

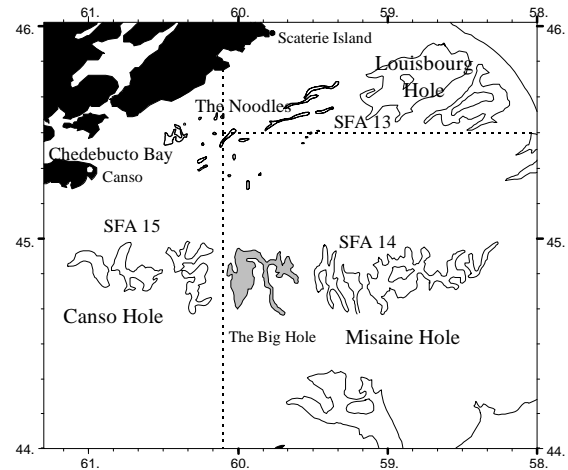
Northern Shrimp on the Eastern Scotian Shelf

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, currently consisting of 9 active licenses fishing in Chedebucto Bay, is developing between Canso and Scaterie Island.



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.

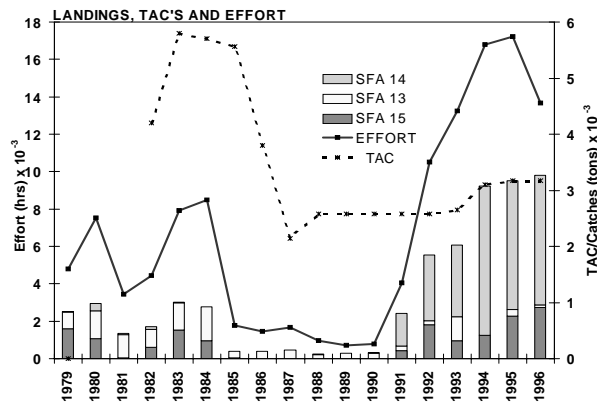
Landings (thousands of tons)

Year	77-79	80-89	1992	1993	1994	1995	1996
	Avg	Avg					
TAC	5021	4153	2580	2650	3100	3170	¹ 3170
Total	471	453	1851	2044	3074	² 3197	² 3261

¹includes 70 tonnes survey allocation. ²catch in excess of TAC from experimental trap fishery. The 1996 catch is preliminary.

Unlike previous years, trawler **effort** in 1996 did not concentrate in the "Big Hole" but was more widespread in the Misaine and Canso shrimp holes, possibly due to attempts by fishers to maintain high early season catch rates. In addition, shrimp prices in 1996 did not provide an incentive for fishers to target large shrimp. Effort decreased in 1996, reflecting increased catch rates.

By fall 1996, the **trap fishery** in Chedebucto Bay involved 9 active licenses fishing 100 traps each. Catches averaged about 4.5 lbs/trap since the increased effort began in July. The fishery can be conducted most of the year except during spring and early summer (May-July) when temperatures are too cold in Chedebucto Bay for the migrating shrimp. Traps continue to take the larger animals (i.e. transitionals and females).



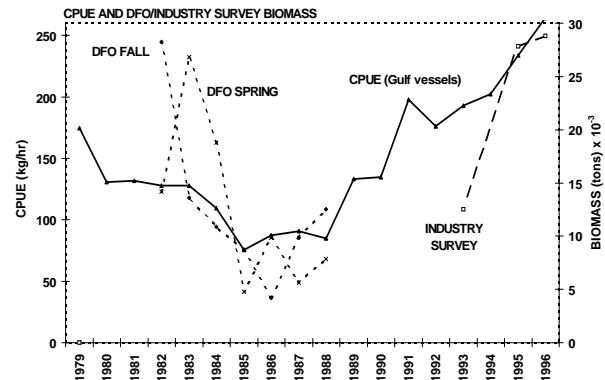
Resource Status

Assessments are based on two commercial CPUE indices obtained from trawler logbooks (since 1977 and 1993), an industry questionnaire (since 1994), samples from commercial trawl and trap catches (since 1994), and trawl surveys conducted by DFO (1982-88) and the industry (1993, 1995, 1996). Logs are also available from the trap fishery to monitor changes in catches per trap haul and effort distribution.

