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Lobster Stock Assessment for LFA 31

by

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Abstract

Lobster landings in LFA 31 in the late 1970's were less than 5% of the historical peak. Landings began to recover in 1980 and despite an 1150% increase by 1989 were still only 20% of the historical high. Fishermen in the easternmost portion of LFA 31, LFA 31', requested a permanent two week extension of their season. This assessment is based on historical landings, logbook data and catch size frequencies.

It was determined that lobstermen between 1986 and 1989 in LFA 31' fished 20% fewer days per season than those in the remainder of LFA 31. During this same period, increases in the following state variables were determined for LFA 31'; days fished, traps hauled, CPTH, and exploitation rate. Concomitant with these increases were decreases in mean carapace length and average weight of lobsters.

Given that a stock-recruitment relationship has not been discerned, that there is some degree of growth overfishing, and that a well defined set of management objectives for stock recovery have not been developed, the request to increase effort was not supported.

Résumé

Dans la ZPH 31, les débarquements de homard de la fin des années 1970 n'atteignaient pas 5 % des plus fortes prises historiques. Ils commencèrent à s'accroître en 1980. Bien qu'ayant augmenté de 1150 %, ils n'atteignaient en 1989 que 20 % du record historique. Les pêcheurs de la zone LFA 31', c'est-à-dire de l'extrémité est de la ZPH 31, ont réclamé une prolongation permanente de deux semaines de leur saison. La présente évaluation est fondée sur les débarquements historiques, sur les données des journaux de pêche et sur les fréquences de taille des prises.

On a établi qu'entre 1986 et 1989, les pêcheurs de la ZPH 31' ont connu 20 % de moins de jours de pêche par saison que ceux du reste de la ZPH 31. On a par ailleurs constaté des augmentations dans les variables d'état suivantes durant cette période dans la ZPH 31' : jours de pêche, casiers levés, prises par casier levé et taux d'exploitation. Parallèlement à ces augmentations, on a enregistré une diminution de la longueur moyenne de carapace et du poids moyen du homard.

Comme il n'a pas été possible d'établir une relation entre le stock et le recrutement, que la population en croissance est dans une certaine mesure surexploitée et qu'il n'y a pas d'objectifs de gestion bien arrêtés pour rétablir les stocks, on ne peut souscrire à la demande d'accroissement de l'effort.

Introduction

Lobster fishermen in the Canso portion [Lobster Fishing Area (LFA) 31'] of Lobster Fishing Area 31 (see Fig. 1)] requested a two week extension to their open fishing season (see Appendix 1). Season extension would increase fishing effort. Current CAPSAC advice recommends no increase in effort for the eastern Canadian lobster fishery. Similarly, Miller et al. (1987) recommended no increase in effort in LFA 31/32 (these two lobster LFA are managed as a single stock based on the similarity of historical landing patterns) without a concomitant increase in minimum legal size. The purpose of this paper is to review available data on the fishery to determine the merits of the Canso fishermen's request.

Background

LFA 31/32 is located on Nova Scotia's eastern shore between Halifax and Cape Breton Island (Fig. 1). The eastern portion of this stock (LFA 31) includes the southern half of Chedabucto Bay and extends west to the Halifax/Guysborough County border. Lobster landings peaked in the late 1800's (Fig. 2a), and since have never been stable. There were two minor peaks; one in the early 1930's, the other in the early 1950's. The fishery was deemed collapsed (5% of peak landings) in the late 1970's (Robinson 1980). Since, there has been a five-fold increase in annual yields, but they are yet far short of the historical peak (Fig. 2a).

