fish, clams, polychaete worms, brittle stars, shrimp, snow crab, and other crustaceans. Predators include various groundfish, other snow crabs, and seals.

Crabs grow by molting, in spring. Females cease molting when they achieve sexual maturity between 40 and 75 mm carapace width (CW), whereas males may continue to molt until their terminal molt to adulthood, between about 40 and 115 mm CW.

The fishery is prosecuted using fleets of conical baited traps. The minimum legal size is 95 mm CW. This regulation excludes females from the fishery while ensuring that a portion of the adult males in the population remain available for reproduction.

The minimum legal mesh size of traps is 135 mm., to allow small crabs to escape. Under-sized and soft-shelled males that are retained in the traps must be returned to the sea and an unknown proportion of these die.

The fishery began in 1968 and was limited to NAFO Divisions 3KL until the mid 1980's. It has since expanded throughout Divisions 2J3KLNOP4R and is prosecuted by several fleet sectors. Management of the fishery led to the development of multiple quota-controlled management areas with over 3300 licence/ permit holders under enterprise allocation in 2002. Stock status is not assessed at this fine management scale.



Newfoundland and Labrador Snow Crab Management Areas

Summary

- Resource status was evaluated based on trends in fishery catch per unit of effort (CPUE), biomass, recruitment prospects and mortality. Data were derived from the fall Div. 2J3KLN multi-species bottom trawl survey, inshore Div. 3KL trap surveys and fishery data from logbooks as well as observer catch and effort data.

Division 2J

- **Landings** declined by 35% from 5,400 t in 1999 to 3,500 t in 2002, in part due to a reduction in TAC imposed in 2000. **Offshore commercial CPUE** has declined by 60% since 1998.

- The exploitable **biomass** index, as determined from the **fall multi-species survey** data, decreased steadily, by 94%, from 1998-2002 consistent with a decline in commercial CPUE since 1998. Spatial distribution of the exploitable resource has been contracting since 1998.
- The fall survey **pre-recruit index** and observer discard pre-recruit index both decreased from 1998 to a lower level during 1999 – 2001. The survey index decreased in 2002 while the discard index increased. The disagreement between the pre-recruit indices creates uncertainty about short-term recruitment prospects. Long-term **recruitment** prospects are also uncertain.
- The **exploitation rate** index increased from 1999-2001 but changed little in 2002. The percentage of the total catch discarded increased sharply in 2002, implying increased **handling mortality** on pre-recruits during the 2002 fishery.
- The exploitation rate and pre-recruit mortality will likely increase if the current catch level is maintained.
- The exploitable **biomass** index, as determined from the fall multi-species survey data, has been stable over the past 4 years at a lower level than during 1996-1998 in contrast to the offshore commercial CPUE. Spatial distribution of the exploitable resource contracted during 1998 – 2001, but changed little in 2002. An **inshore trap survey index** and **inshore commercial CPUE** have increased since 2000.
- The fall survey **pre-recruit** index declined from 1997 - 1999, and has since varied at a lower level. The observer discard pre-recruit index declined from 1997 - 1999, and has since varied at a lower level. Recruitment is expected to remain relatively low in the short term. Long-term **recruitment** prospects are uncertain.
- The **exploitation rate** index increased steadily from 1997 to 2000 and remained relatively high over the past 3 years. The percentage of the total catch discarded in the fishery decreased from 25% in 2001 to 19% in 2002, implying decreased **handling mortality** on pre-recruits during the 2002 fishery.
- The exploitation rate is expected to remain relatively high if the current catch level is maintained.

Division 3K

- **Landings** declined by 29% from 21,400 t in 1999 to 15,100 t in 2001, in part due to a reduction in TAC imposed in 2000. They increased to 16,400 t in 2002 due to increased inshore TAC. **Offshore commercial CPUE** declined by 24% from 1998-2001, and remained virtually unchanged in 2002. **Inshore commercial CPUE** has increased since 2000.

Division 3L

- **Landings** increased from 23,500 t in 2001 to 25,100 t in 2002, primarily due to increased inshore TACs. **Offshore commercial CPUE** remained stable at a high level over the past 3 years. The **inshore commercial CPUE** increased from

1997 – 2000 and has since remained virtually unchanged.

- The exploitable **biomass** index, as determined from fall multi-species survey data, declined by 70% from 1996-2000 and has since remained at a low level in contrast to both inshore and offshore CPUE indices. The distribution of the exploitable resource has contracted slightly since 1998.
- The fall survey **pre-recruit** index declined from 1996 - 1999, and remained at a relatively low level over the past 4 years. The observer discard pre-recruit index declined from 1997 – 1999 and has remained at a relatively low level over the past 4 years. Recruitment is expected to remain relatively low in the short term. Long-term **recruitment** prospects are uncertain.
- The **exploitation rate** index increased steadily from 1997- 2001 and changed little in 2002. The percentage of the total catch discarded decreased sharply in 1998 and continued to decline gradually until 2002, implying reduced **handling mortality** on pre-recruits.
- Biomass has declined, as indicated by the exploitable biomass index, while the fishery continues to perform at a high level, based on commercial CPUE. The effect on exploitation rate of maintaining the current catch level is unclear, because the trends in the two indices do not agree.

