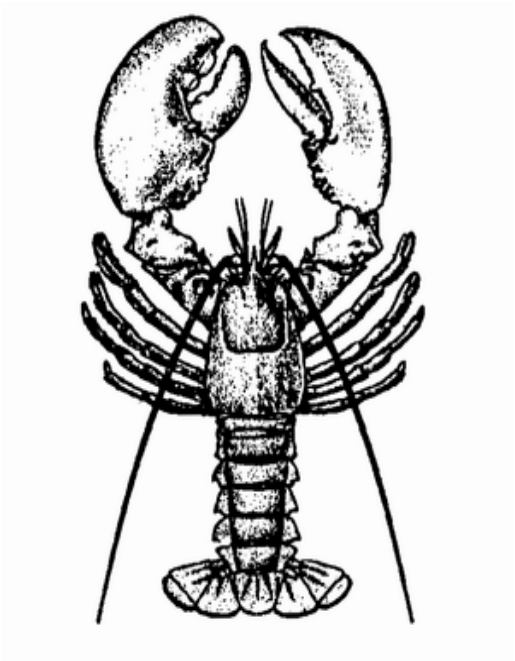
Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences
Newfoundland and Labrador Region
Canadian Science Advisory Secretariat
Science Advisory Report 2009/026

ASSESSMENT OF AMERICAN LOBSTER IN NEWFOUNDLAND



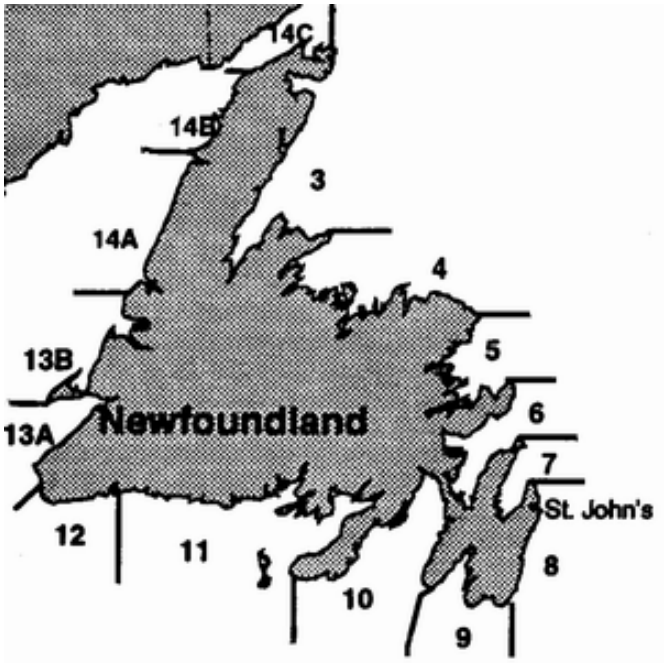


Figure 1: Newfoundland and Labrador Lobster Fishing Areas.

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 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. Regulations prohibit the harvest of undersized and ovigerous animals. In addition, there is a voluntary practice called V-notching, which involves cutting a shallow mark in the tail fan of an ovigerous female. The mark is retained for 2 to 3 molts, and notched females cannot be retained. The pratice thus serves to protect proven spawners even when they are not brooding eggs externally. The number of licenses is currently around 2900 and trap limits vary between lobster fishing areas (LFAs; Fig 1).

These stocks were last assessed in 2006 and are currently assessed every three years. The key indicators for the assessment are landings data and estimates of mortality. Limited fishery monitoring data are available to estimate mortality rates in some LFAs.

A meeting of the Regional Advisory Process (RAP) was held during January 15 – 16 and January 19, 2009 in St. John's, NL to assess the status of the American Lobster in Newfoundland. Participants included DFO scientists, DFO fisheries managers, DFO policy and economics sector, the provincial government, representatives from the industry and Memorial University.

SUMMARY

- In the absence of fishery-independent data, the assessment is based only on limited fishery-dependent data.

- Extensive logbook data would enable the assessment of V-notching activity, and may provide estimates of abundance and survival.

- Reported landings, summed over the whole island, have remained relatively constant for more than 50 years, but relative variability in individual LFAs is considerably higher.

- Newfoundland lobster landings have increased in recent years, from 1900 t in 2004 to 2600 t in 2007, due largely to increased landings in LFAs 11, 13A, 13B and 14A.

- Reported landings in LFAs 4, 8, 9 and 10 declined to record lows in 2007.