Effort is limited in this fishery. A limited entry fishery was introduced in 1968. The number of licensed fishermen was reduced by 53% in 1978/81 (voluntary retirement program), from 300 to 141 in LFA 31; 75 of these are in LFA 31'. The original open fishing season for this stock (LFA 31/32) was 63 days, extending from April 29 to June 30. Lobster fishermen in LFA 31 had this changed, by a variation order in 1987, to 65 days; extending from April 18 to June 21. Fishermen in the Canso area (now LFA 31', see Fig. 1), had their open season changed as well, from April 29 to June 30, a total of 63 days. The reason given for a later occurring open season was late spring ice conditions, particularly in southern Chedabucto Bay. Traps are limited to 250, the lowest number permitted in eastern Canada.

The collapsed fishery of the 1970's created some attention at the Canso Causeway workshop (McCracken 1979). Dadswell (1979) suggested the Causeway inhibited flow of larvae from the warm, summer waters of George Bay [warm summer waters should increase larval survival, all else being equal (MacKenzie 1987)] to the colder Chedabucto Bay waters. Harding et al. (1983) agreed, and estimated that the Causeway decreased larval flow by about 20%. Robinson (1979), argued that excessive fishing pressure, causing recruitment overharvesting, was to blame. Robinson (personal communication to JDP) claimed the fishery was stable during the 1940's when estimated egg production per recruit was 5,000. The recent increase in landings, beginning in 1983, came from, what appeared to be a reduced broodstock of the 1970's (this is based on a linear relationship between catch and broodstock density). A stock-recruit relationship is not apparent.

Both broodstock density and yield per recruit can be protected by legal minimum size. Miller et al. (1987), found the LFA 31/32 stock to be yield overharvested. They estimated a 21% increase in y/r with a 13 mm increase in minimum legal size, to 94 mm CL (about one molt length).

Data Sources and Methods

Historical lobster landings were obtained from Statistics Canada records, collated by Ms. Ann Williamson, DFO St. Andrews, and from the Scotia-Fundy Region's Statistics Division. Certain fishermen in LFA 31/32 volunteered to record daily number of trap hauls and daily landings. Canso (LFA 31') fishermen do not fish Sundays, whereas those fishermen to the westward tend to. Thus the data presented in Table 1 are for LFA 31 fishermen who do not fish Sundays.

Exploitation rate (A) was calculated using the method employed by Miller et al. (1987):

$$A = 1 - (M2/M1)$$

where $M1 = M1'/tm1$ and $M2 = M2'/tm2$. $M1'$ and $M2'$ are the number of lobsters in the catch in the first and second molt classes of market size (approx. 81-93mm and 93-107 mm CL), and $tm1$ and $tm2$ are the average time in years spent in the molt class.

Number of lobsters in each molt class was obtained from length frequency data collected by lobster technicians (D. Moore in 1985 and R. Duggan in 1986 through 1989) from the landed catch of fishermen. A sample was 500 lobsters chosen haphazardly from the catch of 2-4 fishermen from the ports of Canso and Port Bickerton, in both the early and latter parts of the season. Average time spent in each molt class was determined from estimates of molt probability.

Results and Observations

Annual lobster landings in LFA 31 increased by 1150% since 1980 (Fig. 2b) [Note that Guysborough Co. includes all of SD 14 (Fig. 1), whereas LFA 31 excludes the most northerly portion of this insignificant lobster producing SD]. The 1989 landings, however, are yet less than 20% of all time peak landings. Nevertheless, annual yields continue to increase at a rapid rate; 1989 landings (540 t) increased by 32% over 1988 (366 t) landings. LFA 31 consists of Statistical Districts (SD) 15 through 17 and a portion of SD 14 (Fig. 1). Landings increased more rapidly in SD 15 and 17 than in the other two SD (Fig. 2b).