Divisions 3NO

- The fishery has been concentrated along the shelf edge in Div. 3NO. **Landings** peaked in 1999 at 6500 t but dropped by 35% to 4200 t in 2000, due to TAC reduction, then increased to 5000 t in 2002. **Commercial CPUE** increased by 20% from 1997 - 2002.
- Because estimates of the exploitable **biomass** index, as determined from the fall multi-species survey data, have wide margins of error, no inferences about biomass trends can be made from these data. CPUE has remained high in recent years.
- Similar to the situation regarding interpretation of the biomass index from surveys, wide margins of error preclude estimating **pre-recruits**, from the fall multi-species survey data. The observer discard pre-recruit index decreased sharply in 2000 and fluctuated at a relatively low level over the past 3 years. Recruitment is expected to remain relatively low in the short term. Long-term **recruitment** prospects are unknown.
- Trends in **exploitation rate** are unclear because of uncertainties associated with the exploitable biomass index. The percentage of the total catch discarded in the fishery decreased by about half since 1999, implying reduced **handling mortality** on pre-recruits.
- Trends in the exploitable biomass index are unclear, but the fishery continues to perform at a high level.

Subdivision 3Ps

- **Landings** for Subdiv. 3Ps were similar in 2001 and 2002 at approximately 7,700 t. **Offshore commercial CPUE** declined by about 50% from 1999 – 2002. **Inshore commercial CPUE** has also declined in recent years.
- No estimates of an **exploitable biomass** index are available as there are no reliable research survey data from this area.
- The observer discard **pre-recruit** index has remained stable over the past 4 years. Recruitment is expected to change little in the short term.
- The percentage of the total catch discarded in the Subdiv. 3Ps fishery increased from 21% in 2001 to 32% in 2002 implying increased **handling mortality** on pre-recruits during the 2002 fishery.
- Assuming that CPUE reflects the exploitable biomass, and the declining trend continues, exploitation rate and pre-recruit mortality will likely increase if the current catch level is maintained.

Division 4R and Subdivision 3Pn

- **Landings** averaged 1650 t during 1999-2001 but increased to 1880 t in 2002 due to an increase in TAC. **Commercial CPUE** has been stable since 1993 but remains low relative to other divisions.
- There are no reliable fishery independent data from this area. CPUE has remained stable since 1993.

- The observer discard **pre-recruit** index has remained stable during recent years suggesting stability in short-term recruitment.
- The percentage of the total catch discarded has fluctuated without trend since 1995 at a higher level than in other divisions, implying high **handling mortality** on pre-recruits relative to other divisions.
- Assuming that CPUE reflects the exploitable biomass, and remains stable in 2003, exploitation rate will likely remain unchanged if the current catch level is maintained.

Species Biology

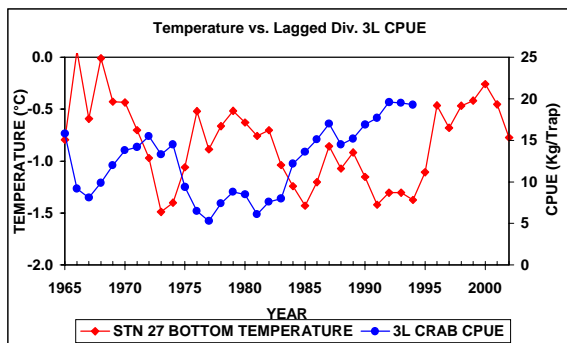
The snow crab life cycle features an initial planktonic larval period, following spring hatching, involving several stages before settlement. Benthic juveniles of both sexes molt frequently, but at about 40 mm carapace width (CW) (~ 4 years of age) they may become sexually mature.

Females cease molting after sexual maturity is achieved at about 40-75 mm and so they do not contribute to the exploitable biomass. However sexually mature (adolescent) males may continue to molt annually until their terminal molt, when they develop enlarged claws (adults), which enhances their mating ability. Males may molt to adulthood at about 40-115 mm CW, and so only a portion of any cohort will recruit to the fishery at 95 mm CW (~ 8 years of age). Adult legal-sized males remain new-shelled with low meat yield throughout the remainder of the year of their terminal molt and are considered to be pre-recruits until the following year when they begin to

contribute to the exploitable biomass as older-shelled adults. Crabs may live about 5 - 6 years as adults after the terminal molt.

Ecology

A negative relationship exists between bottom temperature and commercial CPUE 8 years later (in Div. 2J, 3K and 3L) or 7 years later (in Subdiv. 3Ps). This lag period corresponds to the approximate age-at-recruitment, supporting the hypothesis that cold conditions early in the life cycle are associated with the production of strong year classes. Relatively warm oceanographic conditions have persisted since 1995 implying reduced productivity during that period.



