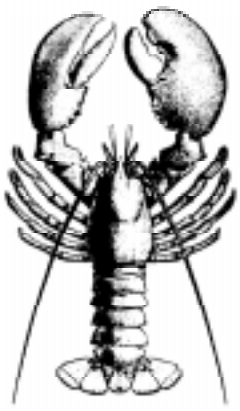
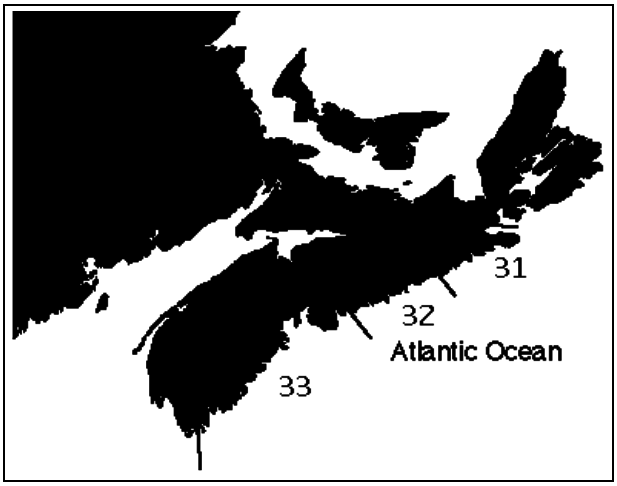
Fisheries and Oceans Pêches et Océans

Maritimes Region

DFO Science
Stock Status Report C3-60(1998)





Eastern and South Shore Nova Scotia Lobster LFAs 31-33

Background

Lobsters first entering the fishery in LFAs 31, 32, and 33 are 6-9 year old. Most males grow (molt) annually. Females molt annually until reaching sexual maturity when they switch to biennial molting. After two molts into legal size the frequency decreases. Lobster add about 50% to their weight at each molt. Size at female maturity is a full molt smaller in LFA 31 than in 32 or 33. Lobster movement in all three LFAs is confined to local deep-shallow seasonal migrations with little mixing between the grounds of adjacent fishing communities.

The lobster fishery is regulated as a trap-only fishery. The parlour trap came into use in the 1920s and wire construction replaced wood in LFA 33 in the 1980s. In LFA 31 and 32, wood or hybrid wood-wire construction still predominate. The inshore trap fishery is the only gear sector in these LFAs.

The fishery is not managed by TAC. Management objectives are to control the cost of fishing, avoid waste of the harvested resource, and realize its potential yield in weight and value.

Summary

- Landings in LFA 32 and most of LFA 33 have stabilized in the last few years, but continue to fall in LFA 31 and western LFA 33.
- Over the past decade catch per trap haul has gradually decreased in all areas.
- Exploitation rate is lowest in LFA 31, intermediate in 32, and highest in 33.
- In LFAs 31 and 32 minimum size will increase from 81 to 86 mm during 1998-2001. These LFAs will also choose, for females only, either a maximum size or a closed size window.
- Several options for doubling egg production in LFA 33 include contributions from both small and large females. These size groups probably hatch their eggs at different times increasing the chance of successful year classes.

The Fishery

The inshore lobster fishery has been under regulation since 1873. Important current **regulations** are no new licenses, a trap only fishery, no sport fishery, trap limits, fishing seasons, lobster minimum size, and a prohibition against retaining berried females. Division of the coast into Lobster Fishing Areas allows regulations to be adapted to local climatic conditions and allows the industry to supply markets with more sizes and during more months of the year. In 1998, the minimum size was increased from 81 to 82.5 mm in LFAs 31 and 32. By 2001 the minimum size is to increase to 86 mm and fishers are to choose between a 127 mm maximum size on females and a closed window of 114-124 mm for females. These changes were indicated in an April-1998 press release from the DFO minister.

