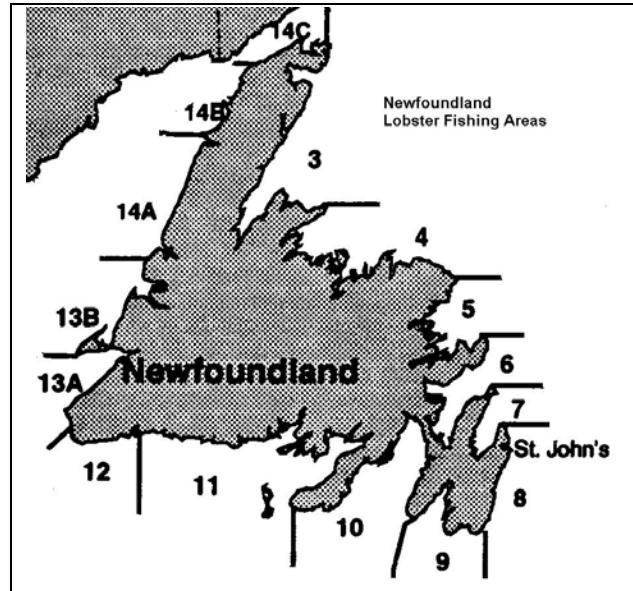


Newfoundland Lobster

Background

Lobsters are distributed nearshore around the island of Newfoundland and along the Strait of Belle Isle portion of the Labrador coast. Populations are localized. The major life history events occur during mid-July to mid-September following the spring fishing season. It takes 8-10 years from hatching to recruit to the fishery. At 1-2 mm below the minimum legal size of 82.5 mm carapace length (CL), about 50% of the non-ovigerous females will spawn during summer. At smaller sizes many of the ripening females molt and spawn in the same summer. After it has spawned for the first time, a female lobster will normally follow an alternate year molt/lay sequence (i.e. a 2-year reproductive cycle). This means that the majority of females have to survive at least one season of very intensive fishing before they spawn. Ovigerous (spawny) females are protected from exploitation. Eggs are brooded under the female's abdomen for about a year before hatching and larval release. During the 6-10 week planktonic phase there are three molts and during the last of these metamorphosis to a postlarval stage occurs. This stage is equipped with swimming and behavioural capabilities designed to locate suitable settling habitat. However, the extent to which postlarval settlement originates with eggs produced in the same area is unknown. Fishing is carried out from small open boats during an 8-10 week spring season. Traps are set close to shore in depths generally less than 20 m. Fishing effort is controlled through restrictive licencing and trap limits. The number of licences is currently around 2900 and trap limits vary between lobster fishing areas (LFAs) from 100 to 425. Landings declined from the long-term (since 1905) high of 3207 t in 1992 to 1756 t in 2000. They increased to 2118 t in 2001 and 2275 t in 2002.



Summary

- From a long term high of 3207 t in 1992, lobster landings declined to 1756 t in 2000. There was an increase to around 2118 t in 2001 and a preliminary figure (2275 t) suggests a further increase in 2002.
- Landings declined through the 1990's in all LFAs except LFA 11 (Fortune Bay) where they continued high and increased somewhat. In 2001 and 2002 increases occurred in west coast LFAs (13A, 13B, 14A) and LFA 11. In all others landings remain low relative to early 1990s highs.
- There was a 25% reduction in total lobster licences from 3898 in 1998 to 2931 in 2002.
- A 5-year (1997 – 2001) average exploitation rate of 94% was calculated from logbook-based estimates of catch and standing stock

for Eastport, Bonavista Bay, one of four local sites around the island where fishery monitoring has been conducted in recent years.

- Exploitation rates estimated from size frequency distributions of commercial lobsters from at-sea sampling at all four monitoring sites have exceeded 94% for males and ranged from 88 to 95% for females.
- Egg per recruit has been increased substantially as a result of the 1.5 mm CL size limit increase implemented in 1998.
- V-notching has been practiced in the fishery overall at much less than the 25% rate required in the 1998 – 2002 management plan. Increased egg per recruit anticipated with this measure has been minimal.
- There has been no increased egg per recruit associated with reductions in nominal fishing effort.
- Six small areas have been closed to lobster fishing around the island since 1997. While locally very significant, these represent a tiny fraction of total Newfoundland lobster habitat and therefore have increased egg per recruit minimally overall.
- Overall, the increased egg per recruit from the foregoing conservation initiatives fell short of the doubling objective of the 1998 - 2002 management plan.
- There is a strong environmental-ecological influence on recruitment and in a system where recruitment is limited by low egg production,

fluctuations in annual landings will be especially subject to environmental variability.

