

# MODIFICATIONS IN GEAR TO CURTAIL THE DESTRUCTION OF UNDERSIZED FISH IN OTTER TRAWLING<sup>1</sup>

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## INTRODUCTION

The destruction of undersize haddock did not become a problem of importance to the New England fishery until fairly recent years, for as late as 1900 the total haddock catch hardly reached 50,000,000 pounds and was taken mainly by line trawls. Following the introduction of the otter trawl into the commercial fleet in 1905, the landings slowly increased as the result of a gradual growth in the otter-trawl fleet.

The increasing use of the otter trawl met considerable opposition among the line and dory fishermen because of the belief that it was unduly destructive. As a consequence, Congress, in 1912, provided funds to enable the Commissioner of Fisheries to investigate beam and otter trawl fishing and report "whether or not this method of fishing is destructive to the species or is otherwise harmful or undesirable." Following an extensive investigation the Bureau's committee reported their conclusions in 1915. They found that the

<sup>1</sup> Investigational Report No. 24. Approved for publication, Sept. 6, 1934.

principal valid objection to the otter trawl was the large number of undersized food fish captured and destroyed by the nets. During the period of the investigation this amounted by *weight* to 40 percent for cod and 38 percent for haddock during June to December, and 3 percent for cod and 11 percent for haddock during January to May. Converted to numbers, the proportion of haddock destroyed amounted to about 77 percent and 40 percent, respectively. At that time, however, the recent introduction of the otter trawl and small size of the fleet made it impossible to reach any conclusion as to whether or not this additional strain would have any appreciable effect on the abundance of fish. Consequently, the committee recommended that otter trawling be restricted to certain banks and that developments during the following years be observed closely to determine what

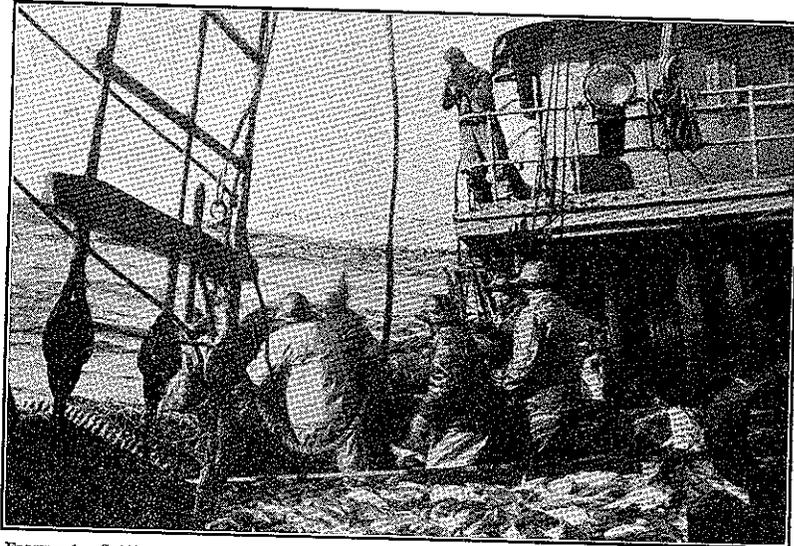


FIGURE 1.—Setting the trawl after a good catch, Brown's Bank, March 1932, *Kingfisher* trip III.

effect this fishing would have on the abundance of groundfish over a long period of years. The committee also warned: "We emphatically state it to be our opinion that this regulation will prove futile and an unnecessary imposition on American fishermen unless Canada, particularly, and possibly Newfoundland and France will take such action as will prevent or restrict the use of the trawl on the banks in the western North Atlantic" (Alexander, Moore, and Kendall, 1915). The industry did not see fit to support these recommendations; consequently, at that time, neither the United States nor other Governments took further action.

During the following years there were a number of new developments in the groundfish industry. Improved processing methods resulted in an expanding market which led to a rapid increase in the otter-trawl fleet until in 1930 there were 323 such boats fishing out of Boston, Gloucester, Groton, and Portland.<sup>2</sup> This fleet landed nearly 3 times as much fish as the 142 liners and dory vessels fishing from the

<sup>2</sup> These ports receive all New England groundfish landings except a relatively small amount landed at local ports from inshore fishing grounds.

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same ports. Although the expanded fishery was based mainly on haddock, the supply showed no alarming signs of decline until 1929 and 1930; in fact, the catch in 1927 (catch per boat per day) was the best within the modern records of our fishery (since 1915). But in 1929 haddock began a rapid decline from the high level reached in 1926, 1927, and 1928. This trend created considerable concern in the industry and was largely responsible for the allotment of funds to the Bureau of Fisheries for the study of the haddock fishery. The investigation was designed to determine the cause of the decline in the haddock catch and whether any effective measures could be devised for its relief.

The study of the fishery begun late in 1930 has demonstrated that the scarcity of marketable haddock during 1929 to 1931 arose principally from two causes. First, haddock spawning during 1925 to 1928 failed to produce more than negligible quantities of small fish, with the result that the stock of haddock of marketable size received few additions of upgrowing young to replace those taken by the fishery and natural mortality.<sup>3</sup> Second, the greatly expanded fishing fleet was removing haddock from the banks at a rate more rapid than ever before in the history of the fishery. Consequently, the marketable stock, with negligible recruitments of young fish, was reduced rapidly by an annual commercial catch which in 10 years had more than trebled in quantity.