Lobster Fishing Area	Trap limit	Min. size (mm)	Seasons	Number licenses
31A	250	82.5	Apr. 29-June 30	149
31B	250	82.5	Apr. 19-June 20	
32	250	82.5	Apr. 19-June 20	166
33	250	81	last Mon. in Nov.-May 31	771

Recorded **landings** have underestimated actual landings. A 1993-94 survey of fishers and fishery officers disclosed underestimates of 15, 18, and 29% for LFAs 31, 32, and 33 respectively. Beginning in the fall of 1995-96 the method of collecting landings' data changed from sales slips obtained from buyers to monthly reports submitted by lobster fishers. The accuracy of the new method will not be known until another audit is undertaken.

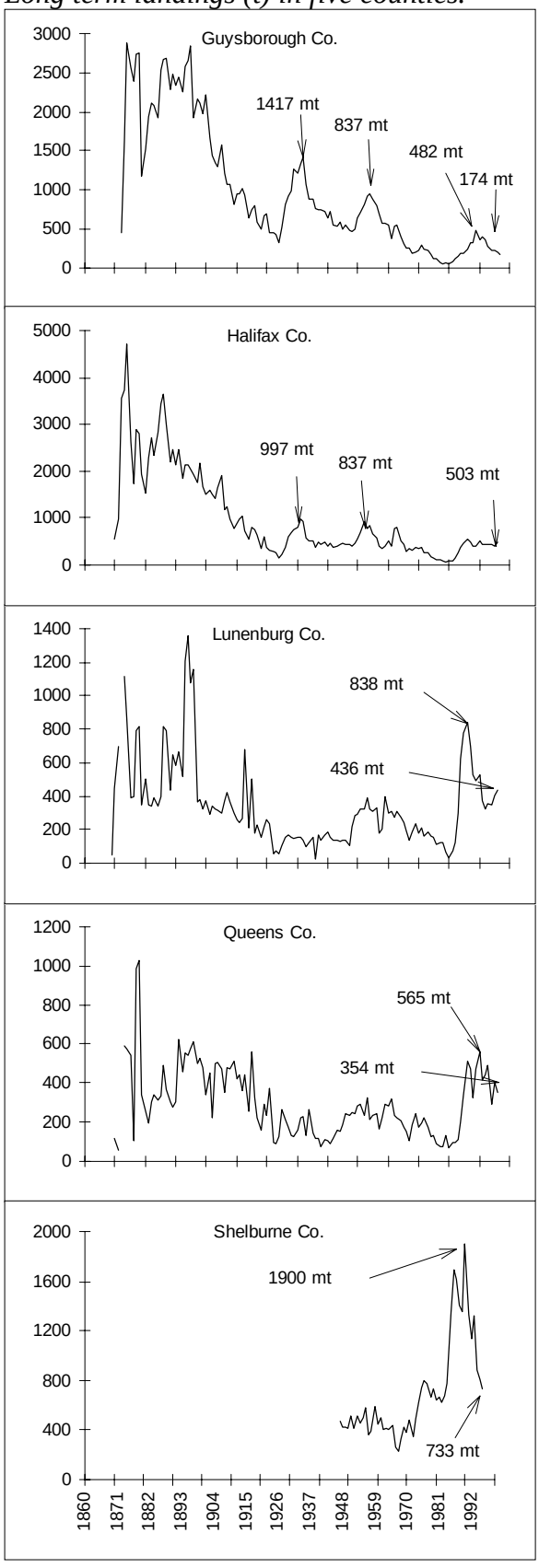
Landings from the mid-1970s to early-1980s were the lowest recorded in the history of the fishery for all LFAs. All three areas peaked about 1990. Since then declines in recorded landings have been about 65, 30, and 40% in LFAs 31, 32, and 33 respectively.

	Landings (mt) Year							
LFA	70-79	80-89	90-92	1993	1994	1995	1996	1997*
31	123	240	375	284	240	193	174	146
32	127	163	302	279	262	219	216	239
33	458	1462	2211	1817	1724	1443	1764	1792

*preliminary

The long-term history of landings is available only by county. Guysborough Co. (equivalent to LFA 31) sustained high landing from 1875-1900, followed by three successively lower peaks; landings are now about 15% of the 19th century average. Halifax County (75% in LFA 32 and 25% in LFA 33) has shown a similar trend to Guysborough, and is also now at about 15% of 19th century levels. Lunenburg and Queens counties are similar to one another with gradual declines to about 1920, and low levels from then until 1980, and recent peaks. The late 1980s-early 1990s had brief peaks equal to 18th century averages. Shelburne County is mostly in LFA 34, and the portion of landings in LFA 33 can be separated only since 1947. For this 50-year portion of the record the trend is similar to Lunenburg and Queens counties, but without the low landings around 1980.

