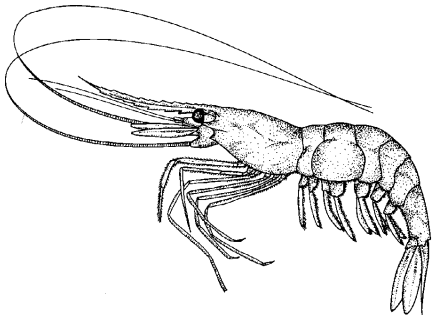


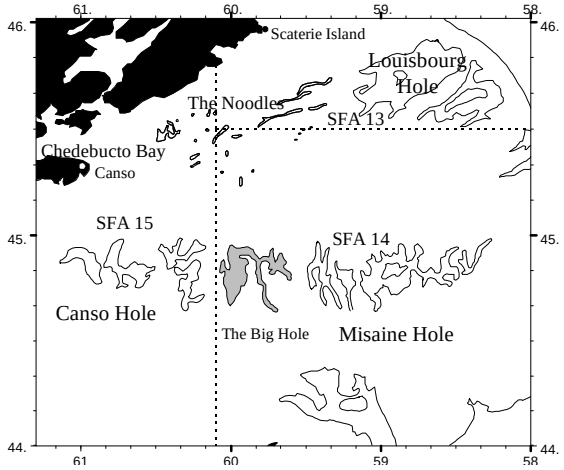
Northern Shrimp on the Eastern Scotian Shelf

Background

The northern or pink shrimp, Pandalus borealis, is the only shrimp species of commercial importance in the Maritimes Region. Shrimp are crustaceans, and have a hard outer shell which they must periodically shed (molt) in order to grow. The females produce eggs once a year in the fall and carry them, attached to their abdomen, through the winter until the spring, when they hatch. The newly hatched shrimp spend 3 to 4 months as pelagic larvae, feeding near the surface. At the end of this period they move to the bottom and take up the life style of the adults. The northern shrimp first matures as a male, at 2 to 3 years of age, but around age 4 it changes sex, to spend another 1 to 2 years as a female.

Shrimp concentrate in deep holes on the eastern Scotian Shelf, but nearshore concentrations along coastlines closest to the offshore populations have recently been discovered. They prefer temperatures of 2 to 6 ºC, and a soft, muddy bottom with a high organic content.

The shrimp fishery on the Scotian Shelf concentrates during summer in Shrimp Fishing Areas (SFAs) 13-15, also called the Louisbourg, Misaine and Canso holes, respectively. The shrimp are fished with otter trawls having a 40 mm mesh size throughout. The main management tools are limits on the number of licenses (30) and size of vessels used, minimum mesh size, use of a Nordmøre separator grate, and a Total Allowable Catch (TAC). The fleet is divided into two sectors, a midshore sector consisting of vessels 65-100' LOA based in New Brunswick on the Gulf of St. Lawrence side, and an inshore sector consisting of vessels <65' LOA based on the Atlantic coast of Nova Scotia. An experimental inshore trap fishery, currently consisting of 9 active licenses, has recently developed in Chedebucto Bay. Commercial quantities were also discovered in Mahone Bay on the South Shore during 1997.



The Fishery

The introduction of the Nordmøre grate in 1991 reduced bycatches of groundfish to negligible levels and allowed the fishery to expand to its full potential. In 1996, the inshore (24 vessels <65' LOA) component of the trawler fleet moved from individual quotas (IQs) to individual transferable quotas (ITQs), while the midshore (6 vessels 65-100' LOA) moved from a competitive fishery to IQs. This fishery continues to take most (75%) of the TAC early in the season during May and June and has taken the TAC every year since individual SFA quotas were combined into the single TAC in 1994.

