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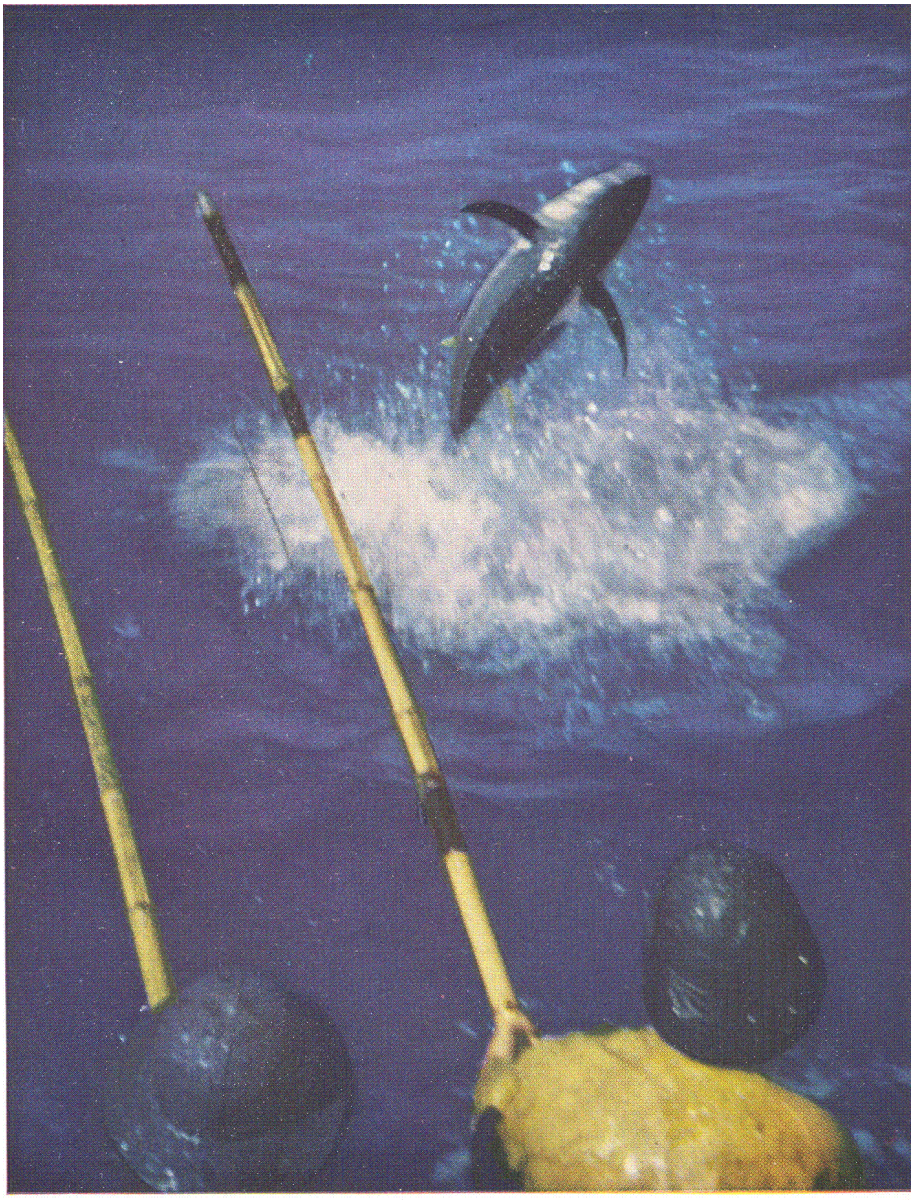
MARINE FISHERIES BRANCH
FISH BULLETIN No. 91
Common Ocean Fishes of the California Coast

By
PHIL M. ROEDEL
1953



COMMERCIAL FISHING FOR YELLOWFIN TUNA

TABLE OF CONTENTS

ACKNOWLEDGMENTS

Had it not been for the cooperation of many persons, the task of preparing this bulletin would have been far greater. Almost every member of the Marine Fisheries Branch made some contribution. I am particularly indebted to Mr. J. E. Fitch, whose comments on the entire manuscript were particularly helpful, and to Mr. J. B. Phillips, without whose aid the section on rockfishes could not have been adequately prepared.

In addition to members of the staff, I am under great obligation to Dr. C. L. Hubbs and Mr. K. S. Norris, Scripps Institution of Oceanography, La Jolla, Mr. W. I. Follett, California Academy of Sciences, San Francisco, and Dr. B. W. Walker, University of California, Los Angeles. These men reviewed the manuscript, made many suggestions of great value, and provided heretofore unpublished data with special reference to range limits. To them, and to all those others who assisted, go my thanks.

PHIL M. ROEDEL
February, 1953

1. INTRODUCTION

This bulletin is designed as a guide to those marine fishes of California which are likely to be caught by commercial and sport fishermen. While the species included represent only a fraction of the total recorded from the State, those remaining are mostly either deep-sea forms or small fishes of inshore waters which rarely, if ever, enter the fisherman's catch. The guiding precept of likelihood of capture by fishermen results in the inclusion of some species which are actually rather rare in California and the exclusion of some common varieties. The selections represent the concensus of departmental staff members and are as representative as space will allow.

Because the bulletin is meant for anyone interested in fishes, regardless of his technical background, scientific terminology has been avoided as far as possible. Those technical terms which do appear are defined in the glossary on page 150.

Much of the information presented in this bulletin is drawn from its two immediate predecessors, numbers 68 and 75 (Roedel, 1948, and Roedel and Ripley, 1950). These, in turn, supplanted numbers 28 and 45 (Walford, 1931, 1935). The text, however, has been revised completely with regard for both published and heretofore unpublished data which have become available in the last few years. Unless otherwise qualified, statements made apply to conditions in California alone.

Descriptions of appearance and color refer to adult specimens and cannot be relied upon for young fish except as specifically noted in the text. The color patterns given are believed typical of freshly-caught individuals. However, color is often difficult to describe; many species are highly variable and iridescence frequently results in two people seeing different tones in the same specimen.

Notes on fishing season and fishing gear are based on California records for the years 1947–1952. The relative importance of the different species as game and commercial varieties changes somewhat from year to year; rankings are exclusive of shellfish and mollusks and are based on California records for 1951, the most recent period for which complete figures are available.

As used herein, "Northern California" includes the area from the Oregon border to Marin County, "Central California" that from northern Marin County to Pt. Conception, and "Southern California" that from Pt. Conception to the Mexican border.

Illustrations, unless otherwise credited, are from the department's files.

2. COMMON AND SCIENTIFIC NAMES

2.1. COMMON NAMES

The common names used in this bulletin are those which the California Department of Fish and Game has designated as "official." The fundamental reason for the State's assigning official names is to assist in the collection of accurate catch statistics. For the department to understand

the State's many fisheries it is essential that the catch, both sport and commercial, of each species be known, and consistent terminology on the part of both the industry and sportsmen is of vital importance in the collection of accurate records.

The importance of uniform terminology was recognized years ago by the State Legislature. A law enacted in 1919 provided that "The Fish and Game Commission shall have the power to decide what is the common usage name of any variety." In 1933, the law was changed to its present form. Article 5 (Commercial Fishing Reports), Section 1093, of the Fish and Game Code provides that: “"The names used in the receipt for designating the species of fish dealt with must be those in common usage, and may be designated by the commission."”

While this law applies specifically only to commercial landings, and consequently, to species entering the commercial catch, it has been the policy of the department to assign common names to other than commercial varieties, both fresh water and salt, to insure uniformity in state publications and records and to attempt to attain uniformity in common usage on the part of fishermen. official names have been assigned to all the fresh-water and anadromous fishes of California (Shapovalov and Dill, 1950), and to the more important marine varieties (Roedel, 1953b). The marine list sanctions a few alternative names where either of two vernaculars will lead to the ready identification of the species in question.

Ideally, a common name would have sole use throughout a fish's range, would not be used for any other species, and would indicate, rather than confuse, relationship. In practice, the same name is frequently used for several species and one species may have several names, even in a limited area. Equally frequently, these names give a false picture of the fish's relationship. In selecting "official" names, we have been guided by usage both in California and elsewhere, official lists of other organizations, and suitability, considering both marketing factors and the problems of relationship. Unfortunately, many well-established names are completely misleading so far as relationship is concerned—the white seabass, for example, is a croaker—but it would be futile to attempt their overthrow and they are given official recognition. The names selected represent the concensus of the department's staff, but we are quite aware that errors will be made in selections, that usage will change and that, as a result, no such list is immutable.

2.2. SCIENTIFIC NAMES

From the foregoing, it becomes evident that a common name cannot be depended upon to provide a term which will separate a given animal from any other or show the relationship of various kinds to each other. Herein lies the reason for and the value of scientific names. Scientific names are often regarded as unintelligible and consequently useless appendages designed by the scientist for no good reason except perhaps the confusion of the layman. They serve, however, definite and useful purposes. They indicate relationship through a classification system and they give each species a name which is reserved for it alone. It does not matter what language one speaks or in what tongue a book is written, Seriphus politus always refers to what we call officially queenfish. The

fact that in other parts of the world a queenfish may be something quite different or that our queenfish may be called herring or shiner or some other name in California does not matter. As long as we say or write Seriphus politus there can be no question of what we mean, for no two members of the animal kingdom have the same scientific name.

The structure of the classification system is designed to show relationship. Speaking generally, it breaks large groups into smaller on the basis of progressively smaller differences and greater likenesses. The first and very broad division of living things places them in either the plant or the animal kingdom. The animal kingdom in turn is broken into a number of large groups called phyla (singular, phylum), on the basis of broad anatomical likenesses. Phylum Chordata, for example, includes all animals with backbones and some very primitive forms which do not have a backbone but which do possess certain structures in common with typical vertebrates, such as mammals, birds and fishes. The next major subgroup is the class, one of which includes the bony fishes. Classes are divided into orders, orders into families, families into genera (singular, genus), and genera into species (both singular and plural), the basic unit in classification. In addition to these major units, various intermediate stages are used as well, such as superfamilies and subspecies.

Classification is not a rigid structure, but a changing thing which is altered as knowledge accumulates. Further, the various divisions are man-made, and biologists do not always agree as to the proper position of, or the degree of relationship exhibited by, the sundry groups of animals and plants. One man may think of three species as forming a single genus while another man may feel that the differences among them are great enough to warrant establishing two or even three separate genera. There is agreement on objectives and on many points of classification but often disagreement on how the observed differences and similarities should be interpreted.

The scientific name, as it usually appears, consists of two parts, the name of the genus followed by the name of the species. Sometimes the name of the subspecies, if there is one, follows. The words are italicized with only the generic name beginning with a capital letter. Thus Engraulis mordax designates the northern anchovy: species mordax in genus Engraulis. There are, however, two known subspecies of this fish and to show that we are speaking of the San Francisco Bay form as distinguished from the one found in the ocean, we must add the subspecific name nanus, thus: Engraulis mordax nanus. often the name of a man, printed in Roman type, follows the scientific name. This is the person who first described the species. When a date follows the name, it indicates the year in which he published the original description.

The naming of animals is subject to certain rules laid down by the International Commission on Zoological Nomenclature. With scientists working throughout the world, some confusion and duplication is inevitable. The rules provide how a name from the family level down is to be formed and a means of settling any disputes which may arise.

Names must be rendered in Latin or in Latinized form. The generic name of the black perch, Embiotoca, for instance, is derived from two Greek words meaning "living" and "bringing forth," most appropriate for this fish which bears its young alive. This is characteristic of all the

surfperches and is reflected in the family name, Embiotocidae. The specific name of the black perch, jacksoni, was given in honor of Mr. A. C. Jackson who was one of the first to call attention to this feature of its life history. The rather formidable generic name of the Pacific salmons, Oncorhynchus, means simply "hook snout," while the various specific names are derived from the Russian vernacular. Not all names are as apt. These were chosen to exemplify the fact that there is a meaning to, as well as a reason for, scientific names.

3. DESCRIPTIONS AND ILLUSTRATIONS

3.1. THE SHARKS

3.1.1. THE HORN SHARK FAMILY, HETERODONTIDAE

CALIFORNIA HORN SHARK

Heterodontus francisci (Girard)

Relationship: This family includes fewer than 10 living species, all referred to a single genus.

Range: Morro Bay, Central California, to Cape San Lucas, Baja California, and into the Gulf of California. Reported years ago from Monterey Bay. This is a fairly common inshore bottom form, particularly around rocks and kelp. It has been caught at depths of over 500 feet and is thought to migrate from shallow to deeper water at certain times of the year.

Description: A spine before each dorsal fin; anal fin present. **Color:** Brownish with scattered black spots. **Length:** To about 4 feet.

Development: Lays eggs, each enclosed in a distinctively shaped horny case surrounded by spiral fluting. These cases, which are several inches long, may be found wedged around rocks in the lowest tide zone.

Food: Mollusks, crabs and other hard-shelled invertebrates.

Importance: None.

3.1.2. THE COWSHARK FAMILY, HEXANCHIDAE

SIXGILL COWSHARK

Hexanchus griseum (Bonnaterre)

Range: On our coast, from northern British Columbia to Southern California. Also known from Japan, the southeast Pacific, both coasts of the Atlantic, the Mediterranean and the south Indian Ocean. Not as common in California as the sevengill cowshark.

Description: Six gill slits on each side; one dorsal fin; teeth in upper jaw quite unlike those in lower (Figure 1). **Color:** Dark gray or brown to almost black; a pale streak along the side. **Size:** A record specimen from San Francisco Bay was 11 feet long and weighed 464 pounds (Herald and Ripley, 1951). There is an account of a 26-foot specimen caught in England in 1846. **Development:** Bears a large number of live young.

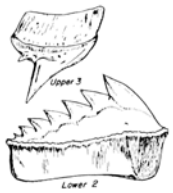


FIGURE 1

Remarks: This is a bottom shark which has been caught in very deep water. It feeds on fish and crustaceans. The Pacific sixgill is regarded as a distinct species (H. corinum) by many workers; the differences are not valid according to Bigelow and Schroeder (1948).

Importance: One of the more desirable meat species but not taken in any quantity.

SEVENGILL COWSHARK

Notorynchus maculatum Ayres

Range: Northern British Columbia to Southern California. Common in San Francisco, Tomales and Monterey Bays; rarely seen off Southern California where it is usually found in fairly deep water.

Description: Seven gill slits; one dorsal fin; teeth in upper and lower jaws unlike (Figure 2). **Color:** Sandy gray to blackish, spotted sparsely with black. **Length:** Reputed to reach 15 feet; there is record of an 8½-foot female caught off Washington. **Development:** Bears live young (ovoviviparous).

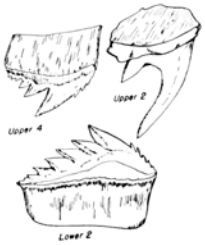


FIGURE 2

Importance: Considered by the markets as one of the more palatable sharks.

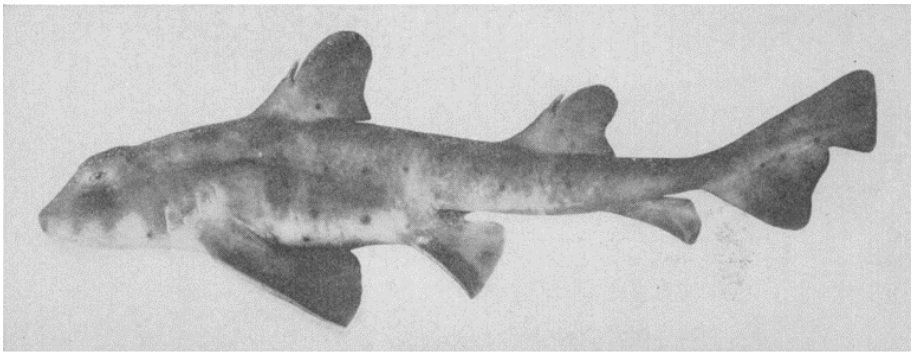


FIGURE 3. California horn shark, Heterodontus francisci

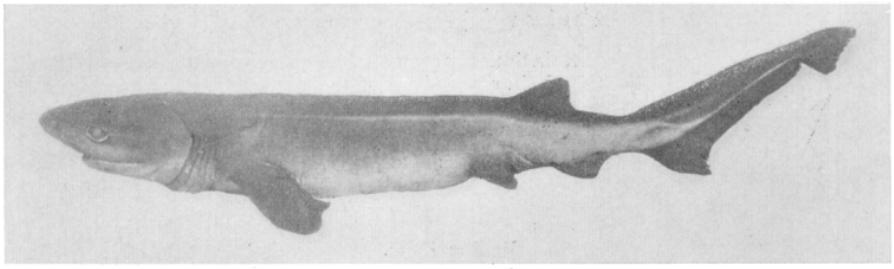


FIGURE 4. Sixgill cowshark, *Hexanchus griseum*
Photograph by Paul Williams for Scripps Institution of Oceanography

FIGURE 4. Sixgill cowshark, Hexanchus griseum

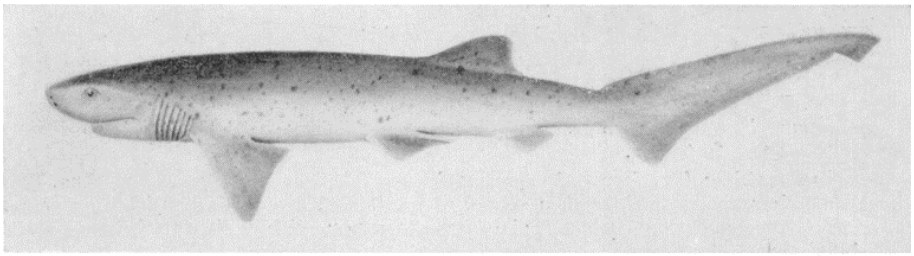


FIGURE 5. Sevengill cowshark, Notorynchus maculatum

3.1.3. THE THRESHER FAMILY, ALOPIIDAE

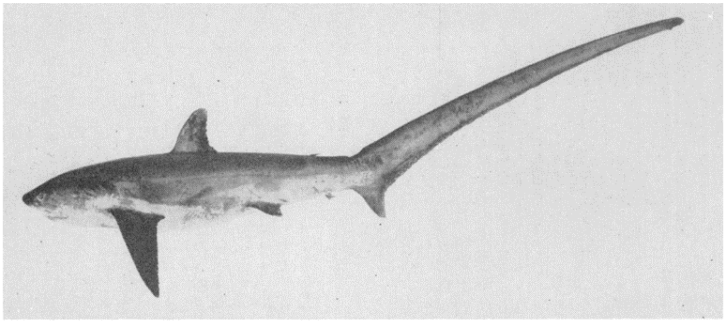


FIGURE 6

COMMON THRESHER
Alopias vulpinus (Bonnaterre)

Relationship: One of several known species. Whether the similar threshers of the western Pacific and the Indo-Australian region are the same as those found off our coast and in the Atlantic remains to be settled.

Range: Temperate and tropical waters of the Atlantic, the Mediterranean, the eastern Pacific from the Straits of Juan de Fuca south; the balance of the Pacific and Indian Oceans if the fish found there prove identical with the eastern Pacific form. Pelagic, but coming close to shore at times; individuals have been taken in San Pablo and San Francisco Bays.

Description: Tail extremely long, constituting about half the total length; teeth small, weak, those figured from 8-foot specimen. **Color:** Bluish or brownish gray to back above becoming white below. **Size:** Variously reported to reach 20 to 25 feet and a weight of half a ton. A New Zealand specimen (which may belong to another species) measured 18 feet and weighed 922 pounds. Reaches no great size in California. Most specimens seen run from five to eight feet. **Development:** The young are born alive, apparently in very small litters. Those reported included two or four pups. Large females have been found carrying young about five feet long.

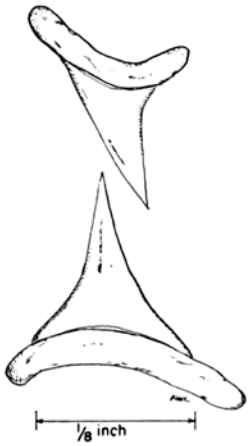


FIGURE 7

Feeding Habits: The long tail apparently serves a good purpose in feeding. The thresher swims about or through a school of small fish, the flailing tail acting either as a scare to concentrate the school or as a weapon with which to injure or kill individual fish.

Importance: Considered one of the most desirable food sharks.

Fishery: Taken in fairly large numbers off Santa Barbara in gill nets during the summer.

Remarks: There is a story of many generations' standing that threshers, in company with swordfish, attack whales and even kill them with their powerful tails. Like so many good stories, it is not true—these exploits can be laid to killer whales which do attack their larger relatives. The thresher is harmless to man. While it is a fast swimmer, it has a small mouth and weak teeth.

3.1.4. THE MACKEREL SHARK FAMILY, LAMNIDAE

Several of the sharks of this group are dangerous and vicious. The only fatal attack on man in California is attributed to the man-eater. The Atlantic and South Pacific makos are fine game fishes, famed for their fight and spectacular leaps.

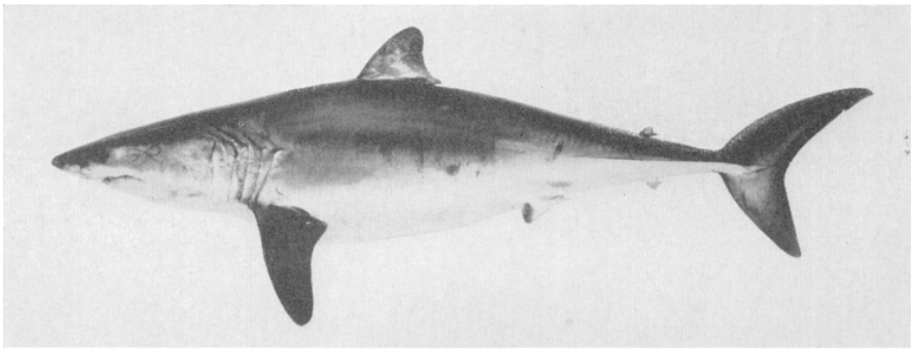


FIGURE 8

FIGURE 8

BONITO SHARK

Isurus glaucus (Müller & Henle)

Relationship: The Atlantic mako shark belongs to this genus. The mako of Australia and New Zealand may be the same as our bonito shark, though it has been described as a distinct species.

Range: Central California (Cordell Bank; Follett, 1952) to northern Baja California (near Rosarito Beach); Hawaii, Japan; the entire Indo-Pacific if there is but one species in the area. A pelagic shark common off Southern California.

Description: A single keel on each side of the root of the tail fin, which is upright and crescentic; teeth long, sharp, with knifelike edges and without small points at their bases (Figure 155); first dorsal fin inserted behind pectoral base. **Color:** Dark blue above becoming white on the sides and belly. **Size:** off Southern California, usually less than seven or eight feet. **Development:** Bears live young (ovoviviparous).

Remarks: Bonito sharks are caught not infrequently in purse seines, along with the sardines or mackerel on which they feed, and are often a pest to mackerel scoop fishermen.

Importance: Considered an excellent food fish. The liver contains little vitamin A.

MAN-EATER

Carcharodon carcharias (Linnaeus)

Usually found in the open ocean. Cosmopolitan in temperate and tropical seas but rare off California. It is voracious and is known to have killed man; a man-eater was probably responsible for the only fatal attack recorded from California. A record specimen (Australia) was 36½ feet long; the largest California specimen was reported to be about 32 feet long. Keel and tail fin as in bonito shark; teeth large, triangular, with sawtooth edges (Figure 153). Unauthorized name, great white shark.

SALMON SHARK

Lamna ditropis Hubbs & Follett

Coastal north Pacific from Alaska south to Southern California and Japan. Not uncommon off Northern California. A double keel on each side of base of tail fin (Figure 152); teeth fanglike with smooth edges and two small points at their bases (Figure 154); belly spotted. A 6½-foot female caught in Southern California in 1950 contained four young, each 30 inches long and each weighing 18 pounds. Unauthorized name, mackerel shark.

3.1.5. THE BASKING SHARK FAMILY, CETORHINIDAE

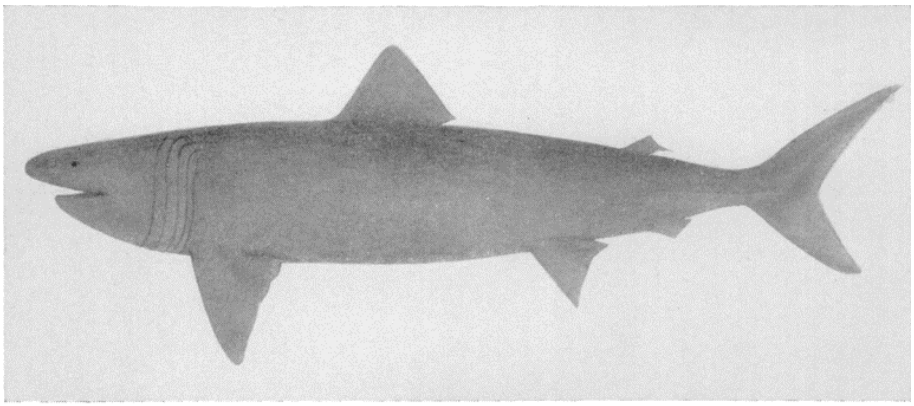


FIGURE 9

BASKING SHARK
Cetorhinus maximus (Gunner)

Relationship: The only member of the family, if baskers from the northern and southern hemispheres, the Pacific and the Atlantic belong to the same species.

Range: Temperate and subarctic seas of both hemispheres. On the Pacific coast from Southern California northward but uncommon south of the Santa Barbara channel.

Description: A keel on each side of base of tail fin, which is upright and crescentic; gill slits extremely long, nearly meeting under throat; numerous long, horny gill rakers; teeth small, numerous, smooth-edged, those figured from a 28-foot specimen. **Color:** Lead gray above, usually becoming lighter below. **Size:** A number of specimens over 30 feet and up to 45 feet are on record. Those caught off California usually run from 15 to 30 feet, and in 1946–47 averaged about 1# tons in weight. No specimen under 10 feet has been caught in California. **Development:** Bears live young.

Importance: Basking sharks have been fished sporadically off Central California for many years.

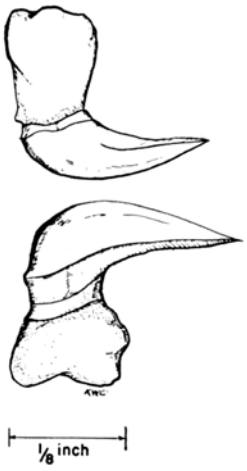


FIGURE 10

Fishing Method: Harpooning from small craft.

Remarks: These sharks appear off the Central California coast from fall to spring and schools containing as many as 100 or more individuals have been observed. Despite their huge size, they are harmless to man, being somewhat sluggish creatures usually found swimming leisurely at the surface. They feed on small organisms which they strain from the water with their long, close-set gill rakers. Many tales of sea serpents can be laid to the discovery of partially decomposed remains of basking sharks washed ashore, and still others to the sight of several of them swimming one behind the other with dorsal and tail fins above the surface.

3.1.6. THE CATSHARK FAMILY, SCYLIORHINIDAE

This family includes many species of small sharks and representatives are found in most temperate and tropical seas. All are believed to be egg layers. Three species are known from California. **Family Characters:** Anal fin present; no keels on caudal peduncle; first dorsal fin far back, above pelvics.

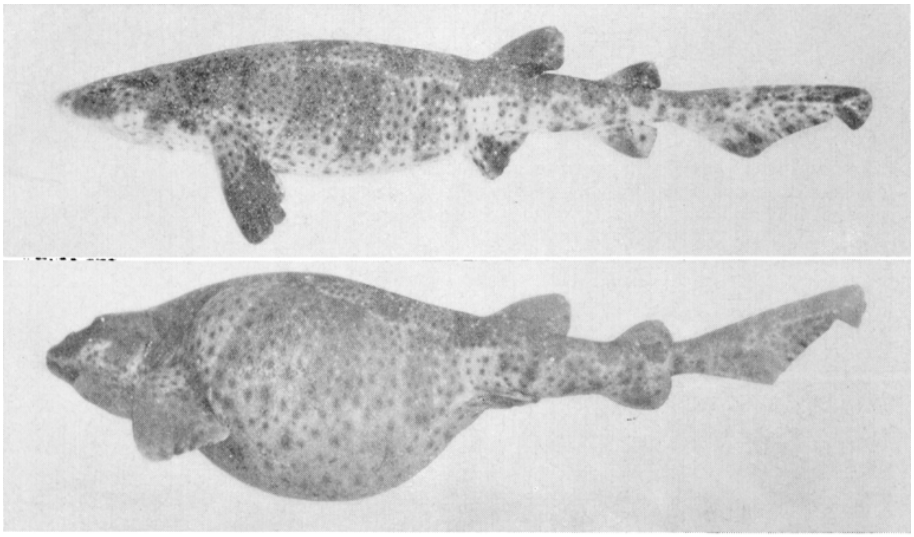


FIGURE 11

FIGURE 11

CALIFORNIA SWELL SHARK

Cephaloscyllium ufer (Jordan & Gilbert)

Range: Monterey Bay south into Baja California, at least as far as San Benito Islands; Guadalupe Island. Reported once from Acapulco, Mexico. A common inshore form in Southern California, particularly around kelp; not common north of Pt. Conception.

Description: See above. Labial folds absent or rudimentary; head broad, blunt, flat; skin thick; scales large, rough; able to inflate belly. Teeth resemble those of the mackerel shark but are very small. **Color:** Shades of brown tinged with yellowish; barred and spotted with black on back and sides; sides with small whitish spots. **Length:** To about three feet. **Development:** Lays eggs contained in amber-colored cases.

Remarks: This shark fills its belly with air when taken from the water and can distend itself to the grotesque proportion illustrated. A fish eater, it can take surprisingly big individuals in its large mouth. It is sometimes caught in lobster traps but is of no economic importance. According to fishermen, eating the flesh will cause diarrhea.

FILETAIL CATSHARK

Parmaturus xaniurus (Gilbert)

Range: Central California (off Monterey) at least to San Roque Bay, Baja California; reported fairly common in deep water. **Distinguished by:** Labial fold on lower jaw about twice as long as that on upper (Figure 150).

BROWN CATSHARK

Apristurus brunneus (Gilbert)

Range: British Columbia to Southern California; a deep water form. **Distinguished by:** Labial fold on lower jaw slightly shorter than that on upper (Figure 151). **Remarks:** of no economic importance, though it is frequently taken by deep-water trawlers off Northern California.

3.1.7. THE SMOOTHHOUND FAMILY, TRIAKIDAE

A widespread family in warmer seas, the many members are relatively small and harmless to man. **Family Characters:** Anal fin present; caudal peduncle without keels; first dorsal fin in front of pelvics; spiracle present.

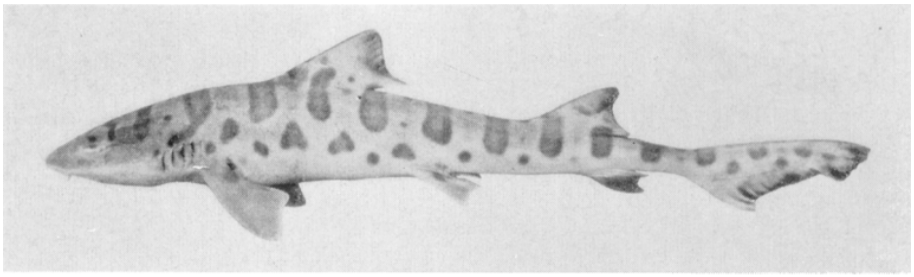


FIGURE 12

FIGURE 12

LEOPARD SHARK

Triakis semifasciata Girard

Range: Oregon to Magdalena Bay, Baja California. Common in shallow water along the Southern California coast and in bays farther north.

Description: See above. Black crossbars on upper parts. **Color:** Gray with black crossbars on upper parts and black spots on sides; belly pale. **Length:** To five feet. **Development:** Bears live young.

Fishery: Caught quite frequently by Southern California fishermen. Taken throughout the year in Northern California.

Importance: Commonly marketed for its flesh. The liver contains no vitamins.

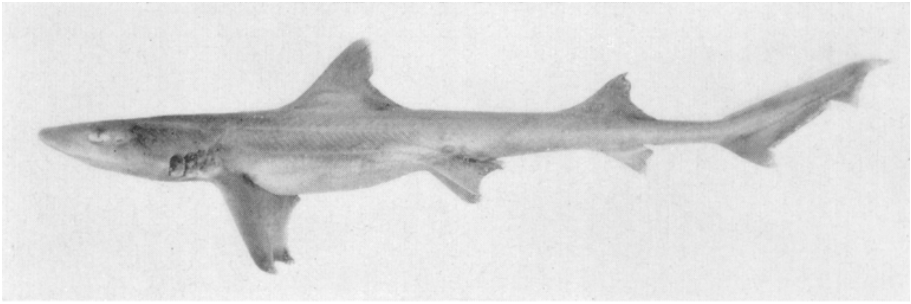


FIGURE 13

FIGURE 13

BROWN SMOOTHHOUND

Rhinotriacis henlei Gill

Range: The coast of California south into the Gulf of California. Common in Central California bays; it is the most abundant shark in San Francisco Bay.

Description: See opposite page, top; teeth small, pavementlike, but with sharp points; pectoral, when held against body, reaches a point below middle of first dorsal; second dorsal much larger than and inserted in advance of anal. **Color:** Red brown or bronze above; sides sometimes silvery; belly white. **Length:** To 38 inches. **Development:** Bears live young.

Importance: Considered one of the more desirable sharks for its meat. The liver has no value.

Fishery: Taken chiefly on hook and line and offers some considerable sport to fishermen in the bay region.

Note: This shark is sometimes confused with small soupfin, but is easily identified by the position and size of the anal fin (Figure 15 and 16).

GRAY SMOOTHHOUND

Mustelus californicus Gill

Range: Central California to and into the Gulf of California. Abundant in shallow water off Southern California but not common to the north.

Description: See opposite page, top. Teeth flat, blunt, pavementlike, without points; pectoral fin, when held against body, does not reach past a point below first quarter of first dorsal; lower lobe of tail rounded. **Color:** Dark gray above becoming whitish on the belly. **Length:** To three or four feet. **Development:** This shark is viviparous, the young getting nourishment from the mother through a placental attachment.

SICKLEFIN SMOOTHHOUND

Mustelus lunulatus Jordan & Gilbert

Range: San Diego south to Colombia.

Description: Lower lobe of caudal expanded as a pointed lobe; pectoral reaches a point below middle of first dorsal; otherwise as for the gray smoothhound. **Color:** Grayish above, belly white. **Length:** To six feet. **Development:** Bears live young.

3.1.8. THE REQUIEM SHARK FAMILY, CARCHARHINIDAE

This is the largest of the shark families, with its members widely distributed in tropical and temperate seas. Some, including the tiger shark, are definitely dangerous to man. Most, however, are harmless and a few, such as the soupfin, are, or have been, extremely valuable commercially. Six species are known from California and can be indentified by the key, page 155.

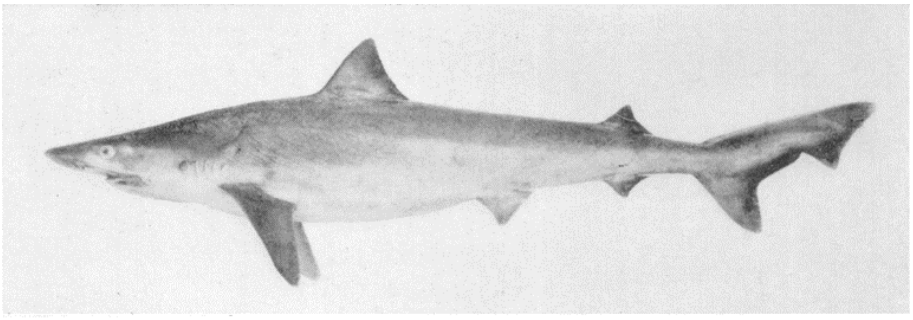


FIGURE 14

SOUPFIN

Galeorhinus zyopterus Jordan & Gilbert

Relationship: Very similar sharks, some perhaps specifically identical, are found in the eastern Atlantic and Mediterranean, on both coasts of South America, and in the central, western and south Pacific.

Range: Northern British Columbia southward at least to Abreojos Pt., central Baja California, in inshore waters from the surface to the bottom. Soupfin have been fished in depths of up to 150 fathoms and have been caught in 225. Males predominate in the northern part of the State; females in shallow water off Southern California.

Description: Anal fin present; first dorsal fin in front of pelvics; caudal peduncle without keels; second dorsal fin directly above and about the same size as anal (see Figure 15 and 16; small soupfin are sometimes confused with the brown smooth-hound, but in the latter the second dorsal is larger than and inserted in advance of the anal); spiracles present; teeth sharp, notched on the outer edge below the point, the lower part of the notch divided into two to five points. **Color:** Dark gray or bluish above, becoming paler on the sides and whitish below. **Size:** Females reach 6½ feet and a weight of nearly 100 pounds; males, 6 feet and about 60 pounds. **Development:** Ovoviviparous. Litters average 35.

Food: Chiefly fishes of medium and small size. Stomach contents examined included both bottom dwelling forms (flatfish, rockfish, midshipman) and pelagic type (sardines, mackerel, barracuda, squid).

Importance: Although soupfins were once the object of an intensive fishery along the Pacific Coast, the development of synthetic vitamin A and a dwindling supply of soupfins have caused an economic decline in the fishery. The liver of the soupfin is the richest known natural source of vitamin A and during World War II it and the west coast dogfish were the chief sources in the production of vitamin A for the United States and the allied nations.

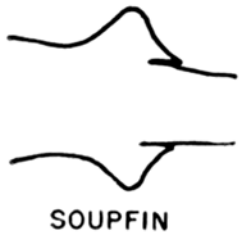


FIGURE 15

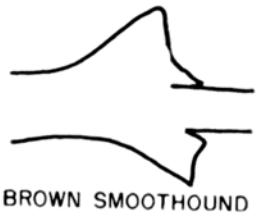


FIGURE 16

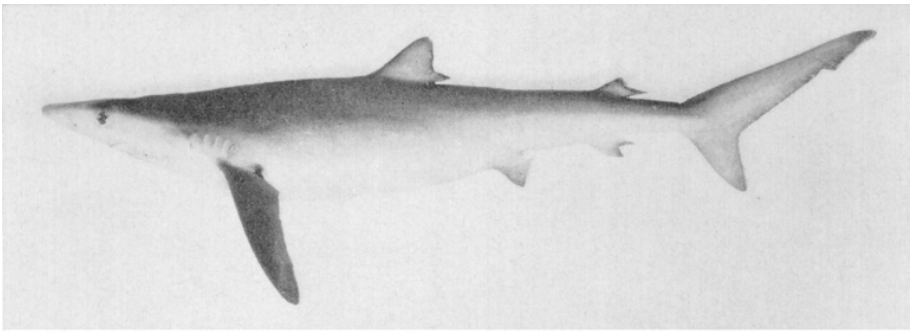


FIGURE 17

FIGURE 17

BLUE SHARK

Prionace glauca (Linnaeus)

Range: Tropical and temperate seas of the world. On our coast, from British Columbia to the Gulf of California, where it is found both on the high seas and in inshore waters. Common off the Southern California coast. Occasionally common in Monterey Bay and elsewhere above Pt. Conception when warm currents approach the shore.

Description: Anal fin present; middle of base of first dorsal nearer pelvics than pectorals; caudal peduncle without well-developed keels; upper teeth serrate; lower teeth usually finely serrate, a few sometimes smooth or nearly so (teeth figured from a 6½-foot specimen); snout long, pointed; pectorals long, pointed; no spiracles. **Color:** Indigo blue above, lighter blue on sides, belly white. **Size:** Reputed to reach 15 or 20 feet but a 12-foot 7-inch specimen is apparently the largest actually on record. The six-footers commonly encountered in our waters weigh 60 or 70 pounds. **Development:** Viviparous, the embryos attached to the mother by a placenta. The litters are large; a Mediterranean specimen contained 54. This shark probably does not mature until 7 or 8 feet long.

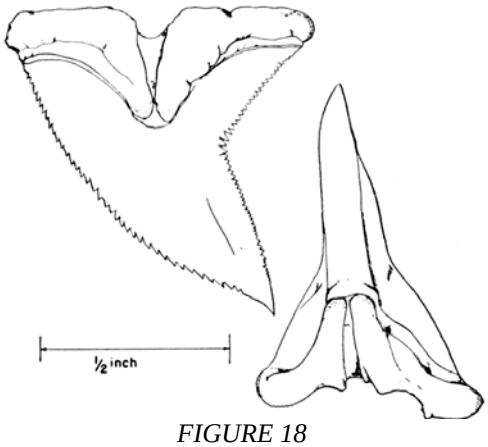


FIGURE 18

Remarks: There are no authentic records of blue sharks attacking men, though they have unsavory reputations. Apparently they feed chiefly on small fish and squids but they are quite voracious and have an amazing vitality even when horribly mutilated.

Importance: of no significant commercial importance. Its occurrence and capture sometimes makes it quite a nuisance to drift net fishermen, and it is often a pest to mackerel scoop net fishermen. It is occasionally taken by deep sea anglers.

3.1.9. THE HAMMERHEAD FAMILY, SPHYRNIDAE

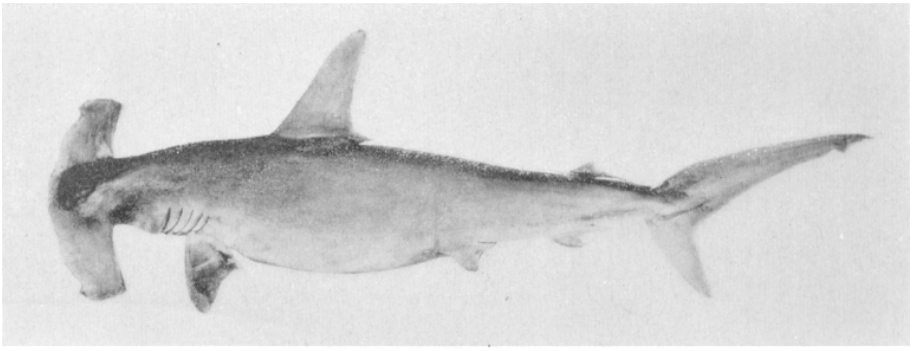


FIGURE 19

FIGURE 19

COMMON HAMMERHEAD

Sphyrna zygaena (Linnaeus)

Relationship: The status of the various kinds of hammerheads has long been confused. At present, three species are recognized as having occurred in California waters.

Range: Tropical and warm temperate seas; occasionally off Southern California. Found in surface waters both inshore and off.

Description: Head hammer shaped; front margin of head evenly rounded centrally, deeply scalloped by the nostrils; posterior lobe of second dorsal about twice as long as the fin is high. **Color:** Dark slate gray or brownish gray becoming white below. **Size:** Reaches 12 or 13 feet; a 12½-foot specimen probably of this species weighed 900 pounds. There are records of larger individuals up to more than 15 feet but all are either believed or known to refer to other species. **Development:** Bears live young; believed ovoviviparous. Females containing up to 37 embryos have been caught.

Remarks: There are authentic cases of hammerheads in the western Atlantic and in the Australian region attacking man.

Importance: None in California, though it is utilized to some extent for its hide and liver in areas where it is abundant.

Other California Species: Two species, the scalloped hammerhead, S. lewini (Griffith), and the bonnethead, S. tiburo (Linnaeus), have been reported from California. S. lewini is superficially very much like S. zygaena but the central portion of the front margin of the head is notched instead of being evenly rounded (Figure 156). The bonnethead has a head shaped more like a spade than a hammer, the front margin of which is fairly evenly rounded (Figure 156).

3.1.10. THE DOGFISH FAMILY, SQUALIDAE

This family is widely distributed throughout the world and the relationships of the various groups are uncertain. Three species are recorded from California: the dogfish, the sleeper shark (Somniosus pacificus), and the bramble shark (Echinorhinus brucus).

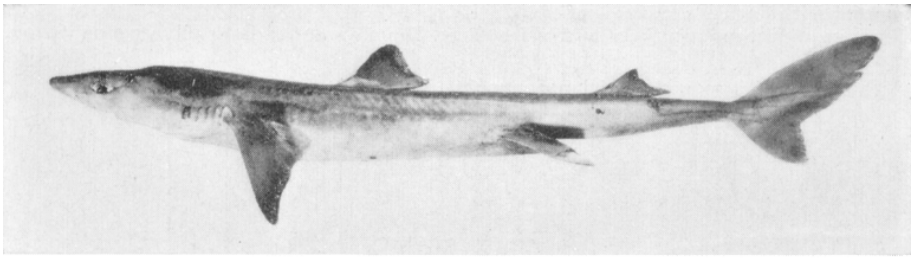


FIGURE 20

FIGURE 20

DOGFISH

Squalus acanthias Linnaeus

Relationship: The north Pacific and north Atlantic dogfishes were long regarded as separate species (S. suckleyi and S. acanthias respectively), but Bigelow and Schroeder (1948) found no difference between them. Because the Atlantic dogfish was described first, its scientific name takes precedence.

Range: Northern Baja California (Santo Tomas) to Alaska and south on the Asiatic side to north China and Japan; temperate and subarctic north Atlantic. Similar dogfishes from the southern hemisphere may belong to this species. Common, often schooling, in inshore waters along most of the Pacific Coast; in deeper water off Southern California.

Description: No anal fin; a spine in the forepart of each dorsal fin. **Color:** Slate gray or brownish above, becoming white below. **Size:** Length to about five feet, the females averaging larger than the males. **Development:** Ovoviviparous, with litters of from 3 to 14. The period of gestation is nearly 2 years.

Food: Small fishes and invertebrates, refuse.

Importance: No longer the object of a heavy fishery because of the capture of the market by synthetic vitamin A; during the years of a heavy shark fishery it ranked second to the soupfin, making up in numbers what it lacked in individual potency and value.

Remarks: The spines, which are probably mildly poisonous, form a defense weapon, the fish curling like a bow before striking. often a pest to fishermen, destroying gear and taking bait designed for other species.

3.1.11. THE ANGEL SHARK FAMILY, SQUATINIDAE

CALIFORNIA ANGEL SHARK

Squatina californica Ayres

Relationship: The only California member of family Squatinidae.

Range: Southern Alaska to and into the Gulf of California. An inshore bottom dweller, common along the Southern California coast but rare to the north.

Description: Body flattened, raylike, with pectorals and pelvics expanded; pectorals not attached to sides of the head as in the rays; gill openings crowded in a deep notch behind head; no anal fin. **Color:** Red brown, dark almost black above, spotted with darker shades; fins edged with gray posteriorly; underparts white. **Size:** Average specimens are three to five feet long. **Development:** Bears live young (ovoviviparous).

Remarks: This shark, which has no value, is taken in drag nets.

3.2. THE RAYS

3.2.1. THE GUITARFISH FAMILY, RHINOBATIDAE

SHOVELINOSE GUITARFISH

Rhinobatos products (Ayres)

Relationship: One other species is known from California, the mottled guitarfish, Zapteryx exasperata (Jordan & Gilbert). It ranges from San Diego County to Panama. Guitarfish, despite their superficial sharklike appearance, are classified with the rays.

Range: Monterey Bay to and into the Gulf of California. Common in shallow water along the coast and in bays.

Description: Two dorsal fins; tail fin present; disk longer than wide, about two-thirds as long as rest of body; snout sharply pointed; one row of hooked spines along the back and tail, others on the shoulders and sometimes around the eyes; skin fairly smooth, covered with fine shagreen. **Color:** Brownish gray above becoming white below. **Length:** To about four feet. **Mottled guitarfish** has conspicuous dark markings; disk about as long as rest of body.

Remarks: Bears live young (ovoviviparous). Feeds chiefly on invertebrates such as crabs and clams. It is often caught by sport fishermen who usually call it "shovelnose shark." The flesh is palatable.

