ARTICLES

THE NEW THREAD HERRING FISHERY IN EASTERN GULF OF MEXICO

By Charles M. Fuss, Jr.*

The Atlantic thread herring, Opisthonema oglinum (Le Sueur), is a marine fish of the family Clupeidae that ranges from the Gulf of Maine to Brazil and throughout the Gulf of Mexico (Butler, 1961; Berry and Barrett, 1963). Thread herring seldom exceed 10 inches and are characterized by a thread-like elongation of the last ray of the dorsal fin (fig. 1). This characteristic led to the name "hairy back" frequently used by commercial fishermen.

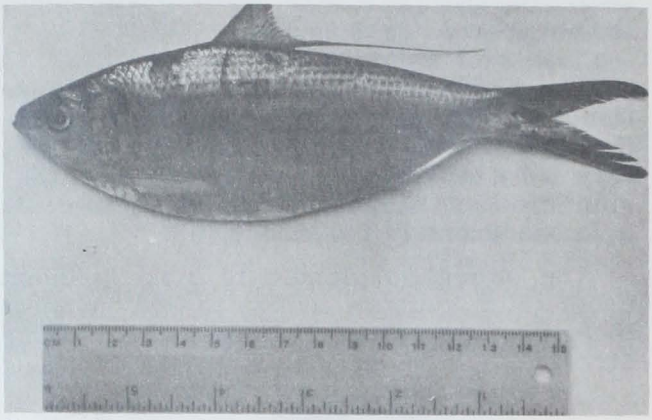

Fig. 1 - The Atlantic thread herring, Opisthonema oglinum (Le Sueur).

Thread herring occur in great numbers on the west coast of Florida, particularly between Tampa Bay and the Florida Keys. They are frequently concentrated in nearshore waters, generally inside the 10-fathom contour. The earliest report on the extent of thread herring schools in the eastern Gulf resulted from tuna bait explorations by the Bureau of Commercial Fisheries' "Oregon" in 1953 (Butler, 1961). In 1967, Bullis and Thompson--on the basis of aerial and surface surveys by BCF's Exploratory Fishing and Gear Research Base, Pascagoula, Miss.--estimated that the Gulf stock is about 1 million tons. The size and significance of the resource have been further confirmed by aerial surveys of the St. Petersburg Beach Laboratory and by commercial exploratory fishing (Sykes, 1967).

THE DEVELOPING FISHERY

In 1961, Butler described the earl (1953-60) developments of the fishery on t Florida Gulf coast. The industrial fishe began in the St. Petersburg area during wint 1958-59, when catches up to 27 tons per s were made with lampara seines. Single-bo purse seining, introduced in winter 1959-6 produced catches of 5 to 40 tons per set. Th fish were transported to pet food and reduc tion plants in the northern Gulf of Mexico be cause landing facilities were not available o the lower west coast. Adverse weather dur ing the winter, and a shortage of freight ves sels to transport the catch, further limite development of the fishery.

In 1957, a small bait fishery for threa herring and other clupeoids was started in St Petersburg by one vessel equipped with lampara seine. Single-boat purse seinin began in 1958. Fishing has continued inter mittently since then, and a converted men haden vessel was added in 1967. The sam vessels are used for taking food fish in off shore waters.

Predictions of a continuing decline in A lantic menhaden stocks (Henry, 1966) and th promising results of Gulf thread herri surveys generated intense commercial inte est in the further development of an industri thread herring fishery on the Florida we coast in early 1966. In August 1967, a r duction plant (fish meal, oil, and soluble was opened on Charlotte Harbor in the Fo Myers area. Initially, the plant was supplie by one vessel fishing a single-boat purs seine rig (fig. 2); a typical menhaden vess (2-boat rig) joined the operation in October Landings at the plant by the end of Decembe totaled about 3,750 tons1/ of thread herring

In November, Louisiana-based menhade vessels (fig. 3) entered the fishery off For Myers. One of these vessels made a recor

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1/Unpublished BCF statistical data.

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catch of 500 tons in 5 hours. Landings in Louisiana by the end of December were about 1,150 tons[1/]. These catches, plus the Florida landings, totaled almost 5,000 tons during September-December.

