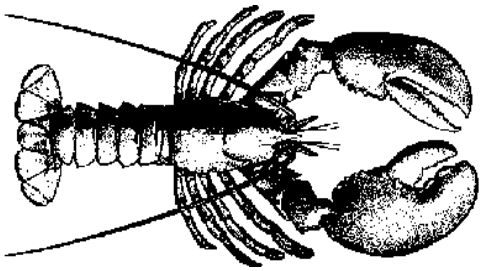


LFA 41 Offshore Lobsters

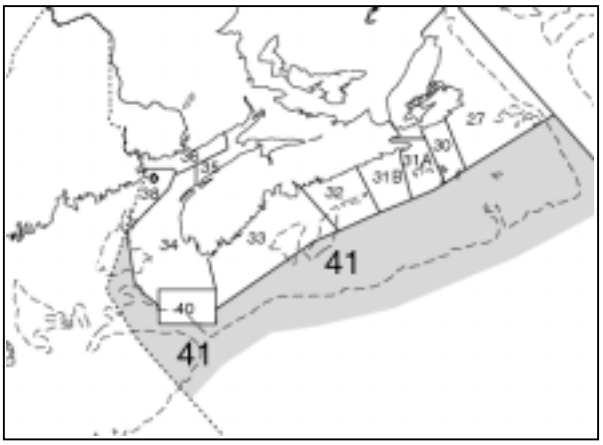
Background

Lobsters are found in coastal waters from southern Labrador to Maryland, with the major fisheries concentrated around the Gulf of St. Lawrence and the Gulf of Maine. Though lobsters are most common in coastal waters, they are also found in deeper, warm water areas of the Gulf of Maine and along the outer edge of the continental shelf from Sable Island to off North Carolina. Lobsters make seasonal migrations moving to shallower waters in summer and back to deeper waters in winter. Over most of the lobster's range these movements amount to a few kilometres for most lobsters. However, in the Gulf of Maine and off the coast of New England lobsters can undertake long distance movements of 10`s to 100`s of km. Tagging studies have also shown that at least some of these lobsters are capable of returning to the same areas each year.

A crustacean, the lobster has its skeleton on the outside of its body and to grow must shed the shell, a process called molting. Very young lobsters molt 3-4 times a year, increasing 50 % in weight and 15 % in length with each molt. In the waters off southwest Nova Scotia lobsters take 8 or perhaps more years to reach legal size at 82.5 mm carapace length (CL). At that size they weigh 0.45 kg (1 lb.) and molt once a year. Larger lobsters molt less often, with a 1.4 kg (3 lb.) lobster molting every 2-3 years. The largest lobster ever reported was 20 kg (44 lb.), estimated to be 40-65 years old.

Off southwestern Nova Scotia, the average size at maturity is between 95 and 100 mm CL at an average weight of 0.7 kg (1.5 lb.). The mature female mates after molting in midsummer and the following summer produces eggs that attach to the underside of the tail. The eggs are carried for 10-12 months and hatch in July or August. The larvae spend 30-60 days feeding and growing near the surface before settling to the bottom and seeking shelter. For the first 2-3 years lobsters remain in or near their shelter to avoid the small fish that feed on them. As they grow and have less chance of being eaten, they spend more time outside the shelter. At this point, they become more catchable in lobster traps.

Lobster landings increased dramatically over the entire east coast of North America during the 1980s. While landings have subsequently declined in many areas they have remained high in the Gulf of Maine-Bay of Fundy region (LFA 34-41). The underlying cause of the increase is not known but the large-scale nature of the increase suggests an environmental cause that improved larval and juvenile survival.



Summary

- The ecological and oceanographic information reviewed infer that there is a complex lobster stock within the Gulf of Maine and Georges Bank area, with an unknown degree of seasonal and life history mixing amongst Canadian LFAs and USA fishing areas. Thus the evaluation of stock status in LFA 41 needs to be considered within the broader context of the Gulf of Maine area.
- The development of the LFA 41 Jonah crab bycatch fishery in 1995 resulted in more widespread fishing activity within the traditional offshore area.
- The 1998-99 season has the 4th lowest landings in the 14 year series but initial reports from the fall and winter 1999-2000 season indicate high landings.
- 1997-99 had the lowest CPUE in the recent period (1994-99). During the past several years there has been substantial change in the bottom temperature in the area which may have affected the characteristics of this fishery.
- Size information from the trawl surveys infers a considerable abundance of small legal sized lobsters in LFA 41 which are

not prosecuted by the fishery.

- The size composition of the lobsters in the trap catch on Georges Bank, SE Browns and Georges Basin has remained stable since the fishery began in 1972. The greater temporal variability in other areas requires more extensive sampling before conclusions can be drawn.
- The large median size (1-3 molt groups above the size of 50% maturity) and the wide size structure means that a very high percentage of animals reproduce at least once prior to capture and most twice.
- Sex ratios shifted in the late 1970s-early 1980s with an increase in the proportion females in the catch.
- There is no evidence that the LFA 41 fishery has affected the landings in LFA 34, which have increased from 3000t in 1976 to over 13,000t in 1998-99.
- The LFA 34 midshore fishery developed since the early 1980s and its landings may exceed that of the offshore in the western Browns Bank area. The development of this fishery could have an effect on size and catch rates in LFA 41.

