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NEW ENGLAND'S INDUSTRIAL FISHERY

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BACKGROUND

New England's industrial fishery began at the turn of the present decade as a result of at least two different fishery developments. The first of these was the failure of the sardine (pilchard) fishery on the West Coast, and the second, the extension of the menhaden fishery into New England waters. At this same time, the yellowtail flounder was suffering a decline in southern New England which forced a sizable group of smaller draggers to turn to other species for part of their income. The failure of the sardine fishery meant an increased need of meal from other sources. The plants that process menhaden also process other fish with some modifications, and fishermen in need of funds are willing to bring in less profitable species of fish. For these and other reasons, New England's industrial fishery now seems to be growing into a healthy and important part of the New England fishery economy.

The term "industrial fishery" as used here refers to only that part of the fishing industry that takes fish for reduction to meal or to a liquid concentrate. Generally speaking, there are two types of vessels that supply the bulk of this fish: those which specialize in the so-called "trash" or industrial species only, and those which fish for both market and industrial species. The bulk of the industrial catch is landed at New Bedford and Point Judith. Closely related to this fleet of vessels, but not included here as part of it, are the boats that specialize in catches (whiting preferred) for mink food, and dog and cat food. Fish for reduction are given no special treatment other than some sorting that may be necessary to sell certain species separately.

Table 1 - Industrial Fish Landings at Point Judith, New Bedford, and Gloucester--1949-56

Year	Pt. Judith, R. I.	New Bedford, Mass.	Gloucester, Mass.	Total
	. . . . (1,000 Pounds)			
1956	102,254	27,496	15,954	145,704
1955	73,402	20,964	14,224	108,590
1954	58,595	20,113	22,671	101,379
1953	51,794	21,294	5,600	78,688
1952	29,247	16,417	66	45,730
1951	23,740	16,699	800	41,239
1950	9,404	56,041	5,500	70,945
1949	9,989	44,115	7,890	61,994
Total	358,425	223,139	72,705	654,269

LANDINGS

This industrial fishery really began in 1949 (Snow 1950 and Sayles 1951). The landings for three ports are listed in table 1. The catch at Point Judith has continued to increase and since 1951 has been more than double the catch at all other New England ports combined. New Bedford and Gloucester figures include relatively small amounts of fish landed as animal food. The abrupt change in New Bedford production

