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Science | Sciences
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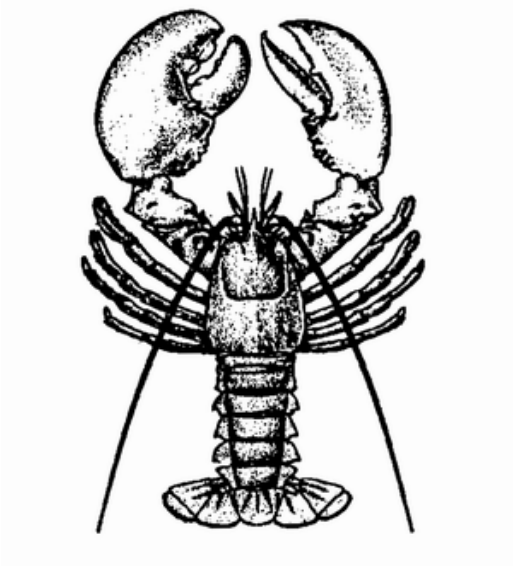
# AN ASSESSMENT OF AMERICAN LOBSTER IN NEWFOUNDLAND



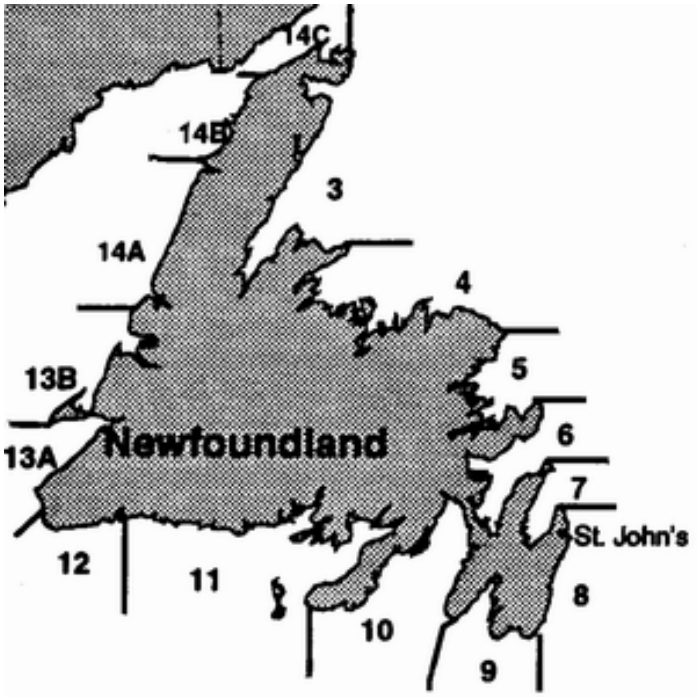



*Figure 1: Newfoundland and Labrador Lobster Fishing Areas.*

## Context

*The American lobster (Homarus americanus) is distributed nearshore around the island of Newfoundland and along the Strait of Belle Isle portion of the Labrador coast. Major life history events (i.e. molting, mating, egg extrusion, hatching) generally take place during mid-July to mid-September, following the spring fishing season.*

*The fishery is localized and prosecuted from small open boats during an 8-10 week spring fishing season. Traps are set close to shore, at depths generally less than 20 m. Fishing effort is controlled through restrictive licensing and trap limits. The number of licenses is currently around 2900 and trap limits vary between lobster fishing areas (LFAs; Fig 1). Regulations prohibiting harvest of undersized, ovigerous and v-notched animals are strictly enforced.*

*These stocks were last assessed in 2003 and are currently assessed every three years. The key indicator for assessment is exploitation rate. Limited fishery monitoring data are available to estimate exploitation rates in some LFAs.*