The Fishery

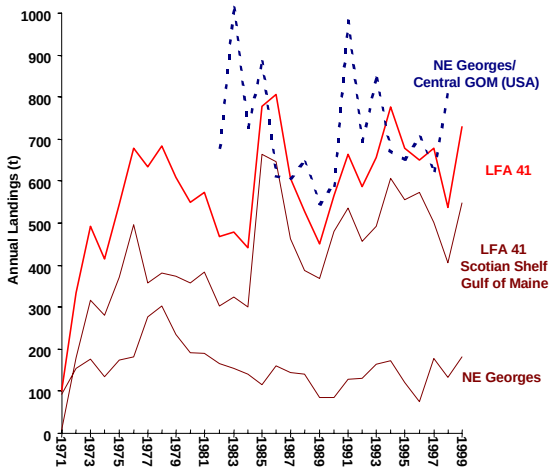
Year	71-80 Avg.*	81-91 Avg.*	93/94 **	94/95 **	95/96 **	96/97 **	97/98 **	98/99 **
TAC (t)			720	720	720	720	720	720
Total (t)	504	569	700	717	721	670	622	548 ***

* Annual landings Jan-Dec.
** Quota year landings Oct. 16-Oct. 15 (1984-99)
*** Preliminary Landings

The Canadian offshore fishery began in 1972 in the area outside the offshore boundary line, approximately 92km from shore, from the Gulf of Maine to the Laurentian Channel off Cape Breton. All fishing occurs in the Crowell Basin, Georges Basin, Browns Bank portion of 4X and Georges Bank (5Ze) area. Licences were frozen at 8 in 1976 with a trap limit of 1000/vessel and a 408t TAC (total allowable catch) was placed on vessels fishing 4X; no quota was applied to 5Ze. To protect brood stock believed to occur on Browns Bank, a rectangular closed area (LFA 40) was established in 1979 that encompassed all portions of the bank less than 50 fathoms.

Landings are reported by quota year (Oct. 16-Oct 15) since 1984 but the time series involving historical data is reported as annual landings (Jan 1- Dec 31) and this may exceed the nominal TAC.

Annual lobster landings



Following the International Court of Justice (ICJ)-Gulf of Maine boundary decision in 1984, American effort was removed from northeast Georges Bank and most of Georges and Crowell basins. A 720t TAC (90 t/licence) was set in 1985 for all of LFA 41 and an Oct. 16 - Oct. 15 season was established. The 720t TAC was based on the previous 4X quota (408t), the historical 5Ze landings and a conservative estimate of previous American landings from the region. An Enterprise Allocation plan was put in place in 1985 and trap limits were eliminated in 1994. In 1995, a 720t Jonah crab bycatch was allowed. In 1998, landing of v-notched lobsters was prohibited and in the fall of 1999 the minimum size was increased from 81mm carapace length (CL) to 82.5 mm.

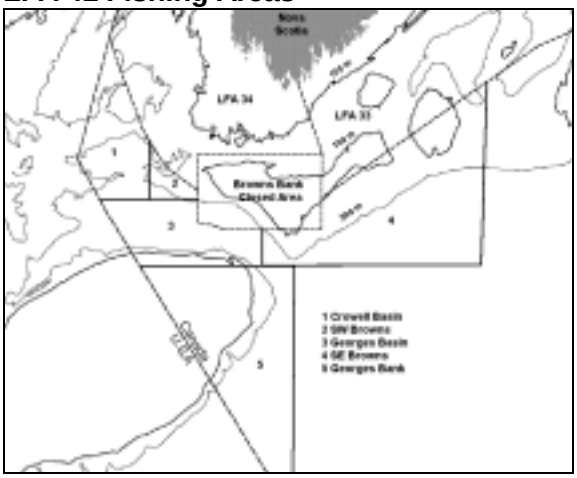
Annual landings (t)

	Canada LFA 41				USA
	Scotian Shelf Gulf of Maine		NE Georges Bank	LFA 41 Total	NE Georges Bank /Central Gulf of Maine
	W Browns	SE Browns			
1971	0	8	92	100	N/A
1972	22	158	154	334	N/A
1973	136	181	176	493	N/A
1974	132	149	135	416	N/A
1975	171	201	173	545	N/A
1976	378	118	182	678	N/A
1977	290	68	277	635	N/A
1978	297	84	303	684	N/A
1979	215	158	236	609	N/A
1980	147	210	192	549	N/A
1981	136	247	190	573	N/A
1982	150	152	166	468	680
1983	210	114	154	478	1012
1984	173	127	140	440	729
1985	456	208	114	778	883
1986	478	169	161	808	612
1987	352	112	145	609	606
1988	289	99	139	527	643
1989	308	56	85	449	545
1990	373	108	85	566	589
1991	435	100	129	664	981
1992	382	74	130	586	696
1993	392	101	164	657	845
1994	434	173	172	779	674
1995	388	169	121	678	652
1996	405	169	76	650	704
1997	318	180	177	675	624
1998	269	137	132	538	816
1999	410*	148*	169*	727*	N/A