Estimates of effort and fishing success as derived from logbooks over four years, are presented in Table 1. Since 1986 effort, as represented by mean number of days fished, increased as follows: Canso (LFA 31'), by 26%; Larry's River, (western SD 15) by 13.5%; Port Bickerton (SD 16), by 4%; and Liscomb (SD 17), by 7.6%. Season trap hauls increased as well in all these areas, but

again the largest increase was Canso with an increase of 36%. The mean number of trap hauls per day in this port was 183 in 1986, in 1989 it was 212. This same character was 211 and 218 respectively for Larry's River: 227 and 230 respectively for Port Bickerton (SD 16); and 214 and 218 respectively for Liscomb (SD 17). Despite marked increases in effort in LFA 31' (Canso) since 1986, the mean number of days fished (41) is still lower by up to 20% than ports to the westward (Table 1). Similarly, total trap hauls per season per fisherman was lower at 8022, compared to more westward ports, which ranged from 10,319 (SD 16) to 11,077 (SD 17).

Fishing success, measured as CPTH, is presented in Table 1. Recruit abundance, as measured by this characteristic, appears to have increased in all of LFA 31 (this includes LFA 31') from 1986 through 1989. The lowest CPTH in 1986 was 0.20 kg at Larry's River. This increased to 0.37 kg per trap haul in 1989. This character at Canso ranged from 0.32 kg in 1986 to 0.49 kg in 1989. The grand seasonal mean per study site ranged from a low of 0.26 kg cpth at Larry's River (SD 15) to 0.42 kg cpth at Canso (LFA 31').

Annual mean lobster size (both CL length and weight) for both Canso (LFA 31') and Port Bickerton (SD 16) is given in Table 2, as is the grand mean for each characteristic over the four years. The Canso annual mean CL decreased from 1986 (101 mm) to 1989 (92.5 mm); the annual mean weight decreased as well (from 0.93 kg to 0.68 kg). The grand mean for both length and weight was 96.9 mm and 0.77 kg respectively.

Exploitation rate for Canso increased markedly between 1985 and 1986, going from 0.33 to 0.50. Thereafter, the rate increased slowly to 1987 (0.53), decreased slightly (0.49) to 1988 and then increased to 1989 (0.54).

Discussion

The 1989 annual lobster landings for LFA 31 are the highest in nearly three decades (Fig. 3). Yields have been increasing at an annual rate not experienced since the late 1950's. The marked reduction in licensed fishermen a decade ago, and the decision two decades ago to both limit entry to the Canadian lobster fishery and disallow a sport fishery has no doubt permitted individual fishermen to enhance earnings. Cause of this widespread increase in landings is due to an increased abundance (Pringle and Duggan 1984, Miller et al. 1987) and not an increase in fishing pressure. The increased effort noted earlier (Table 1), was driven by the increased lobster densities.

The increase in landings has been widespread, occurring somewhat earlier in the southern Gulf of St. Lawrence (Anonymous 1989, Pezzack in press) than along Nova Scotia's Cape Breton, eastern and southern shores and in Massachusetts (Pezzack in press). Cause(s) of this recruitment pulse are currently being debated; given the time from egg hatch to recruit (about five to ten years depending on water temperatures), it must have had its origin in the early to mid 1970's. For Guysborough Co., the last, albeit minor, peak in annual landings (Fig. 3) occurred ten years prior to the recruitment pulse

(1971). This might have been the broodstock source that is driving current landings. Robinson (personal communication to JDP) reported a large increase in pre-recruit abundance at a 1979, DFO sponsored workshop (Pringle et al., 1980). However, most suggest the lag between egg hatch and recruit abundance, about seven to eight years for these waters, is shorter than what was observed. Others have suggested favourable environmental conditions for pre-recruit survival, but such factors have not been identified (Miller et al., 1989, Pezzack in press). In fact, the recruitment pulse has challenged (Dr. G. Conan, pers. communication to JDP) the only previously successful predictor of lobster landings (Sutcliffe 1973): The mean annual St. Lawrence River discharge (Dr. K. Drinkwater as personal communication to JDP). Conan (Dr. G. Conan, personal communication to JDP) recently suggested that improved DFO resource management was responsible for the increase in abundance. The recruitment pulse has, however, crossed the USA/Canada border. Management systems are markedly different within the two countries.