- Data for LFAs 3, 4, 6, 7, 8 , 9, 12, 13A, 13B and 14C are insufficient to assess the size of the stock, the extent and direction of changes in abundance and the rate of renewal.

- At-sea sampling data for LFAs 5, 10, 11, 14A, and 14B provide information on stock structure, including V-notched females, and mortality rates. Catch consists largely of incoming recruits. Annual survival of males has varied without trend, but was generally less than 0.2; survival of females was higher.

- The most extensive time series of commercial logbook data comes from Eastport, (part of LFA 5), and shows that commercial catch per unit of effort has changed little since 1997.

- V-notching has been taking place annually since initiation in the mid-1990s. However, there are no reliable accounts of how much has taken place. If there is a positive effect on recruitment, it should become discernible in about three to five years.

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) of 82.5 mm in carapace length (CL). 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 temperature.

Mating occurs in the months of July to September, and females extrude (i.e. spawn) eggs roughly one year subsequent to mating. The eggs are carried in clutches on the underside of the female's tail and the ovigerous (i.e. 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 extrude eggs during a spawning season. 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 larvae earlier in the season, potentially enhancing growth and survival (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, which resemble miniature adults, are prepared to transition to the benthic environment. 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 American lobster fishery in Newfoundland dates back to the early 1870s. The fishery is prosecuted from small open boats. Traps are set close to shore, at depths generally less than 20 m. Effort was essentially uncontrolled up to 1976, at which point a limited-entry licensing policy was implemented, and trap numbers were regulated. Following the implementation of the 1998-2002 management plan, there was a 25% reduction in licenses in the Newfoundland lobster fishery. The minimum legal size was increased from 81 mm CL to 82.5 mm CL in 1998.

There are currently about 2900 licenses with trap limits varying from 100 to 350 per licensed fisher, depending on the LFA. Additionally, traps must possess vents which allow undersize lobster to escape. Regulations prohibit the retention of undersize animals, as well as ovigerous and V-notched females.

Reported landings peaked at almost 8000 t in 1889 (Fig. 2). Early documentation indicates that all lobsters that were captured were 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 1925-27. The fishery reopened in 1928, and landings reached over 2000 t, but dropped sharply the following year. In the early 1930s, regulations were introduced to protect undersized and ovigerous animals.

Landings, summed over the whole island, have remained relatively constant for more than 50 years, although relative variability in individual LFAs is considerably higher (Fig. 3). Overall, Newfoundland lobster landings increased in recent years, from 1900 t in 2004 to 2600 t in 2007, due largely to increased landings in LFAs 11, 13A, 13B and 14A. Reported landings in LFA 4, 8, 9 and 10 declined to record lows in 2007.

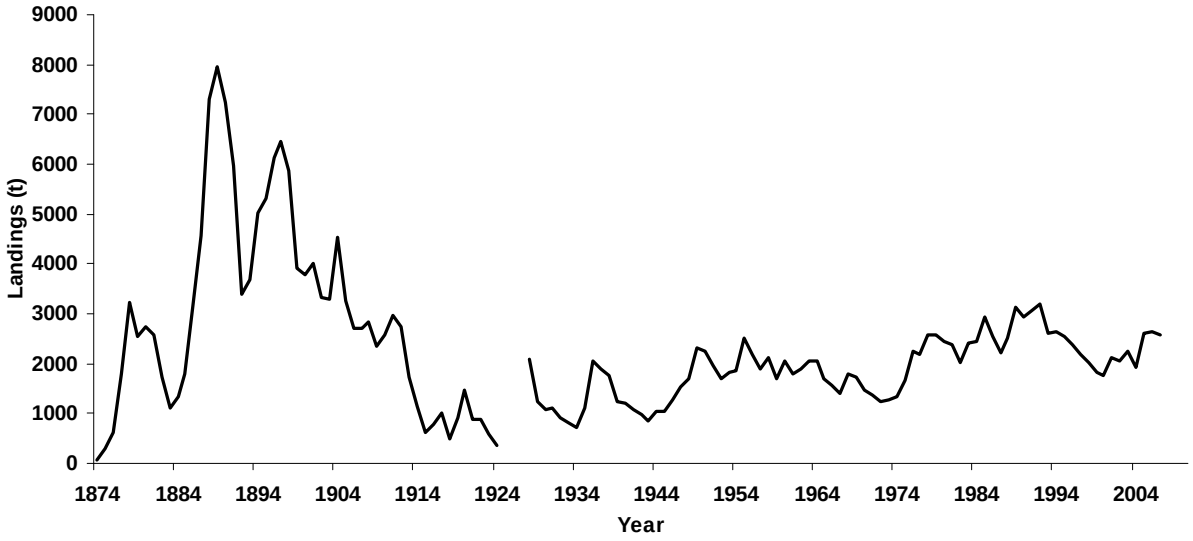


Figure 2: Historical landings for the Newfoundland lobster fishery. Value for 2007 is preliminary.