3.2.2. THE THORNBACK FAMILY, PLATYRHINIDAE

CALIFORNIA THORNBACK

Platyrhinoidis triseriata (Jordan & Gilbert)

Range: Central California south to Lagoon Head, Sebastian Vizcaino Bay, Baja California. Common on sandy bottoms in Southern California but very rare north of Point Conception (Herald, 1953).

Description: Two dorsal fins; tail fin present; snout broadly rounded; disk wider than long; skin fairly smooth, covered with fine shagreen; three rows of strong spines along middle of back and tail; patches of spines on shoulders; smaller spines and prickles along front margin of pectoral and usually along inner edge of eye; first dorsal fin about at middle of tail. **Color:** Brown or brownish olive above; belly white or buff. **Length:** To two or three feet. **Development:** Bears live young (ovoviviparous).

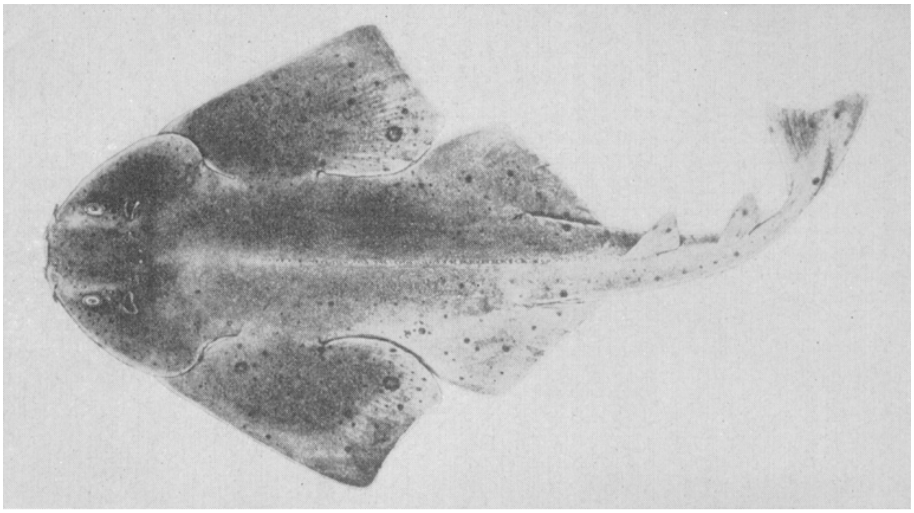


FIGURE 21. California angel shark, *Squatina californica*. From Garman, 1913.

FIGURE 21. California angel shark, Squatina californica. From Garman, 1913

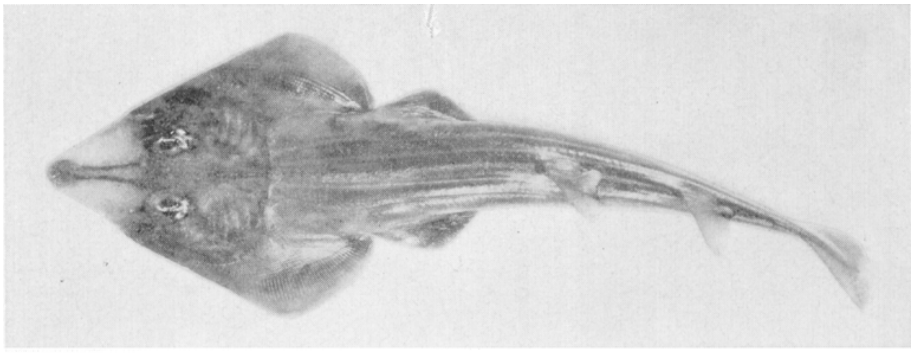


FIGURE 22. Shovelnose guitarfish, *Rhinobatos productus*

FIGURE 22. Shovelnose guitarfish, Rhinobatos productus

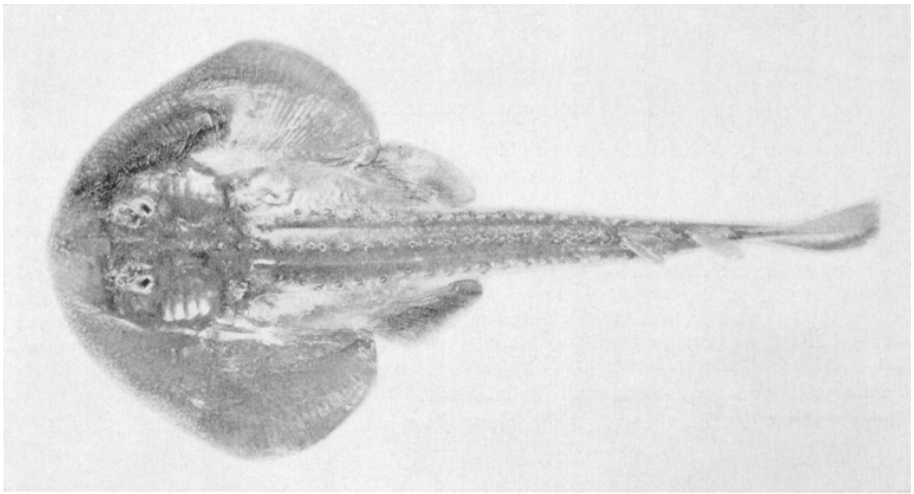


FIGURE 23. California thornback, *Platyrhinoidis triseriata*

FIGURE 23. California thornback, Platyrhinoidis triseriata

3.2.3. THE SKATE FAMILY, RAJIDAE

This family includes many species from all over the world, six of which are known from California. Skates are oviparous, laying eggs enclosed in distinctive leathery cases. They live chiefly on muddy bottoms, both inshore and in deep water. In California, skates are definitely underexploited. Although almost any type of equipment that fishes the bottom may be employed to take them, the great bulk of the catch is derived from trawl boat landings at Monterey and San Francisco. Los Angeles landings are from hook and line and from gill and trammel net boats. Three species are of importance in the catch—the California skate, Raja inornata, the big skate, Raja binoculata, and the longnose skate, Raja rhina. Only the trimmed wings (pectoral fins) are used.

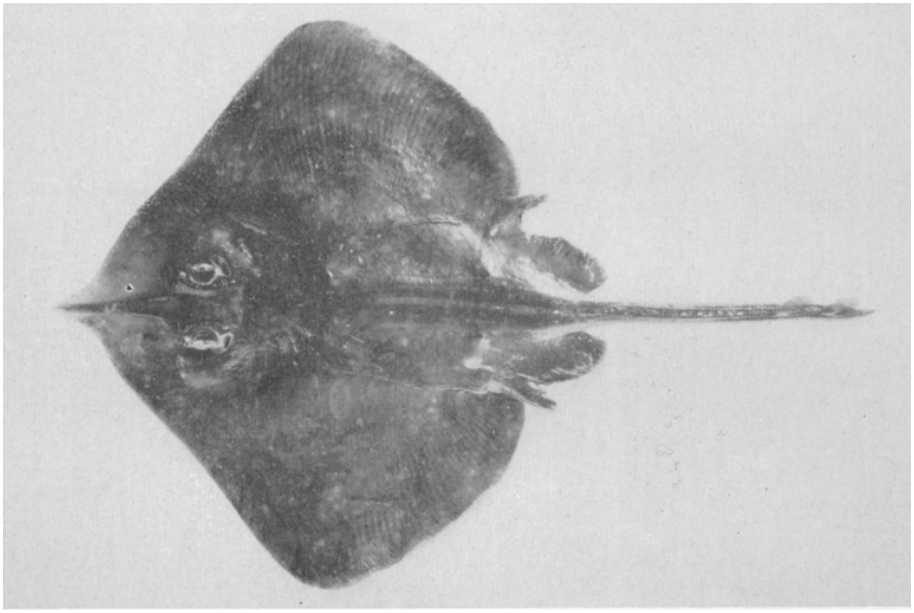


FIGURE 24

FIGURE 24

CALIFORNIA SKATE

Raja inornata Jordan & Gilbert

Range: Straits of Juan de Fuca to Turtle Bay, Baja California. Common off most of the California coast; has been caught in fairly deep water.

Description: Two dorsal fins set far back on the tail; tail fin extremely small; front margin of disk somewhat concave; lines drawn from tip of snout to the outer angles of the pectorals pass outside the edge of the body for all or most of their length (Figure 163); outer margin of pelvic fins deeply concave when held at right angles to the tail (Figure 164); prickles scattered on upper surface; spines along inner edges of eyes and in three to five rows on tail. **Color:** Dark olive brown above, usually with a small dark ring at the base of each pectoral; sometimes with two pale spots on pectorals or somewhat mottled; belly pale. **Length:** To 2½ feet.

Fishery: Taken for the most part by trawlers.

Importance: Perhaps the most important skate in the commercial catch.

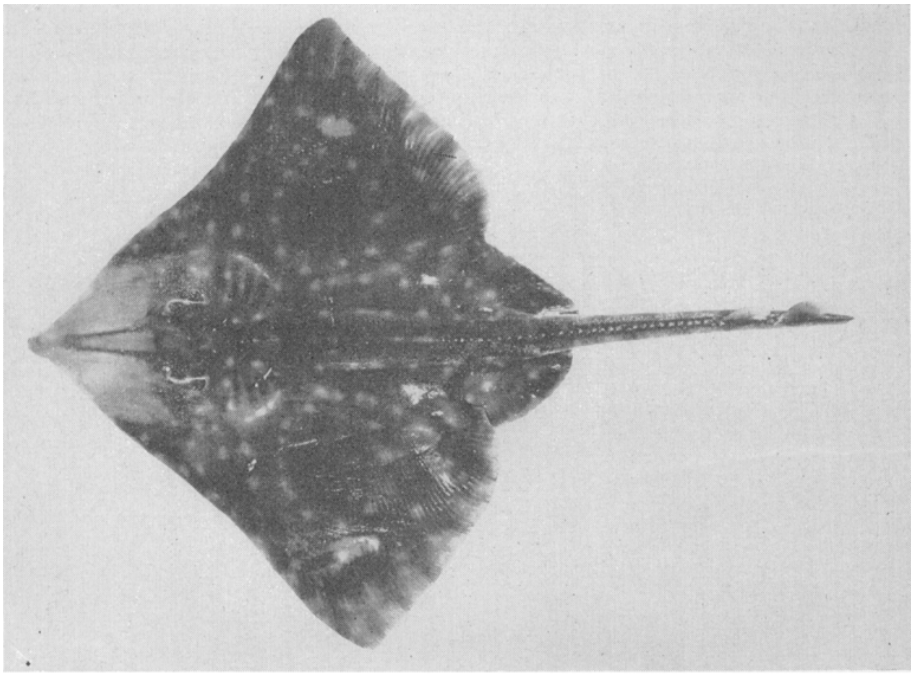


FIGURE 25

FIGURE 25

BIG SKATE

Raja binoculata Girard

Range: Northwestern Alaska to Southern California. Relatively abundant in Northern and Central California but not common south of Pt. Conception.

Description: Two dorsal fins far back on the tail; tail fin extremely small; front margin of disk concave, a line drawn from tip of snout to outer angle of pectoral passing outside the edge of the body; outer margin of pelvic fins shallowly concave, almost straight, when held at right angles to the tail (Figure 165); upper surface covered with small prickles; spines along tail. **Color:** Brown above, usually with a large dark spot surrounded by lighter spots at the base of each pectoral fin; light spots about the size of the eye scattered over the body; belly white. **Length:** To six or eight feet.

Fishery: Taken commonly by trawl boats along the Northern California coast, and occasionally by sportsmen, particularly in Monterey Bay.

Importance: While this is one of the three most important species, relatively few are utilized commercially.

LONGNOSE SKATE

Raja rhina Jordan & Gilbert

Found from Alaska to Southern California. Reaches four or five feet. Snout long, tapering; front margin of disk deeply concave, lines drawn from tip of snout to outer angles of pectorals passing well outside edge of body; outer margins of pelvic fins deeply concave when held at right angles to the tail. Not considered as desirable as the California and big skates.

3.2.4. THE STINGRAY FAMILY, DASYATIDAE

Three members of the stingray family are known from California waters. There are many kinds of stingrays in the world, including such extremes as the giant Australian stingaree, which reaches seven feet in width and double that length, and the fresh-water varieties found in some South American rivers. The spines or stings which characterize these rays are toxic and can cause dangerous wounds. Those from some large tropical species are occasionally deadly to man. **Care of wounds:** The wound should be cut open, bleeding encouraged and suction applied. Prolonged soaking of the injured limb in a strong solution of epsom salts (or ordinary table salt) in very hot water is perhaps the best home remedy. Consult a doctor to obtain further relief from pain and to obtain treatment needed to control the secondary infections which frequently occur. Reference, Halstead and Bunker, 1953.

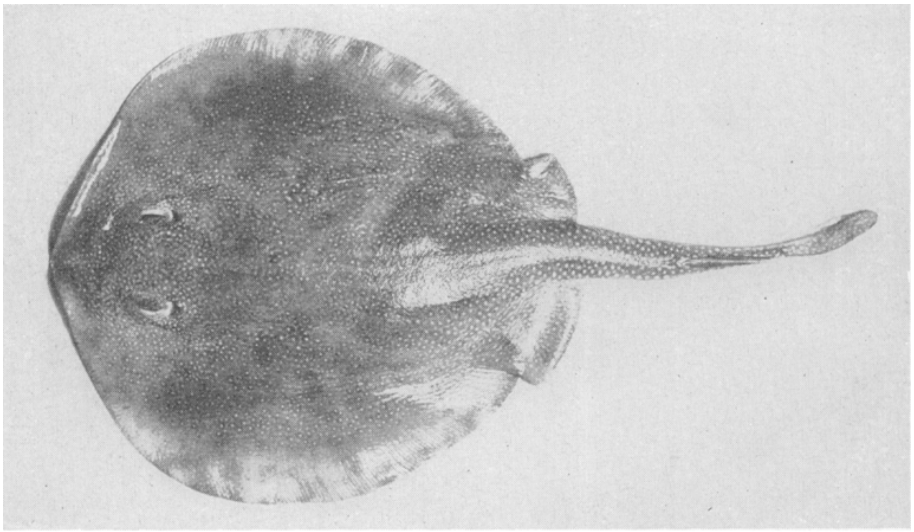


FIGURE 26

FIGURE 26

ROUND STINGRAY

Urobatis halleri (Cooper)

Range: Monterey Bay to Panama Bay; common in Southern California bays and sloughs and along beaches, but recorded only once north of Pt. Conception (Herald, 1953).

Description: No dorsal fin; tail fin present; tail with a long sting; disk nearly circular; tail shorter than disk; skin smooth. **Color:** Shades of brown above, sometimes mottled and spotted; yellowish below. **Length:** Reaches about 20 inches. **Development:** Ovoviviparous, bearing up to eight young.

Danger to Man: Like all their kind, these rays can inflict extremely painful wounds, this despite their small size. This is the commonest California species and consequently the most likely to be encountered by swimmers. Reference, Holloway, et al., 1953.

DIAMOND STINGRAY

Dasyatis dipterurus (Jordan & Gilbert)

Found from British Columbia south into Central America, perhaps to Peru. Common in bays and on beaches from San Diego south. Length to six feet or more. No dorsal or tail fins; disk somewhat diamond shaped; tail whiplike, longer than disk, armed with a strong sting. It can inflict painful and dangerous wounds.

CALIFORNIA BUTTERFLY RAY

Gymnura marmorata (Cooper)

Found from Pt. Conception south into Central America. No dorsal or tail fins; disk nearly twice as wide as long; tail very short; sting small or absent and consequently of little danger. Reported to reach a width of four or five feet; seldom reaches two feet in California.

3.2.5. THE EAGLE RAY FAMILY, MYLIOBATIDAE

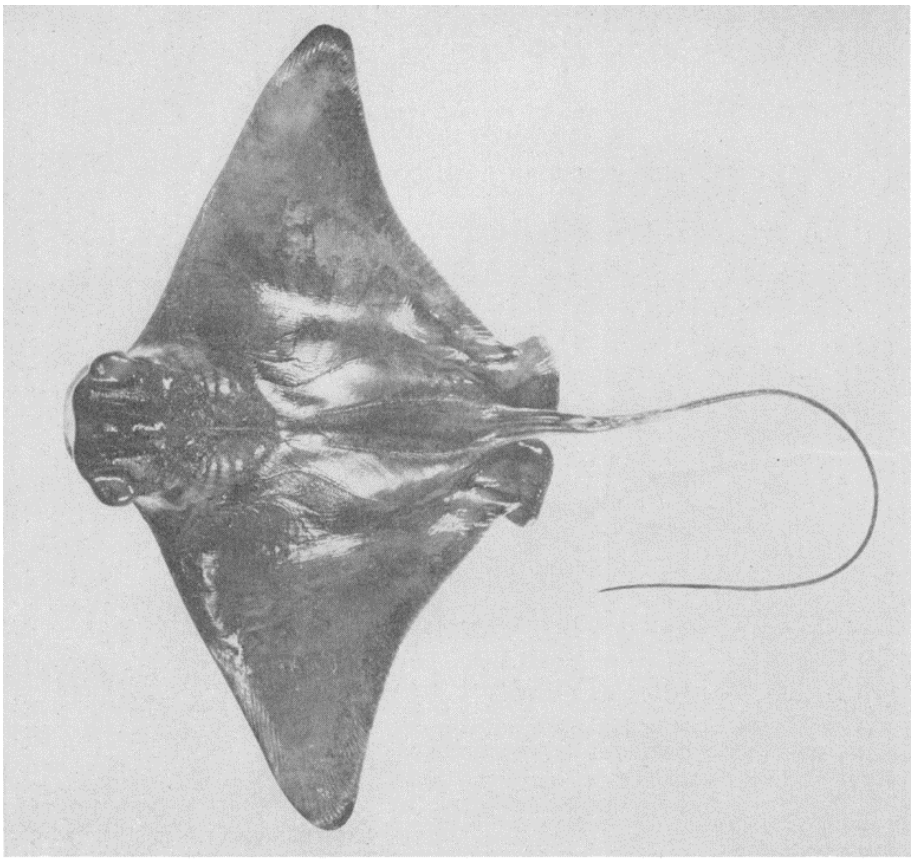


FIGURE 27

BAT RAY
Holorhinus californicus (Gill)

Relationship: The only California member of the family.

Range: Oregon to and into the Gulf of California. Common inshore and in bays and sloughs.

Description: One dorsal fin followed by one or more long stings; tail whiplike, as long as or longer than the width of the disk; head distinct, elevated above disk; eyes on side of head; teeth flat, pavementlike; skin smooth. **Color:** Dark brown to dark olive or almost black above; white below. **Size:** Width to about four feet; reported to reach a weight of over 150 pounds.

Depredations: The teeth of this ray are particularly suited to crushing oysters, clams, crabs and the like. It is very destructive to oysters and is a major reason for the fencing often seen around commercial beds.

Warning: The stings are venomous and wounds from them can cause extreme pain. Treatment is discussed on the opposite page. Reference, Halstead and Modglin, 1950.

3.3. THE CHIMAERAS

3.3.1. THE CHIMAERA FAMILY, CHIMAERIDAE

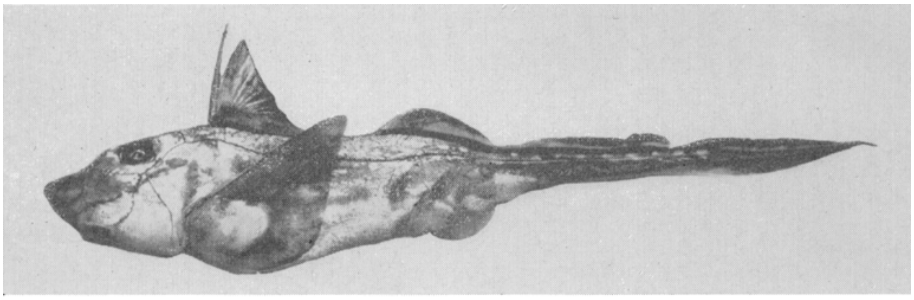


FIGURE 28

FIGURE 28

RATFISH

Hydrolagus colliei (Lay & Bennett)

Relationship: The only member of the family found off California. The chimaeras are placed in the same broad classification unit (class) as are the sharks and rays, but fall in a separate division (subclass) within it.

Range: Northwest Alaska to northern Baja California (Santo Tomas). Usually found in moderately shallow water to the north and in progressively deeper water to the south. Fairly common off California, particularly in the northern part of the State.

Description: Skeleton cartilagenous as in sharks and rays but gill openings single on each side, as in the bony fishes; gill cover of flesh or soft cartilage; two dorsal fins, the first preceded by a strong spine; tail tapering to a point; teeth united into bony plates; skin smooth; males with a clublike appendage between the eyes and with claspers by the pelvic fins. **Color:** Silvery with iridescent reflections of gold, blue and green; back with pale spots. **Length:** To about three feet. **Development:** Lays eggs encased in ridged capsules about five inches long.

Warning: The spine on this animal is venomous and can inflict a very painful wound. The reproductive organs are toxic and should not be eaten. Reference, Halstead and Bunker, 1952.

Use: Oil from the liver makes a good antioxidant lubricant for exposed machinery. The fish is not utilized commercially.

3.4. THE BONY FISHES

3.4.1. THE HERRING-LIKE FISHES

The bonefish, round herring, herring and anchovy families are included among the clupeoids, or herring-like fishes. For an annotated list of the Pacific Coast species see McHugh and Fitch (1951).

3.4.1.1. THE BONEFISH FAMILY, ALBULIDAE

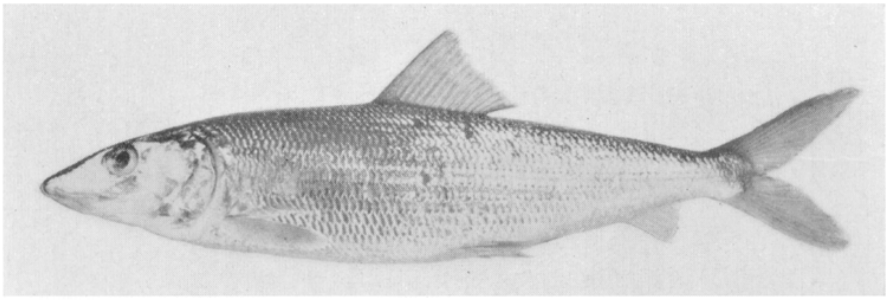


FIGURE 29
Photograph courtesy of Scripps Institution of Oceanography

FIGURE 29

BONEFISH
Albula vulpes (Linnaeus)

Relationship: The only California representative of the family.

Range: Worldwide in warm seas; from Central California to Panama on our coast. Rare north of Los Angeles Harbor; recorded once from north of Pt. Conception (San Francisco Bay).

Description: One dorsal fin at middle of back; lateral line present; pelvic fins abdominal; snout projecting beyond tip of lower jaw; coarse roundish teeth on roof and floor of mouth and on tongue. **Size:** Reported to reach three feet and 15 pounds; those seen on the Pacific coast seldom weigh two pounds. **Color:** Blue to brownish above becoming white below; sides with narrow horizontal streaks following the scale rows and with eight to twelve underlying dusky vertical bars, these most apparent on freshly caught fish; bases of fins yellowish.

Importance: of no significance in California because of its relative scarcity. Considered a fine game fish on the Atlantic coast.

Remarks: Bonefish feed in shallow water, grubbing in the mud for mollusks and crustaceans. The small fish tend to school while large ones tend to be solitary. These fish develop in an unusual manner. The transparent larvae are elongate ribbon-like creatures, which shrink as they metamorphose into small fishes resembling the adults.

3.4.1.2. THE ROUND HERRING FAMILY, DUSSUMIERIIDAE

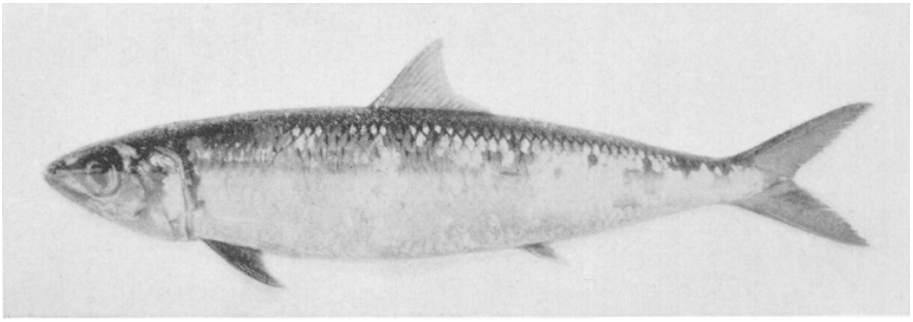


FIGURE 30

FIGURE 30

PACIFIC ROUND HERRING

Etrumeus acuminatus Gilbert

Relationship: The only California representative of this family of herring-like fishes.

Range: Monterey Bay to Panama; recorded but once from north of the Los Angeles area (Phillips, 1951b).

Description: One dorsal fin at middle of back; pelvic fins attached entirely behind dorsal; no lateral line on body (well developed and branched lateral line on head); mouth terminal; body almost round in cross-section; anal fin base very short; no ventral scutes (saw teeth along belly). **Length:** To a foot or more. **Color:** Dark blue with brown spots on the scales above becoming silvery below.

Remarks: Not sufficiently abundant in California to have any economic importance. often confused with the sardine by fishermen, it can be distinguished readily by the position of the pelvic fins.

Unauthorized Name: Japanese sardine.

3.4.1.3. THE HERRING FAMILY, CLUPEIDAE

Members of this family are found throughout the world. The group is of prime economic importance, supporting many of the world's great fisheries. Four species occur in California. **Family characters:** Abdominal pelvic fins, a single short dorsal fin near the middle of the back, no lateral line, no scales on head, mouth terminal, not unusually large.

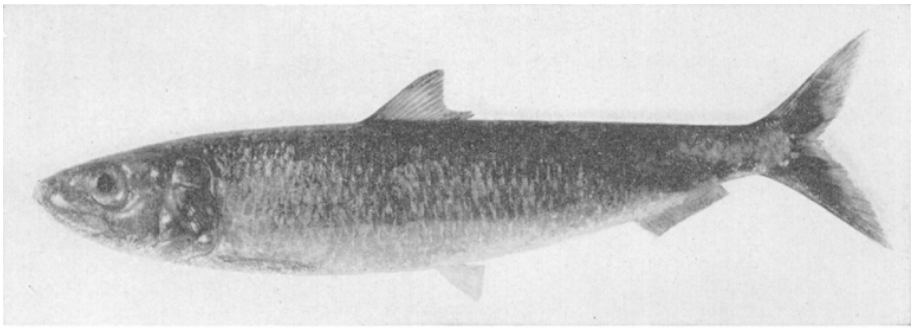


FIGURE 31

FIGURE 31

PACIFIC SARDINE

Sardinops caerulea (Girard)

Relationship: A true sardine. Several close relatives are native to other parts of the world (Japan, Peru and Chile, Australia and New Zealand, and South Africa).

Range: Southeastern Alaska to and into the Gulf of California as far as Guymas (Walker, 1953).

Description: See above. Gill cover with low raised ridges running obliquely downward; breast and belly not drawn to a sharp, saw-toothed edge, although the scales have spines which can be felt when the finger is moved toward the head. **Length:** Record 16¼ inches to fork of tail; usually does not exceed 13 inches. **Color:** Dark green to blue above with many small dark spots, shading into bright silvery on the sides and below. Opalescent reflections above, the silvery part iridescent; a series of round black spots of varying degrees of distinctness often extends backward under the scales.

Importance: For many years the State's leading commercial species in terms of poundage. In 1951, third in value with most of the catch delivered at Los Angeles. At one time, Monterey and San Francisco were of equal or greater importance, but the fishery has declined seriously in recent years, particularly in Central California. In the 1952–53 season, the fishery was a failure throughout the State. Used primarily for canning and for production of fish meal and oil. Up to five percent of the catch is used for dead or live bait (this mostly young fish), particularly by the tuna, mackerel and sport fisheries.

Fishing Season: Subject to state regulations, throughout the year. Most of the catch is landed during the fall and winter when there are no restrictions on canning and when reduction of specified amounts of whole fish is allowed.

Fishing Gear: Roundhaul nets, chiefly purse seines. Small quantities are taken in gill nets.

Remarks: Occurs in schools, sometimes mixed with Pacific and jack mackerel and anchovies. The spawning grounds center off Southern California and central Baja California; the spawning season is in the spring and early summer months. Sardines, other than those taken for bait, normally enter the fishery when two or three years old and eight or nine inches long. They migrate along the coast, the larger, older fish going the farthest north. There is evidence that fish from southern Baja California and the Gulf form a separate population which probably does not mingle with the stock supporting our fishery. Literature on the sardine is voluminous; for recent reports on the fishery and on the cooperative research program see Clark, 1952, and Mar. Res. Comm., 1952.

Unauthorized Name: Pilchard.

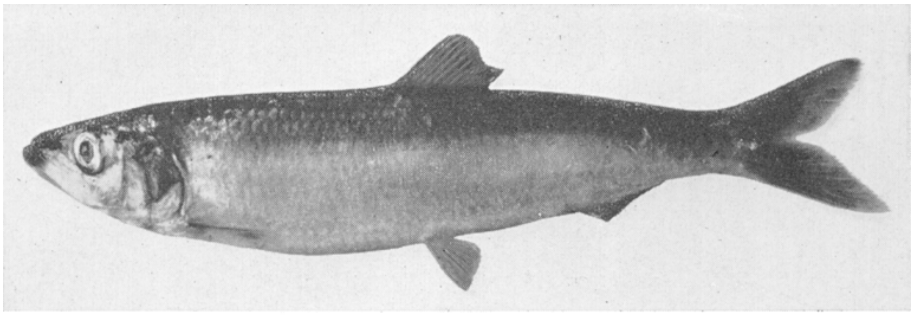


FIGURE 32

FIGURE 32

PACIFIC HERRING

Clupea pallasi Valenciennes

Range: Northern Eurasia; Bering Sea to Japan; at least to San Diego Bay on our coast. A schooling fish.

Description: See page 33, top. No ridges on gill cover (separating it from the sardine); breast and belly with low, sharp points but not drawn to a saw-tooth edge as in the shad. **Length** to about 18 inches. **Color:** Pinkish purple above, becoming silvery on the sides and below; sides without black spots.

Importance: Eleventh in poundage in 1951, with heaviest landings in the San Francisco region, followed by the Eureka. Part of the catch has been canned in recent years and the California fishery has, as a result, enjoyed a modest expansion. This species is of great commercial importance in Asia and in Alaska and British Columbia.

Fishing Season: December into the late summer with the great bulk of the catch landed from January through March. Taken chiefly in Humboldt, Bodega, Tomales, San Francisco, and Monterey bays.

Fishing Gear: Beach seines, gill nets, roundhaul nets. In San Francisco Bay, taken during the spawning run by sportsmen who use improvised dipnets.

Remarks: These fish enter our bays in the winter and spring to spawn, depositing their eggs in clusters on seaweed and rocks in shallow water. It is at this time that the fishery flourishes. For a description of the Tomales Bay fishery see Scofield, 1952.

PACIFIC THREAD HERRING

Opisthonema libertate (Günther)

Range: Common off southern Baja California and ranging south to the Galapagos Islands and Peru; occasionally taken off Southern California. **Distinguished** from other California clupeoids by the extremely elongate last dorsal ray. **Remarks:** Used to some extent as bait by tuna boats in Mexican and Central American waters; the California specimens may have been brought north in bait tanks.

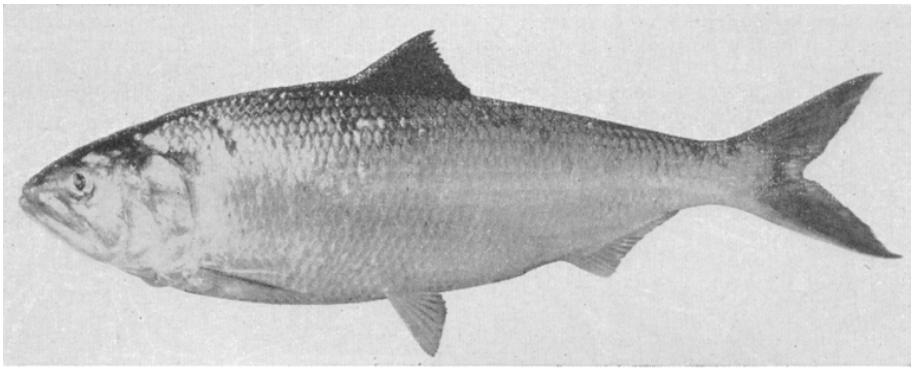


FIGURE 33

FIGURE 33

AMERICAN SHAD

Alosa sapidissima (Wilson)

Range: Alaska to San Diego, not common south of Monterey Bay. In the Atlantic Ocean, from Newfoundland to Florida. An anadromous fish, ascending rivers to spawn.

Description: See page 33, top. Body deep, drawn to a sharp saw-toothed edge on breast and belly; head length much less than body depth. **Length** to about 30 inches. **Color:** Deep bluish above, becoming silvery on the sides and below; a number of dark spots run along the back under the scales.

Importance: A minor commercial species in California. Heaviest landings are made at Pittsburg. Most of the catch is sold fresh, although part is canned or, occasionally, smoked. The roe is sold fresh or canned. A minor game fish in the rivers.

Fishing Season: At present (1953) the commercial season extends from March 15 to May 31; but only in a district comprising part of the Sacramento-San Joaquin river delta. There is no closed sport season but bag limits are in effect part of the year. Consult fish and game regulations.

Fishing Gear: Gill and trammel nets are the only legal commercial gear at this time (1953). Most sportsmen on the rivers use a modified dipnet although some sportsmen take them by angling with bait, streamer flies, or other small artificial lures.

Introduction: This fish is native to the Atlantic coast. In 1871, 10,000 fry from Rochester, New York, were liberated in the Sacramento River; in 1873, an additional 35,000 were planted; and between 1876 and 1880 some 574,000 more. Conditions were so favorable that in 1879 shad were being captured in marketable quantities and are reported to have spread to the Columbia River in 1880.

Remarks: Shad ascend rivers to spawn in the spring and summer, the peak of the run usually occurring in May, and return to the ocean in the early summer. The young move seaward in the fall.

3.4.1.4. THE ANCHOVY FAMILY, ENGRAULIDAE

Four anchovies are known from California, one of which is of commercial importance. **Family characters:** Like the Clupeidae, abdominal pelvic fins, a single short dorsal fin near the middle of the back, no lateral line, no scales on the head. Distinguished by the extremely large mouth with the snout projecting beyond the tip of the lower jaw and the very long maxillary reaching almost to the edge of the gill cover. For a review of American anchovies see Hildebrand, 1943.

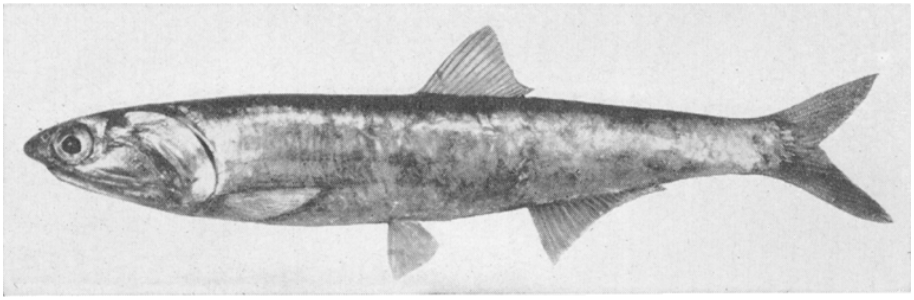


FIGURE 34

FIGURE 34

NORTHERN ANCHOVY

Engraulis mordax Girard

Relationship: There are two recognized subspecies of this fish. One, Engraulis mordax mordax, is found along the entire coast. The other, Engraulis mordax nanus, is a smaller, brackish-water form found in San Francisco Bay.

Range: British Columbia to Cape San Lucas, Baja California. A schooling fish.

Description: See above. Head length greater than body depth (separating it from the deepbody and slough anchovies); gill covers not united under head. **Length** to about nine inches. **Color:** Metallic bluish or greenish above becoming silvery on the sides and belly.

Importance: By far the most valuable of our anchovies, it comprises practically the entire "anchovy" catch which ranked tenth in poundage and seventeenth in value among the State's fisheries in 1951. Used largely as bait, both live and dead. The live bait catch in 1950 (not included in the landing figures) was over 3,800 tons compared with about 2,400 tons delivered ashore. The market catch is sold fresh for the most part, though small amounts are salted. The fish was not canned to any extent until 1948. Since then moderate amounts have been canned especially at Monterey.

Fishing Season: Throughout the year, the bait fishery reaching a peak in the summer and the market fishery in the fall.

Fishing Gear: Roundhaul nets.

Remarks: Anchovies spawn throughout the year. The eggs are elliptical and float near the water's surface. About half the adults appear to be mature at two or three years and all at four years. Fish seven years old have been taken. There is evidence of three populations between Canada and southern Baja California which do not intermingle completely. For further details as to the biology and the fishery see McHugh (1951) and Clark and Phillips (1952).

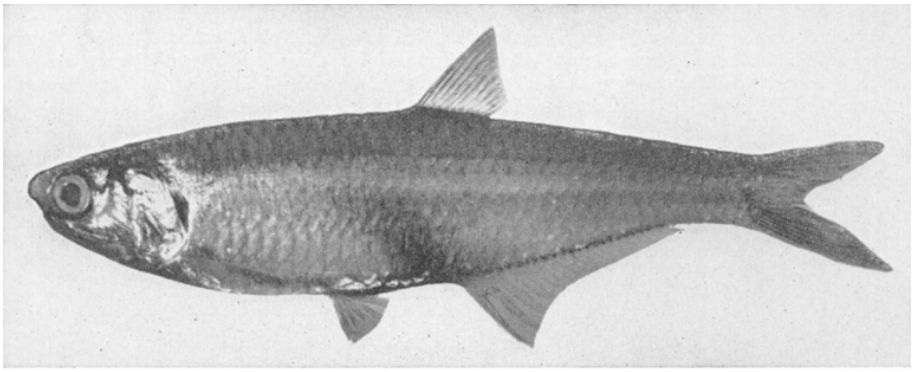


FIGURE 35

FIGURE 35

DEEPBODY ANCHOVY

Anchoa compressa (Girard)

Range: Central California (Morro Bay) to Todos Santos Bay, northern Baja California. A schooling fish.

Description: See opposite page, top. Body deep, thin, its depth about equaling length of head; length of base of anal fin much greater than length of head (in the slough anchovy, length of anal base about equals head length); gill covers not united under head. **Length** to about 6 inches. **Color:** Pale translucent straw color, a bright horizontal silvery band extending the length of the body and shading downward on the lower part of the side.

Importance: Small amounts are used as live bait. Rarely appears in the market catch.

Fishing Season: As a rule it is taken accidentally with other species, not in sufficient quantity to show a seasonal trend.

Fishing Gear: Roundhaul nets.

SLOUGH ANCHOVY

Anchoa delicatissima (Girard)

Range: Common in relatively quiet inshore waters from Los Angeles County to Magdalena Bay, southern Baja California. **Distinguished** by head length about equal to body depth, base of anal fin scarcely longer than head, gill covers not united under head. **Used** to some extent as live bait.

ANCHOVETA

Cetengraulis mysticetus (Günther)

Range: From Los Angeles County south to Peru. **Distinguished** by the membrane which unites the gill covers under the head. This membrane is very thin and delicate and is easily torn. It is broad in adults but is narrow in juveniles. **Importance:** An extremely desirable tuna bait; large quantities are taken in Mexican and Central American waters. Not abundant enough to support a bait fishery off Southern and Baja California. Attempts have been made to establish this species in the Salton Sea as a forage fish.

3.4.1.5. THE SMELT FAMILY, OSMERIDAE

These are the true smelts. Six species are recorded from California. All are similar in general appearance and are difficult to distinguish from each other. **Family Characters:** Pelvic fins abdominal; dorsal fin composed of soft rays followed by an adipose fin; no scaly appendage above base of pelvic fin; no scales on head; lateral line present. References, Hubbs, 1925; Hart and McHugh, 1944.

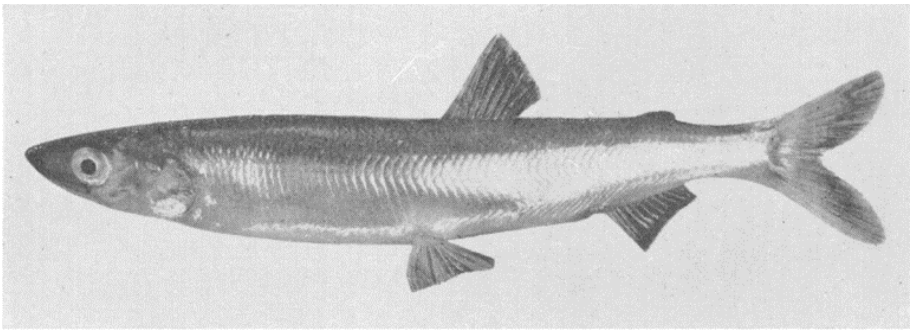


FIGURE 36

WHITEBAIT SMELT

Allosmerus elongatus (Ayres)

Range: The Straits of Juan de Fuca to San Pedro (a single record from south of San Francisco; Clark, 1940).

Description: See above. A few canine-like teeth on the vomer; 15 to 17 anal rays; more than 30 relatively long gill rakers on first arch; mouth rather large; maxillary reaching at least to back edge of pupil. **Length** to about nine inches. **Color:** Pale greenish, almost colorless, a silvery stripe along the side.

NIGHT SMELT

Spirinchus starksi (Fisk)

Range: Vicinity of Pt. Arguello (Fitch, 1949b) north into Washington. **Distinguished** by a number of small, evenly uniserial teeth, not canine-like, on vomer; pectoral fins shorter than head; mouth rather large; maxillary reaching at least to back edge of pupil. Size and color as for whitebait smelt. Spawns in the surf.

THE WHITEBAIT FISHERY

Constituents: The night and whitebait smelts are the major constituents of the whitebait catch, though small amounts of other smelts and of the young of other species are included in this category.

Importance: of minor commercial significance. Landed chiefly in the Eureka region and sold entirely in the fresh fish markets. Used to some extent as bait by commercial and sport fishermen.

Fishing Season: Throughout the year with maximum landings in the spring and summer.

Fishing Gear: Taken in the surf both commercially and by sportsmen with dip nets or small hand seines.

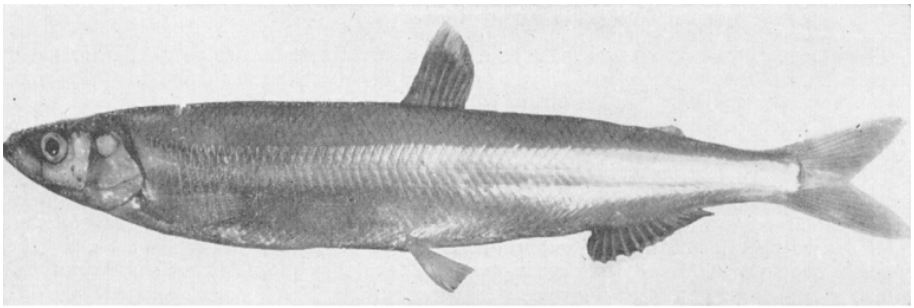


FIGURE 37

FIGURE 37

SURF SMELT

Hypomesus pretiosus (Girard)

Range: Southern Alaska to Central California, spawning in the surf.

Description: See top of opposite page. Teeth minute, not canine-like, on vomer; maxillary does not reach beyond middle of pupil; 66–76 scales along lateral line; pectoral fins do not extend half way to pelvic insertion. **Length** to about 10 inches. **Color:** Pale greenish, becoming silvery on the sides and below.

Importance: A minor commercial species, comprising a small fraction of the State's "smelt" catch and landed chiefly at San Francisco. (Most of the "smelt" catch consists of silversides, family Atherinidae, pages 76 to 78.) The young of this species are taken to some extent and form a portion of the "whitebait" catch. Used as bait by commercial and sport fishermen.

Fishing Season: Caught throughout the year, with larger landings during the summer.

Fishing Gear: Small roundhaul nets, gill nets. Caught in the surf with dip nets or small seines.

EULACHON

Thaleichthys pacificus (Richardson)

Range: Bering Sea to Northern California. **Description:** A few canine-like teeth on vomer; anal rays 17–22; gill rakers on first arch four to six on upper arch, 13 to 16 on lower. **Length** to about a foot. **Importance:** The object of a minor sport fishery in the Klamath River each spring. These fish ascend the river to spawn and are caught at night with special dip nets. of commercial importance in the Pacific northwest. Very rich and oily, they were once actually used as candles—hence the name "candlefish" which is prevalent in the Klamath area.

3.4.1.6. THE TROUT FAMILY, SALMONIDAE

These extremely important commercial and game fishes are distinguished by abdominal pelvic fins, a dorsal fin composed of soft rays followed by an adipose fin and a scaly appendage above the base of each pelvic fin.

PACIFIC SALMONS

Members of Genus Oncorhynchus

There are at least six species of Pacific salmon, five of them native to the northeast Pacific Ocean. Two of them, the **king** and **silver salmons,** are common in California. Two others, the **sockeye** and the **chum salmons** (O. nerka, O. keta), are rare visitors. The fifth, the **pink salmon** (O. gorbuscha), spawns irregularly in some Mendocino County streams but is of very minor importance both as a commercial and as a game fish in this State. It has been taken in the Sacramento River.

All the salmons are anadromous—that is, they spend part of their life in the ocean and then enter fresh water to spawn. During the time that these fish are in streams on their spawning migration, they undergo great changes in appearance and color. The changes are so pronounced that some people believe that the mature fish are not the same species as are found in the ocean. After spawning, Pacific salmon invariably die, differing in this respect from the trouts described on page 43. Literature on the salmons is voluminous. See Fry and Hughes (1951) for an account of the California troll fishery, and Hallock, et al. (1952) for a report on California's marking program.

KING SALMON

Oncorhynchus tshawytscha (Walbaum)

Range: At sea, from Southern California to Alaska and south on the Asiatic side to the Amur River on the mainland and Japan; rare in Southern California. Enters streams to spawn; it is the only species of salmon normally found in the Sacramento-San Joaquin system. Rarely enters streams south of San Francisco Bay.

Description: Less than 30 gill rakers on first arch; about 135–155 oblique rows of scales crossing lateral line; pyloric caeca 140–185 (extreme recorded range 93–214); anal rays 15 to 19 (last ray double but counted as one); mouth cavity and gums dark. The sockeye salmon has more gill rakers, the pink salmon more oblique rows of scales, the silver salmon white gums and fewer pyloric caeca, while the chum salmon usually and the trouts always have fewer anal rays. These fish change greatly in appearance after they enter fresh water and become sexually mature. Figure 38 shows an ocean fish, a mature male, and a mature female. Reaches a maximum **weight** of over 100 pounds, but specimens over 50 pounds are uncommon and Sacramento River fish average about 20 pounds. Mature fish, nearly always males, weighing as little as three or four pounds are common and are not unknown under a pound. **Color:** At sea: bluish to dark gray above becoming silvery on the sides and belly; black spots on the back and both lobes of the tail. Mature fish in streams: blackish with dark coloration on the sides of the head; the males, especially the larger fish, with dull red blotches often covering much of the sides. Small males tend to be a dirty yellow rather than red.

Importance: California's ninth fishery in poundage and sixth in value in 1951. (Catch figures include the silver salmon, which forms the smaller proportion of the catch.) Once the leading fishery of the State and still one of the most important in Central and Northern California. The bulk of the catch is sold fresh, the balance being smoked, salted, cured or canned. One of our most desirable game fishes.

Fishing Season: Consult fish and game laws for both commercial and sport regulations. Varies by districts.