Fishing has been restricted to a relatively small area off Fort Myers in nearshore waters about 3 to 10 fathoms deep (fig. 4).

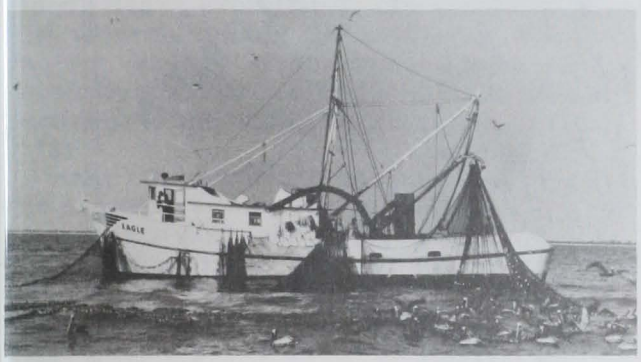

Fig. 2 - Single-boat purse-seine rig used in thread herring fishery.

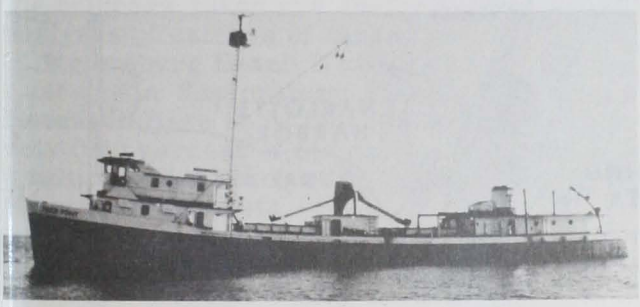

Fig. 3 - Menhaden vessel used in thread herring fishery.

LEGAL PROBLEMS OF THE FISHERY

The new thread herring fishery has been beset with conflicts reminiscent of those in the menhaden fisheries. Sport fishing interests have become aroused, bait dealers and gill net fishermen are concerned, and conservationists view developments with misgivings. The State of Florida does not allow the taking of food fish with purse seines in territorial waters (out to 10.5 miles on the Gulf coast). The law was initially interpreted to include incidental food fish captured in thread herring sets. In November and December 1967, enforcement of the law caused the temporary withdrawal of the Louisiana vessels from the fishery. A court decision in February 1968 included an interpretation that allows a certain percentage of food fish in industrial fish catches, subject to administrative regulation by the Florida Board of Conservation. As a result, prospects for continued development of the fishery are good.

SHOULD THE FISHERY CONTINUE?

The world demand for animal protein is increasing steadily. Marine fish, particularly clupeoids, are becoming more important in supplying that need. Chapman noted in 1967 that the trend in world fish catches shows an increase in landings of clupeoid fishes from one-quarter of the catch in 1948 to about one-half in 1965. He inferred these reasons for the increased production: (1) the ocean contains more of them than of any other group presently harvested, (2) they congregate in large shoals that can be caught efficiently and cheaply, and (3) animal-husbandry practices in the past 20 years have been revolutionized by adding animal-protein supplements, primarily fish meal, to the diets of domestic fowl and mammals.

Despite increasing world utilization of industrial fish for animal food and industrial products, production in the United States has declined steadily in recent years. In 1962, the Atlantic and Gulf menhaden fisheries produced a record 2.3 billion pounds of fish but, in 1967, the yield was down to 1.2 billion pounds. The drop in production was due primarily to the failure of the Atlantic menhaden fishery. As a result, imports of fish meal increased from 44.7 percent of U. S. consumption in 1962 to 75.5 percent in 1967 (Lyles, 1968).

The new thread herring fishery is of great importance in light of these facts. A stock estimate of 1 million tons, a demonstrated catch of 5,000 tons in 4 months, the continuing decline of menhaden stocks, and the increasing world demand for animal protein--all show the definite need and feasibility of this fishery's further development.

THE NEED FOR BIOLOGICAL INFORMATION

Little has been published on the biology of thread herring--except work on its identification (Berry and Barrett, 1963) and a survey of Gulf stocks and fishing methods (Butler, 1961).

