

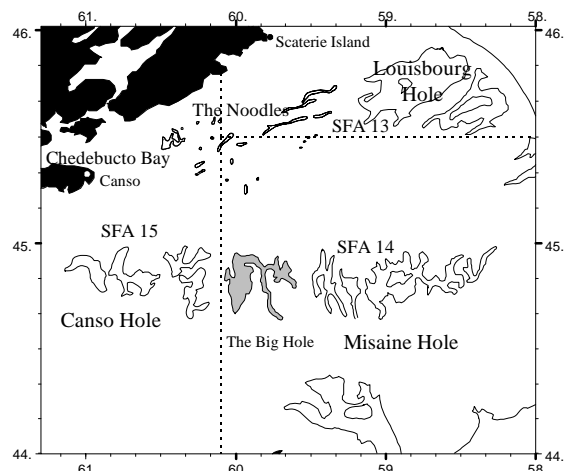
NORTHERN SHRIMP ON THE EASTERN SCOTIAN SHELF

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 °C, and a soft, muddy bottom with a high organic content.

The shrimp fishery on the Scotian Shelf concentrates in Shrimp Fishing Areas (SFAs) 13-15, also called the Louisbourg, Misaine and Canso holes, respectively, during summer. 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 is currently developing between Canso and Scaterie Island. An additional 14 trap licenses have been approved for issue in 1996 for a total of 18.



The Fishery

The fishery has been able to take the TAC in the last 2 years because the remaining individual Shrimp Fishing Area (SFA) quotas were lifted in 1994. The inshore component (24 vessels <65' LOA) has had individual **vessel quotas** since 1994 and the offshore component (6 vessels 65-100' LOA) will adopt I.Q.'s in 1996. Catches occur from March to December, but 75% are taken during May-June.

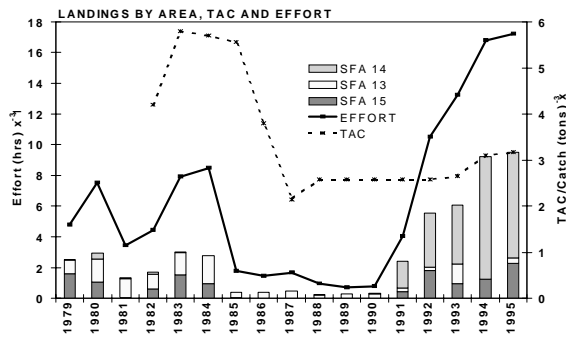
Landings (thousands of tons)

| Year | 77-79 | 80-89 | 1991 | 1992 | 1993 | 1994 | 1995 |
|-------|-------|-------|------|------|------|------|-------------------|
| | Avg | Avg | | | | | |
| TAC | 5021 | 4153 | 2580 | 2580 | 2650 | 3100 | ¹ 3170 |
| Total | 471 | 453 | 804 | 1851 | 2044 | 3074 | ² 3197 |

¹includes 70 tonnes survey allocation. ²27tonnes in excess of TAC from experimental trap fishery.

A **trap fishery**, using Maine-style, rectangular wire traps, began in late 1994 with one experimental license fishing 100 traps in Chedebucto Bay. Catches average 10 lbs/trap in the fall-winter when larger animals migrate close to shore, and decrease to negligible levels in the spring-summer due to emmigration and interactions with snow crabs in the vicinity of the traps. Traps take mainly transitionals and females. Experimental trapping and a trawl survey during 1995 showed that inshore shrimp distribution on the eastern Scotian Shelf is restricted to the coast between Canso and Scaterie Island. An additional fourteen 100-trap licenses have been approved for 1996 to make a total

of 18 experimental licenses.



The distribution of **effort** in 1995 by trawlers again concentrated in the “Big Hole” area of SFA 14 due to the relatively large catch rates, low counts (no. shrimp/pound) and short distances from markets and home ports. Fishers’ comments, distribution of commercial counts and research surveys indicate that larger animals tend to congregate on the southern edges of the holes. Commercial samples throughout the fishing season indicate that egg release occurred in April-May offshore, and about a month earlier inshore. Spawning occurred in July-August in both areas. Inshore trap samples have shown a lower percentage of females than offshore for the last two years, and the inshore percentage was lower in 1995 than 1994.