## SUMMARY


- Newfoundland lobster landings in recent years declined in most LFAs, from the long term high of 3200 t in 1992 to 1800 t in 2000. Reported landings have since increased to about 2300 t in 2003, due largely to increased landings in LFAs 11, 13A and 13B. A preliminary value for 2004 is 1900 t.
- Due to insufficient data, it is impossible to assess the overall status of the lobster resource at the present time.
- Reductions in trap limits for LFAs 9 and 10 were implemented in 2003, and a reduction in the trap limit for 14B occurred in 2005. In addition, Sunday fishing was prohibited in LFAs 4, 10, 13B, 14A, 14B and 14C in the 2003-2005 management plan.
- Exploitation rate estimates for four localized monitoring sites were all high.
- Each year the catch is comprised almost exclusively of incoming recruits, and future recruitment is strongly influenced by environmental/ecological conditions.


## BACKGROUND

### Species Biology

The American lobster, *Homarus americanus*, is a decapod crustacean characterized by a life cycle which is predominately benthic. Lobsters may live for more than 30 years. In Newfoundland waters, at the northern range of the species distribution, it takes about 8-10 years for a newly hatched lobster to reach the minimum legal size (MLS). The MLS is currently set at a carapace length of 82.5 mm. Growth is achieved through molting, and frequency of molting decreases with increasing age. Growth is also affected by temperature, as molting probability tends to decrease with lower temperatures.

Mating occurs in the months of July to September, and the female extrudes eggs roughly one year subsequent to mating. The eggs are carried in clutches on the underside of the female's tail, and the ovigerous (egg-bearing) animal protects and maintains the eggs for a period of 9-12 months. Thus, female lobsters are characterized by a biennial molt-reproductive cycle, though mature female lobsters at the lower end of the size range sometimes molt and spawn within the same year. At 1-2 mm below the MLS in Newfoundland, about 50 % of females will spawn during the summer. Estimates suggest that egg production by undersize females can account for 60-80% of total egg production in Newfoundland waters. Fecundity of females increases exponentially with size. Eggs from larger lobsters tend to contain more energy per unit weight, and larger females tend to release their offspring earlier in the season, when growth and survival are enhanced (Attard and Hudon, 1987).

Hatching occurs during a four month period extending from late May through most of September. Once released, the larvae swim upward and undergo a series of three molts during their 6-10 week planktonic phase, during which most mortality is thought to occur. With the third molt, a metamorphosis occurs and the newly developed postlarvae resemble miniature adults and are equipped with considerable swimming and behavioural abilities to locate suitable benthic habitat. Newly settled lobster progress through several juvenile stages and an adolescent phase before reaching adulthood.

The adult lobster is thought to have few natural predators and commercial harvesting accounts for most adult mortality. Diet typically consists of rock crab, polychaetes, molluscs, echinoderms, and various finfish.

## The Fishery

The history of the lobster fishery in Newfoundland dates back to the early 1870s. Statistics indicate that landings peaked at almost 8000 t in 1889 (Fig. 2). Early documentation indicates that essentially everything that was captured was landed and processed by one of many small canning operations that existed around the coast. A stock collapse occurred in the mid 1920s, after which the fishery was closed for three years, from 1925-1927. The fishery reopened in 1928, and landings reached over 2000 t, but dropped sharply the following year. In the early 1930s, shipment of live animals to US markets commenced, and regulations protecting undersize and ovigerous animals were strictly enforced. By the early 1950s, essentially all landings were shipped to the US, and the fishery has remained a live market industry since. Effort was essentially uncontrolled up to 1976, at which point a limited entry licensing policy was implemented, and trap numbers were regulated.

Following a 17 year period of general decline to about 1200 t in 1972, landings increased to about 2600 t in 1979. This trend was consistent with those of other Atlantic regions, and was attributed to a period of strong recruitment associated with persistent favourable environmental/ecological factors. This upward trend in Newfoundland landings generally continued through the 1980s, and reached 3200 t in 1992. A conversion to uniform trap limits was implemented for all LFAs between the late 1980s and early 1990s. Over the course of the 1998-2002 management plan, there was a 25% reduction in licenses in the Newfoundland lobster fishery, and minimum legal size was increased from 81 mm CL to 82.5 mm CL in 1998.

