

**Lobster LFA 34 SW Nova Scotia**

**Background**

Lobsters belong to a group of animals called Crustaceans that includes shrimp, krill and crabs, among others. They have their skeleton on the outside of the body, and to grow must shed the shell, a process called molting. Very young lobsters molt 3-4 times a year, increasing 50% in weight and 15% in length with each molt. In the waters off southwestern Nova Scotia lobsters take 7-8 years to reach the legal size of 81 mm carapace length (CL). At that size they weigh 0.45 kg (1 lb.) and molt once a year. Larger lobsters molt less often, with a 1.4 kg (3 lb.) lobster molting every 3-4 years. The largest size reported was a 20 kg (44 lb.) giant estimated to be 40-65 years old.

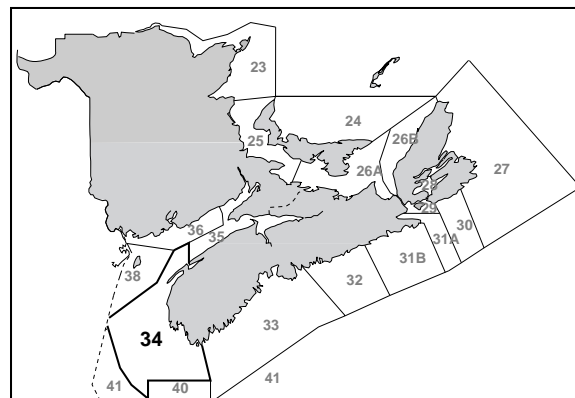
Off southwestern Nova Scotia lobsters mature between 95 and 100 mm CL at an average weight of 0.7 kg (1.5 lb.). The mature female mates after molting in midsummer and the following summer produces eggs that attach to the underside of the tail. The eggs are carried for 10-12 months and hatch in July or August. The larvae spend 30-60 days feeding and growing near the surface before settling to the bottom and seeking shelter.

For the first 4-5 years lobsters remain in or near their shelter to avoid the small fish that feed on them. As they grow and have less chance of being eaten, they spend more time outside the shelter. This is when they become more catchable in lobster traps.

Lobsters are found in coastal waters from southern Labrador to Maryland, with the major fisheries in the Gulf of St. Lawrence and the Gulf of Maine. Though lobsters are most common in coastal waters, they are also found in warm deep water areas of the Gulf of Maine and along the outer edge of the continental shelf from near Sable Island to off North Carolina. Lobsters make seasonal migrations moving to shallower waters in summer and deeper waters in winter. Over most of the lobster's range these movements amount to a few kilometres however in the Gulf of Maine, the offshore regions of the Scotian Shelf and off New England lobsters can undertake long distance migrations of 10s to 100s of km. Tagging studies have also shown that at least some of these lobsters return to the same areas each year.

Current thinking is that the Gulf of Maine lobster population can be viewed as a metapopulation, that means that there are a number of sub-populations linked in various ways by movements of larvae and adults. The number and distribution of these subpopulations remains unknown.

Lobster landings increased dramatically over the entire east coast of North America during the 1980s. The underlying cause of this increase is not known but the large scale nature of the increase suggest an environment cause which improved larval and juvenile survival.



**The Fishery**

The lobster grounds off of southwestern Nova Scotia are amongst the richest in the world accounting for over 25% of Canada's lobster landings. The fishery is undertaken by 975 full time fishers and 7 part-time (Category B license). The fishery is managed by minimum size and effort controls. There is an 81mm carapace length (CL) minimum size and a prohibition on landing egg-bearing females. Fishing is limited to the period between the last Tuesday in November and May 31 with trap limits of 375 in the fall (Nov.-March) and 400 in the spring (March-May). The fishing grounds extend from the coast to the offshore lobster boundary approximately 92 km from shore. Historically the fishery took place in the coastal areas (within 20 km and in waters less than 55m). Beginning in the late 1970s fishers began to fish deeper water out to the offshore line on grounds referred to as the "Midshore" and on Browns Bank (closed to lobster fishing in 1979). The midshore fishing effort expanded and accounted for approximately 10% of the landings in 1992-93 and may now represent up to 20%.