The recruitment pulse has benefitted LFA 31 fishermen, but the increases in catches throughout the stock have not been equal: Fishing success has been greater in the east than in the west (Table 1), although it began in 1981 in all Area SD (Fig. 3). Unfortunately, log book records were not available prior to 1985, but at this time the mean lobster size in the Canso (LFA 31') catch was 101 mm CL, much larger than in 1989 (92.5 mm). These data suggest the mean recruit size is decreasing, a sign of excess fishing pressure. This concept is supported by a decrease in the size of the largest animals observed per year in the catch (Table 2). However, despite a smaller mean size in the catch, both landings and cpth have increased in concert with increased fishing pressure, which suggests a healthy fishery. Furthermore, exploitation rates of around 0.50, are far short of the values reported for Newfoundland (>0.85) (Pringle et al., 1983), and by Miller et al. (1987) for the Bay of Fundy (0.71), southwestern Nova Scotia (0.83), southern Nova Scotia (>0.74) and the Sydney Bight (0.82).

Fishermen of LFA 31' want a two week increase in the open fishing season, one week on either side of the present May/June harvest. They claim bad weather gives them fewer fishable days than their colleagues to the west. Comparison of effort data (Table 1) shows that they do indeed fish fewer days by up to 20%. Canso fishermen have a work ethic that is similar to that of the more westward workers. They do not fish Sundays, but neither do the fishermen displayed in Table 1. It appears they do have a legitimate complaint; that their fishing grounds are considerably more exposed to adverse winds and high seas than the grounds to the west. This prevents them from attaining equal access to the lobster stock.

The LFA 31/31 stock is in a recovery mode. Furthermore, this stock and that to the westward (LFA 33-Halifax to Cape Sable Island) have not had a history of stable and sustained yield (Figure 2-landing patterns in LFA 33 are similar), unlike the stocks further to the west (LFA 34-southwest Nova Scotia) and east (Sydney Bight-LFA 27). Both these stocks have sustained equal or greater fishing pressure to that of LFA 31/32, with a much higher level of

productivity. [This may be due to mechanisms which promote increased larval survival: in LFA 27, warm water and the presence of a gyre (personal communication from Dr. Brian Petrie to JDP) and; in LFA 34, upwelling of cold, but nutrient rich waters seaward of the inshore grounds which may help to retain larvae]. Thus the resource management plan for LFA 31/32 may have to be much more aggressive than for LFA 27 and 34. If the LFA 31/32 stock collapsed because of recruitment overharvesting, as suggested by Robinson (1980), then a larger broodstock may be required. This can be accomplished by either increasing the minimum legal size (see Miller et al., 1987) or by maintaining a conservative exploitation rate.

The request to increase the length of the open season by 14 days, would yield about nine more fishing days (losses due to Sundays and adverse weather). The 75 fishermen would pull about 200 traps for each of these days for a total of 135,000 trap hauls. This would represent an increase in effort of about 22% for LFA 31'. Such an effort increase would no doubt increase exploitation rate significantly.

Conclusions

- 1) That lobster production along Nova Scotia's eastern shore has been unstable; and is now, despite a dramatic increase in annual yields the past eight years, only 20% of peak landings.
- 2) That LFA 31' fishermen fish 10% to 20% fewer days than their colleagues in LFA 31 to the west, because of harsher weather conditions.
- 3) That since 1986, catch rates, effort and annual landings have increased in LFA 31', but mean lobster size and maximum lobster size have decreased.
- 4) That exploitation rates between 1986 and 1989 have increased from 0.33 to 0.54.

Recommendations

- 1) That current levels of effort not be increased, and that the exploitation rate of about 0.50 continue to be the target.
- 2) That research be carried out to better understand the reproductive ecology of the LFA 31' broodstock and its contribution to both the local fishery and that of the total management area (LFA 31/32).
- 3) That the request of the LFA 31' fishermen be reassessed in two to three years.

