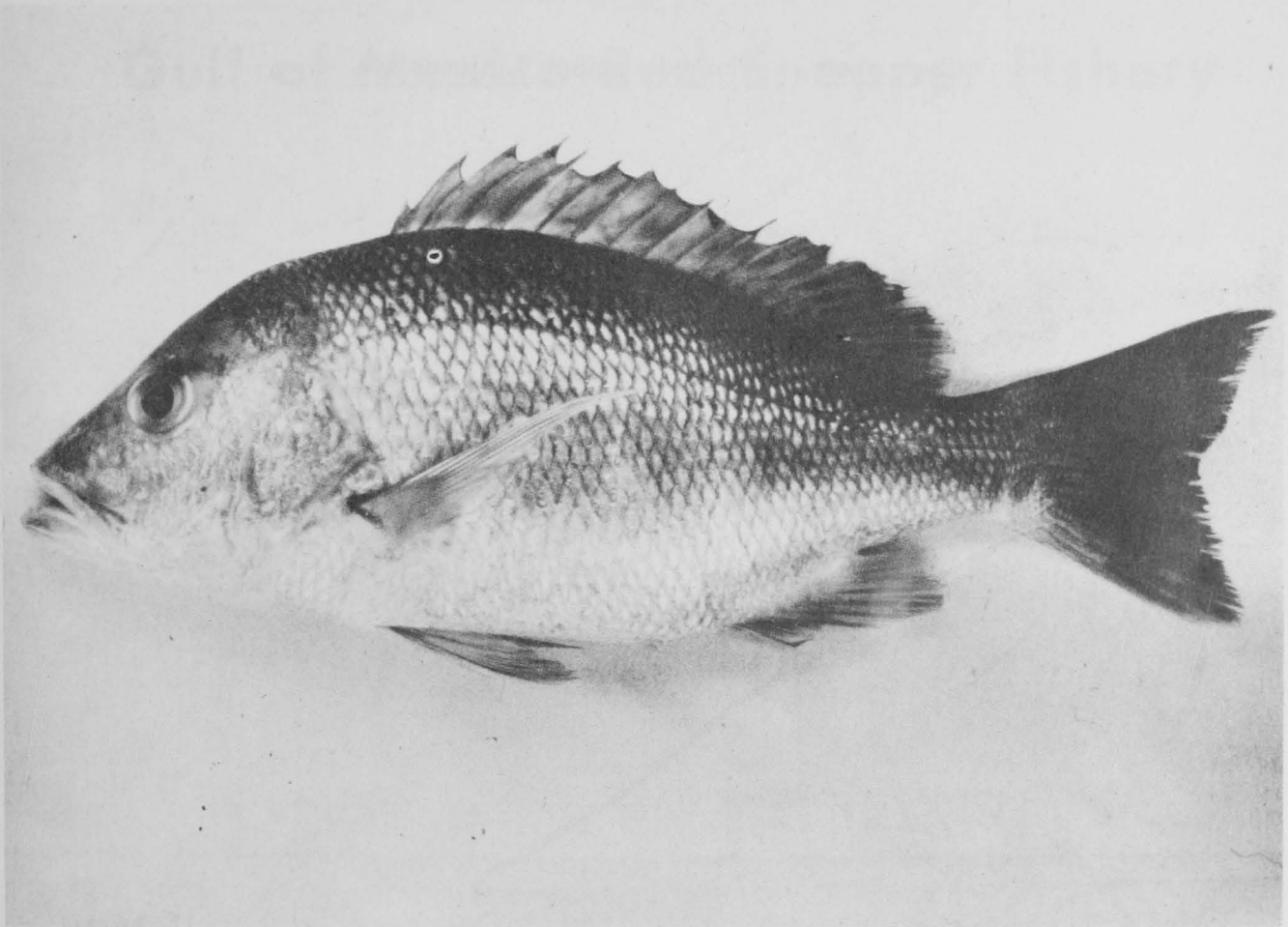


A Review of the Gulf of Mexico Red Snapper Fishery



**UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES**

Circular 208

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Cover photo. -- The red snapper, Lutjanus aya.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF FISHERIES
WASHINGTON, D. C.

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By

JAMES S. CARPENTER

Circular 208

Washington, D.C.

August 1965

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CONTENTS

	Page
Abstract	1
Introduction	2
History	2
Vessels	2
Fishing grounds	7
Fishing methods and gear	10
Handling and marketing	15
Species taken	27
Production	27
Fluctuation of effort on the Campeche Banks	31
Production problems	31
Summary	31
Acknowledgments	33
References	35

FIGURES

	Page
Cover photo. The red snapper, <i>Lutjanus aya</i> .	
1. The <u>Buccaneer</u> , built in 1925, is a 105-gross ton, 103-foot two-masted schooner of the type used in the early fishery. A few are still in use today.	3
2. The <u>Star Queen</u> , built in 1953, is a 71-gross ton, 68-foot motor sailboat.	4
3. The <u>Silver Chalice</u> , built in 1964, is a 63-gross ton, 72-foot snapper boat.	5
4. The <u>Ten Kids</u> , built in 1964, is a 58-gross ton, 70-foot combination vessel that can be used to fish for snapper and trawl for shrimp.	6
5. Major sources of snapper in the Gulf of Mexico since 1865 (Camber, 1955).	7
6. Fisherman retrieving fish with hand reel.	9
7. Hand reel with bicycle coaster brake and a large hand-drive wheel.	10
8. Direct-drive high-speed hand reel.	11
9. Modified direct-drive high-speed hand reels of the type now used on most vessels.	12
10. Mixed catch of snapper, porgies, and triggerfish taken with modified otter trawl by BCF-chartered exploratory vessel <u>Silver Bay</u> .	13
11. Pile of fish accumulated on deck.	14
12. Fish being thrown into icebox.	15
13. Fish being unloaded from vessel by large-capacity steel bucket.	16
14. Fish being unloaded from hold of vessel.	17
15. Fish being dumped into hopper.	18
16. Fish leaving hopper on conveyor belt.	19
17. Fish being sorted and weighed.	20
18. Weight of catch being recorded by fisherman (left) and fish house employee (right).	21
19. Heads being removed from snapper and grouper.	22
20. Snappers being washed before they are packed in ice.	23
21. Boxes of fish being loaded on truck.	24
22. Barrels of fish being loaded on express truck for delivery to railroad.	25
23. Boxes of snappers being iced for shipment.	26
24. Seasonal fluctuations in number of trips per month to the Campeche Banks, 1929-36 and 1938.	32
25. Seasonal fluctuations in number of trips per month to the campeche Banks, 1937, 1939-51.	33
26. Areas fished by the commercial snapper fleet in the Gulf of Mexico.	34

TABLES

1. Total production of snapper and grouper by U.S. fishing-vessels from the Gulf of Mexico for various years, 1880-1963.	28
2. Production of red snapper in round weights from the Gulf of Mexico for 1954-63 by U.S. snapper fleet.	29
3. Production of grouper in round weights from the Gulf of Mexico for the years 1954-63.	30

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By

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ABSTRACT

The developments of the fishery (fourth most valuable fishery in the Gulf) are shown by the following comparisons:

Vessels.-From a relatively small fleet of sail-driven schooners with live-wells for keeping fish to numerous diesel powered boats using ice for preserving the catch.

Fishing grounds.-From areas lying close to the mainland (inside 40 fathoms) off Florida and the "Middle Grounds" southeast of Pensacola to the "Western Grounds" off Texas and the Campeche Banks off Mexico.

Gear, equipment, and fishing methods.-From cotton handlines using the hand over hand technique to stainless steel lines with reels and improved terminal gear. From dead-reckoning and sounding techniques for navigation and locating fishable bottoms to modern electronic equipment, complete and accurate charts, and celestial navigation. From the generally ineffective cod gill nets, longlines, hoop nets, and fish traps for catching snapper to the highly successful modified otter trawls.

Handling and marketing.-From unsatisfactory fish handling techniques, resulting in poor quality fish, to greatly improved methods. From almost exclusive use of railroads for shipping fish iced in barrels to the predominant use of trucks for shipping boxes of iced fish.

Production.-From good catches made per boat by the relatively small snapper fleet, producing moderate total landings, to decreased catches per boat for a much increased fleet, making greater total production.

INTRODUCTION

The existing literature contains only few and incomplete descriptions of the red snapper fishery. Comprehensive descriptions have been made at various times by Stearns (1885); Jarvis (1935); and Camber (1955). There is, however, no up-to-date description. Since so many innovations in vessels, gear, and methods have been made in the past few years, and because the Bureau of Commercial Fisheries has received numerous requests for information on the snapper and grouper fishery, it is necessary to redescribe the fishery to include these changes.

HISTORY

The Gulf of Mexico red snapper fishery, pioneered by New Englanders, had its origin off the northwestern coast of Florida some 15 or 20 years before the Civil War. During this period, catches, taken by handlines from live-well smacks¹ and chings² that fished only the inshore waters, were either shipped to New Orleans "where they sold like hot cakes" (Collins, 1887) or were sold in Mobile (Warren, 1898). Some catches were sold in Pensacola for local consumption. "The existence of red snapper grounds in Florida waters and the potentialities of the waters offshore were unknown to the local people. In the early seventies of the last century the grounds fished were within the forty fathom line, between Mobile, Ala., and Fort Walton, Fla. The lack of experience as deep sea fishermen, as well as the absence of correct soundings, contributed further to the delay in the discovery of the red snapper banks off the Gulf coast." (Camber, 1955).

Not until after the Civil War (1872) was the fishery really started on a large scale (Warren, 1898). At this time, a New Englander built a fish house for handling and shipping red snapper and imported fishermen and live-well smacks from the North. In the following few years, with the organization of new companies and partnerships, the red snapper fishery in Pensacola became more firmly established. The Texas red snapper fishery developed in the 1880's (Camber, 1955), and at about this same period Mobile became one of the principal snapper centers. In 1932, two companies in Pensacola worked about 70 smacks and produced half the U.S. red snapper catch (Jarvis, 1935).

In the early fishery, live-well chings and smacks were used exclusively. These vessels were constructed to hold live fish in tanks or wells. Fish could be kept alive only for a relatively short period of time; therefore, fishing was confined mostly to grounds lying short distances from home ports.

A revolution in the red snapper fishery had its beginning when schooners brought ice from Maine. Fish dealers found that ice-packed red snapper remained in good condition for long periods. Although natural ice was available as early as 1868 (Collins, 1887), it soon became too expensive to use because of increased shipping costs.

¹"Smacks" are large schooners of 50 to 60 tons, carrying 8 to 12 men. They spend at least 17 and up to 32 days at sea.

²"Chings" are small sailing vessels over 5 but not exceeding 20 tons, carrying 3-7 fishermen. They spend a maximum of 10 days at sea.

In 1895, ice manufacturing plants began producing ice at a reasonable price. With disappearance of prejudice among fishermen against the use of ice for preserving fish, live-wells were eventually abandoned (Camber, 1955). With vessels modified or constructed to carry ice, fishing ranges were extended, and, as a result, much larger catches were landed.

After the turn of the century, most snapper grounds from Texas to Florida and along the entire Bank of Campeche had been fished. Several years later, vessels began to fish off the coast of Mexico. Major areas initially fished off Mexico were directly south of the Rio Grande River and east-southeast of Vera Cruz, Mexico. Some vessels would make the complete circuit and fish the entire Mexican coast from the United States-Mexico border to the Yucatan peninsula. Now, U.S. vessels fish on all known snapper grounds in the Gulf.

In the past few years, with only a few vessels lost or retired and numerous vessels constructed, the size of the commercial fleet has increased tremendously. More boats were built in the past 12 months than in the previous 12 years. In the early fishery, a minute fleet of sail-driven smacks and chings fished out of one port (Pensacola) in northwestern Florida; today a vast fleet of diesel powered vessels fish regularly from numerous ports along the Gulf coast.