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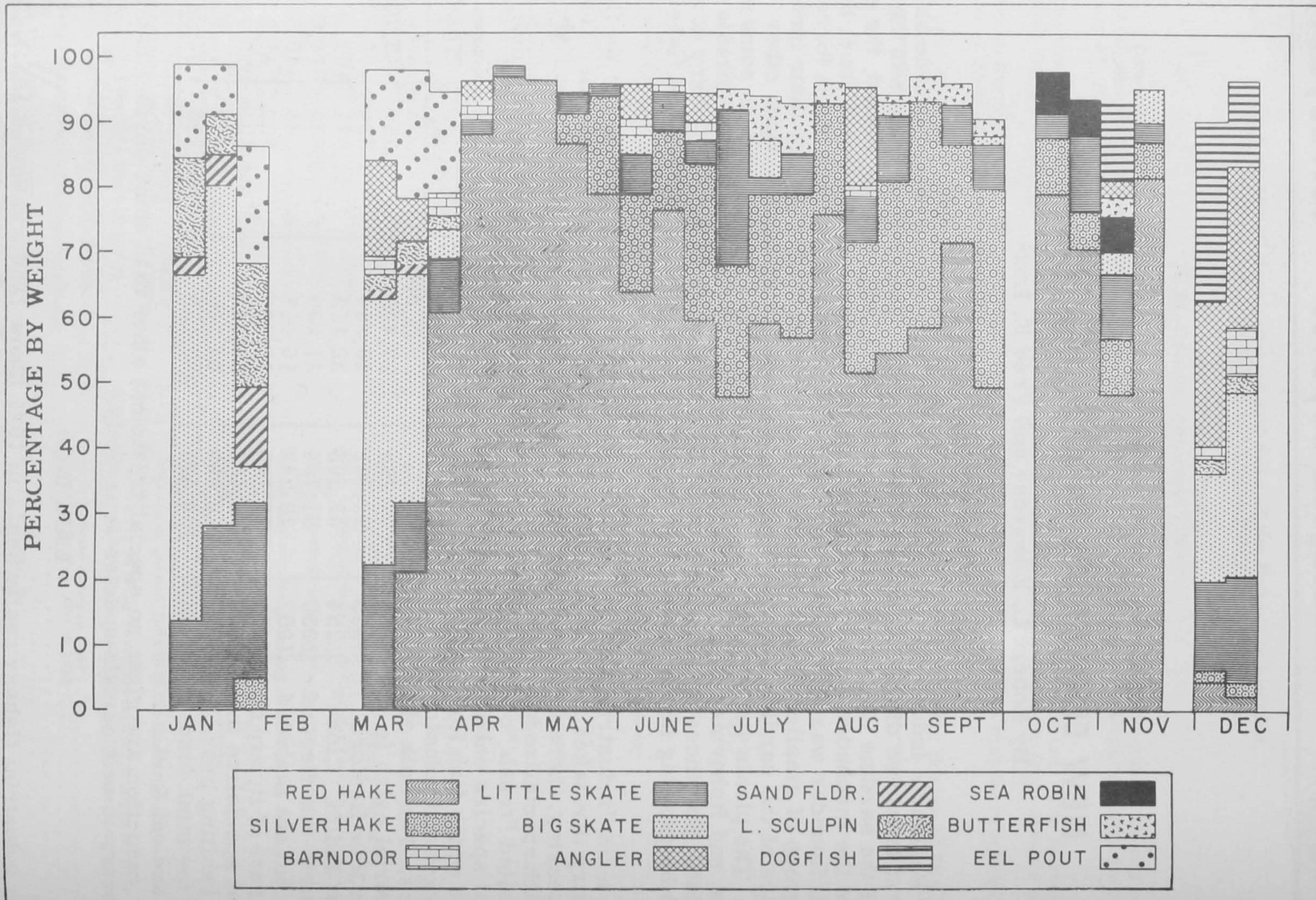

FIG. 1 - SPECIES COMPOSITION OF INDUSTRIAL FISH IN PERCENTAGE BY WEIGHT FROM NO MANS FISHING GROUND. (BASED ON SAMPLES TAKEN AT NEW BEDFORD AND POINT JUDITH DURING MAY 1955 THROUGH DECEMBER 1956.)

after nearly two years of heavy landings was brought about by a considerable drop in the price paid for industrial fish. Not all of the fish landed at Point Judith is processed there. A large quantity is trucked to another plant near Gloucester. All of the industrial fish landed at New Bedford is trucked out.

Aside from their value as a protein source, industrial fish products contain what are commonly referred to as unidentified growth factors. Fish concentrates are widely used in poultry feeds, and because of these growth factors, poultry raisers are getting more pounds of chicken in less time. While these growth factors are not all found exclusively in fish products, fish are an inexpensive source. New processes are currently being developed for the production of fish flour for human use. As additives to basic foodstuffs, such as cereals or bread, these may well become important in the diets of people in countries where proteins are scarce.

Capture and processing of the industrial species has become one of the important fishing industries of New England. As time goes on, the distinction between industrial and food fishes will become less sharp. This will raise the all-important question of best utilization of various fishes and could conceivably alter all our views concerning the management of a general marine fishery. For this reason, the industrial fishery should be given a long, hard look by biologists and members of the fishing industry, especially with respect to the future of the industry and whether or not it offers the best utilization of fish not generally utilized for food or the demand of which for food purposes is limited.

BIOLOGICAL STUDY INITIATED

A study[1/] of the industrial fishery was established at Wood Hole in early 1955. An initial aim was to determine whether or not significant numbers of undersized yellowtail flounders were being landed in industrial trips. It was soon apparent that this problem was not the most important one. The best utilization of fish of any species and the stability of the industrial fishery itself were more important problems. This project has collected information for over 18 months now; it has answered many questions, and brought up even more questions. We are now in a position to begin to examine the entire problem of the utilization of a community of fish. Since most of the industrial fish have come from southern New England waters, the following discussion will be based on that area.