- Management measures are required to further increase egg production and reduce the level of exploitation.

The Fishery

Following a 17-year period of decline to 1238 t in 1972, the downward trend in Newfoundland lobster landings quite unexpectedly reversed and increased rapidly to 2592 t in 1979, continuing generally upward to reach a long-term (since 1905) high of 3207 t in 1992 (Fig. 1). A downward trend followed which saw landings decline to 1756 t in 2000. As with previous trends, the most recent decline was part of a widespread pattern in Atlantic Canada.

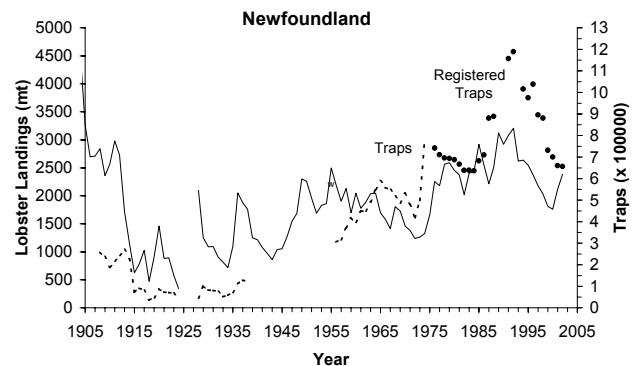


Figure 1. Historical landings and nominal effort for the Newfoundland lobster fishery.

The pattern of landings over the past 10 years has varied among LFAs (Fig. 2). The only exception to the overall downward trend is LFA 11 (Fortune Bay) where the high landings have continued beyond the early 1990s peak. This contrasts most markedly with LFA 10 (Placentia Bay) just east on the opposite side of the Burin Peninsula where landings have declined precipitously;

