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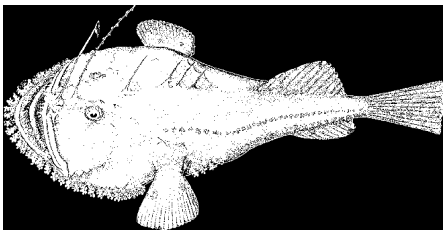
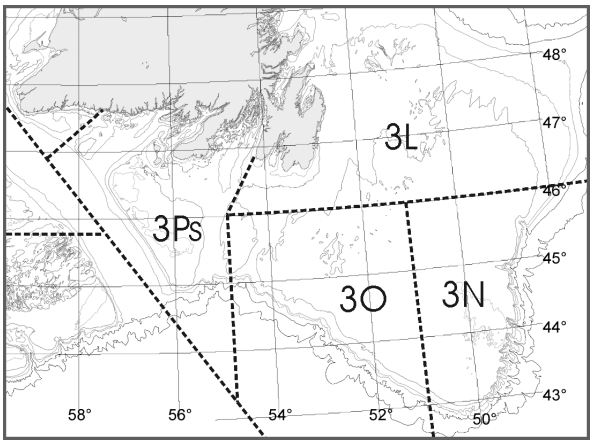
Newfoundland and Labrador Region **Stock Status Report 2003/045**



MONKFISH IN DIVISIONS 3L, 3N, 3O AND SUBDIVISION 3Ps



Background

The monkfish or goosefish (Lophius americanus) is a bottom dwelling, fish that lives in relatively warm waters. In the western Atlantic, it is found occasionally as far north as the Labrador Shelf and as far south as Florida but more commonly on the southern Grand Banks, throughout the Gulf of St. Lawrence, on the Scotian Shelf and in the Bay of Fundy, and south the mid-Atlantic Bight. It has been found in depths from the tide line down to about 800 meters (435 fathoms) in temperatures from 0-21° C, although the preferred condition on the Grand Banks is where temperatures exceed 3° C. Studies on the Grand Banks have indicated a limited seasonal migration to shallower water in summer and deeper water in winter and shifts in depth over time. The stock structure of monkfish is not known. However, on the Grand Banks, its distribution is restricted to the southwest slope and adjacent Laurentian Channel.

Spawning is thought to occur from late summer and fall in Canadian waters. Growth appears to be fairly rapid, faster in females. Monkfish is thought to be a relatively short lived species, with a maximum age of about 11 years.

Until recently, monkfish were taken only as bycatch in 3LNOPs, but with the decline in other resources, a directed trawl fishery was initiated in 1991. An experimental gillnet fishery was carried out in 1993-1994 and, since then, a limited directed fishery has been prosecuted primarily with gillnets. There are currently no quota restrictions for this species.

Summary

- There are deficiencies in the knowledge of monkfish in 3LNOPs limiting our ability to assess the species: information on size and age structure, growth rates, age of maturity, commercial catch size and ages are lacking, and there are uncertainties in reported landings.
- Survey biomass and abundance data show considerable fluctuation among years. Variable catchability or availability for this species makes it difficult to monitor.
- In 2003, average size was at a low in the time series while abundance was relatively high suggesting the possibility of good recent recruitment. Survey biomass has increased from mid-1990's to the present.
- Landings remained low until 2002-2003 when they increased by about 6 times to 2,795 t compared to those during the previous five years due mainly to an increase in effort driven by market conditions. This species is not under quota regulation.

Canada

- As a result of the increase in landings in 2002-2003, the index of exploitation (catch/RV biomass) has increased 4 fold compared to the previous 5 years. Fishing mortality may now exceed a sustainable level.
- Further development of the stock will have to be closely monitored given the expansion of the effort on this resource. Fishing effort now occurs over much of the area where monkfish are distributed.

Monkfish Biology

The stock structure of monkfish is not known. However, on the Grand Banks, its distribution is restricted to the southwest slope and adjacent Laurentian Channel. Survey distributions do not indicate a discontinuity with fish to the south and west. Degree of mixing with monkish on the Scotian Shelf is unknown.

On the Grand Banks monkfish are found where temperatures exceed 3°C and studies there have indicated a limited seasonal migration to shallower water in summer and deeper water in winter and shifts in depth over time.

Based on observations on the Scotian Shelf, spawning is thought to occur from late summer and fall in Canadian waters. Females lay a buoyant mucoid egg mass referred to as a veil as long as 12m. Upon hatching, larvae with enlarged dorsal head spines and pelvic fins float to the surface, spending several months in a pelagic phase, then settle to the bottom as post-larvae. Young stages have been found as far north as the northeastern edge of the Grand Banks.

No studies on age and growth have been carried out on the Grand Banks. Elsewhere, growth appears to be fairly rapid, faster in females. Limited information suggests that they reach a length of about 11 cm (3 inches) at age 1, and lengths of about 76 cm (30 inches) and 102 cm (40 inches) at ages 7 and 10, respectively. Monkfish is thought to be a relatively short lived species, with a maximum age of about 11 years. The largest specimens weigh about 27 kg.