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MEMORANDUM

NOTE DE SERVICE

TO
A

Dr. J.D. Pringle
A/Div Chief/Laboratory Director
Invertebrate Fisheries & Aquaculture Div
Biological Science Branch
Scotia-Fundy Region

FROM
DE

F.H. Allen
Area Manager
Fisheries & Habitat Management
Eastern Nova Scotia

SUBJECT
OBJET

Request For Extension To The Lobster Fishing Season
For A Segment Of Lobster Fishing Area 31
(West of White Head)

SECURITY CLASSIFICATION / DFO / PERSÉCUTÉ
5754-1
OUR FILE - N / RÉFÉRENCE 1989
232833
YOUR FILE - V / RÉFÉRENCE
DATE
14 March '89

I refer to the formal request for a two week increase to that part of Lobster Fishing Area 31 lying west of White Head, Guysborough County, N.S. The request for a two week seasonal increase was tabled at the Area 31/32 Lobster Advisory Committee Meeting in Sherbrooke, N.S. on Tuesday, 28 February 1989 and was presented by the two elected representatives of the lobster fishermen in that area.

As noted at that meeting, this has been a long standing request by lobster fishermen of Area 31 fishing west of White Head but, until recently, they had not been in a position to present a unified approach. They now state that they are unified in their request for a two week increase with a week to be added to each end of the existing season.

Having said that, the original season, by regulation, for Lobster Fishing Area 31 was from 0600 hrs, 29 April to 30 June, inclusive.

At the request of the Area 31 Lobster fishermen, that season was varied in 1987 to run from 18 April, 0600 hrs, to 21 June, inclusive.

After that, the lobster fishermen fishing west of White Head requested a season for their portion of Area 31 only to run from 0600 hrs, 01 May to 30 June, 1987. This request was due to severe ice conditions in the area, was approved and was implemented by variation order in 1987. The request for the late start was again tabled in 1988, again due to late moving ice and again implemented by variation order.

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Memo to: J.D. Pringle
From: F.H. Allen
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At this point in time, the lobster fishermen fishing Area 31 west of White Head are looking for a two week increase to that revised sub-area and, as such, this memorandum constitutes their formal request for that two weeks' increase in season.

The stated reason for the extension is to off-set a number of days lost annually due to storms in this exposed area. While we note that there are differences in the portion of Area 31 in question, ie more exposed coastline, and there are invariably a few fishing days lost to storms, we do have mechanisms (variation orders) to allow for loss of fishing time. In any case, we do not feel they lose two weeks fishing time annually.

It was mentioned during the Area 31/32 Lobster Advisory Committee meeting that log book reports from lobster fishermen west of White Head suggest that those fishermen may have had eight to 10 days less fishing time than others in Area 31. Some lobster fishermen stated that it was because the fishermen west of White Head did not, by choice, fish on Sundays while others did. However, local officers report very limited fishing, on Sundays, throughout Area 31. Certainly, we do not feel that the portion of Area 31, west of White Head loses eight to ten days fishing time, for any reason, on an annual basis unless related directly to fishermen effort.

The bottom line is, however, that the request for a two week increase to this segment of Area 31 has been presented and the question is what impact on the resource could be expected from such an increase as suggested and, indeed, could science support the request.

At the 28 Feb meeting, representation from other segments of Area 31 stated generally they were not in favor of an increase in their area but see no problem for an increase, if possible, for that part of Area 31 west of Whitehead.

However, we have just received a letter & petition from Fishermans Harbour, Guysborough Co, N.S. (attached) wherein thirteen (13) of the eighteen (18) lobster fishermen in the immediate area are in favour of an extension (increase) of some sort to Lobster Fishing Area 31.

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From: F.H. Allen
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So it begins! We can expect the ball to start rolling throughout Area 31 in favour of an additional two weeks if all concerned see it as a distinct possibility for one small segment.

For your information and referral through the CAFSAC process.