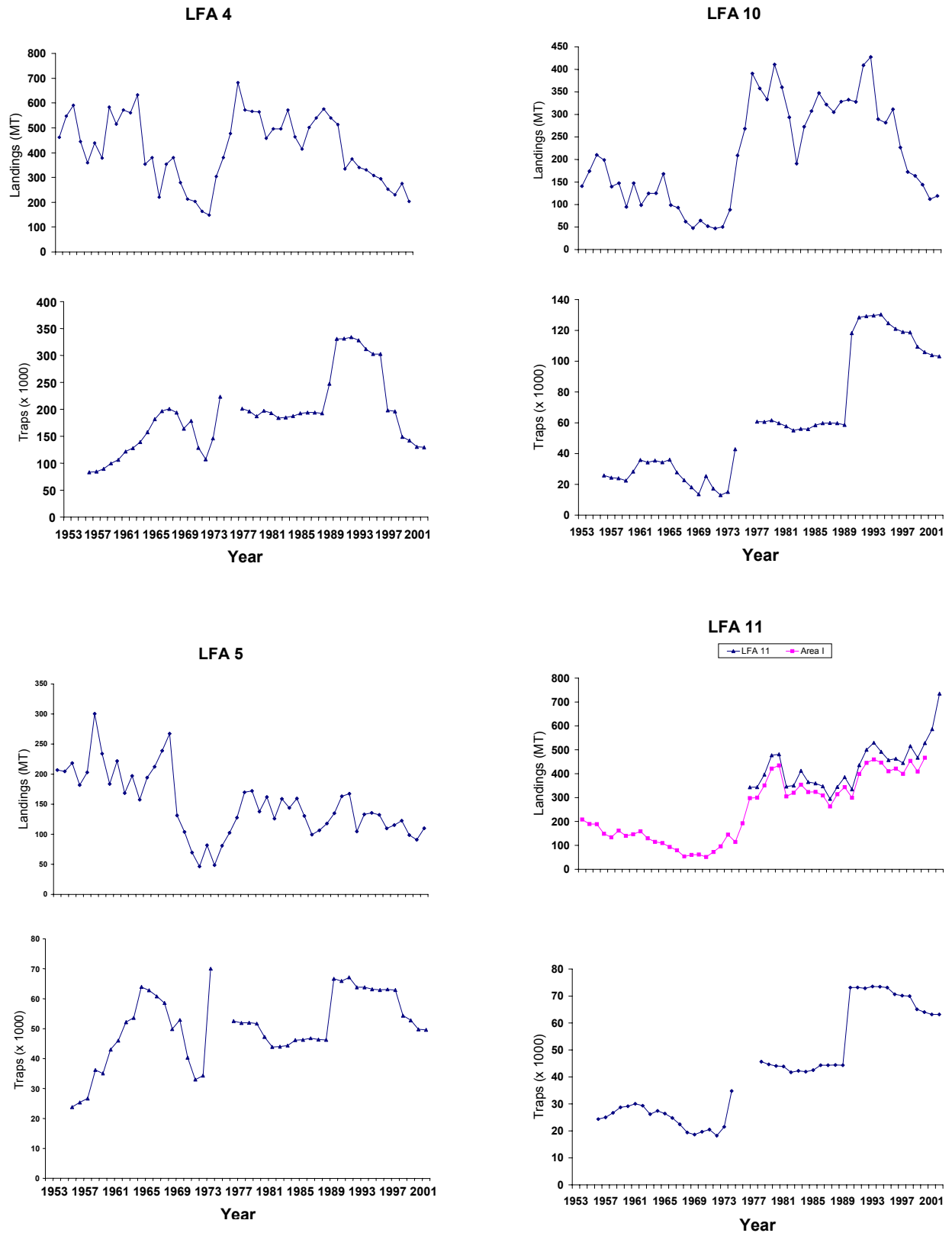


Figure 2. Historical landings and nominal effort for several LFAs.

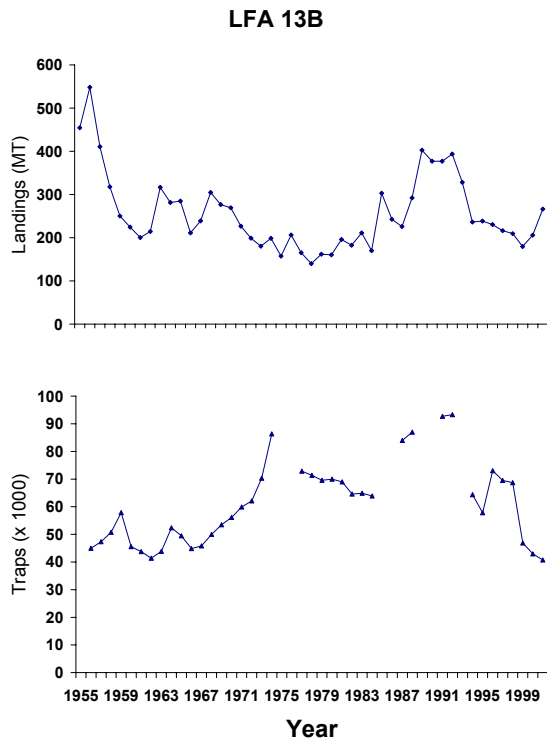


Figure 2 (continued). Historical landings and nominal effort for several LFAs.

historically trends in both areas had been similar (Fig. 2). There is no obvious explanation for the difference between these two major lobster-producing areas on the south coast.

In LFA 4 (Notre Dame Bay), the major producing area on the east and northeast coasts, landings have also declined precipitously whereas in LFA 5 (Bonavista Bay) the decline has been more gradual.

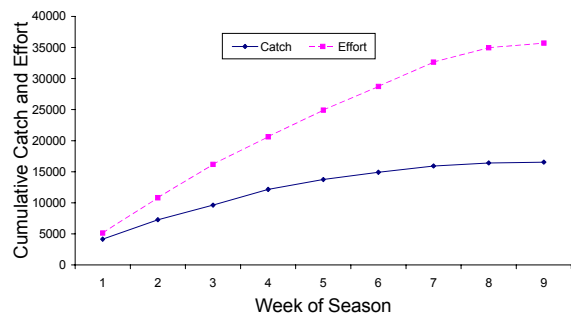
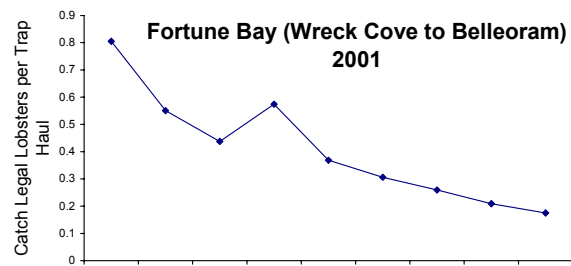
An increase in the total Newfoundland landings to around 2118 t in 2001 and 2275 t in 2002 (quota report) was due mostly to LFA 11, however, increases were recorded for three of the four major west coast LFAs (13A, 13B, 14A). These increases on the west coast, however, in contrast to Fortune Bay, followed the period of decline and landings are still well below highs of the early 1990s.