Monkfish consume a wide variety of fish and invertebrates, sometimes almost as big as themselves. The fishing 'lure' on its head serves as an attraction to prey.

The Fishery

Canadian catches (landings plus discards), since extension of jurisdiction in 1977, remained less than 200 t annually until 1991. During that period, all landings were bycatch and most was discarded. A directed experimental trawl fishery began in 1991, and 314 t was caught that year.

Landings (t)

Year	77-90 Avg.	91-97 Avg.	1998	1999	2000	2001	2002	2003[1]
TAC		.2[2]						
Can.	+	.3	.4	.2	.1	.8	2.4	2.8
Others	.8	.1	+	+	+	+	+	+
Total	.8	.4	.4	.2	.1	.8	2.4	2.8

[1] Provisional

[2] 1995-1997

[+] Catch less than 100 t

Most effort shifted to use of gillnets after a successful experimental fishery in 1993-94, and 830 t was taken in 1994 by Canada. The catches in 1995-2000 dropped to an average of 283 t. Catches increased greatly to 799 t in 2001, 2,346 t 2002 and 2,795 t in 2003.

Canadian catches have come predominantly from Division 3O and Subdivision 3Ps. During 1995-2003, 71% was reported taken from 3O and 29% from 3Ps.

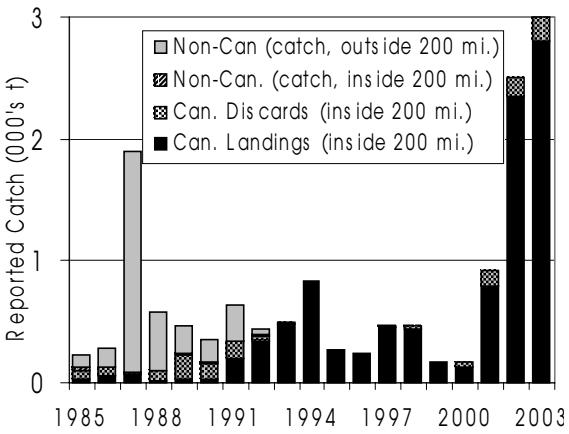


Figure 1 – Catches of monkfish by country and location, 1985-2003 (2003 is preliminary).

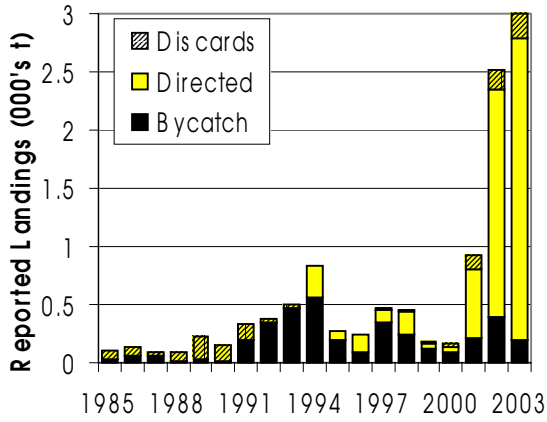


Figure 2 – Canadian catches in 3LNOPs, directed and bycatch including estimates of discarding, 1985-2003 (2003 is preliminary).

Monkfish caught during the 2000-2003 Canadian fishery ranged in size from 30 to 118 cm (12-46 inches) total length, although most were within 45-100 cm (18-39 inches) and averaged about 64 cm (25 inches), down from about an average of 80 cm (32 inches) in 1993-1999. The predominant gear used to capture monkfish was gillnet, using large (12 inch) mesh.

Reported non-Canadian catches have generally been less than 500 t annually, although it was reported that about 3,500 t were taken in 1977 and 1,808 t in 1987. It is believed that the 1987 figure is inflated due to mis-reporting. Most of the non-Canadian catches have been from Division 3N and are likely attributable to bycatch in other fisheries. No non-Canadian catches have been reported since 1994.

Resource Status

The only information available for monkfish in this area comes from research surveys. The **survey relative biomass indices** for the different areas indicate that most monkfish (99%) are found in Division 3O and Subdivision 3Ps, with 66% in 3O, distributed along the southwest slope of the Grand Banks and into the Laurentian Channel.