Fishing Gear: Trolling in the ocean; gill and trammel nets in part of the Sacramento-San Joaquin River system. Consult fish and game regulations. Sportsmen troll or use hook and line with various lures and baits.

Alternative Name: Chinook salmon.

Unauthorized Names: Quinnat salmon, tyee salmon, spring salmon, black salmon, chub salmon, hookbill, Sacramento River salmon, Columbia River salmon.

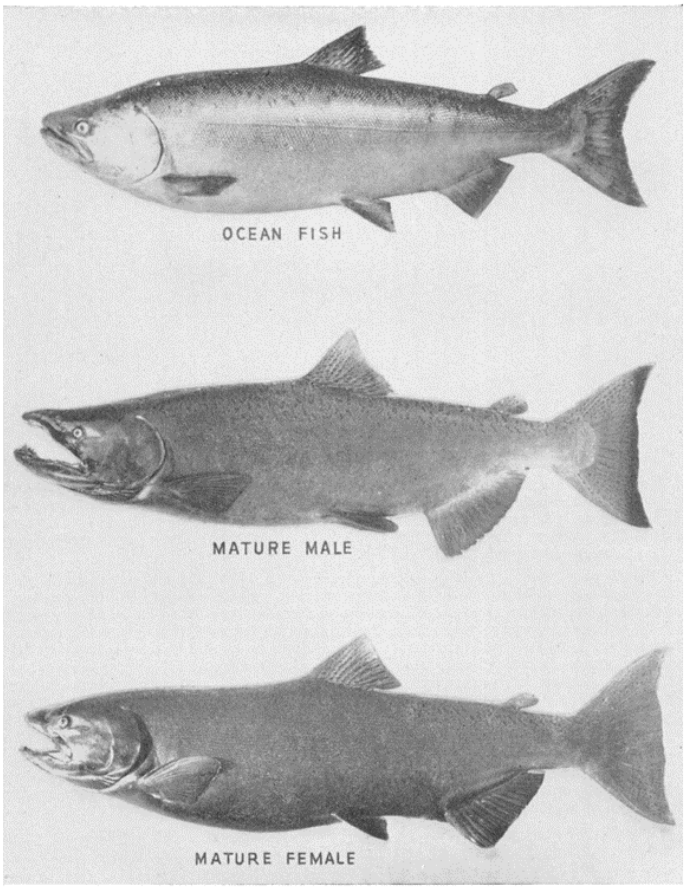


FIGURE 38. King salmon, Oncorhynchus tshawytscha

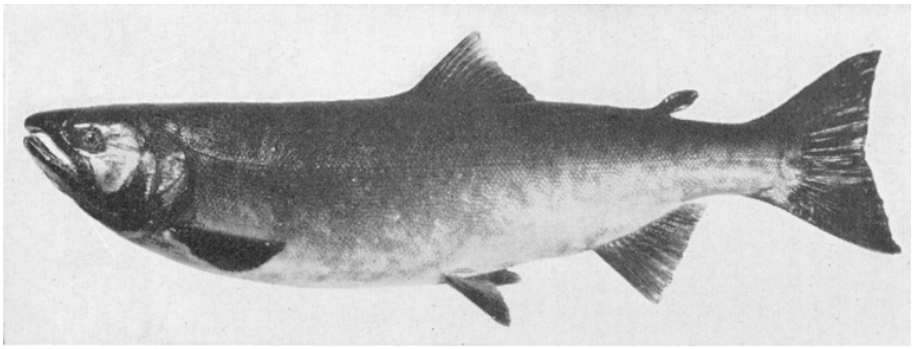


FIGURE 39

FIGURE 39

SILVER SALMON

Oncorhynchus kisutch (Walbaum)

Range: At sea, from at least the Coronado Islands, Mexico, north to Alaska and south on the Asiatic side to Japan. Rare south of Monterey. Spawns in rivers and streams from Monterey Bay north but very rarely enters the Sacramento-San Joaquin system. (A salmon caught near Cape Colnett, Baja California, may have been a silver; Byers, 1942.)

Description: See page 40, top. First arch with 19–25 gill rakers (separating it from the sockeye salmon which has 30 or more); pyloric caeca 45–83 (separating it from the king, pink, and chum salmons which have at least 93); 13 or 14 (rarely 12, 15–17) anal rays (separating it from the trouts with normally 12 or fewer); crown of gums through which teeth protrude white, border of gums and balance of mouth cavity darker (gums dark in king salmon, mouth white in trouts). Like the king salmon, these fish change in appearance when they enter fresh water and become mature. **Weight** to 30 pounds but rarely over 15. **Color:** At sea, metallic blue or blue green above becoming silvery on the sides and belly; small dark spots on the back, dorsal fin and upper lobe of the caudal fin. Mature males become mostly brick red and mature females a dull bronze.

Importance: Forms the smaller, but nevertheless sometimes important, part of the commercial salmon catch. South of Pt. Arena it is of little commercial importance, but at Crescent City it rivals the king salmon. A very desirable sport fish.

Fishing Season: Consult fish and game regulations. Varies by district.

Fishing Gear: Troll lines. Sportsmen troll or use hook and line.

Unauthorized Names: Coho salmon, dog salmon, hookbill, silversides, jack salmon.

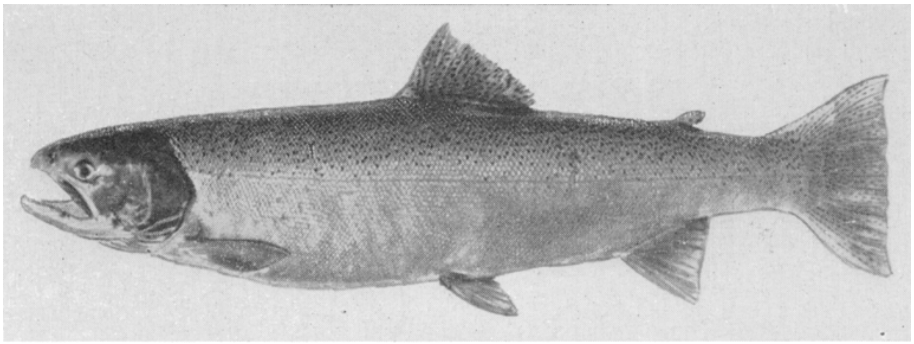


FIGURE 40

FIGURE 40

STEELHEAD RAINBOW TROUT

Salmo gairdneri Richardson

Relationship: One of a closely related group of trouts, the natural relationships of which have been greatly obscured in the course of fish cultural operations. Some individuals run to sea (the steelheads) while others appear to form resident stream populations.

Range: Alaska south into northern Baja California. Enters practically all suitable California coastal streams to spawn (the steelhead, unlike the Pacific salmons, does not necessarily die after spawning).

Description: See page 40, top. Tongue with patch of teeth at tip but none on back; anal fin relatively short with 9 to 12, rarely 13, rays (last ray often double but counted as one); lining of mouth white. The salmons have 13 (rarely 12) or more anal rays and, as adults, at least some dark patches in the mouth. Reaches a maximum **weight** of about 30 pounds, though specimens of 20 pounds are rare and the average fish runs well under 10 pounds. **Color:** At sea, steel blue above with bright silvery sides, usually with definite black spots on the head, body and unpaired fins. Gradually assumes the coloration of a stream rainbow trout after entering fresh water.

Importance: A highly esteemed game fish, but not caught to any extent in the ocean. Steelhead caught commercially in other states may be sold in California subject to the rules of the Fish and Game Commission.

Fishing Season: Illegal to take commercially. Consult fish and game regulations for the sport season, which varies in different parts of the State.

Fishing Gear: Hook and line with various baits and lures.

Unauthorized Names: Salmon trout, half pounder, summer salmon, hardhead.

CUTTHROAT TROUT

Salmo clarki Richardson

This species also has a sea run form which is not as widely distributed in California as is the steelhead rainbow. It is found in many of our inland waters but occurs in the ocean only off the northern part of the State, entering the streams of Del Norte and Humboldt Counties. The cutthroat usually, but not always, has a red dash under each side of the lower jaw and has teeth on the back of the tongue as well as at its tip.

3.4.1.7. THE SAURY FAMILY, SCOMBERESOCIDAE

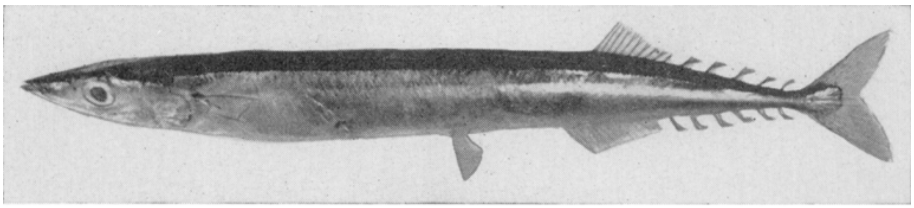


FIGURE 41

FIGURE 41

PACIFIC SAURY

Cololabis saira (Brevoort)

Relationship: The only member of the family in the North Pacific, except for dwarf forms in more tropical waters.

Range: A schooling fish of the open ocean found from Baja California to Alaska and south off Asia to Japan. Occurs, rarely, in Peru.

Description: Dorsal and anal fins set far back on body, each followed by a series of finlets; pelvic fins small, well back of the pectorals, almost midway between snout and tip of tail. **Length** generally under 10 inches; reported to reach 14 inches. **Color:** Deep blue to dark green above; sides silvery, the scales tipped with blue or green; belly silvery; base of pectoral bright blue; fins colorless except that the rays are dark on the dorsal and caudal.

Importance: None in California, though a small amount was canned experimentally at Monterey in 1947. A commercial species in Japan.

Fishing Gear: Occasionally taken in roundhaul nets.

Remarks: Abundant off the California and Baja California coasts but not commonly found in inshore waters. It is apparently an important fodder fish, and is known to form a large part of the diet of marlin and albacore (Hubbs and Wisner, 1953; McHugh, 1952). In 1951, eggs were taken commonly from February through July and a few were found during the off season. The newly hatched larvae are relatively large and are active swimmers. (Mar. Res. Comm., 1952.)

Unauthorized Names: Skipper, sourbelly.

3.4.1.8. THE HALFBEAK FAMILY, HEMIRAMPHIDAE

Three species are recorded from California, though the family is essentially one of more tropical waters. Halfbeaks can be recognized by the prolonged lower jaw.

3.4.1.9. THE NEEDLEFISH FAMILY, BELONIDAE

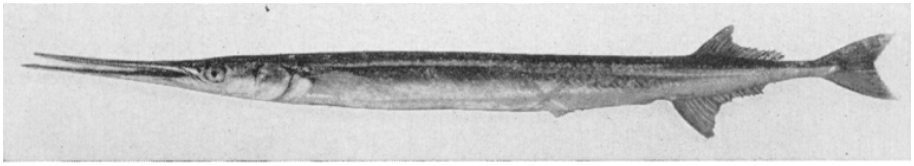


FIGURE 42

FIGURE 42

CALIFORNIA NEEDLEFISH

Strongylura exilis (Girard)

Relationship: The only member of the family found in California.

Range: San Francisco south at least to Magdalena Bay, Baja California. There are only two definite records from north of Pt. Conception, though fishermen say it appears occasionally off Monterey.

Description: Dorsal and anal fins set far back on body; jaws long, narrow, greatly prolonged; body slender, almost round; pelvic fins far behind pectorals. **Length** to about three feet. **Color:** Green above becoming silvery below; a bluish band along side of body.

Importance: Neither a commercial nor a game fish, it is caught accidentally throughout the year in roundhaul nets and on hook and line. It has a fine flavor.

3.4.1.10. THE FLYINGFISH FAMILY, EXOCOETIDAE

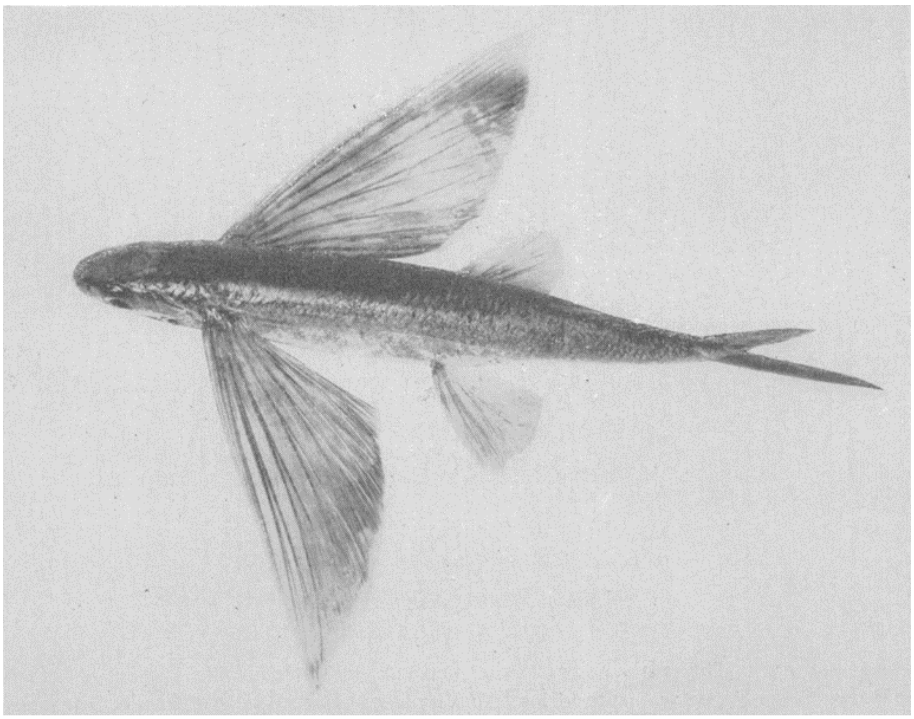


FIGURE 43

CALIFORNIA FLYINGFISH
Cypselurus californicus (Cooper)

Relationship: The common California representative of the family; two other species are recorded from the State.

Range: Pt. Conception south at least to Cedros Island and perhaps to Cape San Lucas, Baja California.

Description: Single dorsal fin; greatly enlarged wing-like pectoral fins. **Length** to about 18 inches. **Color:** Deep blue on back and sides becoming abruptly silvery on belly.

Importance: Very small quantities are delivered to the Los Angeles fresh fish markets. Used to some extent as bait for swordfish, marlin and tuna.

Fishing Season; Taken mostly in the late spring and summer.

Fishing Gear: Gill nets, roundhaul nets, scoops under lights.

Remarks: The early life history, behavior and classification of the California flyingfish are discussed by Hubbs and Kampa (1946) and Miller (1952). The eggs are heavier than water and become attached to floating objects by the numerous long filaments covering them.

3.4.1.11. THE LIZARDFISH FAMILY, SYNODIDAE

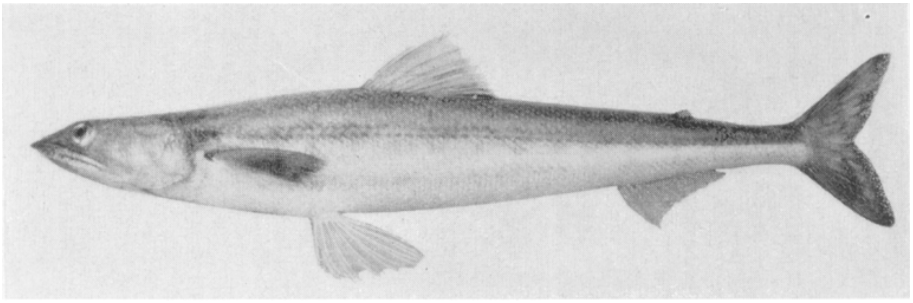


FIGURE 44

FIGURE 44

CALIFORNIA LIZARDFISH

Synodus lucioceps (Ayres)

Relationship: The only member of the family found in California.

Range: Central California to and into the Gulf of California. Unusual north of Pt. Conception, though it was taken as far north as San Francisco in years past and now appears occasionally at Monterey.

Description: Pelvic fins abdominal; adipose fin present; head and body with scales; head broad; snout almost triangular; numerous sharp teeth in jaws. **Length:** The record fish was 23 inches long. **Color:** Brownish above, grayish below; the sides with a gold tinge; bottom of head and pelvic fins yellow.

Importance: Caught occasionally by both sport and commercial fishermen.

Unauthorized Name: Candlefish.

3.4.1.12. THE LANCETFISH FAMILY, ALEPISAURIDAE

PACIFIC LANCETFISH

Alepisaurus borealis Gill

Relationship: The only member of the family found in California.

Range: Northwest Alaska nearly to the equator (vicinity of the Galapagos Islands).

Description: Pelvic fins abdominal; dorsal fin high, extends almost the whole length of back, followed by adipose fin; body and head scaleless; roof of mouth with several large, fanglike teeth. **Length** to about five feet. **Color:** Gray or brownish green above becoming silvery on the sides.

Remarks: Caught not infrequently by both sport and commercial fishermen; a number of specimens have been found struggling feebly in the surf. Stomach contents of several individuals examined have been remarkable both for the quantity and variety of organisms found.

3.4.1.13. THE HAKE FAMILY, MERLUCCIIDAE

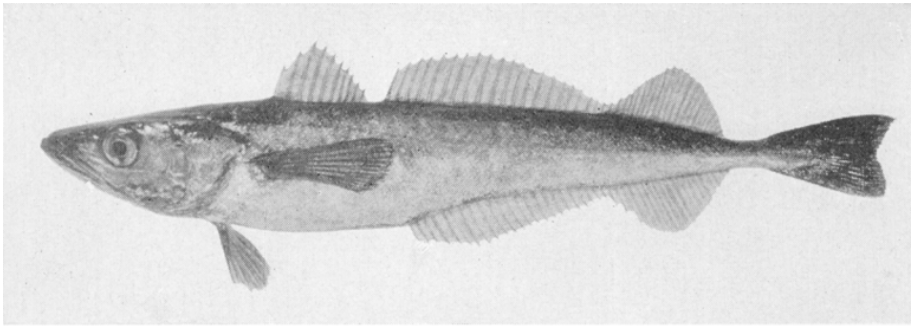


FIGURE 45

FIGURE 45

PACIFIC HAKE

Merluccius productus (Ayres)

Relationship: The only member of the family found on the California coast.

Range: Alaska south to and into the Gulf of California.

Description: Two separate dorsal fins, the first short and composed of spines; second dorsal and anal fins long and deeply notched toward the tail; head and mouth large, lower jaw protruding; teeth strong, sharp; no barbel on lower jaw; scales loosely attached. **Length:** To about three feet. **Color:** Metallic blackish or silvery gray above shading to silvery below; lining of mouth and opercles black.

Importance: of negligible commercial importance. Landed almost entirely in Northern and Central California and sold fresh. Not liked by sportsmen.

Fishing Season: Not taken in sufficient quantity to show a seasonal trend.

Fishing Gear: Trawls, hook and line.

Remarks: Hake appear to be abundant off most of the Pacific coast and represent a latent resource of considerable magnitude. Their soft flesh and poor keeping qualities are reported to combine against their use as human food. The poundage now taken by sport and commercial fishermen is mostly wasted. Hake larvae were the most abundant taken by the cooperative sardine investigations in 1951; the larvae were found from San Francisco to Cape San Lucas and as far as 300 miles at sea. Most of the spawning occurred from February through April. (Mar. Res. Comm., 1952.)

3.4.1.14. THE OPAH FAMILY, LAMPRIDAE

OPAH

Lampris regius (Bonnaterre)

Range: Worldwide in warmer seas.

Description: Body deep, ovate, much compressed; dorsal fin high; pelvics long; jaws without teeth. **Length:** To six feet; weight to 500 or 600 pounds; specimens from California in recent years have run from about 10 to about 80 pounds (Fitch, 1951). **Color:** Bluish above becoming silver tinged with red below; prominent silver spots on body; fins bright red; flesh light salmon.

Remarks: Taken uncommonly in California by both sport and commercial fishermen. The flesh is good to eat and smokes well.

3.4.1.15. THE CODFISH FAMILY, GADIDAE

Although this family includes a number of species which are of prime importance in northern seas, it is of negligible importance in California. Five species are on record for the State, but only one, the tomcod, occurs in any numbers.

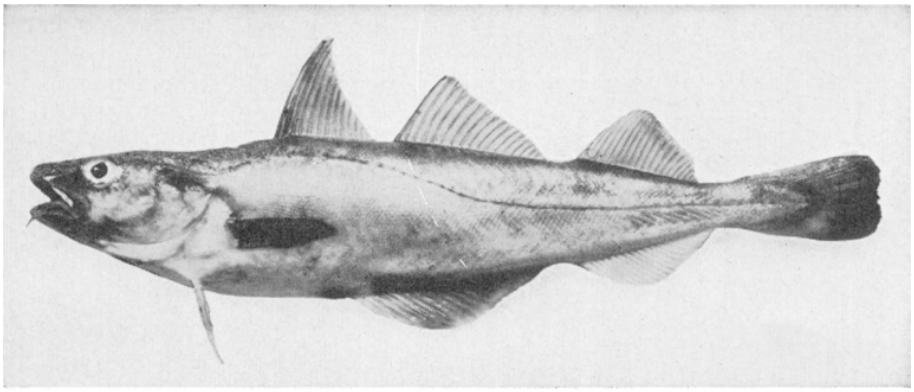


FIGURE 46

FIGURE 46

PACIFIC TOMCOD

Microgadus proximus (Girard)

Range: Alaska to Central California; fairly abundant off San Francisco and taken occasionally at Monterey.

Description: Three separate dorsal fins; two separate anal fins; upper jaw extends beyond lower; a barbel under tip of lower jaw, about as long as pupil; vent under posterior portion of first dorsal. **Length** to about a foot. **Color:** Olive or brownish above becoming white or silvery on the sides and belly; fins dusky.

Importance: of no commercial importance; the total landings in 1951 were only a ton. A minor game fish in Central California; esteemed as a food fish by some sportsmen.

Fishing Season: No seasonal trend shown by the extremely small landings.

Fishing Gear: Drag nets; hook and line.

PACIFIC COD

Gadus macrocephalus Tilesius

Range: Common from the Bering Sea to Oregon; taken occasionally by Northern California trawlers and recorded once 25 miles south of Monterey (Phillips, 1951a). **Description:** Resembles the tomcod in general appearance; barbel as long as or longer than diameter of eye; vent under forepart of second dorsal.

3.4.1.16. THE RIBBONFISH FAMILY, TRACHIPTERIDAE

CALIFORNIA RIBBONFISH

Trachipterus rexsalmonorum Jordan & Gilbert

Range: Vancouver Island to Southern California. **Distinguished** by the silvery ribbonlike body, no anal fin, long red dorsal fin; length to five or six feet. Caught fairly often in Southern California.

3.4.1.17. THE MORAY FAMILY, MURAENIDAE

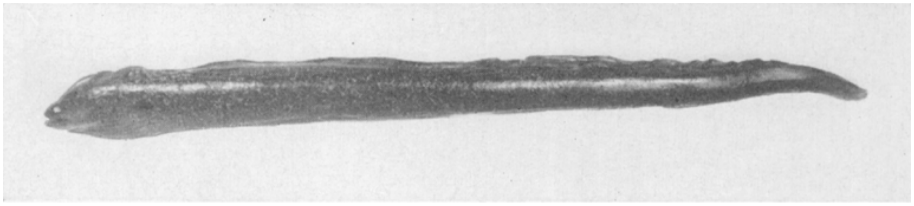


FIGURE 47

FIGURE 47

CALIFORNIA MORAY

Gymnothorax mordax (Ayres)

Relationship: The only California member of the family. A number of related species are known, chiefly from warm seas of the Western Hemisphere. Not a true eel.

Range: Pt. Conception to Santa Maria Bay, southern Baja California; Guadalupe Island; in rocky places.

Description: Pectoral and pelvic fins absent; skin leathery, scaleless; dorsal and anal fins reduced to low fleshy ridges; jaws well-developed with sharp teeth. **Length** to about five feet. **Color:** Dark brown or greenish mottled and spotted with lighter yellowish shades; throat and sometimes belly with dark horizontal streaks.

Importance: Occasionally sold in very small quantities. It is considered an extremely ferocious fish and consequently an unwelcome catch, though it is good to eat.

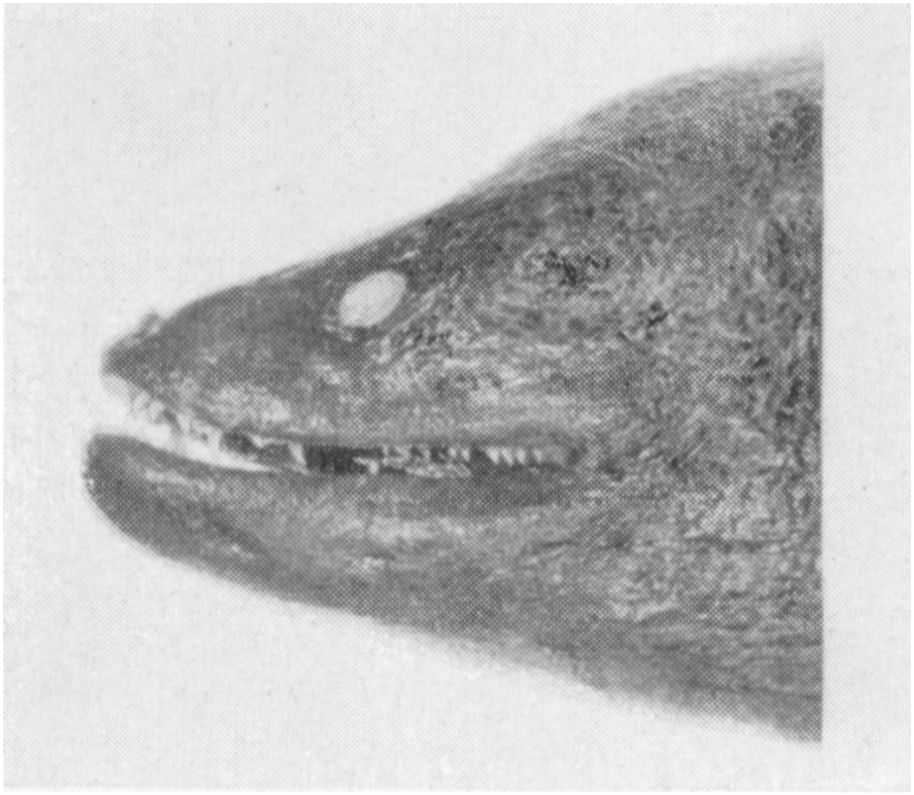


FIGURE 48

FIGURE 48

Fishing Season: None. Caught incidentally throughout the year.

Fishing Gear: Accidentally on hook and line and in lobster traps.

3.4.2. FLATFISHES

3.4.2.1. Members of Order Heterosomata

Relationship: All flatfish belong to one or another of the several families comprising the order Heterosomata. The commercial species of California are members of either the righteyed flounder family, Pleuronectidae, or the lefteyed flounder family, Bothidae. Most of the fish called sole and turbot in California, the starry flounder and the Pacific halibut are in the righteyed flounder family, while the sanddabs, the California halibut and the fantail and bigmouth soles are in the lefteyed flounder family. Norman (1934) reviewed these families on a worldwide basis.

Description: Flatfish, except when they are very young, are at once distinguished by having both eyes on the same side of the head. They hatch with an eye on each side, but one soon migrates and the fish take on their typical adult form. Normally, the eyed side of the body is colored and the blind side white or nearly white. Occasional specimens may be found which are pigmented on both sides. Lefteyed flounders (Bothidae) typically have the eyes on the left side, while righteyed flounders (Pleuronectidae) typically have them on the right. However, three of our common species, the California halibut, the fantail sole and the starry flounder, may have the eyes on either the right or the left side, and occasional reversed specimens occur in many and perhaps in all species.

3.4.2.1. SOLE

Relationship: All the important commercial species known on the West Coast as "sole" belong to family Pleuronectidae. Two minor species, the fantail and bigmouth soles, belong to family Bothidae.

Importance: Sole ranked seventh among California's fisheries in both poundage and value in 1951, supporting one of the most important market fisheries in the State. The entire catch is sold fresh. (Part was canned in 1947.) Eureka is the leading port of landing, followed by San Francisco. Monterey and Santa Barbara handle a small percentage of the catch.

Fishing Season: Throughout the year.

Fishing Gear: Trawls; some hook and line.

3.4.2.1. TURBOT

Relationship: The California turbots belong to family Pleuronectidae.

Importance: of minor commercial importance, forming a small proportion of the State's flatfish catch. San Francisco is the chief port of landing. Considered by many persons the finest of our flatfishes. Part of the catch is marketed as sole, particularly in Southern California.

Fishing Season: Irregularly throughout the year.

Fishing Gear: Trawls; some hook and line.

3.4.2.2. THE LEFTEYED FLOUNDER FAMILY, BOTHIDAE

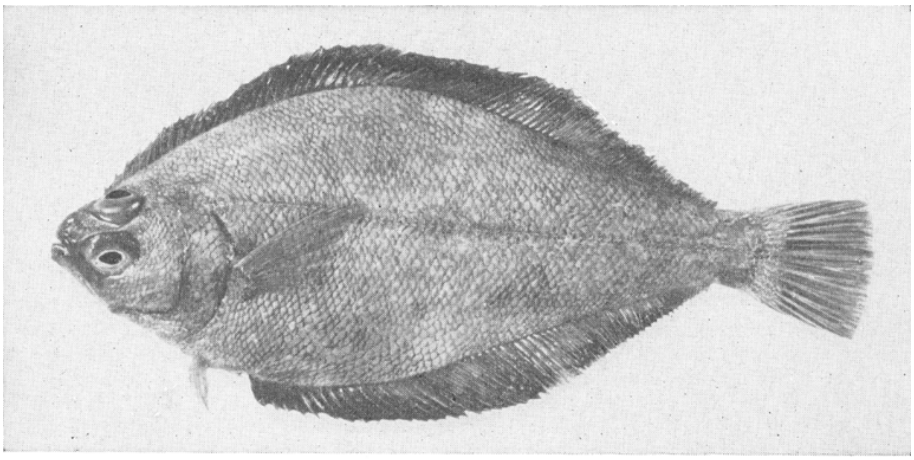


FIGURE 49

FIGURE 49

PACIFIC SANDDAB

Citharichthys sordidus (Girard)

Range: Alaska to Baja California in depths from 10 to 100 fathoms.

Description: Pelvic fins asymmetrical, that on the eyed side attached to the ridge of the abdomen; lateral line nearly straight; no dorsal branch to lateral line; scales large, loosely attached; lower eye longer than snout; pectoral on eyed side shorter than head; gill rakers on lower limb of first arch 13 or more. Eyes on left side of body. **Length** to 16 inches; **weight** to two pounds. **Color:** Various shades of tan or brown, sometimes spotted or blotched with dull orange or black.

Importance: Forms a small percentage of the State's flatfish catch although abundant in the ocean. Marketed fresh and considered a delicacy; always served whole. Landed chiefly at San Francisco and Eureka.

Fishing Season: Throughout the year.

Fishing Gear: Trawls; hook and line.

Remarks: Sanddabs usually mature at three years of age at which time they are about eight inches in length. Fish at least 10 years old have been taken. Spawning occurs in the summer. (See Arora, 1951, for a report on the biology of this species.)

3.4.2.2. OTHER SANDDABS

Two other species of sanddab are found in California. The speckled sanddab, Citharichthys stigmaeus Jordan & Gilbert, ranges along the entire coast. Lower eye small, no longer than snout; pectoral fin shorter than head; body thin, wafery; gill rakers on lower limb of first arch 8–10; color brownish, heavily speckled with black; length to six inches. The longfin sanddab, Citharichthys xanthostigma Gilbert, ranges from Southern California south into the Gulf of California. Pectoral fin longer than head; prominent yellow spots on the body.

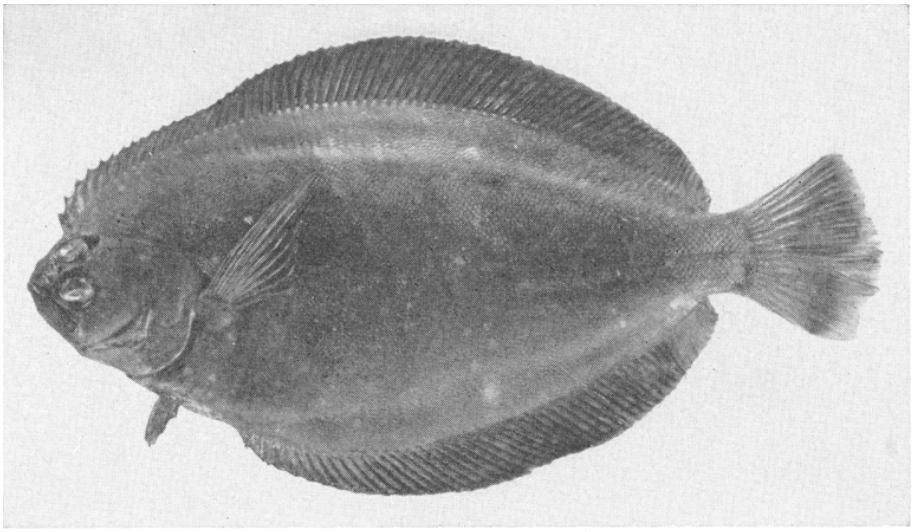


FIGURE 50

FIGURE 50

FANTAIL SOLE

Xystreurys liolepis Jordan & Gilbert

Range: Central California south into Baja California and reputedly into the Gulf of California.

Description: Lateral line with an abrupt high arch over the pectoral fin; no dorsal branch to lateral line; jaws about equally developed on blind and eyed sides but with more teeth on blind side; maxillary extends below middle of lower eye; caudal fin rounded; pectoral fin on eyed side almost as long as or longer than head. Eyes on either the left or the right side. **Length** to about 15 inches. **Color:** Brownish and olive mottled with darker, occasionally with many gray and reddish brown blotches; a large eyelike spot behind head and usually another toward tail fin; fins with dark blotches, the pectoral on the eyed side with oblique bars.

Importance: Forms a small but desirable portion of the sole catch in the Santa Barbara region.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, hook and line.

Unauthorized Names: Longfin sole, true petrale.

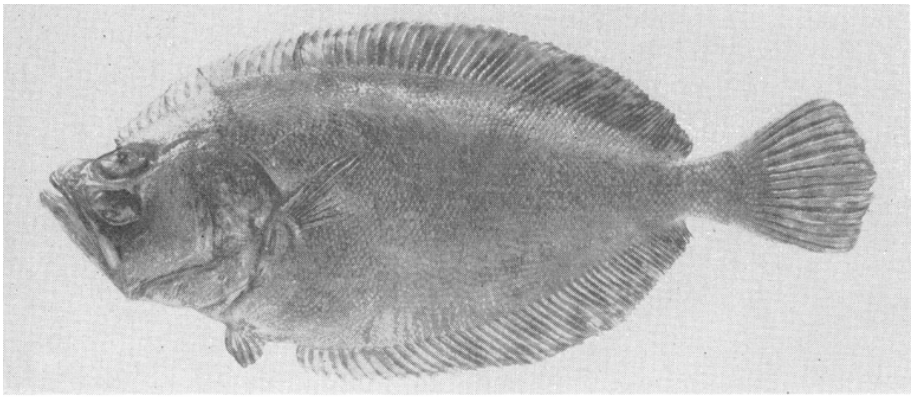


FIGURE 51

FIGURE 51

BIGMOUTH SOLE

Hippoglossina stomata Eigenmann & Eigenmann

Range: Pt. Conception south into the Gulf of California.

Description: Abrupt high arch in lateral line over pectoral fin; pectoral fin on eyed side little more than half as long as head; maxillary reaches below or past hind border of eye; high bony ridge between eyes; eyes on left side of body. **Color:** Brownish tinged with blue, with numerous spots of light and dark brown and bluish; usually five pairs of large dark brown spots near upper and lower edges of body; a pair of spots on caudal peduncle.

Importance: Negligible. The flesh is reported to be of high quality.

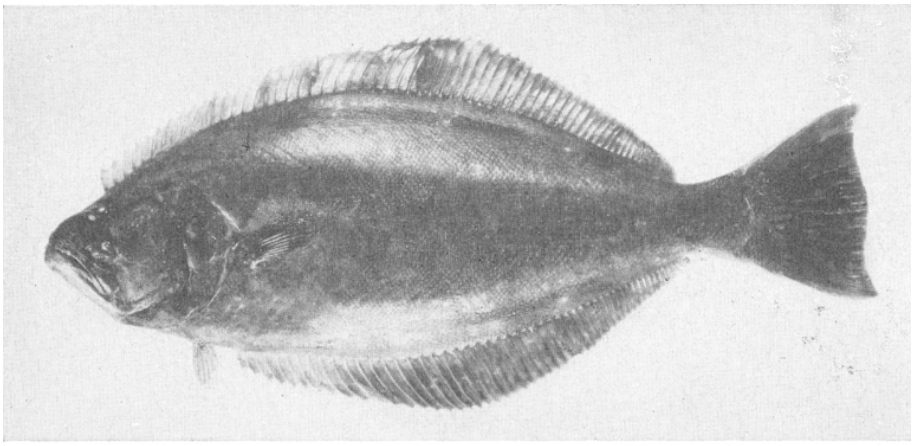


FIGURE 52

FIGURE 52

CALIFORNIA HALIBUT

Paralichthys californicus (Ayres)

Range: Central California south into the Gulf of California.

Description: Lateral line with a high arch over the pectoral fin; no dorsal branch to lateral line; jaws large, about equally developed on both sides; teeth moderately strong, sharp; maxillary reaches to or beyond hind border of lower eye; about 100 scales in lateral line; pectoral fin on eyed side little more than half as long as head; eyes small with a rather wide, flat area between them. Eyes on either right or left side of body. **Length** to five feet and **weight** to 60 pounds. **Color:** Greenish or grayish brown, sometimes mottled with darker and lighted shades, sometimes with small vague whitish spots, especially in young fish.

Importance: Twentieth in poundage and fifteenth in value among California's fisheries in 1951. About a quarter of the catch was taken in Mexican waters. Heaviest local catches have been made in the Santa Barbara area in recent years. One of the most desirable sport species in Southern California, it ranked seventh in total sport catch in 1951.

Fishing Season: Taken throughout the year, with heaviest California catches usually made in the early months of the year. Heaviest Mexican catches are usually landed in the late summer and fall.

Fishing Gear: Trammel nets, hook and line, trawls. Sportsmen generally use live bait, fishing from boats, barges and piers.

Remarks: Males first mature when about nine inches, females from 17 inches. A majority are four or five years old before reaching maturity. Spawning occurs from February to July, reaching a peak in May. The spawning grounds are believed to be inshore in shallow water. Ginsberg (1952) reviewed the North American species of both Paralichthys and Hippoglossina.

Unauthorized Names: Chicken halibut, bastard halibut, southern halibut, Monterey halibut, alabato.

3.4.2.3. THE RIGHTEYED FLOUNDER FAMILY, PLEURONECTIDAE

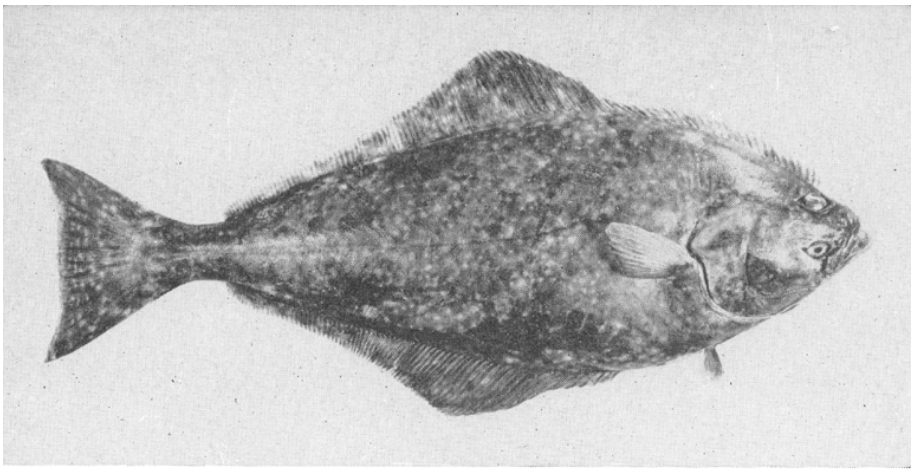


FIGURE 53

FIGURE 53

PACIFIC HALIBUT

Hippoglossus stenolepis Schmidt

Range: Central California north to the Bering Sea; to northern Japan on the Asiatic side. Reported once from Santa Rosa Island (Walford, 1928).

Description: Lateral line with a high arch over the pectoral fin; no dorsal branch to lateral line; jaws about equally developed on blind and eyed sides; teeth strong; maxillary not reaching past middle of lower eye; pectoral fin on eyed side little more than half as long as head; 150 or more scales in lateral line. Eyes normally on right side though specimens are sometimes found with eyes on the left. **Length** to nearly nine feet; **weight** to about 500 pounds. **Color:** Nearly uniform dark brown, often with vague paler blotches.

Importance: of minor importance in California in terms of total poundage and value but one of the more desirable market fish. Landed chiefly at Eureka, in smaller quantity at San Francisco.

Fishing Season: Subject to the rules of the International Fisheries Commission.

Fishing Gear: Long lines; illegally in trawls.

Remarks: This fish supports an extremely important fishery in the northeastern Pacific which for many years has been under the control of the International Fisheries Commission, which establishes seasons and quotas and gear limitations (only hook and line is legal). California contributes only about one percent of the catch. Halibut are found in depths up to at least 600 fathoms, though they are usually found in much shallower water. Spawning occurs in the winter. Females attain a much greater size than males, mature between the ages of 8 and 16 and may live more than 35 years. See publications of the Commission for details of biological and fishery studies.

Unauthorized Names: Alabato, northern halibut.

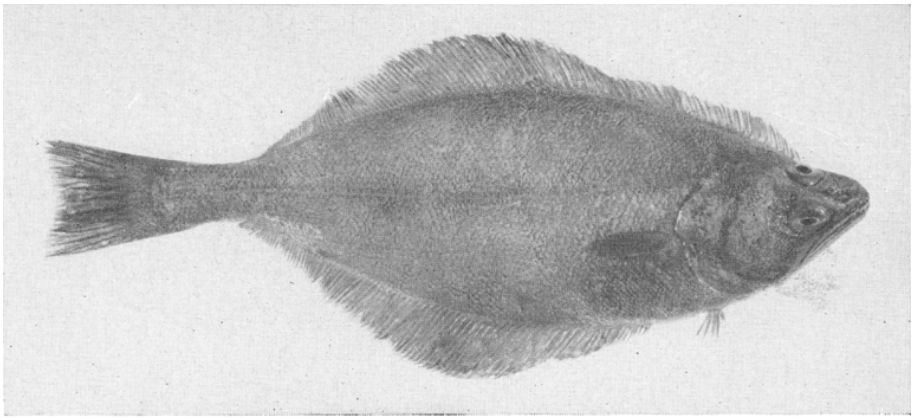


FIGURE 54

FIGURE 54

ARROWTOOTH HALIBUT

Atheresthes stomias (Jordan & Gilbert)

Range: The Bering Sea to Central California.

Description: No abrupt, high arch in lateral line over pectoral fin; no dorsal branch to lateral line; mouth large, maxillary reaching to or behind hind edge of lower eye; upper eye almost on rim of head; jaws about equally developed on both sides with most of the teeth with arrowlike tips in adults; caudal fin inwardly curved. Eyes on the right side. **Length** to about 30 inches. **Color:** Brown to olive-brown; blind side white with fine black dots.

Importance: Forms a minor proportion of the sole catch in California; locally abundant.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, some hook and line.

Unauthorized Names: Turbot, bastard halibut, French sole.

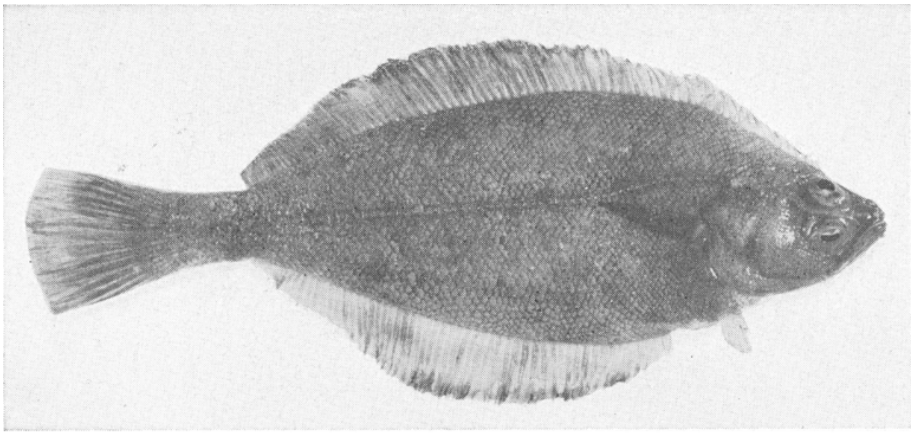


FIGURE 55

FIGURE 55

SLENDER SOLE

Lyopsetta exilis (Jordan & Gilbert)

Range: Alaska to the Coronado Islands, northern Baja California.

Description: No abrupt high arch in lateral line over pectoral fin; no dorsal branch to lateral line; mouth moderately large with jaws and teeth about equally developed on both sides; maxillary extends to below middle of lower eye; scales large, loosely attached, rough and abrasive on both eyed and blind sides, about 20 rows between lateral line and dorsal fin at widest part of body and 75 or less along lateral line; pectoral fin shorter than head. Eyes on the right side. **Length** to about a foot. **Color:** Reddish brown with dark points forming edgings on each scale; blind side pale orange-yellow to white; fins dusky.

Importance: Forms a minor proportion of the sole catch in California.

Fishing Season: Throughout the year.

Fishing Gear: Trawls.

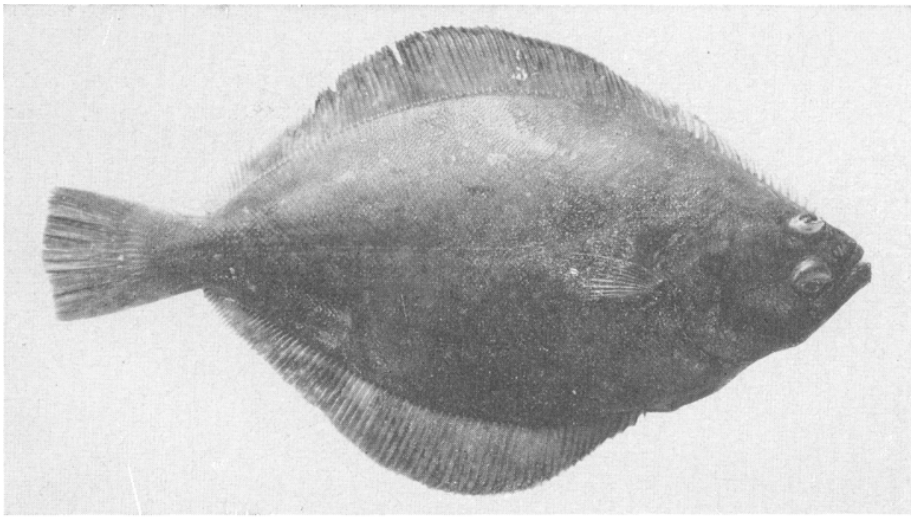


FIGURE 56

FIGURE 56

PETRALE SOLE

Eopsetta jordani (Lockington)

Range: Alaska to the Coronado Islands, northern Baja California.

Description: No abrupt high arch in lateral line over pectoral fin; no dorsal branch to lateral line; mouth moderately large, jaws and teeth about equally developed on both sides; maxillary extends to below the middle of lower eye; scales small, about 30 rows between lateral line and dorsal fin at widest part of body and about 88 to 100 along lateral line; pectoral fin shorter than head. Eyes on the right side. **Length** about 20 inches; **weight** to six or eight pounds. **Color:** Brown or olive-brown sometimes with vague paler blotches.