Despite a continuous reduction in number of licences issued, nominal effort (number of licences x trap limit) increased dramatically from the mid-1980s to an all-time high in 1992. This increase is associated with a conversion to uniform trap limits (i.e. the same number for each licence) in all LFAs. With ongoing attrition and early retirement of licences, as well as some trap limit reductions, this measure of nominal effort has declined from the 1992 high of 1,188,932 traps to 656,690 in 2002.

Fishery Monitoring

Logbooks

Logbooks have been completed in recent years at local sites in Bonavista Bay (LFA 5), Fortune Bay (LFA 11), St. George’s Bay (LFA 13A) and St. John Bay (LFA 14B) as part of cooperative arrangements with harvesters to conduct basic lobster fishery monitoring.



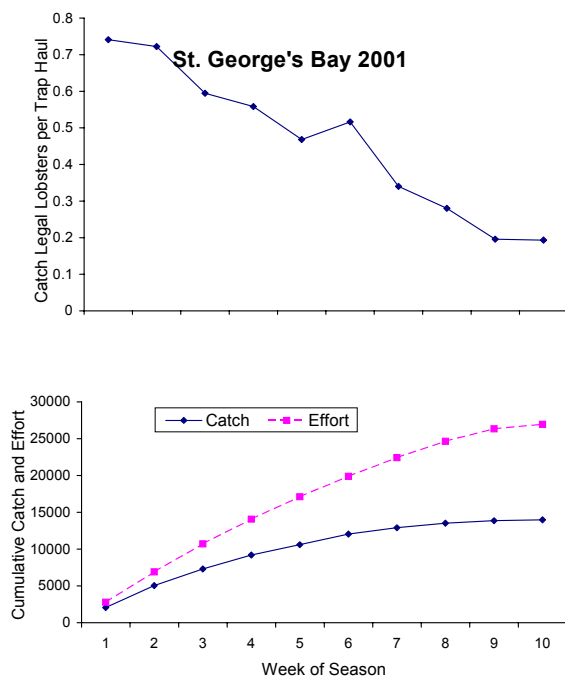


Figure 3. Catch rate, cumulative catch and effort over the 2001 fishing season at Fortune and St. George's bays.

Characteristically, catch rate declines rapidly and cumulative catch levels off early as effort continues to increase over the course of the fishing season (Fig. 3). This happens during the period that bottom temperature, hence lobster catchability, is increasing rapidly indicating nearly complete removal of the standing stock (i.e. the commercially legal component of the population) each year. A 5-year average exploitation rate of 94% was calculated from logbook-based catch and standing stock estimates for Eastport.

At-Sea Sampling

At-sea sampling was conducted at each of the four sites where logbooks were completed in recent years. The near elimination of the standing stock over the course of each fishing season is also evident from a comparison of the relative abundance of animals in the recruit and

recruit +1 size groups of the commercially legal component of at-sea samples (Figs. 4 and 5). The bulk of the commercial catch of both males and females is made up of recruits. Estimates of annual exploitation rate from these data collected at Eastport from 1998-2001 have been consistently very high for males at 96-97% and ranged between 88 and 95% for females. The lower values for females reflects the protection of spawners which allows more to reach larger sizes. Estimates of exploitation rate by the same method for the other three areas where at-sea sampling has been conducted in recent years are similar to those for Eastport.

At-sea samples also provide a basis for evaluating the effectiveness of the size limit increase implemented during the 1998 ovigerous females in the population. The fishing season in terms of additional size limit was increased from 81 to 82.5 mm CL on May 25, 1998. With rounding to the nearest 1 mm CL, the new minimum legal size is represented in at-sea sampling by the 83 mm CL size and the 81 and 82 mm CL sizes represent additions to the undersize component of the population. The proportion of ovigerous females at 81 and 82 mm CL is comparable to that at adjacent smaller sizes and substantially greater than in the commercial sizes (Fig. 6). Note, however, that the increasing relative abundance of lobsters over the sublegal size range, associated with increasing retention in commercial traps, is sharply reversed at 82 mm CL. This indicates some harvesting of animals just below the size limit. This is also indicated by the decreasing relative abundance of animals at and just below the upper end of the recruit size range.