F.H. Allen

cc: G. Jefferson
N. Bellefontaine
L. Boudreau

Attachments

Table 1. Fishing effort (days fished and trap hauls) for Canso (an average of from 1-4 fishermen) and non-Sunday fishing fishermen from three other ports in LFA 31.

Year	Canso mean			Larry's River			Pt. Bickerton			Liscomb		
	days fished	trap hauls	c.p.t.h. (kg.)	days fished	trap hauls	c.p.t.h. (kg.)	days fished	trap hauls	c.p.t.h. (kg.)	days fished	trap hauls	c.p.t.h. (kg.)
1986	34	6234	.32	45	9494	.20	48	10919	.35	49	10665	.39
1987	42	7803	.43	50	11249	.21	44	9948	.32	50	11244	.37
1988	41	8140	.43	51	11293	.27	41	8866	.35	51	11020	.35
1989	46	9752	.49	52*	11375*	.37	50	11544	.45	53	11382	.45
Mean (4 yr)	41	8461	.44	50	10853	.26	46	10139	.37	51	11077	.39

* Figures adjusted to reflect Sunday fishing only, this individual fished Sundays for first time this year.

Table 2. Data from length frequencies (average size and weight and maximum size) for Canso and Port Bickerton.

Year	Canso			Port Bickerton			
		Avg. size (cl mm)	Avg. wt. (Kg.)	max. size (cl mm)	Avg. size (cl mm)	Avg. wt. (Kg.)	max. size (cl mm)
1986	1 *	102	.93	188	94.2	.61	134
	2 **	100	.93	181			
mean		101	.93				
1987	1 *	93	.70	141	91.4	.65	135
	2 **	100	.60	195			
mean		96.5	.65		93.5	.73	
1988	1 *	96	.79	176	90.7	.63	123
	2 **	98	.88	175			
mean		97	.84		92.1	.69	
1989	1 *	93	.69	152	91	.63	139
	2 **	92	.67	159			
mean		92.5	.68		92.5	.67	
4 yr mean		96.9	.77		93.1	.68	

