The Effects of Large Meshes on the Catch and Landings of Yellowtail Flounder in Subarea 5

by

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68-04

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Biologists at the Woods Hole Laboratory of the Bureau of Commercial Fisheries have been studying the yellowtail flounder fishery for several years. They are monitoring the status of the stocks of fish by maintaining records of length, age, and abundance. In studies of the effect of fishing they keep records of amount of fishing, landings, and areas fished. Certain studies of growth rates and mortality rates are completed and recently some mesh selection studies (c. f. Lux, research document series, 1968 meeting) were conducted to obtain information on the effects of possible change in mesh size in the nets of the commercial fleet.

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. (Table 1 and Figure 1 (top panel)). Discards usually were greatest in the 3rd and 4th quarter. The annual discard averaged about 11. 4 thousand metric tons, compared with landings of 33. 3 thousand metric tons. Data on length composition of discards are given in Brown (Document 75, ICNAF Annual Meeting, 1964).

The catch and landings given here are for the food-fish fishery only. The vessels use a 4. 5-inch 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 (Figure 1). 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. A greater reduction in discards than that indicated certainly was hoped for. The 5. 7-inch mesh reduces the immediate landings by nearly half as much as the discards.

Table 1. Discards and landings of yellowtail in New England (food fishery only, metric tons round fresh).

Year		
1963	Discards	12,356
	Landings	35,146
1964	Discards	10,867
	Landings	35,736
1965	Discards	9,394
	Landings	34,144
1966	Discards	13,145
	Landings	28,078
Average	Discards	11,440
	Landings	33,276

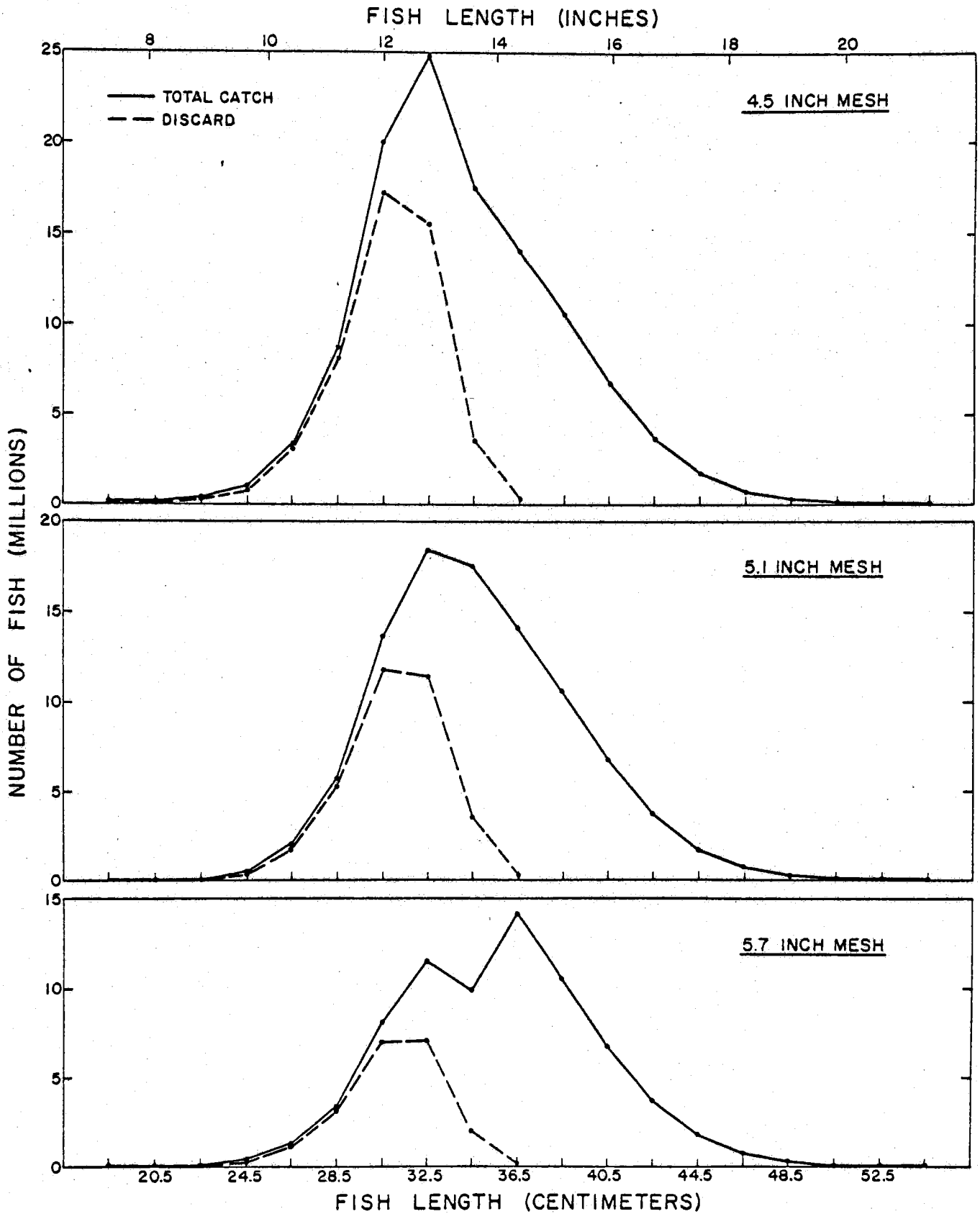

Figure 1. Estimated length compositions of total catch and discards of yellowtail with 3 different codend mesh sizes. (Length compositions are based on the composition in 1963-66).

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 2. 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.

The effect of the industrial fishery has not been included in the foregoing analysis. If landings of yellowtail in the industrial fishery, where small mesh nets are used, were very great, then some of the anticipated benefits of a bigger mesh for yellowtail in recent years (up to 1966) have been small, and would not have a significant effect. In 1967 they were about 4.6 thousand metric tons.

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 desirable 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 2. 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		% Change in Discards
	Immediate	Long Term (4 yrs)	
5.1"	- 4	+10	-27
5.7"	-21	+17	-56

The high fishing rate raises the question of reducing effort as a means of increasing catch rate and landings. The series of catch and effort data collected since 1939 indicates several major changes in stock abundance which were not apparently related to fishing effort. We have no estimate of the level of effort which would provide the maximum sustainable catch, and no evidence that reducing the current level of effort would be beneficial in the long run.

Conclusions

Mesh selection experiments on yellowtail flounder indicate that trawl nets with mesh sizes of 5.1-inch and 5.7-inch do, in general, retain a greater proportion of larger fish than the 4.5-inch nets now in use in the commercial fisheries. However, the selection of these larger meshes is such that rather considerable quantities of small fish are also retained.

The estimated long term benefit of 10% with the 5.1-inch mesh is rather small in relation to the variation in real benefits which might be caused by changes in fishing rate and recruitment. The estimated 17% benefit with the 5.7-inch mesh must be judged as a borderline benefit for the reasons above and in relation to the immediate losses of 21%.