VESSELS

The early live-well chings and smacks had holding tanks or "wells", which were made by installing two watertight bulkheads. The tanks or wells occupied about one-third of the total length of the vessel. Water was supplied to the wells through several hundred auger holes bored in the hull (Jarvis, 1935). When ice was used to preserve fish on vessels, the wells had to be modified to keep ice. Later, new vessels were built with ice boxes. The number and size of ice boxes or bins vary as do their insulative properties. Chings usually have four boxes, each of which holds 500 to 3,000 pounds of fish. The larger smacks have six to eight boxes, each with a capacity of 3,000 to 5,000 pounds. The smaller chings do not make lengthy cruises, so their holds and ice boxes are poorly insulated, having only tar paper tacked to the bulkheads and thin layers of cork and sheathing elsewhere. Conversely, smacks are well insulated with tar paper, 4- to 6-inch cork slabs, and sheathing (Jarvis, 1935). Styrofoam slabs, 4- to 6-inches thick, are used in place of cork. The entrance to each ice box is closed off from the hold with 3/4- by 6- by 30-inch shifting boards and bottom and top doors.

The smaller vessels or chings that fished for snapper were usually of the schooner design; however, some were nondescript with numerous variations in hulls and riggings. Chings were 30 to 40 feet long and between 10 and 20 tons, with most less than 15 tons. They had a 3- to 7- man crew, and trips were seldom more than a week. Chings could never handle more than 5,000 pounds of fish; usual catches ranged from 500 to 3,000 pounds. In 1885, snapper boats increased in size to more than 20 tons net (Stearns, 1885). Later, with the introduction of the larger schooners or smacks of the 26- to 50- ton class, a definite size distinction became obvious (Camber, 1955).

The larger two-masted schooners or smacks which were 50 to 100 feet long carried 8 to 12 men, and

fishing trips were 2 to 4 weeks (figs. 1 and 2). The increased size of these vessels, compared with chings, enabled them to make longer cruises and to explore offshore grounds.

A boost was given to the fishery after the turn of the century when sail-rigged smacks were powered with auxiliary gasoline engines; in the early 1920's diesel engines provided a further boost. With motor-powered vessels, fishermen were not as dependent on weather as they

had been when only sails were used. Freed from dependence on winds, the boats needed less time for passage to and from fishing grounds and more time was spent in the actual fishing operation.

In 1923, over half the vessels operating from Florida ports were auxiliary-powered sailing vessels. In 1939, the first modern diesel engines were installed in snapper boats. By 1945, most snapper vessels had converted from auxiliary-powered sailing vessels to diesel

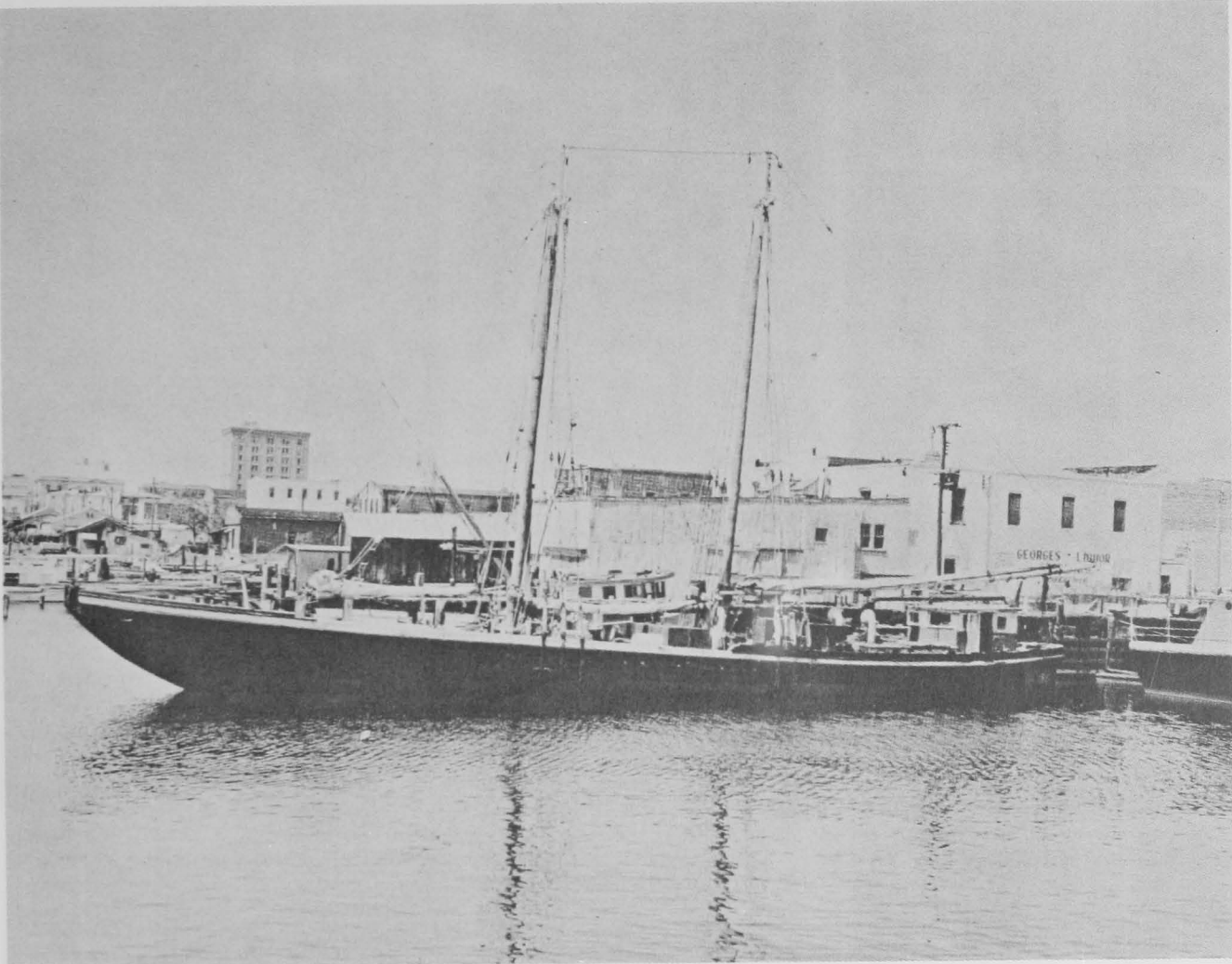


Figure 1.--The Buccaneer, built in 1925, is a 105-gross ton, 103-foot two-masted schooner of the type used in the early fishery. A few are still in use today.

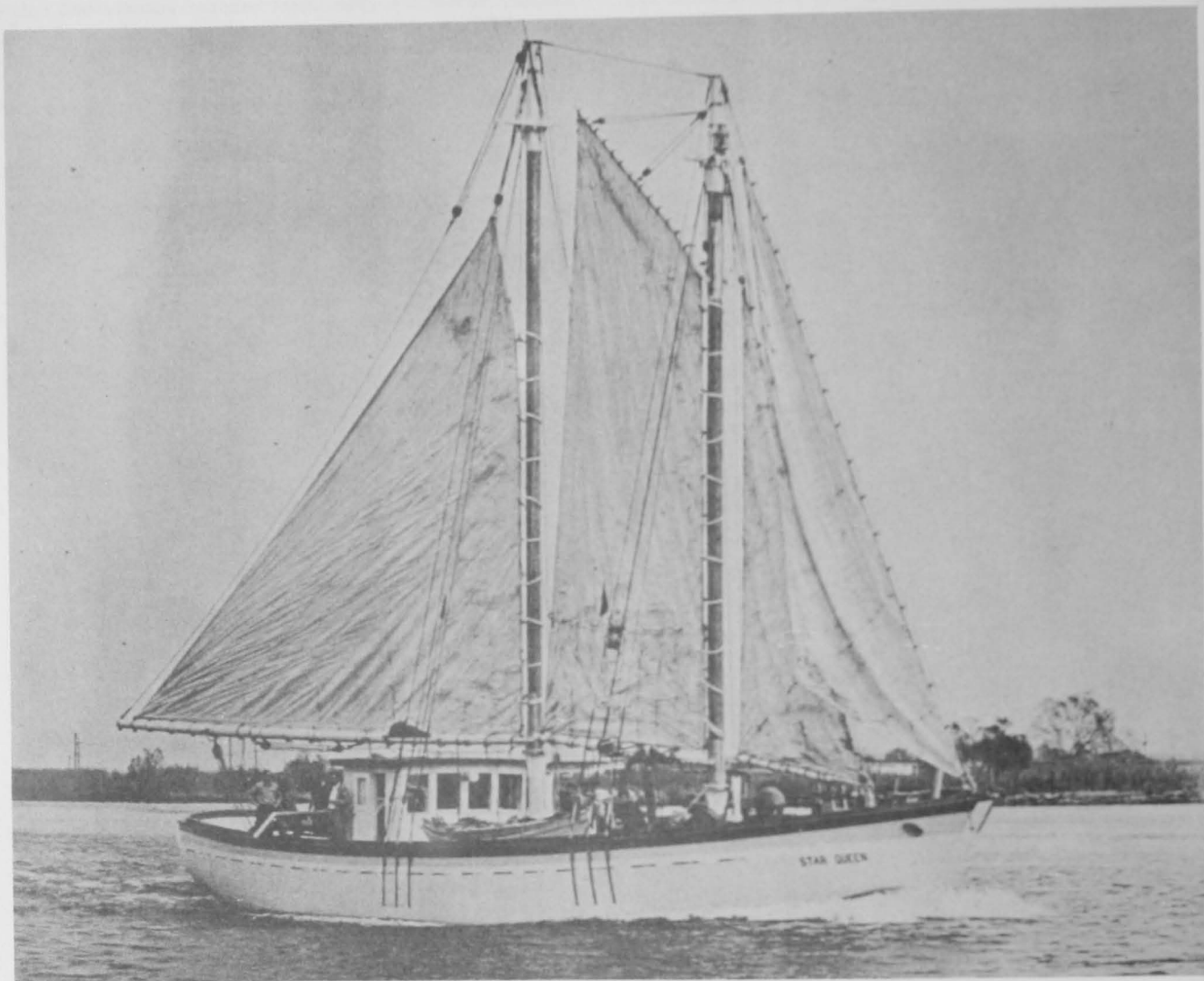


Figure 2.--The Star Queen, built in 1953, is a 71-gross ton, 68-foot motor sailboat.

powered vessels (Camber, 1955). Some diesels were installed during World War II; however, the ready availability of surplus engines after the war was probably the main factor that contributed to complete dieselization. Although the adoption of diesel engines has changed the mode of locomotion, sails are still used on boats for stabilization. The main engine, together with the steadying effect of the mainsail ("spanker"), is used to maintain position on fishing grounds, where winds and currents are variable.

As a result of the varying profitability of the fishery, the size of the commercial red snapper fleet has fluctuated considerably in the past. From 1935 to 1955 only 3 to 4 new boats were added to the snapper fleet; however, during the past several years new and more modern vessels have been built -- about 15 vessels are under construction. The new vessels have a modified schooner design that incorporates features of the New England schooner and of the deep water shrimp trawlers.

These vessels have schooner bows and use a "spanker" or mainsail. Most new vessels are 65 to 80 feet long and have larger horsepower engines than were previously installed on the older smacks. Also, there has been a reduction in the amount of sail (fig. 3).

The arrangement of all superstructure is the prerogative of the captain for whom the boat is built. Probably the greatest variations in new vessels are in the positions of the galley and mast, whether they are placed forward or aft of the pilothouse.