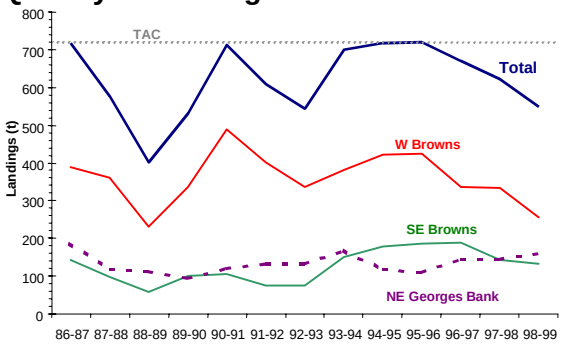
*Preliminary

The offshore fishery has been traditionally assessed by 5 areas based on fishing patterns and size structure rather than biological or stock significance. In recent years, vessels have moved their gear more and the 5 areas have become less distinct so they are often combined into three major grounds: Georges Bank (outer shelf and upper slope), Southeast Browns (outer shelf and upper slope east of the Northeast Channel) and West Browns (Georges Basin-Crowell Basin SW Browns).

LFA 41 Fishing Areas



Quota year landings

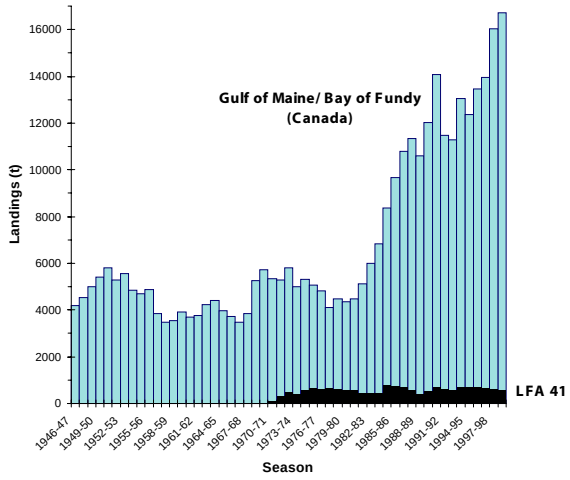


Canadian landings increased in 1985-86 following the removal of American effort from Canadian grounds, and introduction of the new TAC. At the same time, the introduction of larger vessels increased the fleet's flexibility, allowing vessels to fish more than one area at a time and move gear between them as catch rates changed. The result was increased fishing effort in the area west of Browns Bank and in Georges Basin and Crowell Basin.

Landings have remained relatively stable since the new TAC and season were established in 1985-86. In contrast, adjacent LFA 34 has more than tripled its landings over the same period. The offshore fishery harvests a wide size range that includes more than 10 molt-classes compared to the nearshore fisheries in which 70% of the landings are from the newly recruited first molt group. With fishing pressure spread over

many sizes and landings not subject to year to year variations in recruitment, short-term variations in landings are believed to be due more to changing distribution, catchability and effort than to changes in overall abundance.

Gulf of Maine (LFA 24-41) lobster landings



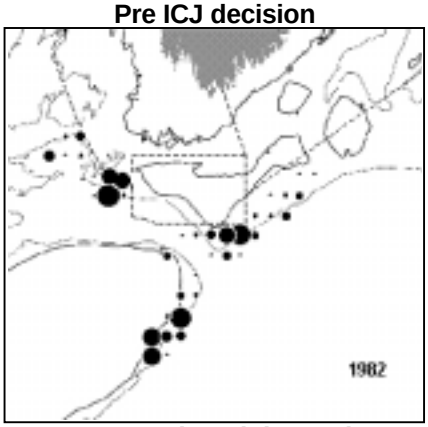
West Browns-Crowell Basin area has been the dominantly fished area since the early 1980s. Georges Bank has declined in importance since the 1970s as vessels target the closer, smaller and more economically valuable lobsters in West Browns. SE Browns has been fished by 1-2 vessels during the 1980s and 1990s and has shown a small increase in landings in recent years with vessels venturing further east than before.

The downturn in quota year landings in 1997-98 and 1998-99 corresponded to a period when cold Labrador slope water extended down the slope and into the basins. The cold water appeared along the outer slope in the fall of 1997 and moved into the basins in 1998. Temperatures were 2-4°C below normal. The cold water disappeared in late 1999 and during the fall of 1999 landings were well above the 1985-99 average.

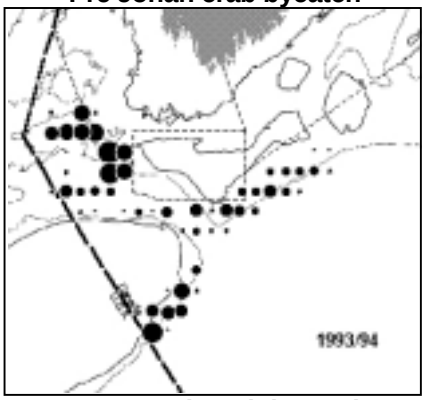
Two major events influenced lobster **landing distribution** in LFA 41. Before the ICJ decision in 1984, landings were concentrated in three areas of SW Browns, SE Browns, and Georges Bank. After the ICJ decision, Canadian landings increased in Georges and Crowell Basins following the removal of the American effort. The Jonah crab bycatch, introduced in 1994, lead to vessels fishing less productive lobster grounds in search of crab, giving a more even distribution of landings over the five areas.