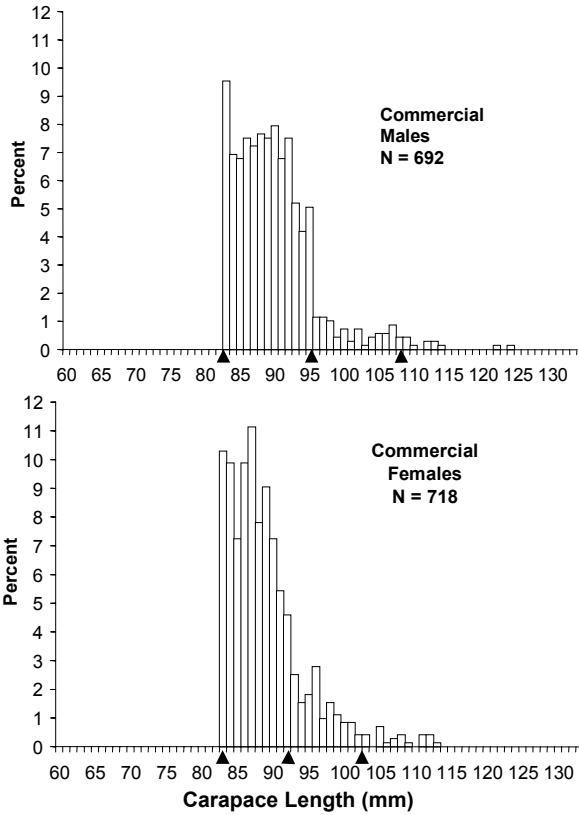


Figure 4. Size-frequencies for commercial lobsters in 2001 at-sea sampling at Eastport.

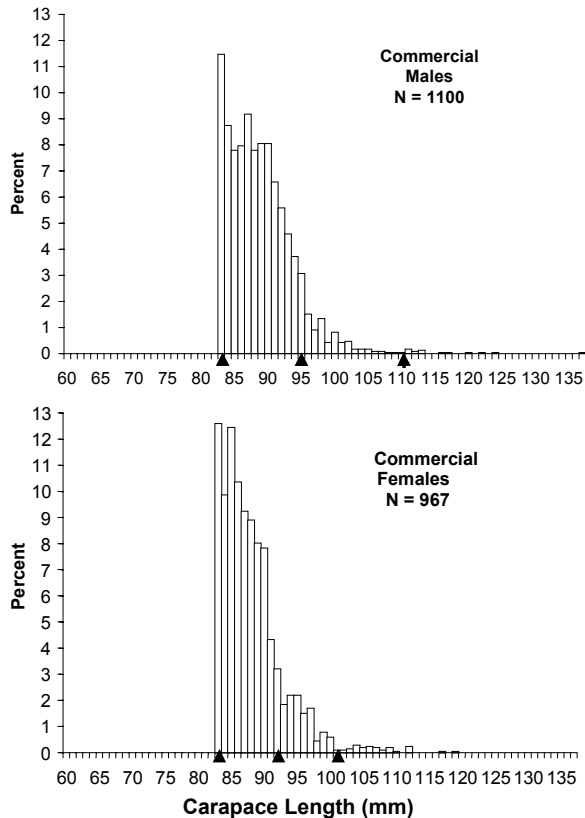


Figure 5. Size-frequencies for commercial lobsters in 2001 at-sea sampling at Fortune Bay.