The abundance of **predatory groundfish** species has remained low since the early 1990's but **cannibalism** is known to occur. The implications for mortality are unknown.

The Fishery

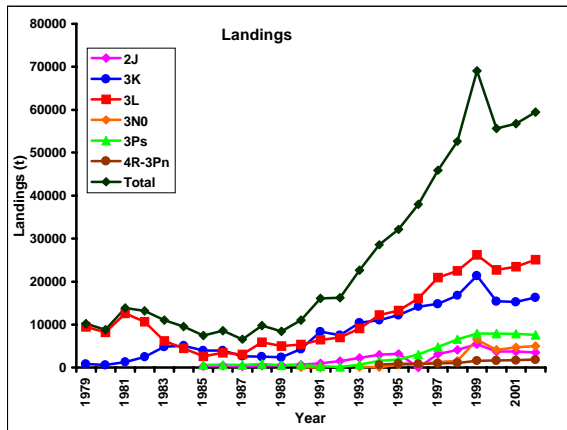
The fishery began in Trinity Bay (Management area 6A) in 1968. Initially, crab were taken as gillnet by-catch but within several years there was a directed trap fishery in inshore areas along the northeast coast of Div. 3KL during spring through fall.

Until the early 1980's the fishery was prosecuted by approximately 50 vessels, limited to 800 traps each. In 1981 fishing was restricted to the NAFO division where the licence holder resided. During 1982-87 there were major declines in the resource in traditional areas in Div. 3K and 3L while new fisheries started in Div. 2J, Subdiv. 3Ps and offshore Div. 3K. Since the late 1980s, the resource has increased in these areas. A snow crab fishery began in Div. 4R in 1993.

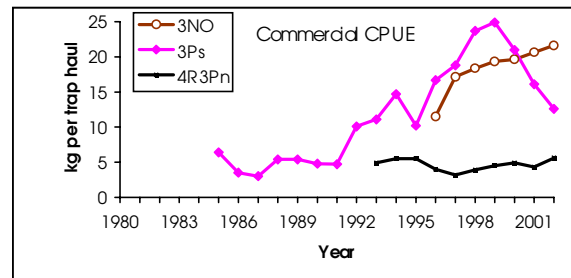
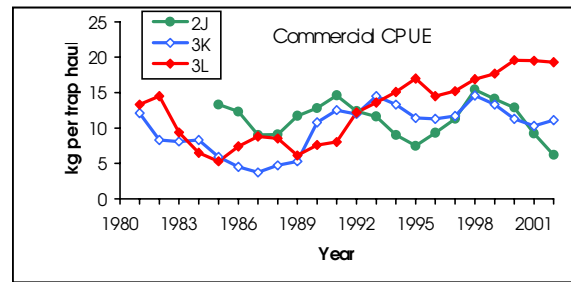
Licences supplemental to groundfishing were issued in Div. 3K and Subdiv. 3Ps in 1985, in Div. 3L in 1987 and in Div. 2J in the early 1990's. Since 1989 there has been a further expansion in the offshore. Temporary seasonal permits for vessels <35 ft. were introduced in 1995. There are now several fleet sectors and 3300 licence and permit holders.

In the late 1980's quota control was initiated in all management areas of each division. The season was also shortened and timed differently for the fulltime and supplementary fleets. All fleets have designated trap limits, quotas, trip limits, fishing areas within divisions, and differing seasons.

Landings for Div. 2J3KLNOP4R increased steadily from about 10,000 t annually during the late 1980's to 69,000 t in 1999 largely due to expansion of the fishery to offshore areas. They decreased by 19% to 55,600 t in 2000 in association with a 17% reduction in TAC, before increasing slightly to 56,500 t in 2001 and 59,400 t in 2002.



Effort, as indicated by estimated trap hauls, has approximately tripled throughout the 1990's. It declined in 2000 then increased slightly in 2001 and 2002 with changes in TAC. Increasing effort in the 1990's was primarily due to vessels <35 feet with temporary seasonal permits. Effort has been broadly distributed in recent years. Catch rates have remained high in Div. 3LNO but have declined in Div. 2J3K and Subdivision 3Ps.

