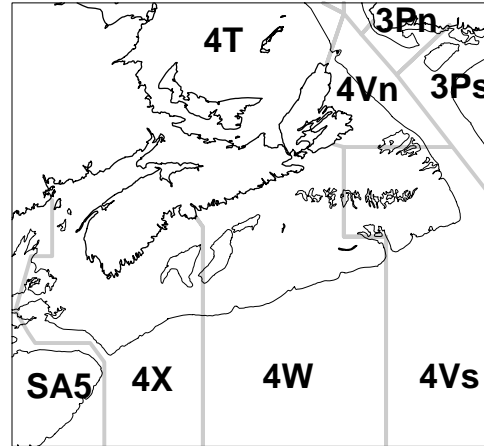


**MONKFISH ON THE SCOTIAN
SHELF AND NORTHEAST
GEORGES BANK**



Background

Monkfish, *Lophius americanus*, also called goosefish or angler ranges from the Grand banks and Northern Gulf of St. Lawrence south to Cape Hatteras, North Carolina. Individuals have been collected from inshore areas to depths greater than 800m, although highest concentrations occur between 70-100m and in deeper waters of about 190m. They have been taken in water, ranging in temperature from 0-24°C, but in Canadian waters, appear most abundant between 3-9°C.

The goosefish has been described as mostly mouth with a tail attached, and reports of monkfish eating prey almost as big as themselves are common. Growth appears to be fairly rapid and similar for both sexes up to age 4, (47-48cm). After this, females grow a bit more rapidly and seem to live somewhat longer, up to 12 years, reaching a size of over 100cm while the males have not been found older than age 9, at approximately 90cm.

Sexual maturity occurs between ages 3 and 4 and spawning may take place from spring through to autumn depending on the latitude. Females lay a nonadhesive, buoyant mucoid veil that can be as large as 12m long and 1.5m wide. Incubation lasts from 7-22 days, after which the larvae spend several months in a pelagic phase, before settling to the bottom at a size of about 8 cm.

The stock structure of monkfish is unknown, but USA survey distributions suggest northern and southern components with the shallow waters of central Georges as a boundary zone. Canadian survey distributions do not suggest a discontinuity between the 4X, 4W and 5Z components of this stock. However, distribution patterns may suggest a separate 4V component. The degree of mixing in both USA and Canadian waters is unknown and large scale migrations have not been reported. Spawning appears to take place in Canadian waters during the summer months, thus suggesting some degree of independence between the various components.

The Fishery

Landings (thousands of tonnes)

Year	70-79	80-89	1991	1992	1993	1994	1995	1996
	Avg.	Avg.						
TAC	-	-	-	-	-	-	-	0.2*
4VW								
Can	0.02	0.44	0.31	0.37	0.14	0.04	0.06	
For	5.98	0.12	0.16	0.05	-	-	-	
4X								
Can	0.03	0.27	0.31	0.46	0.55	1.20	0.93	
For	0.54	0.01	0.03	-	-	-	-	
5Zc								
Can	-	0.80**	1.00	0.47	0.35	0.54	0.42	
Total	6.57	1.60	1.80	1.40	1.00	1.80	1.40	

* - study allocation

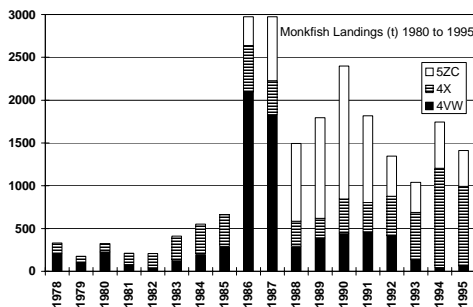
** - average is from 86-89 as no 5Zc designation prior to 1986

Since 1978, monkfish has been predominately a by-catch of the groundfish and scallop fisheries. Large landings in 4VW attributed to the USSR prior to 1978, are not considered reliable. 4VW landings since then have remained low, at an average of 159t per year, until 1986 and 1987, when scallop dredges recorded catches of 1,800t and 1,400t respectively. Landings in 4VW subsequently dropped to an average of 400t per year until 1993, when they dropped to 135t and further to 63t in 1995.

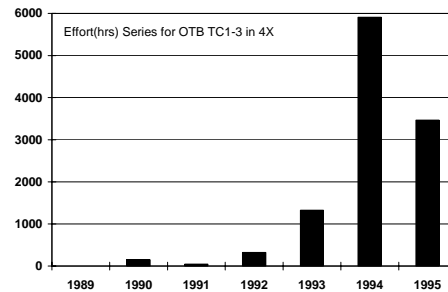
Available from: Maritimes Regional Advisory Process, Department of Fisheries and Oceans, P.O. Box 1006, Stn. B105, Dartmouth, N.S., Canada B2Y 4A2. Telephone: 902-426-8487. E-mail: d_geddes@bionet.bio.dfo.ca

Because of the emergence of new markets in the early 1990s, trips targeting monkfish have become more common, especially the mobile gear fleet less than 65 ft in 4X. Consequently, 4X landings, having averaged 250t per year prior to this, increased to a high of 1,159t in 1994 with a drop to 930t in 1995. In an effort to reduce possible over-exploitation, particularly in a small area of the Fundian Channel where the majority of directed and by-catch monkfish fisheries are prosecuted, the mobile gear less than 65ft fleet were put on a 20% by-catch restriction early in 1995. By September of that year, a cooperative science/industry study had been set up to assess the abundance of monkfish and its potential as a developing fishery. The 1995 landings in 4X include a directed fishery of 200t allocated to the vessels participating in this study.