Failure of the annual spawning, the first condition named above, appears to be beyond control, for no practical method has yet been developed by which the spawning success on the great offshore banks can be appreciably influenced by man. The second condition offers greater promise, for if means can be found to lessen considerably the strain on the stock without detriment to the fishery, a distinct saving will be achieved.

#### WASTAGE OF SMALL FISH IN NEW ENGLAND FISHERY

The published figures of haddock landings do not provide an adequate picture of the greatly increased strain on the fishery in recent years, for in addition to the threefold increase in the commercial catch it is an uncontroverted fact that each year large numbers of fish too small for market are taken by the trawls and thrown back into the sea dead. The trawler investigation in 1913 to 1914 showed how large was the proportion of undersized haddock and cod destroyed by the otter trawls, particularly during the summer and fall months. But at that time few boats were using this gear and the additional strain thus imposed on the population by the destruction of young had not caused any noticeable decrease in abundance.

The great increase in the trawling fleet since 1915 not only caused a tremendously augmented drain on the commercial stock through the catch of fish of marketable sizes (this strain would be equally great if the same quantity were caught by any other gear) but in addition imposed an equally serious but less obvious drain from a similar increase in the destruction of small fish. The magnitude of this destruction usually is not fully appreciated even by the most severe critics of the otter trawl. A few hundred or a thousand small haddock, because of their insignificant size, will attract little notice when

<sup>3</sup> The data upon which this statement is based will appear in a later report on the haddock fishery.

scattered about in a haul of several thousand pounds of trash and market fish. It is only when their numbers greatly surpass the large fish that the small haddock become particularly noticeable.

Quantitative records of the destruction of undersized haddock are available for two short periods, 1913-14 and 1930-32. The extensive series of observations made during the first period by Bureau observers engaged in the trawler investigation showed that of the total number of haddock caught between June and December, about 77 percent were unmarketable, and of those caught between January and May, about 40 percent. During the study of the haddock fishery in 1930, 1931, and 1932, length-frequency data collected by observers on 20 sea trips aboard commercial trawlers provide more recent information. Between September 1930, and May 1931, the percent of undersized haddock was approximately as follows: South Channel, 50 percent; Northern Edge, 67 percent; Southeastern Georges, 75 percent. During the last part of 1931 and in 1932 the proportion dropped off to 20 percent or less on Georges Bank, but on Browns Bank and eastward it amounted to nearly 75 percent. Thus it is evident that the proportion of undersized haddock in the catch varies with the season, the bank fished, and the year. The destruction is great during years following good spawning seasons, for the young fish then are present on the banks in large numbers; but after a series of poor seasons the number wasted is relatively low. Nevertheless, whether members of good or poor year classes, young haddock are subject to extensive decimation by the trawlers during the time they are growing from about  $\frac{1}{4}$  to  $1\frac{1}{2}$  pounds (22 to 42 centimeters). On Georges Bank this growth requires about  $1\frac{1}{2}$  to 2 years. Consequently, before reaching marketable size each must run the gauntlet of the commercial fishery for nearly 2 years and the millions that fail to get through reduce the stock of haddock on the banks to the same degree as the capture of an equal number of large, commercially valuable fish.

#### EFFECT OF DESTRUCTION OF UNDERSIZED FISH ON STOCK

Before proceeding further it may be well to consider the effect on the stock caused by the destruction of millions of small fish. The subject has received considerable attention in Europe and in the case of certain species, notably the plaice, there still exists some difference in opinion. The negative argument is based principally on the "thinning theory" developed in Europe from results obtained in certain studies of the plaice fishery in the North Sea, Belt Sea, and western Baltic. The theory maintains that thinning out a stock of fish is desirable, especially for the smaller sizes, as it leaves a greater amount of food available for the survivors, which by their increased growth more than compensate for the weight of fish removed. Certain writers have transferred this argument from the plaice to other species and at one time it was held by several to be the solution of the overfishing problem. Peterson (1920) and Garstang (1926) argued that through an increase in the growth rate of its members a stock of fish would adjust itself to the strain upon it. The evidence in favor of the argument has come almost entirely from the plaice fishery but even for this species has been more or less discounted by the investigations of recent years (Hlogvad, 1932; Hjort, 1932; Jensen, 1932).

The keystone rate which results. However, in the and herring, it has population has r 1932; Hjort, 1932; accumulated to s on the North Am changes in growth tion but that we tion for the destr absence of any fa conclusion that the nets now use increased strain o Summarizing t our present fisher are destroyed and greater with the destruction of yo hand, this destruc small fish which i the commercially improving his cat viding a larger re result from a serie can be developed v of undersized fish fleet, a clear gain fish will be saved v Although it is c haddock by the ot can by no means part of this destru to 1928 level. But we shall obtain be present methods co A review of the bility of avoiding haddock and cod. as to whether any prevent the destru operations of the found, the future d where an intensive tion in some of the the catch of marke trawling, and of t fourths pound apic pounds per hour an is done in our fish this to the 13,500 p net tons and over) catch per day is for