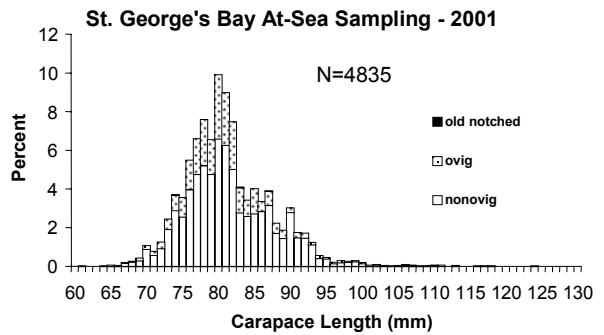
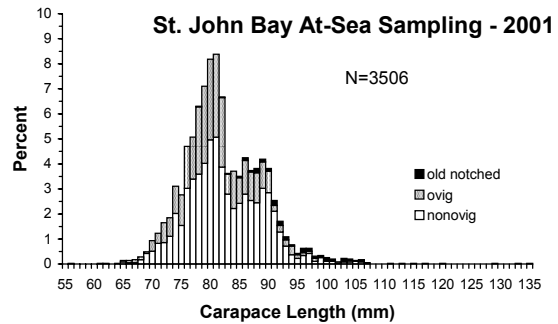
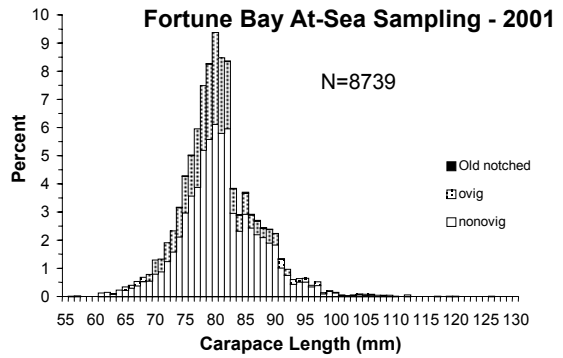
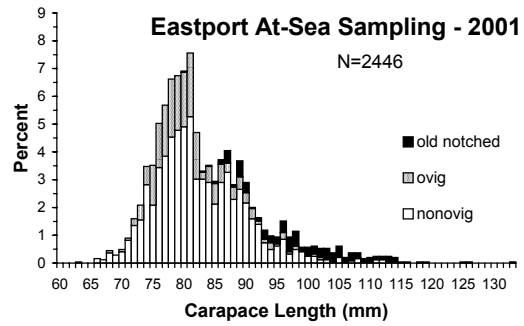


Figure 6. Size frequencies and relative incidence of various components of the female population in 2001 at-sea sampling at Eastport and in Fortune, St. John and St. George's bays.

Nominal Effort vs. Exploitation Rate

The long-term study of lobsters at Arnold's Cove yielded a 20-year (1976-1995) time series of annual estimates of standing stock, exploitation rate and total trap hauls. Over the period there was considerable inter-annual variation in exploitation rate and trap hauls but no obvious correlation between the two (Fig. 7a) indicating that exploitation rate remains quite high over a very broad range of effective fishing effort and only at quite low levels of effort can any significant reduction in exploitation rate be expected. However, a strong positive correlation ($r=0.67$) between effort and standing stock is apparent (Fig. 7b). This simply means that more effort is expended when abundance is high.

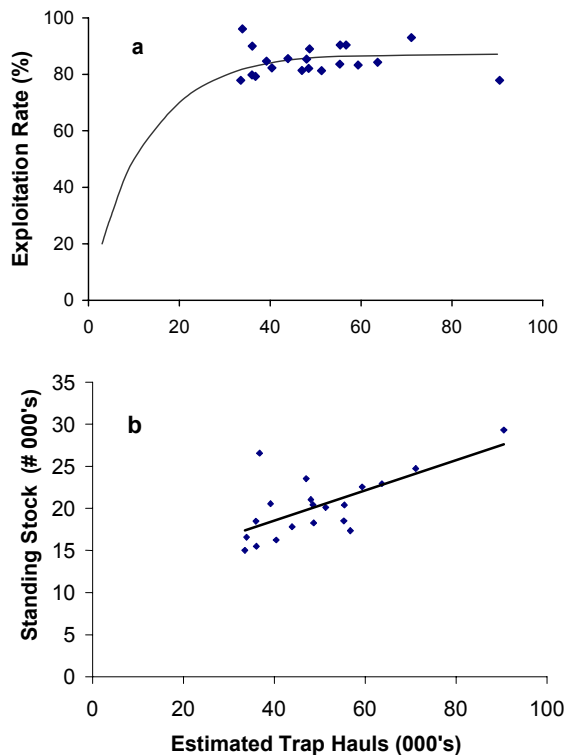


Figure 7. Annual estimates of exploitation rate (a) and standing stock (b) versus effective effort for Arnold's Cove, Placentia Bay, 1976-1995.