Importance: Third in importance in poundage among the soles, comprising about 12 percent of the catch; considered one of the finest and a premium fish on the market. Almost all of the fish landed are filleted.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, some hook and line.

Unauthorized Name: Brill.

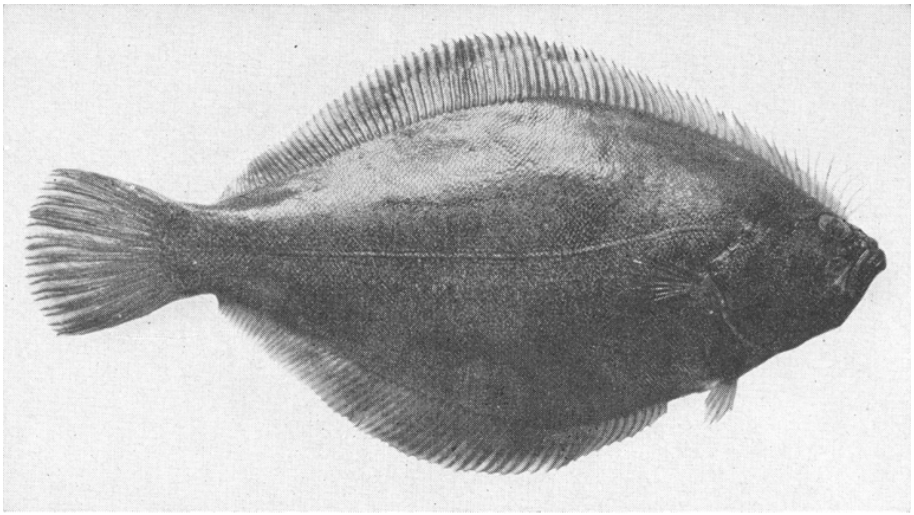


FIGURE 57

FIGURE 57

SAND SOLE

Psettichthys melanostictus Girard

Range: Alaska to Southern California; uncommon south of Pt. Conception and nowhere as abundant as some of the other species.

Description: No abrupt high arch in lateral line over pectoral fin; lateral line with dorsal branch; first few rays of dorsal fin elongated, not connected by a membrane for about half their length; jaws and teeth about equally developed on both sides; maxillary extends to or almost to a point below middle of lower eye; eyes small, the space between them wide; pectoral fin shorter than head; caudal fin rounded. Eyes on the right side. **Length** to 20 inches; **weight** to four or five pounds. **Color:** Brownish, vaguely mottled with darker, everywhere speckled with dark brown or black.

Importance: Forms a minor proportion of the sole catch in California, but is considered a desirable species.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, some hook and line.

Unauthorized Names: Fringe sole, spotted flounder.

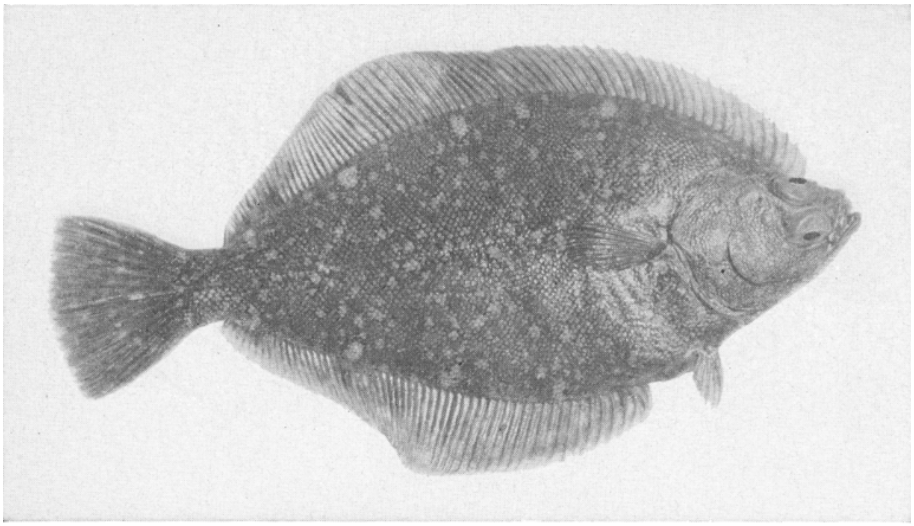


FIGURE 58

FIGURE 58

SCALY-FIN SOLE

Isopsetta isolepis (Lockington)

Range: Alaska to Southern California; rare south of Pt. Conception.

Description: Lateral line curves upward over pectoral fin but does not have a high arch; lateral line with a dorsal branch; jaws and teeth better developed on blind side; maxillary extends to a point below fore part of lower eye; scales rough on eyed side of body, head and fins, 90 or fewer along lateral line; space between eyes narrow, flat. Eyes on the right side. **Length** to about 18 inches. **Color:** Brownish or grayish mottled and blotched with darker and sometimes with lighter.

Importance: Forms a minor proportion of the sole catch in California.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, some hook and line.

Unauthorized Names: Butter sole, Bellingham sole.

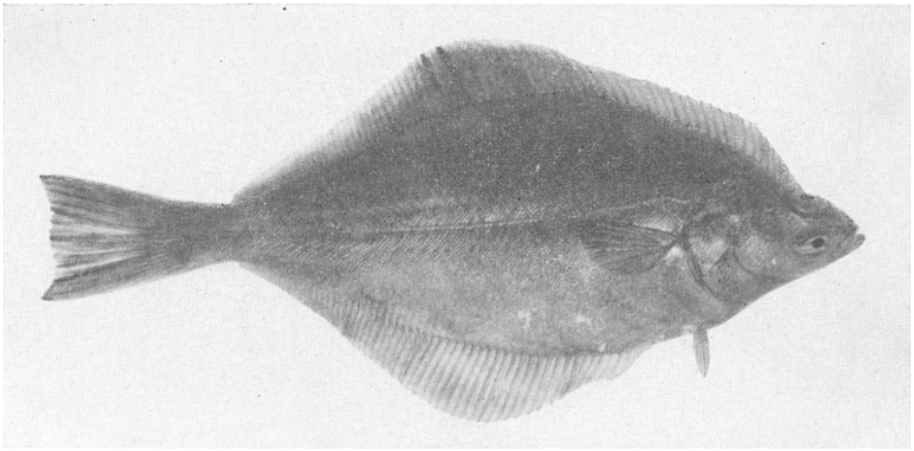


FIGURE 59

FIGURE 59

ENGLISH SOLE

Parophrys vetulus Girard

Range: Alaska south to Sebastian Vizcaino Bay, central Baja California.

Description: No abrupt high arch in lateral line over pectoral fin; lateral line with a long dorsal branch; snout region projects prominently; jaws rather pointed, stronger on blind side and with teeth chiefly on blind side; maxillary extends below fore part of lower eye; scales smooth on eyed side, about 90 or more along lateral line; a ridge in the narrow space between the eyes; upper eye almost on rim of head. Eyes on the right side. **Length** to about 21 inches. **Color:** Pale brownish to brown; dorsal and anal fins tipped with darker. Blind side light yellow to white.

Importance: Forms the second largest proportion (about 25 percent) of the sole catch. Used extensively in the fresh fish markets of California with most of the catch filleted.

Fishing Season: Throughout the year.

Fishing Gear: Trawls.

Remarks: Known to hybridize with the starry flounder. See Budd (1940) for a description of the eggs and early larvae.

Unauthorized Names: Common sole, California sole, lemon sole.

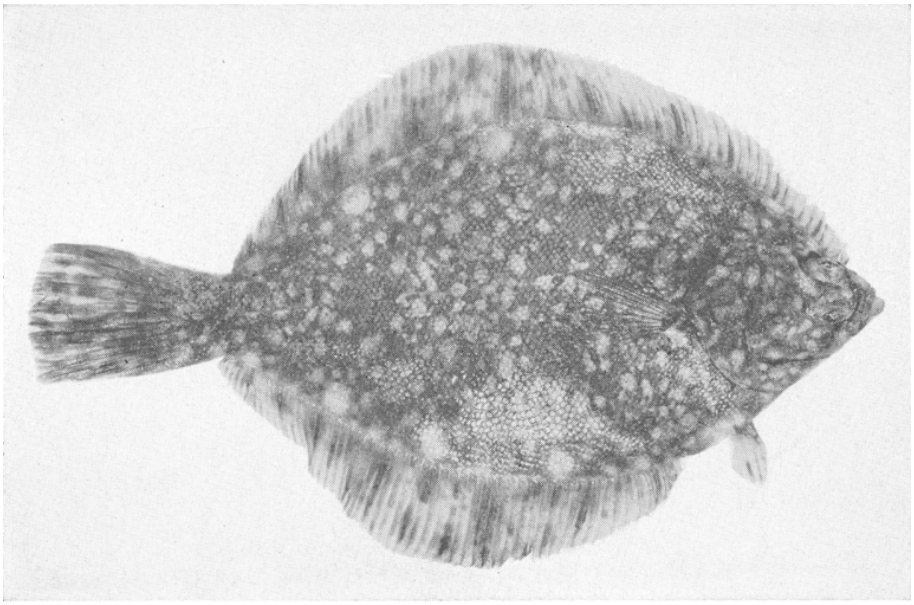


FIGURE 60

FIGURE 60

ROCK SOLE

Lepidopsetta bilineata (Ayres)

Range: Southern California to the Bering Sea and Kamchatka; south on the Asiatic side to Japan. Rare in Southern California; locally abundant in the San Francisco region.

Description: Lateral line with an abrupt high arch over pectoral fin and with a dorsal branch; jaws and teeth better developed on the blind side; mouth small, maxillary extends to below fore part of lower eye; pectoral fin on eyed side shorter than head. Eyes on right side. **Length** to 18 or 20 inches. **Weight** to five or six pounds. **Color:** Dark brown, with vague paler blotches, mottled and spotted with darker and lighter shades; dorsal, anal and caudal fins with dark blotches or bars; blind side white to yellowish.

Importance: Forms a very minor part of the sole catch in California; not one of the more desirable species.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, some hook and line.

Unauthorized Name: Broadfin sole.

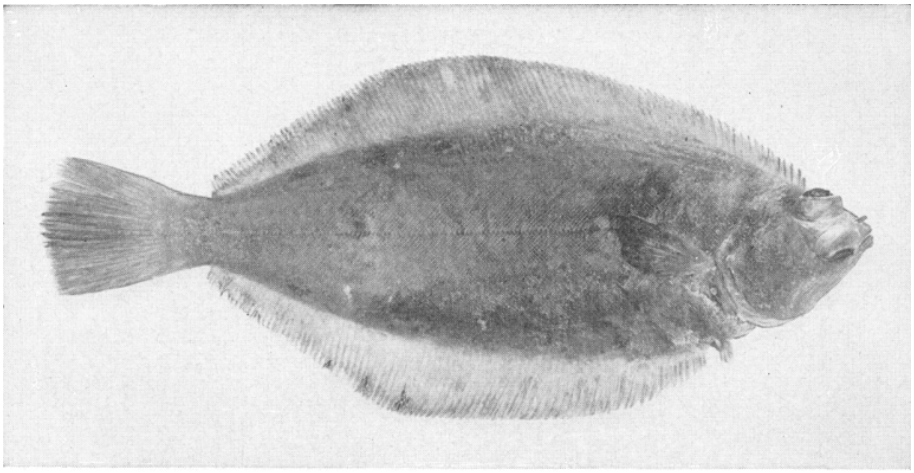


FIGURE 61

FIGURE 61

DOVER SOLE

Microstomus pacificus (Lockington)

Range: Alaska to northern Baja California; Guadalupe Island.

Description: Lateral line nearly straight with no dorsal branch; opercular opening barely reaches above base of pectoral fin; maxillary reaches under fore part of lower eye; mouth small with jaws better developed on blind side; few if any teeth on eyed side; caudal fin about two-thirds length of head; pectoral fin shorter than head. Secretes large amounts of slime. Eyes on the right side. **Length** to about 2½ feet; **weight** to 10 pounds. **Color:** Shades of brown sometimes with blotches of lighter or darker shades.

Importance: Not used commercially in California until 1947, but since then it has become of major importance and now comprises over 40 percent of the sole catch. New techniques in catching and handling made its marketing possible. It is marketed exclusively as fillets.

Fishing Season: Throughout the year but with small landings in the winter.

Fishing Gear: Trawls.

Remarks: Dover sole are found in deeper water than most of our flatfishes, frequent muddy bottoms and feed on invertebrates. They reach at least 15 years of age; those in the catch are chiefly 8 to 12. Spawning occurs in the winter. The larvae are pelagic, as are those of most flatfishes, and apparently do not settle to the bottom for several months. The left eye does not complete its migration until the larva is 1½ to 2 inches long. Reference, Hagerman (1952).

Unauthorized Names: Slippery sole, slime sole, shortfinned sole.

DEEPSEA SOLE

Embassichthys bathybius (Gilbert)

Range: The coast of California in deep water. **Distinguished** from the Dover sole, which it resembles, by having teeth equally developed on both sides of the jaws. **Remarks:** of no commercial importance at this time, though it is not uncommon in deep-water trawl catches. **Unauthorized Names:** Speckled sole, blackmouthed sole.

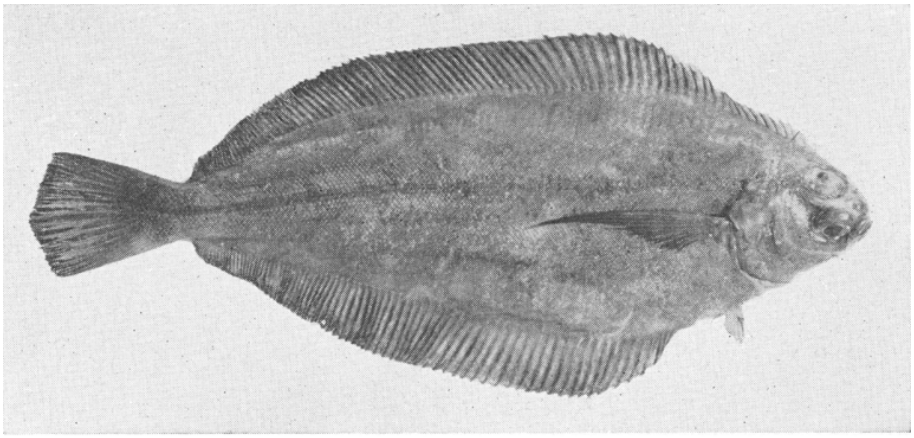


FIGURE 62

FIGURE 62

REX SOLE

Glyptocephalus zachirus Lockington

Range: The Bering Sea to Southern California; not common to the south.

Description: Lateral line nearly straight with no dorsal branch; mouth small with jaws and teeth better developed on blind side; maxillary extends below front of lower eye; pectoral fin very long on eyed side (that on blind side not extended). Eyes on the right side. **Length** to 20 inches. **Color:** Uniform light brown on the eyed side; the fins darker brown or dusky.

Importance: Generally considered one of the finest of California soles, it makes up perhaps five percent of the statewide sole catch. Used as a whole fish, never filleted.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, some hook and line.

Unauthorized Name: Long-finned sole.

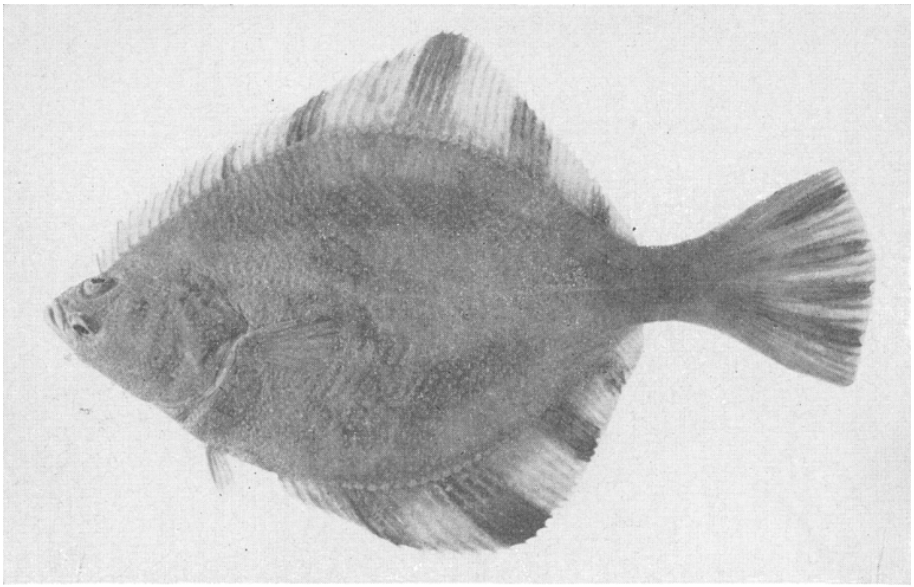


FIGURE 63

FIGURE 63

STARRY FLOUNDER

Platichthys stellatus (Pallas)

Relationship: California representatives are considered to constitute a subspecies, the southern starry flounder (P.s. rugosus Girard).

Range: Santa Barbara County to Alaska; south on the Asiatic side to Japan and Korea; Bering Sea, arctic coast of Alaska and western Canada. Enters brackish and fresh water, at times moving considerable distances up streams.

Description: Black bars on dorsal, anal and caudal fins; no abrupt high arch in lateral line over pectoral fin; no dorsal branch to lateral line; jaws and teeth better developed on blind side; maxillary extends below fore part of lower eye; body rough, covered with scattered plates formed of starlike scales, roughest in a row along bases of dorsal and anal fins. Eyes on either left or right side. Reputed to reach a **length** of three feet and a **weight** of 20 pounds, although the usual market sizes are much smaller. **Color:** Dark brown to black with vague blotchings; fins striped with black, orange to whitish between.

Importance: In modest demand, it is not a leading commercial variety. Landed mostly at Eureka and San Francisco. An important sport fish in Central and Northern California, especially in bays.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, hook and line.

Remarks: Found in bays and from very shallow water to about 150 fathoms over all types of bottoms save rock; feeds chiefly on invertebrates. In Central California the fish spawn once a year during the winter months in water less than 25 fathoms deep. Males mature in their second year when about a foot long; females in their third year when about 14 inches long. Known to hybridize with the English sole. Reference, Orcutt (1950).

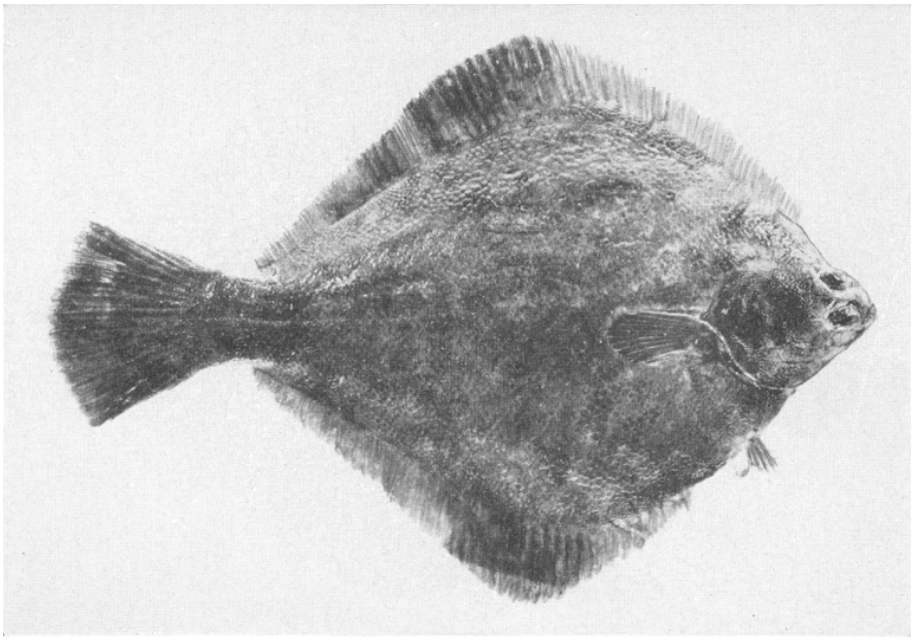


FIGURE 64

FIGURE 64

DIAMOND TURBOT

Hypsopsetta guttulata (Girard)

Relationship: California representatives are considered to constitute a subspecies, the northern diamond turbot, H. g. guttulata (Girard).

Range: Northern California south into the Gulf of California, most commonly in bays and sloughs.

Description: No high abrupt arch in lateral line over pectoral fin; lateral line with long dorsal branch extending back more than half way along body; mouth small with jaws better developed on blind side; teeth small, few, if any, on eyed side; maxillary extends below fore part of lower eye; dorsal fin starts on midline of body; no high spiny ridge between eyes; body depth about half of entire length, including tail. Eyes on right side. **Length** to about 18 inches and **weight** to about four pounds. **Color:** Dark greenish brown to brown, mottled with paler shades.

Importance: of negligible commercial importance, though it ranks second to the curlfin among California turbots.

Fishing Season: Throughout the year.

Fishing Gear: Hook and line, trawls.

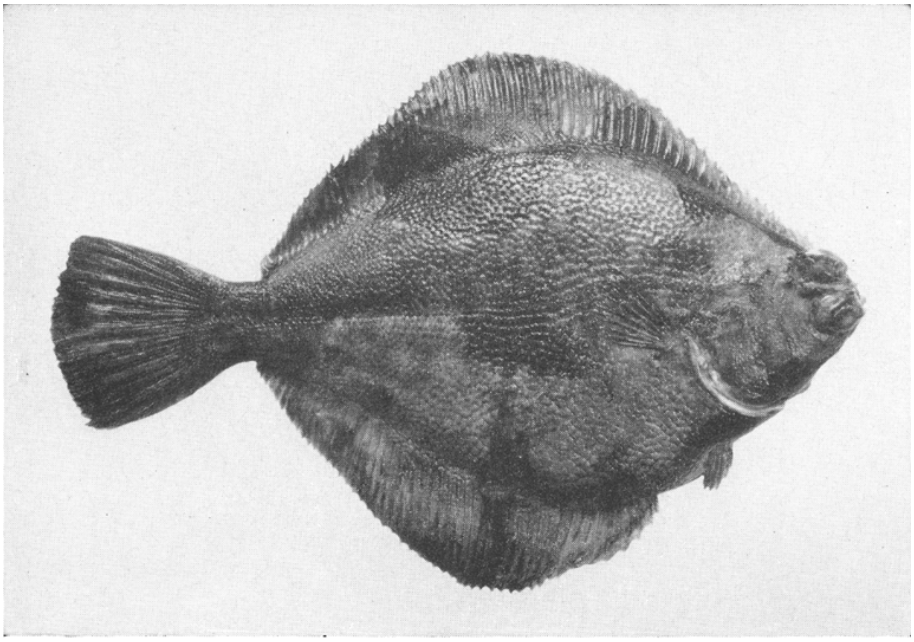


FIGURE 65

FIGURE 65

CURLFIN TURBOT

Pleuronichthys decurrens Jordan & Gilbert

Range: Alaska to Southern California.

Description: No high abrupt arch in lateral line over pectoral fin; lateral line with a long dorsal branch which extends back about to middle of body; dorsal fin originates on blind side on a level with the corner of mouth; at least the first nine dorsal rays on blind side; a high, narrow, bony ridge between eyes with a blunt, bony spine at either end; bony prominence in front of each eye and two or three behind upper eye; mouth small with jaws and teeth better developed on blind side; maxillary extends below fore part of lower eye. Eyes on the right side. **Length** to about a foot. **Color:** Yellowish brown to dark brown vaguely mottled with brownish and grayish, fins dark.

Importance: The most desirable of the turbots; landed chiefly at San Francisco.

Fishing Season: Throughout the year.

Fishing Gear: Trawls, some hook and line.

Reference: Budd (1940) described the eggs and early larvae of this species and of the hornyhead and C-O turbots.

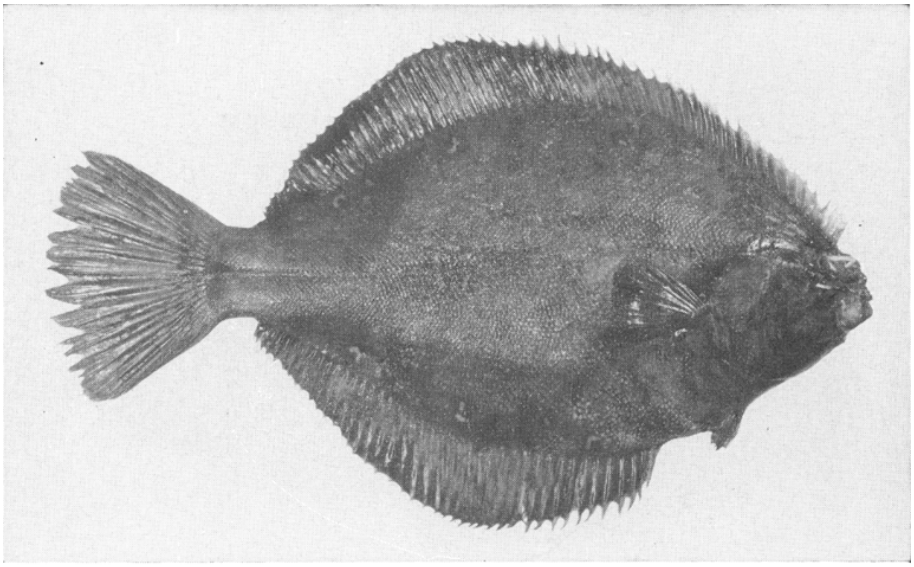


FIGURE 66

FIGURE 66

HORNYHEAD TURBOT

Pleuronichthys verticalis Jordan & Gilbert

Range: Northern California, at least to Pt. Reyes, south into the Gulf of California.

Description: No high abrupt arch in lateral line over pectoral fin; lateral line with long dorsal branch; first five or six dorsal rays originate on blind side but do not extend down to a level with corner of mouth; a high, narrow, bony ridge between eyes with sharp, prominent spines at either end; a blunt spine overhanging mouth in front of lower eye; several smaller blunt spines around upper eye; mouth small, with jaws better developed on blind side and with no teeth on eyed side; maxillary extends below fore part of lower eye. Eyes on the right side. **Length** to about 10 inches. **Color:** Brown on brownish, irregularly mottled and blotched with darker; scattered pale spots on the body.

Importance: of little commercial importance; it ranks third among the turbots.

Fishing Season: Through the year.

Fishing Gear: Trawls; some hook and line.

C-O TURBOT

Pleuronichthys coenosus Girard

Range: Alaska to Southern California. Distinguished from the hornyhead turbot by the lack of a prominent spine at front of bony ridge between eyes. **Importance:** A very minor constituent of the turbot catch.

SPOTTED TURBOT

Pleuronichthys ritteri Starks & Morris

Range: Southern California to Sebastian Vizcaino Bay, Baja California; frequently occurring in bays. **Distinguished** by a less prominent ridge between eyes with two short blunt spines at its front, and by the presence of a distinct spot at the middle of the lateral line and one on each side of the body by the hind portions of the dorsal and anal fins. **Importance:** A very minor constituent of the turbot catch.

3.4.2.4. THE TONGUEFISH FAMILY, CYNOGLOSSIDAE

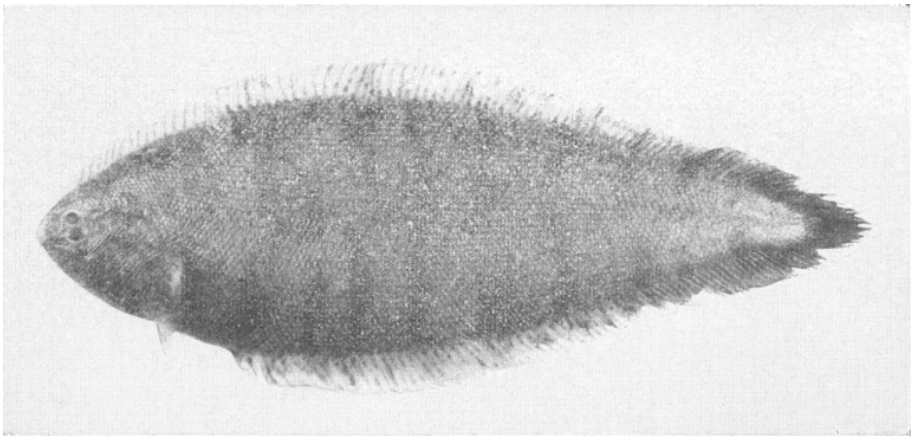


FIGURE 67

FIGURE 67

CALIFORNIA TONGUEFISH

Symphurus atricauda (Jordan & Gilbert)

Relationship: It is the only California representative of the family.

Range: Central California (Monterey Bay) south to Cape San Lucas. Rare north of Pt. Conception.

Descriptión: Body tapers to a point posteriorally, dorsal and anal fins joining caudal fin; no lateral line; mouth small, twisted; eyes small, close-set. Eyes on the left side. **Length** to six inches. **Color:** Brownish with dark vertical bars extending from dorsal and anal fin bases toward center of body.

Importance: of no commercial importance, though taken occasionally with other species.

Fishing Gear: Accidentally in drag nets or on hook and line.

3.4.2.5. THE BASS FAMILY, SERRANIDAE

This large and widespread family is represented in California by several species of prime importance to sportsmen but of little significance commercially—the striped bass, the black sea bass, and the kelp bass. **Family characters:** Pelvic fins thoracic with one spine and five rays; three spines at front of anal fin (these may be difficult to locate); maxillary exposed when jaw is closed; teeth present on vomer. Eight species are recorded from California, though there is but a single record of one, the splittail bass, Hemianthias peruanus.

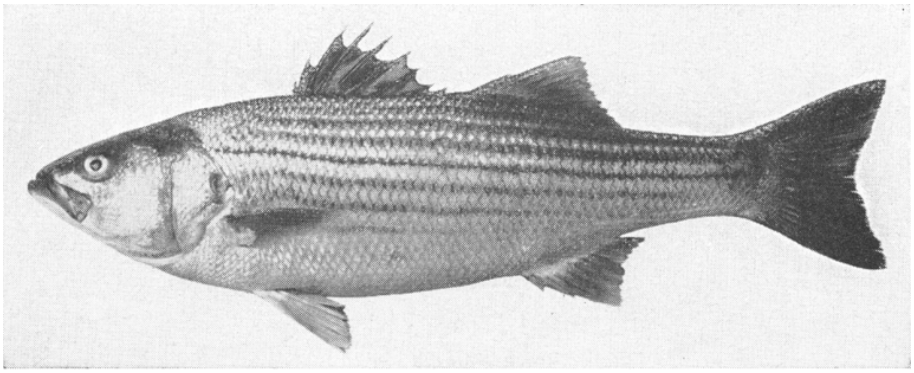


FIGURE 68

FIGURE 68

STRIPED BASS

Roccus saxatilis (Walbaum)

Range: On the Pacific coast from Southern California to Washington; uncommon south of Monterey Bay and north of Coos Bay, Oregon. In the Atlantic Ocean from the Gulf of St. Lawrence to the Gulf of Mexico.

Description: See above. Two dorsal fins; a series of seven or eight horizontal blackish stripes along the sides; pectoral fins do not reach back beyond tips of pelvics; eye relatively small, much less than one-third as long as head. (The latter two characters separate the striped bass from the little salema, page 92, with which it is sometimes confused in Southern California.) **Length** to four feet. **Weight:** A 78-pound specimen is on record from California, but the average is 10 pounds or less. **Color:** Striped as described above; steel blue to olive-green above becoming silvery on the sides and belly; everywhere with brassy reflections.

Importance: An extremely popular sport fish in San Francisco Bay and the Delta area.

Fishing Season: Sport, throughout the year, reaching a peak in the fall; subject to bag and size limits. Closed to commercial fishing since 1935. Consult fish and game regulations.

Fishing Gear: Hook and line.

Introduction: This fish was introduced into the San Francisco area from the Atlantic Coast in 1879 and an additional plant was made in 1882. Though a total of only 432 fish was imported, bass were being taken in commercial quantities in 1889. Unsuccessful attempts have been made to establish the fish in the Salton Sea.

Remarks: This is an anadromous fish, moving into fresh water to spawn. It is found in inshore waters, bays and rivers, the San Francisco Bay-Sacramento-San Joaquin rivers area being especially suited to it. Spawning takes place in the lower reaches of the rivers, chiefly in the spring. Females usually mature at five years when about two feet long, males may mature at two when about one foot long. The fish may attain an age of 20 years or more. Text accompanying the Department's "Striped bass fishing map for the bay and delta areas of Central California" includes considerable information on the fish's life history and the fishery. Recent reports on the striped bass in California include Calhoun, 1952 (migrations), Johnson and Calhoun, 1952 (food habits), and Calhoun, 1953 (distribution of fry).

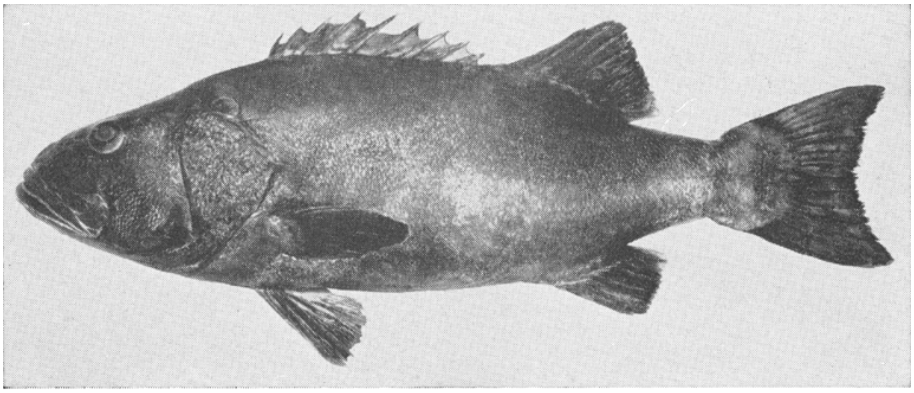


FIGURE 69

FIGURE 69

CALIFORNIA BLACK SEA BASS

Stereolepis gigas Ayres

Range: Central California south to and into the Gulf of California. A bottom fish usually found close to shore. Reported years ago from as far north as the Farallon Islands; there is but one certain Central California record in the last 25 years (Monterey Bay about 1935).

Description: See page 71, top. Two dorsal fins with more spines (normally 11) than soft rays (normally 10); dorsal spines shorter than dorsal rays in the adult; pectoral fins reach beyond pelvic fins in the adult. **Length** to seven feet or more and **weight** to 500 or 600 pounds. **Color:** Dark brown to blackish above, somewhat paler below. **Young:** The young are very different in both shape and color. In specimens about an inch long the spiny dorsal is higher than the soft, the body is nearly as deep as it is long, and the pelvics are longer than the pectorals. The body is brick red with distinct brownish or blackish spots. As the fish grows it gradually takes on the typical adult appearance. The dark spots on the sides are often evident in 30-pound specimens.

Importance: A minor Southern California market species. The great bulk of the catch is made in Baja California waters with heaviest landings at Los Angeles and San Diego. A popular game fish.

Fishing Season: Throughout the year.

Fishing Gear: Hook and line; set lines.

Unauthorized Name: Jewfish.

GROUPERS

Genus Mycteroperca

Two species, common in Mexican waters, are known from the San Diego County coast. These are the broomtail grouper, M. xenarchus Jordan, and the gulf grouper, M. jordani (Jenkins & Evermann). They are taken fairly frequently (the broomtail most often) by skin divers and have been caught commercially. **Distinguished** by continuous dorsal fin with more soft rays than spines; 11 or 12 anal soft rays. **Broomtail:** End of tail jagged; gill rakers on lower limb of first arch about 18. **Gulf:** End of tail smooth; about 10 or 11 gill rakers on lower limb of first arch.

GENUS PARALABRAX

The three California members of this genus, the kelp, sand and spotted basses can be separated from other California basses by having more dorsal soft rays (13–15) than spines (10) and seven or eight anal soft rays. Fishermen often confuse them with some of the rockfishes (Sebastodes, pages 120 to 135) which, however, have 13 (rarely 14) dorsal spines.

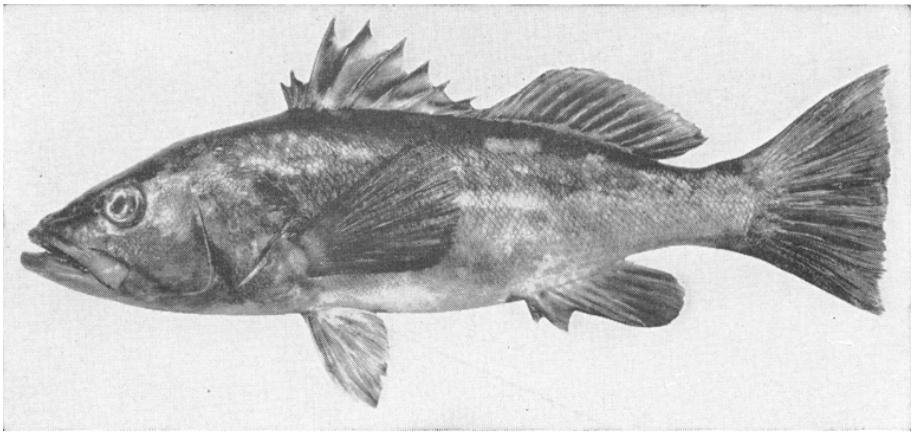


FIGURE 70

FIGURE 70

KELP BASS

Paralabrax clathratus (Girard)

Range: Central California to Abreojos Point, Baja California; most abundant around kelp beds. Uncommon north of Pt. Conception but caught occasionally in Monterey **Bay.**

Description: See page 71, top, and above. A deep notch between spiny and soft portions of dorsal fin; longest dorsal spines longer than soft rays; third to fifth dorsal spines about the same length (separating it from the sand and spotted basses). **Length** at least to two feet. **Color:** Dark gray, brownish, or greenish gray above; upper part of the side mottled and barred with broad blotches of lighter shades; lower part of sides and underparts silvery tinged with yellow; fins tinged with yellow. Young marked with oval opalescent spots on a darker background.

Importance: A very desirable game species, it ranked first in 1951 among California's sport fishes in terms of numbers caught. (The records do not distinguish between kelp and sand bass, but the great bulk of the catch is kelp bass.) A minor commercial species, it forms the bulk of the "rock bass" catch and is landed chiefly at Los Angeles. The sport catch far exceeds the commercial.

Fishing Season: Throughout the year with heaviest landings usually in the summer. Part of the catch is made in Mexican waters.

Fishing Gear: Chiefly hook and line; also entangling nets, roundhaul nets. Most of the sport catch is made using live bait.

Remarks: Both kelp and sand bass appear to spawn in the summer and to mature when about 10 inches long. Reference, Collyer and Young (1953).

Unauthorized Names: Calico bass, bull bass.

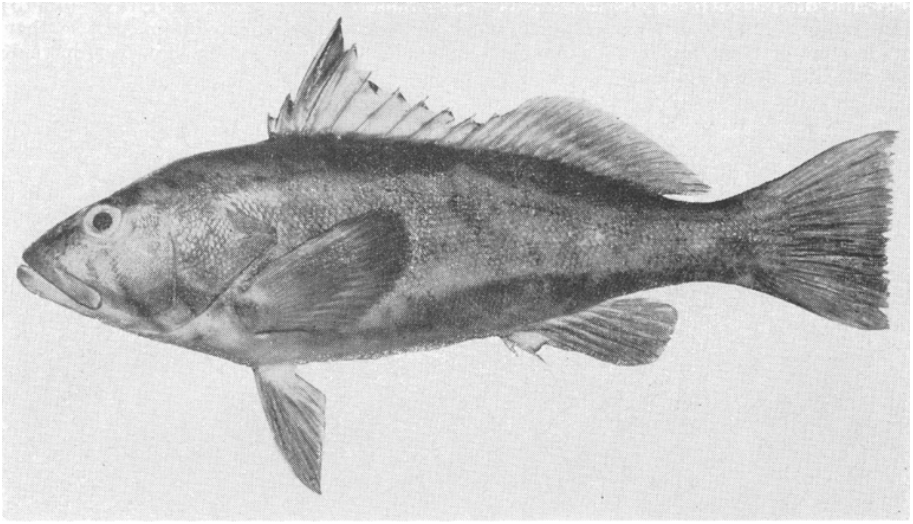


FIGURE 71

FIGURE 71

SAND BASS

Paralabrax nebulifer (Girard)

Range: Central California to Magdalena Bay, Baja California; not common north of Pt. Conception but taken at times in Monterey Bay. Found over sandy and rocky bottoms. One of the most common basses of central Baja California, where it appears to outnumber the kelp bass.

Description: See top of pages 71 and 73. Spiny and soft portions of dorsal fin broadly connected; third dorsal spine conspicuously longer than the rest; about 70 scales along lateral line. **Length** to about 20 inches. **Color:** Greenish gray with traces of irregular vertical dusky bands on the side of the body; under parts white or pale gray; cheek and region below the eye with small round golden or yellowish brown spots. Young specimens often with a pinkish color from underside of lower jaw almost to pelvic insertion and with dark spots on head and body, but with dark markings on base of pectoral not forming round blackish spots.

Importance: A desirable sport species but of far less importance than is the kelp bass. of slight significance commercially, it makes up a small proportion of the "rock bass" catch.

Fishing Season: Throughout the year, reaching a peak in the summer.

Fishing Gear: Chiefly hook and line; also entangling nets, roundhaul nets.

Unauthorized Names: Ground bass, sugar bass.

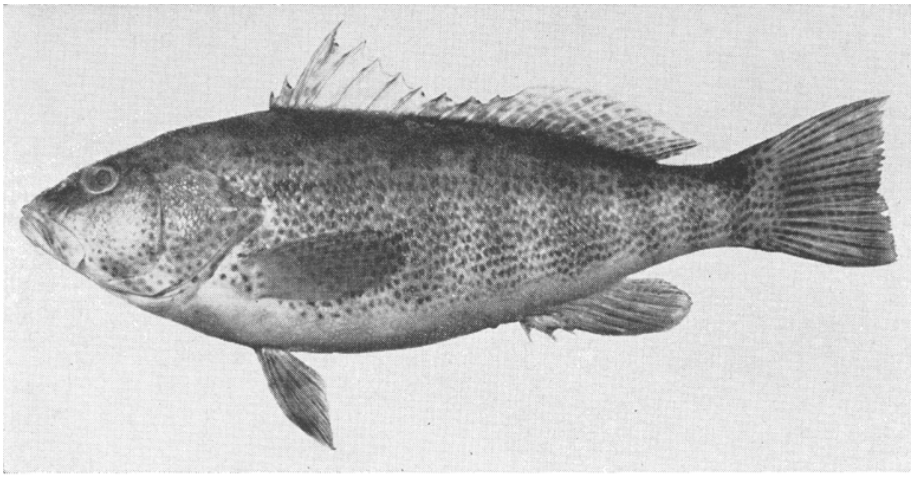


FIGURE 72

FIGURE 72

SPOTTED BASS

Paralabrax maculatofasciatus (Steindachner)

Range: Southern California (vicinity of San Pedro) into the Gulf of California and south to Mazatlan, Mexico. Most common in bays and lagoons. (The California fish may prove distinct from the Gulf form.)

Description: See top of pages 71 and 73. Spiny and soft portion of dorsal fin connected, third spine appreciably longer than the rest; about 90 scales along lateral line; small brownish spots cover head, fins, and body except for the belly, dark markings on base of pectoral forming round blackish spots (separating it from the sand and kelp basses). **Length** to about 18 inches. **Color:** Greenish or olive brown above becoming whitish below; six or seven vague dusky bars extend down the sides from the back and a dark streak runs down and back across the cheek from the eye; spotted as described above.

Importance: of no commercial importance in California though often caught by sportsmen in Newport and Mission bays.

Fishing Season: Not taken in sufficient quantity to show a seasonal trend.

Fishing Gear: Hook and line.

3.4.2.6. THE SILVERSIDE FAMILY, ATHERINIDAE

The species are known from California, the jacksmelt, topsmelt, and the grunion. These fishes are commonly called "smelt" which is a misnomer (true smelts appear on pages 38 and 39). **Family Characters:** Abdominal pelvic fins; two dorsal fins, the first composed of weak spines, the second of soft rays; teeth small or absent; no lateral line; a silvery streak along the side; a single spine at the front of the anal fin.

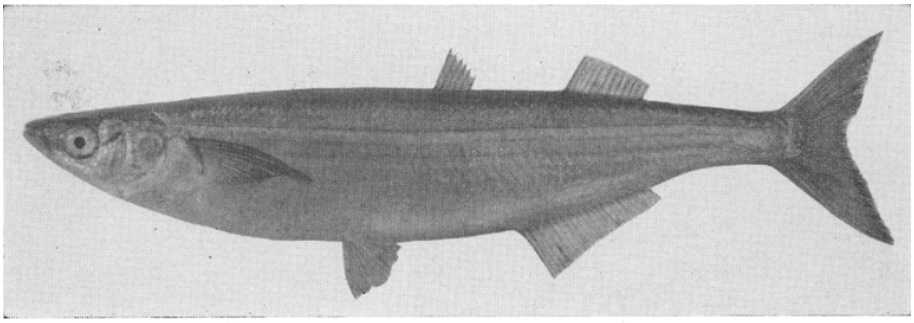


FIGURE 73

FIGURE 73

JACKSMELT

Atherinopsis californiensis Girard

Range: Northern Oregon to southern Baja California (Santa Maria Bay).

Description: See above. Snout prominent, mouth rather large and teeth small, unforked, set in bands (separating it from the topsmelt and grunion; Figure 166); front of spiny dorsal fin in front of vent; jaws even. **Length** to 22 inches. **Color:** Grayish green to green above, with a bluish tinge; sides and belly silvery; a metallic band tinged with blue and edged above with bright blue extends the length of the body.

Importance: The leading commercial "smelt" forming two-thirds to three-fourths of the State's "smelt" catch. Heaviest landings are made at San Francisco. Sold entirely in the fresh fish markets. Used in very small quantities as live bait. Taken in considerable quantity by anglers, especially from piers, and sought especially in the Pismo Beach-Avila area.

Fishing Season: Throughout the year.

Fishing Gear: Lampara nets, gill nets, circle gill nets. Sport, with baited hooks or with snag lines after chumming heavily.

Remarks: Occurs in schools, often with topsmelt. Usually found within a few miles of shore. The spawning season is from October to March, the individual fish spawning more than once. Most jacksmelt mature when two years old and about six inches long; they are known to reach an age of eight or nine years. Reference, Clark (1929).

Unauthorized Names: Smelt, horse smelt, blue smelt.

The "Smelt" Fishery: As noted above, landings of "smelt" in California consist chiefly of jacksmelt. The balance is primarily topsmelt with some grunion; only a small fraction to the total consists of true smelts, family Osmeridae. The fishery is of minor importance.

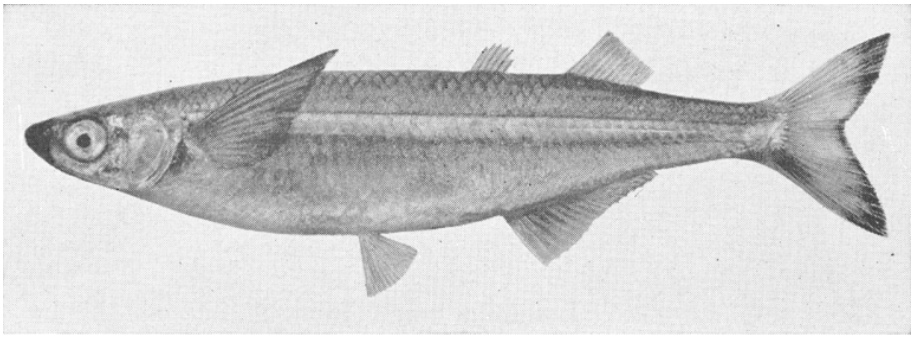


FIGURE 74

FIGURE 74

TOPSMELT

Atherinops affinis (Ayres)

Relationship: Several subspecies are recognized in California, including the San Francisco topsmelt (A. a. affinis), bay topsmelt (A. a. littoralis), kelp topsmelt (A. a. cedroscensis), and island topsmelt (A. a. insularum).