The orderly development and wise management of any fishery require considerable knowledge of the biology of exploited stocks. Although many consider the sea's resources almost limitless, a critical examination of world fisheries presents disturbing evidence to the contrary. In 1967, Moe discussed fishery production and management with special

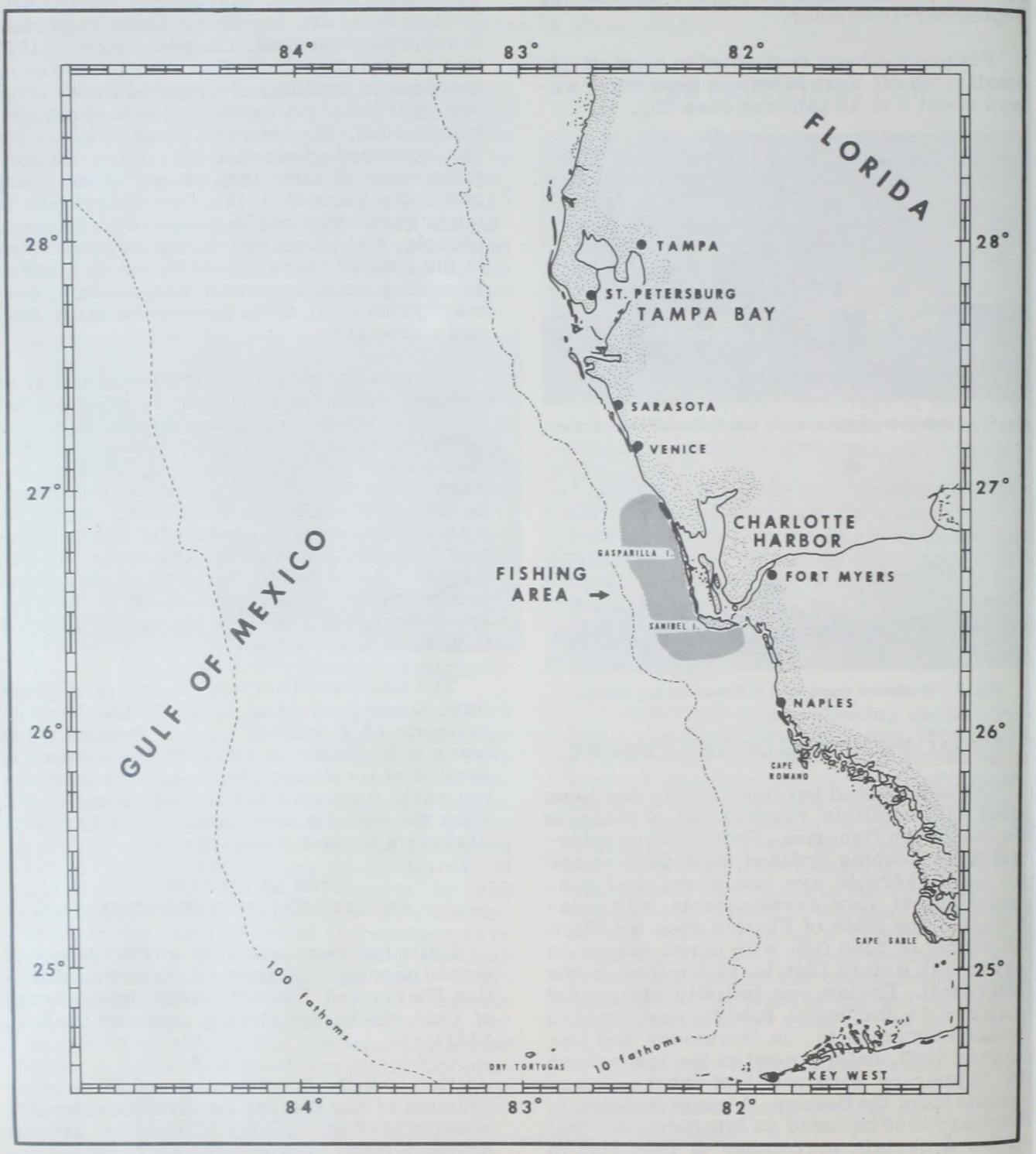

Fig. 4 - Thread herring fishing grounds on Florida west coast.

reference to purse seining. He gave examples that illustrated the effects of overfishing a marine finfish resource. He stated that the primary step toward wise management of any fishery is to develop thorough knowledge of the fish's life history.