**Seasonal\* Landings (tonnes)**

Season*	71-80	81-91	91-92	92-93	93-94	94-95	95-96
	Avg.	Avg.					
Landings	3575	7105	8876	8919	10308	9646	10161 (prelim)

\*Nov.-May

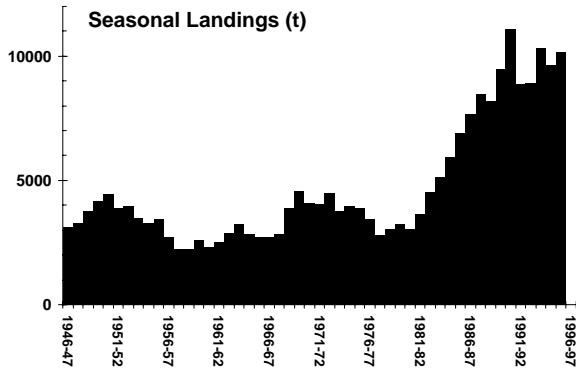
Commercial lobster fishing began in the mid-1800s and landings exceeded 12,000t in the late 1890s. Overfishing resulted in a decline in landings, dropping to 1,700t by 1920 and remaining between 1,000t and 4,500t until the early 1980s. Landings increased throughout the 1980s as part of a widespread recruitment pulse and peaked at 11,000t

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during the 1990-91 season. Landings remained high in LFA 34 and the remainder of the Gulf of Maine (LFA 35-41, Maine, New Hampshire and Massachusetts) during the 1995-96 season. Based on preliminary data, LFA 34 landings increased by 3.6% to 9996t and are the third highest this century, 2.7 times the average for the 1970-1979 period.



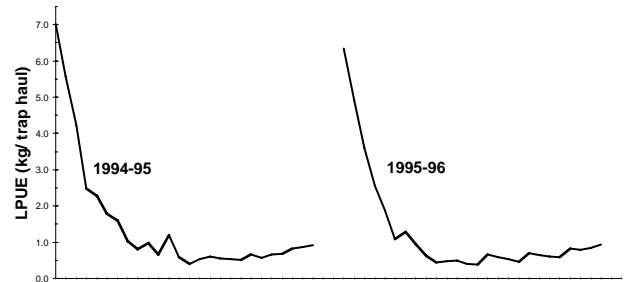
**Biological data:** Samples of the commercial catch size frequency are obtained from at-sea samples during Dec. (1979-93) and May (1979-96). Catch rates are obtained from index fishers' logbook data.

**Resource Status**

Stock status was based on trends in landings and size distribution in the commercial catch. Exploitation rates (percentage of the legal sized lobster removed by the fishery) for females were estimated using two catch curve techniques, a Length Cohort Analysis used in recent American assessments of Gulf of Maine lobsters and a molt group comparison method traditionally used in Canadian assessments. The recruitment index is based on catch rates of pre-recruits during the spring at-sea sampling period.

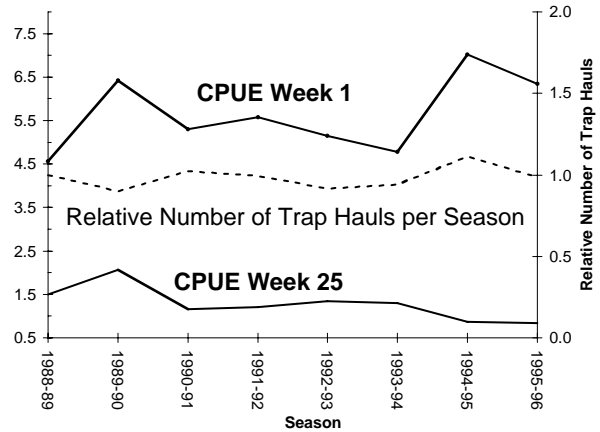
**Catch rates** show a strong seasonal trend starting high and dropping sharply over the first two weeks. Over 50% of the catch is taken during the first 3 weeks. Catch rates remain low during the winter but high prices encourage fishers to continue fishing. Catch rates increase again in the spring as lobsters become more active.

**Seasonal trends in weekly CPUE (kg per trap haul) for Statistical District 34 index fishers**



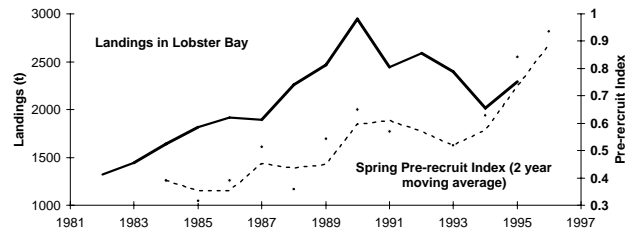
Data from index fishers do not indicate any clear trends in effort or catch rates over the 1988-1996 period.