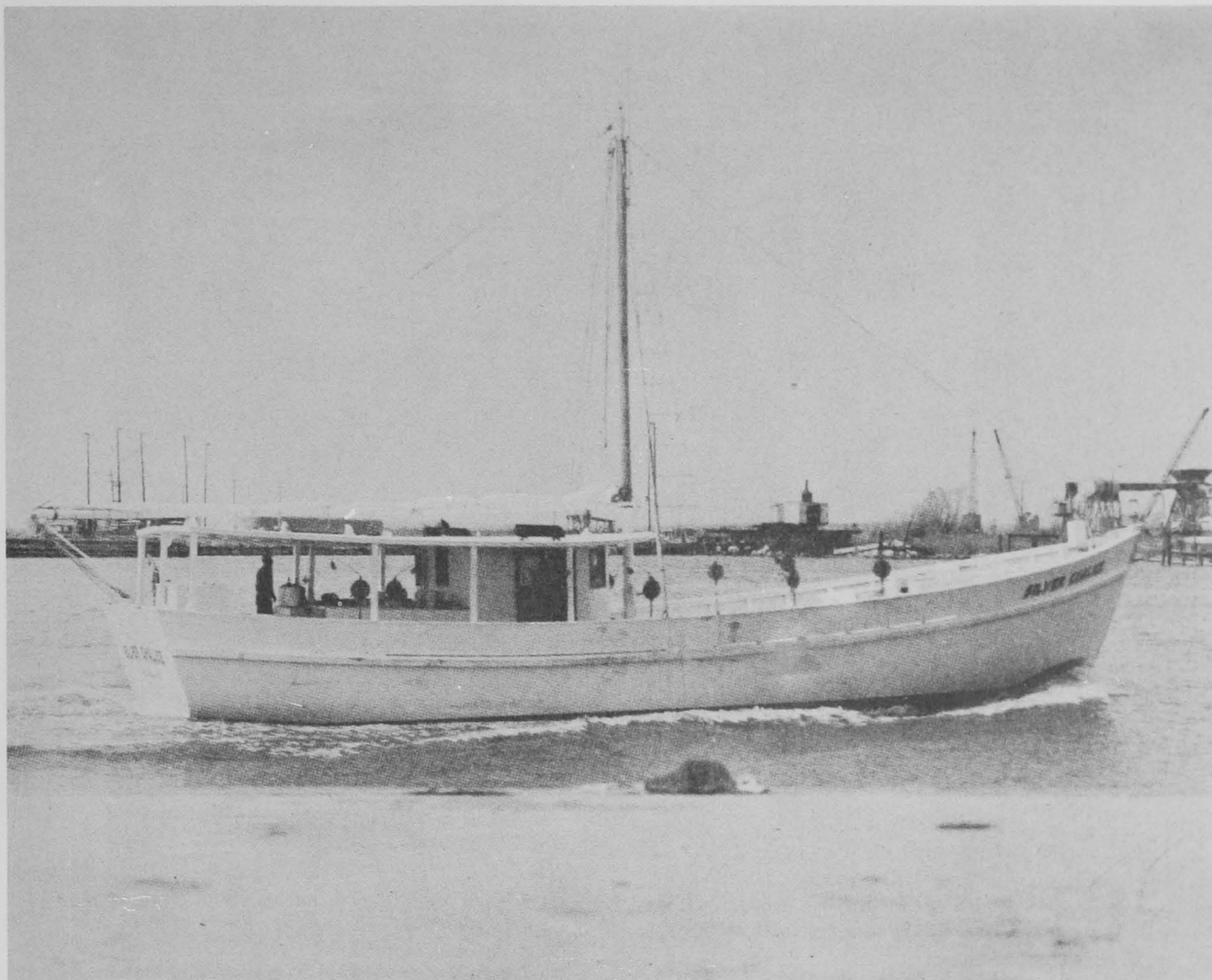


Figure 3.--The Silver Chalice, built in 1964, is a 63-gross ton, 72-foot snapper boat.



Figure 4.--The Ten Kids, built in 1964, is a 58-gross ton, 70-foot combination vessel that can be used to fish for snapper and trawl for shrimp.

Some of the new boats are constructed so that they can be used as combination vessels to fish for snapper and shrimp (fig. 4).

Statistics compiled by the Bureau of Commercial Fisheries for 1962³ list 420 snapper and grouper vessels in the Gulf of Mexico. Also, N.L. Pease (personal communication) said that 546 vessels fish the Gulf waters for snapper and grouper. Although these totals are documented, they appear high and probably do not represent the

actual size of the commercial fleet that consistently fishes for snapper and grouper. Evaluation of information gained through interviews with industry members (fish company officials, vessel captains, and fishermen) indicates that shrimp and sport fishing vessels, which fish on only a part-time basis, form the greatest part of the above values. The size of the commercial fleet (smacks and chings), which fishes only for snapper and grouper, probably does not exceed 300 vessels.

³ 1962 statistics of the number of vessels fishing for snapper and grouper in the Gulf of Mexico, compiled by the Branch of Statistics, have not yet been published and are, therefore, unofficial.

FISHING GROUNDS

During the early period of the fishery, chings fished only inside the 40-fathom curve between Mobile Bay, Ala., and Cape St. George, Fla. (fig. 5). Because of its proximity to the grounds and other advantages, such as communications, transportation, and harbor facilities, Pensacola became the red snapper center. "Before 1880 it was common for smacks to make weekly trips, and they were seldom compelled to go far for good fishing" (Warren, 1898). In 1883-84, however, heavy fishing pressure on the waters parallel to the edge of the continental shelf caused the area off Pensacola to become less productive. Consequently, vessels had to sail 200 miles southeast of Pensacola to an area called the "Middle Grounds" (fig. 5). In due time, the increased fishery on the "Middle Grounds" resulted in rapid declines in catches (Stearns, 1883).

With discovery in 1885 of new snapper grounds between Tampa and the Dry Tortugas by the U.S. Fish Commission research vessel *Albatross* (Collins, 1885), and discovery of excellent snapper grounds (Galveston "Lumps" or "Western Grounds") off Texas in the 1880's (Camber, 1955), new centers were established, and the fishery gradually spread out from Pensacola. These cen-

ters, Tampa, Carrabelle, Apalachicola, Panama City, and Niceville, Fla.; Pascagoula, Miss.; and Freeport and Brownsville, Tex., were supplied with fish caught by smaller vessels on grounds that had been abandoned earlier by the larger vessels (Camber, 1955). New ports that have developed as snapper centers in recent years are Bayou La Batre and Gulf Shores, Ala.; and Corpus Christi, Port Arthur, and Aransas Pass, Tex.

Not until about 1890 did smacks begin to fish for snapper on the Campeche Banks. Although fish could be taken from that area on a year round basis, the heaviest fishing pressure was generally during times of the year of adverse weather (winter) on the U.S. side of the Gulf. During winter, good catches could not be made on the Florida and Texas coasts.

By 1897, with continued emphasis on the Campeche Banks, numerous smacks from Pensacola, Mobile, and Galveston fished on a year round basis. At the turn of the century the areas fished (Arcas Cay, Triangle Cay, Arenas Cay, and Alacran Reef) were confined easterly by the Tortugas at lat. 24° N., long. 83° W. and extended westerly across the banks to lat. 20° N., long. 93° W. (Camber, 1955) (fig. 5).

With snapper schooners compelled to sail 400 to

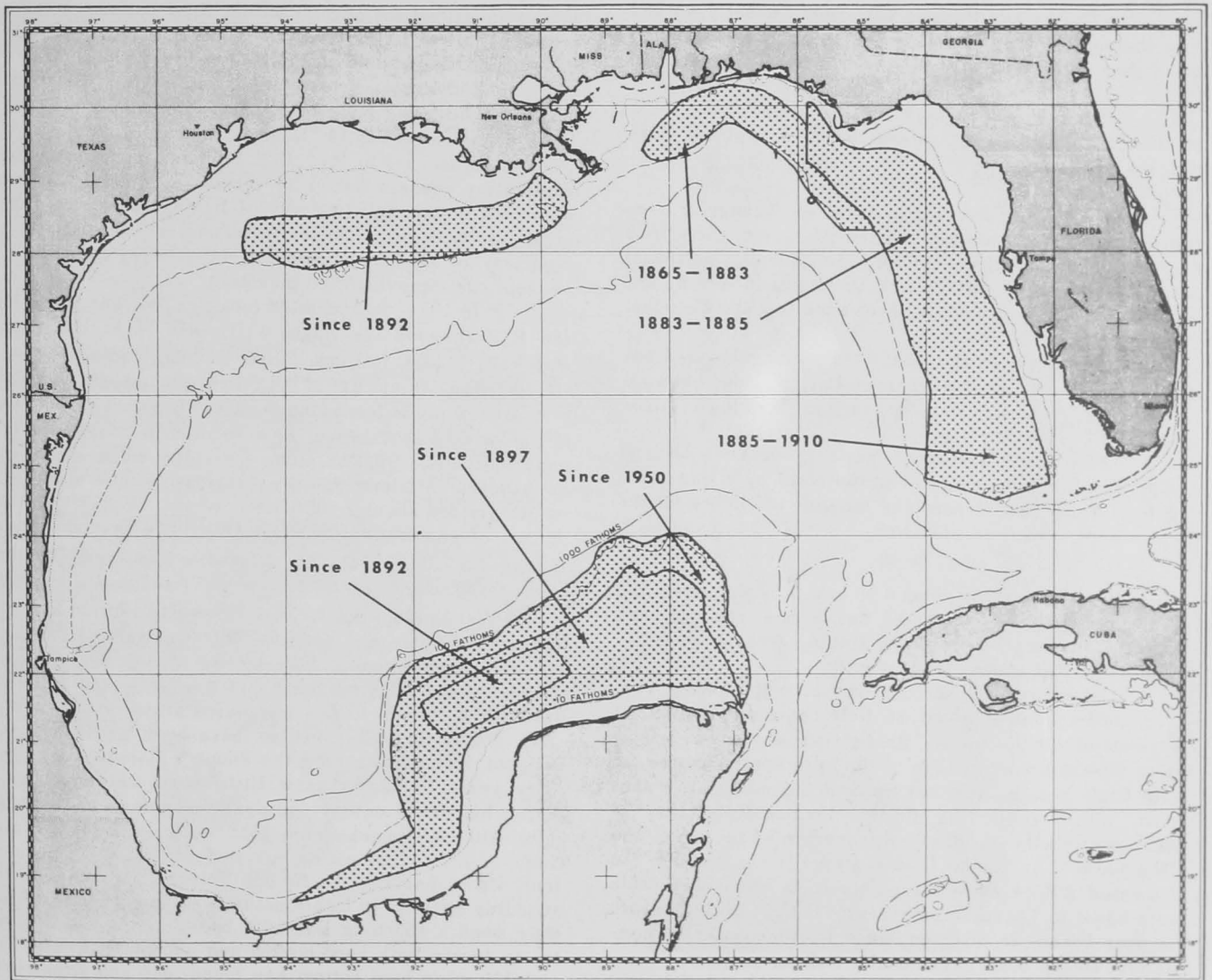


Figure 5.--Major sources of snapper in the Gulf of Mexico since 1865 (Camber, 1955).

700 miles to reach the Campeche Banks, the average fishing trip was about 23 days, of which 8 were allotted for the outward and homeward passage.

Through the years, even with ever increasing fishing pressure, Campeche Banks have remained the most important snapper area in the Gulf. Jarvis (1935) estimated that 75 percent of all snapper taken in 1933 were from the Campeche Banks. Company officials of the larger snapper companies in Pensacola and Mobile have agreed with this estimate of 75 percent of the snapper and grouper catch coming from the Campeche Banks (personal communications). In 1935, however, about 50 percent of the total catch came from U.S. waters. This reduction in Campeche's contribution can probably be attributed to increased fishing activities on the "Western Grounds", an area from a few miles south-southwest of the Mississippi River Delta to Galveston, Tex., at depths of 10 to 100 fathoms (fig. 5). Areas fished in 1933 were from the eastern limit in about lat. 21° 20' N., long. 86° 40' W., with the northern limit about 400 miles from Pensacola (Jarvis, 1935).