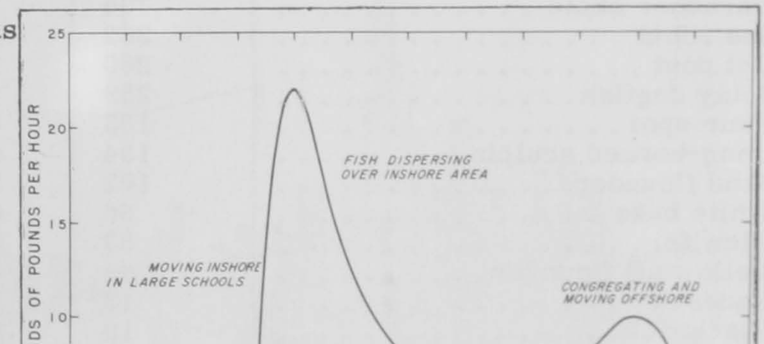

FIG. 2 - THE CHANGES IN ABUNDANCE (POUNDS PER HOUR OF FISHING) OF THE RED HAKE ON SOUTHERN NEW ENGLAND FISHING GROUNDS. (BASED ON INTERVIEW DATA DURING 1955 AND 1956.)

Regular sampling of industrial landings was begun in May of 1955. Samples were taken of trips from each of the more important fishing grounds frequently enough to provide a picture of the seasonal and local variations in the distribution of various fish species. Fig. 1 summarizes data collected from trips sampled from the fishing area southwest of Martha's Vineyard known as the "No Mans" fishing ground. Because this ground provides so much of the fish, it may be considered typical of the entire industrial fish landings from the southern New England area. The differences observed in other areas are not sufficiently great to change the general picture presented in the No Mans ground data.

1/FINANCED WITH FUNDS MADE AVAILABLE BY THE SALTONSTALL-KENNEDY ACT OF 1954.

RED HAKE PRINCIPAL SPECIES

The red hake (Urophycis chuss Walbaum) is the principal species landed. The seasonal movements of this fish account for its variation in quantity throughout the year. Second in importance is the whiting or silver hake (Merluccius bilinearis Mitchill), a fish that is most abundant during the warmer months of the year. The red hake, whiting, and two species of skates--the common skate (Raja erinacea Mitchill) and the big skate (Raja ocellata Mitchill)--together account for all but a very small percentage of all of the industrial fish landed. During the colder months of the year, the catch is principally made up of the common skate, the big skate, the eel pout (Macrozoarces americanus Bloch and Schneider) and the sculpin (Myoxocephalus octodecimspinosus Mitchill). The commercially-important food fish are present in very small quantities. The butterfish (Poronotus triacanthus Peck), more than any other marketable food fish, is present in measurable amounts. At the present time there is no indication that the food fish are suffering from undue exploitation as industrial fish.

Table 2 - Quantities and Percentages of Various Species of Fish Landed by the Industrial Fleet at New Bedford During 1956 from the No Mans Fishing Ground[1/]

Species	Pounds	Percentage
	1,000 Lbs.	%
Red hake	17,024	68.1
Silver hake	3,390	13.6
Little skate	1,488	6.0
Butterfish	418	1.7
Anglerfish	407	1.6
Big skate	403	1.6
Barndoor skate	306	1.2
Sea robin	262	1.1
Eel pout	260	1.0
Spiny dogfish	259	1.0
Four spot	185	0.7
Long-horned sculpin	134	0.5
Sand flounder	102	0.4
White hake	86	0.3
Alewife	63	0.3
Yellowtail flounder	48	0.2
Haddock	13	0.1
Blackback	19	0.1
Smooth dogfish	21	0.1
Scup	9	-
All others	101	0.4

1/BASED ON AN ESTIMATED 25 MILLION POUNDS LANDED FROM THE NO MANS GROUND.

A breakdown by species based on samples of the catches from the No Mans ground landed at New Bedford during 1956 is presented in table 2. A total of 27.5 million pounds of industrial fish were landed there during 1956. The figures are based on an estimated 25 million pounds landed from the No Mans ground.