Distribution of landings summarised by 10 min. squares from representative years

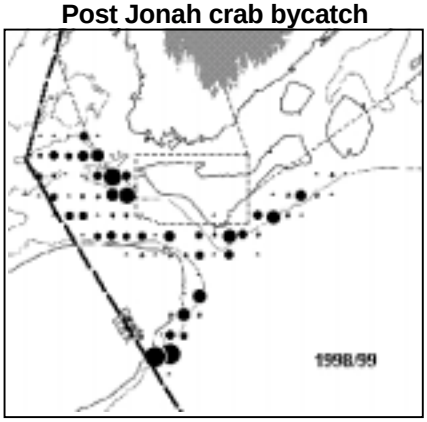
Pre ICJ decision



Pre Jonah crab bycatch



Post Jonah crab bycatch



Stock Structure

A few studies on the **genetic structure** of the lobster resource have been undertaken but the results from these have been inconclusive largely due to techniques employed and small sample sizes. A more comprehensive examination of the genetic structure of lobsters is currently in progress, which may provide insight into the relationships between various fishing areas. Data on morphology are similarly sparse but suggest differences among areas, most notably nearshore and offshore New England areas. Fishermen also claim to recognise mixed stocks in certain areas at different times of year. Morphometric studies may provide additional insight into both movement and stock relationship.

Lobster larvae are hatched predominantly nearshore (within the 30m depth contour) or offshore over the banks (~100 to 40 m depth). Settling stage larvae (stage IV) are distributed widely over the deeper waters of the Gulf of Maine. Concentrations appear off the northern edge of Georges Bank and on the warm side of the cold water front off southwest Nova Scotia, from Browns Bank to Lurcher Shoal. They are found in reduced numbers in the vicinity of Lobster Bay**.**

A **3-dimensional numerical model** of the mean summertime circulation of the southwestern Scotian Shelf and Gulf of Maine area was used to investigate possible drift patterns of lobster larvae. The model did not include nearshore areas with depths shallower than 10m and the coastline was highly idealized. However, the model currents capture the primary observed circulation features over the continental shelf.

Modeled lobster larvae were tracked from four possible lobster release sites (northern Georges Bank, southwest Browns Bank, German Bank and the Lobster Bay and vicinity). These “larvae” were then advected passively by the climatological circulation at 10 m or in one of two near surface flow fields (currents averaged over 0-1 m or 0-5 m) for upwards of 60 days. “Larvae” that reach the model shoreline are assumed to remain there.

Conclusions are preliminary but, if the model lobster larvae behave as passive particles, then based upon 30 day particle tracking at a constant depth layer using the climatological circulation model, we would conclude the following:

- Very few model lobster larvae released on northern **Georges Bank** are transported towards southwest Nova Scotia or into the central Gulf of Maine. Most of the model larvae in the upper 5m are advected offshore to the east while the vast majority of those released at 10m remain on the bank.

- Model lobster larvae released in the upper 5m on southwestern **Browns Bank** are advected predominantly eastward to the Scotian Shelf or offshore. The majority of larvae released at 10m are transported to LFA 34 seaward of the 60m isobath.

- Most of the model lobster larvae released in the upper 5m on **German Bank** are advected into the nearshore area of St. Mary's Bay whereas those released at 10m move to the mouth of the Bay of Fundy or are advected to the southwestward off the coast of Maine.

- The majority of the model larvae released in the top 10m at the outer reaches and within the confines of **Lobster Bay** remain in the nearshore region with the majority being advected to the St. Mary's Bay area. Releases at 10m also showed a significant number advected into the Bay of Fundy and to the coastal region of Maine. Significant

numbers of model larvae released at all three depths remain within the nearshore area between Cape Sable and Cape Forchu, including Lobster Bay. This, coupled with the lack of model larvae advected into this region from the other three release areas suggests that the primary source of larvae may be local production.

The predominant seaward circulation in the near surface layers offshore of Lobster Bay, as indicated by both the model and observations from drift bottles and drogued buoys, provide further support for the conclusion that few lobster larvae are likely to be advected into the bay from offshore locations. Drift bottles released offshore, however, were collected from the areas of Cape Sable east and Cape Forchu north.

The conclusions regarding possible lobster larvae drift and potential settlement areas from the model must be viewed with caution because of the idealized flow fields, the lack of time-dependent winds and the absence of lobster larval behavior.

Modeled larval drift shows strong dependence upon the vertical and horizontal release positions. Wind direction has an important effect on the particle drift tracks, especially those particles released within the top 5m. The model does not yet include realistic time-dependent winds or any life history strategies of the lobster larvae including vertical migration, depth-dependent stages, temperature-dependent stage duration, or possible directional swimming of stage IV larvae.