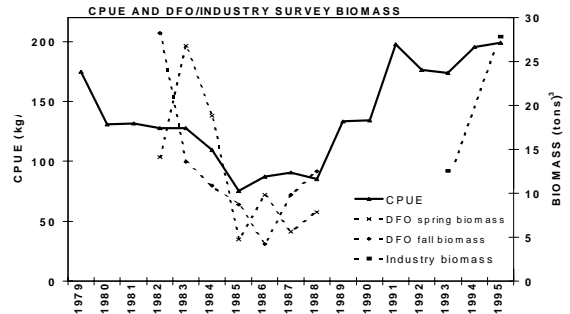
Resource Status

Assessments are based on landing trends, commercial CPUE obtained from logbooks (since 1993), an industry questionnaire (since 1994), samples from commercial catches (since 1994), and trawl surveys conducted by DFO (1982-88) and the industry (1993, 1995).

Commercial trawl **catch rates** increased significantly ($p > 0.05$) from 1993 to 1994, but 1995 levels are about the same as the previous year. These changes correspond to results from the industry questionnaire, which sampled 20 of the 30 trawl license holders in both 1994 and 1995.

The 1995 **industry trawl survey** produced the second highest biomass estimate on record. Although it is probably the most accurate estimate to date due to increased sampling intensity and density estimates calculated from set by set swept area measurements, comparison with previous surveys is difficult because of gear and method discontinuities. The 1995 survey shows a relatively large number of small animals present in the population, but comparison with previous years must be approached

cautiously because of different sampling times during the growing season. Inshore coverage during the 1995 survey showed high densities of relatively small animals, but biomass could not be estimated in this area due to insufficient information on distribution by depth and bottom type.



Length frequencies from commercial trawl catches and surveys indicate that the nominal 1990 year-class, which has been important to the fishery over the last 2 yr, is approaching its maximum life span. Continued good catches will become increasingly dependent on the success of more recent year-classes. However, relative **year-class strength** cannot be determined without several years of survey and commercial sampling. The **exploitation rate** of this stock is roughly 10%, calculated as the percentage of the 1995 biomass that was caught.

Ecosystem Considerations

Shrimp are important prey species for commercially important fish, including cod, pollock, white hake, silver hake, flatfish and herring. With groundfish currently at low levels, predation mortality by these species may be reduced.

At the southern limits of distribution, shrimp population increases are associated with colder water temperatures. Recent increases on the Scotian Shelf and in the Gulf of Maine are probably partially due to colder water temperatures during the early 1990’s.

Outlook

The stock appears to be healthy and there is no biological reason to change the current TAC, which was increased in 1994 to 3100 tons. It is not possible to quantitatively project abundance and catches with the available information, but continued annual commercial sampling and surveys as in 1995 should allow estimation of year-class strength. The outlook for an inshore trap fishery is good based on catch rates from experimental traps.

Management Considerations

It is not possible at this time to conclude whether or not the shrimp fished in the offshore holes and in Chedebucto Bay represent one or two populations. Notwithstanding this, at present fishing levels it is unlikely that fishing in the inshore would have any significant impact on the offshore resource. The inshore shrimp may represent a relatively small, local resource which is currently increasing due to favourable, but anomolous environmental conditions. Catch can be expected to decline when conditions return to normal. If inshore shrimp are a spillover from the offshore resource, again catches will drop off when densities offshore decline. Under either scenario current fishing effort will not result in significant mortality. Even if not sustainable, harvesting in the inshore is best managed with a separate TAC based on an independant inshore biomass estimate. It would also be wise to maintain current (1996) license restrictions and carefully monitor the development of the inshore fishery before contemplating any further expansion.

The decrease in ovigerous females inshore mentioned above may warrant action if this is found to be due to fishing. Shrimp traps can catch relatively large numbers of female snow crab. This potential problem should be monitored and an exclusion device developed if necessary.

For More Information

Contact: Peter Koeller
Invertebrates Division
Halifax Fisheries Research Laboratory
1707 Lower Water St.
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

References

- Koeller, P.A, M. King, M.B. Newell, A. Newell and D.Roddick. 1995. An inshore shrimp trap fishery for eastern Nova Scotia? Can. Tech. Rep. Fish. Aquat. Sci. 2064: 41p.
- Koeller, P. 1996. The Scotian Shelf shrimp (*Pandalus borealis*) fishery in 1995. DFO Atlantic Fisheries Research Document 96/8.

Koeller, P. 1996. Aspects of the biology of northern shrimp *Pandalus borealis* on the Scotian Shelf. DFO Atl. Fish. Res. Doc. 96/9.

Koeller, P. 1996. Results from the experimental shrimp trap fishery 1995. DFO Atl. Fish. Res. Doc. 96/10.