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Preliminary results of the lobster (<u>Homarus americanus</u>) minimum carapace size increase program in the Gulf Cape Breton, N.S. fisheries.

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ABSTRACT

The effects of an increase in the minimum legal carapace size of lobster are being examined in an experimental zone of the Cape Breton, N.S. area of the southern Gulf of St. Lawrence (Area 26B). The minimum carapace size is being increased from 63.5 mm to 70.0 mm over four years, 1987 to 1990. Theoretical benefits include higher yields to fishermen in future years, and an increase in the reproductive potential because greater numbers of lobster may mature and reproduce before harvesting. Preliminary results show a 7.5% decrease in catch during the first year of the size increase program and a 14.1% increase in catch the second year. The size increase program is monitored through sea-sampling, tagging and examination of lobster fecundity of the area. Sea-sampling data shows an increase in mean size of commercial lobster, from 70.8 mm in 1986 to 72.4 mm in 1988. The mode of undersize lobster shifted from 60.0 mm before the size increase program to 64.0 mm in 1988. Earlier tagging studies show little movement into and no movement out of Area 26B. The program will continue to be monitored to determine the response of lobster populations to this management strategy.

RESUME

Les effets d'une augmentation de la taille minimale légale de la carapace des homards sont étudiés dans une zone expérimentale du sud du Golfe du St.-Laurent, au large du Cap Breton, Nouvelle-Écosse (Zone 26B). La taille minimale de la carapace doit être augmentée de 63,5 mm à 70,0 mm, s'echelonnant sur une période de quatre ans, de 1987 à 1990. Les avantages théoriques comprennent des rendements futurs plus élevés pour les pêcheurs ainsi qu'un potentiel reproducteur plus elevé dû à un plus grand nombre de homards pouvant devenir matures et se reproduire avant d'être capturés. Les résultats préliminaires indiquent une diminution des prises de 7,5% durant la première année de pêche et une augmentation de 14,1% après la deuxième année. Le programme est suivi à l'aide d'échantillonnage en mer, d'études de marquages et d'une étude de la fécondité des homards dans la région. Les échantillons en mer indiquent une augmentation de la taille moyenne des homards de taille légale de 70,8 mm en 1986 à 72,4 en 1988. Le mode des homards sous-légaux s'est déplacé de 60,0 mm avant l'augmentation de la taille légale à 64,0 mm en 1988. Les études de marquages antérieures indiquent peu de déplacements vers l'intérieur et pas de déplacements vers l'extérieur de la Zone 26B. Le programme continuera d'être surveillé pour déterminer la réponse des populations de homards à cette stratégie de gestion.

INTRODUCTION

Lobster (Homarus americanus) catches in the Gulf of St. Lawrence have traditionally been divided into two size categories: market and canner. Market lobster measure greater than 81 mm (3-3/16 inches) carapace length (CL) and canners between 63.5 and 81 mm (2-1/2 and 3-3/16 inches) CL. In many areas, canners account for the bulk of the catch, up to 80%. The fishery is highly dependent on recruitment to canner size from one fishing season to the next. The lobster fishery is regulated by minimum carapace size, prohibition to retain females bearing eggs, limited number of licenses, maximum number of traps per license, trap size, and length of fishing season. Historical landings fluctuated from 6690 metric tons (1918) to 21,134 mt (1988); a continuous increase has been observed since 1974 (Figure 1).

The concept of increasing the legal size, in the Maritime fisheries where canner lobster predominate, has been discussed for many years. In 1975, the lobster fishery task force recommended a size increase to 3 3/16" (81 mm) CL in the southern Gulf of St. Lawrence. A carapace size increase was identified as a priority at a Canada-United States lobster workshop in St. Andrews, N. B. in 1978 (Anthony & Caddy, 1980). However, most size limit increase proposals were rejected by licensed lobster fishermen of Areas 25 and 27 in the southern Gulf of St. Lawrence.

Area 26, fished by Nova Scotia (Gulf) and southeastern Prince Edward Island fishermen, was proposed as an area to implement a size increase measure. In 1984, 82% of the Nova Scotia fishermen and 30% of the P.E.I. fishermen were in favour of increasing the legal size. Since both groups fish Area 26, the proposal could not proceed for the entire area. The Cape Breton (Gulf) fishing area is fairly well separated from other portions of Area 26, and was regarded as an alternative where the program could be implemented without interfering with P.E.I. fishermen. In 1985, meetings were held in the Cape Breton area and over 81% of fishermen favoured implementing an experimental size increase. The area is now identified as Area 26B and the remainder as Area 26A (Figure 2). Minimum legal size is being increased from 63.5 mm (2 1/2") CL to 70 mm (2 3/4") CL by an increment of 1/16" in each of four years, 1987 to 1990 (Table 1).