Landings of monkfish in 5Zc have increased from 340t to 1986 to a high of 1,554t in 1990, largely attributable to scallop dredges on Georges Bank. Because of these relatively high landings and lack of evidence to prove any discontinuity in monkfish across the shelf, the area considered in this stock status report has been extended to include the Canadian side of the ICJ line on Georges Bank (5Zc).



The **commercial effort data** were not used to derive catch rate indices for resource status because of the relatively new nature of this fishery. The effort data presented for otter trawlers (OT) TC 1-3 include directed effort only, which in 1994 and 1995 represented approximately 20% of the catch. This effort exhibits a sharp increase since 1993, indicative of new markets and better prices for this species over the last few years. The 1995 decline is likely due to the introduction of management measures in that year. As mentioned above, the majority of the monkfish catch is taken as a by-catch of vessels fishing other groundfish species and scallops.

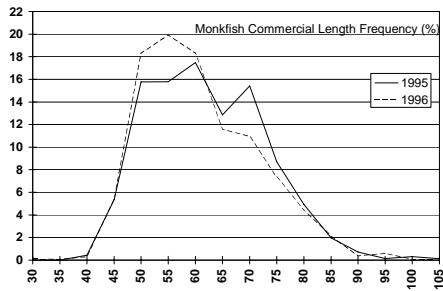


Resource Status

Stock status evaluations were based on the Scotian Shelf summer and Georges Bank February research vessel survey abundance indices. Distribution and size composition for both the research vessel surveys and an industry survey conducted as part of the five year cooperative monkfish study were also evaluated. The five vessels involved in the 200t directed fishery used a 203mm square mesh, whereas on the survey in October 1995, they used a 130mm square mesh. Data from this survey were not used to estimate abundance since this is the first year in a five year series.

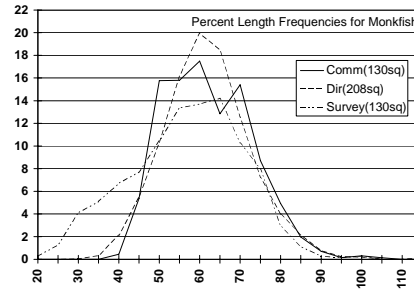
A requirement of the joint monkfish study was that half of the directed (200t) trips must be observed. Therefore the size compositions from the industry survey, the directed (200t) and commercial (by-catch) fisheries can be compared. **Length frequencies** were taken from the mobile gear fleet only as scallop dredge samples were not available.

Comparisons from the commercial (by-catch) fishery using a 130mm square mesh, for 1995 and the first third of 1996, show a similar size range, from 30cm to 105cm, with the majority of the catch taken between 50cm and 70cm.



When the length frequency for the directed fishery is compared with that of the by-catch fishery, a similar trend in size range is apparent despite the restriction of 203mm square in the directed fishery. In comparison, the industry survey caught a larger proportion of fish less than 40cm than did the commercial (by-catch) fishery which was using the same mesh size. It would seem that the 130mm square mesh has the potential of taking a large proportion of small fish. The absence of these small fish in the commercial (by-catch) fishery may indicate that discarding is taking place. Alternatively, this difference could be influenced by varying concentrations of fish on the fishing grounds as well as by the fact that small fish are often cut at sea

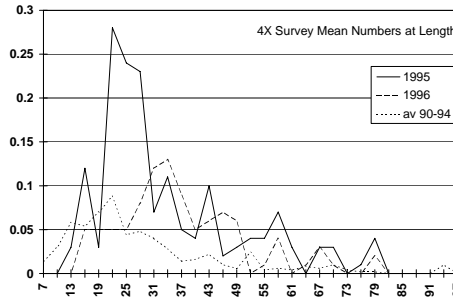
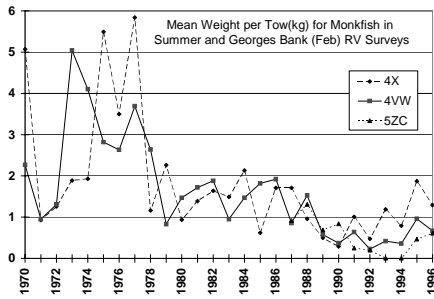
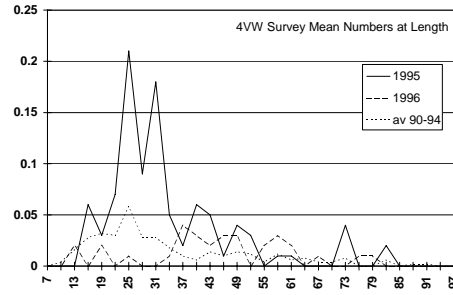
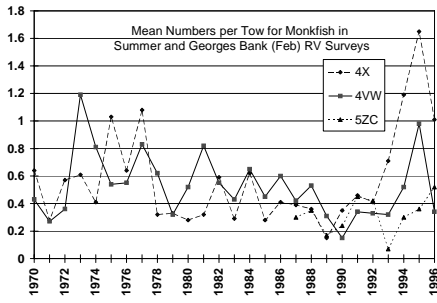
for tails and, therefore, are not available for land based sampling. However, the discarding theory is consistent with the anecdotal information from the industry.