Without the red hake there would be no industrial fishery of importance, all other things being equal. It is abundant and not in great demand as food. Should the abundance of this species markedly decrease, the industry could not be maintained at its present level even if new fishing areas were exploited and some of the present food species were included in the industrial portion of the catch.

ABUNDANCE

It must be remembered that there is no stability in time for these communities of fish; they vary both seasonally and annually. Undoubtedly, some of the long-term changes are cyclic rather than irregular, but the fact remains that these communities are always in a state of change. The long-term changes, especially those related to changes in the physical environment, may be deduced from the seasonal changes when enough information on both the fish and the environment has been gathered. The seasonal changes in abundance, measured in terms of catch per hour, can be dramatic. For example, in fig. 2, the changes in abundance throughout the year for red hake from No Mans ground for the past two years show the effect of seasonal movements. The fish move inshore early in the spring. At this time of the year they apparently are in tight schools, since boats may catch as much as 60,000 pounds an hour at this time. Shortly after their arrival inshore they begin to disperse over the fishing grounds and peripheral areas and the catch drops to around 5,000 pounds an hour. The red hake spawn from July to early September with the peak occurring in the middle of August. This period coincides with a lowered level of abundance. Following spawning, concentrations again appear and the catch rises for a short while before the fish move offshore. Early in December the catch on this ground has fallen to a small fraction of the spring abundance.

THIRTY SPECIES INCLUDED

There are approximately 30 species of significance involved in this industrial fishery, including those sold for the food market. Fig. 3 combines seasonal and an-