Theoretical benefits of a size limit increase include: lobster enter the fishery at a larger size, and greater numbers can reproduce before being harvested. The growth rate of newly recruited lobster (63.5 mm, 2 1/2" CL) varies depending on size and sex, however, studies in the Northumberland Strait have shown that these small canners will increase their weight by about 50% per molt, on average (Wilder, 1963). Female lobster in the southern Gulf may mature at 61 mm with 50% mature by 83 mm (Templeman, 1944), therefore, an increase in size at first capture would allow more females to mature and reproduce before being fished. This could potentially improve future recruitment, although the extent cannot be predicted as recruitment processes for lobster remain largely unknown.

Concerns expressed by fishermen include the immediate financial loss incurred when they release lobster they would otherwise keep, and that larger lobster may move out of the area to be caught elsewhere. However, tagging studies by Wilder (1963), Maynard and Chiasson (1986) and Maynard et al. (1988) in the southern Gulf of St. Lawrence did not indicate extensive movements. With a shift to larger sizes, possible biological responses from the population may offset any positive benefits expected from a size increase strategy. Greater numbers of larger lobster could increase competition for food and space, resulting in decreased growth rates and increased natural mortality. However. historical evidence indicates that larger animals existed in the southern Gulf of St. Lawrence. Knight (1918) reported of areas in the Northumberland Strait. where catches are presently composed of at least 70% canner lobster, that once supported populations of an average size of 140 mm CL. No data suggests 63.5 mm CL is the size for maximum lobster production in the area.

Regardless of these observations, questions or concerns still exist and the experimental program in Area 26B will examine these issues. Data collected before, during and after the size increase program from a control port (Caribou, N.S., Area 26A) (Figure 2) will be analyzed to determine population changes of an area not undergoing a size increase.

MATERIALS AND METHODS

Sea-sampling: To monitor the lobster fishery in Cape Breton Area 26B and the control area, sampling of catches at sea is conducted. The following measurements are taken: carapace length of all lobster (sub-legal and legal), sex (male, female or berried female) and missing or regenerating limbs. Samples are taken throughout the fishing season, to obtain size frequency distributions of lobster caught, and monitor the effect of the fishery on the lobster populations.

Tagging: Five thousand lobster were tagged in 1988 with sphyrion tags at three sites along the Cape Breton coast to monitor growth and movement during the size increase program. Two thousand were tagged at Port Hood, 2,000 at Margaree and 1,000 at Pleasant Bay. Tag recoveries will begin during the 1989 fishing season.

Fecundity: A fecundity study to examine egg production of female lobster was initiated in the Cape Breton area in October 1988. Twenty-eight berried female lobster ranging in size from 66.0 mm to 95.2 mm CL were collected in the Port Hood, N.S. area. Number of eggs per female was determined. This study will be completed in the spring of 1989, with a second sample taken from the same area. Any differences in number of eggs per female may provide an indication of winter egg-loss for female lobster of various sizes.

RESULTS AND DISCUSSION

Commercial catches in Cape Breton Area 26B ranged from 345 mt in 1947 to 1173 mt in 1988 (Figure 3) with an increasing trend since 1974. Catches by canner and market size categories from 1984 to 1988 (Figure 4) indicate that yearly fluctuations in catch of canner lobster affect the total lobster catch for the area. Market catches have remained relatively steady over the years.

With the first carapace size increase in 1987, catches dropped 7.5% However, this decrease should not be attributed solely to the size (Figure 4). as lobster populations have constantly fluctuated over the increase program, years (Figures 1 and 3). In 1987, escape gap mechanisms on lobster traps became mandatory. Fishermen can choose from three types of escape mechanism: traps with the first two lathes spaced 38.1 mm apart; a plastic lath with a rectangular opening of 38.1 mm by 203.0 mm; or a lath with two or three round holes of 44.4 diameter each. If fishermen used the lath with a rectangular opening they mm would have lost a portion of their catch (Branch, 1986). These factors make it difficult to determine what proportion of the decrease was caused by the size increase implementation. From 1987 to 1988, catches in the Cape Breton area increased 14.1% (preliminary data). Part of this increase can be attributed to the size increase strategy, however, year to year fluctuations of lobster populations still remain and are difficult to measure.

Sea-sampling data from Cape Breton Area 26B, 1985 to 1988 (Table 2), indicate a 1.2:1 ratio of females to males. Size frequency distributions of sampled lobster from 1985 to 1988 (Figure 5) show a shift in the mode of undersize lobster, from 60.0 mm CL in 1985 and 1986 to 62.0 mm in 1987 and 64.0 mm in 1988. The undersize lobster component of the total catches has also increased, from 49% in 1985 to approximately 69% in 1988. Size frequency distributions of legal lobster catches in Area 26B indicate an increase in the mean size, from 70.5 mm in 1985 to 72.4 mm in 1988 (Figure 6). Data from future sea-sampling, together with port samples, will examine this further.

The effect of the fishery on the size distribution of lobster in the Cape Breton area, from beginning to end of the fishing season, is a decrease in the number of commercial size lobster, making up 70% of the catch near the beginning of the season to 44% near the end of season (Figure 7). Samples were taken near the beginning (A) and end (B) of the fishing season at Margaree Harbour, N.S. 1986. The fishery has been very dependent on yearly recruitment to canner size, representing mainly one year class. Once the minimum legal size of 70.0 mm (2 3/4 inches) CL is reached in 1990, the fishery may still be dependent on one or two year classes, however, yields theoretically will be higher, and a greater number of lobster may reproduce before entering the fishery.