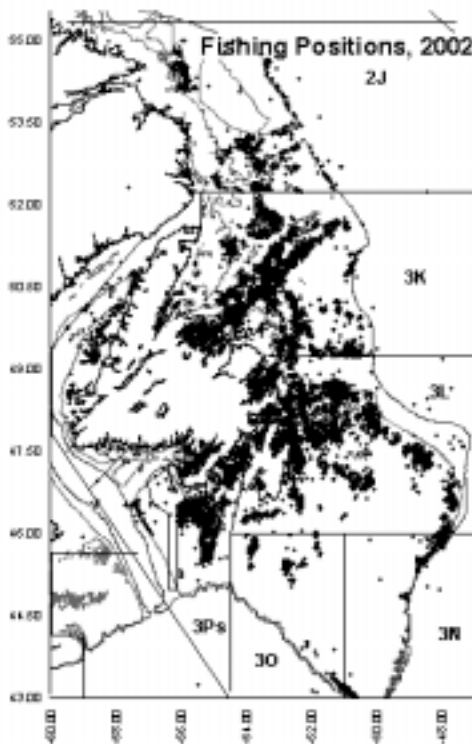


Resource Assessment

Resource status was evaluated based on trends in indices of **biomass** (from trawl surveys and fishery performance), **recruitment**, and **mortality**.

The multi-species fall bottom trawl survey (a predominately offshore and post-season survey with respect to snow crab) provides an index of the **exploitable biomass** (older-shelled adults of legal size) available for the fishery in the following year for Div. 2J3KLN0. This index was compared with offshore commercial CPUE to evaluate trends in the exploitable biomass. Inshore CPUE was compared with catch rates from inshore trap surveys, where available.

The fall bottom trawl survey also provides data on adolescents larger than 75 mm that were used to calculate an index of **pre-recruit** legal-sized males that would result from imminent molting in spring. These new-shelled crabs would begin to recruit to the fishery as older hard-shelled adults one year later. This survey index was



compared to observer-based catch rates (kg/trap haul) of total crabs discarded. Both the **survey pre-recruit index** and the observer **discard pre-recruit index** reflect catch rates of undersized and new-shelled legal-sized pre-recruits.

Trends in **exploitation rate** are inferred from changes in the ratio of commercial catch to the projected exploitable biomass. The **percentage discarded**, by weight, of the total catch is a function of both the commercial CPUE and the observer discard pre-recruit index, and was interpreted as an index of **handling mortality** on pre-recruits. Handling mortalities of pre-recruits will impact future recruitment.

Division 2J

Commercial Fishery

Landings increased slightly from 310 t in 1985 to 650 t in 1990, before increasing to about 3,200 t during 1995-1997. Landings peaked in 1999 at 5,400 t but declined to 3,500 t in 2002, in part due to a reduction in TAC first imposed in 2000.

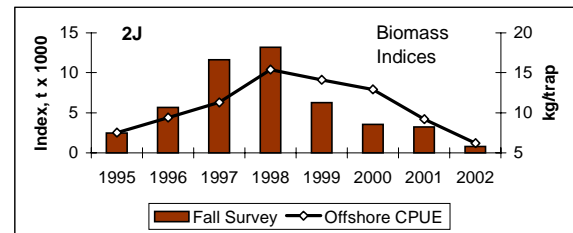
Commercial catch rates (CPUE) have oscillated over the time series, initially decreasing during 1985-1987, increasing to a peak in 1991, decreasing again to 1995, and increasing to peak again in 1998. CPUE again declined steadily to 2002.

Resource Status

Biomass

The **exploitable biomass index** increased steadily during 1995-1998 then decreased by 94%, from 1998-2002.

Commercial catch rates (CPUE) have declined steadily from 1998-2002, in agreement with the decline in the exploitable biomass index, indicating a recent decline in biomass.

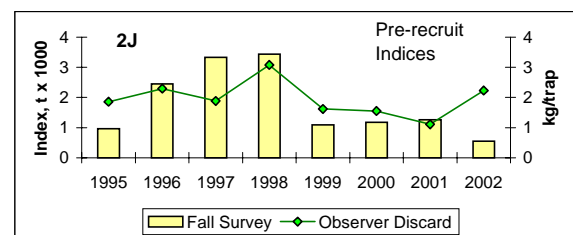


The distribution of the exploitable biomass, based on research survey data, has contracted since 1998, as indicated by an increase in the percentage of fall survey sets containing no legal-sized adult males and a decrease in the proportion of the survey area accounting for 95% of the exploitable biomass.

Recruitment Prospects

The fall **survey pre-recruit index** increased steadily from 1995-1998 but then decreased by 66% in 1999. The index changed little during 1999-2001 before decreasing in 2002 to its lowest level in the time series.

The **observer discard pre-recruit index** (kg/trap haul) also increased overall during 1995-1998, dropped by about half in 1999 but has remained stable through 2001. This index doubled in 2002 in contrast to the survey pre-recruit index.



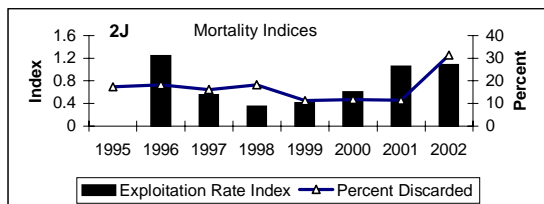
The disagreement between the survey pre-recruit index and the observer discard index creates uncertainty about **short-term recruitment prospects**.