An extensive published literature on **lobster movement**, as revealed by mark-recapture techniques, contributes to our present understanding of stock structure in the Gulf of Maine. Most published studies have used broad size categories (e.g. <95mm; > 95mm carapace length) to analyze movement. Long-distance movement (> 50 nautical miles; 92.6km) is generally restricted to large lobsters, and may involve recaptures up to 5 years following release.

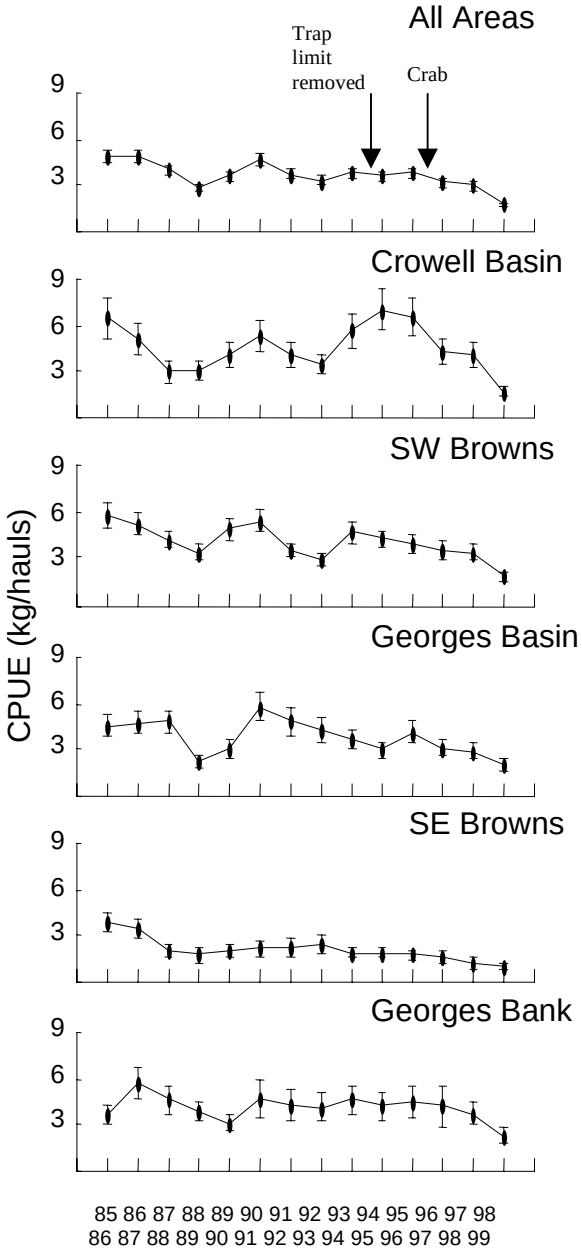
There is evidence for along-shore movement in the nearshore, as well as for dispersal from nearshore and midshore release sites off southwestern Nova Scotia, and from the Bay of Fundy, to offshore fishing grounds and US fishing grounds. Although one US tagging study showed significant movement occurred from Jordan Basin, but not Crowell Basin, into nearshore areas, there is generally little evidence for return movement to the nearshore following offshore dispersal. Seasonal interchange between offshore banks and deeper slope and basin areas occurs, including indications of long-distance movement within the offshore area. Quantitative estimates of exchange rates between different parts of the Gulf of Maine cannot be given at this time.

The **mark-recapture** approach used in historical studies does not permit discrimination between residence and return **migrations** after lengthy periods at large, except where intervening recaptures of the same individual lobster are involved. The origin of the animals that are tagged in any one location is unknown. Determining the proportion of animals in the population which make long distance movements is confounded by regional difference in the reporting rate of recaptures and the fact that where local fisheries are intense, there is a low probability that legal-sized animals survive to move long distances. The closed season in LFA 34 from June to November poses a problem in that summer movement into nearshore areas would not have been detected in these earlier studies.

Resource Status

Stock status evaluations are based on trends in landings, catch rate (CPUE) calculated from daily logbooks, and size structure of the commercial catch from at-sea sampling.

Fall-Winter CPUE by fishing area



There is uncertainty as to the use of **CPUE** as a measure of abundance. In lobsters, CPUE is strongly affected by water temperature, behaviour, gear design and learning by fishermen.

Catch rates (kg/trap haul) were analyzed for fall-spring (Oct. 8 - Apr. 7) 1985-86 to 1998-99 fishing seasons using the multiplicative model. The fall-spring period represent the majority of the catches and the highest catch rates and are thought to be most indicative of trends the fishery. Only trips with no crab bycatch were used to avoid trips wholly or partially targeting Jonah crab. The impact of this on CPUE estimates is unclear.

These analyses indicated that catch rates were the lowest in 1998-99 season for each of the five fishing areas and for all of LFA 41. The 1998-99 catch rates were between 35% to 70% of the mean of the 1994-95 to 1997-98 seasons. The 1998-99 catch rates were the lowest observed since 1994.