* Early season sample

** Late season sample

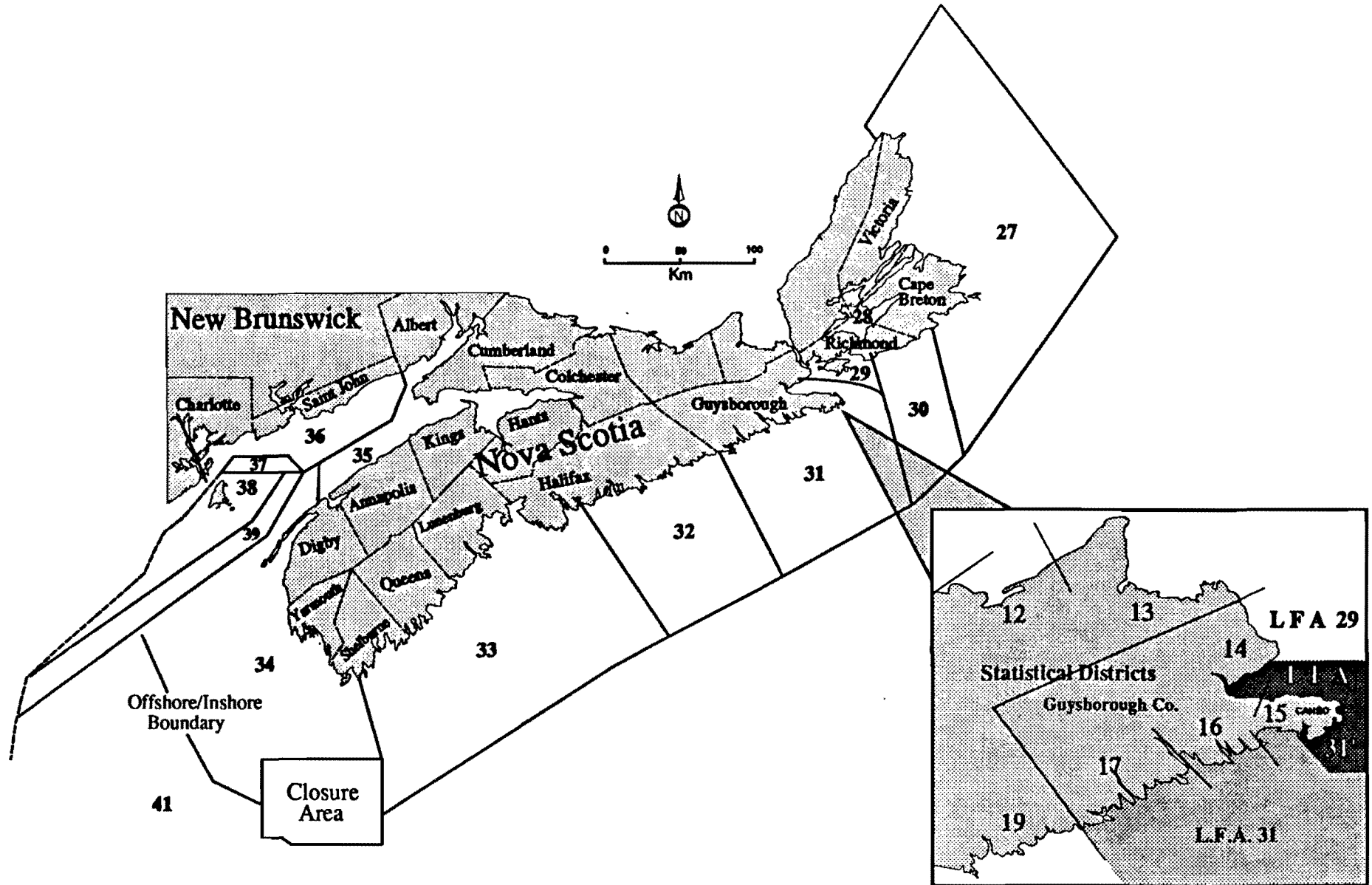


Figure 1. Scotia Fundy Region Lobster Fishing Areas. LFA 31' and associated statistical districts.