There clearly has been a reduction in nominal fishing effort (number of licenses

X trap limit) in most LFAs over recent years. Between 1998 and 2002 there was a 25% reduction in the number of licences overall. This has improved economic conditions for remaining licence holders compared to what they otherwise would have been. Elimination of active participants from the fishery, through early retirement, buy back, attrition, etc, is equivalent to increased lobster abundance in that it provides access to a greater share of the resource for those remaining. This provides greater incentive to increase fishing effort as well as greater opportunity to improve its effectiveness. Further, in most areas of Newfoundland the limited cod fishery is conducted on an IQ basis allowing holders of licences for both species to extend fishing for lobsters to the end of the season. Although regulated seasons were shortened somewhat in most LFAs just before and as part of the 1998-2002 management plan, it had been common in most areas for most of the traps in use to be removed from the fishing grounds 2 to 3 weeks or longer before the end of the season. In effect, in terms of actual fishing days, it is much more likely that seasons have been lengthened in recent years.

The reductions in nominal fishing effort in the Newfoundland lobster fishery over recent years have not resulted in any reduction in the overall exploitation rate on the standing stock.

Status of the Egg per Recruit Doubling Objective

There were three measures included in the 1998-2002 management plan as a basis for doubling egg per recruit (E/R) from current (current conditions defined prior to 1998 as an overall average 85% exploitation rate and an 81 mm CL minimum legal size). These were an

increase in minimum legal size from 81 to 82.5 mm CL (for which a 56% E/R increase was credited), a commitment by stakeholders to voluntarily v-notch at a 25% rate annually (for which a 35% E/R increase was credited), and the remaining 9% was credited for nominal effort reductions over the 2 or 3 years prior to 1998. The first two measures assumed that the exploitation rate on the commercially legal component of the population would not exceed 85% in the fishery overall.

There is no basis for a fully quantitative evaluation of the extent to which the E/R doubling (i.e. 100% increase) objective has been achieved in the overall Newfoundland fishery. The following, therefore, is largely qualitative.

The minor reductions in nominal fishing effort achieved during the years just prior to implementation of the 1998–2002 management plan had not been sufficient to reduce the exploitation rate. The available evidence indicates that the exploitation rate has been increasing during the recent past throughout the fishery but especially in areas such as St. Chads-Burnside (Fig. 8) where a moderate rate (~80%) had been the norm. There appears to have been a general compensatory reaction by fishers to initial losses associated with implementation of conservation measures, superimposed on which has been an economic incentive associated with access to an increased share of the available resource as the number of licences was reduced.

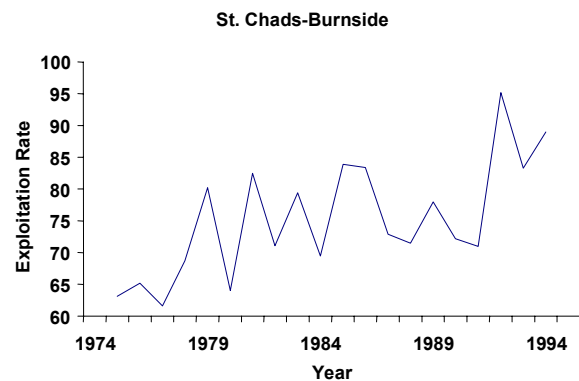


Figure 8. Estimates of exploitation rate at St. Chads-Burnside, Bonavista Bay, 1975-1994.

Acceptance of v-notching was conditional upon validation by way of broad-scale, at-sea sampling by observers during the 2000 and 2001 fishing seasons – this was not done. The only data available for this purpose are from the fishery monitoring carried out in recent years at Eastport, Bonavista Bay (1998-2002), around the Connaigre Peninsula, Fortune Bay (1999-2001), at Eddies Cove West, St. John Bay (2000-2001), and at Crabbes River-St. David's, St. George's Bay (2001).

V-notching has been practiced at Eastport from at least 1996 and there has been a high incidence of v-notched lobsters in annual at-sea sampling initiated in 1998. In the 2001 sampling, old-notched animals (notched in previous years) made up 31.4% of the combined ovigerous plus old-notched females in the recruit size range (83-92 cm CL) and 83.1% at larger sizes (Fig. 6).

Compared to Eastport, the incidence of old-notched females was very low in at-sea sampling conducted in Fortune, St. John and St. George's bays (Fig. 6). This indicates that outside the Eastport co-management area v-notching is not being practiced to any significant extent. This is consistent with the general consensus

that most who practiced v-notching in years just prior to implementation of the old management plan stopped doing so as a back-lash to the increase in size limit in 1998. This was in spite of the provision in the plan for a further size limit increase if widespread participation in v-notching could not be validated.