**Index Fishers seasonal CPUE (Catch per unit effort), and relative number of trap hauls in Statistical District 34 of LFA 34.**



The **recruitment** index increased throughout the 1980s and has remained high since 1990-91. The index from the May 1996 sampling period was the highest observed.

**Lobster Bay landings and pre-recruit index**



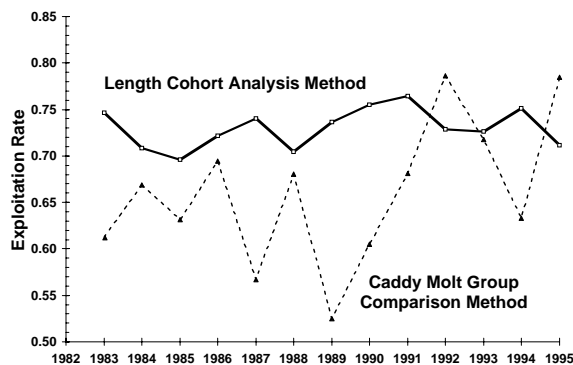
High landings in the 1996 Maine fall fishery suggests continued high recruitment in the western portion of the Gulf of Maine.

Length Cohort Analysis (LCA) estimates of **exploitation rate** on females in the nearshore varied between 70 and 76% between 1983-84 and 1995-96,

with a mean of 73%. Estimates for the midshore and offshore (LFA41) fisheries were 69% and 21% respectively. Estimates of exploitation rate on females in the nearshore using the Molt Group Comparison method were more variable, varying between 52-79%, with a mean of 66%.

The LCA and molt group comparison methods used for estimating exploitation rates gave results different enough to have implications in determining the need for, and the benefit of, new conservation methods. More weight is given to the LCA method because it is less variable and uses more size groups in the calculations.

### Comparison of female Exploitation Rate estimates



Most of the mature sized females (50% mature at 96mm carapace length) removed by the fishery are taken in the nearshore areas. The removals of mature sizes in the midshore have been increasing but are still smaller than the nearshore. The offshore removes very few animals and even considering their larger size and greater number of potential eggs the effect on total egg production is small.

**Sources of uncertainty:** The method of obtaining landings data changed from sales slips collected from fish buyers to a self reporting system by fishers. It is not known if the new system will capture more or less of the actual landings.

The low sampling rates of the commercial catch in recent years and the lack of fall samples since 1994 may introduce biases in estimates of exploitation rate. Additional bias may result from inaccurate weighting of the midshore catch caused by a lack of information on the spatial distribution of the catch. The present weights given to midshore landings are based on the 1993-94 survey of fishers and informal polling of fishers during more recent seasons.

The lack of information on intermolt periods and its variability in this and other LFAs adds uncertainty to estimates of exploitation rates and egg production used in the FRCC overfishing definition.

The LCA method of estimating exploitation rate is new to the Canadian lobster assessments and further work is needed to determine the levels of uncertainty associated with it.

The Gulf of Maine lobster population can be viewed as a metapopulation, (contains a number of sub-populations linked by movement of animals). The relationship between areas within LFA 34 (midshore and nearshore) and with other LFAs (LFA 35, 38, 40 and 41) and deep-water populations in American waters remains unclear and has implications in estimating fishing mortality, egg per recruit and determining the benefits and cost of new conservation initiatives.

### Outlook

The short-term outlook is for good landings in 1996-97, however there is reason for caution in the longer term. First, many lobster fishing areas outside the Gulf of Maine which increased in the 1980s are now in decline. The underlying cause of the coast-wide increase in recruitment and resulting increase in landings during the 1980s-90s is not known, but it is believed to be due to an environmental or ecological change. Second, high exploitation rates and low egg per recruit values (less than 5% of an unfished population) increase the stock vulnerability to increased fishing power, and changes in the environment or ecosystem which makes conditions less favourable for larval and juvenile survival. Evidence from stock recruitment relationships suggest that at low levels of egg production recruitment could decrease rapidly and without warning.

The lobster fishery is “growth overfished” meaning that greater yield could be obtained at much reduced exploitation rates.

The FRCC proposed measures to increase egg production and decrease exploitation rate. Increased egg production could be obtained through an increase in the minimum size. Measures such as v-notching egg-bearing females (protects them after the eggs are hatched) or maximum size would have a small benefit given the present high exploitation rates but could make a contribution if combined with other measures such as an increased minimum size.

*For More Information*

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