ASSESSMENT

In the absence of fishery-independent data, the assessment is based only on limited fishery-dependent data. The view of resource status was derived from landings data for all LFAs, as well as fishery monitoring data from five localized sites around the island. Detailed at-sea sampling data were collected from 1997-2007 for Eastport (in LFA 5), parts of Placentia Bay (in LFA 10), parts of Fortune Bay (in LFA 11), Rocky Harbour (in LFA 14A) and St. John Bay (in LFA 14B). Based on differences in catch rates and size structure, Section 30 within LFA 10 was considered separately from Sections 31 and 32.

Estimates of total mortality were calculated for these monitoring sites by examining the ratio of the number of animals in the recruit and recruit+1 molt groups. Additionally, size-frequency distributions from these data provided an indication of stock structure, including V-notched females.

A limited amount of commercial logbook data provided information on catch and effort, as well as V-notching activity.

Resource Status

Landings data are available for all LFAs (Fig. 3). Size-frequency distributions are available from at-sea sampling in LFAs 5, 10, 11, 14A and 14B. They indicate that the commercial catch consists largely of incoming recruits (Fig. 4 & Fig.5). In most areas, few animals appear to survive past the recruit+1 molt group. Therefore, the landings for these LFAs constitute most of the exploitable biomass at the beginning of the season. Landings since 1992 have been generally increasing in LFA 11, and decreasing in LFA 10 (by approximately 90%) as well as LFA 5. The number of V-notched females was recorded for all samples; however, it is impossible to determine the extent of V-notching activity.

