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The effects of large meshes in the Yellowtail Flounder Fishery

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Selection Experiments

Selection studies were carried out aboard two New Bedford yellowtail draggers in September 1967. The procedure followed was to use a codend of the mesh size to be tested on one vessel and a lined codend, which retained all sizes of yellowtail caught, on the other vessel. The vessels then made several pair tows with each combination on grounds southwest of Nantucket Shoals lightship. BCF and Massachusetts Division of Marine Fisheries personnel on the vessels measured samples of the catches and obtained information on catch per tow of market and discard yellowtail. By comparing the catches of the lined and unlined codends, the selection curves of the tested codends were estimated.

The size of yellowtail in the area fished was small; most of them were under 15 inches long. We, therefore,obtained rather poor information on escapement of large fish. The cull mid-point for yellowtail by the commercial fleet was about 13.5 inches (34 cm) in September. That is, yellowtail under 13.5 inches were mostly discarded.

Selection information was obtained for 2 codend mesh sizes: 5.1 inches (129 mm) and 5.7 inches (145 mm). The 5.1-inch mesh was made of twisted nylon and the 5.7-inch was made of braided nylon.

The yellowtail catch data for the 5.1-inch codend versus the lined codend, based on 6 pair tows, are given in the table below.

Table 1. 5.1-inch codend and lined codend compared

Size Category	Catch - bushels per hour	
	5.1-inch codend	Lined codend
Market > 34 cm.	3.9	2.5
Discard	4.5	6.8
Total	8.4	9.3

This codend caught relatively more market yellowtail (3.9 bushels/hour) than the lined codend (2.5 bushels/hour), while releasing some of the undersized fish.

The selection curve for the 5.1-inch codend is shown in Fig.1. From this curve it is estimated that 75% of the 9.9-inch (25 cm), 50% of the 11.4-inch (29 cm - age 2.5 years), and 25% of the 12.6-inch (32 cm) yellowtail were released by this codend. It retained most of the market fish (those 13.5 inches and over).

The yellowtail data for the 5.7-inch codend versus the lined codend, based on 3 pair tows, are given in the table below. The 5.7-inch codend caught 3.6 bushels per hour of the market sized fish as compared to 7.6 bushels per hour with the lined codend.

Table 2. 5-7-inch codend and lined codend compared.

Size Category	Catch - bushels per hour: 5.7-inch codend	Lined codend
Market	3.6	7.6
Discard	6.5	16.7
Total	10.1	24.3

The selection curve for the 5.7-inch codend is shown in Fig.1. This curve indicates that 75% of the 10.9-inch (27.7 cm), 50% of the 13.5-inch (34.3 cm - age 3.1 years), and 25% of the 15-inch (38.1 cm) fish escaped through the meshes. A large amount of market yellowtail were released by this codend.

Effects of increase in mesh size on catch and landings

It is important that the assessment be made using total catch of fish, i.e. both the discards (at sea) and landings. In order to average out variations in recruitment from year to year, we have used the average of discards and landings for the years 1963-1966, inclusive. (Fig.2 (top panel)). Discards usually were greatest in the 3rd and 4th quarter. The annual discard averaged about 11,000 metric tons, compared with landings of 33,000 metric tons.

The catch and landings given here are for the food fish fishery only, which includes over 90% of the catches. The vessels use a 4.5-inch (114 mm) mesh codend. Applying the selection curves of the 5.1- and 5.7-inch codends relative to a 4.5-inch codend to the catch composition of the 4.5-inch mesh, and assuming that the discarding practices would remain the same, the estimated catches and discards with the new meshes are obtained (Fig.2). These estimates are for the period immediately following a change to the bigger mesh.

Discards are reduced by 27% and 56%, and the immediate landings by 4% and 21%, for the 5.1-inch and 5.7-inch mesh codends, respectively, relative to that with the 4.5-inch mesh. The 5.7-inch mesh reduces the immediate landings by nearly half as much as the discards.

In the long run, there would be a gain with the 5.1-inch mesh of 10% in landings, relative to those of the 4.5-inch mesh; with the 5.7-inch mesh there would be a long term gain of 17% in landings.

The immediate and long term effects of changing to the larger mesh sizes are summarized in Table 3. The immediate loss to landings of 4% with the 5.1-inch mesh would probably be made up within a year, or at most 18 months. The full gain of 10% would be achieved in about 4 years. The immediate loss of 21% with the 5.7-inch mesh would be made up in 24-30 months.