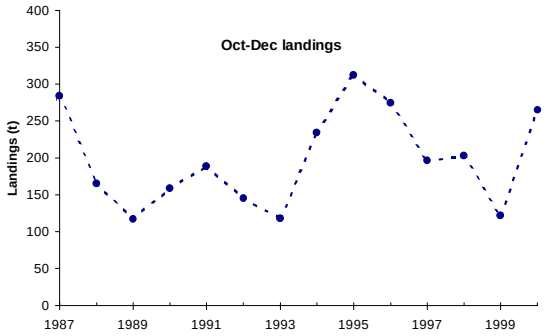
Catch rates in kilogram per trap haul (kg/th) of the five assessment areas

Area	1994-98 CPUE (kg/th)	1998-99 CPUE (kg/th)
Crowell Basin	5.39	1.90
SW Browns	3.80	1.69
Georges Basin	2.71	1.88
SE Browns	2.19	1.29
Georges Bank	4.33	2.56

Technological changes in navigation and depth sounders may have increased effective effort in recent years compared to those of the early 1980s. Conversely, prior to the removal of trap limits in 1994, trap hauls may have been under estimated by 20-50%. After 1994-95, effort reporting improved and present log records accurately report the number of traps fished. In 1995-96, the Jonah crab bycatch was introduced creating a two species fishery with some vessels targeting crab while others fished both crab and lobster. As a result, there are difficulties in comparing recent catch rates with those from earlier years.

Uncertainty exists as to the importance of the **cold water event** noted on the fishing grounds in 1997-99. Temperature is an important factor in determining lobster behaviour, movements and catch rate. Preliminary catch and size frequency data from the fall and winter of 1999-2000 suggest a reversal of the trends observed in 1997-1999 period. Comparison of catch rates and size frequencies before, during and after the event will be needed to determine its role in recent changes in the fishery.

October to December landings(t) 1987 to 1999



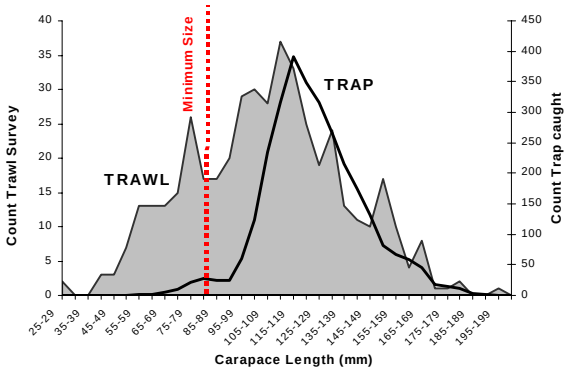
Despite the complexity of interpreting the catch rate data in LFA 41, persistent decline in catch rates over the past few years in several areas gives reason for concern.

American groundfish trawl surveys indicate no change in abundance on Georges Bank and an increasing trend in much of the Gulf of Maine over the last 15-20 years. The increase is consistent with the recruitment pulse observed in lobsters stocks on the western Atlantic in the 1980s and 1990s. Canadian groundfish surveys were not used due to inconsistent reporting of lobsters over time.

The **fishing grounds** have expanded over time, especially following the ICJ decision and in 1996-99 in response to the development of the Jonah crab fishery. Nevertheless, the major fishing concentrations remain unchanged.

Comparison of **size frequencies** in commercial lobster trap and the United States NMFS trawl survey data on Georges Bank indicates that traps in the commercial fishery do not sample the entire population. This results from different spatial distribution of sizes, size related behavioural differences and trap selectivity. Trap catches appear to under represent the prerecruit sizes and those in the first 2-3 molt groups (<120mm). The differences may be greater than the data shows as the trawl also under samples the smaller sizes.

Northeastern Georges Bank lobster size frequency from NMFS trawl survey (1980-98) and Canadian LFA 41 commercial lobster catch from at sea sampling



The **size structur**e has remained relatively stable on most grounds (Georges Bank, SE Browns and Georges Basin) since the fishery began in 1972. The most stable size frequencies are observed on Georges Bank, southeast Browns Bank and in Georges Basin. Southwest Browns Bank and Crowell Basin are more variable with the median size decreasing during the last few seasons. The decrease appears to be due to a larger proportion of the catch in the smaller sizes though no significant change was noted in the general distribution at larger sizes. There is seasonal variation in the size structure of these areas that border LFA 34 and the USA fishery. The shift in size structure could result from a number of causes, such as: seasonal movement of animals through the grounds, change in size related catchability due to the recent cold water conditions, a recruitment pulse increasing the numbers in the smaller sizes as observed in the Bay of Fundy fishery, or subtle changes in fishing practices, areas and gear. The potential impact of these factors on the size structure is not known.