In 1935, vessels from Pensacola and Mobile took their fares from all portions of the Campeche Banks while Galveston schooners fished from the Triangle Reefs northward. The Tampa and Panama City fleets usually worked only the eastern area of the banks. At this time, Mexican and Cuban schooners were also fishing that area (Jarvis, 1935).

Camber (1955) states that about 40 vessels fished the Campeche Banks between 1937 and 1951 and lists the areas as follows:

a. "The Eastern Grounds"--a triangular area formed by a line running along the 25 fathom curve from Cape Catoche to Alacran Reef, then running northeast along the 60 to 65 fathom line to longitude 88° W. and latitude 23° 30' N., and from there back to Cape Catoche.

b. "Between the Reefs"--a rectangular area between the Alacran Reef and Arcas Cay, bounded seaward by the 65 to 70 fathom line, and inshore by the 15 fathom line.

c. "Arcas Grounds"--an area between the 18 and 55 fathom lines, confined in the north by a line running from Arcas Cay inshore and tapering off in the southwest toward Vera Cruz, Mexico.

"In 1950-51 fishing commenced on new grounds consisting of an area formed between the former most northerly and westerly seaward limits of the fishing area and the 140 fathom line." (Camber, 1955) (fig. 5).

Between 100 and 150 commercial snapper vessels, sailing out of about 15 Gulf coast ports, fish all portions of the Campeche Banks (inside the 100-fathom curve from the eastern edge of the bank southwest toward Vera Cruz, Mexico) and the "Western Grounds" off Texas. Also, U.S. vessels fish off the Mexican coast from an area east-southeast of Vera Cruz, referred to as the "Mountains" up to the United States-Mexico border. An estimated 200 or more pleasure boats, from the Florida west coast to Texas, make occasional trips to the inshore snapper banks. In addition, an unknown number of commercial shrimp boats occasionally fish for snapper.

The Campeche Banks are considered the most

important snapper area in the Gulf. An estimated 30 to 60 U.S. vessels can be seen on the Banks at any time of the year. Captains of snapper vessels fishing the Campeche Banks have stated (personal communications) that most fishing effort is concentrated near Arcas, Obispo, The Triangles, and Nuevo. In the past few years not much fishing has been done in the Arenas, Alacran, "The Eastern Grounds", and "Northern Shelves" areas; however, boats are gradually shifting back to these areas, especially to the "Northern Shelves" and "The Eastern Grounds", down to an area near Cape Catoche. Depths fished range from 20 to 100 fathoms with heaviest concentration of effort in 25 to 60 fathoms.

Concentrations of red snapper are usually found only over certain types of bottoms. Irregular hard bottom formation (submarine elevations or lumps and depressions or gullies) of rock or limestone covered with live coral and grass are especially preferred by snapper. However, as stated by Camber (1955), "The number of such habitats is relatively small." Fish schools are usually located several feet off the bottom of lumps and gullies where food material brought in by eddying current settles out. The Gulf of Mexico snapper lumps are usually small in area (less than a mile), although a few snapper banks are known to extend for several miles. Hard bottoms are the preferred habitat for snapper and grouper, yet good catches have often been made from mud and sand bottoms.

Red snappers have been reported from Brazil to Massachusetts and have been taken from waters of less than 10 fathoms out to 140 fathoms.

From 1950 to 1960, U.S. Fish and Wildlife Service exploratory vessels fished for snapper at several hundred locations in the Gulf. Results of fishing operations from areas known to the snapper fishermen, as well as exact positions of productive areas discovered by exploratory vessels, were provided the industry.

In 1956, an uncharted rock "ridge" was found by the R/V Oregon. The ridge, which was 50 to 100 yards wide and 2 to 8 fathoms above the surrounding bottom, originated near lat. 27° 57' N., long. 94° 55' W. and extended several miles in an east-southeasterly direction along the 50-fathom curve. Echo recorder tracings showed good indications of fish along the entire ridge. A series of handline stations made at various points along its length yielded about 1,600 pounds of red snapper and 300 pounds of grouper in 1 day's fishing (R/V Oregon Cruise Report No. 38, 1956). All information gathered by the Oregon was passed on to the snapper fishery. As a result of this disclosure, vessels from Texas and Florida started fishing this ridge and caught 200,000 pounds of snapper and grouper in 1 month. Although not documented, further reports on the ridge revealed that 500,000 pounds of fish were taken in a 3- to 4-month period after its discovery.

Considerable changes have been made in navigational techniques since the snapper fishery began. In early years fishermen knew little about celestial navigation but relied entirely on dead reckonings and soundings. Although smacks were able to sail all areas of the Gulf, errors in navigation resulted in loss of time and fuel. Upon reaching the fishing grounds, fishermen used sounding methods to locate actual fishing spots. The first mate used a sounding line with baited hooks attached to try to locate both hard bottom and snappers. Almost invariably when hard bottom was found, one and sometimes

two snappers were hooked. At this time, all hands, including the skipper and cook, would join in the fishing operation (Wallace, 1923). Inasmuch as snappers are scarce on soft bottoms and hard bottoms were often difficult to locate, many hours were spent in searching. When a "hot spot" was located, vessels were either anchored or allowed to drift across the area. A more productive fishery evolved as information was accumulated on positions of snapper banks (gained through years of fishing experiences), and complete and accurate charts depicting depths and bottom types were introduced. But not until the introduction of modern navigational instruments were fishermen able to "pinpoint" latitudes and longitudes. With radios, depth recorders, and lorans as standard equipment, fishermen have little difficulty in locating and staying over fishable bottoms. Once a vessel reaches a fishing area, the depth and topography of the bottom (recorded by depth devices) determine the anchorage spot where the actual fishing will commence.

A fish finder, "which utilizes an oscilloscope to electronically portray the bottom composition and fishes present under the boat" (Moe, 1963) was tested by the R/V Oregon. This device was found to be promising in

locating concentrations of snapper. "Good correlations of trial handline catches were found with indications of fish on the fish finder, conversely, no fish or few fish were hooked over good appearing rocky bottom where it failed to show fish" (R/V Oregon Cruise Report No. 19, 1953). Such fish finders are most often used as additional instruments on board vessels equipped with recording fathometers (Moe, 1963).

Depth sounding devices of several types are used in the fishery. The Recorder Type records the depths graphically by stylus tracings which correlate actual depths and topographies. Permanent recorded tracings or markings on paper can be retained for future reference. One of this type, "the white line recorder," has been introduced and used with great success in the fishery. It records graphically the seabed, its consistency, and fish concentrations on or above the bottom. With this instrument fishermen can locate gullies and lumps and actually distinguish between hard and soft bottoms. The Indicator Type has a flashing light viewed on the calibrated screen of a cathode ray tube. This second type of depth sounding device is not commonly used.



Figure 6.--Fisherman retrieving fish with hand reel.

FISHING METHODS AND GEAR

Today's fishing operations are basically similar to those in the past; i.e., a line with baited hooks is suspended about 1 to 3 feet above the bottom. When a bite is felt, the hook is set by a sharp jerk and the fish is brought up, unhooked, and thrown aside. Today a hand reel (fig. 6) is used to bring up the fish, while in the past the "hand over hand" technique was used.

Baits most commonly used in the fishery are ladyfish, Spanish mackerel, blue runners, mullet, cigarfish, menhaden, shrimp, and squid. Most bait is bought in a frozen condition rather than fresh as it was in the early fishery. Bait is placed in wooden or steel barrels aboard vessels and salted on the outward passage to the fishing grounds. Salting hardens the bait and subsequently makes it more difficult for fish to strip it from the hooks. After the fishing area is reached, the thawed and salted bait is cut into small strips and threaded on the hooks. Fishermen consider ladyfish and squid to be most effective in catching fish. Squid are imported from the Atlantic and Pacific coasts, while ladyfish are bought from Florida dealers.

Jarvis (1935) said the handlines are "made of no. 12 tarred cotton line and average about 100 fathoms in length. When not in use the lines are coiled down in small wooden tubs. A pear-shaped 'patent' lead is used by most fishermen. These leads come in several different weights, but the usual weight is $3\frac{3}{4}$ pounds. A short brass rod, ending in an eye with a box swivel, projects at an angle from the lower end of the lead. To this are fastened two, sometimes three, 3-foot gangings, each with a no. 4 Mustad japanned hook."

Changes in snapper gear, as noted by Camber (1955), have been in the use of untarred hard lay net twine for handlines and Kirby Nos. 3, 4, and 5 hooks rather than Mustad japanned hooks. In recent years there has been a change from hard lay net twine to $3/64$ -inch stainless steel line on reels. Also, fishermen have returned to the use of japanned or "tuna circle hooks", Nos. 6 to 9. Fishermen claim that these hooks do not have to be set, since the fish will hook themselves. Nos. 5 and 6 hooks are most widely used in the fishery. From 5 to 15 of these hooks are secured to a line. Off the Texas coast ("Western Grounds"), snapper are located in shallower waters and are predominantly smaller in size. In this area, up to 40 No. 9 hooks are strung out on a single line. Instead of the $3\frac{3}{4}$ -pound pear-shaped lead, window sash weights are used as sinkers. A rather new apparatus in the fishery is the rubber shock or "rubber snubber". This device, molded of rubber with brass eyes on each end, is about 12 to 18 inches long. The swiveled end of the stainless steel line is attached to one end of the "rubber snubber" and a heavy duty (test) monofilament line with gangings (snoods), swivels, and hooks is secured to the opposite end. When fish take the baited hooks, the elasticity of the "rubber snubber" prevents sudden, strong tension on the line; consequently, fewer fish are lost from gear breakage or tearing loose from the hooks. Increased reliability is another advancement of today's gear; i.e., all lines, monofilament nylon and stainless steel, are fastened to accessories by a crimping process using a micro-press and sleeves.

Other advances in snapper gear have been in developing electric and gasoline powered reels, which were introduced in 1950 and 1952 by the Warren Fish Company and E.E. Saunders Fish Company. These reels were found to be effective in catching snapper. Because of high costs and complexity, however, these reels were soon found to be impractical and only a few were installed on boats. "Electric reels were used with considerable success" during Cruise No. 9 by the U.S. Fish and Wildlife Service exploratory vessel Oregon (R/V Oregon Cruise Report No. 9, 1951). Later, the Warren Fish Company introduced a simpler reel which consisted of a bicycle coaster brake and a large hand-drive wheel with stainless steel line (Camber, 1955) (fig. 7). In 1949, a fleet of 14

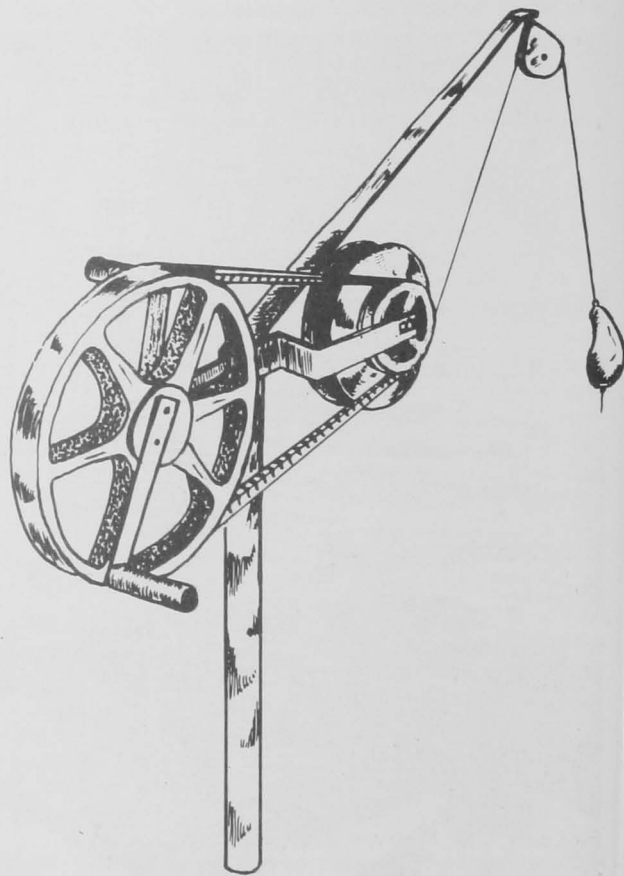


Figure 7.--Hand reel with bicycle coaster brake and a large hand-drive wheel.