The commercial trawl **CPUE** index from the 18 vessels that fished every year since 1993 increased significantly ($p > 0.05$) from 1995, despite a switch to square meshed codends by many fishers. The 1996 index from Gulf based vessels was the highest of the 20 year series and has increased every year since 1992.

The biomass estimate from the 1996 **industry trawl survey** for the offshore holes was 28,808 mt, slightly higher than 1995, the previous record high. A comparison of length frequencies from the exploited (SFA 14-15) and unexploited (SFA 13) part of the offshore population shows that fishing is associated with significantly lower proportions of larger (female) animals. There is also some indication that the 1994 year-class is not as strong as the 1993 year class, but only in the unexploited area. Comparison of length frequencies from the fished areas shows little change in population structure from 1995. The

year-class (nominal 1994) represented by immature males is about the same as the 1993 year-class, and the year-class represented by juveniles (nominal 1995) is about the same as the 1994 year-class. Since recruitment appears to be unaffected and biomass continues high, fishing seems to have had little impact on reproductive capacity and production. Expanded coverage of inshore shrimp habitat (La Have clay) deeper than 50 fathoms resulted in an inshore biomass estimate of about 5,000 mt.



Length frequencies from **port samples** collected in 1995 and 1996 are difficult to interpret, probably due to differences in commercial trawl selectivities. This data suggests that the 1993 year-class, presently males, is relatively strong. However, as with survey data, the limited number of years available makes it impossible to determine year-class strength with any confidence.

The time of **egg release** (April-May) and **spawning** (July-August) in 1996 were similar to 1995. The percentage of ovigerous females in offshore commercial samples remains high (>90%). The percentage of ovigerous females is considerably lower inshore probably due to emigration, but this percentage has not decreased further since the fall of 1995. There were reports from both trawler and trap fishers that large numbers of shrimp lost their eggs in the fall. Observations on trap-caught samples in October confirmed a high incidence of "white" eggs likely caused by a protozoan parasite.

The **exploitation rate** of this stock is roughly 10%, calculated as the percentage of the 1996 biomass estimate 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 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 limits of distribution. Therefore, 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

Although the impact of fishing is noticeable in terms of population composition, this does not appear to have affected recruitment and biomass. The stock appears to remain healthy and there is no biological reason to change the current TAC. It is not possible to quantitatively project abundance and catches with the available information, but continued annual commercial sampling and surveys, as in 1995-96, should eventually allow estimation of year-class strength. The current sampling program should be continued to allow timely management responses to any fishery induced population declines, especially if the TAC is increased.

The outlook for the inshore trap fishery continues to be good. The decrease in the percentage of ovigerous females noticed during the first year of fishing has not continued, and changes appear to be due to local movements into/from the fishing area, rather than a depletion of spawning stock. It is expected that this fishery will take approximately 300 mt in 1997 with current effort and catch rates. If the inshore area were to be exploited at the same rate as the offshore (i.e. 10% of the inshore biomass), this fishery could take as much as 500 mt annually. Since this is well within the capacity of existing trap licenses it would be prudent not to increase effort further at least until one full year's fishing has taken place and all viable licenses are active.

The "crab collars" presently required on shrimp traps appear to be an effective exclusion device for small, immature female snow crabs. However, even low crab bycatches on an individual trap basis can amount to 1000+ crabs/day for all fishers combined. Further work may be needed to reduce bycatch, and/or ensure the survival of crabs returned to the sea.

The current survey methodology requires improvement because of logistic and data interpretation problems, in particular the use of a different gear/boat combination every year. Every effort should be made to purchase a single set of doors and a trawl which can be fished by most shrimp trawlers, to be used exclusively for the

industry survey. In addition to reducing the uncertainties associated with comparative fishing, this has the added advantage of allowing use of a smaller meshed codend to retain incoming year classes at a younger age.

For More Information

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Reference

Koeller, P. 1996. The Scotian Shelf shrimp (*Pandalus borealis*) fishery in 1996. DFO Atlantic Fisheries Research Document 96/128. 58p.