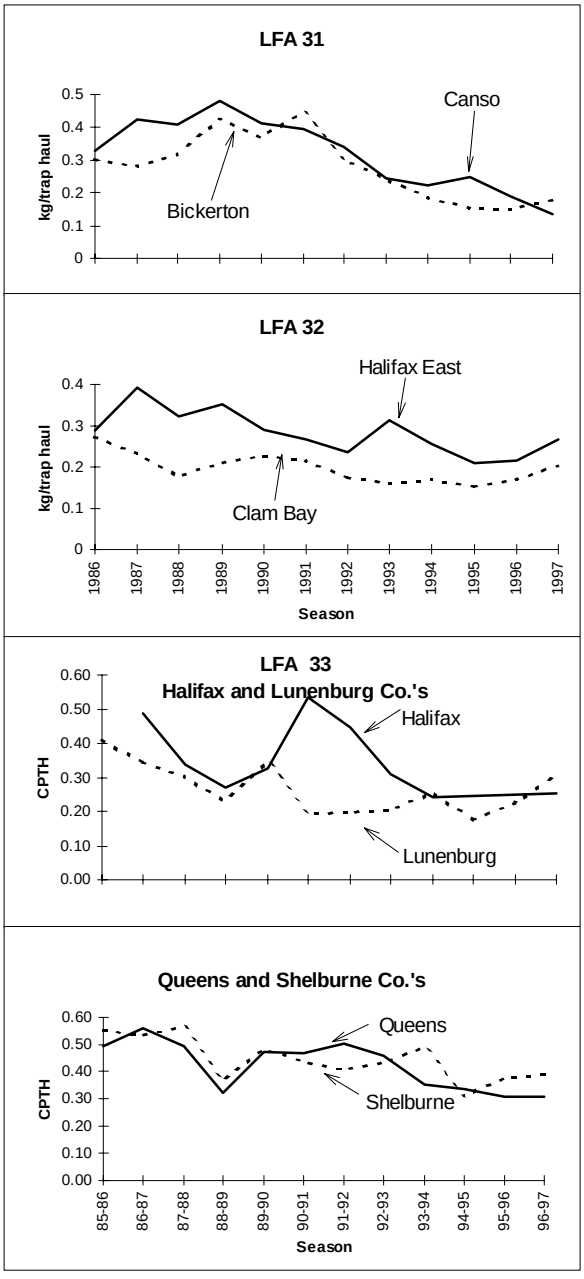
Long term landings (t) in five counties.



Resource Status

Catch-per-trap-haul is based on 30-50 volunteer log books distributed throughout the three LFAs (5-11 in LFA 31, 5-16 in LFA 32, 12-26 in LFA 33). The participating fishers change over time. Over the past decade there has been a gradual decrease in catch-per-trap-haul in all areas.

Kg per trap haul for three LFAs.



Size frequencies, based on catch sampling twice per season in each of seven ports, illustrate port-to-port differences, but no year-to-year trend. The proportion in the first molt group (81-93 mm) increases from LFA 31 to 33.

Percentage of catch (no. of lobsters) in the first molt at four time intervals in seven ports.

	Percent of catch 81-93 mm			
LFA 31	1985-86	1988-89	1993-94	1997-98
Canso	39	57	53	47
Bickerton	53	67	41	57
LFA 32				
Clam Bay	66	68	70	69
LFA 33/Co				
Halifax	--	71	78	86
Lunenburg	79	73	68	72
Queens	78	81	69	87
Shelburne	79	79	79	80

Exploitation rates were calculated two ways, by length cohort analysis (LCA) and the ratio of frequencies in the first and second molt classes of commercial size. Size frequencies of sampling ports were pooled when there was more than one port in an LFA. Temporal increases can be caused by either higher fishing intensity or a sharp increase in recruitment. There is no apparent trend over time, but the rate does increase from LFA 31 to 33.