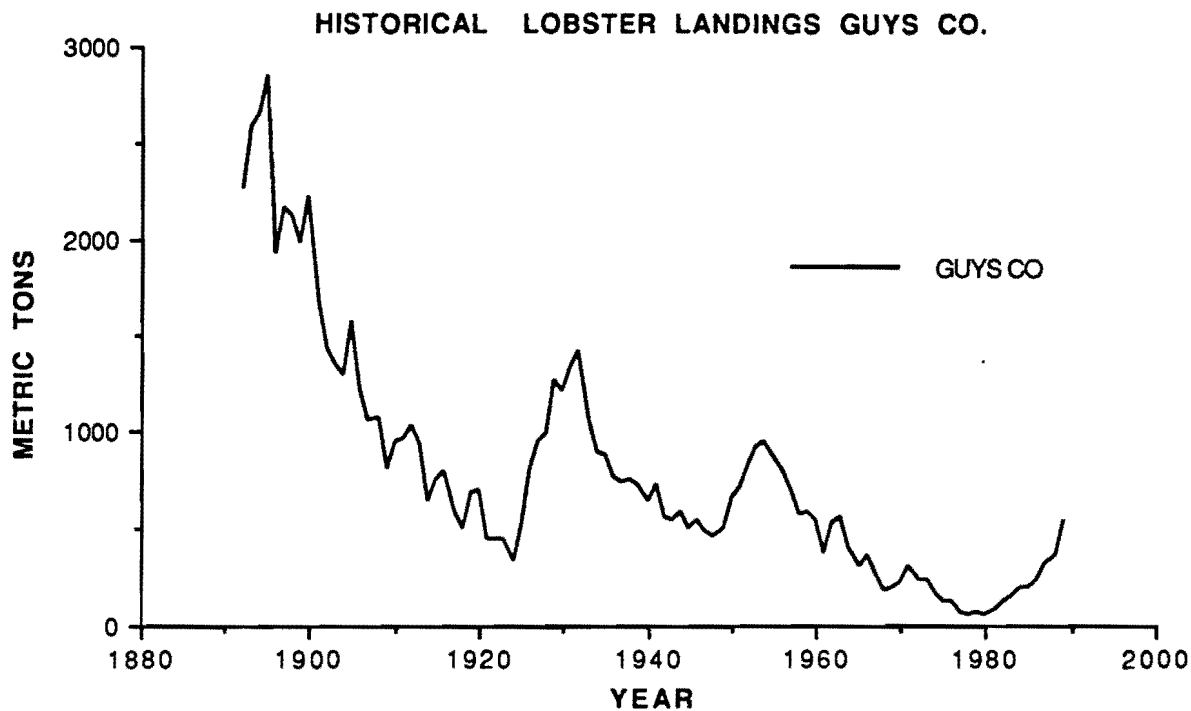


Figure 2 a. Historical lobster landings Guysborough Co.

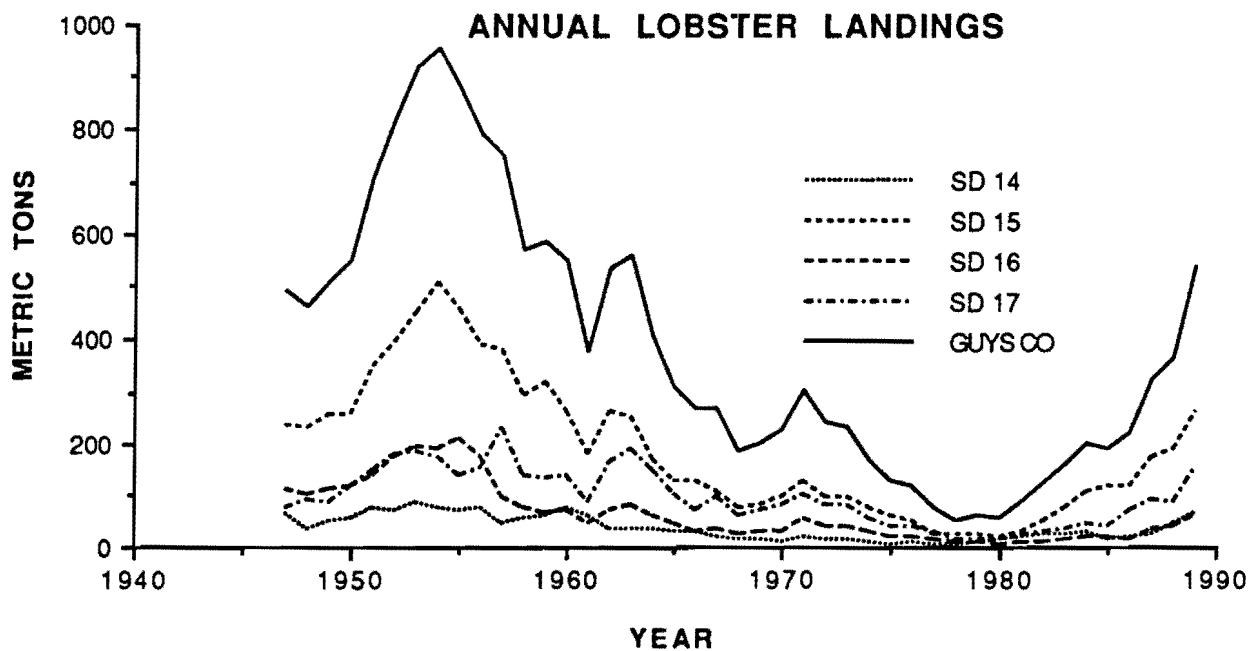


Figure 2 b. Annual lobster landings by statistical district for Guysborough Co.