There is very limited evidence of progression of smallest males (< 41 mm CW) to larger sizes, in recent years. Therefore, **long-term recruitment prospects** are uncertain.

Mortality

The exploitation rate index decreased from 1996-1998, was unchanged in 1999 then increased from 1999-2001 with little change in 2002.

The percentage of the total catch discarded in the fishery increased sharply in 2002, implying increased handling mortality on pre-recruits in the 2002 fishery. This increase in percent discarded was largely due to an increased prevalence of soft-shelled crabs in 2002 compared to the previous year.



Outlook

Trends in both the fall survey index and fishery CPUE indicate that the biomass has declined steadily since 1998.

Because of disagreement between indices of observer and survey pre-recruit biomass, recruitment prospects in the short term are uncertain. There is also uncertainty in the long term because there is very limited evidence

of progression of the smallest males to larger sizes.

The exploitation rate and pre-recruit mortality will likely increase in 2003 if the current catch level is maintained.

Division 3K

Commercial Fishery

Landings averaged about 3300 t during 1985-1990 then increased to about 21,400 t in 1999 before declining by 29% to 15,100 t in 2001, in part due to a reduction in TAC imposed in 2000. They increased to 16,400 t in 2002 due to increased inshore TAC.

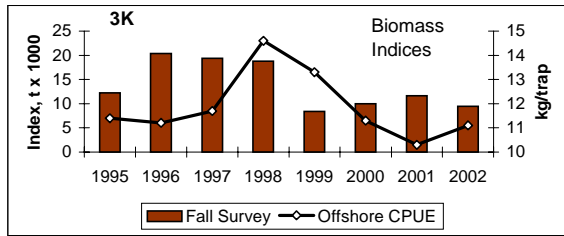
Inshore landings have accounted for about 17 % of the total during each of the past four years.

Commercial catch rates (CPUE) oscillated over the time series, initially decreasing from 1980 - 1987, increasing again and peaking in 1993 and 1998. Offshore commercial CPUE then declined by 24% from 1998 - 2001 and remained virtually unchanged in 2002. Inshore commercial CPUE declined from 1997 - 1999, remained unchanged in 2000 and then increased over the past 2 years.

Resource Status

Biomass

The **exploitable biomass index** increased sharply in 1996 and remained at a high level during 1996-1998. It dropped by more than half in 1999 and has remained relatively stable at a lower level over the past 4 years.



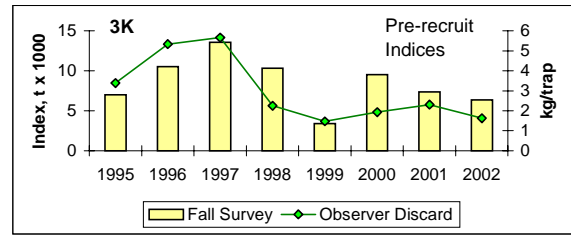
The distribution of the exploitable biomass has contracted during 1998-2001, as indicated by an increase in the percentage of fall survey sets catching no legal-sized adult males and a decrease in the proportion of the survey area accounting for 95% of the exploitable biomass. It changed little in 2002, consistent with little change in biomass.

Offshore commercial catch rates (CPUE) declined steadily from 1998-2001 and remained virtually unchanged in 2002, in agreement with relative stability in the exploitable biomass index.

Inshore commercial CPUE has been consistently lower than offshore CPUE since 1997. Whereas offshore CPUE changed little in 2002, inshore CPUE increased over the past 2 years. A trapping survey, conducted annually since 1994, also suggests a recent increase inshore.

Recruitment Prospects

Both the fall **survey pre-recruit index** and the **observer discard pre-recruit index** increased between 1995 and 1997 before declining during 1997 – 1999. They have since varied at a lower level. Therefore, recruitment is expected to remain relatively low in the short term.

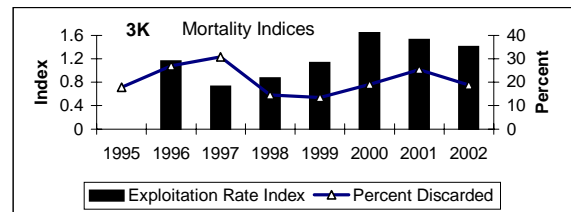


There is very limited evidence of progression of smallest males (< 41 mm CW) to larger sizes, in recent years. Therefore, **long-term recruitment prospects** are uncertain.

Mortality

The **exploitation rate index** decreased from 1996-1997, steadily increased from 1997 to 2000, and has remained relatively high over the past 3 years.

The percentage of the total catch discarded in the fishery decreased from 25% in 2001 to 19% in 2002, implying decreased handling mortality on pre-recruits in the 2002 fishery.



Outlook

Trends in both the fall survey index and offshore CPUE indicate that the biomass has recently stabilized at a lower level relative to 1998. Inshore commercial CPUE data, as well as inshore trap survey data suggest some recent increases inshore.