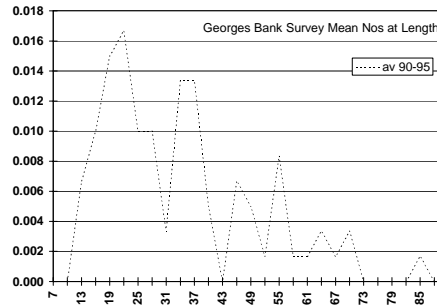
The **summer survey stratified mean numbers per tow** in 4X, although variable from year to year, indicate an increasing trend in the 1990s. Mean weight per tow exhibits a similar but less pronounced trend.

The stratified mean numbers per tow for the summer survey in 4VW are also highly variable and show an increase in abundance since 1990. Mean weight per tow has declined since the early 1970s and has remained relatively low since 1990.

Summer survey results are not available for the 5Zc area, but in the February Georges Bank survey mean numbers per tow reached a low in 1993 and have increased since then. Mean weight per tow also declined to 1993 but has been increasing slightly to 1996.

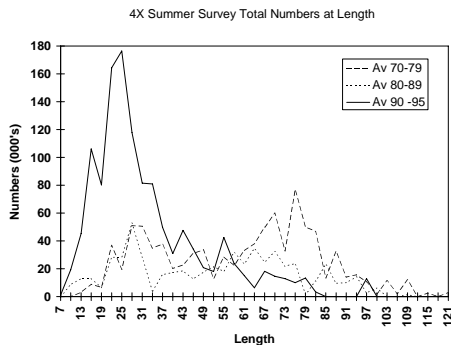
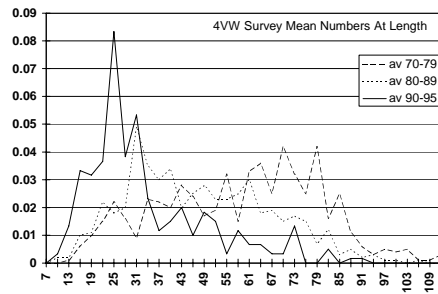


Survey length frequency distributions of monkfish in both 4VW and 4X since 1990 show a wide range in sizes, from 7cm to 97cm. Large numbers of small fish (16cm to 30cm), are evident in both areas from the 1995 survey. This pulse of small fish appears to continue in 4X in 1996, suggesting incoming recruitment. Such is not the case however in 4VW where the 1995 peak does not appear to be sustained.



There are too few monkfish caught in the Georges Bank survey to make conclusions on recruitment trends.

Over the long-term, the length frequency distributions of the summer survey show a gradual decline in size range. On the Scotian Shelf, for the 1990 to 1995 period, larger fish, especially in 4VW appear to have been significantly reduced, compared to early time periods.



Outlook

Because the distribution of monkfish appears to be relatively continuous across 4VW, 4X, 5Y and 5Z, the regulation of the USA fishery could have an impact on the Canadian monkfish fishery. Notwithstanding this, given our lack of understanding of the migratory patterns and reproductive biology of this species, it would be prudent to manage this resource independently in Canadian waters.

The decline of commercial sized fish through the 1970s and 1980s is a concern. Whether this is due to natural causes or related to unreported by-catch taken or discarded by fleets selecting for cod, haddock and pollock, cannot be determined. From a long-term perspective, the survey abundance in the 1990s is at the low end of the range but is increasing, with the best signs of recruitment in 4X.

Currently there is no biological basis for the 20% by-catch limit in the commercial fishery. If the TAC levels for other directed species change, a review of by-catch levels should be undertaken. The relatively large numbers of monkfish taken by scallop dredges on Georges Bank requires documentation, both in terms of size composition and verification of catches.

There is insufficient information at this time to determine appropriate harvesting levels. The joint science/industry study is currently in its second year of the five year program. The continued commitment of both industry and science to provide better information on monkfish and to maintain catches at a low level, is required and will ultimately result in a more reliable assessment and rational development of this resource.

For More Information

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