Range: Northern Oregon south into the Gulf of California. A schooling fish, often in company with jacksmelt.

Description: See opposite page, top. Tip of blunt or rounded upper jaw projects very slightly over tip of lower; teeth forked, set in a single row in the jaws (separating it from the jacksmelt and the grunion; Figure 167); front of first dorsal fin about over vent. **Length** to about 12 inches. **Color:** Blue-gray to clear green above, becoming silvery below; a bright silver band bordered above with bright blue or purple extends the length of the body.

Importance: A minor commercial species, it is estimated to form about a quarter of the statewide "smelt" catch.

Fishing Season: Throughout the year.

Fishing Gear: Roundhaul nets, gill nets, circle gill nets, baited hooks or snag lines after heavy chumming.

Remarks: These are common inshore fishes which enter brackish and even fresh water. They mature at two or three years of age, spawning in shallow water and depositing their eggs on marine plants. Reference Schultz (1933).

Unauthorized Name: Smelt.

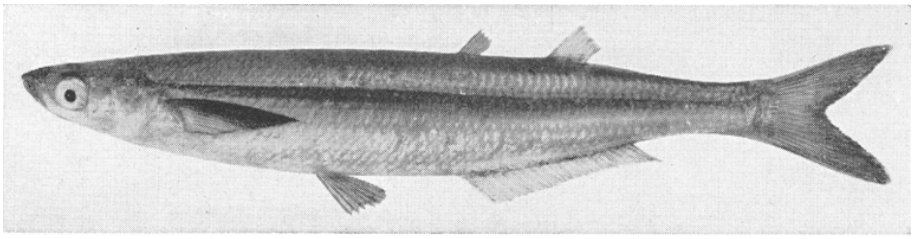


FIGURE 75

FIGURE 75

CALIFORNIA GRUNION

Leuresthes tenuis (Ayres)

Range: Monterey Bay at least to San Juanico Bay, southern Baja California; uncommon north of Pt. Conception and south of Pt. Abreojos.

Description: See page 76. Body very slender, no teeth in mouth (separating it from the jacksmelt and topsmelt); front of upper jaw (premaxillary) can be drawn out for a considerable distance to form a tube; front of first dorsal fin back of vent. **Length** to about seven inches. **Color:** Bluish green above, silvery below; a bright silvery band tinged with blue and bordered above with violet extends the length of the body.

Importance: Because of its remarkable spawning habits, it is of great interest to amateur fishermen, who catch large numbers on the beaches during the open months of the spawning season. of minor commercial significance, it forms a very small portion of the statewide "smelt" catch.

Fishing Season: Currently (1953) cannot be taken during April and May. Consult fish and game laws.

Fishing Gear: Illegal to catch in the surf or on the beach except with the hands. Commercially in roundhaul nets.

Habits: These fish are famous for their remarkable spawning habits, for they come onto beaches at night to spawn during the periods of highest tides. The spawning season extends from late February or March to August or early September. The eggs are buried in the sand, to be released and to hatch on the next series of high tides. While the times of the spawning runs can be predicted with accuracy, the fish are erratic in their appearance on any specific beach. At a year of age the fish are about five inches long and are mature. The usual life span is two or three years. They are found in inshore waters and are believed to be nonmigratory. Reference Walker, 1952.

GULF GRUNION

Leuresthes sardina (Jenkins & Evermann)

This closely related species found in the upper portion of the Gulf of California is coming more and more to the attention of California sport fishermen as the gulf area becomes more accessible. It spawns in daylight hours as well as at night.

3.4.2.7. THE MULLET FAMILY, MUGILIDAE

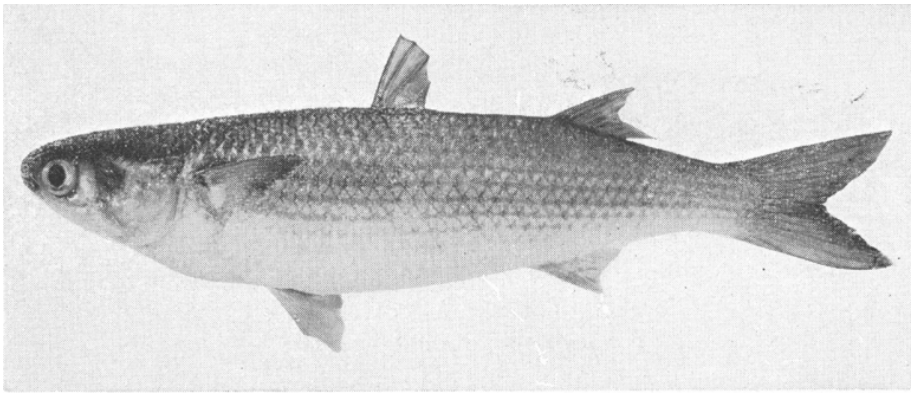


FIGURE 76

FIGURE 76

STRIPED MULLET

Mugil cephalus Linnaeus

Relationship: The only member of the family found in California.

Range: Warm seas throughout the world; from Central California to Chile on our coast. Not common north of Los Angeles County. A schooling fish, usually found in bays and lagoons along the coast; also occurs in the lower Colorado River and the Salton Sea.

Description: Dorsal fins two, well-separated, the first usually with four slender spines; teeth minute; no lateral line; space between eyes very broad, almost one-half as long as the head; scales large. **Length** to about three feet. **Weight** to about 15 pounds. **Color:** Deep olive-gray on the back becoming silvery on sides and belly; distinct dark stripes along each row of scales on sides and back.

Importance: A good food fish but not the object of a heavy fishery in California.

Fishing Season: Throughout the year in the ocean. Taken commercially in the Salton Sea only under permit and at specified times.

Fishing Gear: Beach seines, gill nets, dip nets, snag hooks.

Remarks: This usually is the fish seen jumping in bays. It feeds on algae and diatoms.

3.4.2.8. THE BARRACUDA FAMILY, SPHYRAENIDAE

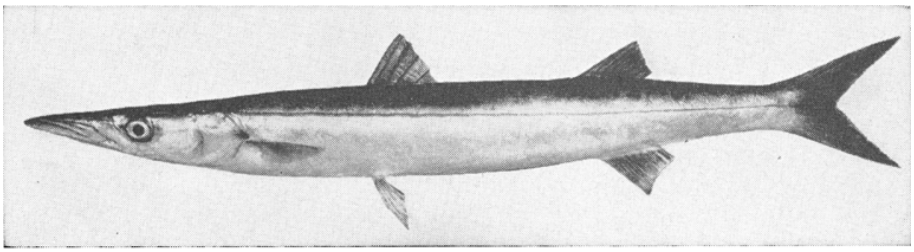


FIGURE 77

FIGURE 77

CALIFORNIA BARRACUDA

Sphyraena argentea Girard

Relationship: The only member of the family found in California.

Range: Alaska to Magdalena Bay, Baja California; not common north of Pt. Conception. Reports of this fish from the Gulf of California are now thought to refer to another species. Occurs in schools.

Description: Body slender, cigar-shaped; lower jaw pointed, extending beyond the upper; teeth strong, unequal; two well-separated dorsal fins, the first composed of five spines, the second of one spine and soft rays; lateral line present. **Length** to about four feet and weight to 10 or 12 pounds. **Color:** Brownish with a blue tinge to metallic blackish gray above; silvery to whitish on the sides and underpart; tail yellowish.

Importance: One of the most important market species in Southern California. Fifteenth in volume among the State's commercial fishes in 1951 and thirteenth in value; heaviest landings were at Los Angeles. Sold fresh almost exclusively; small amounts are occasionally smoked or canned. One of our most desirable game fishes, it ranked third in terms of numbers caught in the entire State and second in Southern California in 1951.

Fishing Season: Reaches a peak in Southern California during the spring and summer, falling off to almost nothing in the winter. Taken throughout the year in Mexico. About two-thirds of the 1951 commercial catch was made in Mexico.

Fishing Gear: Gill nets, poles and live bait, troll lines. Illegal to take in roundhaul nets in California; purse seines are used in Mexican waters. Sportsmen usually fish with live bait from boats and from barges and piers. Also caught by jigging or trolling with feather or bone jigs and with plugs.

Remarks: Studies by Walford (1932) showed that barracuda spawn in the spring and summer, individual fish spawning more than once each season. Most females, and all males, spawn in their second year. The fish reach at least 11 years of age.

Unauthorized Name: Scooter.

3.4.2.9. THE BUTTERFISH FAMILY, STROMATEIDAE

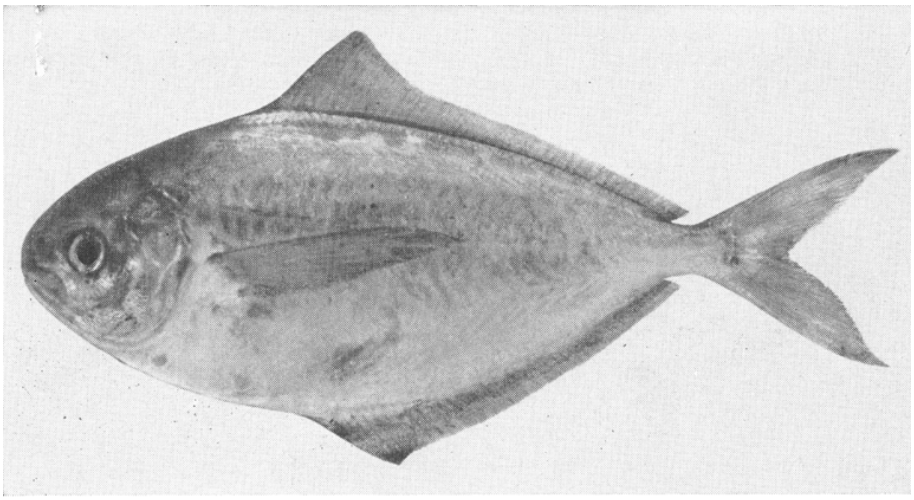


FIGURE 78
FIGURE 78

CALIFORNIA POMPANO
Palometa simillima (Ayres)

Relationship: The only California member of the family and not a true pompano. The true pompanoes belong to the jack family, Carangidae.

Range: British Columbia at least to Cedros Island, central Baja California.

Description: Body deep, thin; no pelvic fins; dorsal and anal fins long, low, about the same length and shape. **Length** to 8 or 10 inches. **Color:** Dull green or blue shading into bright silvery below, the whole fish gleaming with iridescence.

Importance: A minor species in terms of total catch, but considered a delicacy and brings a high price. Most of the 1951 catch was delivered at Los Angeles. Sold entirely in the fresh fish markets. Sought by a few sportsmen, it is taken in fair quantity, particularly by pier fishermen.

Fishing Season: Caught irregularly throughout the year.

Fishing Gear: Small roundhaul nets. Sportsmen use very small hooks and cut bait or snag hooks.

3.4.2.10. THE DOLPHINFISH FAMILY, CORYPHAENIDAE

COMMON DOLPHINFISH
Coryphaena hippurus Linnaeus

Relationship: One of the two known species.

Range: Worldwide in warm seas; in some years taken in fair numbers off San Diego; recorded as far north as off the Columbia River.

Description: Dorsal fin single, extremely long, beginning on top of the head, with no spines; pelvics with one spine and five soft rays; profile of older males nearly vertical, that of females rounded. **Weight** reported to 45 pounds. **Color:** Brilliant and highly variable; nearly always bright golden yellow spotted with black when taken from water; a boated fish may exhibit virtually every color known in a rapidly changing series as it dies.

Importance: Too scarce and sporadic to be of any significance in California. Considered a fine game fish.

3.4.2.11. THE JACK FAMILY, CARANGIDAE

This is a large family the members of which are usually found in warm seas. Seven species are recorded from California but only two of them are of regular occurrence—the yellowtail and the jack mackerel.

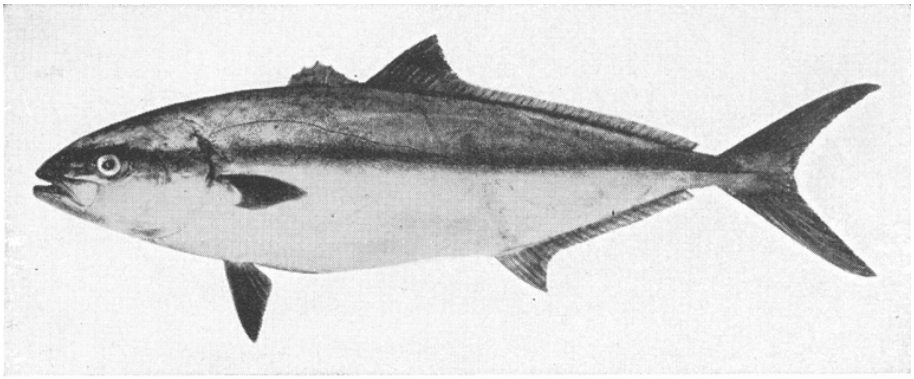


FIGURE 79

FIGURE 79

CALIFORNIA YELLOWTAIL

Seriola dorsalis (Gill)

Range: Central California (Monterey Bay) south along the Baja California coast and into the Gulf of California. Rare north of Pt. Conception. A schooling fish.

Description: Two dorsal fins, the first composed of spines less than half the height of the first soft rays; a blunt low keel on either side of the slender caudal peduncle; no shields along the lateral line. **Weight** in California generally under 15 pounds; a record speciment from Guadalupe Island, Mexico, weighed 80 pounds and was nearly five feet long. **Color:** Metallic blue to green above, a brassy horizontal stripe along the sides from eye to tail; silvery below; tail yellowish green.

Importance: An extremely popular Southern California game fish, particularly at San Diego, but not taken in large numbers. Commercially, California's twelfth fishery in volume and value in 1951. Landed chiefly at Los Angeles and San Diego. Most of the catch is made in Mexican waters and most of the Mexican catch is canned.

Fishing Season: Throughout the year in Mexican waters. Most abundant in California in the summer and early fall.

Fishing Gear: In California, both commercial and sport fishermen use hook and line, generally with live bait. Roundhaul nets are illegal in California but most of the Mexican catch is taken in purse seines.

MEXICAN SCAD

Decapterus hypodus Gill

Range: Apparently abundant in northern Baja California and at Guadalupe Island; recorded from San Clemente Island. South at least to San Benedicto Island (Revilla Gigedo group). **Description:** Bears a close superficial resemblance to the jack mackerel but has no accessory lateral line, has enlarged scales only along last half of lateral line and has a widely separated finlet following both dorsal and anal fins.

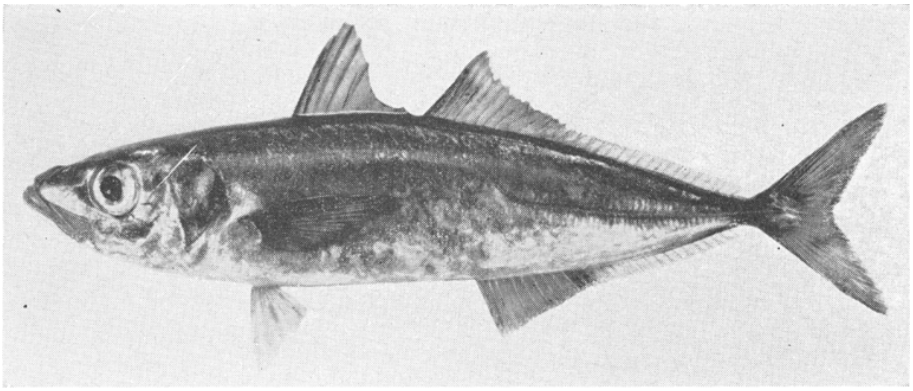


FIGURE 80

FIGURE 80

PACIFIC JACK MACKEREL

Trachurus symmetricus (Ayres)

Range: British Columbia south at least to Acapulco, Mexico.

Description: Dorsal fins two, close together; an accessory lateral line along the back close to base of first dorsal, usually terminating at origin of second dorsal (Figure 169); lateral line bends down abruptly above vent, bony shields along its entire length; no distinctly separate finlet after the dorsal and anal fins. **Length:** to 30 inches (total). Commercial sizes usually range from 8 to 15 inches. **Weight** at least to five pounds. **Color:** Iridescent green above, sometimes with a bluish luster, often mottled with lighter and darker shades; silvery on the sides and belly.

Importance: Not the object of an intensive fishery until 1947. Since then of major importance, its rise occasioned by the scarcity of sardines and Pacific mackerel. Fourth in poundage and fifth in value in 1951. Used almost entirely for canning. Fished chiefly in Southern California and landed for the most part at Los Angeles.

Fishing Season: Throughout the year.

Fishing Gear: Roundhaul nets, chiefly purse seines, and accidentally on lines, in scoops and in gill nets. Occasionally taken by sportsmen.

Remarks: A schooling fish, found fairly often with sardines and Pacific mackerel. It has been caught nearly 500 miles off the California coast, but is fished rather close to shore. It is believed that very large individuals are 20 or more years old. Those in the commercial catch are for the most part less than six years of age. The spawning season apparently centers in the spring, with the major spawning grounds well off the Southern California and northern Baja California coasts. References: Roedel and Fitch, 1952; Roedel, 1953a.

Unauthorized Names: Horse mackerel, Spanish mackerel.

3.4.3. THE MACKEREL-LIKE FISHES

This group includes some of California's most important commercial and game fishes. All have one character in common—the series of four or more finlets following both dorsal and anal fins. References: Kishinouye (1923), Fraser-Brunner (1950a), Rivas (1951).

3.4.3.1. THE MACKEREL FAMILY, SCOMBRIDAE

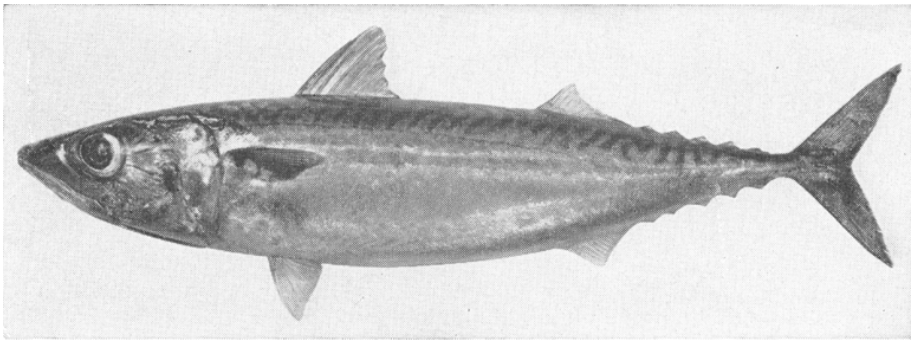


FIGURE 81

FIGURE 81

PACIFIC MACKEREL

Pneumatophorus diego (Ayres)

Relationship: The only member of the family in California waters. Very similar species are found elsewhere; many workers consider this fish a subspecies of the Japanese P. japonicus.

Range: Gulf of Alaska south to Mazatlan, Mexico; the Gulf of California as far as Guaymas (Walker, 1953); the Revilla Gigedo Islands. Not common north of Monterey Bay.

Description: Dorsal and anal finlets 5 (4–6); first dorsal fin rather high, widely separated from the much lower second dorsal; scales small, easily lost; two very small keels on each side of caudal peduncle; a series of about 30 wavy dark streaks run vertically down the back to just below the lateral line. **Length:** Usually under 15 inches, though there is record of a 25-inch specimen which weighed over 6# pounds. **Color:** Dark green to blue above with metallic reflections, shading into iridescent silvery on the sides and below; wavy bars as described above.

Importance: California's fifth fishery in volume and eighth in value in 1951. The catch has fallen off sharply in recent years. Used almost entirely for canning. Most of the catch is delivered at Los Angeles Harbor and at Newport Beach. Not considered a desirable game fish, though fairly large numbers are caught by Southern California sportsmen; it ranked ninth in number caught among the State's ocean sport fishes in 1951.

Fishing Season: Taken throughout the year with the bulk of the catch landed from September through December.

Fishing Gear: Mackerel scoops, roundhaul nets; small quantities with striker poles, set lines, hook and line, gill nets. Will strike on all types of baits and lures.

Remarks: Occurs in large schools, sometimes mixed with sardines or jack mackerel. Most mackerel mature at an age of two years when slightly over a foot long. Spawn has been found along the coast from Southern California into the Gulf of California; spawning reaches its peak in the spring at which time the fish are scarce in Southern California. There is evidence that fish from the southernmost part of the range form a separate population which does not contribute to the fishery. Tagging experiments showed that fish from central Baja California do move into California waters. The most recent reviews of the fishery are by Fitch (1952a) and Roedel (1952).

Unauthorized Names: Blue mackerel, green mackerel, striped mackerel.

3.4.3.2. THE SPANISH MACKEREL FAMILY, CYBIIDAE

This family, which includes the bonitos, has a world-wide distribution in tropic and temperate seas. Two species are known from California. In these fishes the first dorsal fin is longer than the head and the body is completely covered with scales.

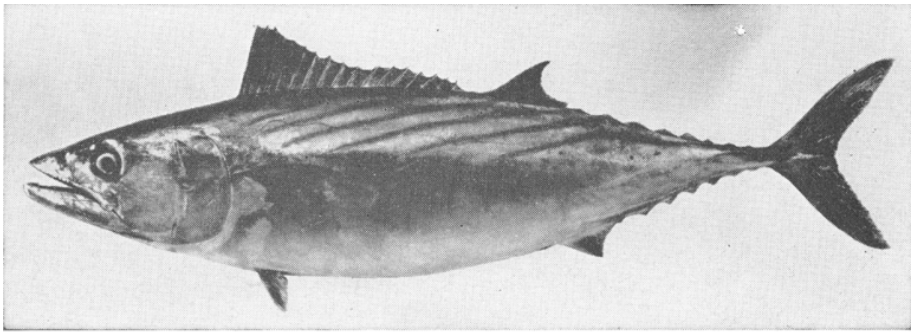


FIGURE 82

FIGURE 82

CALIFORNIA BONITO

Sarda lineolata (Girard)

Relationship: This fish has at times been considered identical with the South American S. chilensis.

Range: From Vancouver Island south into Baja California at least to Magdalena Bay; not common north of Pt. Conception. A schooling fish.

Description: See above. Dorsal and anal finlets 6–8; oblique dark stripes on back above lateral line; 15 or more gill rakers on lower limb of first arch. **Weight** to 25 pounds. **Length** to 40 inches. **Color:** Blue to violet above with greenish reflections and a metallic luster, shading into silvery below; stripes on the back as described above; young with vague darker vertical bars.

Importance: A relatively minor commercial variety. Heaviest landings are normally made at Los Angeles with most of the balance delivered to San Diego. Used almost entirely for canning, it is considered the least desirable of the tuna-like fishes. The pack cannot be labeled "tuna." A desirable sport fish, although caught in relatively small numbers.

Fishing Season: Throughout the year. Most of the catch is made in Mexican waters.

Fishing Gear: Hook and line with live bait; purse seines.

MEXICAN BONITO

Sarda velox Meek & Hildebrand

Reported from Magdalena Bay, Baja California, to Peru, this fish may be taken incidentally by California vessels. Gill rakers on lower limb of first arch less than 10.

SPANISH MACKERELS

Genus Scomberomorus

The sierra, S. sierra Jordan & Starks, and the Monterey Spanish mackerel, S. concolor (Lockington), are Mexican species; the latter is occasionally caught off Southern California and in years past was known from Monterey Bay (records of sierra from California are now thought to refer to concolor). Small amounts of Mexican-caught sierra are delivered to Southern California ports. **Characters:** As for family (above); S. sierra heavily spotted with gold, 10–12 gill rakers on lower limb of first arch; S. concolor lightly spotted or unspotted, 15–20 gill rakers on lower limb. Both reach but seldom exceed five pounds in weight.

3.4.3.3. THE SKIPJACK FAMILY, KATSUWONIDAE

This family, widespread in temperate and tropical seas, is represented in California by three species. One, the skipjack, is of great commercial importance. The other two, rare in California, are frequently encountered by our fishermen in Central American waters, but have at present no commercial value. In this family, scales are confined to the fore part of the body (the corselet) and along the lateral line. References: Godsil and Byers (1944), Shaefer and Marr (1948), Shimada (1951).

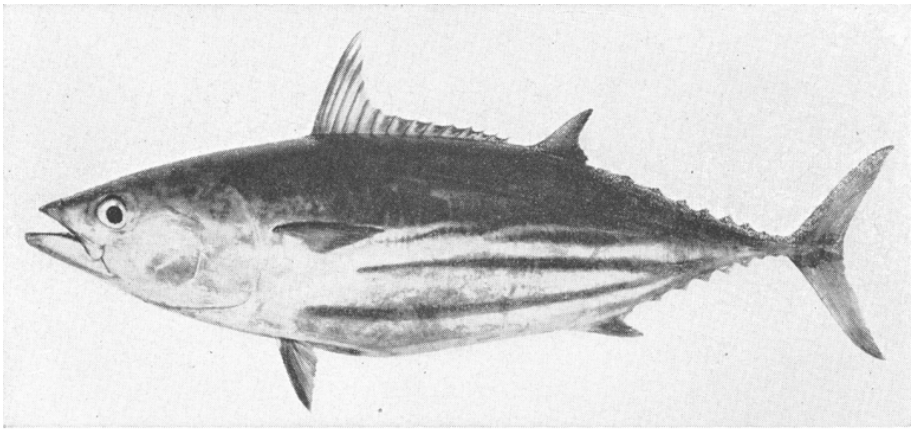


FIGURE 83

FIGURE 83

SKIPJACK

Katsuwonus pelamis (Linnaeus)

Range: Cosmopolitan in temperate and tropical seas. In the eastern Pacific, from Vancouver Island to the coast of South America (rare north of Pt. Conception and not common in Southern California); spans the Pacific to Hawaii and Japan. A schooling fish found commercially both close to shore and at considerable distances from land.

Description: See above. Dorsal finlets usually 8, anal finlets usually 7; four or five dark stripes along sides and belly (distinguishing it from our other tuna-like fishes). **Length** rarely exceeds two feet; there are two records of three-foot, 43-pound specimens. **Color:** Blue to violet above, becoming dull after death; silvery on the sides and below; stripes as described above.

Importance: Third in poundage and second in value among California fisheries in 1951, with San Diego the leading port and Los Angeles second. Used entirely for canning. A desirable sport fish, but not taken in any quantity.

Fishing Season: Throughout the year. Most of the catch is made off Mexico and Central America where skipjack and yellowfin tuna form a single fishery. Most abundant in California during August and September.

Fishing Gear: Hook and line with live bait; purse seines. Most of the sport catch is taken with live bait or by trolling.

Unauthorized Names: Striped tuna, oceanic bonito.

BLACK SKIPJACK

Euthynnus lineatus Kishinouye

Common off Mexico and Central America; reported twice from Southern California. Length to about two feet; striped horizontally above; several dark blotches below pectoral fin.

BULLET MACKEREL

Genus Auxis

Common off Mexico and Central America and reported at times from Southern California. Two species are known to exist in the eastern Pacific. Length to about 16 inches; dorsal fins widely separated; dorsal and anal finlets 7–9.

3.4.3.4. THE TUNA FAMILY, THUNNIDAE

Tunas enjoy a world-wide distribution in tropical and temperate seas. The three species known from California are among the State's most important commercial varieties. In the tunas, the body is completely covered with scales and the base of the first dorsal is shorter than the head. References: Godsil and Byers (1944), Godsil (1948), Schaefer and Marr (1948), Godsil and Holmberg (1950), Shimada (1951), Schaefer (1952), Ginsberg (1953).

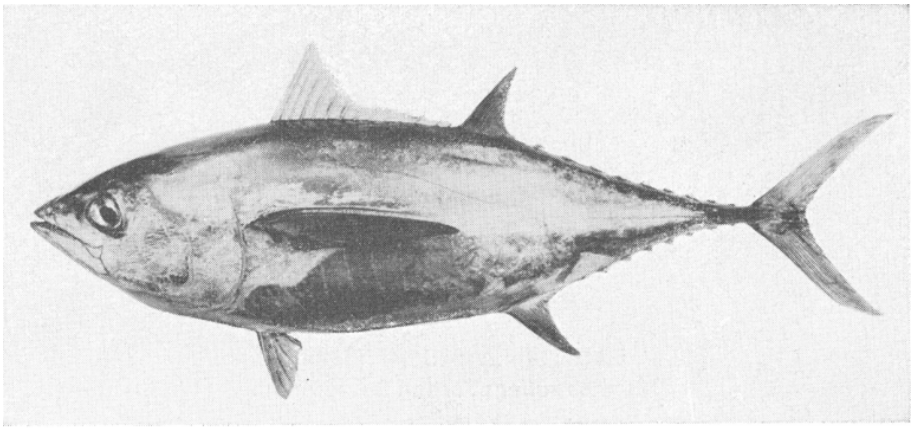


FIGURE 84

FIGURE 84

PACIFIC YELLOWFIN TUNA

Neothunnus macropterus (Temminck & Schlegel)

Relationship: The question of the relationship of the yellowfins from the Pacific, Indian and Atlantic oceans remains unresolved. All may prove referable to a single species.

Range: In the eastern Pacific from Pt. Conception to Peru; spans the Pacific to Asia. Usually found off Southern California only in the summer and fall and then not common.

Description: See above. Dorsal and anal finlets usually 8; pectoral fin reaches normally beyond front of anal fin; vent oval or tear shaped; ventral liver surface unmarked, of uniform color; second dorsal and anal fins may be greatly elongated in larger specimens. (Vent round, and ventral surface of liver radially striated in albacore and bluefin; faint marginal striations on ventral surface of liver and a more elongated pectoral fin in bigeye tuna.) **Weight** to 450 pounds, though California specimens rarely exceed 125 pounds. **Color:** Metallic dark blue above, shading into silvery gray below. When first caught, there is generally a golden yellow, iridescent band along the side. Fins tinged with yellow; the finlets usually lemon yellow edged with black. Belly marked with transverse white bars with irregular white dots or blotches between, especially in younger fish.

Fishery: The California tuna fleet operates chiefly off Central America and northern South America, extending its activities as far south as Peru. Practically none of the catch originates in California waters. Yellowfin and skipjack form the basis of a single fishery, yellowfin usually being found commercially on the coastal shelf and at outlying banks and islands.

Importance: Second in poundage and first in value among California's fisheries in 1951. San Diego is the leading port followed by Los Angeles. Used almost entirely for canning. One of the most desirable game fish in Southern California but taken in small numbers.

Fishing Season: Throughout the year.

Fishing Gear: Pole and line with live bait; purse seines; sport, both live bait or trolling.

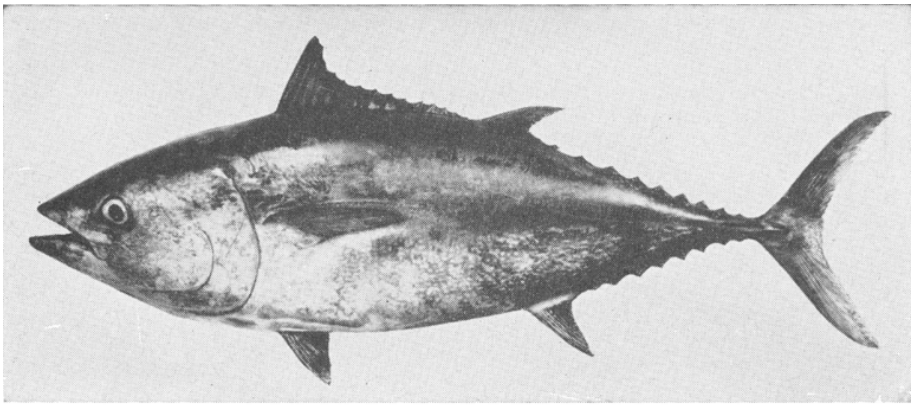


FIGURE 85

FIGURE 85

CALIFORNIA BLUEFIN TUNA

Thunnus saliens Jordan & Evermann

Relationship: Formerly considered identical with the Atlantic bluefin, T. thynnus. Recent studies (Godsil and Holmberg, 1950) showed differences between Atlantic and California specimens which warrant recognition of the California bluefin as a distinct form, provisionally as a distinct species.

Range: Recorded from the Columbia River to Cape San Lucas, Baja California; common only from Pt. Conception to central Baja California. A schooling fish usually seen in the summer and fall.

Description: See page 87, top. Dorsal finlets usually 8, anal finlets usually 7; pectoral fin short, usually extending only to 11th or 12th dorsal spine, shorter than head; vent round; entire ventral surface of liver striated radially with blood vessels. (Generally distinguished from the other tunas by the relatively short pectoral fin; vent oval in the yellowfin and bigeye.) **Weight:** To about 250 pounds; it is a much smaller fish than the Atlantic bluefin which is reputed to reach 1,800 pounds. Commercial sizes usually 10 to 40 pounds; sporadic runs of fish over 100 pounds occur. **Color:** Deep blue above; silvery on the sides and belly; the belly with irregular white spots. Lacks the golden yellow band along the sides and the black edging of the finlets found on the yellowfin tuna when caught.

Importance: Thirteenth in the State in poundage and tenth in value during 1951. Los Angeles is the leading port of landing, followed by San Diego. A prized game fish but not taken in any quantity.

Fishing Season: Usually reaches a peak in July and August. Only very occasional catches are made during the winter months. Fished in both California and Mexican waters, particularly at Guadalupe Island. The great bulk of the 1951 catch originated in Mexican waters.

Fishing Gear: Purse seines (commercial); hook and line (sport).

BIGEYE TUNA

Parathunnus sibi (Temminck & Schlegel)

Widely distributed in the Pacific; known in the eastern portion from the Galapagos Islands, where it is reported fairly abundant in the fall, Guadalupe Island and Alijos Rocks: recurrent reports from California remain unverified. Occasionally enters the commercial catch but not differentiated in the records from yellowfin. Distinguished by long pectorals extending beyond anal insertion, faint marginal striations on ventral surface of liver and an oval vent.

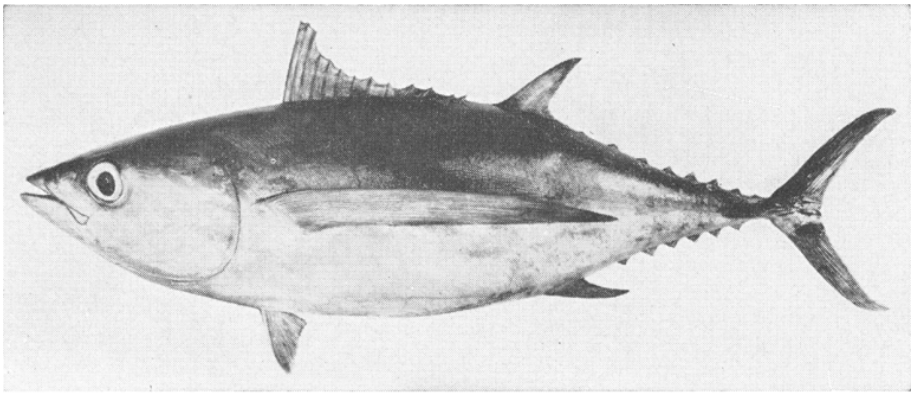


FIGURE 86

FIGURE 86

PACIFIC ALBACORE

Thunnus germo (Lacépède)

Relationship: May prove identical with the Atlantic species (T. alalunga).

Range: Widespread in temperate waters of the Pacific. It has been taken near the equator in deep, cooler water. From Alaska to central Baja California on our coast. A schooling fish usually found in relatively warm, blue, oceanic waters.

Description: See page 87, top. Dorsal and anal finlets 7 or 8; pectoral fins very long, extending beyond front of anal fin; vent round; entire ventral surface of liver striated with blood vessels. (Differentiated from bluefin and, generally, yellowfin by the elongated pectoral; from yellowfin and bigeye by the round vent.) **Weight** reputed to 80 pounds; usually less than 40 pounds. **Color:** Dark steel blue above, silvery on the sides and underparts.

Importance: Considered the best of the tunas for canning and the only one which can be labeled "white meat tuna." The State's sixth fishery in volume and fourth in value in 1951. Over half of the 1951 catch was made off the Baja California coast. One of the leaders in general popularity among Southern California sportsmen and fourth in the state-wide sport catch (numbers) in 1951.

Fishing Season: Chiefly from June through November with the peak in August and September. During the balance of the year albacore are usually not present in California and Baja California waters.

Fishing Gear: Hook and line with live bait, feather jigs; troll lines with feather or bone lures. Most of the sport catch is taken with live bait.

Food: McHugh (1952) found that fishes dominated in the albacore's diet, with the saury (page 44) the most important species.

3.4.3.5. THE SAILFISH FAMILY, ISTIOPHORIDAE

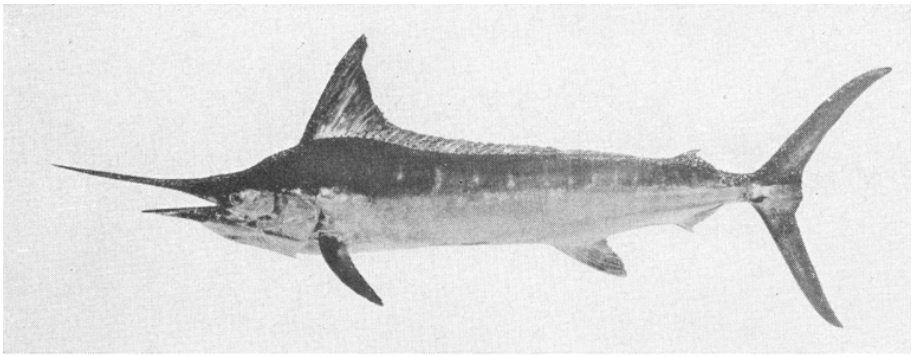


FIGURE 87

FIGURE 87

STRIPED MARLIN

Makaira mitsukurii (Jordan & Snyder)

Relationship: A number of marlins are found in different parts of the world and some ichthyologists believe that several kinds occur in California. The sailfish belongs to the same family.

Range: Pt. Conception south into Mexico. Thought to be the same species as is found off Japan, Hawaii and New Zealand.

Description: Upper jaw prolonged, the "sword" more rounded and less sharp-edged than in the swordfish; first dorsal fin long, extending almost entire length of back; elongate pelvic fins present; two small keels on either side of base of tail. **Size:** In 1947 the average weight of marlin caught off Southern California was about 150 pounds. The record fish for rod-and-reel, caught in 1931, weighed 692 pounds and was 13 feet, 5 inches long. **Color:** Purplish blue above shading into silvery below, the back crossed with about 15 vertical light blue stripes.

Importance: A highly prized game fish but not the object of a heavy sport fishery because of the cost of private boat charters and specialized fishing tackle. Illegal to buy or sell since 1937.

Fishing Season: From June or July to November or December.

Fishing Gear: May be taken only with hook and line.

Remarks: Recent studies (Hubbs and Wisner, 1953) have shown that the saury (page 44) was by far the most important item in the diet of marlin caught in the San Diego area in 1951.

3.4.3.6. THE SWORDFISH FAMILY, XIPHIIDAE

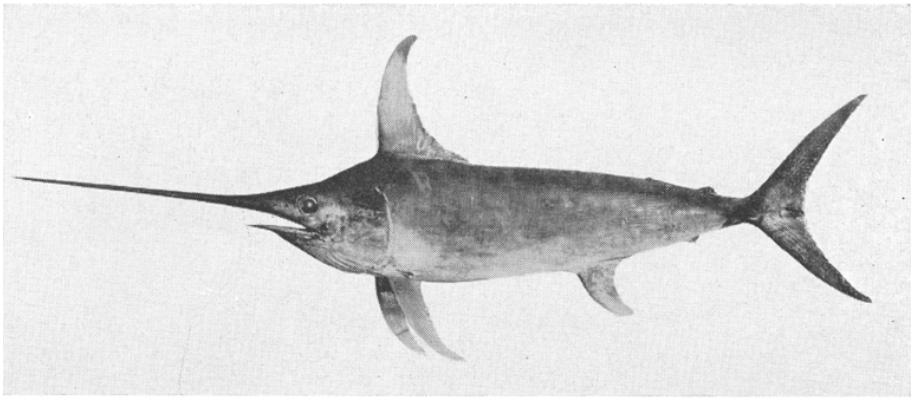


FIGURE 88

FIGURE 88

SWORDFISH

Xiphias gladius Linnaeus

Relationship: The sole member of the family.

Range: Warm and temperate seas throughout the world. On our coast, usually south of Pt. Conception but known from as far north as Oregon.

Description: Upper jaw greatly prolonged, the sword flattened and sharp-edged rather than rounded as in the marlins; first dorsal fin high, short; no pelvic fins; a single wide keel on each side at base of tail. **Size:** Reported to reach 15 feet in length and a weight of over 1,000 pounds. California specimens usually run from 300 to 500 pounds. **Color:** Generally dusky, purplish to almost black above becoming paler on the sides and below.

Importance: Relatively minor in terms of poundage though it is considered a fine food fish and brings a good price. of far less importance as a game fish than is the striped marlin.

Fishing Season: Usually from May to December, with maximum landings between August and October. Part of the catch is made in Mexican waters.

Fishing Gear: Harpoons, hook and line. No other gear is legal.

Alternative Name: Broadbill.

3.4.3.7. THE SALEMA FAMILY, XENICHTHYIDAE

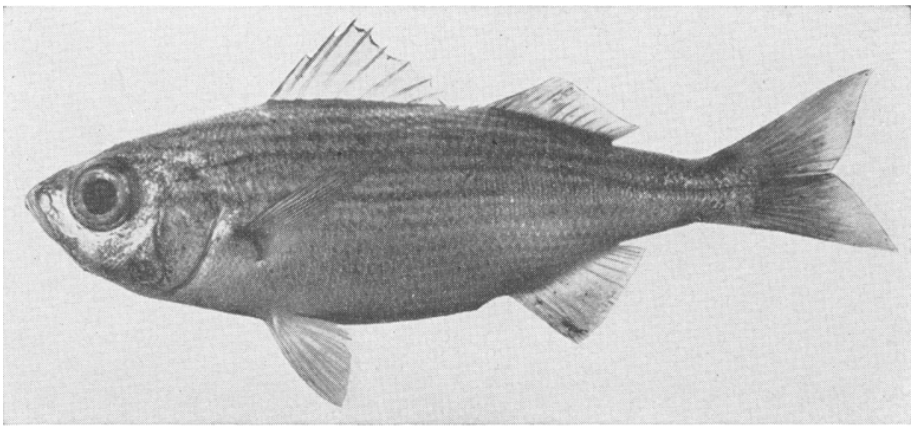


FIGURE 89

FIGURE 89

CALIFORNIA SALEMA

Xenistius californiensis (Steindachner)

Relationship: The only member of the family found in California.

Range: Central California (one record from Monterey Bay; Phillips, 1936) south along the Baja California coast and into the Gulf of California.

Description: Two dorsal fins; three spines at front of anal fin; six to eight orange brown horizontal stripes on sides; most of maxillary slides under bone above it when mouth is closed; pectoral fins reach back past tips of pelvic fins; eye very large, almost equal to one-third length of head. The last three characters separate it from the striped bass (page 71), with which it is sometimes confused in Southern California. **Length** to about 10 inches. **Color:** Blue to green with iridescent reflections above, becoming silvery on the sides and belly; striped as described above, tail fins orange brown, pelvics white, other fins tinged with orange brown.

Importance: Not fished commercially in California and of almost no significance as a game fish. Taken to some extent as tuna bait in Mexican waters. Close relatives are heavily utilized by California tuna fishermen at the Galapagos Islands. All are called "salema" by them.

Fishing Season: Taken irregularly by sportsmen, chiefly in the spring and summer and mostly off San Diego County.

Unauthorized Name: Bigeye bass.

3.4.3.8. THE GRUNT FAMILY, HAEMULIDAE

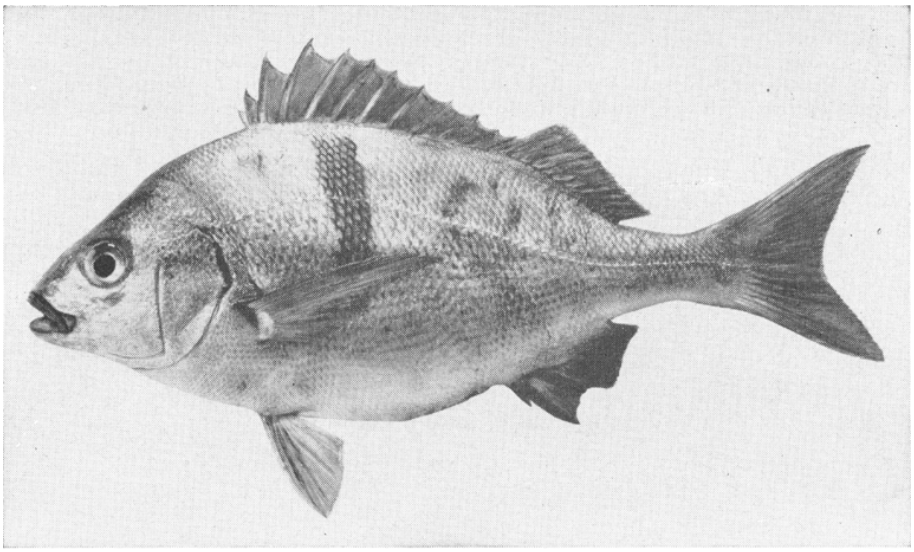


FIGURE 90

FIGURE 90

CALIFORNIA SARGO

Anisotremus davidsoni (Steindachner)

Relationship: The only member of the family in California.

Range: Pt. Conception to and into the Gulf of California.

Description: No teeth on vomer; fine, single-pointed, unmovable teeth on jaws; dorsal fin with 11 or 12 spines and 14 to 16 soft rays; anal fin with three spines and 9 to 11 soft rays; a dark vertical band runs across body; a dark spot on and above base of pectoral fin. **Length** to 20 inches. **Color:** Entirely metallic silvery; iridescent with a grayish tinge above, plain silvery below; back, head and sides sometimes with vague dark blotches; band and spot as described above; caudal, soft dorsal and anal fins with a yellowish tinge. Those caught in bays tend to be darker in color. Young up to three or four inches with several dark horizontal stripes; the vertical bar appears at two or three inches.

Importance: Forms a small proportion of the Southern California "perch" catch. A minor sport fish caught in fair numbers in Newport Bay.

Fishing Season: Irregular, but caught particularly in the summer and fall. Taken incidentally with other species.

Fishing Gear: Hook and line; accidentally in roundhaul nets.

Unauthorized Names: Perch, china croaker, blue bass.

3.4.3.9. THE CROAKER FAMILY, SCIAENIDAE

This is a widespread family, its members typically found along sandy coasts in warm seas. Nine species are recorded from California's ocean waters, including several which are highly prized by sportsmen (one species, Ophioscion thompsoni (Hubbs), is known only from a single specimen). A multitude of relatives are found in Mexican waters and several Gulf of California species have been introduced into the Salton Sea; one, the Gulf croaker, Bairdiella icistius (Jordan & Gilbert), has successfully reproduced there (Douglas, 1953). **Family Characters:** Pelvic fins thoracic, with one spine and five rays; one or two spines at front of anal (may be difficult to see); lateral line extends onto tail fin; no vomerine teeth; two dorsal fins. Reference: Skogsberg, 1939.