Survey and fishery indices agree in indicating that recruitment is expected to remain relatively low in the short term. There is uncertainty in the long term because there is very limited evidence

of progression of smallest males to larger sizes.

Exploitation rate will remain relatively high if the current catch level is maintained but would most likely not increase.

Division 3L

Commercial Fishery

Landings increased from about 1,300 t in 1975 to 13,800 t in 1981, before decreasing to 2,600 t in 1985. They increased steadily to peak at 26,200 t in 1999, before declining to 22,700 t in 2000, due to a reduction in TAC. They increased to 23,500 t in 2001 and 25,100 t in 2002 primarily due to increases in inshore TACs.

Inshore landings have accounted for about 23% of the total over the past four years.

Commercial catch rates (CPUE) have oscillated over the time series, initially decreasing from 1973, then peaking in 1981 and 1995. Offshore CPUE decreased in 1996, increased to 2000 and has since remained high. **Inshore commercial CPUE** has been consistently lower than offshore CPUE, but shows a similar trend.

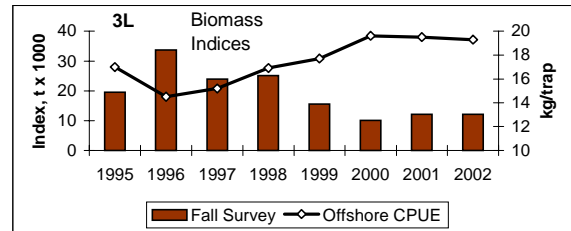
Resource Status

Biomass

The **exploitable biomass index** declined by 70% from 1996-2000 and has since remained at a low level in contrast with the CPUE trends. The distribution of exploitable biomass has contracted slightly since 1998, as indicated by an increase in the percentage of fall survey sets containing

no legal-sized adult males and a decrease in the proportion of the survey area accounting for 95% of the exploitable biomass.

Divergence between the exploitable biomass index and CPUE, since 1996, introduce uncertainty regarding recent trends in biomass.



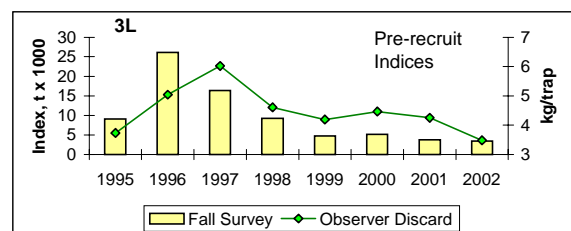
Trap survey catch rates and corresponding inshore commercial CPUE trends from three localized inshore areas declined in recent years. This is in contrast to the more broad-scale offshore and inshore CPUE trends.

Recruitment Prospects

The fall **survey pre-recruit index** declined from 1996 - 1999 and has remained at a relatively low level over the past 4 years.

The observer **discard pre-recruit index** increased from 1995-1997, declined from 1997 - 1999 and has remained at a relatively low level over the past 4 years.

Recruitment is expected to remain relatively low in the short term.

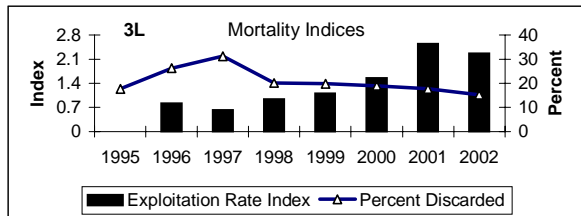


There is very limited evidence of progression of smallest males (< 41 mm CW) to larger sizes, in recent years. Therefore, **long-term recruitment prospects** are uncertain.

Mortality

The **exploitation rate index** increased from 1997 - 2001 and changed little in 2002.

The percentage of the total catch discarded in the fishery increased from 1995-1997, decreased sharply in 1998 then declined gradually until 2002, implying decreased **handling mortality** on pre-recruits.



Outlook

The trawl survey and the commercial CPUE (both inshore and offshore) biomass indices do not agree. Whereas the survey data suggest a decline since 1996, the fishery continues to perform at a high level.

The effect on exploitation rate of maintaining the current catch level is unknown, because trends in biomass indices do not agree.

Division 3NO

Commercial Fishery

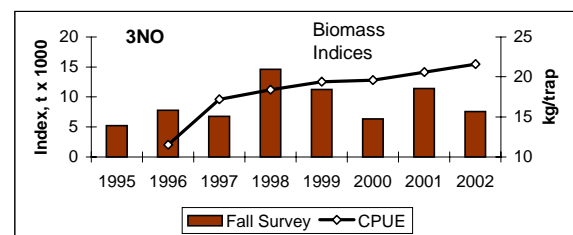
The fishery began in 1995. **Landings** peaked in 1999 at 6500 t then dropped by 35% to 4200 t in 2000, due to TAC reduction. They then increased to 5000 t

in 2002. Commercial CPUE increased by 20% from 1997 - 2002.