Newfoundland lobster landings in recent years declined in most LFAs, from 3200 t in 1992 to 1800 t in 2000. Landings have since increased to about 2300 t in 2003, due largely to increased landings in LFAs 11, 13A and 13B. A preliminary value for 2004 is 1900 t.

The American lobster fishery in Newfoundland is prosecuted from small open boats during an 8 to 10 week spring fishing season. Traps are set close to shore, at depths generally less than 20 m. Fishing effort is controlled through limited entry and trap limits. There are currently about 2900 licenses with trap limits varying from 100 to 350 per licensed fisher, depending on LFA. Additionally, it is required that traps possess vents which allow undersize lobster to escape. The MLS is now set at 82.5 mm CL, and regulations prohibiting the retention of ovigerous females and v-notched females are enforced. V-notching is a voluntary practice that involves cutting a shallow mark in a specific portion of the tail fan. The mark is retained for 2 to 3 molts, and notched females cannot be retained. This protects the animal from exploitation, even when not carrying eggs externally.

Management changes implemented since 2003 involve reductions in individual trap limits, from 200 to 100 for LFA 9 and from 300 to 200 in LFA 10. A reduction in the individual trap limit from 425 to 350 traps for 14B occurred in 2005. In addition, Sunday fishing was prohibited in LFAs 4, 10, 13B, 14A, 14B and 14C in the 2003-2005 management plan.

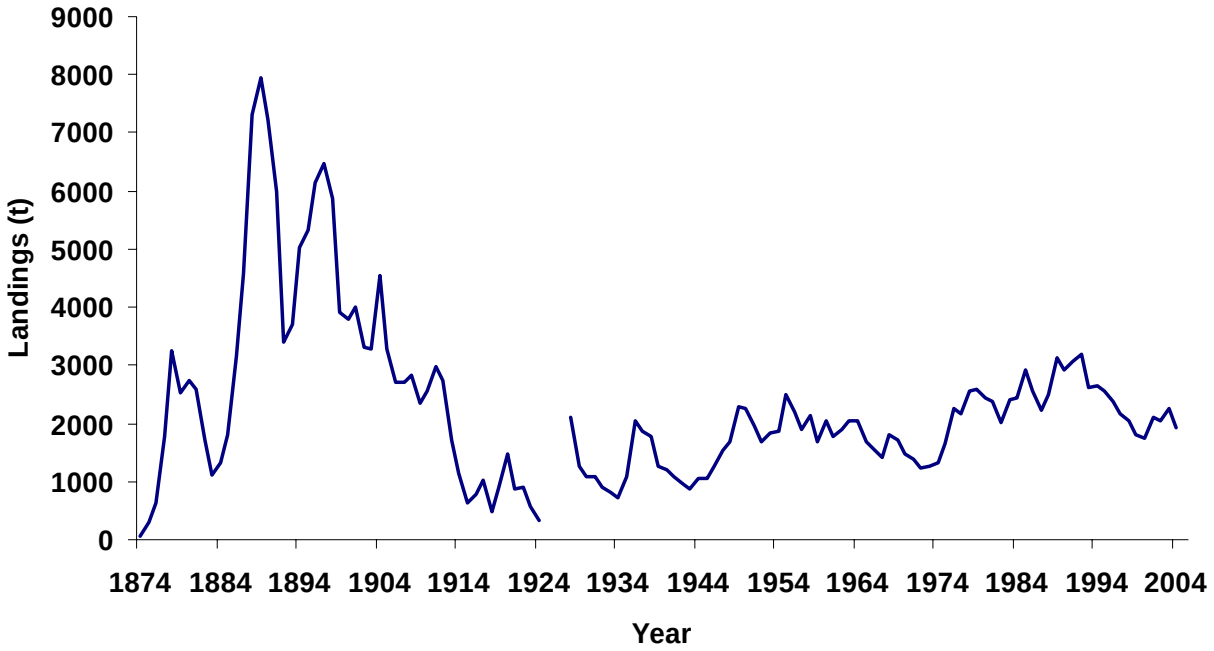



*Figure 2: Historical landings for the Newfoundland lobster fishery. Value for 2004 is preliminary.*