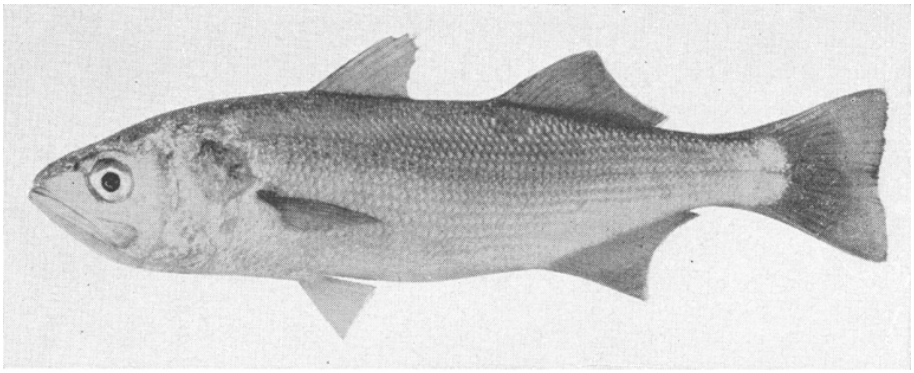


FIGURE 91

FIGURE 91

QUEENFISH

Seriphus politus Ayres

Range: Central California south at least to San Juanico Bay, Baja California (Fitch, 1952b). Less common north of Pt. Conception. Occurs in schools, often with white croaker and other species. Prefers shallow water and sandy bottoms; found also in bays and sloughs.

Description: See above. Lower jaw large, projecting slightly beyond tip of upper; dorsal fins widely separated (separating it from our other croakers); no barbel on lower jaw; base of anal fin almost equal in length to base of second dorsal; two weak spines at front of anal. **Length** to about a foot. **Color:** Bluish above shading into silvery on the sides and underparts; fins yellowish; base of pectorals dusky.

Importance: of minor significance as a market fish. Included with the white croaker in catch records, it forms a small percentage of the "kingfish" catch. Appreciable quantities are used as live bait. It is generally thought far less desirable for this purpose than sardines or anchovies, though it is considered excellent for some species, particularly California halibut. Landed chiefly at Los Angeles. Regarded with contempt by most sportsmen.

Fishing Season: Throughout the year; probably with larger landings in the winter and spring.

Fishing Gear: Taken commercially chiefly with bait nets. Taken by anglers mostly from piers or from boats in shallow water with hook and line, jigging with multiple hooks and a shiner, or with live or dead bait.

Unauthorized Names: Herring, tomcod, shiner, sea trout.

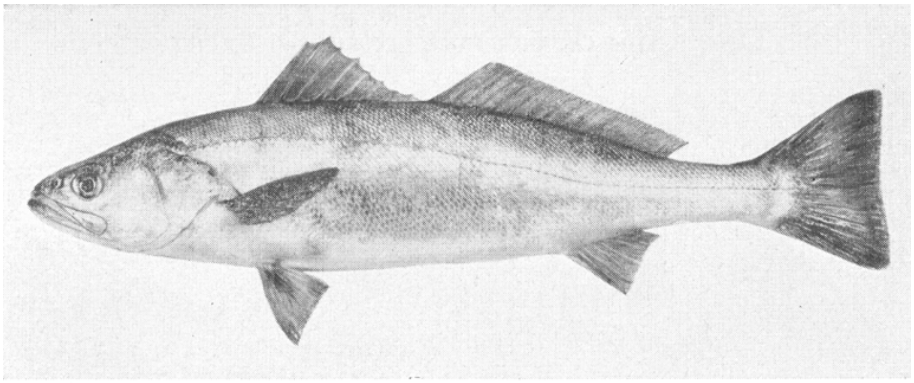


FIGURE 92

FIGURE 92

WHITE SEABASS

Cynoscion nobilis (Ayres)

Relationship: Not a true bass. Closely related to the weakfish of the Atlantic coast, the several Mexican corvinas and the totuava.

Range: Alaska to Magdalena Bay, Baja California, becoming less common north of Pt. Conception and uncommon north of San Francisco.

Description: See oppostie page, top. Lower jaw projects slightly beyond tip of upper; dorsal fins at least in contact; no barbel on lower jaw; base of second dorsal much longer than base of anal; two weak spines at front of anal fin; no caninelike teeth in upper jaw; raised ridge on belly from pelvic base to vent. **Length** to four feet and **weight** to 80 pounds, but specimens of as much as 60 pounds are rare and the usual commercial sizes run 15 to 20 pounds. **Color:** Bluish gray to steely blue above often with gold highlights, frosted silvery to whitish below; inner base of pectoral with a dusky spot. Young, up to a foot or more, with three to six dark vertical bars. Back and sides with very small dark points.

Importance: The most important croaker in California. It ranked seventeenth in poundage and twelfth in value in 1951. Landed mostly in Southern California with greatest poundage in the Los Angeles region in 1951. A valuable market variety and very popular as a sport fish in Southern California. It ranked tenth in terms of numbers caught among the State's ocean sport fishes in 1951. Small amounts of shortfin corvina are included in the Mexican catch.

Fishing Season: Throughout the year, with heaviest landings during the summer and fall months. A small portion of the catch is made in Mexican waters.

Fishing Gear: Gill nets, hook and line. Illegal to take with purse seines or other roundhaul nets in California waters.

Unauthorized Name: Sea trout.

TOTUAVA AND CORVINA

Several species of Cynoscion are abundant in the Gulf of California and are caught by both American and Mexican fishermen. The totuava, C. macdonaldi, an important commercial variety, attains 6 feet in length. It is distinguished from the white seabass by the lack of a ridge on belly. The shortfin, gulf, orangemouth and striped corvinas (C. parvipinnis, C. othonopterus, C. xanthulus, C. reticulatus) all have caninelike teeth in the middle of upper jaw and no ridge on the belly. The shortfin corvina was reported as common off Southern California in years past.

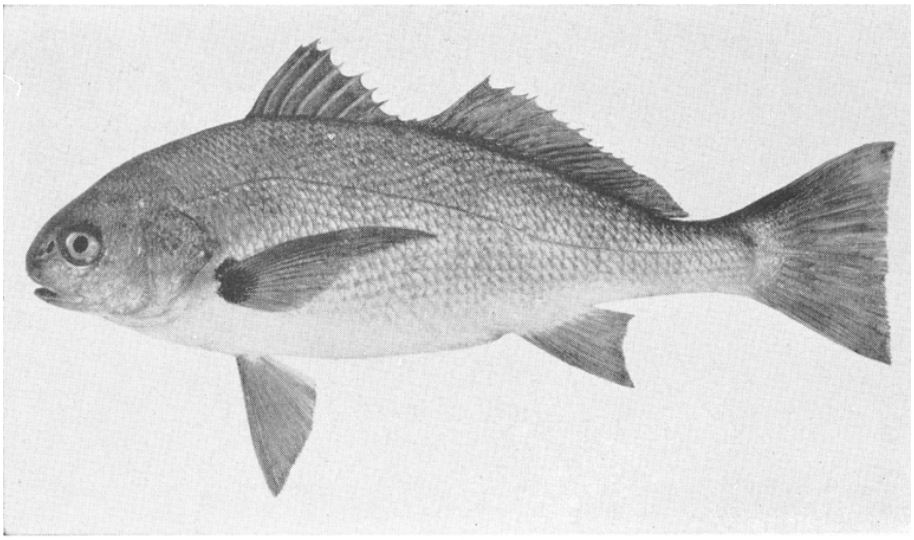


FIGURE 93

FIGURE 93

SPOTFIN CROAKER

Roncador stearnsi (Steindachner)

Range: Point Conception to San Juanico Bay, Baja California (Fitch, 1952b).

Description: See page '94, top. Dorsal fins connected but with a deep notch between them; no barbel on lower jaw; two stout spines at front of anal fin; tip of the snout projects beyond tip of lower jaw; first dorsal fin with less than 12 spines (usually 10); pectoral fin about as long as head; a large black spot at base of pectorals (separating it from our other croakers). **Length:** A record specimen was 26½ inches long and weighed 9¼ pounds. **Color:** Grayish silvery with a bluish luster or metallic steel gray above, becoming silvery to white below; sometimes distinctly golden or brassy; a large black spot covering both the inside and outside surface of the pectoral base.

Importance: Illegal to take with nets since 1909 or to buy or sell since 1915. A very popular sport fish, especially among surf fishermen.

Fishing Season: Throughout the year, but reaching a definite peak in the late summer.

Fishing Methods: Taken chiefly in the surf, but also in bays and from piers, boats and barges, using sand crabs, mussels, clams, etc., as bait.

Unauthorized Name: Golden croaker.

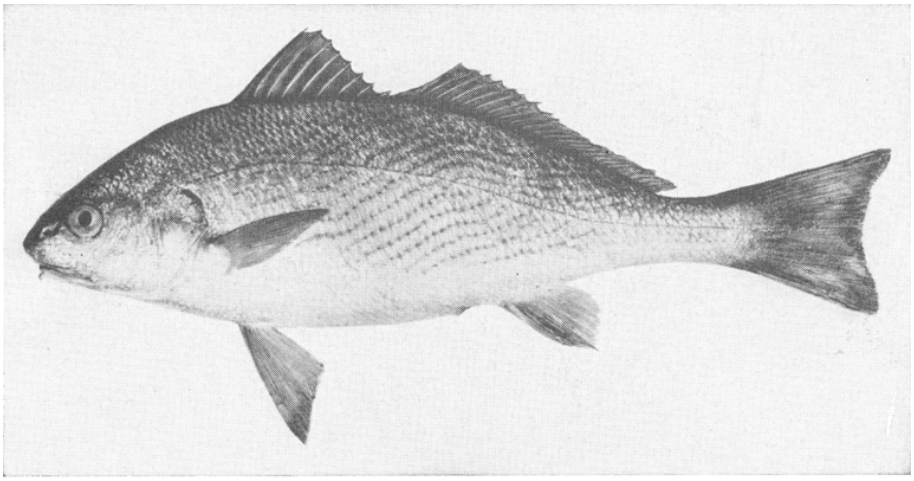


FIGURE 94

FIGURE 94

YELLOWFIN CROAKER

Umbrina roncador Jordan & Gilbert

Range: Pt. Conception to Magdalena Bay, Baja California; perhaps very rarely north to San Francisco. Usually found in shallow water over a sandy bottom, often in the surf or in bays and sloughs.

Description: See page 94, top. Tip of snout projects beyond tip of lower jaw; spiny and soft dorsals connected by a low membrane; a single, short barbel at tip of lower jaw (separating it from our other croakers except the corbina); two strong spines at front of anal fin (separating it from the corbina). **Length** to about 16 inches. **Weight:** Up to three pounds. **Color:** Metallic grayish or greenish with brassy and golden reflections shading into silvery white below; back and sides with many wavy, deep olive lines extending upward and backward following the rows of scales; fins mostly yellow, the dorsals darker.

Importance: Illegal to take with nets since 1909 or to buy or sell since 1915. A prized sport fish.

Fishing Season: Throughout the year, but reaching a peak in the late summer.

Fishing Methods: Taken by sportsmen in the surf, from piers and boats in the ocean and in bays. Usually caught with cut bait, though live bait, especially anchovies, is also considered excellent.

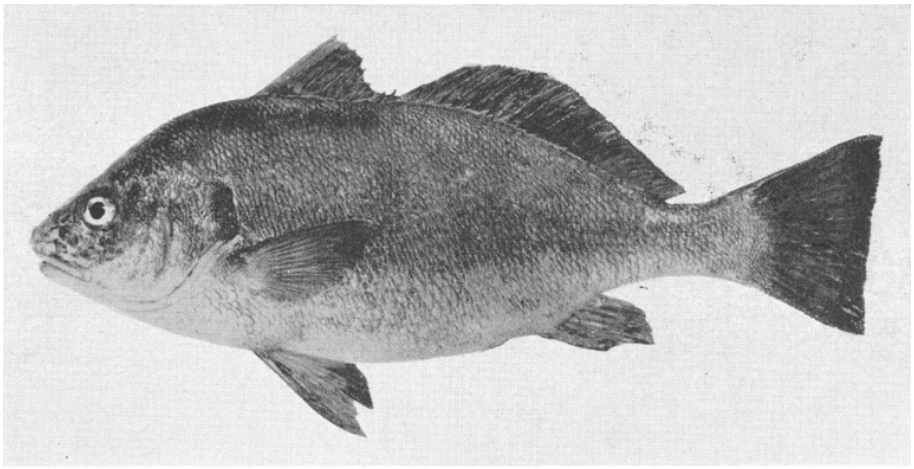


FIGURE 95

FIGURE 95

BLACK CROAKER

Cheilotrema saturnum (Girard)

Range: Point Conception south along the Mexican coast and into the Gulf of California; rather rare. Commercial rockfish fishermen report that they catch them fairly often on set lines in moderately deep water.

Description: See page 94, top. Tip of snout projects beyond tip of lower jaw; dorsal fins connected, but with a deep notch between them; no barbel on lower jaw; spiny dorsal with less than 12 spines (usually 9 or 10); pectoral fin shorter than head; edge of the opercle jet black (separating it from our other croakers); two stout spines at front of anal fin. **Length** to about 15 inches. **Color:** Bluish or dusky to blackish with coppery reflections above; silvery below dusted with dark specks; a vague pale band usually runs across the body from the front of the second dorsal to the pelvic fins; fins dusky; edge of opercle black. Young to about 4 inches with several horizontal black bands on upper two-thirds of body.

Importance: Rarely taken, though it is a good table fish.

Fishing Season: Taken irregularly by sport fishermen.

Fishing Gear: Hook and line, chiefly from piers and in bays and sloughs.

Unauthorized Names: Chinese croaker, black perch, blue bass.

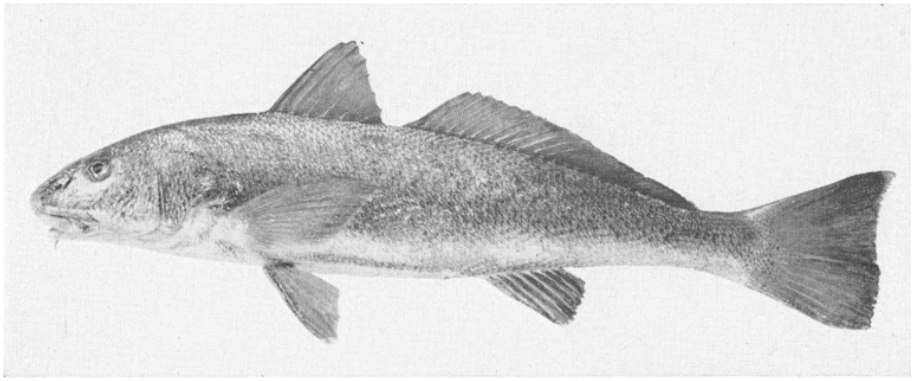


FIGURE 96

FIGURE 96

CALIFORNIA CORBINA

Menticirrhus undulatus (Girard)

Relationship: The Atlantic coast whiting belongs to the same genus.

Range: Pt. Conception south into the Gulf of California; perhaps rarely north of Pt. Conception. A bottom fish usually found on sandy beaches along the coast, but also caught in shallow bays.

Description: See page 94, top. Tip of snout projects beyond tip of lower jaw; spiny and soft dorsals connected by a low membrane; short fleshy barbel at tip of lower jaw (separating it from our other croakers, except the yellowfin); a single weak spine at front of anal fin, sometimes two (two strong spines in yellowfin croaker); lower surface of body somewhat flattened; pectoral fins large and rather fan-shaped. **Length** to 2½ feet; **weight** reported to reach eight pounds but the heaviest specimen we have actually checked weighed 4¼ pounds. **Color:** Sooty gray to steel blue on the back with metallic reflections, shading into gray on the sides and white below.

Importance: Illegal to take with nets since 1909 or to buy or sell since 1915. The most popular game surf fish in Southern California.

Fishing Season: Best in the summer, though these fish are taken throughout the year.

Fishing Methods: Taken almost entirely in the surf, using sand crabs, mussels, clams, or pile worms as bait. Sand crabs probably form the major natural item of its diet.

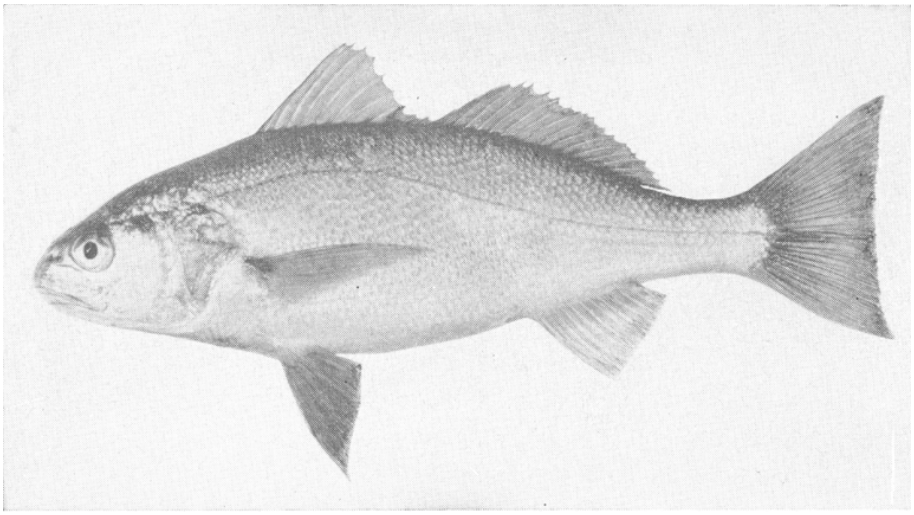


FIGURE 97

FIGURE 97

WHITE CROAKER

Genyonemus lineatus (Ayres)

Range: Vancouver Island to San Juanico Bay, Baja California (Fitch, 1952b); rare north of San Francisco. A schooling fish, often in company with queenfish and other species in shallow water over sand bottoms; found also in bays and sloughs.

Description: See page 94, top. Tip of snout projects beyond lower jaw; several very small barbels on chin; dorsal fins connected, a deep notch between them; two weak spines at front of anal fin; first dorsal fin with 12 to 15 spines. **Length** to a little over a foot; **weight** to at least 2½ pounds. **Color:** Silvery with a brassy luster, becoming lighter below; faint wavy lines follow the rows of scales backward and upward; fins, except the pelvics, normally yellowish; a small black spot at the upper, inner corner of the pectoral base. **Young** up to 4 or 5 inches closely resemble the spotfin croaker but can be distinguished by the greater number of dorsal spines.

Importance: A market species of minor importance forming the bulk of the "kingfish" catch; heaviest landing are made in the Monterey and Los Angeles regions, the latter usually reporting the greatest catch. Used to a small extent as live bait in Southern California. Not considered a game fish, though it is caught in huge quantities by anglers in Southern California, who usually refer to it as "tomcod" or "tommy." The recorded catch in 1951 showed it to rank sixth in number taken among the State's ocean sport species.

Fishing Season: Throughout the year, with maximum landings at Monterey in the summer and fall and at Los Angeles in the late winter and spring.

Fishing Gear: Commercially in small roundhaul nets, gill nets, accidentally in drag nets, and, in small quantity, by hook and line. Taken by sportsmen on hook and line with all types of bait and lures, though, as with the queenfish, it is generally regarded with contempt.

Alternative Name: Kingfish.

Unauthorized Names: Tomcod, herring, roncador, tommy.

3.4.3.10. THE BLANQUILLO FAMILY, BRANCHIOSTEGIDAE

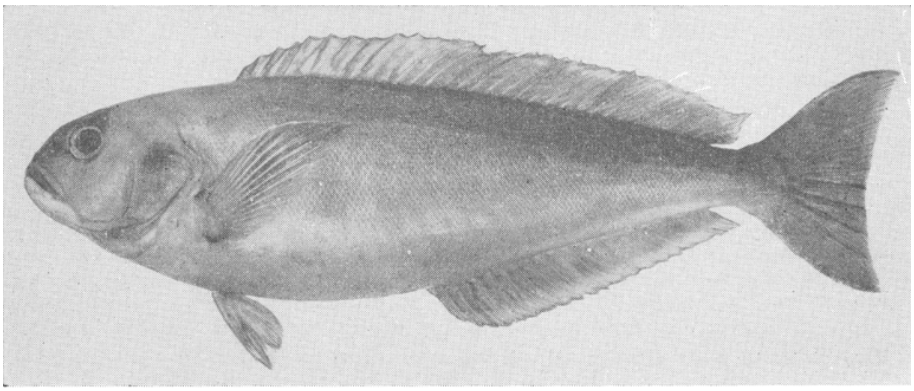


FIGURE 98

FIGURE 98

OCEAN WHITEFISH

Caulolatilus princeps (Jenyns)

Relationship: The only California member of the family; considered a subspecies, C. p. anomalus (Cooper). Not a close relative of the fresh-water whitefish, which is related to the trouts.

Range: Central California to and into the Gulf of California, generally along rocky coasts, not common north of Pt. Conception; the Galapagos Islands and Peru (C. p. princeps).

Description: Dorsal fin long, rather even, unnotched; anal fin long, two spines at front; no teeth on roof of mouth. **Length** to about 40 inches. **Color:** Warm brown above and on the sides, shading into paler below; fins tinged with yellow or green; pectoral fins bluish with a yellowish streak in the center; the dorsal and anal fins with a blue streak near the edge. Occasional specimens are almost entirely yellow.

Importance: A minor market species in Southern California. Considered a good sport fish and taken in some quantity along the Santa Barbara and Ventura County coasts as well as at the Channel Islands. Taken over rocky bottoms usually in conjunction with sheep-head and sand bass.

Fishing Season: Throughout the year, with landings usually greatest in the winter and least in the summer and fall. A varying proportion of the catch is made off Baja California.

Fishing Gear: Hook and line with cut or live bait; set lines.

3.4.3.11. THE SURFPERCHES, FAMILY EMBIOTOCIDAE

Relationship: These fish are not true perches but form a distinct family. At present, 19 salt-water and one fresh-water species are recognized in California. All our marine species are included in the key, pages 165 and 166.

Range: Alaska south into Baja California, each species having its own distribution within this range. Additional species are known from Japan.

Habitat: As the family name implies, these fishes, as a group, are typical of the surf along both sandy and rocky coasts. They are, however, by no means confined to the surf. One species lives in fresh water, two are generally found in tidepools, one is normally found in moderately deep water, and several inhabit bays and shallow inshore water generally. The last part of the common names assigned the individual species reflects these varying habitats; the six species most closely associated with surf are called "surfperch," those associated with the ocean, but not primarily with the surf, are "seaperch," while those of varying habitat are simply "perch."

Description: Body oval or oblong and compressed; no teeth on vomer; anal fin with three spines and 13 or more soft rays; a single dorsal fin with not more than 11 spines (excepting the fresh-water species, Hysterocarpus traski, which has 16 to 18). The several species range in **length** from 3 to about 18 inches. **Color:** Varies with the species; most are silvery, though some are brightly colored.

Reproduction: All of the surfperches bear live young.

Importance: The object of a state-wide but minor commercial and sport fishery, with different species predominating in different districts. Rather important as sport fish along rocky coasts, in bays, and especially in the surf. Heaviest commercial landings were made at San Francisco and Los Angeles in 1951.

Fishing Season: Taken by sportsmen throughout the year. Currently (1953) closed to commercial fishing from May 1 to July 15. Consult fish and game laws.

Fishing Gear: Roundhaul nets; gill nets; beach seines; drag nets; hook and line with clams, mussels, pile worms, cut fish, etc. as bait. Most of the Eureka and the San Francisco region catches are made with beach seines. In Monterey Bay, drag nets and both drift and set gill nets are used. The Southern California catch is taken by gill nets, hook and line, and small roundhaul nets.

"Perch": Commercial landings of perch in Southern California include large quantities of other species, especially halfmoon and opaleye, with smaller amounts of sargo and blacksmith.

Reference: The nomenclature and descriptions in the section on surfperches are drawn in large part from Tarp's recent (1952) revision of the family.

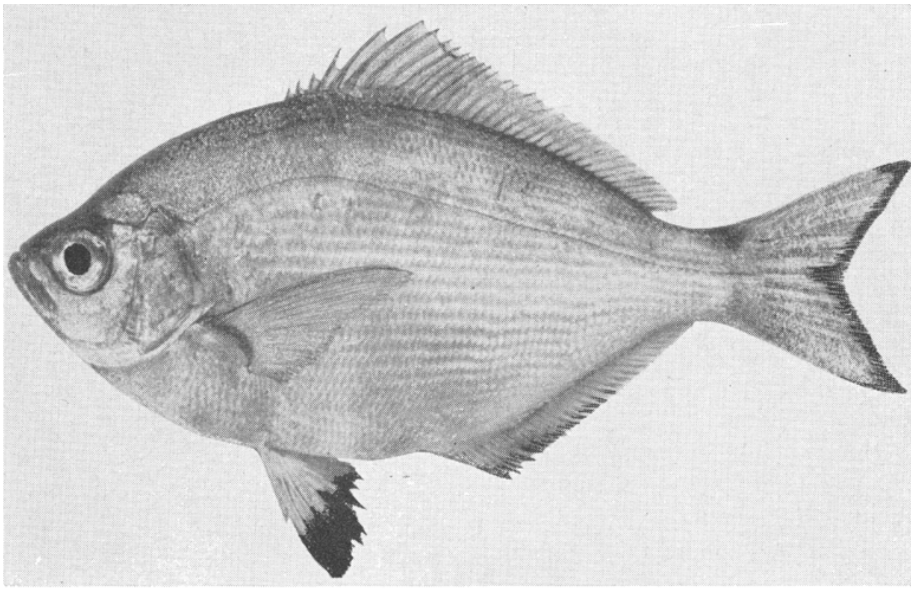


FIGURE 99

FIGURE 99

WALLEYE SURFPERCH

Hyperprosopon argenteum Gibbons

Range: Vancouver Island to Santa Rosalia Bay, central Baja California. Common along sandy beaches.

Description: See page 102. Black-tipped pelvic fins; posterior groove of lower lip not interrupted by a frenum; lateral line scales more than 65; eye very large, about one-third length of head; longest dorsal spine longer than soft rays; mouth when closed parallels outline of lower surface of head; dorsal soft rays 25–28, anal soft rays 30–35. **Length** to about a foot. **Color:** Steel blue above, becoming white on sides and belly; sides with faint bars which fade soon after death.

Importance: One of the more important commercial species throughout the State. Taken by sportsmen in the surf and from piers.

Fishing Season and Gear: See page 102.

SILVER SURFPERCH

Hyperprosopon ellipticum (Gibbons)

Range: Washington to Southern California; usually found along sandy beaches in the surf. **Description:** Similar to walleye surfperch but does not have black-tipped pelvics; dorsal soft rays 25–28, anal soft rays 29–34. **Importance:** None commercially, but may be taken by sportsmen.

SPOTFIN SURFPERCH

Hyperprosopon anale Agassiz

Range: San Francisco to Blanca Bay, Baja California. **Description:** Similar to walleye surfperch; pelvics not tipped with black; a black spot on spiny dorsal and usually a small splash of black on anal; dorsal soft rays 22–25, anal soft rays 23–26.

Importance: As for silver surfperch.

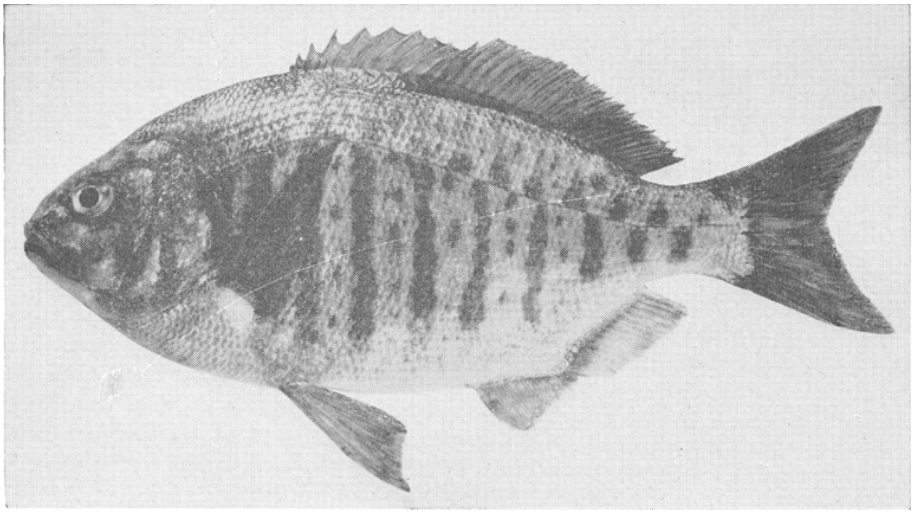


FIGURE 100

FIGURE 100

BARRED SURFPERCH

Amphistichus argenteus Agassiz

Range: Bodega Bay, Central California, to Santa Rosalia Bay, central Baja California; common along sandy coasts.

Description: See page 102. Anal fin with row of small scales extending along posterior half of its base; posterior groove of lower lip interrupted by broad frenum; lower jaw somewhat shorter than upper; longest dorsal spine usually shorter than general contour of soft dorsal; no enlarged scales between pectoral and pelvic; a series of brassy-olive vertical bars alternating with a series of spots normally found on sides; dorsal soft rays 23–27, anal soft rays 25–28. **Length** to about 16 inches. **Color:** White to silvery, tinged with bluish or grayish above; plain white on the sides and belly; usually barred and spotted as described above. Occasionally a uniform brassy olive above and silvery below, sometimes with a few silvery streaks on the sides.

Importance: Forms a small proportion of the "perch" catch. Caught in considerable numbers by surf fishermen; it is one of the leading sport species in the family.

Fishing Season and Gear: See page 102.

REDTAIL SURFPERCH

Amphistichus rhodoterus (Agassiz)

Range: Washington to Halfmoon Bay, Central California; common in surf along sandy beaches. **Description:** Similar in general appearance to barred surfperch but posterior groove of lower lip is not interrupted by a frenum; lower jaw projects slightly; dorsal spines higher than general contour of soft dorsal; scales between lateral line and anterior end of vent 22 (20–22); dorsal soft rays 25–28, anal soft rays 28–31. **Color:** Sides with 9–11 vertical red-brown or bronze bars; pelvic and tail fins usually reddish. An important surf fish to sportsmen; with the white seaperch, the dominant commercial species in the Eureka region. Called "porgy" in the Pacific Northwest.

CALICO SURFPERCH

Amphistichus koelzi (Hubbs)

Range: Northern California (Trinidad) to northern Baja California (Santo Tomas); moderately common in the surf. **Description:** Similar to barred and redtail surfperches; narrow frenum may be present but is usually absent; lower jaw projects slightly; dorsal spines about same height as contour of soft dorsal; scales between lateral line and anterior end of vent 18 (17–20); dorsal soft rays 24–28, anal soft rays 26–32.

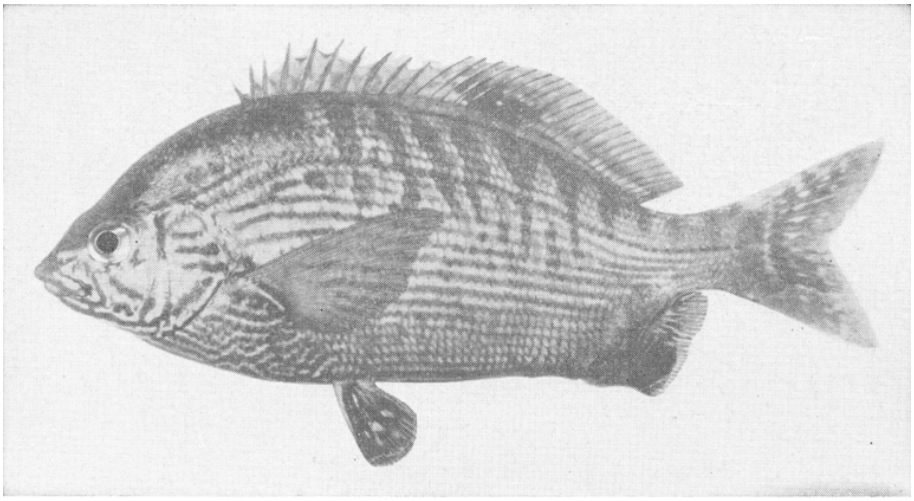


FIGURE 101

FIGURE 101

RAINBOW SEAPERCH

Hypsurus caryi (Agassiz)

Range: Cape Mendocino, Northern California, to Santo Tomas, northern Baja California; not common south of Los Angeles County. Found mostly off rocky shores.

Description: See page 102. Abdomen very long and straight, vent behind origin of soft portion of dorsal fin; posterior groove of lower lip interrupted by a frenum; dorsal soft rays 21–24, anal soft rays 21–23. **Length** to about a foot. **Color:** Striped horizontally with red, orange and blue; irregular streaks of orange and sky blue on the head; fins brightly colored, chiefly shades of orange; a blackish blotch on the soft dorsal and anal fins. The vivid colors fade soon after death.

Importance: Forms a small proportion of the "perch" catch; taken in moderate quantities in Central California.

Fishing Season and Gear: See page 102.

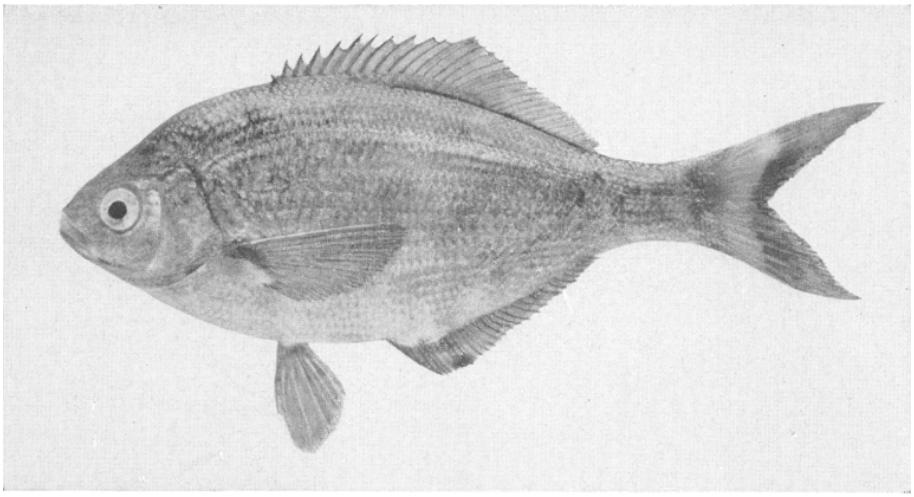


FIGURE 102

FIGURE 102

WHITE SEAPERCH

Phanerodon furcatus Girard

Range: Vancouver Island to Pt. Cabras, northern Baja California. Common along sandy coasts.

Description: See page 102. Posterior groove of lower lip interrupted by a frenum; 4 or 5 rows of large scales between lower edge of scale sheath at junction of spiny and soft portions of dorsal fin and lateral line (one small scale may be present above larger ones); tail deeply forked; dorsal spines slender, the last the longest, almost if not as high as first soft ray; dorsal soft rays 20–26, anal soft rays 29–34; caudal peduncle long, slender. **Length** to about a foot. **Color:** Whitish with a darker hue above; anal fin sometimes with a black spot. often dusky or with a rosy-orange cast when alive, turning dull white shortly after death. Soft dorsal with a black line along its base.

Importance: Perhaps the most important commercial species in the State. One of the two leading species in the Eureka region, the leader at San Francisco, and a major variety farther south.

Fishing Season and Gear: See page 102. Seen quite frequently in trawl catches and in purse seine loads of sardines.

Unauthorized Names: Splittail perch, forktail perch.

SHARPNOSE SEAPERCH

Phanerodon atripes (Jordan & Gilbert)

Range: Monterey to San Benito Islands, Baja California, in moderate depths.

Description: Similar to white seaperch but with black-tipped pelvic fins and with rows of reddish spots along the scale rows; dorsal soft rays 22–24, and soft rays 27–30.

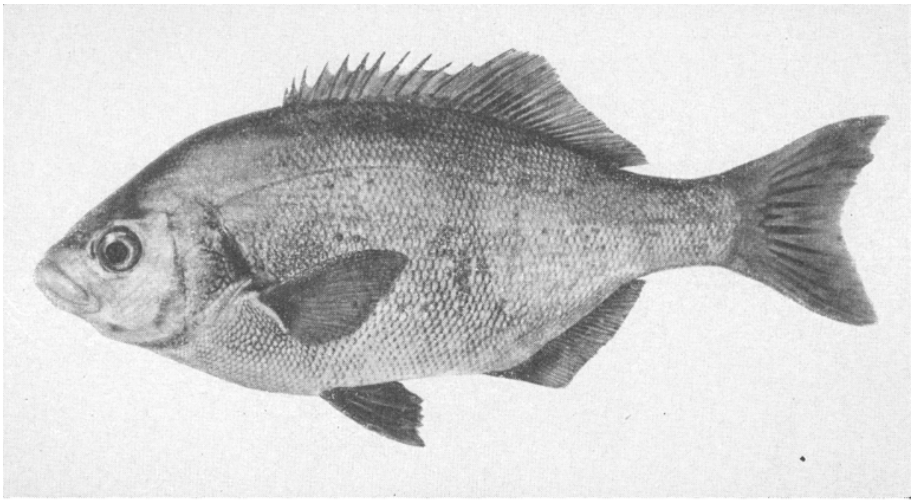


FIGURE 103

FIGURE 103

RUBBERLIP PERCH

Rhacochilus toxotes Agassiz

Range: Central and Southern California; recorded from Bodega Harbor to San Diego.

Description: See page 102. Lips exceedingly thick; posterior groove of lower lip not interrupted by a frenum; spiny portion of dorsal lower than the soft; dorsal soft rays 22–24, anal soft rays 27–30. **Length** to 18 inches. **Color:** Variable, usually whitish, the back with a brassy or bluish tinge or overlaid with smoky blackish, occasionally coppery overall; scales sometimes tipped with blackish on sides and belly; pectoral fins yellowish; pelvic, dorsal and anal fins tipped with black or dusky; lips white or pink; juveniles with 1 or 2 vertical dusky bars on body, these usually not found on adults.

Importance: One of the two leading commercial species in the Monterey area and of moderate importance in Southern California and at San Francisco. Taken commonly by anglers along rocky coasts, from jetties, and in bays; considered perhaps the best food fish among the surfperches.

Fishing Season and Gear: See page 102.

Unauthorized Names: Pile perch, porgy, niggerlip.

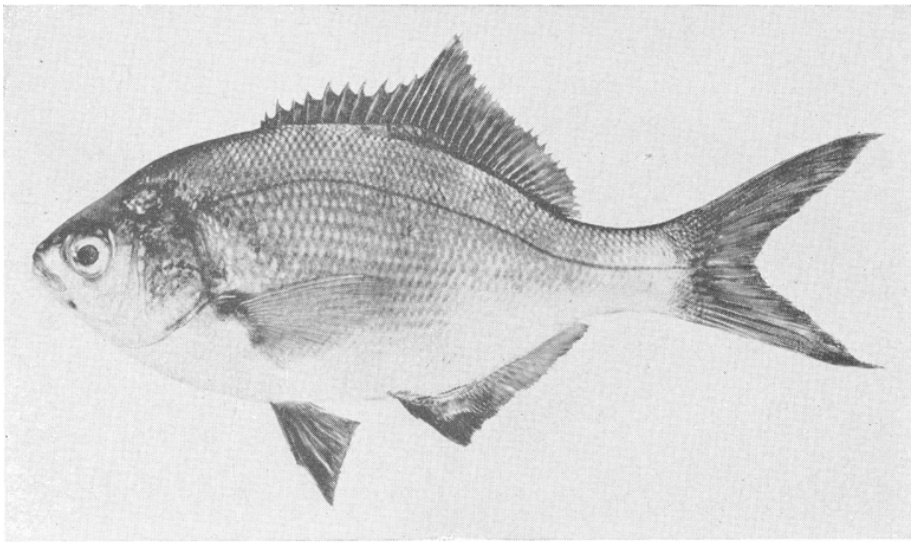


FIGURE 104

FIGURE 104

PILE PERCH

Rhacochilus vacca (Girard)

Range: Alaska to San Martin Island, northern Baja California. Common along both sandy and rocky shores, around kelp, and around pilings.

Description: See page 102. Posterior groove of lower lip interrupted by a broad frenum; 6 or more scales between lateral line and lower edge of scale sheath at junction of spiny and soft portions of dorsal fin; tail deeply forked; first dorsal soft rays sharply elevated, much longer than last dorsal spine; dorsal soft rays 21–25, anal soft rays 27–30. **Length** to about 16 inches. **Color:** Somewhat blackish or brownish with a silver luster above, becoming silvery on the sides and belly; at times with dark blotches on the back and sides; fins dusky. Some specimens are almost entirely silvery. Juveniles with one or two vertical dusky bars on body; these usually not found on adults.

Importance: A moderately important commercial variety, especially in the Monterey region where it is one of the two leading species.

Fishing Season and Gear: See page 102. Seen fairly often in purse seine catches of sardines. Hook and line from piers and rocky shores with small hard shell crabs reported the best bait.

Unauthorized Names: Splittail perch, porgy, forktail perch.

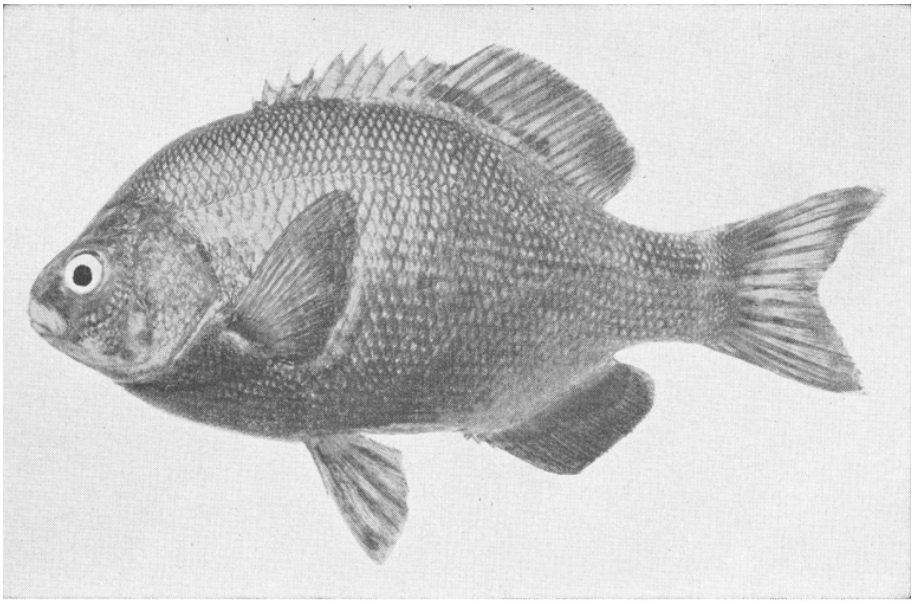


FIGURE 105

FIGURE 105

BLACK PERCH

Embiotoca jacksoni Aggassiz

Range: Central California (Bodega Lagoon) to central Baja California (Pt. Abreojos).

Description: See page 102. A cluster of enlarged scales between pectoral and pelvic fins; posterior groove of lower lip interrupted by a broad frenum; anal fin with a row of small scales along its base; lips rather thick; dorsal spines shorter than dorsal soft rays; dorsal soft rays 19–22, anal soft rays 24–27. **Length** to about 14 inches. **Color:** Highly variable; shades of brown usually predominate, tinged with blue, green, red or yellow. Sometimes a smoky blue. Specimens almost entirely orange have been seen. Anal and pelvic fins often orange to red. Anal at times barred with blue; lips usually reddish brown, often yellow to bright orange.

Importance: A minor constituent of the "perch" catch, it is caught in moderate quantities in Central California. Taken by sportsmen, particularly along rocky coasts, around pilings, and in bays.

Fishing Season and Gear: See page 102.

Unauthorized Names: Bay perch, porgy, blue perch.

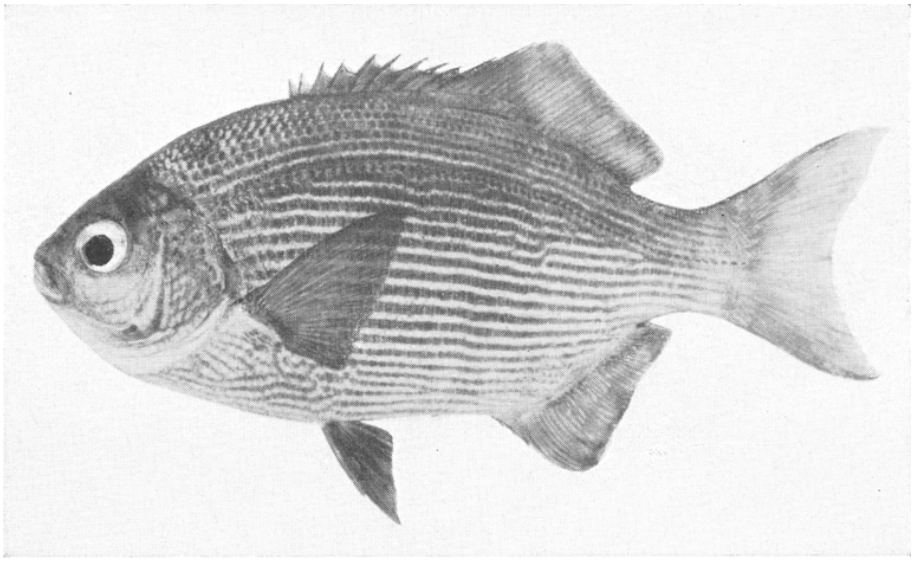


FIGURE 106

FIGURE 106

STRIPED SEAPERCH

Embiotoca lateralis Agassiz

Range: Alaska to northern Baja California (Pt. Cabras). Uncommon in Southern California south of Pt. Dume, but abundant farther north, especially along rocky coasts.

Description: See page 102. Posterior groove of lower lip interrupted by a frenum; six or more scales between lateral line and lower edge of scale sheath at junction of spiny and soft portions of dorsal fin; body striped horizontally; highest dorsal spine about half height of first soft ray; dorsal soft rays 23–25, anal soft rays 29–33. **Length** to about 15 inches. **Color:** Coppery, darker above; striped horizontally with dull orange and blue along the rows of scales; finely speckled with black above; head with several blue spots and streaks; fins coppery. The bright colors start to fade soon after death.

Importance: A minor constituent of the "perch" catch from Santa Barbara north; taken by sportsmen along rocky coasts and around pilings.

Fishing Season and Gear: See page 102.

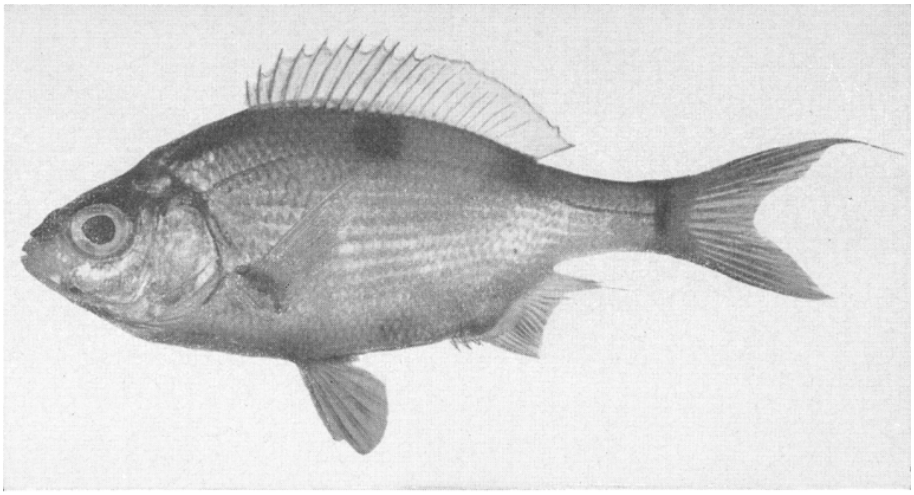


FIGURE 107

FIGURE 107

PINK SEAPERCH

Zalembius rosaceus (Jordan & Gilbert)

Range: Drakes Bay, Central California, to Los Coronados Islands, northern Baja California.