As another measure to address lobster conservation concerns, in 1997 stakeholders at Eastport closed to lobster fishing two small areas within the boundary of their co-management area. Subsequently, local groups established four more lobster closed areas near Random Island, Trinity Bay; at Gander Bay, Notre Dame Bay; at Shoal Point near North Head, Bay of Islands; and near Trout River. Each of these closures resulted from initiatives by local stakeholders totally independent of the overall management plan. The two closed areas at Eastport represent about 1.8% of the lobster habitat in the area. No such estimates are available for the others but collectively these closed areas represent a very small percentage of lobster habitat around Newfoundland.

A substantial increase in egg per recruit was achieved during the 1998-2002 management plan. Most of the increase is attributed to the size limit increase although some of the E/R benefit associated with that measure would have been eroded by an overall increased level of exploitation on the standing stock. While progress was made it fell far short of achieving the E/R doubling objective.

Outlook

In its review of lobster conservation in Atlantic Canada, the FRCC concluded that population egg production was too low and the risk of recruitment failure unacceptably high. The E/R doubling

objective of the 1998-2002 management plan was basically a strategy to start the process of reducing this risk over a much longer term. It was never considered as being all that would be necessary to eliminate the risk or reduce it to what might be considered acceptable.

Over the past 50 years, major long-term trends in Newfoundland lobster landings have been part of widespread phenomena indicating a strong environmental-ecological influence on recruitment. In Newfoundland as elsewhere, lobsters are very heavily exploited and the bulk of annual landings is made up of animals that recruited to the legal component of the population since the previous year's fishing season. In a system where recruitment is limited by low egg production, fluctuations in annual landings will be especially subject to environmental variability.

Landings in most LFA's around the island remain low following the downward trend of the past 10 years but in some they have increased somewhat in the past two years. This may represent the early stage of a broader upward trend. However, future landings can be expected to be lower, on average, and less stable than under a management regime with a lower level of exploitation.

Management Considerations

Effort control has been the preoccupation of lobster fisheries management in Atlantic Canada for nearly 30 years. Yet, despite a large reduction in nominal effort over the years, the level of exploitation on standing stocks is extremely high. DFO scientists have long advocated size limit increases as the most effective way of dealing with growth overfishing as well as concerns about the possibility of recruitment overfishing. However, the

harvesting sector has always strongly opposed any suggestion of an increase in minimum legal size. This is likely related to their concerns about the degree of poaching directed towards undersize lobsters. To a far greater extent than any other conservation measure, a size limit increase makes additional resource available for poaching which compromises the expected benefits.

There appeared to be fairly widespread participation in voluntary v-notching for several years prior to implementation of the size limit increase in 1998. V-notching is still practiced to some minimal extent but the consensus is that most discontinued the practice after the size limit was increased despite the provision in the management plan for a further size limit increase if v-notching to the extent required and committed could not be validated.

As part of their stewardship initiative, stakeholders at Eastport closed two small areas to lobster fishing. Subsequently, and at local stakeholder initiative, four additional closed areas were established elsewhere around the island and the possibility of doing likewise has been considered by several other local groups. This development was not anticipated and occurred independently of the management plan.

To a far greater extent than any other fishery, the Newfoundland lobster fishery cannot be managed effectively without strong stakeholder support and particularly their acceptance of a stewardship role. Over the long term, it appears that the cause of lobster conservation would be better served by supporting the kind of initiatives that stakeholders are receptive to and willing to undertake.

For More Information

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

Tel: (709) 772-2094
Fax: (709) 772-4105
E-mail: ennisg@dfo-mpo.gc.ca

R. K. Collins
Fisheries and Oceans
Canada
P.O. Box 5667
St. John's, NL A1C 5X1

Tel: (709) 772-5948
Fax: (709) 772-4105
E-mail: collinsr@dfo-mpo.gc.ca

References

- Ennis, G. P., P. W. Collins, G. D. Badcock, G. Dawe. 1997. Review of the Newfoundland Lobster Fishery. Canadian Science Advisory Secretariat Res. Doc. 97/126.
- Ennis, G. P., P. W. Collins, G. D. Badcock, R. K. Collins. 2003. An Update on the Newfoundland Lobster Fishery and its Recent Management. Canadian Science Advisory Secretariat Res. Doc. 2003/036.

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
© Her Majesty the Queen in Right of Canada 2003

La version française est disponible à
l'adresse ci-dessus.



***Correct citation for this
publication***

DFO, 2003. Newfoundland Lobster. DFO
Science Stock Status Report 2003/022.