Exploitation rates for three LFAs calculated by the ratio of frequencies in the first two molt classes and by LCA.

	Year								
	90	91	92	93	94	95	96	97	98
LFA 31									
Ratio	0.39	0.26	0.53	0.38	0.39		0.47		
LCA	0.36	0.38	0.31	0.30	0.35		0.24		
LFA 32									
Ratio	0.65	0.36	0.63	0.57	0.69		0.56		
LCA		0.42	0.50	0.51	0.57		0.54		0.58
LFA33									
Ratio		0.69	0.65	0.71	0.66	0.66	0.70	0.75	
LCA		0.55	0.59	0.64	0.57	0.65	0.68	0.62	

Sources of Uncertainty

Uncertainties in determining egg production (discussed in the final section) include catchability of different sized lobsters, temporal and spatial changes in size of female maturity, and growth rates of large lobsters. Also, methods for calculating exploitation rate have received much attention; four methods were used in the 1998 RAP: the recapture rate of tagged lobsters, Leslie analysis, the ratio of catch in the first and second molt class, and LCA. Exploitation rate is an ever-changing parameter and often difficult to estimate. Instead of trying to accurately measure current exploitation, we might, in the future, choose a level for each area that would not likely be exceeded in the forseeable future; for example, 0.5 for LFA 31 and 0.75 for LFA 33. This level would then be entered in the model to calculate lobster sizes that would achieve management targets, without fear of the fishery exceeding the exploitation rate.

Uncertainties are not sufficient reason to delay implementation of measures to increase egg production. To the contrary, a start at increasing egg production provides an incentive to improve the calculations. The

FAO Code of Conduct for Responsible Fisheries states "The absence of adequate scientific information should not be a reason for postponing or failing to take conservation or management measures."

Outlook

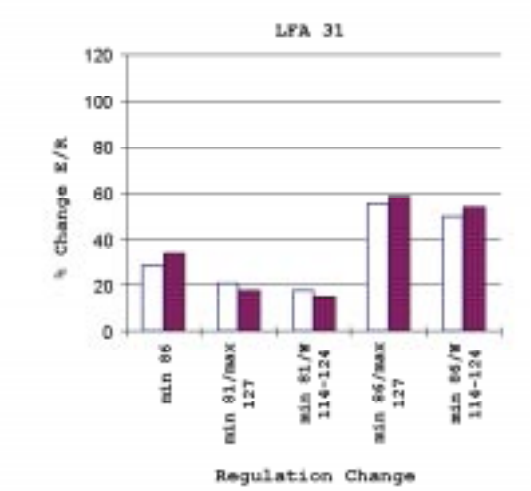
Preceeding the peak of the last decade, all of LFAs 31, 32, and 33 experienced their lowest catches since the the start of the fishery in the 1870s. The recent high catches demonstrated the habitat's capacity to support a large stock, and the low catches the vulnerability of the stock to collapse. Without management change, a return to low and variable landings of the 1920-1980s period seems likely.

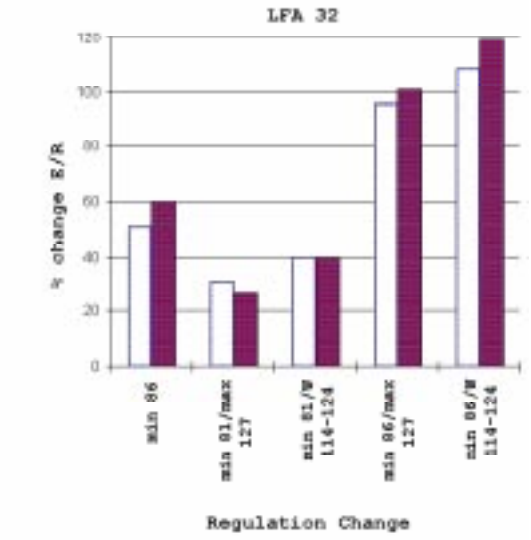
For the first time in several decades a significant change in lobster conservation is being implemented.