## ASSESSMENT

Resource status was evaluated primarily using fishery monitoring data from four localized sites around the island. Logbook and detailed at-sea sampling data were collected from Eastport (LFA 5), eastern Fortune Bay (LFA 11), Rocky Harbour (LFA 14A) and St. John Bay (LFA 14B). These data were used to derive estimates of exploitation rates. Furthermore, size-frequency distributions from at-sea sampling data were used to illustrate the fishery's heavy reliance on incoming recruitment each year.

Using at-sea sampling data from 1999-2005, exploitation rate estimates were calculated for four localized monitoring sites, employing the molt-class-ratio methodology of Caddy (1977). An alternate method of estimating exploitation rates involved the application of a temperature-corrected Leslie analysis (Ennis *et al*. 1982) to logbook data collected from the Eastport Peninsula fishery, from 1997 and 1999-2003.

### Resource Status

Assessment of the overall status of the lobster resource in Newfoundland, from LFA 3 to LFA 14C, is not possible at this time, due to insufficient data. Exploitation rate estimates for four localized monitoring sites were all high, which is consistent with findings of the Fisheries Resource Conservation Council (FRCC) that exploitation rates in the Newfoundland lobster fishery are generally high.

Exploitation rates estimated using the method of Caddy (1977) consistently exceeded 90% for males, while those for females ranged from 67% to 94%. Exploitation rates estimated using the Leslie analysis for the Eastport Peninsula averaged 89%.

Size-frequency distributions of males from 2004 at-sea sampling in all four monitoring sites demonstrate the reliance of the fishery on incoming recruitment (Fig. 3). For example, percentages of recruits in annual catch (i.e. recruit catch/total catch) for the Eastport Peninsula fishery ranged from 73% to 91% during 1999-2005.