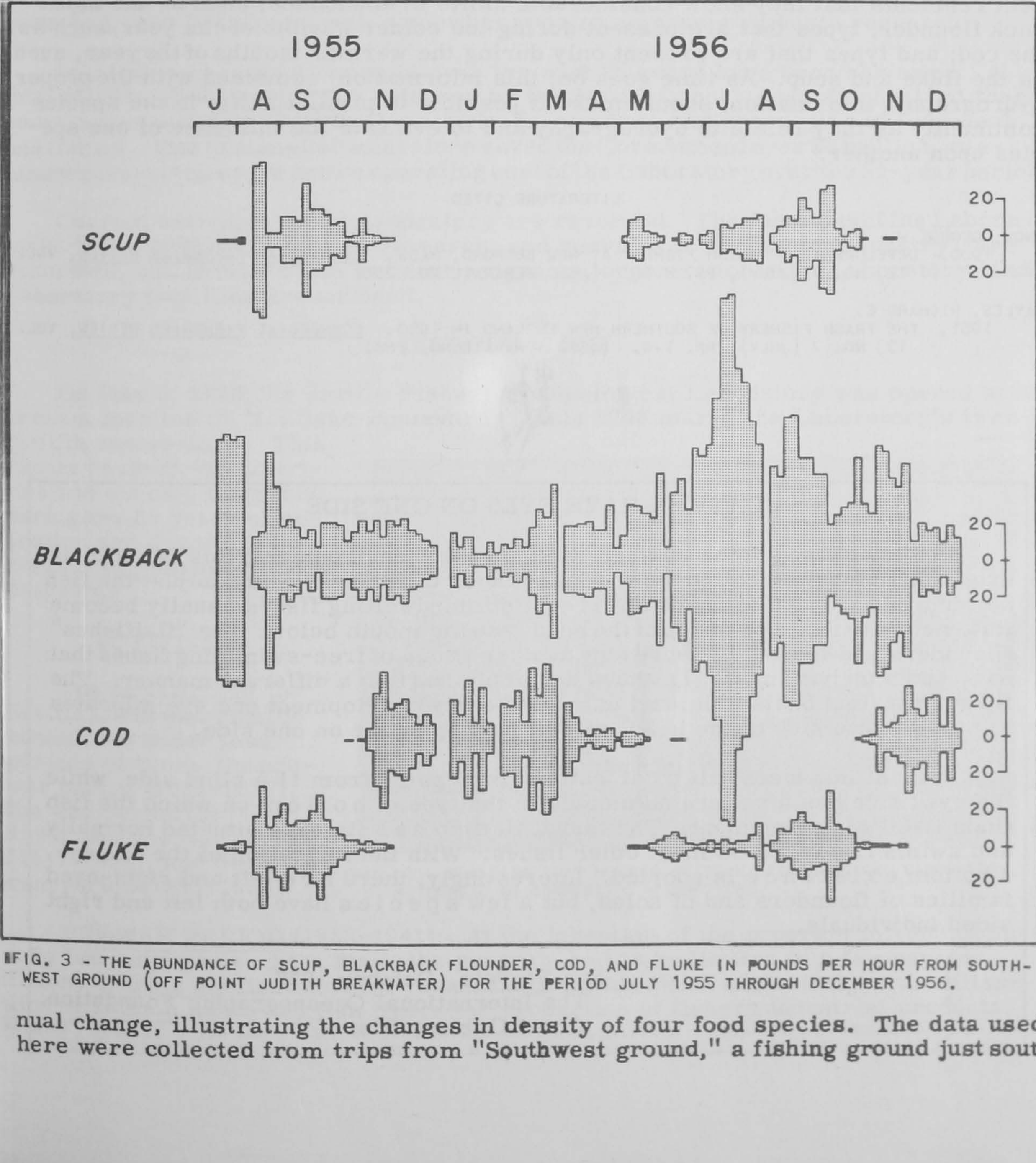

FIG. 3 - THE ABUNDANCE OF SCUP, BLACKBACK FLOUNDER, COD, AND FLUKE IN POUNDS PER HOUR FROM SOUTHWEST GROUND (OFF POINT JUDITH BREAKWATER) FOR THE PERIOD JULY 1955 THROUGH DECEMBER 1956.

nual change, illustrating the changes in density of four food species. The data used here were collected from trips from "Southwest ground," a fishing ground just south of the breakwater at Point Judith. The blackback flounder (Pseudopleuronectes americanus Walbaum) is the most important in terms of poundage. It reaches its peak of abundance in the summer months in Southwest ground, after which it tends to move out into other areas. The blackback catch during the latter part of 1956 was almost double that of the same period in 1955. This increase in 1956 was not restricted to Southwest ground, but more or less typical of the entire area. Following the peak of blackback flounder, the fluke (Paralichthys dentatus Linnaeus) builds up in numbers. It is worthy of note that there were considerably fewer fluke caught in Southwest ground in 1956 than in 1955. The abundance pattern of the scup (Stenotomus versicolor Mitchill) is similar to that of the fluke and indicates that both species are influenced by similar environmental factors. The cod (Gadus callarias Linnaeus) begin to move through the area on their way to the New Jersey spawning grounds at the time when the fluke are leaving for the winter. All of these species are migratory to a degree. All species as well tend to fall into one of the three general types illustrated in figure 3. These types are: the more-or-less permanent residents that may show considerable shifts in abundance, such as the blackback flounder; types that are present during the colder months of the year, such as the cod; and types that are present only during the warmer months of the year, such as the fluke and scup. As time goes on, this information, combined with the proper hydrographic information, should make it possible to predict shifts in the species community as they relate to hydrography and to evaluate the influence of one species upon another.

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FLATFISH HAVE EYES ON ONE SIDE

Fish are said to be closely "tied" to their environment, this is, in their evolution natural selection favors inheritance of features which adjust the fish better to its particular mode of life. Bottom-dwelling fishes usually become flattened with the eyes on top of the head, and the mouth below. The "flatfishes" (flounders and their kin) represent another group of free-swimming fishes that have taken up bottom life, but have accomplished it in a different manner. The flounder swims on its side, and during its early development one eye migrates to the opposite side of the head, so that both eyes are on one side.

In most instances, all color pattern is missing from the blind side, while the eyed side has a pattern adjustable to the type of bottom on which the fish finds itself at any moment. The larval flatfish has its eyes situated normally and swims freely, as do most other fishes. With the migration of the one eye, a bottom existence is adopted. Interestingly, there are left and right-eyed families of flounders and of soles, but a few species have both left and right sided individuals.

--Sea Secrets, October 1957
The International Oceanographic Foundation,
Coral Gables, Fla.