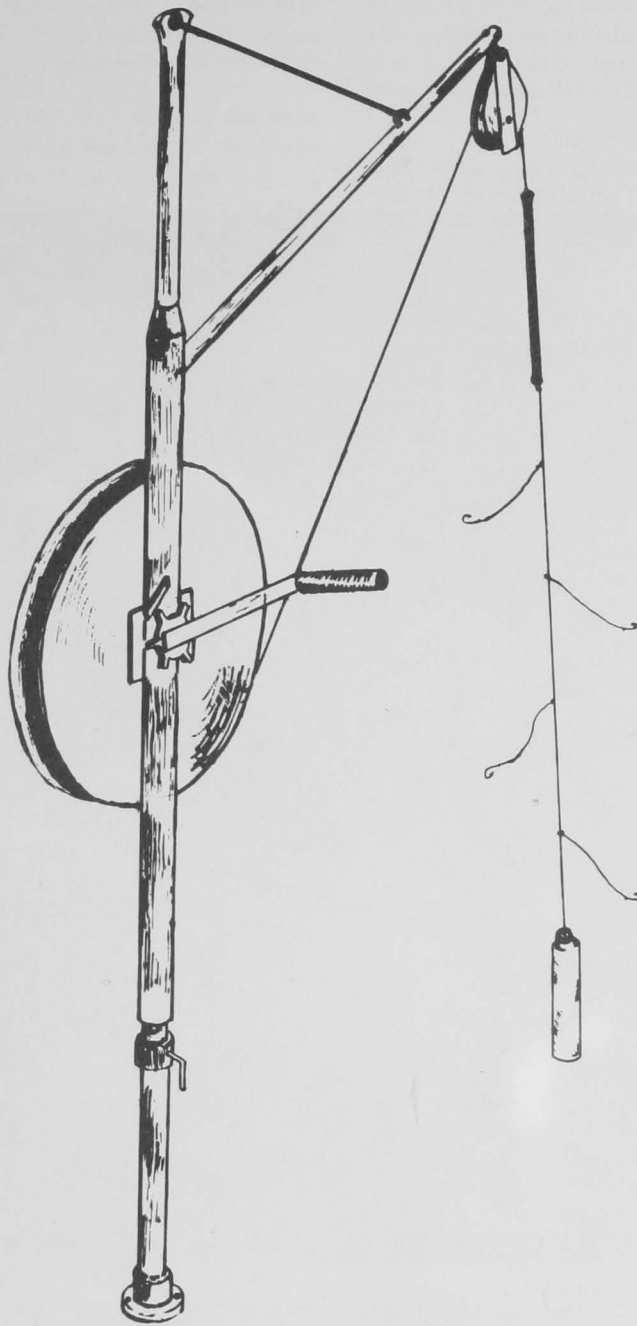


Figure 8.--Direct-drive high speed hand reel.

red snapper vessels was equipped with high-speed manual reels of the direct drive type as seen in figure 8 (Siebenaler and Brady, 1952). With hand reels, which were relatively inexpensive and easy to install, fishermen could fish greater depths much faster than they could with handlines. As a result, catch rates increased considerably.

Most snapper vessels have changed from hand-

lines to manual reels with steel line, of the types seen in figures 7 and 9. Depending on the number of fishermen, each boat has 4 to 12 of these reels, which are mounted on steel posts along the starboard and port weather rails.

Although through the years handlines have been the traditional gear in taking snapper, continual efforts have been made to find more efficient gear and methods.

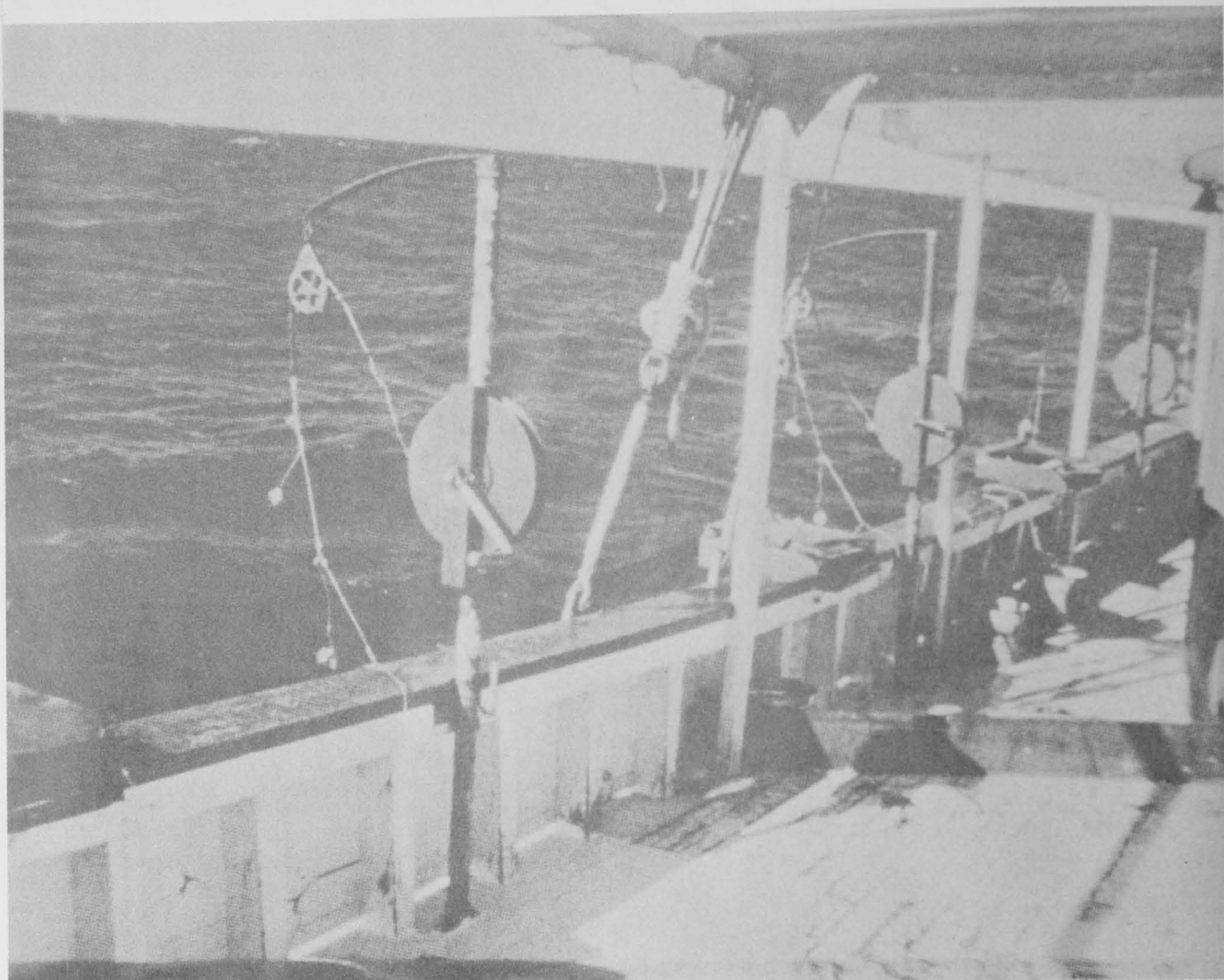


Figure 9.--Modified direct-drive high-speed hand reels of the type now used on most vessels.

Developments in this gear are as follows:

a. Cod gill nets that were brought from Boston in 1884 proved inefficient and impractical in the Gulf. Stearns (1885b) states--"the fishermen did not understand hauling them and were indifferent as to their success."

b. Longlines or trawllines were generally

unsuccessful in catching commercial quantities of snapper (Jarvis, 1935; Whiteleather and Brown, 1945). The ineffectiveness of this gear, in many instances, stemmed from inadequate materials, strong currents, and rough bottoms. As a result, considerable gear was damaged or lost. Jarvis (1935) believed that longlines may be more successful for catching grouper than snapper.

c. Hoop nets were tested and compared with handlines by Smith (1948). He found that with all factors being equal (except gear used) handlines caught more fish than hoop nets.

d. Fish traps of the type used in the West Indies were successful in catching commercial quantities of snapper. Jarvis (1935) states "that this apparatus can be used successfully, especially by chings fishing near shore." Experiments on the effectiveness of traps made

by the R/V Oregon showed trap capture rates to be low in comparison with handline fishing (R/V Oregon Cruise Report No. 9, 1951). Also, more recent trap tests by the Oregon in March 1964 were unsuccessful.

e. Modified otter trawls (fish trawls rigged with roller gear) have been tested on 21 cruises by the U.S. Fish and Wildlife Service exploratory vessels Silver Bay (fig. 10) and Oregon. Conclusions on the effective-



Figure 10.--Mixed catch of snapper, porgies, and triggerfish taken with modified otter trawl by BCF-chartered exploratory vessel Silver Bay.

ness of this gear by Captiva and Rivers (1960) are as follows:

1. Modified otter trawls can be used as effective commercial means of catching red snapper, grouper, and other species in the Gulf of Mexico.

2. Broken and rough bottom areas, previously considered untrawlable, can be worked economically with gear properly designed and constructed.

3. Additional species of marketable snapper, not generally caught with handlines, are available to trawl gear.

4. Release of undersize snapper is accomplished effectively by large mesh trawls and cod ends.

5. Daily trawl catches often surpass those of handline vessels when the two methods are used

simultaneously in one area—especially when the fish are apparently not feeding or during heavy seas.

6. Trawl gear, suitable for use by present Gulf of Mexico shrimp vessels, can be adopted by the industry either on a full-scale or as a supplementary operation during periods of low shrimp catches.

A commercial fisherman out of Pensacola demonstrated the commercial applicability of roller-rigged fish trawls for catching snapper. While fishing in 40 fathoms off Pensacola, he caught 500 to 1,500 pounds of fish per day. Catches were made in an area where handline operations were not producing fish. Recently, 8,000 pounds of snapper and grouper were taken in a 3-day period by this same fisherman. Several Florida trawlers are fishing with roller-rigged fish trawls. Five more trawlers are either being constructed or planned.

Figure 11.--Pile of fish accumulated on deck.



HANDLING AND MARKETING

Improvements in methods of handling snapper have been in eviscerating and carefully packing them in ice. In the past, snapper were often allowed to remain too long on deck and were not eviscerated, but packed round. Fishermen's erroneous objections to gutting fish were that gutted fish decomposed more rapidly. Gutting required too much time during the fishing operation, and gutted or dressed fish were hard to pack (Jarvis, 1935). Also, in the past, ice bins were often overloaded, and, as a result, pressure exerted on the fish prohibited air circulation and, therefore, the cooling effect, and many inferior or spoiled fish were brought in and unloaded at the fish house. With better handling methods, the quality of snapper is considered to be much improved. The fish are gutted and packed usually within an hour after they are landed. Fish are prevented from "drying out" on deck by dousing them regularly with water from either a bucket or a hose.

Since emphasis on quality of fish is stressed continually, more time is spent in the actual drawing and washing operation. Fish are prepared for drawing by making an incision toward the head on the lower side (almost vertically) between the pectoral and ventral fins and running the knife at an angle to the vent. Care is exercised in removing the viscera so that the white membrane (peritoneum) lining the abdominal cavity is not damaged (Jarvis, 1935).

Vessels fishing out of Texas have even a bigger job in cleaning their catch. Texas requires that all fish must not only be gutted but also gilled--the so-called G & G Law.