Although the data on selectivity is not as complete as we should like, we do not believe that further experiments would radically change the present conclusions. A significant change might be obtained if the selectivity could be sharpened, so that all the fish under 30-31 cm, which are now almost entirely discarded, would be released and fish over 32 cm would be retained in larger proportions. This might double the gain, without increasing immediate losses to landings. However, even with sharp selection, moving the 5% retention point beyond 33 cm would remove too many larger sized fish, and an increase in growth of yellowtail at these lengths would provide little in the way of long term gains.

The amount of fishing effort on yellowtail is also important to the assessment. We have estimated the fishing rate to be 80%, which is relatively high. This means that once the fish are vulnerable to the gear, 80% of a given year class will eventually be caught. Again, this figure is not precise; if it were less, the benefits of mesh change would be less than indicated; the converse would hold if the fishing rate was greater.

Table 3. Immediate and long term effects of increasing mesh size from 4.5-inch to 5.1-inch and 5.7-inch.

New Mesh	% Change in Landings: Immediate	Long Term (4 yrs)	% Change in Discards
5.1"	- 4	+10	-27
5.7"	-21	+17	-56

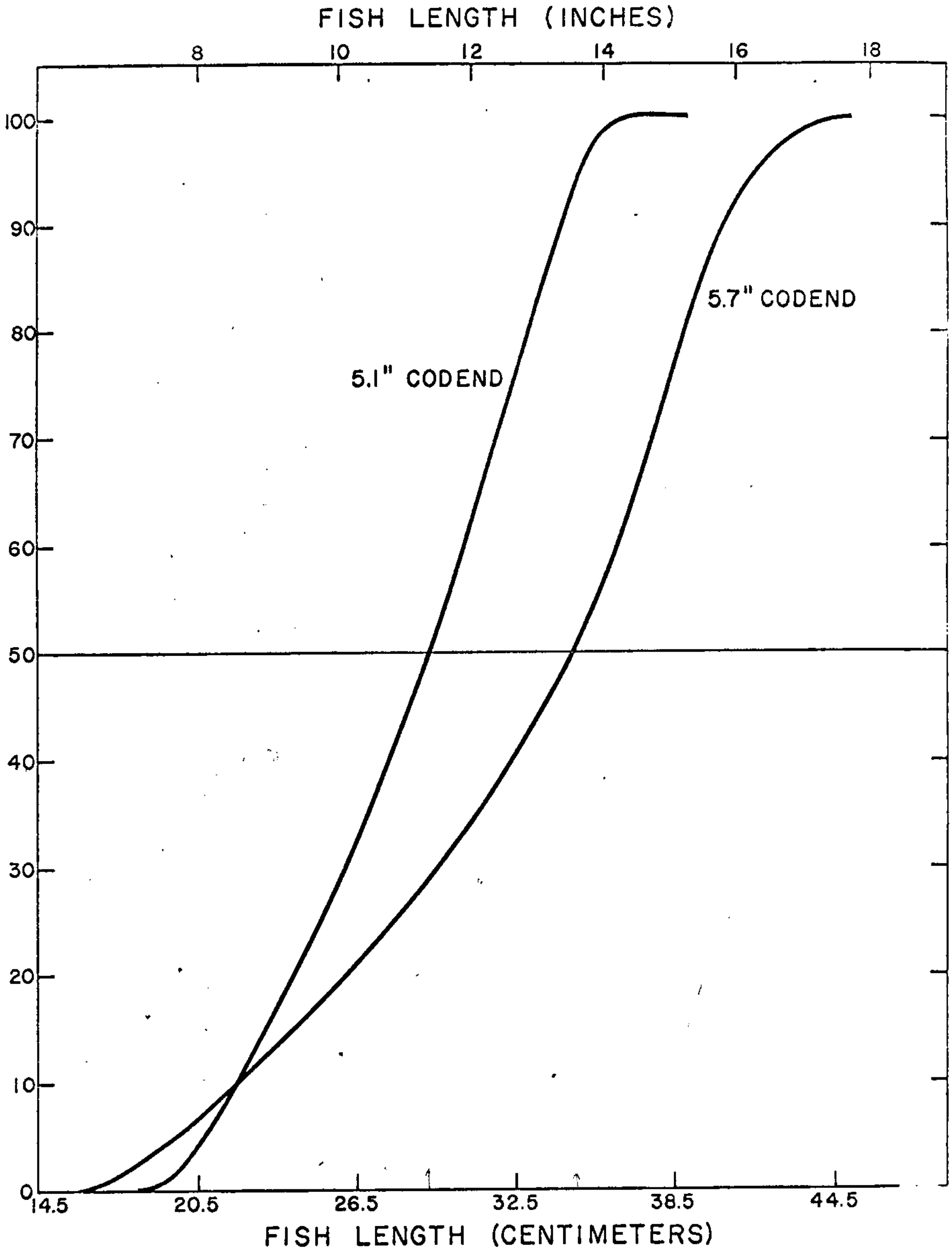

Figure 1. -- Selection curves for 5. 1-inch and 5. 7-inch codends.