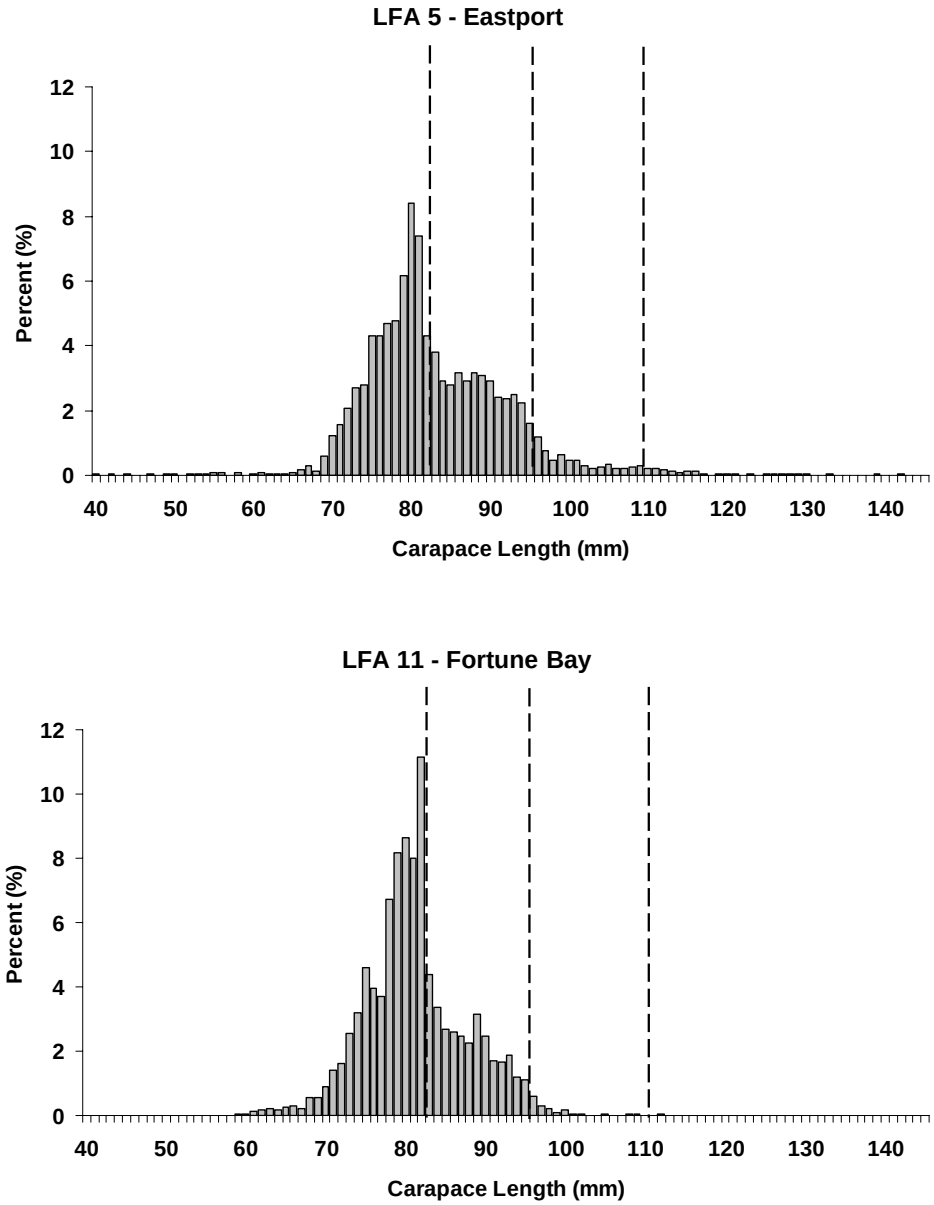



*Figure 3: Male Size frequency distributions for 2004 at-sea sampling data in four monitoring sites. Dashed vertical lines indicate recruit and recruit + 1 size ranges.*