The mean size of berried female lobster in the catches has fluctuated over the four years examined, from 86.2 mm in 1986 to 75.8 mm in 1988 (Figure 8). Results of the first phase of the fecundity study, autumn 1988, Port Hood, N.S. are shown in Figure 9. The number of eggs per female collected ranged from 4668 eggs to 21261 eggs from females measuring 66.0 mm to 95.2 mm CL respectively.

Three tagging studies (Maynard & Chiasson, 1986; Maynard <u>et al</u>. 1988) in Beach Point, P.E.I. (July, 1982); Margaree, N.S. (July-August, 1984);

and St. Georges Bay, N.S. (July, 1986) do not indicate extensive movement of lobster into and out of the Cape Breton experimental zone (Figure 10). The majority were recaptured within five kilometers of the release site and less than three percent migrate distances greater than 35 km in one year (Maynard and Chiasson, 1986). Movement of lobster along the Cape Breton coast is restricted by a 35 meter depth contour, which allows only northern or southern movement along the coast (Maynard & Chiasson, 1986). However, a tagging project conducted in (Figure 10, circles) showed limited movement across St. George's Bay July 1986 to Cape Breton (Maynard et al. 1988). Average growth of lobster tagged in St. George's Bay was 8.85 mm (unpublished data). Lobster tagged during the August 1984 tagging project in Margaree had molted prior to tagging, therefore no growth information was available in 1985. Limited recoveries in 1986 showed an average growth of 9.10 mm (unpublished data), comparable to growth observed in St. George's Bay. Tagging conducted in Cape Breton Area 26B during 1988 will contribute additional data on growth and movement (Figure 11).

This is a unique opportunity to monitor changes in a lobster population in the southern Gulf due to a change in minimum legal size. Information obtained from the program monitoring of the study area and the control area before and after the increase will determine the impact of a minimum size increase measure on lobster biology, recruitement/yield, growth, movement, fecundity of this area.

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Table 1. Lobster minimum legal carapace size for each year of the size increase programin Cape Breton Area 26(B) including the year prior to the increase.

YEAR	MINIMUM LEG	MINIMUM LEGAL CARAPACE LENGTH					
	••••••••••••••••••••••••••••••••••••••						
1986	63.50 mm	(2 - 1/2 inches)					
1987	65.09 mm	(2 - 9/16 inches)					
1988	66.68 mm	(2 - 5/8 inches)					
1989	68.27 mm	(2 - 11/16 inches)					
1990	70.00 mm	(2 - 3/4 inches)					

Table 2. Number of lobsters sampled at sea by sex (male, female and berried female) in the Cape Breton Area 26(B), from 1985 to 1988.

YEAR	MALES		FEMALES			TOTAL		
			NON-BERRIED		BERRIED			
	• NUMBER	%	NUMBER	%	NUMBER	%	NUMBER	%
1985	3442	45.49	3927	51.90	197	2.61	7566	100
1986	4321	43.52	5186	52.2 3	422	4.25	9929	100
1987	2120	44.57	2389	50.22	248	5.21	4757	100
1988	2293	45.18	2575	50.76	207	4.06	5075	100

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Figure 1. Historical landings of lobster in metric tons in the Southern Gulf of St. Lawrence from 1893 to 1988.



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Figure 2. Southern Gulf of St. Lawrence indicating Cape Breton Island, Nova Scotia.

Cape Breton Area 26B: Experimental minimum carapace size increase zone.



Figure 3. Lobster landings in metric tons in Cape Breton Area 26B, 1947 to 1988.



Figure 4. Lobster landings in metric tons in Cape Breton Area 26B, 1984 to 1988: canner, market and total catches.





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Figure 6. Size (carapace length) frequency distributions of legal size lobster collected by sea sampling in the Cape Breton Area 26B from 1985 to 1988. Each bar represents a size class interval of 1.59 mm (1/16 inch).



Figure 7. Comparison of the carapace length frequency distributions of lobster sampled on May 10 (A) and on June 23 (B), 1986, in Margaree Harbour, Cape Breton (Area 26 B). Minimum legal size of 63.5 mm (2 1/2 inches) for 1986 is indicated.



Figure 8. Size (carapace length) frequency distributions of berried female lobster collected during sea sampling in Cape Breton Area 26B from 1985 to 1988.



Figure 9. Number of eggs per carapace size class (mm) of berried female lobster collected in Port Hood, N.S. October 1988. (Preliminary data).

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Figure 10. Geographic distribution of recapture sites of tagged lobsters released at three different location in the Southern Gulf of St.-Lawrence. (Unpublished data)

I - Release site at Beach Point, P.E.I.

- Image: Bay and St. George's Bay, N.S.
- 🗥 Release site at Margaree, Nova Scotia



Figure 11. Release sites of tagged lobsters (July, 1988). Number of lobsters released at each site indicated in parentheses.