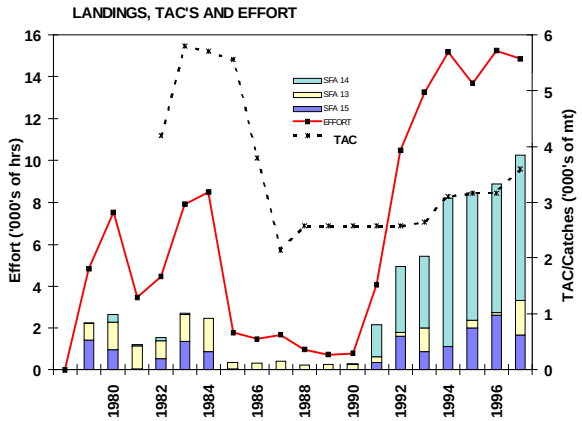
Landings (thousands of mt)

Year	1991	1992	1993	1994	1995	1996	1997
TAC	2580	2580	[1]2650	3100	[1]3170	[1]3170	3600
Total	804	1850	2044	3074	[2]3197	[2]3328	[2]3850

[1]includes 70 mt survey allocation. [2]catch in excess of TAC from experimental trap fishery. The 1997 catch is estimated.

Canada

The distribution of trawler effort has changed over the last three years, with a movement away from the Big Hole, which was fished heavily for several years prior to 1996, to more widespread effort in 1996, including some outside the traditional areas. In 1997, considerable effort also occurred in the Louisbourg Hole for the first time in several years. Concentrations of effort within some holes in 1997 suggests fishers were targeting large animals.

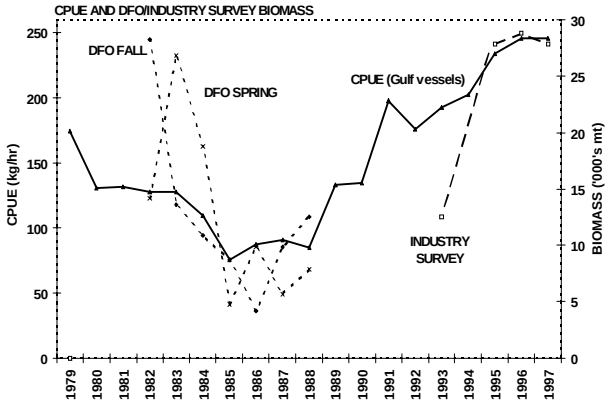


The exploratory inshore trap fishery in Chedebucto Bay completed its first full season (summer 1996-spring 1997) and took about 300 mt, considerably less than the 500 mt provisional TAC which is in addition to the the 3600 mt TAC for the trawler fleet. Catch rates decreased significantly after new licenses began fishing in July 1996, due to a concentration of effort in a small area off Canso (LFA 31A). Consequently most additional licenses will be required to fish outside this area (i.e. in LFA 29 and 30). A new fishery which developed during 1997 in Mahone Bay exploits a different stock than that fished in Chedebucto Bay. Nine additional licenses have been issued along the south shore and on the New Brunswick side of the Bay of Fundy. The 1997 fall trap fishery in Chedebucto Bay was about 6-8 weeks late in starting relative to previous years. This may be due to a late immigration of large animals and unusually high bycatches of small snow crab.

Resource Status

Assessments are based on two commercial catch rate (CPUE) indices obtained from trawler logbooks (since 1979 and 1993), samples from commercial trawl and trap catches (since 1994), and trawl surveys conducted by DFO (1982-88) and the industry (1993, 1995-97). Logs are also available from the trap fishery to monitor changes in catches per trap haul and effort distribution.

The commercial **CPUE** index from the 15 vessels that have fished every year since 1993 appears to have leveled off in 1997, although the last 2 years are the highest of the 5-yr series. Similarly, the CPUE series from Gulf based vessels leveled off in 1997, with the two last years being the highest of the 21-yr series.