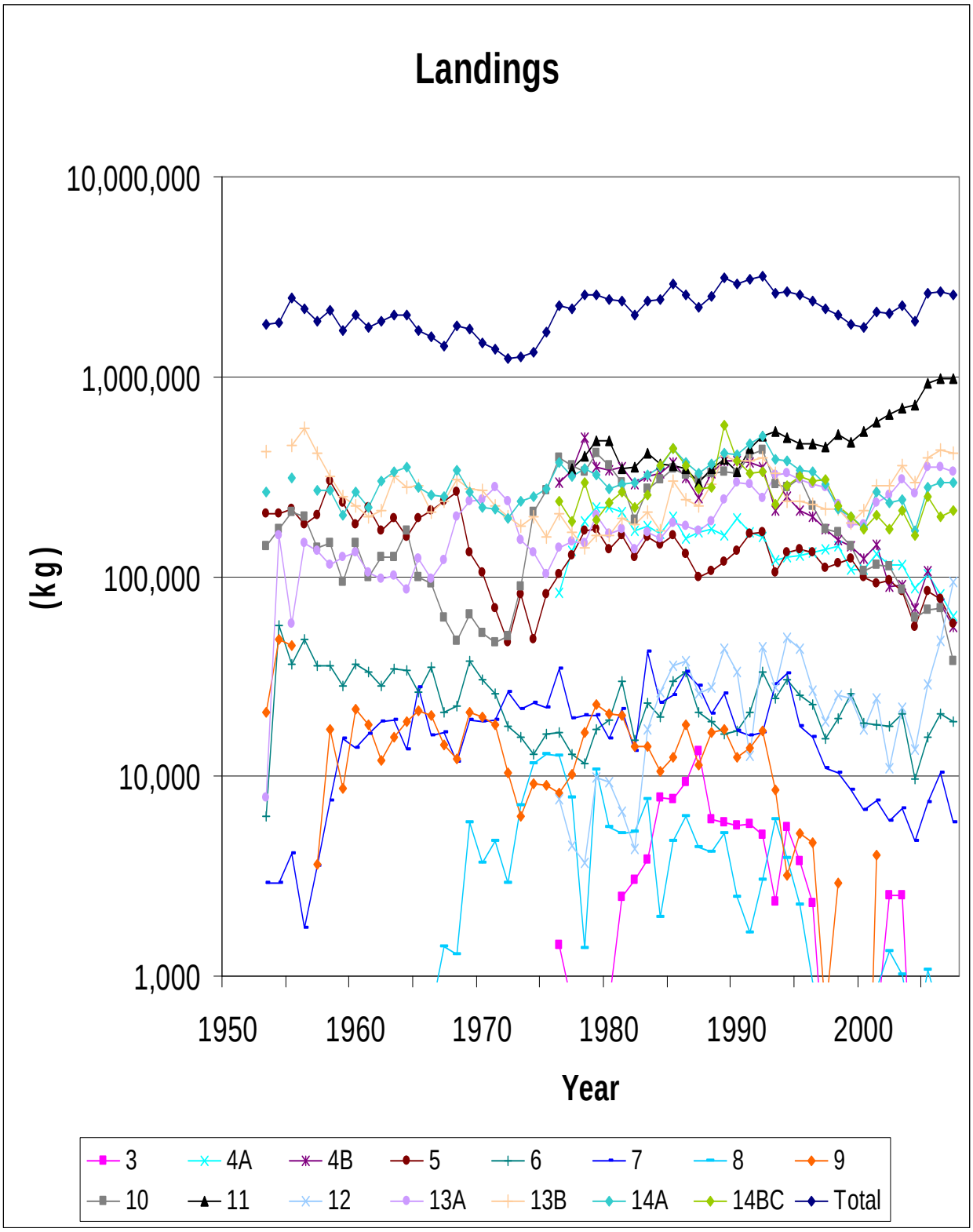


Figure 3: Reported landings for the Newfoundland lobster fishery, in total, and by LFA.

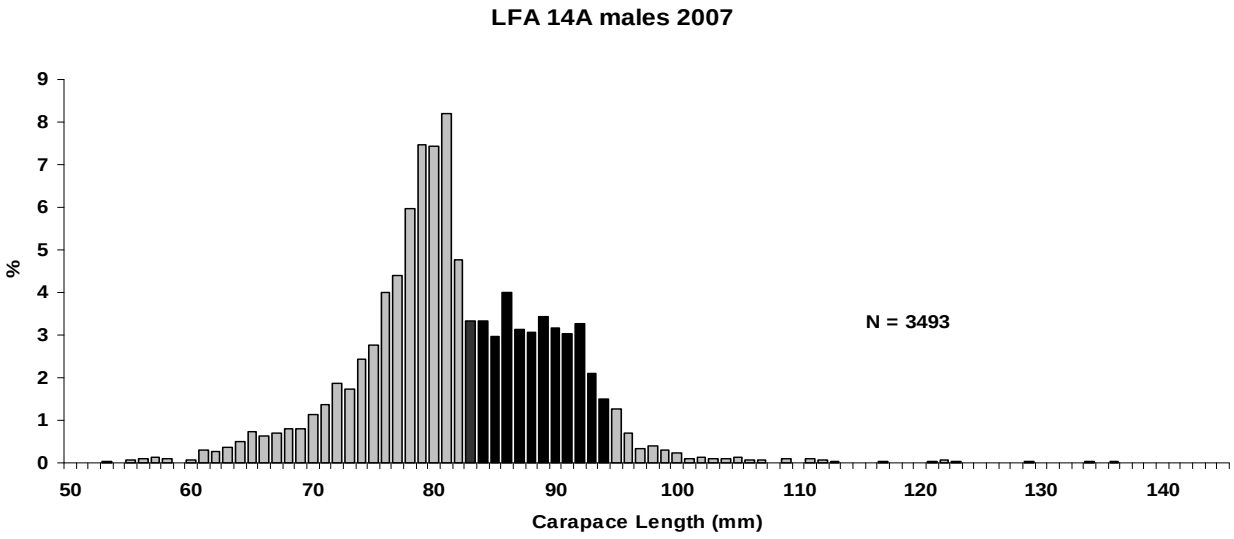


Figure 4: Size-frequency distribution for males from 2007 at-sea sampling for LFA 14A. Black bars indicate recruit size range.