Habitat: Found typically in deeper water than any of the other species. Rarely found in shallow water but common in depths of from 15 to 50 or more fathoms.

Description: See page 102. Two distinct chocolate-colored spots on back, the first and larger below forepart of soft portion of dorsal, the second below end of soft dorsal; posterior groove of lower lip interrupted by a frenum; longest dorsal spine higher than soft rays; uppermost rays of caudal and anal fins often elongated, filamentous in males (see figure); dorsal soft rays 16–19, anal soft rays 18–22. **Length** to about eight inches. **Color:** Rose-red with silver reflections, spotted as described above.

Importance: Rarely enters the commercial "perch" catch and seldom caught by sportsmen. Seen rather often in purse seine loads of other fish where it arouses interest because of its bright color.

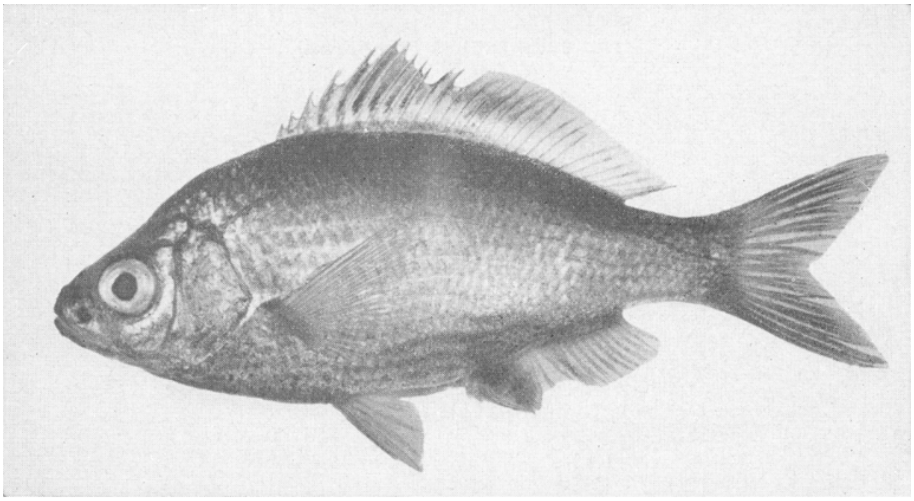


FIGURE 108

FIGURE 108

SHINER PERCH

Cymatogaster aggregata Gibbons

Range: Port Wrangel, Alaska, to Pt. Banda, northern Baja California. Common along sandy shores and in bays.

Description: See page 102. Posterior groove of lower lip not interrupted by a frenum; highest dorsal spine longer than highest soft ray; scales large, less than 50 along lateral line; dorsal soft rays 19–22, anal soft rays 22–25. **Length** to about six inches. **Color:** Silvery, tinged greenish above; about eight horizontal sooty lines along lower sides; three vertical yellow bars behind the pectoral fin; fins usually plain. Some specimens (from deeper water) with a rosy hue. Males, in breeding season, with black horizontal stripes on sides.

Importance: Negligible commercially. Taken in fair quantity by sportsmen. Used to some extent as bait.

Fishing Season and Gear: See page 102.

Unauthorized Name: Seven-eleven.

ISLAND PERCH

Cymatogaster gracilis Tarp

This is a very similar but slenderer fish known only from Santa Cruz, Santa Rosa and Santa Catalina Islands.

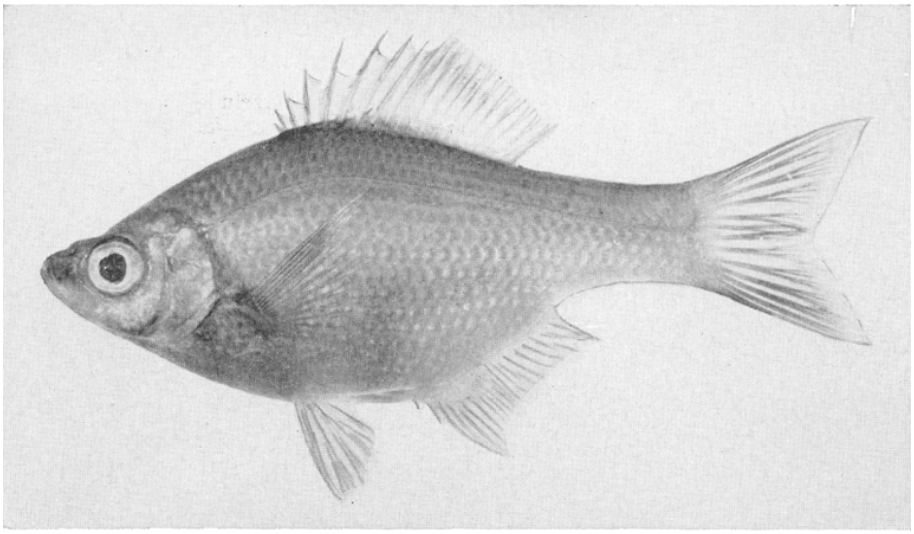


FIGURE 109

FIGURE 109

KELP PERCH

Brachyistius frenatus Gill

Range: Vancouver Island to Turtle Bay, central Baja California; chiefly along rock coasts in the kelp.

Description: See page 102. Posterior groove of lower lip interrupted by a frenum; upper jaw slightly shorter than lower; axilla without a large black triangle, at most peppered with black; spiny portion of dorsal fin usually slightly higher than soft; dorsal soft rays 13–16, anal soft rays 21–24; scales relatively large, less than 50 in a row along lateral line. **Length** to about eight inches. **Color:** Rose to copper brown, usually with an olive or greenish brown cast above and becoming bright copper red below; fins reddish to plain.

Importance: Negligible. Frequently seen in marine gardens where its color makes it notable.

DWARF PERCH

Micrometrus minimus (Gibbons)

Range: Central California (Bodega Lagoon) to central Baja California (San Rosarito Pt.). **Description:** A large conspicuous black triangle in the axilla; longest dorsal spines and soft rays about equal in height; dorsal soft rays 12–15, anal soft rays 13–23; frenum present; jaws equal. **Length:** Seldom attains 3 inches. **Importance:** None. Unlike other surfperches, except the reef surfperch (below), it feeds largely on vegetable matter and is a tidepool form.

REEF PERCH

Micrometrus aurora (Jordan & Gilbert)

Range: Central California (Tomales Bay) to northern Baja California (Pta. San Isidro). **Characters:** Similar to the dwarf perch. See key, page 166. **Length** to 6 inches.

3.4.3.12. THE DAMSELFISH FAMILY, POMACENTRIDAE

This family is well represented in tropical waters and includes many small and brightly colored fishes. Two species are found in Southern California.

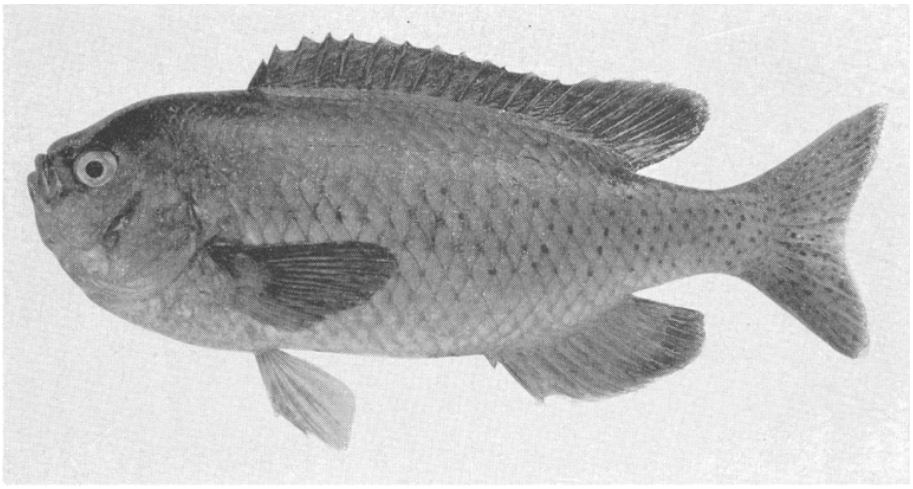


FIGURE 110

FIGURE 110

BLACKSMITH

Chromis punctipinnis (Cooper)

Range: Pt. Conception at least to Turtle Bay, central Baja California. Common in the kelp and around rocks.

Description: Dorsal fin single with about 13 spines and usually 12 soft rays; no teeth on vomer and palatines; two spines at front of anal fin; lateral line ends under soft part of dorsal fin. **Length** to 12 inches or more. **Color:** Dark slate above becoming lighter on the underparts, everywhere tinged with blue or violet; fins blue black; small dark brown or blackish spots on back, soft portion of dorsal fin, and caudal fin. **Young:** Swim in thick schools in mid-winter near shore; color, predominately yellowish to brassy orange.

Importance: Taken incidentally with other species in nets or on hook and line; it forms a very small proportion of the Southern California "perch" catch. Caught occasionally by sportsmen.

Unauthorized Names: Black perch, blue perch, kelp perch.

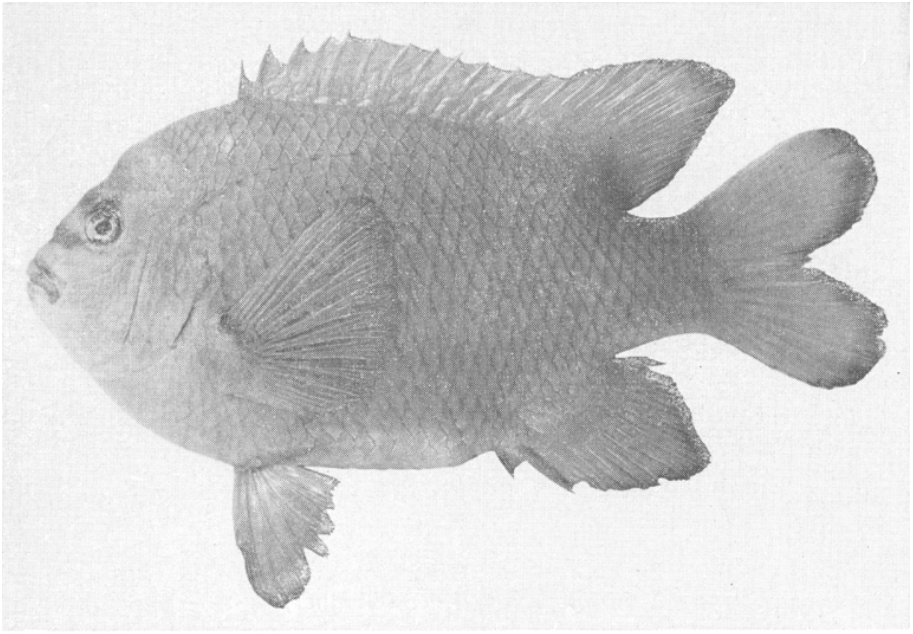


FIGURE 111

FIGURE 111

GARIBALDI

Hypsypops rubicunda (Girard)

Range: Southern California south to Santa Maria Bay, southern Baja California, around rocky shores. Taken as far north as Monterey in the 1850's.

Description: Color, bright orange; dorsal fin single with about 12 spines and 16 soft rays; no teeth on vomer and palatines; two spines at the front of anal fin; lateral line ends under soft part of dorsal fin. **Length** to about 14 inches. **Color:** Uniform bright orange. The young, when first hatched, with large spots and streaks of iridescent blue; at about four inches very little blue remains except on the pelvics and along the back.

Importance: Taken rarely with other species in roundhaul nets and on hook and line. It is one of the most brilliantly colored fishes in California waters and is well known to visitors at marine gardens.

Unauthorized Name: Ocean goldfish.

3.4.3.13. THE WRASSE FAMILY, LABRIDAE

Three species of wrasse are found in California, one of which, the sheep-head, is of some commercial and game significance. The wrasses are fishes of tropical and temperate seas and often are brilliantly colored.

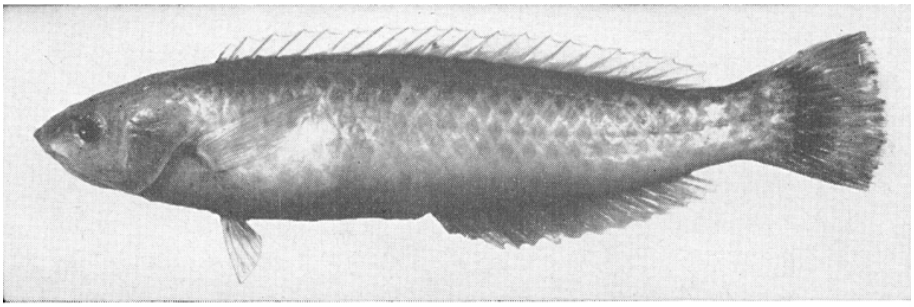


FIGURE 112

FIGURE 112

SEÑORITA

Oxyjulis californica (Günther)

Range: Central California to central Baja California (Cedros Island); Guadalupe Island; common inshore and around kelp.

Description: No teeth on vomer; anal fin with three spines and normally 13 soft rays; dorsal fin single, with nine weak spines (rarely 10); teeth small, sharp, canine-like, projecting forward; body cigar-shaped; lateral line drops abruptly under posterior portion of dorsal fin. **Length** to about ten inches. **Color:** Brown above, the centers of the scales orange-brown, cream color below; streaks of brownish and bluish on sides of head; a large black spot at base of caudal fin.

Importance: Caught fairly often on hook and line and in roundhaul nets by sport and commercial fishermen throughout the year. It is not the object of a fishery and is considered a pest by many sportsmen because of its penchant for stealing bait.

ROCK WRASSE

Halichoeres semicinctus (Ayres)

Found from Southern California to and into the Gulf of California. Resembles the señorita but is less slender and lacks the black spot at base of caudal fin; males with a blue bar behind the pectoral.

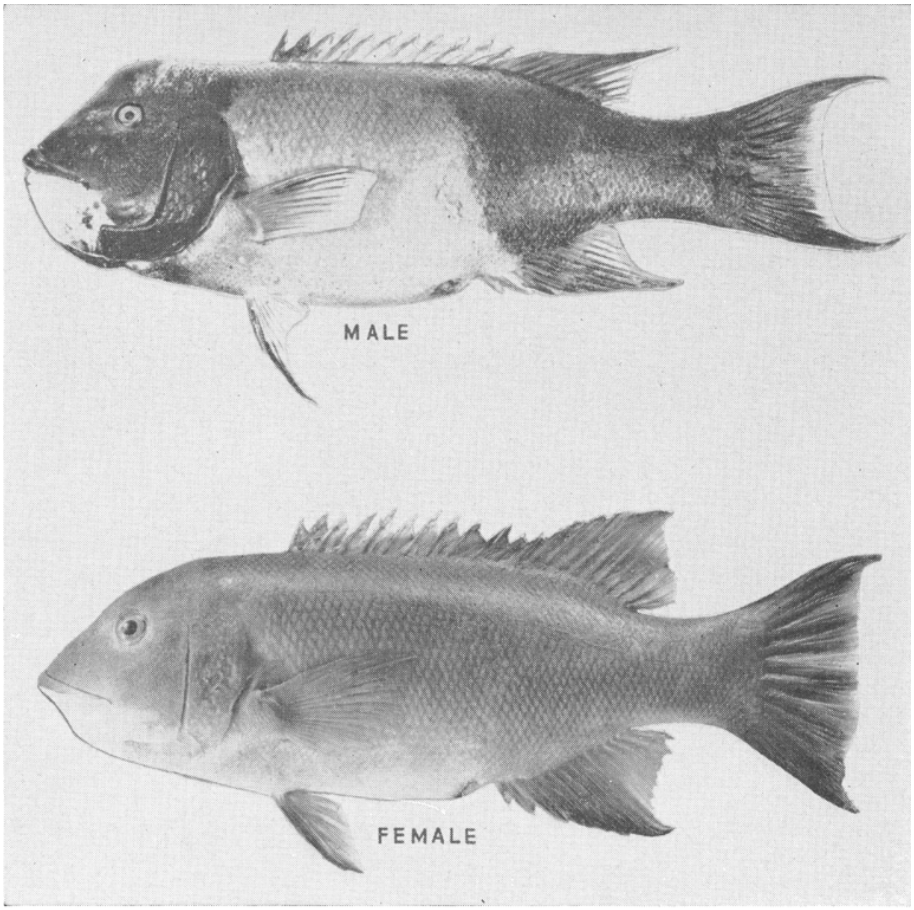


FIGURE 113

FIGURE 113

SHEEP-HEAD

Pimelometopon pulchrum (Ayres)

Range: Monterey Bay south into Baja California at least to San Hipolito; reported to enter the Gulf of California; usually near rocky shores and around kelp beds. Rare in Central California.

Description: Teeth large, canine-like, sloping obliquely forward; three spines at front of anal fin; dorsal fin single with 11 or 12 stout spines, shorter than soft rays. A very prominent fatty hump develops on the forehead of the male during the breeding season. **Length** to about three feet and **weight** to about 30 pounds. **Color:** Male—head, posterior half of body, dorsal, anal and caudal fins jet or purplish black; rest of body usually crimson, sometimes shading to blackish; lower jaw white. Female—dull red to rose, sometimes with blackish areas, or, rarely, all black. Young—rose to crimson; black blotches on the fins until about eight inches long.

Importance: A minor commercial fish from Santa Barbara south. Used extensively as lobster bait. Taken in considerable quantity by sportsmen, particularly at Santa Catalina Island. Caught incidentally in lobster traps and by hook and line.

Fishing Season: Throughout the year, with landings heaviest in the winter and lightest in the summer. A small portion of the catch is made in Mexican waters.

Unauthorized Names: Redfish, fathead, humpy.

3.4.3.14. THE NIBBLER FAMILY, GIRELLIDAE

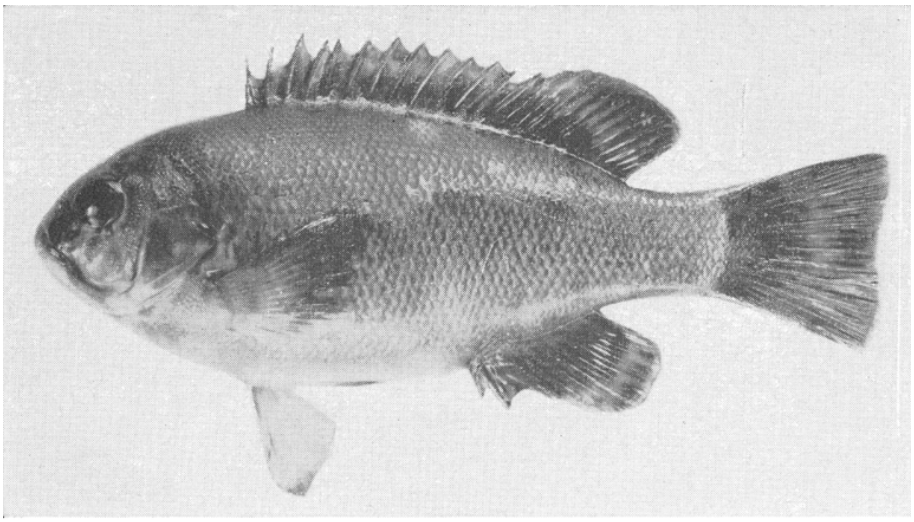


FIGURE 114

FIGURE 114

OPALEYE

Girella nigricans (Ayres)

Relationship: The only member of the family found in California. Other species are found elsewhere in the Pacific.

Range: Monterey Bay south at least to San Juanico Bay, southern Baja California, around rocky shores; common in kelp. The young are found in tidepools. Uncommon as far north as Monterey.

Description: Dorsal spines 14; dorsal soft rays 12–14; anal spines 3, anal soft rays 10–12; no teeth on vomer (there are minute teeth on the palatines at each side of the roof of the mouth); two bands of teeth on jaws, the outer narrow and the inner broad; those in outer band with three points and attached to membrane only, so that they are freely movable. **Size:** A record specimen was 19¾ inches long and weighed 6# pounds; usually less than 4 pounds. **Color:** Greenish blue, becoming paler below; eye opalescent blue; young with one or two whitish blotches on either side of the back.

Importance: A minor constituent of the Southern California "perch" catch forming about five percent of the 1947 landings. Considered one of the more important species by surf fishermen, who catch it along sandy and rocky coasts.

Fishing Season: Usually taken irregularly with other species.

Fishing Gear: Roundhand nets; hook and line.

Unauthorized Names: Black perch, green perch, blue-eyed perch. Catalina perch, button perch, blue bass, greenfish.

3.4.3.15. THE HALFMOON FAMILY, SCORPIDAE

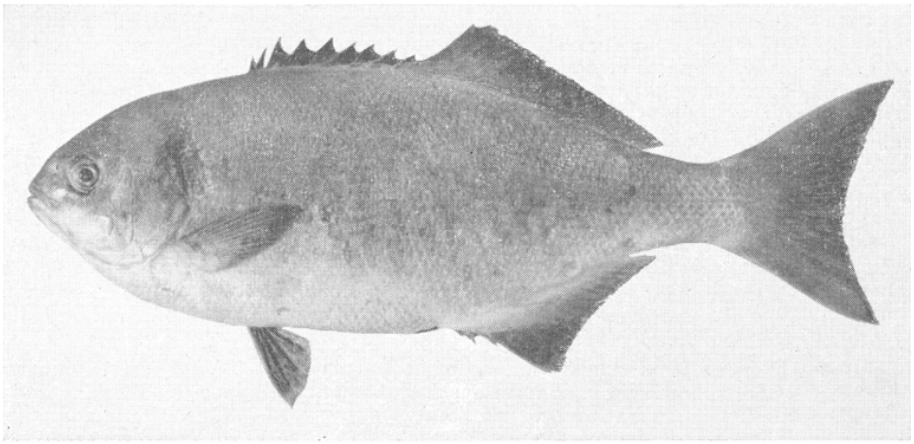


FIGURE 115

FIGURE 115

HALFMOON

Medialuna californiensis (Steindachner)

Relationship: The only member of the family in California waters.

Range: Central California (Tomales Bay) to the Gulf of California. (Muertos Bay); rare in Central California. Common along rocky shores and in kelp.

Description: Soft portions of dorsal and anal fins so covered with scales that the rays are hidden; spiny and soft portions of dorsal fin connected, the spines shorter than the first soft rays; anal fin with three spines and usually 19 or 20 soft rays. **Length** to about a foot. **Color:** Slaty black with a bluish luster, becoming whitish or mottled below. **Young:** pelagic when very young, blue above, silvery below; all fins darkly blotched with black except for pectorals and caudal, which are transparent.

Importance: Formed about 40 percent of the Los Angeles "perch" catch in 1947. Taken in relatively small numbers by sportsmen.

Fishing Season: Caught irregularly throughout the year.

Fishing Gear: Small roundhaul nets, hook and line, gill nets.

Unauthorized Names: Catalina perch, blue perch, blue bass.

3.4.3.16. THE ROCKFISH FAMILY, SCORPAENIDAE

The many species of rockfishes are typical of north temperate seas. The family includes a number of important commercial and game fishes, most of which live in relatively shallow water along rocky coasts. All but three of the fifty-odd species recorded from California belong to genus Sebastodes. **Family characters:** A bony support extends back from lower part of eye across cheek just under the skin; anal fin with three strong spines; no slit behind fourth gill; body covered with scales.

ROCKFISHES

Genus Sebastodes

Relationship: There are about 60 species of rockfish on the Pacific coast of North America and at least 50 of these are found in California. They are very similar in general appearance and are consequently unusually difficult to distinguish as separate species. Those illustrated in the following pages include the most common and distinctive forms.

Range: From as far south as the Gulf of California north to Alaska and south on the Asiatic side to southern Japan and northern China. Each species has its own distribution within this general range.

Description: See above. Dorsal fin deeply notched, with 13 (rarely 14) strong sharp spines; last spine longer than the one preceding it and more closely attached to the soft than to the spiny portion of the fin; space between eyes varies with the species from convex to concave. Spines on top of head very strong in some species, moderate in others and obsolete in still others. All rockfish bear live young which are, however, far less developed at birth than are the surfperches. **Color:** Varies greatly according to species from black and brown to red, yellow and orange, but usually with at least some bright coloration.

Importance: Rockfishes ranked eighth in total poundage and ninth in value among California fisheries in 1951. Sold almost entirely in the fresh fish markets; canned in a very limited amount in California. Heaviest landings have been made in the Eureka region since 1943, followed by Monterey, San Francisco and Santa Barbara. The leading Central California ocean sport fishery in volume. Second in numbers caught among the State's ocean sport fisheries in 1951.

Fishing Season: Throughout the year, with variations from month to month apparently a matter of economic demand rather than availability.

Fishing Gear: Taken commercially chiefly in drag nets since 1943, but also by setlines and hand lines. The Southern California catch is made exclusively on hook and line. Sportsmen use hook and line with cut bait, preferably sardine, or with silvery metal lures.

Note: Some of the rockfishes are at times confused with the kelp and sand basses (Paralabrax) by Southern California fishermen. These basses have only 10 dorsal spines and lack the bony support across the cheek.

Unauthorized Name: Rock cod.

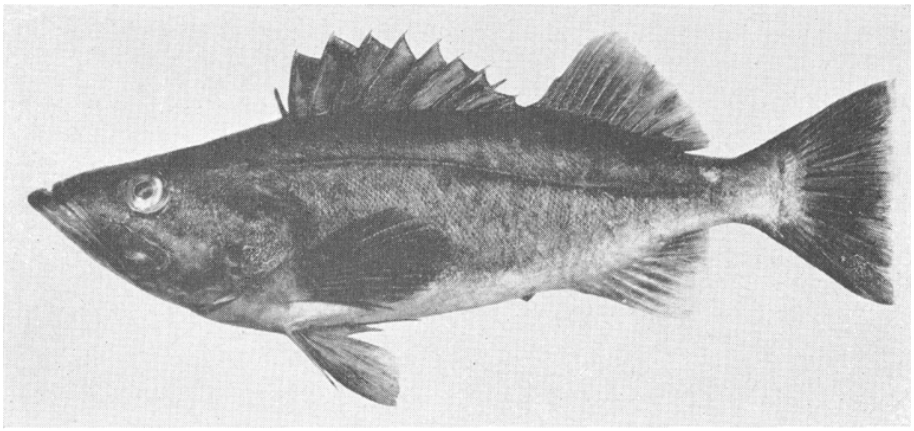


FIGURE 116

FIGURE 116

BOCACCIO

Sebastodes paucispinis (Ayres)

Range: British Columbia to northern Baja California (Sixtymile Bank); less common in the northern portion of the range.

Description: See page 120. Space between eyes broad, convex; no strong spines on top of head; lower jaw greatly projecting; periotoneum white or silver; anal soft rays normally nine. **Length** to 3 feet. **Weight** to 21 pounds. **Color:** Olivaceous to dusky brown above, shading into dull orange reddish on the sides and to pale pink to white below; everywhere flushed with red; sometimes with black blotches on the body.

Importance: One of the most important rockfish in the State, particularly in Central and Southern California. Minor in Northern California.

Fishing Season and Gear: See page 120.

Unauthorized Names: Grouper, salmon grouper.

Remarks: Sebastodes jordani Gilbert is a small species sometimes found in association with the bocaccio and chilipepper and resembles their young. Range: Washington to Southern California. Length to 10 inches. Peritoneum black (white in the other two). Color: Rather like the chilipepper but silvery tinges are evident on the sides. It can be distinguished from all other species of Sebastodes by one feature: the vent is located forward near the middle of the abdomen, rather than close to the insertion of the anal fin.

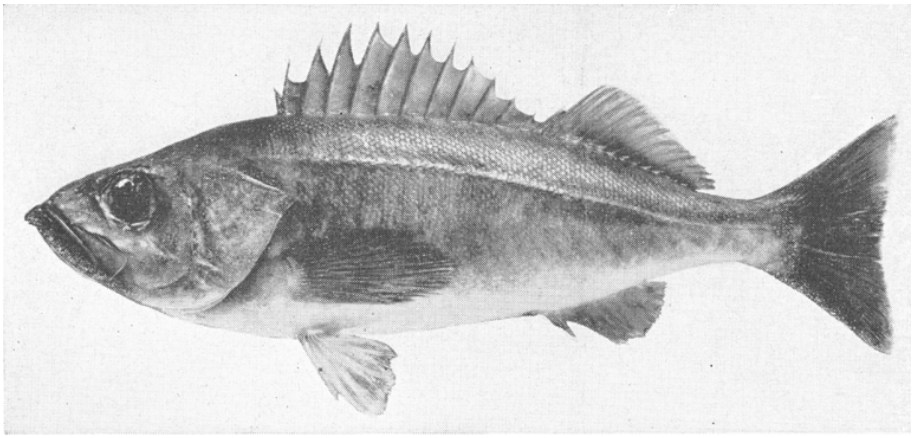


FIGURE 117

FIGURE 117

CHILIPEPPER

Sebastodes goodei Eigenmann & Eigenmann

Range: From about Magdalena Bay, Baja California, north at least to Trinidad, Northern California. Most common in Southern and Central California.

Description: See page 120. Space between eyes broad, convex; no strong spines on top of head; lower jaw projecting; periotoneum white with small scattered black dots; anal rays normally eight. **Length** to about 22 inches. **Color:** Pinkish red above shading into pink below; a narrow clear pink stripe extends the length of the lateral line.

Importance: With the bocaccio, the most important Central California rockfish. Minor in Northern California. One of the three leading Southern California species.

Fishing Season and Gear: See page 120.

Remarks: Sebastodes saxicola (Gilbert) is sometimes found in association with the chilipepper. It rarely attains a length of 14 inches. Range: Alaska to Southern California. Description: Top of head between eyes nearly flat; ridges and spines moderately strong; second anal spine longer than third. Color: body faded pink; may have some indications of dusky areas along the back together with an olivaceous streaking on tail; peritoneum black.

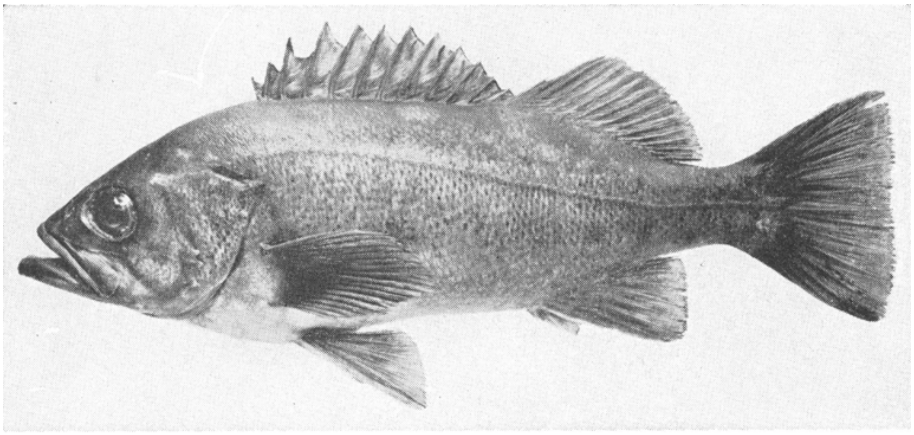


FIGURE 118

FIGURE 118

YELLOWTAIL ROCKFISH

Sebastodes flavidus Ayres

Range: Vancouver Island south into Baja California.

Description: See page 120. Space between eyes convex; no strong spines on top of head; lower jaw projecting; anal fin with 8 (rarely 7) soft rays; knob on under side of point of lower jaw; peritoneum white. **Length** to about two feet. **Color:** Grayish-brown above shading to white below; sides finely spotted with brown; inconspicuous light blotchings on back; caudal fin yellow, other fins dusky-yellow. Young specimens have a black blotch on spinous dorsal membrane between eighth and twelfth spines.

Importance: Forms a fair proportion of the rockfish catch of the State. One of the six or seven leading species.

Fishing Season and Gear: See page 120.

OLIVE ROCKFISH

Sebastodes serranoides Eigenmann & Eigenmann

This species, usually taken around kelp beds, is close to the yellowtail rockfish. General color olivaceous, caudal fin may be tinged with yellow; clear splotches evident along the top of the back; fine dusky stippling on scales on sides of body. Inconspicuous knob on under side of point of lower jaw; peritoneum white; anal fin with nine, rarely eight, soft rays. This species is less common and less important than the yellowtail rockfish.

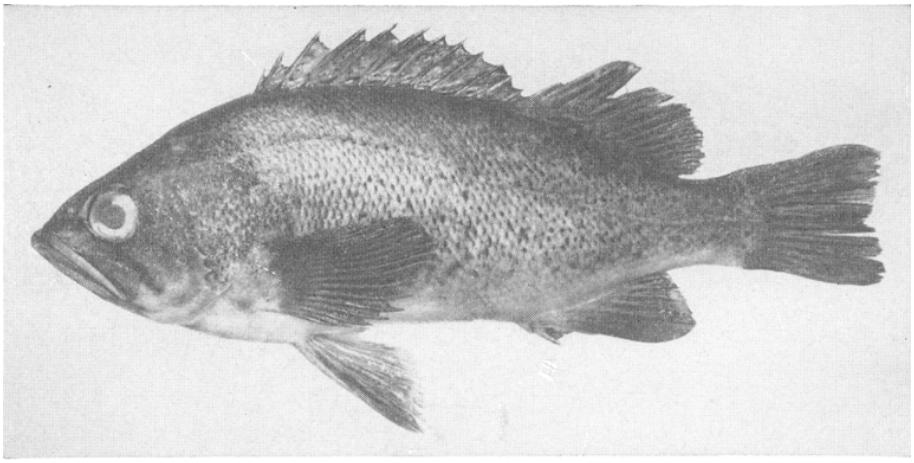


FIGURE 119

FIGURE 119

BLACK ROCKFISH

Sebastodes melanops (Girard)

Relationship: Closely resembles the blue rockfish (opposite page). See remarks below.

Range: Alaska to Pt. Conception.

Description: See page 120. Space between eyes broad, convex; no strong spines on top of head; anal soft rays normally eight, rarely seven or nine; maxillary extends to hind border of eye; peritoneum white. **Length** to about 20 inches. **Color:** Very dark, almost black above becoming paler on sides and dirty white below; fins dark; membrane of spinous dorsal spotted with black on lower portion.

Importance: One of the leading species in the State. Though it is of very minor importance in Central California, landings at Eureka are second only to the orange rockfish.

Fishing Season and Gear: See page 120.

Remarks: This fish is similar in general appearance to the blue rockfish. The two can be separated as follows: Black rockfish: maxillary extends about to rear margin of orbit; membrane of spiny dorsal spotted with black on lower portion; peritoneum white. Blue rockfish: maxillary extends only to middle of orbit; membrane of spiny dorsal not spotted; peritoneum usually black but occasionally nearly white in specimens over 14 inches long.

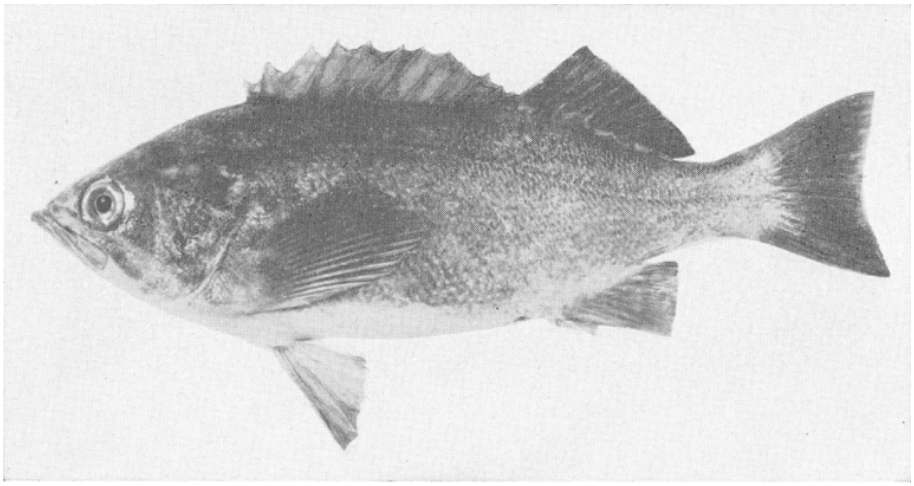


FIGURE 120

FIGURE 120

BLUE ROCKFISH

Sebastodes mystinus (Jordan & Gilbert)

Relationship: Closely resembles the black rockfish (opposite page, see remarks).

Range: Alaska to Southern California, usually in rather shallow water.

Description: See page 120. Space between eyes broad, convex; no strong spines on top of head; spines of dorsal fin lower than soft rays; anal soft rays normally nine; maxillary extends to middle of orbit; peritoneum usually black but occasionally nearly white in specimens over 14 inches long. **Length** to about 20 inches. **Color:** Slaty or bluish black above, becoming paler below and white on the belly; back and sides often vaguely blotched with lighter and darker shades; fins all blackish. **Young:** Brick red with scarcely any of the slaty black; the red disappears when the fish are about six inches long.

Importance: of minor commercial importance but probably the most important sport species.

Fishing Season and Gear: See page 120.

Life History Notes: Wales (1952) reports that males usually mature at four years, females at five, and that spawning occurs in the winter. Young fish, a few months old, are found in tidepools but a majority are believed to be in the subtidal region. Young and the older fish are found from the surface to a depth of 50 fathoms. Over a half million embryos were found in one female.

Unauthorized Names: Bluefish, blue perch, black bass.

WHITEBELLY ROCKFISH

Sebastodes vexillaris (Jordan & Gilbert)

This species is not uncommon in waters of shallow and moderate depths, and the young are taken occasionally with the blue rockfish and other shallow water species. **Range:** Northern California to northern Baja California. **Description:** Top of head, between eyes, flat to slightly concave with ridges and spines strong; color: mottled, varying from coppery-red to yellow-pink with light olive shades in some specimens; a somewhat clear band usually recognizable along the latter two-thirds of lateral line but this may be difficult to discern in larger specimens. In general, the clear areas are whitish at first capture, becoming flushed with coppery color on extended exposure. The peritoneum is white.

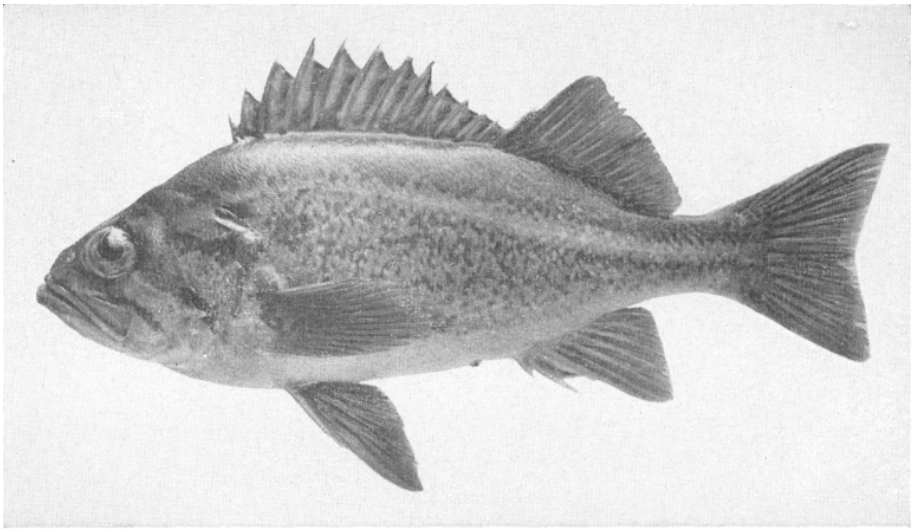


FIGURE 121

FIGURE 121

ORANGE ROCKFISH

Sebastodes pinniger (Gill)

Relationship: Resembles the vermilion rockfish (opposite page).

Range: Northern British Columbia to northern Baja California.

Description: See page 120. Chiefly orange in color; lower jaw smooth to the touch (rough to the touch in the vermilion rockfish); peritoneum white; weak spines on top of head; space between eyes slightly convex; lower jaw projects slightly, a knob at its tip. **Length** to about 30 inches. **Color:** Olive gray blotched with orange red or orange yellow above, becoming nearly white below; occasional individuals have an inky black blotch anywhere on body; three bright orange stripes radiate from the eye; fins generally bright orange. In young specimens there is usually a black blotch on the membrane of the spiny dorsal between the seventh and tenth spines; lips and lining of mouth pale red with dusky or black mottling.

Importance: The most important species in the State in recent years. Dominates the catch at Eureka, but is of lesser importance in Central and Southern California.

Fishing Season and Gear: See page 120.

Unauthorized Names: Canary, red rock cod, codalarga, filione.

TAMBOR

Sebastodes ruberrimus Cramer

This species is taken at times with the orange and the vermilion rockfishes. **Range:** Alaska to Southern California. **Length** to three feet. **Color:** crimson above, shading to a yellow-pink on lower sides. Small and medium sized specimens black on margins of fins, a whitish streak along lateral line, a shorter whitish streak off end of pectoral fin. In specimens over about 15 inches in length, the ridges on top of head, between the eyes, become broken up into numerous low spines (rugose). Peritoneum white.

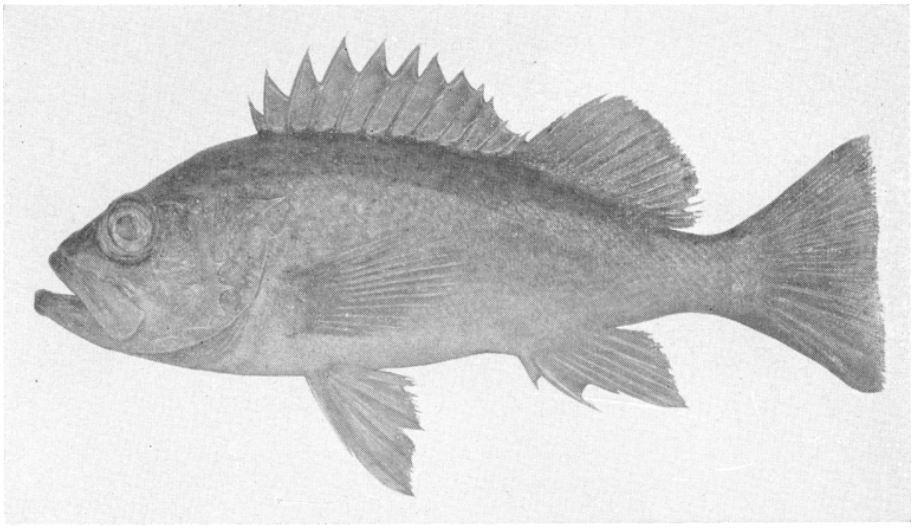


FIGURE 122

FIGURE 122

VERMILION ROCKFISH

Sebastodes miniatus (Jordan & Gilbert)

Relationship: Closely resembles the orange rockfish (opposite page).

Range: Vancouver Island south into northern Baja California (San Jose Pt., Fitch 1952b).

Description: See page 120. Chiefly vermilion or brick red in color; lower jaw rough to the touch (smooth in the orange rockfish); peritoneum white; space between eyes slightly convex; weak spines on top of head; lower jaw projects slightly, a knob at its tip. **Length** to about three feet. **Color:** Vermilion above shading to pink on the sides and light red below with black dots on back and sides which give a dusky tone; three obscure orange stripes radiating from the eye; fins vermilion, the dorsal gray at base; lips and lining of mouth red. Some large specimens may have some yellow on sides, as in the orange rockfish.

Importance: One of the more important commercial species, it is one of the three leading species in Southern California.

Fishing Season and Gear: See page 120.

Unauthorized Names: Red rock cod, red snapper, borracho, rasher.

FLAG ROCKFISH

Sebastodes rubrivinctus (Jordan & Gilbert)

This is another species which may on occasions be found in association with S. miniatus and S. pinniger. A distinctive color characteristic is the several bright red vertical bars against a light pink background. However, in large specimens from deep water the red bars may be faded and less distinct. Top of head between eyes flat to slightly concave, with moderately strong spines; second anal spine as long as, or longer, than the third; peritoneum normally white, sometimes blotched or spotted with black.

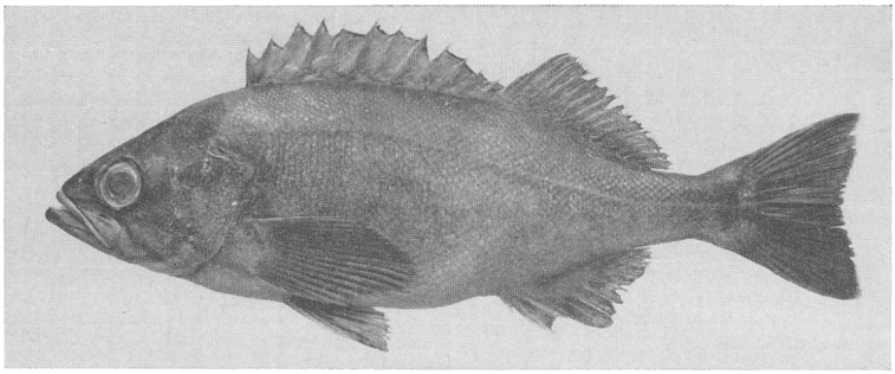


FIGURE 123 Photograph by J. B. Phillips

FIGURE 123

WIDOW ROCKFISH

Sebastodes entomelas (Jordan & Gilbert)

Range: Central and Southern California, usually in rather deep water.

Description: See page 120. Space between eyes broad, convex; no spines on top of head; lower jaw projecting; mouth rather small with maxillary extending under mideye; peritoneum black; anal soft rays normally eight. **Length** to about 18 inches. **Color:** Dusky blackish on body and fins; some light yellow on sides; lower rays of pectoral fin tinged with pink.

Importance: Forms a minor proportion of the rockfish catch. Specimens are often associated with the bocaccio and chilipepper.

Fishing Season and Gear: See page 120.

SPECKLED ROCKFISH

Sebastodes ovalis Ayres

This fish is similar to the widow rockfish and also is found in Central and Southern California. Color dusky-tan becoming creamy-white below, everywhere tinged with pink; back, sides and membranes of dorsal fin covered with many small round black spots; space between eyes wide, convex, with weak ridges and spines; mouth small; lower jaw sharply projecting; peritoneum dusky-black; second anal spine longer than third.

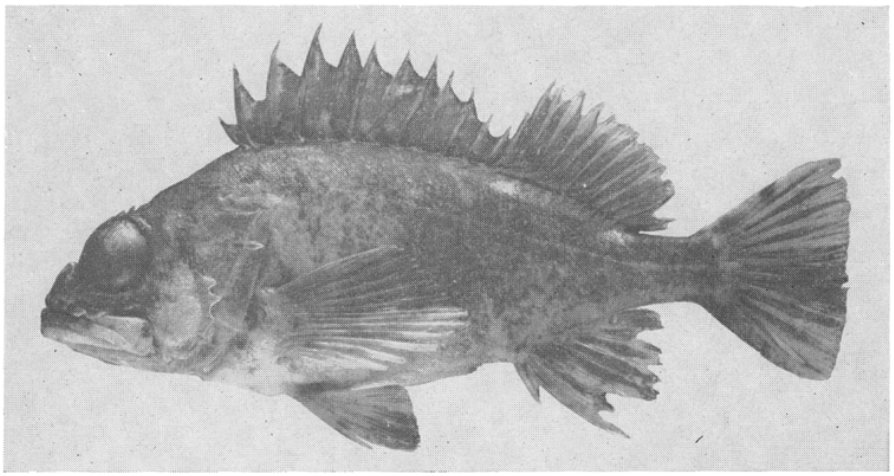


FIGURE 124 Photograph by J. B. Phillips

FIGURE 124

ROSY ROCKFISH

Sebastodes rosaceus (Girard)

Range: Oregon to Santo Tomas, northern Baja California.