Upon accumulation of a good size pile of fish on deck, the fish are drawn and washed and tossed into the hold to be packed in ice (figs. 11 and 12). The first hand or icer, responsible for icing the fish, remains in the hold for considerable lengths of time, adding ice and stacking fish. About 6 inches of ice are shoveled into the bottom

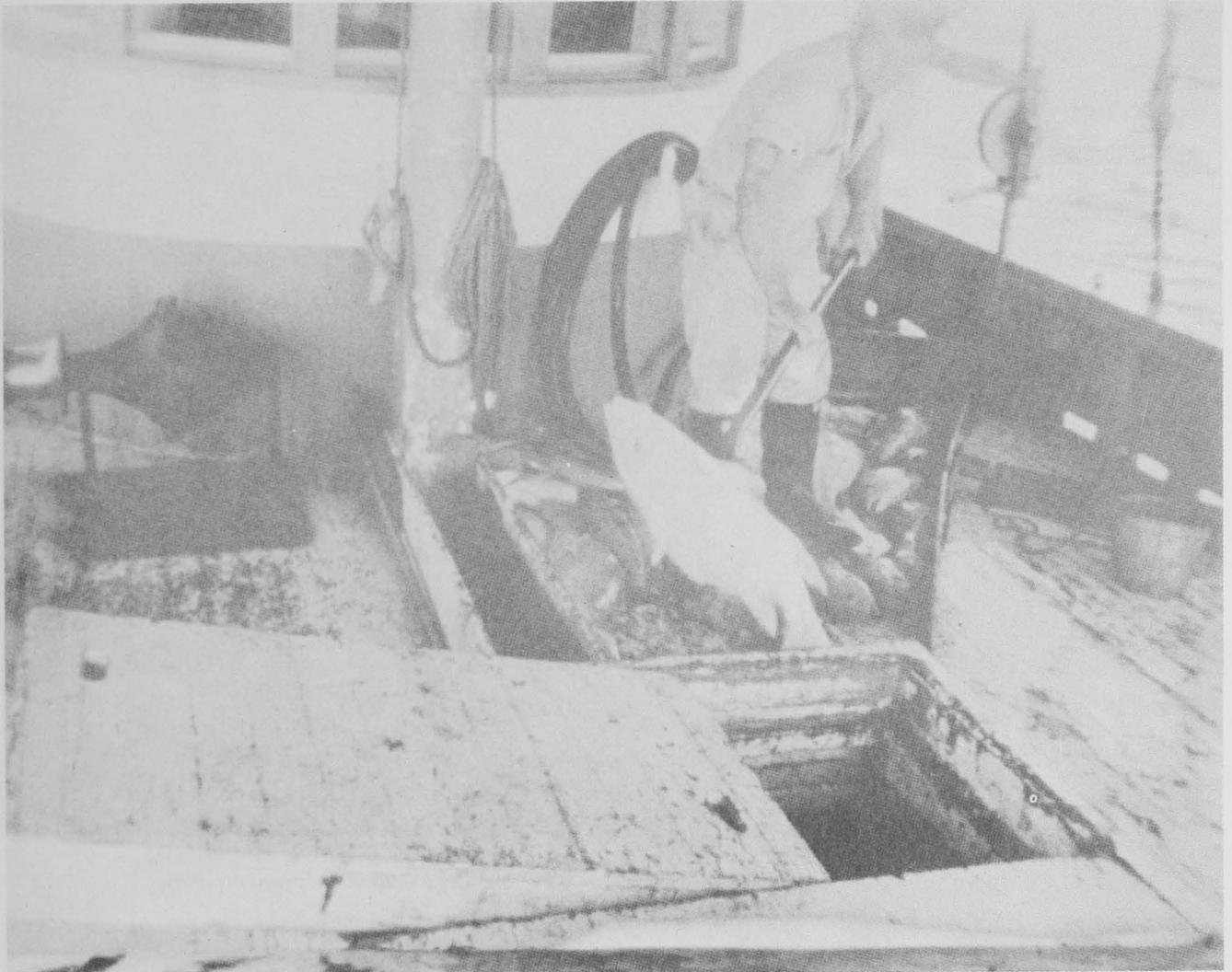


Figure 12.--Fish being thrown into icebox.

of an icebox, then fish are added. Fish are stacked with their drawn sides down to permit drainage. Crushed ice, dispersed evenly to a 2-inch thickness, separates rows of fish. Usually, small fish (1 to 2 pounds) are stacked three and four layers deep before a layer of ice is added. Larger fish are stacked in only one or two layers, then ice is added. After an icebox has been filled or "topped off", a thicker layer of ice is added to the top and in the space between the shifting boards and the doors. If properly cared for, fish caught during the first part of a fishing trip can be kept in ice for 3 weeks and when unloaded will be

almost as fresh as fish taken during the latter part of the trip. If the vessel is still over the fishing area when fish are drawn, the entrails are not discarded overboard, but are retained in buckets so that sharks will not be attracted to the area.

In summer fish are re-iced three and four times a day, but during winter only one or two re-icings per day are required. The first hand's job is lightened somewhat now, because most vessels no longer carry block ice which must be chipped with a pick or chisel--they carry machine-crushed ice provided at the fish house. Ice is added to



Figure 13.--Fish being unloaded from vessel by large-capacity steel bucket.

the boxes by a blower system which is attached to the crusher. Many fish houses have their own plants in which they make ice.

It has been known for a long time that fish spoilage results from chemical decomposition and bacterial action. In the past few years many fish companies have made antiseptic ice by adding a bacteriostatic chemical to the water before freezing. (This chemical retards growth of bacteria.) Fish companies are discontinuing the use of antiseptic ice because they claim that little difference can be detected between fish packed with treated ice and those packed in untreated ice. Also, it seems that fishermen are relying on antiseptic ice alone to keep fish in a fresh condition, rather than on a combination of ice and

good handling techniques.

Only a few changes have been made in the overall processing operation in today's red snapper fishery as compared with processing methods of the past fishery.

Fish companies attempt to arrange vessel arrivals so that landings will be made about the time the fish supply on hand is exhausted. The arrivals, however, cannot always be scheduled properly and, subsequently, a glut may occur. Excess supplies of fish for which the producer does not have an immediate market are frozen and in most cases are sold within a week after storage.

At port, the catches are unloaded from fishing vessels by means of a large-capacity steel bucket (figs. 13 and 14). Each bucket is raised and lowered by an



Figure 14.--Fish being unloaded from hold of vessel.

electric hoist and when fully loaded weighs about 400 to 500 pounds. In the past, each bucket load of fish was weighed before it was unloaded and the weight was check-

ed by the fish house and a member of the vessel crew. Now, fish are not weighed at the beginning of the processing operation but after they have been sorted and graded.



Figure 15.--Fish being dumped into hopper.



Figure 16.--Fish leaving hopper on conveyor belt.

Unloading techniques used by various fish companies in transporting fish from vessels to the fish house are as follows:

a. Fish are dumped from the bucket to a chute and hopper system and then are moved into the fish house via a conveyor belt (figs. 15 and 16). As the fish move

along the belt, they are sorted and graded.

b. Fish are dumped directly from the bucket onto the dock adjoining the fish house. Then fish house employees pew or gaff the fish and separate them into baskets (fig. 17). The fish are pewed or gaffed only in the head.



Figure 17.--Fish being sorted and weighed.

The newer fish companies use the hopper and conveyor method for moving fish, while the older companies retain the old direct handling method.

Regardless of the unloading methods used, the fish are sorted and graded according to species, size, and quality and then are weighed on platform scales (fig. 17).



Figure 18.--Weight of catch being recorded by fisherman (left) and fish house employee (right).

A careful record of weights is kept by the fish house and by a fisherman representing the fishing vessel (fig. 18).

Inferior or spoiled fish are discarded; fish not in prime condition are headed and sold as "headless" fish. However, fish other than those of a lower quality are also headed; i.e., about half of all fish landed are shipped as headless fish. One of the greatest changes in processing

is that whole fish (uneviscerated) are no longer shipped. All fish, including grouper, are shipped drawn, drawn and gilled, or headless and drawn.

A considerable demand has been built up for tenderloins (steaks) and fillets. About 10 to 25 percent of all grouper landed are made into steaks. In addition, a small amount of grouper and snapper is cut as fillets.



Figure 19.--Heads being removed from snapper and grouper.

Steaks and fillets are packed and frozen in small lots with most being sold to restaurants, hotels, hospitals, and public institutions.

Fish houses differ in their ways of processing fish for shipment. Fish that are to be headed go to dressing tables where heads are removed with an axe (fig. 19)

or with an electric saw. Red snapper heads are then moved to another table where small pieces of flesh, roughly triangular in shape, are cut away from the side of the head. This meat, referred to as "snapper throats", actually is snapper cheeks and is said to be the richest and most delicately flavored part of the fish; it is sold in bulk

to some markets. Whole fish are either dumped into large tanks containing iced water (where they are washed) (fig. 20) or they are moved directly to the packing area. In the latter case, fish are washed while in the hopper before they enter the fish house.

Wooden boxes and barrels are used for shipping fish. In the past, barrels were used almost exclusively

and nearly all catches were shipped by rail express. The reasons barrels were preferred to boxes, as given by Jarvis (1935), are: "first, that most shipments are small and made to wayside stations, and undergo considerable rough handling before reaching the buyer. In such shipments barrels are said to be more easily handled and less liable to breakage en route. Expressmen are said to prefer



Figure 20.--Snappers being washed before they are packed in ice.

barrels for larger shipments because of ease of handling. Second, customers are said to request barrels, believing that the fish arrive in better condition with less meltage of ice. In the third place, barrels also have a reuse value

and are preferred by customers for this reason."

Now the trend is reversed. Most shipments (in excess of 75 percent of the production) are made by truck in 100-pound boxes (fig. 21). Some of the older companies



Figure 21.--Boxes of fish being loaded on truck.

continue to send snapper and grouper in barrels by express, mainly to the larger southern cities (fig. 22).

Most fish sales are made by telephone orders from customers in the larger northern and eastern cities. Shipments are sent via truck to distribution centers, such as Chicago, Detroit, Cleveland, St. Louis, Cincinnati, and New York. Although the snapper fishery is quite competitive, fish houses cooperate with one another in making arrangements whereby trucks owned or rented by a certain company will pick up and deliver fish for another company. This system is advantageous for both, since at times one company will not have a large enough supply of fish to

supply customers' needs. Also, trucks which are not fully loaded and are heading for certain cities will go out of their way to pick up fish from other companies that have orders for the same places. In addition to normal retail outlets, fresh fish are sold to independent fish merchants (commonly referred to as fish "peddlers"), who in turn distribute the fish to markets, public establishments, and individuals within about a hundred mile radius of the coast.

Boxes used for shipping snapper and grouper are the standard 100-pound capacity type. Crushed ice is shoveled into the bottom of the packing box, and the fish



Figure 22.--Barrels of fish being loaded on express truck for delivery to railroad.

are carefully packed by alternating heads and tails to secure an even layer. Crushed ice is added to separate layers of fish. After 100 pounds of fish are added, a heavy scoop of ice is placed on top (fig. 23). At one time, it was a practice to "top off" a box with a heavy block of ice. The box was then covered with burlap and wired down. Now, however, because of the expediency of truck delivery, block ice is not added and boxes are seldom covered. Snapper shipments made by truck reach their destinations in 1 to 2 days. If most of the ice melts en route, the driver repacks the boxes with crushed ice, which is carried in the truck.

Barrels used for shipping fish are usually of two sizes: the larger holds 200 pounds of fish and about 150 pounds of ice, the smaller holds 150 pounds of fish and about 100 pounds of ice. Barrels are packed by first placing a 20- to 25-pound block of ice on the bottom and then adding crushed ice to fill in around the block. Fish are packed in layers, in the same way as for boxes. Barrels are "topped off" by adding enough crushed ice to form a mound and then placing an ice chunk on top. Barrels are then covered with bonded burlap paper, which is held in place by wooden hoops that are tacked to make a tight fit. The burlap covers are secured so that expressmen can remove them when re-icings are required.