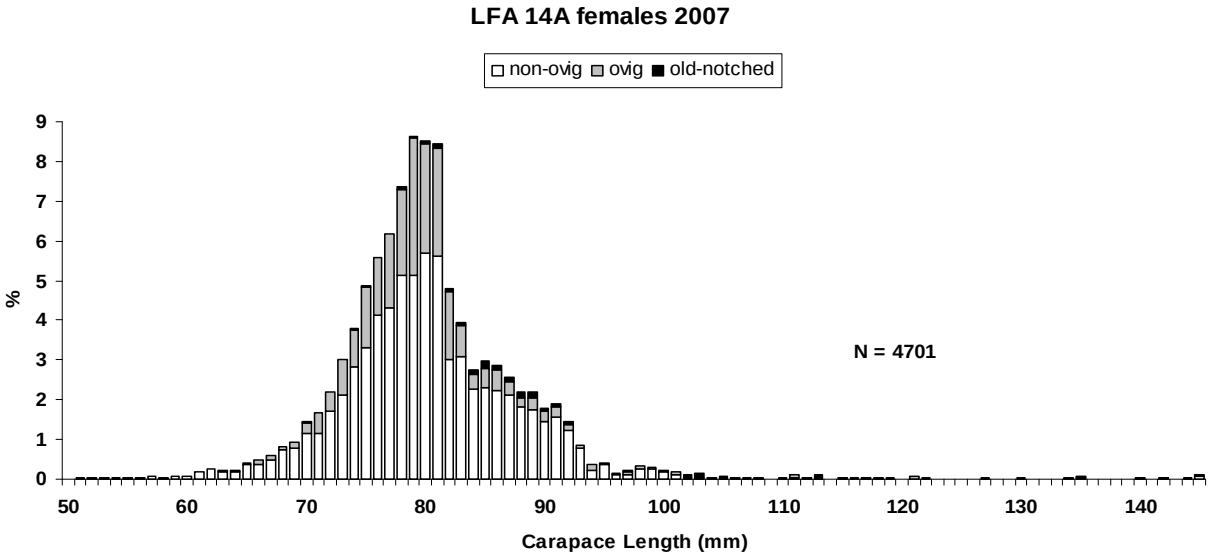


Figure 5: Size-frequency distribution for females from 2007 at-sea sampling for LFA 14A.

Annual survival of males has varied without trend, but was generally less than 0.2; survival of females was higher.

The most extensive time series of commercial logbook data comes from Eastport, part of LFA 5. From 1997-2008, commercial catch per unit of effort has changed little in this area (Fig. 6).

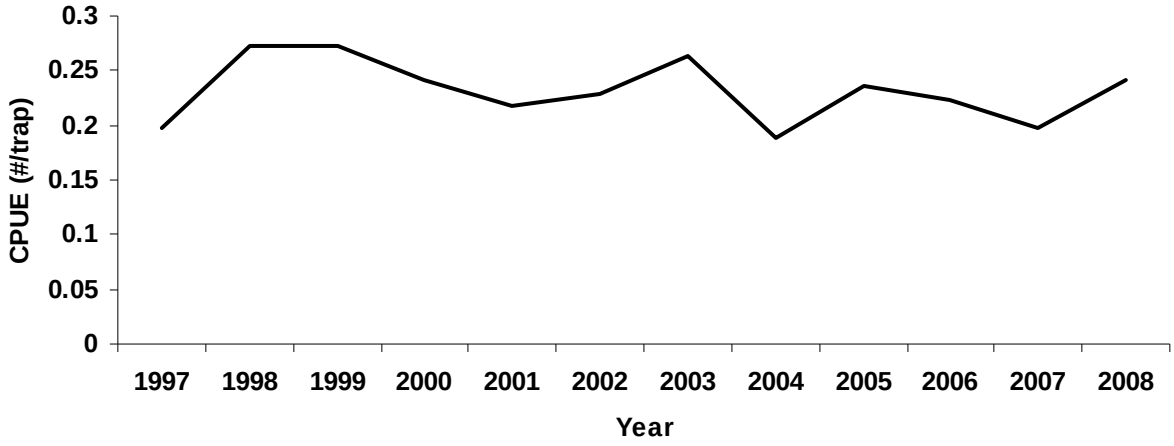


Figure 6: Annual mean CPUEs for commercial logbooks from Eastport (in LFA 5), 1997-2008.

Data for LFAs 3, 4, 6, 7, 8, 9, 12, 13A, 13B and 14C are insufficient to assess the size of the stock, the extent and direction of changes in abundance and the rate of renewal.

Sources of Uncertainty

In the absence of fishery-independent data, the assessment is based only on limited fishery-dependent data.