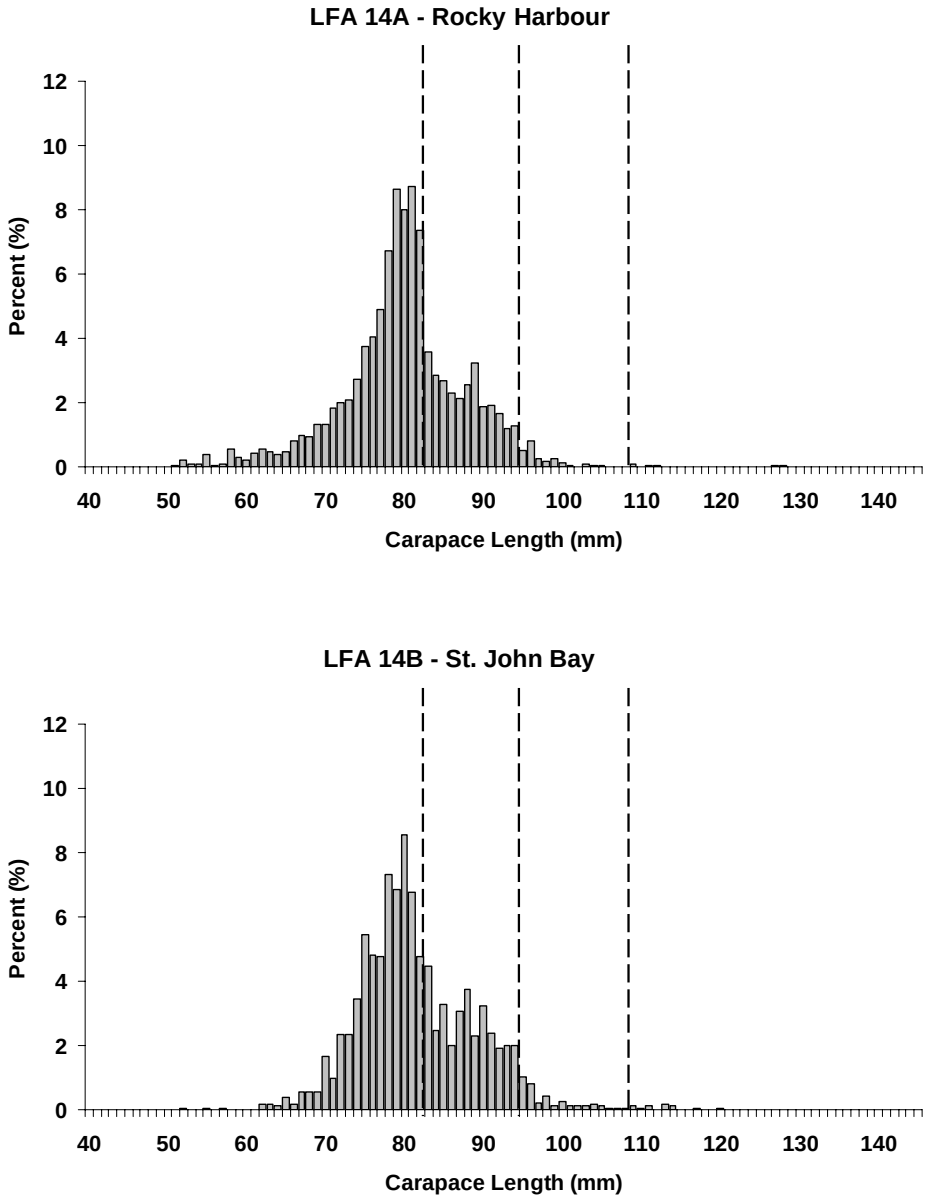



*Figure 3 (Continued): Male Size frequency distributions for 2004 at-sea sampling data in four monitoring sites. Dashed vertical lines indicate recruit and recruit + 1 size ranges.*

## Sources of Uncertainty

Both the molt-class-ratio and Leslie methods of estimating exploitation rates rely on assumptions that may have been violated. The implications of this are that estimates of exploitation may be inflated.

## ADDITIONAL STAKEHOLDER PERSPECTIVES

Lobster is a very valuable resource to harvesters in many regions of the province. During the last decade harvesters have reduced the number of traps, reduced the number of fishing days, changed commercial size requirements, closed some areas to commercial fishing and implemented a v-notching program.

Harvesters feel that the above measures are adequate in conserving the resource and these initiatives are adequate to maintain long term viability of the lobster fishery.

Many harvesters have taken a proactive role in collecting data for scientific purposes. Commercial logbooks and modified trap (experimental trap) logbooks are completed voluntarily, as harvesters realize that very little data exists to accurately determine stock status.

## CONCLUSIONS AND ADVICE

Due to insufficient data, an overall assessment of the status of the resource is not possible.

Exploitation rate estimates remain high in all monitoring sites. Each year the catch is comprised almost exclusively of incoming recruits, and future recruitment is strongly influenced by environmental/ecological conditions. Size-frequency distributions from the four monitoring sites all reflect the relative lack of larger animals in the population, which suggests an unhealthy population structure.

## OTHER CONSIDERATIONS

### Management Considerations

The lack of data pertaining to the Newfoundland lobster resource greatly impairs our ability to monitor changes in stock status over time and evaluate the efficacy of conservation measures implemented by management. A proper assessment of the lobster resource would require broad scale monitoring.

Reproductive potential is protected by regulations regarding minimum legal size, and prohibitions regarding the retention of ovigerous and v-notched females. Nevertheless, the population structure appears to be unhealthy as it is predominately composed of relatively small animals; this may be constraining egg production.

Enhanced v-notching could help improve structure of the stock, while reducing exploitation rates and enhancing egg production. Additionally, the establishment of further closed areas may help to achieve these goals.

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