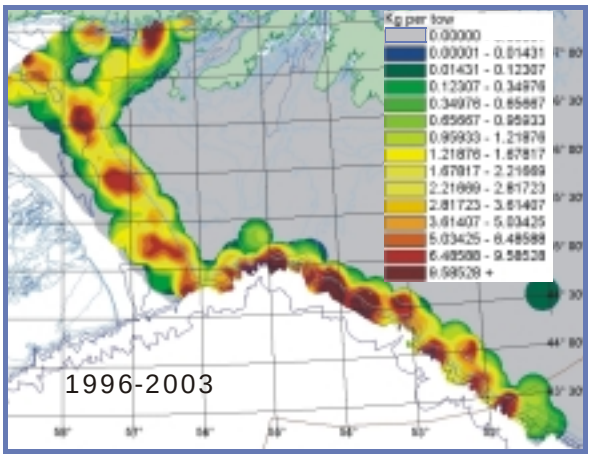


Figure 3 – Distribution of monkfish based on spring 1996-2003 surveys.

Estimates of biomass have fluctuated over the years, peaking in the mid-1970s and mid-1980s reaching a low point in the early 1990s. Survey biomass has increased from the mid-1990's to the present.

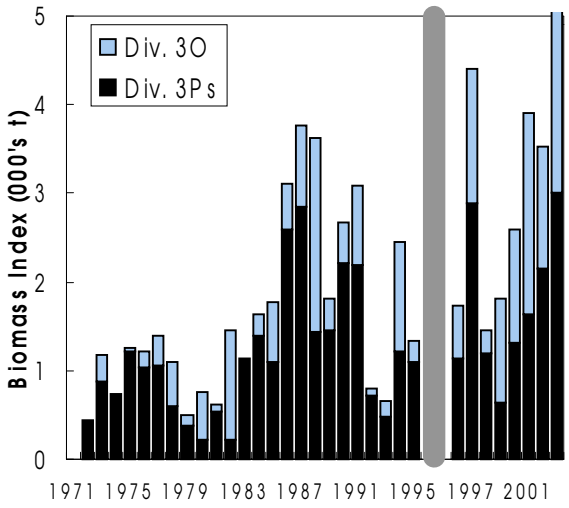


Figure 4 – Spring survey relative biomass index for monkfish, 1971-2003. The grey bar represents a change from Engel to Campelen survey gear.

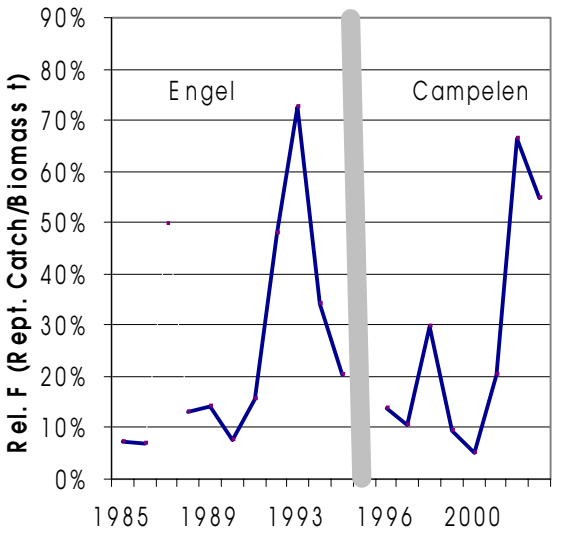


Figure 5 – Index of exploitation (total commercial catch/spring survey biomass) for Monkfish.

Although fisheries data indicate that catches have been reported by a number of countries in both divisions 3L and 3N, the spring surveys from 1977 to the present have not found any monkfish in 3L, and very few in 3N. The fall survey occasionally encounters monkfish as far north as 2J where bottom temperatures are warmest.

Average size of monkfish (biomass/ abundance) from the spring survey has declined since 1996. Whether this decline relates to an increased proportion of smaller fish present in the population or a decline in adults is unclear.

The patterns in the biomass and abundance indices over time suggest that monkfish are subject to natural fluctuations, perhaps not surprising for a fecund, relatively short lived fish. The large inter-annual fluctuations observed between years suggest changes in catchability or availability from year to year. In 1996-2000, the exploitation index was relatively low due to increasing biomass and relatively low catches. As a result of the increase in landings in 2002-2003, the index increased by 4 times compared to that of the previous 5 years.

Sources of Uncertainty

Monkfish are not caught in great abundance during research surveys and have not been routinely studied. Size, growth rates, ages, maturity, fecundity, movements and stock structure are all unknown.

Outlook

The status of monkfish in 3LNOPs is difficult to evaluate based on existing data. Survey biomass and abundance patterns show considerable fluctuation among years. Variable catchability for this species makes it difficult to monitor. In 2003, average size was at a low in the time series while abundance was relatively high suggesting the possibility of better recent recruitment. Survey biomass has increased from the mid-1990's to the present. Landings remained low until 2002-2003 when they increased about 6 fold compared to those in the previous five years due mainly to an increase in effort driven by market conditions. This species is not currently under quota management. As a result of the

increase in landings in 2002-2003, the index of exploitation has increased 4 fold over the past 5 years. Fishing mortality may now exceed a sustainable level. Further development of the stock will have to be closely monitored given the expansion of the effort on this resource. Fishing effort now occurs over much of the area of monkfish distribution.

For More Information

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