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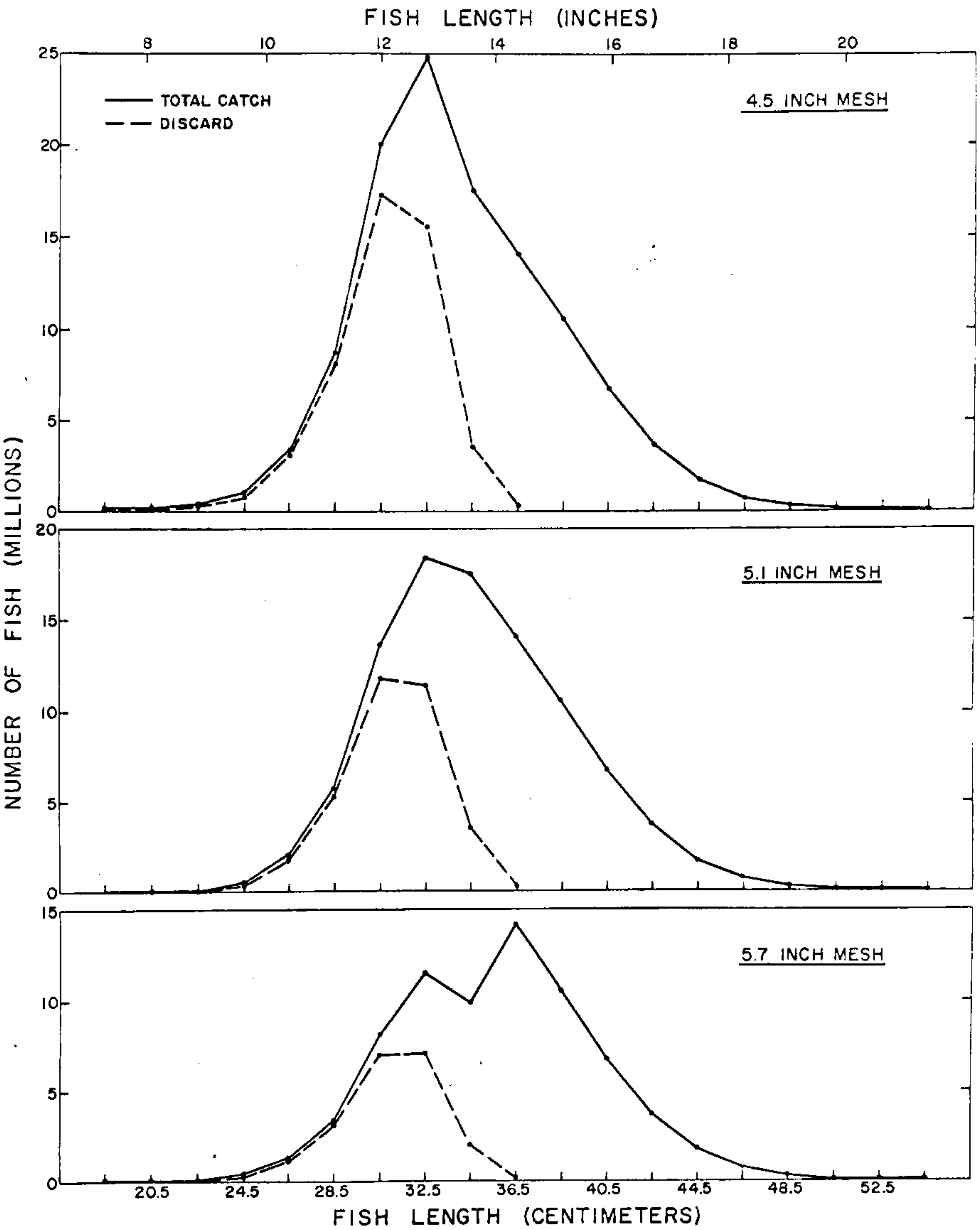

Figure 2. -- Estimated length compositions of total catch and discards of yellowtail with 3 different codend mesh sizes. (Length compositions are based on the composition in 1963-66).