Landings, size compositions and catch rates are influenced by abundance, the extent of fishing effort (e.g. the quantity, location, timing and frequency of trap hauls) and catchability. Environmental conditions, as well as changes in fishing gear, can affect catchability.

Reported landings do not account for local sales, poaching, and holding mortalities that can occur prior to the sale of the catch. The extent of local sales, in particular, can be considerable and varies annually. Landings data from the most recent two years are incomplete.

Commercial catch per unit effort is not a reliable abundance indicator because values do not account for changes in fishing strategy or catchability which can vary within a season, as well as from one year to the next.

It is difficult to make reliable inferences from logbook data because of inadequate and non-random sampling.

Annual estimates of mortality derived from an examination of molt-class ratios assume a constant rate of recruitment, an assumption which may have been violated. A decline in recruitment would underestimate mortality, whereas an increase in recruitment would inflate estimates of total mortality.

Interpretation of landings as an estimate of abundance is based upon the assumption that no important component of the stock is unfished.

ADDITIONAL STAKEHOLDER PERSPECTIVES

Lobster is a very important and valuable resource to harvesters in many regions of the province. The moratorium on cod in the early 1990's resulted in increased effort on the lobster resource. Harvesters recognized the potential problem of this increase in effort and took necessary steps to try and maintain a viable and sustainable fishery. These steps include reduction in trap limits and seasons, an increase in minimum legal size, establishment of closed areas, introduction of a maximum size in some areas and the implementation of a V-notching program.

Harvesters feel that the above measures are adequate in conserving the resource and to maintain long term viability of lobster fishery, however the need for more data collection and scientific sampling still exists. Many harvesters have already taken a proactive role in data collection by voluntarily completing logbooks of their daily fishing activity and also recording information from a modified trap to try and monitor recruitment.

In 2008, the Fish, Food and Allied Workers (FFAW) Union sent out a post season questionnaire to all harvesters who participated in the logbook monitoring program to capture their views on the status of the lobster resource in their area. Most areas had very positive outlooks. The FFAW plans to continue this initiative in 2009 and beyond involving more harvesters to ultimately develop an additional index of abundance.

CONCLUSIONS AND ADVICE

Additional data are required to provide a more comprehensive assessment of the resource including abundance indicators and information on rates of renewal. Estimates of mortality remain high for all monitoring sites. Each year the commercial catch consists largely of incoming recruits. From 1997-2007, size-frequency distributions from at-sea sampling data for these monitoring sites generally reflect the relative lack of larger animals in the population, which may be indicative of an unhealthy population structure.

V-notching has been taking place annually since initiation in the mid-1990s. However, there are no reliable accounts of how much has taken place. If there is a positive effect on recruitment, it should become discernible in about three to five years.

Participation in commercial logbook programs in Newfoundland has been largely voluntary since the fishery began. Logbook coverage currently accounts for less than 5% of licensed harvesters in the region. Extensive logbook data would enable the assessment of V-notching activity and may provide estimates of abundance and survival.

MANAGEMENT CONSIDERATIONS

The lack of data pertaining to the Newfoundland lobster resource greatly impairs the ability to monitor changes in stock status over time and evaluate the efficacy of conservation measures such as V-notching. A proper assessment of the lobster resource would require more extensive, broad-scale monitoring, including a mandatory logbook program and more extensive at-sea sampling.

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 predominately composed of relatively small animals; this may be constraining egg production.

SOURCES OF INFORMATION

Attard, J. and Hudon, C. 1987. Embryonic development and energetic investment in egg production in relation to size of female lobster (*Homarus americanus*). Can. J. Fish. Aquat. Sci: 1157-1164.

FOR MORE INFORMATION

Contact: Roanne K. Collins
Fisheries and Oceans Canada
PO Box 5667
St. John's, NL A1C 5X1
Tel: (709) 772-5948
Fax: (709) 772-4105
E-Mail: Roanne.Collins@dfo-mpo.gc.ca

This report is available from the:

Centre for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO Box 5661
St. John's, NL A1C 5X1

Telephone: (709) 772-8892/2302
Fax: (709) 772-6100
E-Mail: vanessa.sutton-pande@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas

ISSN 1919-5079 (Print)
ISSN 1919-5087 (Online)
© Her Majesty the Queen in Right of Canada, 2009

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

CORRECT CITATION FOR THIS PUBLICATION

DFO. 2009. Assessment of American lobster in Newfoundland. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/026.