Also, the effects of that fishery on other commercial and sport fishes should be understood. Heavy exploitation of a single species with modern fishing methods may affect the general ecology of an area. These effects should be monitored along with those directly pertinent to the exploited stock.

Many controversies have arisen over the use of purse seines for menhaden along the Atlantic and Gulf coasts, particularly with the taking of food fish. This problem prompted studies by Smith (1896), Knapp (1948), Baughman (1950), and Gunter (1963). They concluded that a purse-seine fishery has a negligible effect on food and sport fishes because the numbers taken are insignificant. Initial analyses of catches of thread herring by the St. Petersburg Beach Laboratory and the Pascagoula Exploratory Fishing and Gear Research Base show that food fish constitute only 0.35 percent of the catch. However, the question is not resolved to the satisfaction of all conservationists.

BIOLOGY OF INDUSTRIAL SCHOOLFISHES PROGRAM

Therefore, biological studies on thread herring are extremely important to the development of the fishery. Recognizing possible developments, our laboratory began the Biology of Industrial Schoolfishes Program on July 1, 1967.

The program will investigate the biology of all potentially important industrial schoolfish (excepting menhaden) in the eastern Gulf of Mexico. Limited funds and personnel, however, will restrict initial studies to thread herring, particularly to life history and distribution. Objectives are to:

1. Define the life history of the important industrial schoolfishes of the area.

2. Determine seasonal and annual migrations and fluctuations in abundance.

3. Understand the influence of environmental factors on the movements, behavior, and concentrations of the fishes.

4. Document the importance of contiguous estuaries and determine the origin of fish stocks.

5. Contribute to the taxonomic literature of various species, particularly the juvenile and postlarval stages.

6. Determine behavioral patterns that include feeding habits, schooling characteristics, diel activity, and responses to natural stimuli.

7. Conduct oceanographic surveys of the area for seasonal changes of temperature, salinity, water currents, and water clarity.

8. Understand the effects of fishing pressures and natural mortality on the population dynamics of the species.

9. Construct estimates of maximum sustainable yields, formulate management principles for the fishery, and develop methods to forecast distribution and abundance of stocks.

INITIAL RESEARCH

Field sampling already had begun in April 1967, when the laboratory's research vessel "Kingfish" was equipped with a hydraulic gill net power block (figs. 5 and 6). Monofilament gill nets of various mesh sizes are used for sampling in the deeper parts of estuaries and the Gulf. Plankton tows are made at each gill net station and oceanographic data are recorded. Beach seines and lift nets are used in shallow areas and near docks and bridges. Sampling to date has been limited to Tampa Bay, the Charlotte Harbor-Pine Island Sound area, and nearshore Gulf waters between the two estuaries (fig. 4).

Fig. 5 - R/V Kingfish hauling a gill net with a power block.