Although the 1997 **industry trawl survey** produced the highest biomass estimate to date, the increase above previous estimates is entirely due to an increase in the inshore stratum, which may be related to a change in station selection from fixed to randomly chosen stations in 1997. The estimated offshore biomass from the 3 standardized industry surveys in 1995-97 has remained

high but constant at about 28,000 mt. Consequently, both commercial CPUE indices and the industry survey indicate that recent increases in biomass have leveled off, but that biomass remains high.

Port sampling in 1995-97 indicates that there has been little change in the **catch composition** by length and age over the last 3 years despite a change to square mesh codends by many vessels beginning in 1996. Ages 4 and older, consisting mainly of transitionals and females, make up 78-88% of the catch.

Population estimates at length and age from the industry survey indicate that the 1995 and 1996 year-classes are potentially weak. However, this must be confirmed by subsequent surveys because ages 1-2 animals are poorly sampled by the gear. A liner will be added to the survey trawl, in conjunction with an appropriate comparative fishing experiment, to improve the selectivity of the gear at the younger ages.

If the 1995 and 1996 year-classes prove to be weak, this does not appear to be due to a decreased spawning stock or recent increases in effort (i.e. trap fishery). One possibility is that it could be due to increased egg mortality from a protozoan parasite. Monitoring from 1996 and 1997 showed high incidence of egg disease in the inshore, however, there are no observations from previous years to allow interannual comparisons of the incidence of egg-disease.

The impact of fishing is apparent in terms of population composition when comparing unexploited (SFA 13) versus exploited (SFA's 14 and 15) parts of the stock. The unexploited portion of the stock has a significantly greater proportion of large animals (mainly females).

The **exploitation rate** of this stock roughly 11% calculated as the percentage of the 1997 total biomass that was caught.

Ecosystem considerations: Shrimp are important prey species for commercially important fish. Significant negative correlations between shrimp and cod, redfish, plaice, and turbot abundance have been demonstrated from the Gulf of Maine to the Newfoundland Shelf. With groundfish currently at low levels on the eastern Scotian Shelf, predation mortality by these species is probably below the long-term average. Shrimp biomass can be expected to decrease as groundfish stocks in this region rebuild.

On the Scotian Shelf northern shrimp are near their southern limit of distribution. and population increases are probably associated with colder water temperatures during the early 1990's. It is noteworthy that in 1997, temperatures on the shrimp grounds were about 1°C warmer than the previous 2 years.

Outlook

Although fishing has decreased the female portion of the population, in view of the continued high biomass and population estimates for older ages it seems unlikely that this has decreased the reproductive capacity of the population and led to the potentially weak 1995 and 1996 year-classes. The recent increase in effort by the trap fishery cannot be responsible because of its small size and because it occurred after these year classes were born. If the 1995 and/or 1996 year-classes prove to be weak this should not affect the fishery until 1999 because of the strong 1993 and 1994 year classes. Consequently, there is no reason to change the TAC, which was increased in 1997. It should remain at 3600 mt in 1998 so that the impact of the increase can be evaluated.

The outlook for the trap fishery continues to be good and with the issuance of additional experimental licenses it is expected to expand along the south shore of Nova Scotia and the New Brunswick side of the Bay of Fundy. Additional licenses in LFA 30 and 29 should allow the fishery to approach the 500 mt provisional TAC without affecting the catch rate of the existing fishery in Chedebucto Bay.

For more Information

Contact: Mr. Peter Koeller
Invertebrate Fisheries Division
P.O. Box 550
Halifax, N.S., B3J 2S7
Tel: (902) 426-5379
Fax: (902) 426-1862
E-Mail:
p_koeller@bionet.bio.dfo.ca

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Maritimes Regional Advisory Process
Department of Fisheries and Oceans
P.O. Box 1006, Stn. B105
Dartmouth, Nova Scotia
Canada B2Y 4A2
Phone number: 902-426-7070
e-mail address: MyraV@mar.dfo-mpo.gc.ca

Internet address: http://csas.meds.dfo.ca

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