Resource Status

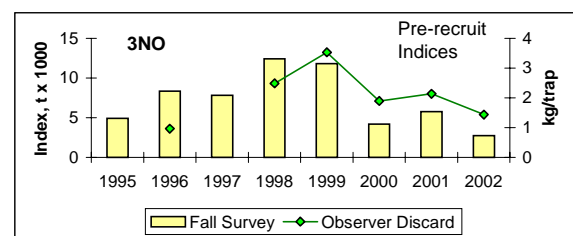
Biomass

The resource has been concentrated along the shelf edge in these divisions. Because estimates of the exploitable **biomass** index, as determined from the fall multi-species survey data, have wide margins of error, no inferences about biomass trends can be made from these data. CPUE has remained high in recent years.



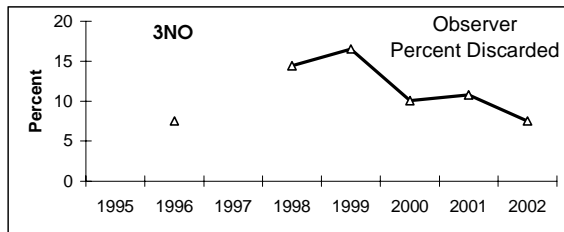
Recruitment Prospects

The uncertainties surrounding the estimates of **pre-recruits** and smaller male crabs, due to wide margins of error, as determined from the fall multi-species survey data, preclude inferences about short-term and long-term recruitment. The observer discard pre-recruit index decreased sharply in 2000 but fluctuated at a relatively low level over the past 3 years suggesting that recruitment will remain low over the short term.



Mortality

Trends in **exploitation rate** are unclear because of uncertainties associated with the exploitable biomass index. The percentage of the total catch discarded in the fishery decreased by about half since 1999, implying reduced **handling mortality** on pre-recruits.



Outlook

Trends in the exploitable biomass index, are unclear, but the fishery continues to perform at a high level.

Subdivision 3Ps

Commercial Fishery

The fishery began in 1985 with landings not exceeding 1000 t until 1994 when the offshore fishery began. Landings rose steadily until 1999 due to increased TACs. **Landings** during 1999 - 2002 averaged 7,800 t.

Inshore landings have accounted for about 44% of the total over the past four years.

Commercial CPUE more than doubled between 1995 and 1999. Offshore CPUE declined by about 50% from 1999 - 2002. **Inshore commercial CPUE** has also declined in recent years.

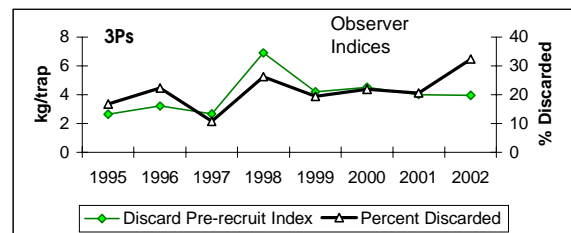
Resource Status

Biomass

No estimates of the exploitable **biomass** index are available as there are no reliable research survey data from this area. Both offshore and inshore commercial CPUE have declined in recent years.

Recruitment Prospects

The observer discard **pre-recruit** index has remained stable over the past 4 years.



Mortality

The percentage of the total catch discarded in the Subdiv. 3Ps fishery increased from 21% in 2001 to 32% in 2002 implying increased **handling mortality** on pre-recruits in the 2002 fishery.

Outlook

Recruitment is expected to change little in the short term. Assuming that CPUE reflects the exploitable biomass, and the declining trend continues, exploitation rate and pre-recruit mortality will likely increase if the current catch level is maintained.

Division 4R and Subdivision 3Pn

Commercial Fishery

The fishery began in 1993 with **landings** not exceeding 1000 t until 1998. Landings averaged 1650 t during 1999-2001 then increased to 1880 t in 2002 due to an increase in TAC. **CPUE** has been stable since 1993 but remains low relative to other divisions.

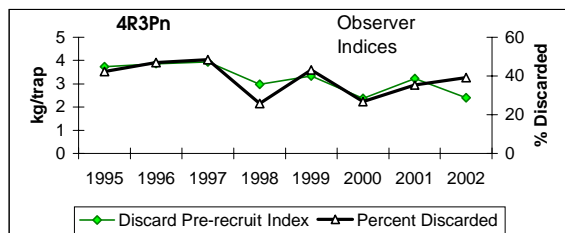
Resource Status

Biomass

There are no reliable fishery independent data from this area. Commercial CPUE remained stable since 1993.

Recruitment Prospects

The observer discard **pre-recruit** index has remained stable during recent years.



Mortality

The percentage of the total catch discarded has fluctuated without trend since 1995 but at a higher level than in other divisions, implying high **handling mortality** on pre-recruits relative to other divisions.

Outlook

Recruitment is expected to change little in the short term. Assuming that CPUE reflects the exploitable biomass, and remains stable in 2003, exploitation rate

will likely remain unchanged if the current catch level is maintained.