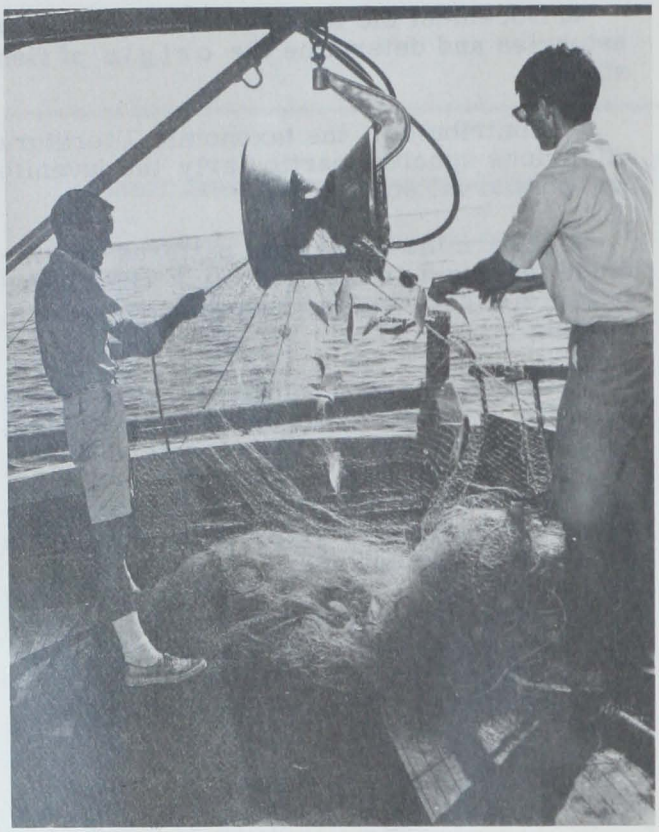

Fig. 6 - Thread herring gilled in a 2-inch monofilament gill net.

Samples have been collected from the commercial catch since the beginning of the fishery off Fort Myers. A systematic port sampling program is beyond our means at present, but the fishermen have been cooperative in preserving samples from individual purse-seine catches. Fishing log books and charts were provided for all vessels engaged in the fishery to document catches, effort, and fishing areas.

Laboratory processing of fish samples includes measurements of body length and depth, body weight, and gonad weight. Sex is determined, and scale, stomach, and gonad samples are preserved for analysis.

Some highlights of research results to date (April 1967-February 1968) are:

1. Thread herring catches per unit of effort (30-minute set with a 2-inch-mesh monofilament gill net) in Gulf waters off St. Petersburg Beach reached a peak in early summer and declined with falling water temperature in the fall. Heavy concentrations of fish (as shown by commercial fishing) off Fort Myers during fall and winter indicate a general southerly or possibly offshore movement when coastal waters are cooling. Schools of thread herring, however, do occur off St. Petersburg in winter (Butler, 1961).

2. Juvenile thread herring appeared in beach seine samples along Gulf beaches in the St. Petersburg area during summer and disappeared by fall, indicating an offshore movement of juveniles.

3. Thread herring had fully developed gonads at $5\frac{1}{2}$ to $6\frac{1}{2}$ inches fork length off St. Petersburg Beach in early April. Spent gonads, indicative of spawning, appeared by late May when water temperature was about 81° F. Gonad development indicates a spawning peak in June. No gonads were ripe in July. The gonads of fish from commercial catches off Fort Myers during winter have been undeveloped.

4. The ratio of males to females in the summer thread herring population off St. Petersburg Beach was about 1 to 5; that of the winter population off Fort Myers was about 1 to 1.

5. Thread herring with a mean fork length of about 6 inches constitute the bulk of commercial catches in the Fort Myers area.

6. Preliminary analyses of catches of purse seines show that the only important food fish in purse-seine catches have been sand sea trout (Cynoscion arenarius; 0.15% of catch) and spanish mackerel (Scomberomorus maculatus; 0.19% of catch).

COOPERATION WITH INDUSTRY

We have tried to maintain close contact with industry in the development of the fishery. Plant operators and fishermen have been very cooperative in providing catch statistics and samples. They have shown much interest in the biological aspects of the fishery.

We have attempted to provide direct services to the new industry when requested. Fishing trials with monofilament gill nets of various mesh sizes were made in the Fort Myers area for fishermen to establish the minimum size required to prevent gilling of fish. The information was used in the selection of purse-seine netting. Laboratory personnel also have served as expert witnesses in court proceedings to give testimony on the quantities of food fish in purse-seine catches. The data presented were instrumental in obtaining a favorable court decision for continuation of the fishery.

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FISH HEARING LIKENED TO HUMAN SMELL

A fish is in about the same predicament as a man trying to determine the source of an odor as far as telling the location of a sound source is concerned, the Acoustical Society of America meeting in New York was told by Prof. Willem van Bergeijk of the Center for Neural Sciences at Indiana University. Because humans have only one nose, the only way they can detect the direction of a smell is by "sniffing it out," trying here and there until stumbling upon the source. It is believed fish have the same problem locating the direction of a sound since fish have only one middle ear.

Fish can locate a sound source if they are close to it, but they do this through their lateral line (tiny sensory buds spread over the body) which is sensitive not to sound but to the small water currents near the sound source, such as those caused by a wriggling worm. (Reprinted, with permission from "Science News," weekly summary of current science, copyright 1966 by Science Service, Inc.)