The long-term stability could be due to a combination of several factors:

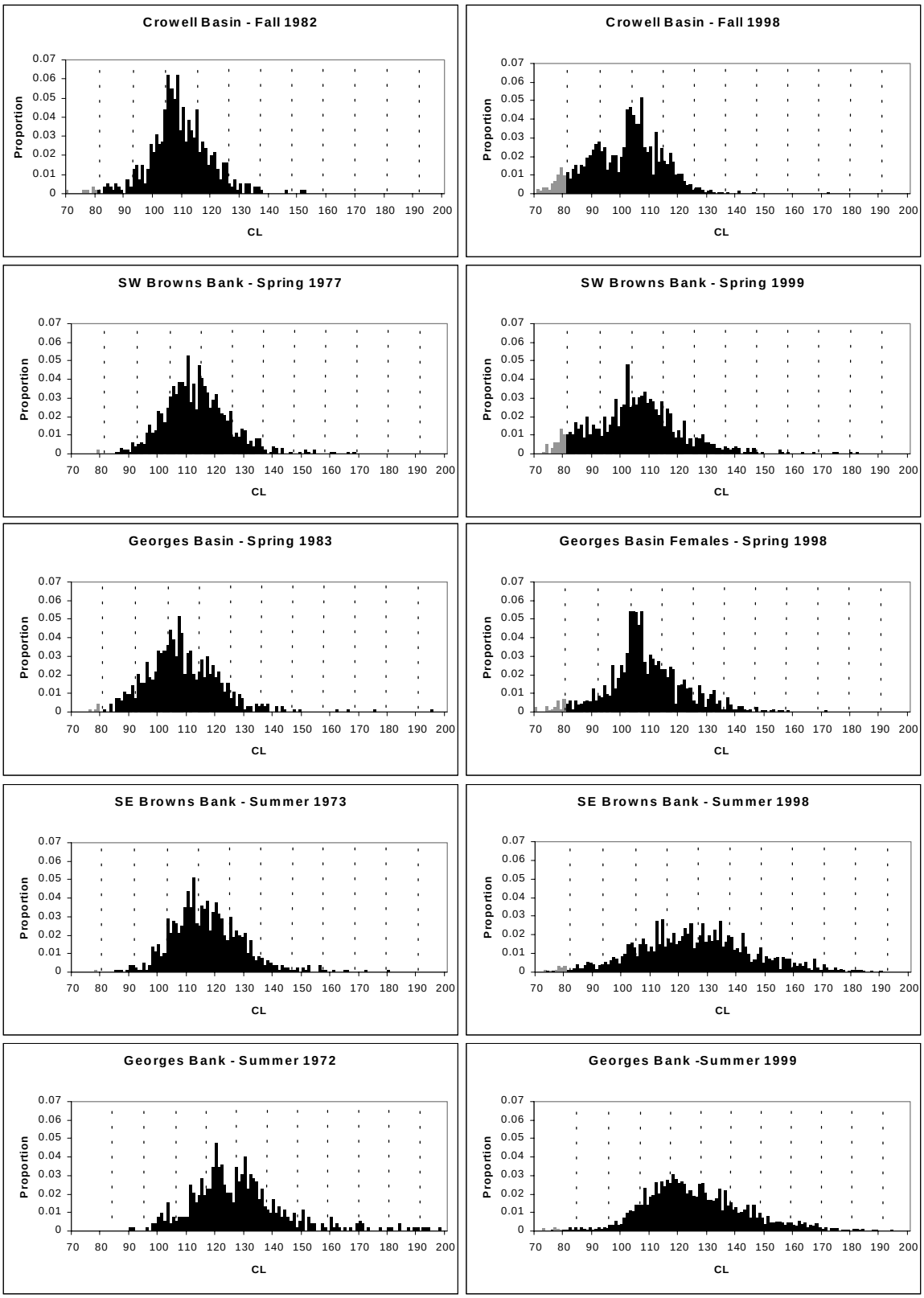
- The fishery may be having little impact on the population.
- The size structure is a dynamic response to life history movements.
- The stability is related to catchability and trap selectivity, which may mask changes in the population size structure.

The percentage of the catch in the first molt group (molt groups based on average female growth increment of 11 mm) ranges from 13% in Crowell Basin to 0.7% on Georges Bank. This contrasts with most coastal lobster fisheries that have >70 % of the catch in the first molt group. The large median size which is 1- 3 molt groups (11-33 mm) above the size of 50% maturity and the wide size distribution means that a high percentage of animals reproduce at least once prior to capture and most twice. The high level of egg production in the larger size groups is important because egg quality may not be as high in first time breeders.

History shows that given high levels of fishing in the nearshore at the turn of the century and on southern New England offshore lobster populations, that populations with large median sizes and multiple size groups can be reduced quickly to recruitment fisheries. The responses to low levels of F are not known. Thus when interpreting catch rate and size frequency trends there is uncertainty as to the true meaning of the changes observed.

Information on the resource suffers from inconsistent sampling, in time and space, making it difficult for conclusions to be drawn. The inconsistent information resulted from variability in resources available and location of the fishery. Steps have been taken to eliminate this problem and with industry support sampling has been increased in recent years.

Size frequencies comparing early and recent distributions



Sex ratios shifted in the late 1970s to early 1980s (40% to 60% male) to an increase in the proportion females in the catch in the 1990s (10% to 40% male). Interpretation of sex ratio is difficult as catchability and distribution varies by sex over the year. While there are numerous fishery and sampling related problems that could explain some of the differences, the increase in proportion female is consistent with a light to moderately fished population. The egg per recruit model indicates that at low fishing mortality (F) females benefit from the extra protection when berried while males do not. In a heavily fished population this benefit is diminished as higher numbers are harvested before they reach maturity and have a chance to become berried.