Figure 23.--Boxes of snappers being iced for shipment.

SPECIES TAKEN

Although commercial landings of snapper fleets do not consist entirely of the red snapper, Lutjanus aya (also called L. blackfordi and perhaps L. campechanus), this species is the predominant one taken (cover photo). Camber (1955) states, "Producers never separate red snappers according to species. As a result, the reported landings include not only the principal species (L. aya), but also other fish marketed as red snapper." The following species (arranged in order of importance) are caught in the Gulf and marketed as red snapper:

Lutjanus aya -- red snapper

Lutjanus vivanus -- yelloweye, golden eye, or silk snapper

Lutjanus analis -- mutton snapper or kingfish

Lutjanus synagris -- Lane or Mexican snapper

Lutjanus griseus -- mangrove or gray snapper

Lutjanus campechanus -- Caribbean red snapper

Lutjanus buccanella -- gunmouth, hambone, or blackfin snapper

Lutjanus apodus -- schoolmaster snapper

Rhomboplites aurorubens -- vermilion, mingo, or bastard snapper

Ocyurus chrysurus -- yellowtail snapper

Etelis oculatus -- queen snapper

Holocentrus ascensionis -- squirrel fish

Pristipomoides macrophthalmus -- wenchman

In addition to the above species, the deep sea wenchman (Pristipomoides andersoni) has been taken in large numbers off the Texas coast by the Bureau's exploratory vessel Oregon and probably is also taken by commercial headline vessels.

The red snapper is most abundant in 20 to 60 fathoms. The yelloweye snapper is the predominant species in 90 to 120 fathoms. The numbers of red snapper and yelloweye snapper appear to be more equally distributed in about 80 fathoms than in other depths (personal communications with snapper boat captains and fishermen).

Studies by Jarvis (1935) and Camber (1955) show that at least 90 percent of the total Gulf of Mexico snapper production throughout the years has been composed of red snapper, while grouper and additional forms of snapper (mainly yelloweye) constitute the remainder of the catches.

In addition to snappers, the Gulf of Mexico supports a large grouper fishery. Most groupers taken by snapper vessels are incidental to snapper catches and are considered a byproduct of the fishery; however, some vessels off the western coast of Florida fish only for grouper. The red grouper (Epinephelus morio) is the most important of the groupers because of its abundance and excellent flavor. Also, the black grouper (Mycteroperca bonaci) is commonly taken. Also marketed are other species of grouper, the speckled hind (Epinephelus drummondhayi), the yellowfin grouper (Mycteroperca venenosa),

the gag (Mycteroperca microlepis), and the scamp (Mycteroperca phenax). The scamp is considered by many to be the finest flavored fish of the group; however, it is taken in relatively small numbers and is usually reserved by the fishermen for their own use (Jarvis, 1935). Little is known of the life history and habits of red snapper and grouper. Numerous examinations of gonads indicate that the red snapper spawns between July and September and groupers spawn in early spring (Jarvis, 1935; Camber, 1955; Moe, 1963).

PRODUCTION

Because many factors have affected production of snapper and grouper, these fisheries have fluctuated tremendously since their beginning. As pointed out by Camber (1955), some of the non-biological factors that have affected production are market conditions, war, size and efficiency of the fishing fleet, labor-management relations, labor shortage, and weather.

Red snapper production increased continually from 1880 to 1902 and then apparently stabilized until 1929. Because of the economic depression from 1929 to 1935, catches declined sharply. From 1935 to 1939, a period of economic recovery, catches increased, but not to the predepression levels. Catches decreased again from 1939 to 1945 because of the disrupting effect of World War II. Catches began to increase after the war, and by 1952 production had again approached the 1929 level. Except for a few sporadic years, production increased continually from 1952 to 1963.

Statistics on red snapper and grouper have been collected since 1880 by the U.S. Bureau of Fisheries, the U.S. Fish and Wildlife Service, and the Bureau of Commercial Fisheries (table 1). From 1880 to 1963, the reported Gulf production of red snapper (round weight) has been 313 million pounds, valued at \$48 million, and the production of grouper has been 174 million pounds, valued at \$13 million. Statistics are, unfortunately, lacking for some extensive periods of years. Estimates of production for these years are provided, based on production in years immediately before and after the missing ones and on partial landings. I estimate that more than 612 million pounds of snapper and 239 million pounds of grouper, valued at \$67 million and \$19 million, respectively, have been taken. This is, roughly, a yearly average of 10 million pounds of both species, valued at \$1 million, for the past 83 years from the Gulf of Mexico, or a total of 853 million pounds worth over \$86 million. In 1963, 12,600,676 pounds of snapper were taken from the Gulf of Mexico. This production value almost reached the all time high. The best year for snapper production was in 1902. Alexander (1905) and Radcliffe (1921) reported 13,608,553 pounds and 13,995,660 pounds, respectively, for that period (Camber, 1955) (table 1).

Since the early 1900's, the Campeche Banks have been the most productive area for red snapper and also an excellent source for grouper. I estimate that 50 percent of the snapper, or more than 300 million pounds, valued at over \$30 million, of the total Gulf production has come from the Campeche Banks and coast of Mexico. This is an average of over 3.5 million pounds a year, valued at over \$350,000.

Table 1.--Total production of snapper and grouper by U.S. fishing vessels from the Gulf of Mexico for various years, 1880-1963

Snapper		Grouper		Snapper		Grouper			
Year	Weight	Value	Weight	Value	Year	Weight	Value	Weight	Value
	Thousand pounds	Thousand dollars	Thousand pounds	Thousand dollars		Thousand pounds	Thousand dollars	Thousand pounds	Thousand dollars
1880	2,750	---	---	---	1939	7,899	615	6,864	230
1888	3,525	102	390	11	1940	6,523	577	5,184	206
1889	3,793	---	393	---	1945	4,782	1,011	8,790	1,026
1890	4,481	134	376	---	1948	6,216	1,352	7,574	905
1897	6,114	200	751	---	1949	7,888	1,864	8,397	835
1902	13,609	410	1,112	15	1950	6,788	1,643	5,622	515
1908	12,546	603	1,430	---	1951	6,670	1,720	5,862	592
1918	9,430	609	5,223	---	1952	8,547	2,016	4,613	536
1923	11,729	864	4,639	121	1953	7,728	2,142	4,290	432
1927	11,899	974	4,720	148	1954	8,386	2,174	4,945	554
1928	10,372	860	4,241	131	1955	8,863	2,265	4,898	501
1929	9,969	816	4,352	134	1956	8,770	2,165	6,063	604
1930	7,113	595	3,346	101	1957	8,541	2,204	6,661	664
1931	6,093	415	2,774	72	1958	9,859	2,532	4,393	490
1932	6,359	315	3,300	67	1959	10,219	2,639	6,180	712
1934	5,856	323	3,570	85	1960	10,215	2,606	6,341	722
1936	7,320	458	5,247	156	1961	11,888	3,061	6,798	694
1937	7,522	516	5,547	175	1962	11,600	2,927	6,600	660
1938	8,110	586	4,814	151	1963	12,676	3,381	7,324	740
Totals for reported years - - - - -						312,648	47,674	173,624	12,985
Estimated totals for all years since 1880						612,735	67,357	239,924	19,399

Table 2.--Production of red snapper in round weights from the Gulf of Mexico for 1954-63 by U.S. snapper fleet.

Total production U.S. vessels (all waters)			Production U.S. vessels (international waters off Mexico, including Campeche Banks)		Percent of total weight from international waters off Mexico, including Campeche Banks
Year	Weight	Value	Weight	Value	
	<u>Thousand pounds</u>	<u>Thousand dollars</u>	<u>Thousand pounds</u>	<u>Thousand dollars</u>	<u>Percent</u>
1954-	8,386	2,174	5,000	1,296	59.62
1955-	8,863	2,265	5,400	1,380	60.93
1956-	8,700	2,165	<u>1/</u>	<u>1/</u>	<u>1/</u>
1957-	8,541	2,204	4,400	1,135	51.52
1958-	9,859	2,532	3,000	700	30.43
1959-	10,219	2,639	3,600	930	35.23
1960-	10,215	2,606	3,017	770	29.54
1961-	11,888	3,061	4,300	1,107	36.17
1962-	11,600	2,927	4,200	1,060	36.21
1963-	12,600	3,162	5,900	1,481	46.83
	100,941	25,735	38,817	9,859	42.94

1/ No data

Table 3.--Production of grouper in round weights from the Gulf of Mexico
for the years 1954-63

Total production U.S. vessels			Production U.S. vessels (international waters off Mexico, including Campeche Banks)		Percent of total weight from international waters off Mexico, including Campeche Banks
Year	Weight	Value	Weight	Value	
	<u>Thousand</u> <u>pounds</u>	<u>Thousand</u> <u>dollars</u>	<u>Thousand</u> <u>pounds</u>	<u>Thousand</u> <u>dollars</u>	<u>Percent</u>
1954-	4,945	554	<u>1/</u>	<u>1/</u>	<u>1/</u>
1955-	4,898	501	<u>1/</u>	<u>1/</u>	<u>1/</u>
1956-	6,063	604	<u>1/</u>	<u>1/</u>	<u>1/</u>
1957-	6,661	664	<u>1/</u>	<u>1/</u>	<u>1/</u>
1958-	4,393	490	200	22	4.55
1959-	6,180	712	200	23	3.24
1960-	6,341	772	316	36	4.98
1961-	6,798	694	900	92	13.24
1962-	6,600	660	1,000	10	15.15
1963-	6,400	640	1,200	12	18.75
	59,279	6,291	3,816	195	9.98

1/ No data

Complete statistics of snapper and grouper landed from the Campeche Banks and off Mexico's coast have been collected by the U.S. Fish and Wildlife Service for the past 9 and 6 years, respectively (tables 2 and 3). An average of 43 percent of the snapper or 38,817,000 pounds, valued at \$9,859,000, and 10 percent of the grouper or 3,816,000 pounds, valued at \$195,000, of the total Gulf production for 1952-63 has come from the Campeche Banks and off the Mexican coast.

FLUCTUATION OF EFFORT ON THE CAMPECHE BANKS

For 1929-51, accurate records of the number of trips made to the Campeche Banks by each vessel is available for a portion of the total fleet. Camber (1955) presents data including the average number of trips to Campeche per month by 28 vessels owned by the Warren Fish and E.E. Saunders Fish Companies of Pensacola, and the Star Fish and Oyster Company of Mobile, during 1929-36 and 1938 (fig. 24). The effort decreased from an average high of 24 trips per month in March to an average low of 17 trips per month in September, and then increased again in October. Figure 25 also shows the average number of trips to Campeche made by 15 vessels owned by E.E. Saunders Fish Company during 1937 and 1939-51. Again, these data show that the Campeche Banks effort is high in March and low in September. Two reasons can be advanced for this pattern: First, hurricanes are most active in the Gulf of Mexico during fall, with September having most hurricanes. Therefore, vessels of any kind avoid getting too far away from home port during this time. Also, snapper and grouper fishing is good and can be done in favorable weather during summer, but during winter the weather is adverse and the northern Gulf is plagued with "Northers" (cold fronts which pass through with considerable velocity at times, causing hazards to unwary fishermen).

These factors tend to explain the concentration of effort on the Campeche Banks from October to April and the decrease in effort during the remaining months. It is evident that this general pattern of effort along the coast of Yucatan would apply to almost any period of years or any one year.

PRODUCTION PROBLEMS

Many problems that confronted the snapper industry in the past exist today, and more problems have arisen, some of which are as follows:

1. Production.-The old problem of catching sufficient quantities of snapper and grouper to make a worthwhile trip still exists. Although there has been considerable advancement in vessels and fishing equipment (diesel engines, depth recorders, radios, and electric and hand reels) during the last few years, the average vessel fare has decreased. Total production, of course, is greater than it was in previous years. The main reason for production declines per vessel is that the numerous vessels are exerting heavy pressure on snapper populations.