Management Considerations

Eggs per recruit (E/R) were calculated using the Idione-Rago E/R model. Female growth was a constant 13.0 mm per molt (S=2.4 mm) from tagging studies in Clam Bay (LFA 32) and 12.4 mm per molt (S=2.2 mm) from tagging studies in Shad Bay (LFA 33). Thirteen mm was used for both LFAs. 50% size at maturity was 81 mm in LFA 31 and 98 mm in LFAs 32 and 33. E/R calculations used two measurements of exploitation, length cohort analysis (new method) and the ratio of catch in the first and second molt classes in commercial size (old method). The means of annual exploitation given in the table above were incorporated in the model.

The following figures for LFAs 31 and 32 give the benefits in percentage increase in eggs per recruit for a minimum size of 86 mm (min), a maximum size of 127 mm (max), and a closed window (a size range of females that cannot be retained) of 114-124 mm (W). Lobsters grow through the closed window and are again available to the fishery, whereas the maximum size removes them permanently from the fishery. Also included are the benefits of the change in minimum size combined with the maximum size or window option. The left bars were calculated using the new method for exploitation rate and the right bars the old method.



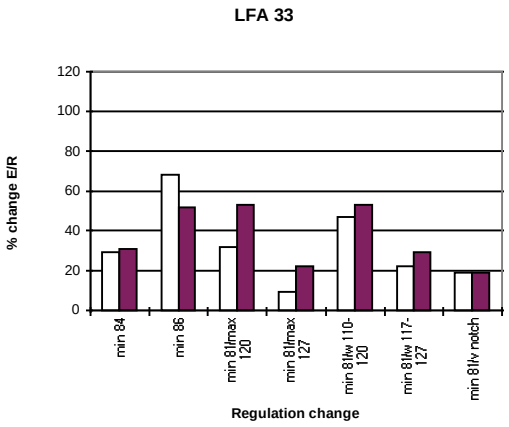


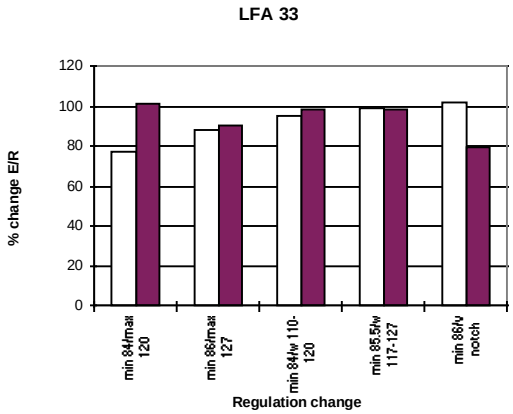
The minimum size and either the maximum or closed window size is being implemented over the years 1998-2001. Either combination provides more eggs from both first-time and multiple spawners. A management objective

included in the FRCC lobster report was a biomass composed of several age classes.

Increases in E/R from LFA 31 will be less than the Minister's announced target of doubling, but the combination of LFAs 31 and 32 will be closer to doubling. Because of the present high E/R in LFA 31, doubling would require a large change in size regulations.

The following figures for LFA 33 include more choices because LFA 33 fishers have yet to choose the new regulations to meet their egg production target. The first figure gives the benefit of each of several measures if applied individually. The second gives combinations of these that would produce a doubling of E/R. The left bars were calculated using the old method for exploitation and the right bars the new method. Min, max, w, and v refers to minimum size, maximum size, and window size, respectively. V-notching is included because of interest from some fishers. However, it would be expensive to measure the fraction of the ovigerous females v-notched, expensive to enforce, and expensive for buyers to monitor their purchases for v-notched lobsters.





Eggs per recruit for a minimum size of 81 mm and without regulations protecting large females are 4800-6100, 900-1200, and 500-900 for LFAs 31, 32, and 33, respectively. These values are low relative to an unfished population.

For more information

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Internet address: www.dfo-mpo.gc.ca/csas
ISSN: 1480-4913

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

Correct citation for this publication:

DFO 1998. Eastern and South Shore Nova Scotia Lobster LFAs 31-33. DFO Sci. Stock Status Rep. C3-60(1998)