Other Considerations

Reproductive biology

Abundance of **mature females** throughout Div. 2J3KLNO was much higher during 1995 – 1998 than during 1999 - 2002, implying reduced egg production in recent years. There was no change in **sex ratio** as abundance of legal sized males also declined throughout the time series. There was a slight decline in the percentage of mature females bearing full clutches of viable eggs in Div. 2J3LN since 1995 but the significance of these trends and implications for future recruitment are unknown.

Bitter crab disease (BCD)

There has been a broadly distributed incidence of **bitter crab disease** during 1996-2002. This disease, which is fatal to crabs, appears to be acquired during molting. The fall bottom trawl surveys indicate that it occurs in Div. 2J3KL, especially in 30-80 mm CW crabs of both sexes. It is usually most prevalent in Div. 3K but appears to be virtually absent in Div. 3NO. Spatial and temporal trends are unclear and implications for mortality are unknown.

Sources of Uncertainty

There is uncertainty regarding the effects of changes in some fishing practices (eg. soak time, trap mesh size and bait quality) on catch rates and their interpretation as indicators of resource status.

Poor handling practices result in unquantified fishing mortality on discarded crabs. There is also

uncertainty regarding the survival of soft-shelled, undersized, and small legal-sized (highgraded) crabs that are caught but discarded. All of these could negatively impact the future fishery.

Biomass indices that are projected from surveys are affected by uncertainties associated with variation in catchability of crabs by the survey trawl, as well as biological parameters such as proportion molting, growth rate, and natural mortality (including that due to BCD).

There is considerable uncertainty regarding the causal basis, and predictability, of long-term recruitment trends. Cannibalism on settling year classes has been proposed as a density-dependent mechanism that results in successive weak year classes and an intrinsic oscillation in recruitment. Cannibalism is known to occur in this area, but there are no data on spatial or annual variation in its prevalence. The negative relationship that exists between temperature and commercial catch rates several years later suggests that a density-independent mechanism affects year class strength early in the life cycle and, subsequently, recruitment. However there is high uncertainty associated with the limited time series that this relationship is based upon, together with the substantial ecosystem changes that have occurred within that short time period.

Management Considerations

Reproductive potential is protected by conservation measures that exclude females and males smaller than 95 mm CW, including a portion of the adult (large-clawed) males, from the fishery. Therefore any increase in exploitation

rate is believed to have minimal impact on reproductive potential.

Handling mortality on pre-recruits can adversely affect future recruitment. Options for minimizing this mortality include early fishing seasons, increasing mesh-size and soak time, good husbandry (handling) practices, reducing high-grading and trap modifications.

For more Information:

Contact: Earl G. Dawe
Fisheries and Oceans Canada
P.O. Box 5667
St. John's, NL A1C 5X1

Tel: (709) 772-2076
Fax: (709) 772-4105
E-Mail: Dawee@dfo-mpo.gc.ca

Dave Taylor
Fisheries and Oceans Canada
P.O. Box 5667
St. John's, NL A1C 5X1

Tel: (709) 772-2077
Fax: (709) 772-4105
E-Mail: [Taylordm@dfo-mpo.gc.ca](mailto:Taylorldm@dfo-mpo.gc.ca)

References

Colbourne, E. 2003. Physical Oceanographic conditions on the Newfoundland and Labrador Shelves during 2002. DFO Can. Sci. Advis. Sec. Res. Doc. 2003/020.

Colbourne, E. 2003. Oceanographic conditions in NAFO Subdivisions 3Pn and 3Ps during 2002 with comparisons to the previous year and the long-term (1971-2001) average. DFO Can. Sci. Advis. Sec. Res. Doc. 2003/001.

Dawe, E. G., H. J. Drew, P. J. Veitch, R. Turpin, E. Seward, and P. C. Beck. 2003. An Assessment of Newfoundland and Labrador Snow Crab in 2002. DFO Can. Sci. Advis. Sec. Res. Doc. 2003/025.

Orr, D., E. Dawe, D. Taylor, P. Veitch, J. Drew, P. O'Keefe, and R. Turpin. 2003. Development of standardized Snow Crab (*Chionoecetes opilio*) Catch-Per-Unit Effort (CPUE) models, as well as, comparisons between commercial logbook and multi-species trawl data. DFO Can. Sci. Advis. Sec. Res. Doc. 2003/029

This report is available from the:

Newfoundland and Labrador Region
Science, Oceans and Environment
Branch
Fisheries and Oceans Canada
PO Box 5667
St. John's NL A1C 5X1
Phone Number (709) 772-2027/8892
Fax Number (709) 772-6100
e-mail address richardsed@dfo-
mpo.gc.ca
www.dfo-mpo.gc.ca/csas

ISSN 1480-4913

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***Correct citation for this
publication***

DFO, 2003. Newfoundland and Labrador snow crab. DFO Science Stock Status Report 2003/021.