2. Production costs.-Operation and maintenance of snapper vessels are expensive. Also, construction

costs of new vessels are high. Since all work aboard vessels is done by hand, operations are slow and tedious.

3. Competition from other seafood products.-Production costs for other sea foods are usually much less than for snapper, so they are sold more cheaply at retail. The promotion of new types of sea foods has given consumers a wider variety, which competes with snappers. In the past, red snappers had much less competition. Sea food markets were generally localized in areas where catches were brought in and fish were sold in fresh condition. With development of modern refrigeration and new methods of processing, packaging, freezing, and canning, all types of sea foods are distributed nationwide.

4. Location and retainment of vessel captains.

With the increased number of new snapper vessels in the Gulf, fish houses are experiencing difficulty in finding and retaining competent captains. In an effort to obtain captains, a type of competition which rarely existed in the early fishery is becoming quite common among fish houses today; i.e., companies continue to advance the attractiveness of employment with their company by offering the captaincy position to the better captains on the newer and better vessels. Also, some fish companies are having vessels constructed according to specifications of their captains within certain limitations, such as size and horsepower. Another problem facing the industry is an overall shortage of fishermen.

SUMMARY

The red snapper fishery in the Gulf of Mexico was started about 1850 off Pensacola, Fla. During early years, live-well vessels fished inside the 40-fathom curve between Mobile, Ala., and Cape St. George, Fla. As the fishery expanded it gradually exploited the grounds off Texas to the Rio Grande and the banks along the west coast of Florida to the Dry Tortugas. In 1890, vessels began to fish for snapper and grouper on the Campeche Banks. At first, efforts on the Banks were sporadic; however, by 1895 live-wells were abandoned when artificial ice became available at a reasonable price. The Campeche Banks became regularly fished with vessels constructed or modified to carry ice. Through the years, the Campeche Banks have remained the most important snapper grounds in the Gulf of Mexico.

From 1935 to 1955, only three to four boats were added to the snapper fleet; however, in the past few years, only a few vessels have been lost or retired and numerous modern vessels have been constructed. Consequently, the size of the commercial fleet has increased tremendously. More vessels were built in the past 12 months than in the previous 12 years; about 15 vessels are under construction.

From the masted schooners of early years, the red snapper fishery changed to vessels rigged with sail and powered with auxiliary gasoline engines. Later, diesel engines were introduced, and by 1945 most of the snapper fleet had transformed to diesel powered vessels.

Throughout the years, efforts have been made to find more efficient types of gear for taking snapper. Of the types of gear developed and tested, the modified otter trawl has proved to be the most promising method of capturing fish. Five trawlers which will be outfitted with roller-rigged fish trawls for snapper fishing are either under construction or in the planning stage.



Figure 24.--Seasonal fluctuations in number of trips per month to the Campeche Banks, 1929-36, 1938

Recent advances in fishing gear have included the introduction and use of power and hand driven reels and stainless steel lines, rather than the traditional cotton handlines of the past. Also, improvements have been made in terminal gear (hooks, swivels, and rubber shocks), and superior techniques were devised for fastening this gear to the mainline. In addition, accurate charts, depth recorders and electronic navigational aids have helped the fishery immensely.

The red snapper (*Lutjanus aya*) is the predominant snapper taken in the Gulf of Mexico. This species has contributed more than 90 percent of the total Gulf production throughout the years. Producers never separate fish according to species, and, as a result, about 13 species of snapper and other fish are marketed as red snapper. Species of snapper other than *L. aya* and about

six species of grouper make up the remaining 10 percent of the total production.

From 1880 to 1963, the total reported Gulf production of snapper and grouper was 313 and 174 million pounds, respectively. I estimate that total Gulf of Mexico production from 1880 to 1963 was more than 612 million pounds of snapper and more than 239 million pounds of grouper. In 1963, 12,600,676 pounds of snapper were taken from the gulf of Mexico. This production value almost reached the alltime high of over 13 million pounds caught in 1902. An average of 43 percent of the total Gulf production, or 38,817,000 pounds, was taken from the Campeche Banks and off the coast of Mexico during the past 9 years, while 10 percent or 3,816,000 pounds of grouper was produced from this area during the past 6 years.

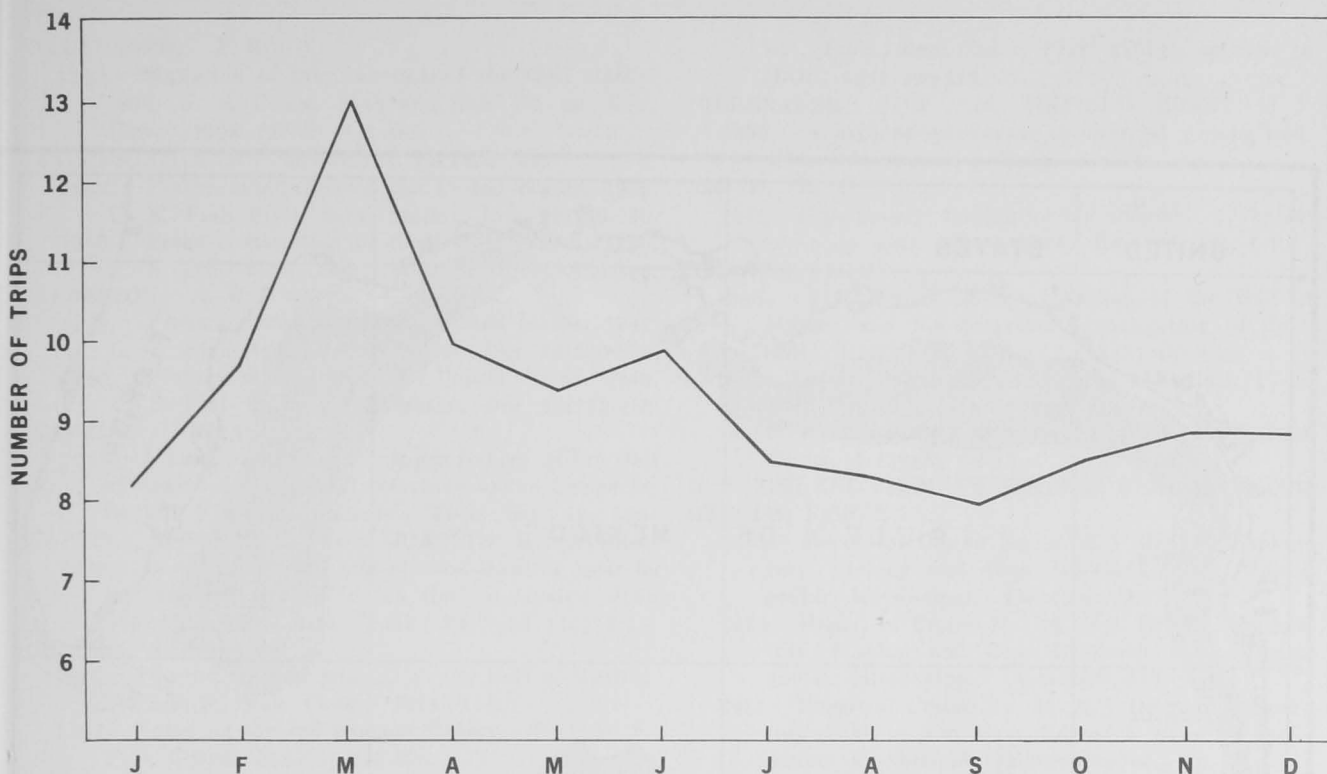


Figure 25.--Seasonal fluctuations in number of trips per month to the Campeche Banks, 1937, 1939-51.

A primary problem facing the snapper industry is the high operation costs. Vessels used in the fishery are expensive to operate and maintain, and construction costs of new vessels are high. The red snapper fishery must also compete with other fisheries that produce fish for considerably less. Although the total catch is greater than in previous years because of the increased number of vessels fishing for snapper, the average catch per boat has decreased.

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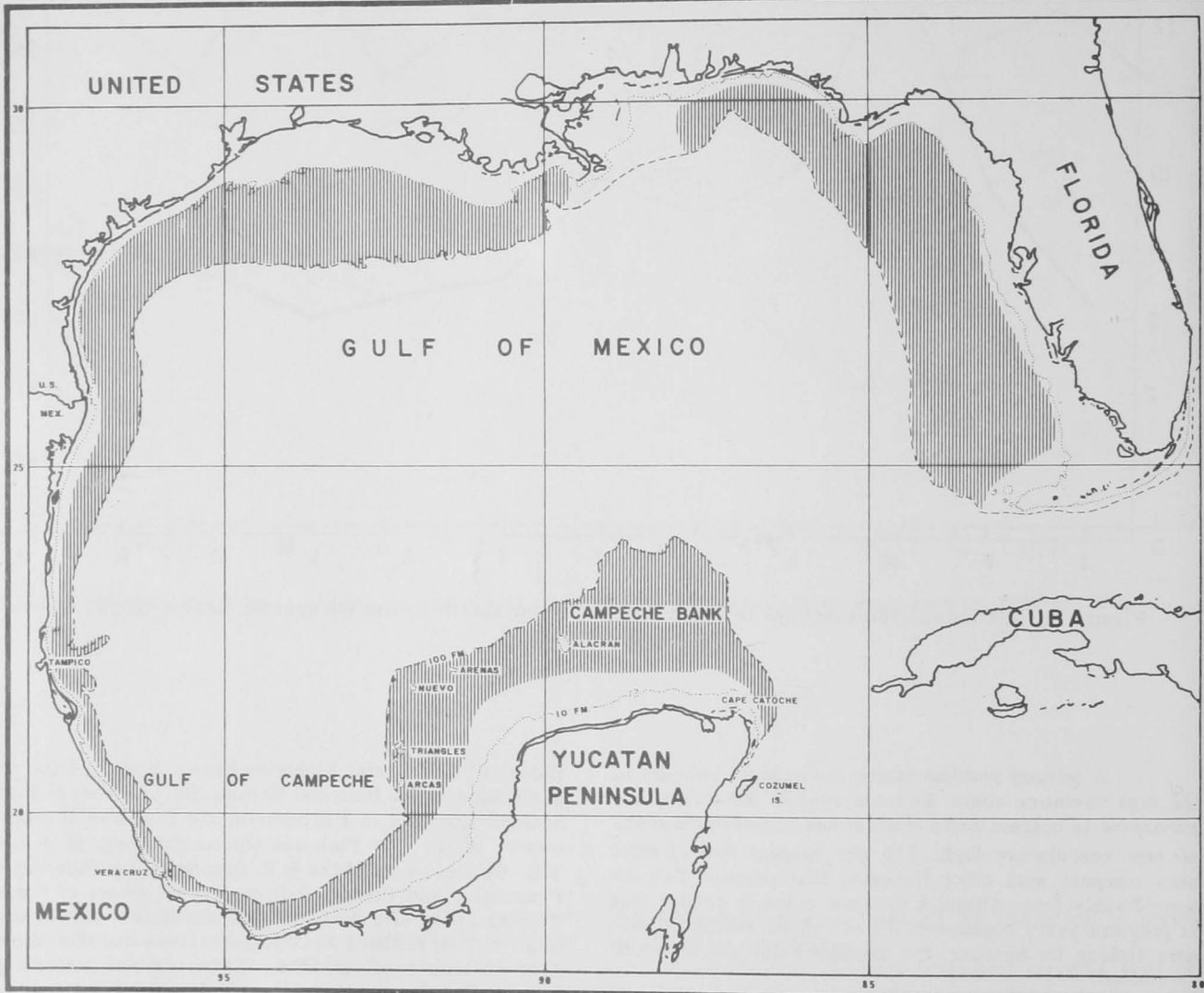


Figure 26.--Areas fished by the commercial snapper fleet in the Gulf of Mexico.

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