The **fishing mortality (F)** and total mortality (Z) in the population to which LFA 41 contributes could well be high but it is not possible to estimate the partial fishing mortality due to the offshore fishery. The relative landings in the Gulf of Maine area suggest the fishing mortality due to the offshore fishery would be a small component.

Assessments and estimations of egg per recruit need to be done on a stock basis and not on management units defined by arbitrary lines. An assessment of the overall Gulf of Maine lobster stock complex is planned for the fall, 2000.

Recruitment has been high in most inshore regions during the 1980-1990s, resulting in the record landings during that period. U.S.A. National Marine Fisheries Service (NMFS) groundfish trawl surveys data on prerecruit lobsters (<83 mm CL/tow) indicate a similar increase in much of the Gulf of Maine. However, during this same period recruitment has been relatively constant on Georges Bank.

There is uncertainly as to the **source of recruitment** to the fishery. Trawl surveys indicate prerecruits in the offshore but tagging also shows some out migration from coastal areas. The importance of these two sources may vary with location and time depending on larval settlement and relative densities of lobsters on the different grounds.

The introduction of the **Jonah crab by-catch** resulted in expansion of areas fished as most of the new area saw crab-directed effort. The crab fishery has not resulted in any major changing of timing of the lobster fishery, which is determined by availability, markets and proportion of TAC caught. The crab fishery has complicated assessments as trips can be directed for crab or lobsters or both.

There is no evidence that LFA 41 fishery has affected the landings in LFA 34. LFA 34 landings have increased from 3000t in 1976 to over 13,000t in 1998-99. The offshore landings have remained relatively constant, averaging around 600t. While accurate information on the extent of midshore LFA 34 landings does not exist, it is possible that they exceed those of the offshore in the Crowell-West Browns Bank area. The midshore fishery has developed since the early 1980s and could have an effect on size and catch rates of lobsters in parts of LFA 41. The midshore size structure is similar to the offshore but detecting changes is difficult because of the lack of a time series of sampling.

Understanding the nature of the **stock structure** is important to correctly address the need for conservation in different areas and in predicting the benefits of any changes. The relationship between nearshore, midshore and offshore fishing is critical to management of these fisheries. We don't have enough information on the strength of the stock-recruitment relationship to infer impact

between areas. It is still unclear what the relationship is between the different parts of the Gulf of Maine. The possibility exist that there are at least two populations (Gulf of Maine and Georges Bank), as well as numerous subpopulations which to varying degrees are self contained but which exchange larvae and adult lobsters with adjacent stocks. The degree of exchange will vary spatially and possibly temporally. These subpopulations do not correspond to management or international boundaries.

Uncertainties

There are a number of uncertainties in the assessment of the LFA 41 lobster fishery. Some of these include:

- LFA 41 is a component of a larger population complex and is difficult to assess in isolation.
- Catch rate data are complex due to the changes in fishing patterns and approaches. Also, expansion after the ICJ decision and different fishing method, makes it difficult to interpret trends.
- Uncertainty exists as to the effect of the recent oceanographic events on landings and CPUE.

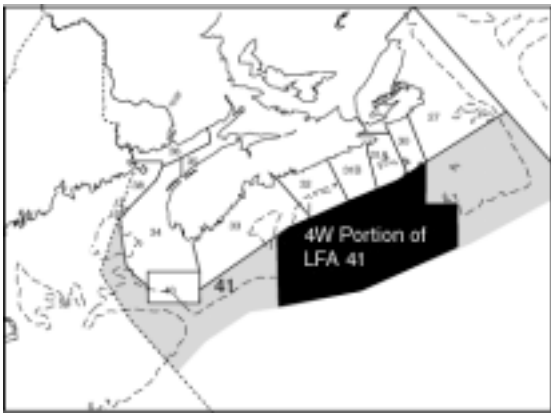
Outlook

To date, there are no indications of any negative impact of the offshore fishery on the inshore fishery. It is still unclear as to the impact of the expanded inshore fishery on the LFA 41 fishery but given its larger size some impacts would be expected.

Management Considerations

Extension of the fishery to NAFO Subarea 4W. LFA 41 extends to the Laurentian Channel but has not been commercially fished for lobsters east of 63°W. Lobsters are consistently present in low numbers in the DFO groundfish survey catches along the outer edge of the Scotian Shelf as far east as The Gully. Existing licence holders have not explored this region because all indications are that catch rates would be much lower than on the existing grounds. There has been renewed interest from fishermen in exploring the possibility of establishing a fishery in 4W.

The size of the population in 4W, its relation to the existing offshore grounds and the degree to which this area is self-sustaining is unknown. A single at-sea sample in 1986 indicates that the mean size of lobster in 4W is considerably larger (median 135mm) than the presently fished areas of LFA 41. An exploratory survey is planned to examine catch rates and sizes in the area.



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