Description: See page 120. Space between eyes concave; strong spines on top of head; lower jaw not projecting; underside of lower jaw naked; second anal spine longer than third; periotoneum dusky. **Length** to 12 inches. **Color:** Orange-red, young with some yellow; back with three to five whitish blotches bordered with blood-red or purple.

Importance: A minor commercial species.

Fishing Season and Gear: See page 120.

Remarks: Sebastodes rhodochloris is a similar but small and slender species. Basically, the color is red but mixed with this color are also green and yellow streakings. The most distinctive characteristic of this species is the very long second anal spine, which is not only much longer than the third, but as long as or slightly longer than the anal soft rays.

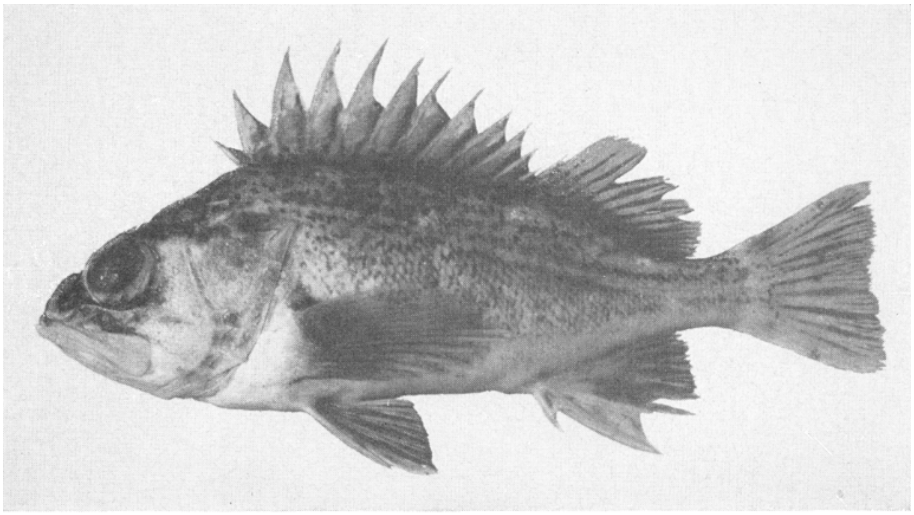


FIGURE 125

FIGURE 125

GREENSPOTTED ROCKFISH

Sebastodes chlorostictus (Jordan & Gilbert)

Range: Northern California to central Baja California, usually in rather deep water.

Description: See page 120. Irregular yellowish-green spots on back and base of dorsal fin; space between eyes broad, concave; strong spines on top of head; a knob at tip of lower jaw, which does not project beyond upper, peritoneum black; no scales on underside of lower jaw. **Length** to about 15 inches. **Color:** Flesh pink vaguely mottled with rose above, becoming pink or whitish below; scales tipped with yellowish green on the back and with yellow or orange on the lower part of the side; fins pink, the membranes washed with yellow; three to five irregular pale pink blotches on the back.

Importance: of minor importance, though often seen in the markets.

Fishing Season and Gear: See page 120.

Unauthorized Names: Chinafish, red rock cod, chucklehead.

PINK ROCKFISH

Sebastodes eos Eigenmann & Eigenmann

Similar to S. chlorostictus in general appearance but with scales on the underside of lower jaw which are lacking in S. chlorostictus. **Length** to 22 inches. **Color:** Faded pink with olivaceous splotchings on the back and several irregular whitish blotches as in S. chlorostictus.

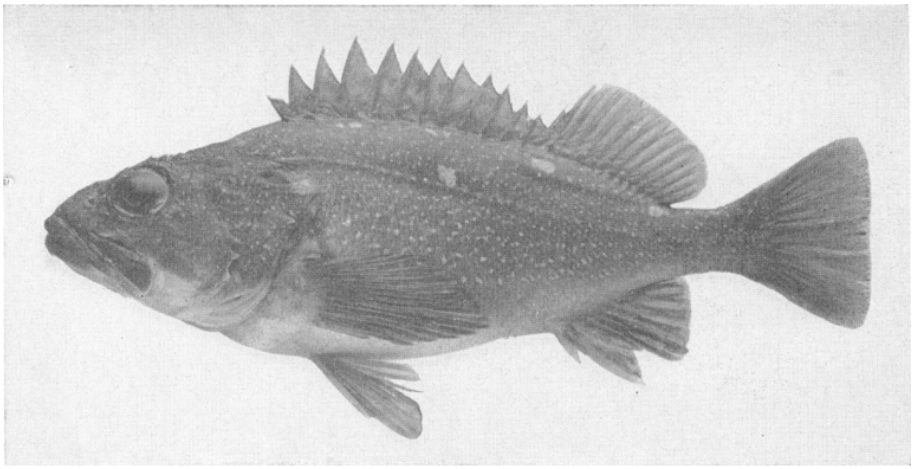


FIGURE 126

FIGURE 126

STARRY ROCKFISH

Sebastodes constellatus (Jordan & Gilbert)

Range: Central California to central Baja California, usually in rather deep water.

Description: See page 120. Body covered with many small pale dots. Space between eyes narrow, concave; three to five whitish pink blotches on sides; peritoneum white. **Length** to about 15 inches. **Color:** Orange to vermilion, shading into yellowish on the sides and becoming white or pink below; back sometimes with brownish blotches.

Importance: A minor commercial species.

Fishing Season and Gear: See page 120.

Unauthorized Names: Chinafish, red rock cod.

HONEYCOMB ROCKFISH

Sebastodes umbrosus (Jordan & Gilbert)

In Southern California this rather distinctive species may be taken in waters of moderate depth. Color light orange, overlaid everywhere with dusky in the form of fine black dots around the posterior margins of the scales; a fine hexagonal network of dark borders about the scale pockets; several clear areas present on back and upper sides as in the starry, green-spotted, and rosy rockfishes, and allied forms. Seldom exceeds 8 or 10 inches.

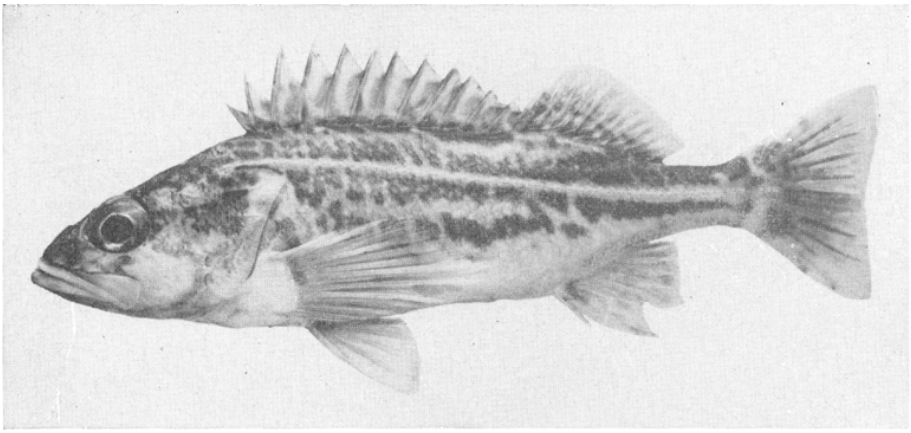


FIGURE 127

FIGURE 127

GREENSTRIPED ROCKFISH

Sebastodes elongatus (Ayres)

Range: British Columbia south to Baja California.

Description: See page 120. Four horizontal irregular green bands run the length of the body, joining to form two near the tail, separated by a pale pink stripe extending along the lateral line; space between eyes narrow, shallowly concave; top of head with strong spines; body slender. **Length** to about a foot. **Color:** Green suffused with pink or red becoming white below; striped as described.

Importance: Forms a minor proportion of the rockfish catch.

Fishing Season and Gear: See page 120.

Remarks: This fish is often found in association with the bocaccio and chilipepper as well as other species taken in water of moderate depth.

Unauthorized Names: Serena, reina, strawberry rock cod.

REDSTRIPE ROCKFISH

Sebastodes proriger (Jordan & Gilbert)

This is another slender species with a clear stripe along the lateral line, but it lacks the distinctive irregular green stripes. Range Alaska to Southern California. Color is red, mottled with dusky olive-green on the back; lips are blackened; a knob present on underside of tip of lower jaw; space between eyes strongly convex with rather weak ridges and spines.

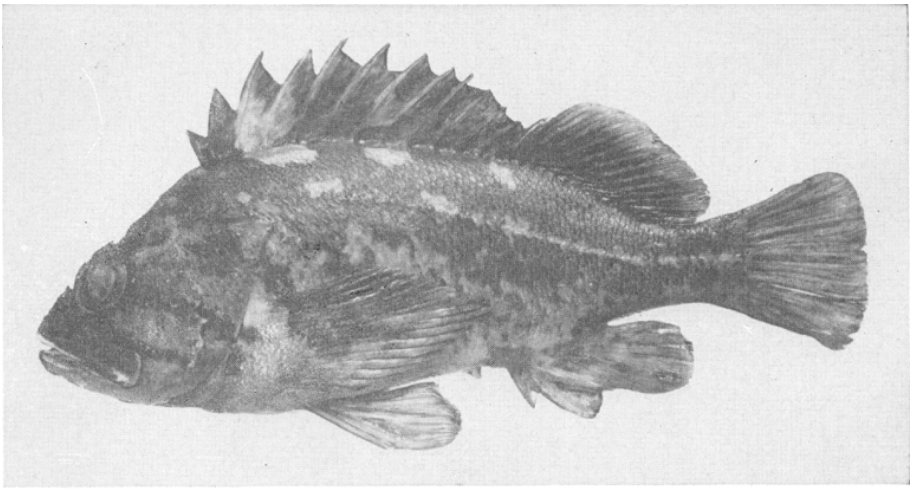


FIGURE 128

FIGURE 128

BLACK-AND-YELLOW ROCKFISH

Sebastodes chrysomelas (Jordan & Gilbert)

Range: The coast of California to northern Baja California.

Description: See page 120. Space between eyes concave; strong spines on top of head; lower jaw not projecting; pectoral fin broad with thick rays. **Length** to about 15 inches. **Color:** Dark, olive-brown to black above, tinged with yellow, shading to yellow below. Back and sides with a number of yellow irregular areas. Four of these clear areas occur as follows: Below third and fourth dorsal spines and extending up onto the membrane between the spines, below the membrane between the seventh and eighth spines, below the notch between the spinous and soft portions of the dorsal fin and below the end of the soft dorsal. Fins colored like neighboring parts. Obscure dark stripes radiate from eye.

Importance: One of the most highly esteemed rockfish of Central California, but not taken in any quantity.

Fishing Season and Gear: See page 120.

Remarks: This fish is rather commonly caught by anglers off rocks in Central California and northern Baja California but not in Southern California.

GOPHER ROCKFISH

Sebastodes carnatus (Jordan & Gilbert)

Very similar to the black-and-yellow rockfish; separable by having flesh-colored rather than yellow blotches. There may, however, be intergrades. Seldom exceeds 10 inches in length. A species of moderate depths from the kelp beds outward and caught rather frequently.

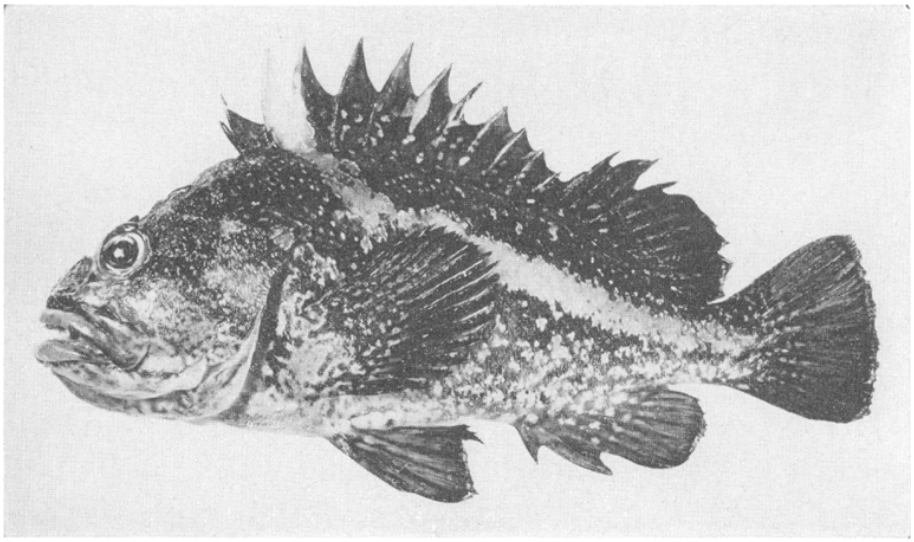


FIGURE 129

FIGURE 129

CHINA ROCKFISH

Sebastodes nebulosus (Ayres)

Range: Central California to Alaska in water of moderate depth.

Description: See page 120. Space between eyes concave; strong spines on top of head; a broad, irregular yellow band runs obliquely from the membrane between the third and fourth dorsal spines to the lateral line and then along the lateral line to the tail fin. **Length** to about 16 inches. **Color:** Blackish to blue-black, everywhere speckled with yellowish or whitish spots which are sometimes tinged with blue.

Importance: of minor importance in terms of poundage though it is a desirable species and commands a good price. Landed both in Central and Northern California.

Fishing Season and Gear: See page 120.

Unauthorized Names: Cefalutano, gopher.

Remarks: On occasions, this species appears in catches of the black-and-yellow and gopher rockfishes. Two other species are at times found with them, the kelp rockfish, Sebastodes atrovirens (Jordan & Gilbert), and the grass rockfish, S. rastrelliger (Jordan & Gilbert). Both are similar in color, dark olivaceous to light dusky brown, with a white peritoneum; space between eyes spiny, slightly convex. The kelp rockfish has 31 to 33 long slender gill rakers on the first arch, the longest about one-half the width of the orbit. The grass rockfish has 22 or 23 short flat gill rakers nearly as high as wide, the longest about one-quarter the width of the orbit. The kelp rockfish is usually found in and around kelp and the grass rockfish close to rocky shores from Central California to northern Baja California.

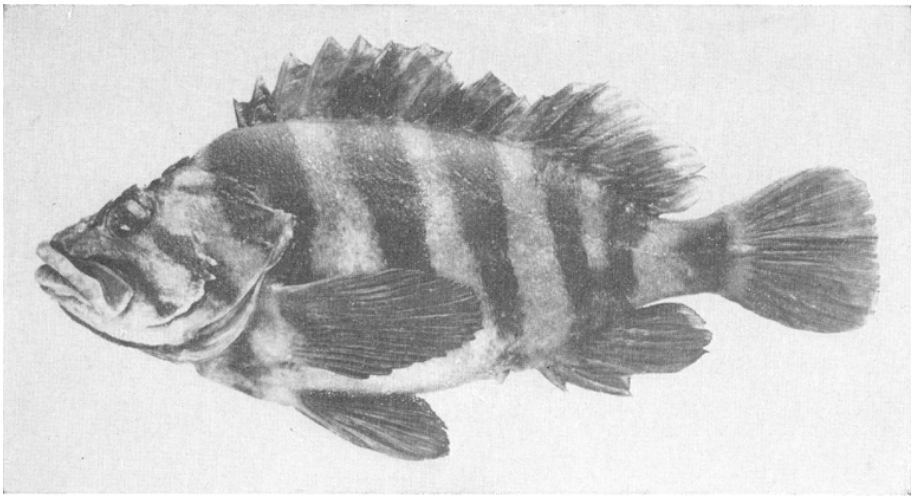


FIGURE 130

FIGURE 130

TREEFISH

Sebastodes serriceps (Jordan & Gilbert)

Relationship: Two other species, the flag rockfish, S. rubrivinctus, and the blackbanded rockfish, S. nigrocinctus, resemble it in having vertical bands of color.

Range: Central California south into central Baja California.

Description: See page 120. Vertical black bands across body; space between eyes narrow, concave; top of head with blunt spines and strong thick ridges which break up to form rugosities in adults; lower jaw not projecting. **Length** to about 14 inches.

Color: Dark olive or blackish above shading to yellowish below; six to seven black bands on the sides and two others running down and back from the eyes; tinged with red on front and lower part of head. In the flag rockfish the ground color is pink or rosy and the broad vertical bars are crimson (see page 127); in the blackbanded rockfish the ground color is bright red and there are about five vertical black bars overlaid with red.

Importance: of very minor significance.

Fishing Season and Gear: See page 120.

HALFBANDED ROCKFISHd

Sebastodes semicinctus Gilbert

This is another form found in shallow and moderate depths in Southern California. It is a slender fish attaining a length of about eight inches. Color dusky pink on the back shading to a clearer pink on the sides; two irregular, dusky bars on posterior portion of body; small brown spots present on the back. Space between eyes flat with low ridges and delicate spines.

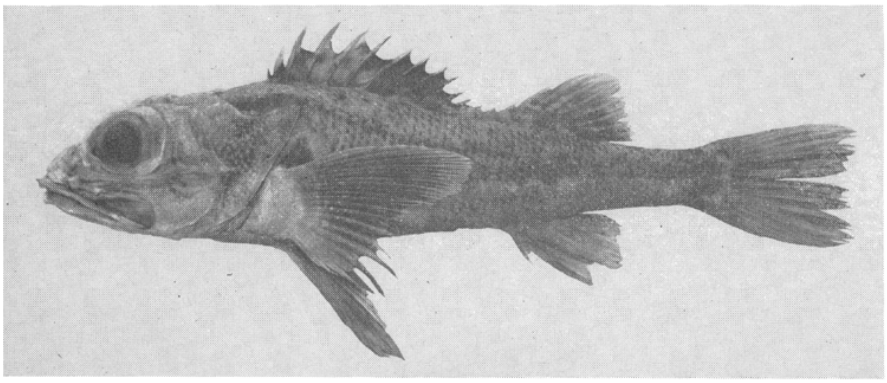


FIGURE 131 Photograph by J. B. Phillips

FIGURE 131

CHANNEL ROCKFISH

Sebastolobus alascanus Bean

Range: The Bering Sea to northern Baja California, usually in from 100 to 300 fathoms.

Description: See page 120. Dorsal fin deeply-notched with 15 to 17 spines, and 9 or 10 soft rays; pectoral fin with prolonged lower rays; head large with conspicuous rows of spines; body slender. **Length** to about two feet. **Color:** Bright red, a dark blotch or blotches on the spiny portion of the dorsal fin; other fins with black markings. Some irregular deeper red to blackish spots on body.

Importance: of minor commercial significance. Included in the "rockfish" catch.

Fishing Season and Gear: No definite season; caught incidentally with other species on set lines and in drag nets.

Alternative Name: Thornhead.

Unauthorized Names: Idiot, channel cod, fagiano, scorpion, deep sea red rock cod.

Remarks: A smaller, very similar species, Sebastolobus altivelis Gilbert is taken occasionally along with S. alascanus in deep water. It lives typically in still deeper water so seldom enters the catch. The characteristics of S. altivelis are the same as for S. alascanus except that the third or fourth dorsal spine in S. altivelis is significantly higher than the preceding and the succeeding dorsal spines, forming an angle in the marginal contour of the fin. In S. alascanus the dorsal spines are uniformly graduated and the marginal contour of the fin is a rather uniform arc. Further, fine scales (difficult to determine) are present on the branchisotegals of S. altivelis which are lacking on S. alascanus.

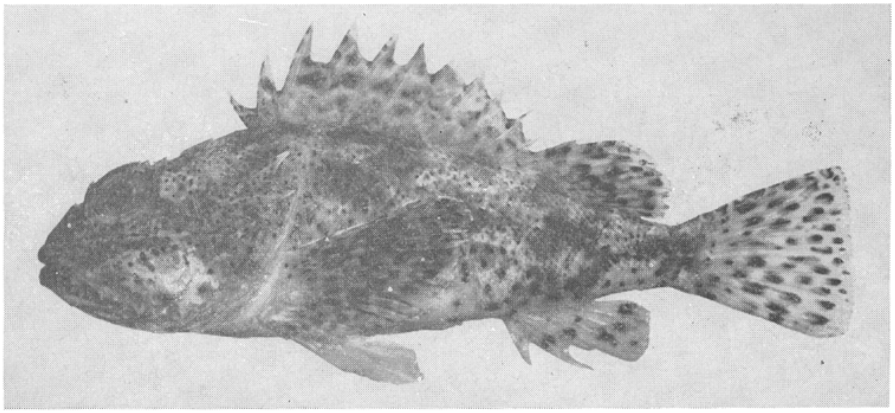


FIGURE 132 Photograph by J. B. Phillips

FIGURE 132

SCULPIN

Scorpaena guttata Girard

Relationship: Not a true sculpin but a member of the rockfish family. True sculpins are shown on pages 140 and 141.

Range: Southern California south at least to Pt. Abreojos, Baja California. Common in bays and along the shore. Reported as far north as Monterey Bay in the 1850's. Records from the Gulf of California probably refer to another species.

Description: See page 120. Dorsal fin with 12 sharp spines; many spines on top of head and on opercle. **Length** to about 17 inches. **Color:** Generally reddish above, mottled with reddish brown, olive, gray or purple and becoming bright pink below; upper parts with many small round brownish or olive spots; pelvic fins plain pinkish or reddish, other fins marked with dark brown.

Importance: of minor commercial significance with heaviest landings in the Los Angeles region. Sold entirely in the fresh fish markets. Considered a desirable species by sportsmen, it ranked eleventh in numbers caught by marine anglers in 1951.

Fishing Season: Throughout the year, usually reaching a peak in the spring and summer.

Fishing Gear: Hook and line, set lines.

Warning: This fish should be handled with care as the spines inflict extremely painful wounds.

Alternative Name: Scorpionfish.

Unauthorized Name: Bullhead.

3.4.3.17. THE SABLEFISH FAMILY, ANOPLOPOMATIDAE

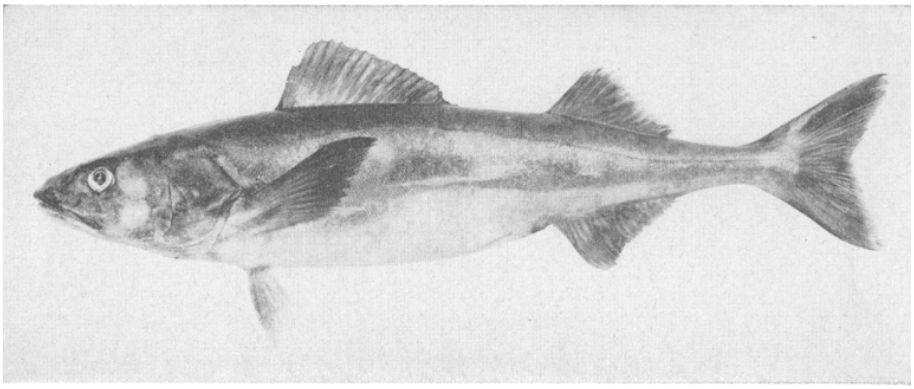


FIGURE 133

FIGURE 133

SABLEFISH

Anoplopoma fimbria (Pallas)

Relationship: The only member of the family.

Range: Northwest Alaska to Cape Colnett, northern Baja California.

Description: A bony support just under skin extends from lower part of eye back across cheek; slit present behind fourth gill; dorsal fins two, separate, the first with spines, the second with rays; two pairs of nostrils; body covered with small scales; anal fin with three spines and 15 to 19 rays. **Length** to more than three feet; **weight** usually less than 25 pounds; a record fish caught in Northern California reputedly weighed 56 pounds. **Color:** Blackish, dark gray or greenish gray on the back and sides, becoming paler below; lining of gill cover and peritoneum blackish. **Young** pelagic; almost blue on back and sides, white on belly.

Importance: One of the more important market species in California, it ranked fourteenth in both poundage and value among the State's fisheries in 1951. Greatest landings are made in the Eureka region, followed by Monterey. Taken in small quantities in Southern California, especially by dories at Newport Beach. Sold chiefly smoked. The liver and viscera have a high vitamin content.

Fishing Season: Throughout the year, with the heaviest catches made during the summer months.

Fishing Gear: Set lines, hand lines, long lines, trawls; trawl catches predominate at Eureka, long lines in Monterey Bay.

Remarks: Sablefish inhabit deep water during the winter, moving into shallower water as the season progresses. The fishery operates for the most part in depths of 80 to 300 fathoms.

Alternative Name: Blackcod.

Unauthorized Names: Coalfish, candlefish, blue cod, bluefish, coal cod.

3.4.3.18. THE LINGCOD FAMILY, OPHIODONTIDAE

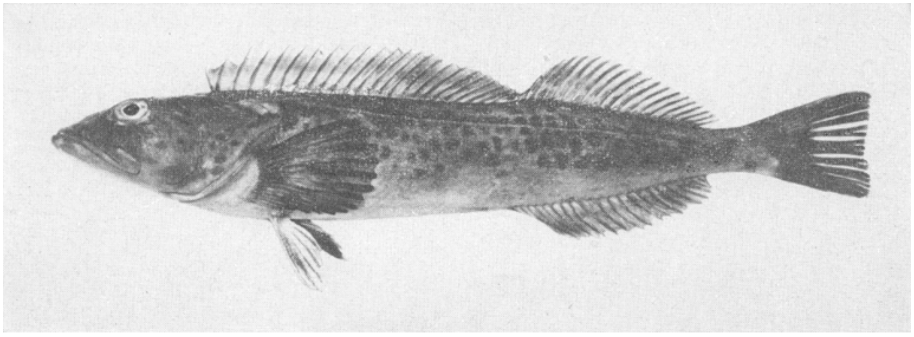


FIGURE 134

FIGURE 134

LINGCOD

Ophiodon elongatus Girard

Relationship: The only member of the family. Not a true cod.

Range: Northwestern Alaska south into northern Baja California at least to San Martin Island.

Description: A bony support extends back from lower part of eye across cheek just under the skin; dorsal fin long, deeply notched; teeth large, canine-like; two large fleshy flaps over eyes; small scales cover body; lateral line single. **Length** to more than four feet and **weight** up to 70 pounds. **Color:** Extremely variable, associated with habitat. Ranges from dark bluish or greenish brown above with darker blotches outlined in orange or pale blue, to lighter brown or tan with spots and blotches of brown, green, orange, or yellowish; gray green or turquoise to whitish below. Flesh turquoise green to whitish (the green color is not harmful).

Importance: A market fish of moderate importance; it ranked sixteenth in both poundage and value in 1951 with heaviest landings in the Eureka region, followed by San Francisco and Monterey; very small quantities are taken in Southern California. The entire catch is sold fresh. A leading Central California sport fish, it ranked twelfth in numbers caught among the State's ocean sport fisheries in 1951.

Fishing Season: Throughout the year with heaviest catches from April to October.

Fishing Gear: Otter trawls, set lines, long lines, hook and line. Taken by sportsmen from boats or rocky shores with cut sardines or jigs.

Unauthorized Names: Greenling, blue cod, white cod, buffalo cod, leopard cod, green cod, cultus.

3.4.3.19. THE SCULPIN FAMILY, COTTIDAE

This is a very large family with some forth species found in California's ocean waters and a few others in fresh. All but two are small fishes of no importance to sport or commercial fishermen, though some of them are very abundant in tidepools. **Family Characters:** All have a bony support extending back under the skin from lower part of eye across the cheek, a single lateral line, no anal spines, fewer than 20 dorsal spines, and gill membranes either united to each other or joined to the isthmus; pelvic fins thoracic with one spine and 2 to 5 soft rays (pelvics absent in one species); scales may be present or absent; dorsal fin usually deeply notched, but in some the spiny and soft portions are separate and in others the notch is shallow. Reference, Bolin, 1944.

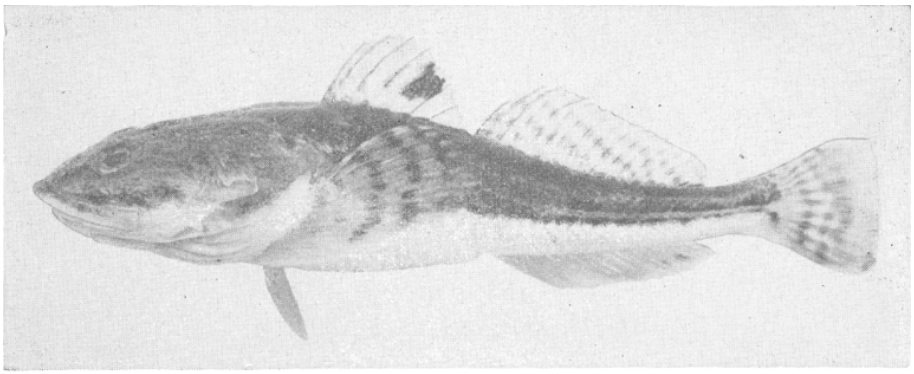


FIGURE 135

FIGURE 135

STAGHORN SCULPIN

Leptocottus armatus Girard

Relationship: Two subspecies have been described: a northern form, L. a. armatus, and a southern, L. a. australis Hubbs.

Range: Northwest Alaska to San Quintin Bay, northern Baja California. Common close to shore and in bays; enters brackish and fresh water at stream mouths.

Description: A bony support extends from lower part of the eye back across cheek just under skin; body scaleless; a large antlerlike spine on the preopercle; pelvic fins with one spine and four rays (spine is so closely attached to first ray that it can be found only by dissection). **Length** to about a foot. **Color:** Back, mottled olive-gray, green or brown; sides, brassy bordered below by yellow; belly, white. Spiny dorsal with a black spot toward its end; soft dorsal and anal fins with gray or green bars; pectoral fins barred with yellow and black.

Importance: A moderately important bait fish, particularly in bays. of no significance as either a market or game fish, though it is caught not infrequently by sportsmen.

Fishing Gear: Hook and line.

Unauthorized Name: Bullhead.

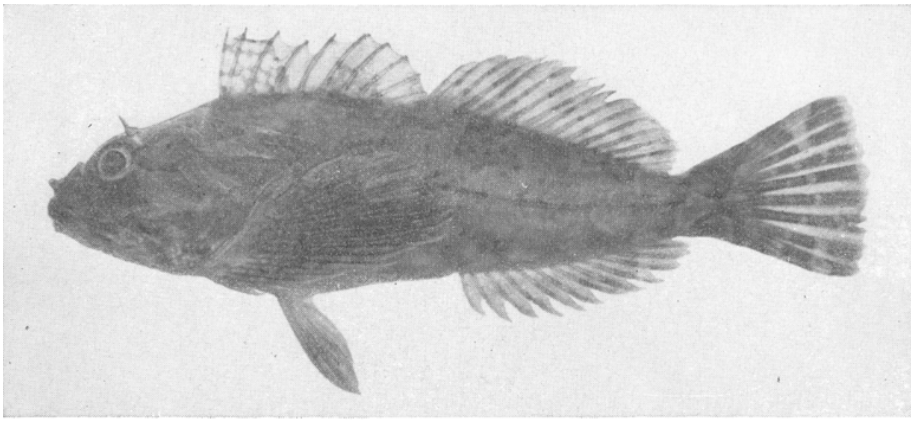


FIGURE 136

FIGURE 136

CABEZON

Scorpaenichthys marmorafus (Ayres)

Range: Northern British Columbia to Turtle Bay, central Baja California.

Description: A broad, bony support extends from lower part of eye across cheek just under the skin; body scaleless, the skin having a wrinkled appearance; anal fin with thick, soft rays but no spines; a fleshy flap on middle of snout and a pair of longer ones just back of eyes; a stout spine just before eye; mouth broad with many small, sharp teeth. Reaches a **length** of 30 inches and a **weight** of 20 to 25 pounds. **Color:** Extremely variable; from dark brown to red, tan, gray or greenish, generally mottled or blotched. Ground color in adults usually green in females (this particularly evident in the lining of the mouth) and red in males.

Importance: An important game fish in the Monterey and Santa Barbara areas. The sport catch has been far greater than the commercial in recent years. of negligible commercial significance, with maximum landings in the Monterey region.

Fishing Season: Caught irregularly throughout the year.

Fishing Gear: Hook and line, with cut bait or jigs.

Remarks: Adult cabezons are found in shallow inshore water over a hard bottom to depths of 30 or 40 fathoms. Crabs form the most important portion of their diet. Spawning takes place in the fall and winter, the males maturing at 2 or 3 and the females at 3 to 5 years of age. A female about 13 years old is on record. The larvae and the blue and silver very young are pelagic, older juveniles and some adults are often found in tidepools. Reference, O'Connell, 1952.

Warning: The roe of the cabezon is poisonous and can cause severe illness if eaten The flesh regardless of color is considered of excellent quality and there is no indication that it can be in any way harmful. (Hubbs and Wick, 1951.)

Unauthorized Names: Bullhead, blue cod, marbled sculpin, bull cod.

3.4.3.20. THE GREENLING FAMILY, HEXAGRAMMIDAE

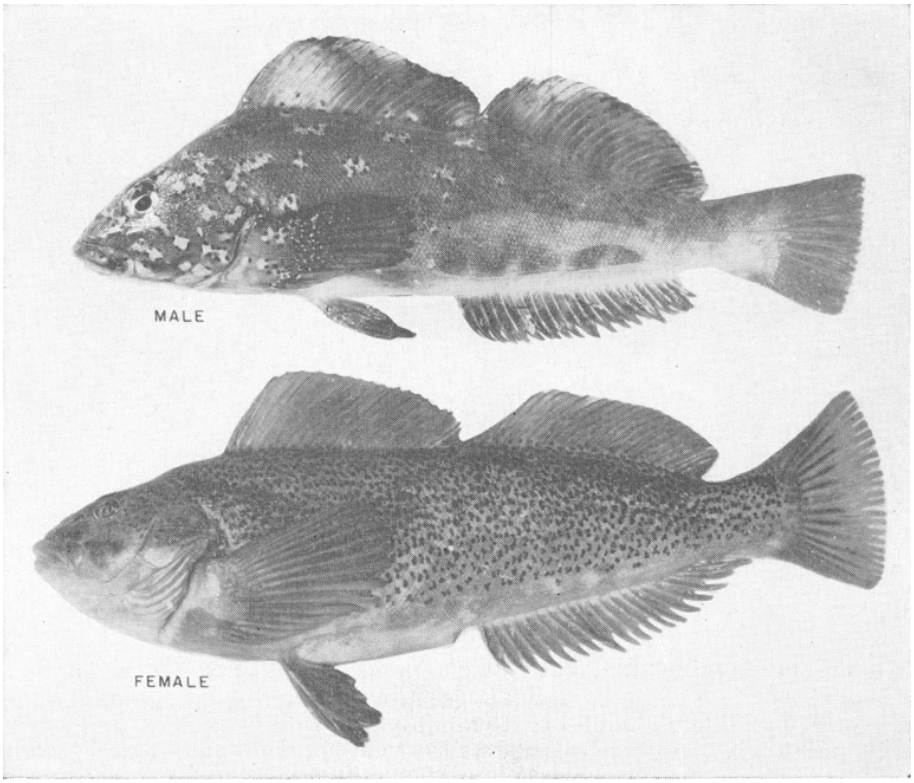


FIGURE 137

FIGURE 137

GREENLING SEATROUT

Hexagrammos decagrammus (Pallas)

Range: Kodiak Island to Southern California, rare to the south (Los Angeles Harbor breakwater, one record, Santa Monica Bay, two records, all 1953).

Description: A bony support just under skin extends back from lower fore part of eye across cheek; dorsal fin long with about 21 spines; no canine teeth in mouth; five lateral lines; two pairs of fleshy flaps on top of head, the first flaps less than half as long as the eye; the second pair may be greatly reduced or lacking. **Length** to about 20 inches. **Color:** Brownish or grayish of various shades, the males sometimes tinged with bluish or coppery, the females sometimes with a slate-blue ground color; head and fore parts of the males with rather large sky-blue spots, each surrounded by a ring of small rusty spots; back, sides and head of the females rather closely and uniformly covered with round, reddish brown spots; the bones sometimes green.

Importance: A desirable sport fish. Very rarely enters the commercial catch.

Fishing Season: Taken irregularly all year.

Fishing Gear: Hook and line, set and long lines, accidentally in trawls.

Remarks: This fish is usually called "seatrout" by California fishermen. In the Pacific Northwest "greenling" prevails and that name is now reported entering California. It is far more appropriate, as the fish is not remotely related to the trouts.

Alternative Name: Kelp greenling.

Unauthorized Names: Rock trout, rockfish, bluefish.

Other California greenlings: See key, page 161. Rock greenling, H. superciliosus, Alaska to Southern California (one record); common in Northern California. White-spotted greenling, H. stelleri, Alaska to Northern California; rare in California.

3.4.3.21. THE GOBY FAMILY, GOBIIDAE

The gobies form a large and widely distributed family in inshore tropical and temperate waters. A few are found in fresh water. The family is represented in California by 12 species, only one of which is of economic significance, though several are abundant on mud flats and in tidepools. These fishes are distinguished by having their pelvic fins completely joined with each other.

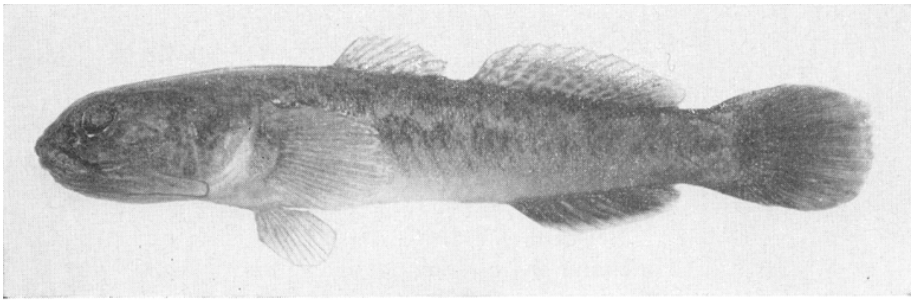


FIGURE 138

FIGURE 138

MUDSUCKER

Gillichthys mirabilis Cooper

Range: Central California (Tomales Bay) to central Baja California. Common in Southern California bays and sloughs. Established in the Salton Sea through accidental introductions.

Description: Pelvic fins united; mouth huge with maxillary greatly developed, extending back to base of pectorals in the adult. (The very young have small mouths and large eyes.) **Length** to at least eight inches. **Color:** Brownish or olive above, speckled, mottled or barred with darker shades, becoming lighter below.

Importance: The only commercially important member of the family in California. Large quantities are used as bait, particularly by inland sport fishermen, and demand exceeds the Southern California supply. In recent years it has been imported, largely by air, from Baja California. The fish is extremely hardy, is reported to live for several weeks in fresh water, and has been transported commercially as far distant as Lake Mead and the lower Colorado river.

Fishing Season: Taken throughout the year.

Fishing Gear: Traps.

Remarks: Weisel (1948) reported the spawning season in the San Diego area to extend from January to July, reaching its height from February to April.

3.4.3.22. THE TOADFISH FAMILY, BATRACHOIDIDAE

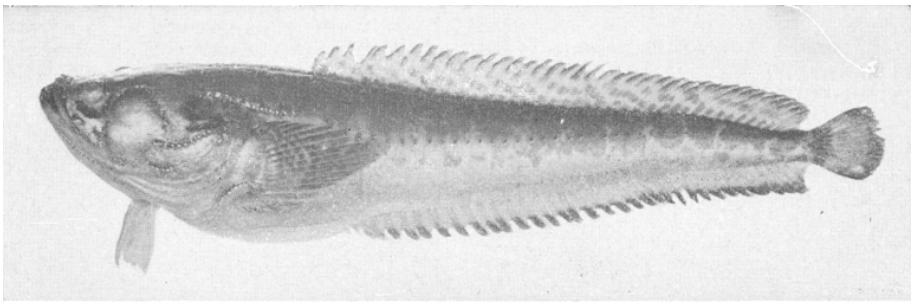


FIGURE 139

FIGURE 139

SLIM MIDSHIPMAN

Porichthys myriaster Hubbs & Schultz

Range: Southern California south into Baja California, usually inshore and in bays.

Description: Numerous luminous organs or photophores arranged in rows on body and head (these look like small shiny spots); the second (branchyostegal) row under the head forming a forward-directed [n] centrally; dorsal fins two, the first very small, composed of two short spines; pelvic fins with one spine and two rays; a strong opercular spine. **Length** to about 15 inches. **Color:** Deep bronze with purplish or bluish reflections above, paler on the sides and becoming golden yellow below, or entirely bronze, darker above; dorsal fin speckled; anal fin margined with dusky or black in adults.

Importance: of no importance as a commercial or game fish, but seen fairly often in catches of other species, particularly in roundhaul nets.

Remarks: This fish often burrows into the sand leaving only its eyes exposed. It feeds voraciously on miscellaneous invertebrates. It is possible, though difficult, to induce an individual to "light up"; when one does it is very spectacular. Reference, Hubbs and Schultz, 1939.

NORTHERN MIDSHIPMEN

Porichthys notatus Girard

Range: Alaska to the Gulf of California in both shallow and deep water; in deeper water, avoiding bays and shoals, south of Pt. Conception. **Description:** Second (branchyostegal) row of photophores under head forms a broad [^]. Dorsal fin nearly plain dusky; anal fin usually without dark margin.

3.4.3.23. THE KLIPFISH FAMILY, CLINIDAE

Eight species of California fishes belong to this family, several of which are very common in tidepools. The group is of little economic significance. Reference, Clark Hubbs, 1952.

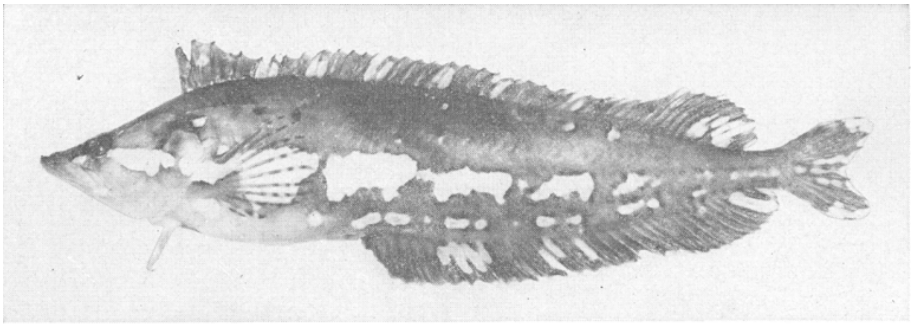


FIGURE 140

FIGURE 140

KELPFISH

Heterostichus rostratus Girard

Range: British Columbia to Cape San Lucas, Baja California. A common inshore form, particularly around kelp and eelgrass, from Pt. Conception to central Baja California.

Description: Pelvic fins with one spine and three rays, inserted in advance of pectoral fins; dorsal fin long with many more spines than soft rays; lower jaw projects; tail forked. **Length** to about 2 feet; it is the largest member of the family. **Color:** Highly variable; the ground color of the body may be orange to reddish, coral, brown, green, or purple; body may be barred or mottled with darker shades or striped with silver or plain orange to reddish. Those in kelp are usually kelp-colored, those in eel-grass bright green with brilliant silvery stripes. The flesh assumes the external ground color.

Importance: None, though caught fairly frequently by both sport and commercial fishermen. It is edible despite the color of the flesh.

3.4.3.24. THE MONKEYFACE FAMILY, CEBIDICHTHYIDAE

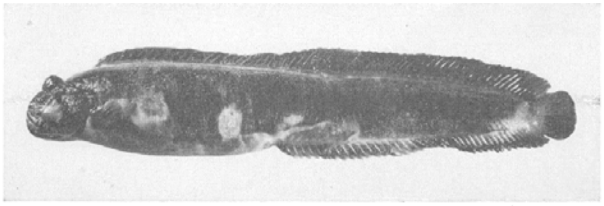


FIGURE 141

MONKEYFACE-EEL
Cebidichthys violaceus (Girard)

Relationship: It is not an eel though commonly so called.

Range: Northern California to San Quintin Bay, Baja California. Seldom reported from south of the northern Channel Islands. Common in the intertidal zone in the northern and central part of the State.

Description: No pelvic fins; lateral line single, near dorsal fin, without definite branches; pectoral fins large, about half as long as head; dorsal fin very long with both spines and soft rays; anal fin with two spines at the front; head short, adults, particularly breeding males, with a fleshy hump on top of head. **Length** to about 30 inches. **Color:** Dull green or brownish green, mottled, and becoming paler below. Sides often with scattered orange or reddish spots in life.

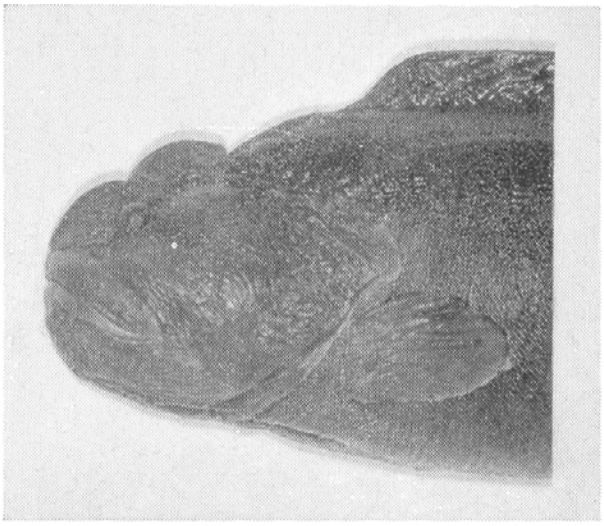


FIGURE 142

Importance: A minor sport fish. Rarely enters the commercial catch.

Fishing Season: Throughout the year, subject to bag and size limits in some places. Consult fish and game laws.

Fishing Gear: A specially made stick with a baited hook at the end; hook and line. Although herbivorous, it is commonly taken with mussel or prawn bait.

3.4.3.25. THE PRICKLEBACK FAMILY, STICHAEIDAE

This family includes a number of small tidepool and inshore fishes as well as the larger rock-eel.

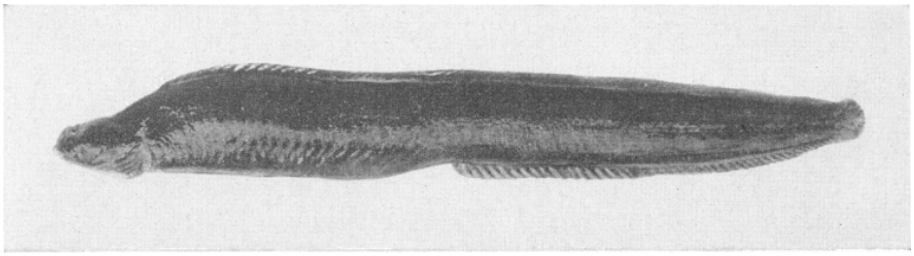


FIGURE 143

FIGURE 143

ROCK-EEL

Xiphister mucosus (Girard)

Relationship: Not a true eel despite its name.

Range: Alaska to Southern California (Santa Cruz Island); common in the intertidal zone.

Description: No pelvic fins; four lateral lines, each with a series of cross-branches; pectoral fins tiny, scarcely if any longer than the eye; no spines in anal fin, no soft rays in the extremely long dorsal fin; small, well-imbedded scales cover the body. **Length** to about 20 inches. **Color:** Blackish green becoming paler below, sometimes with yellowish blotches in older fish; two prominent olive brown streaks edged with black radiate back from the eye; bones tinged with green, sometimes emerald.

Importance: Rarely enters the commercial catch. A minor sport fish in Central and Northern California.

Fishing Season: Taken throughout the year subject to size and bag limits in part of the State. See fish and game laws.

Fishing Gear: Hook and line; a specially made stick with a hook on the end.

Unauthorized Name: Black eel.

3.4.3.26. THE WOLFFISH FAMILY, ANARHICHADIDAE

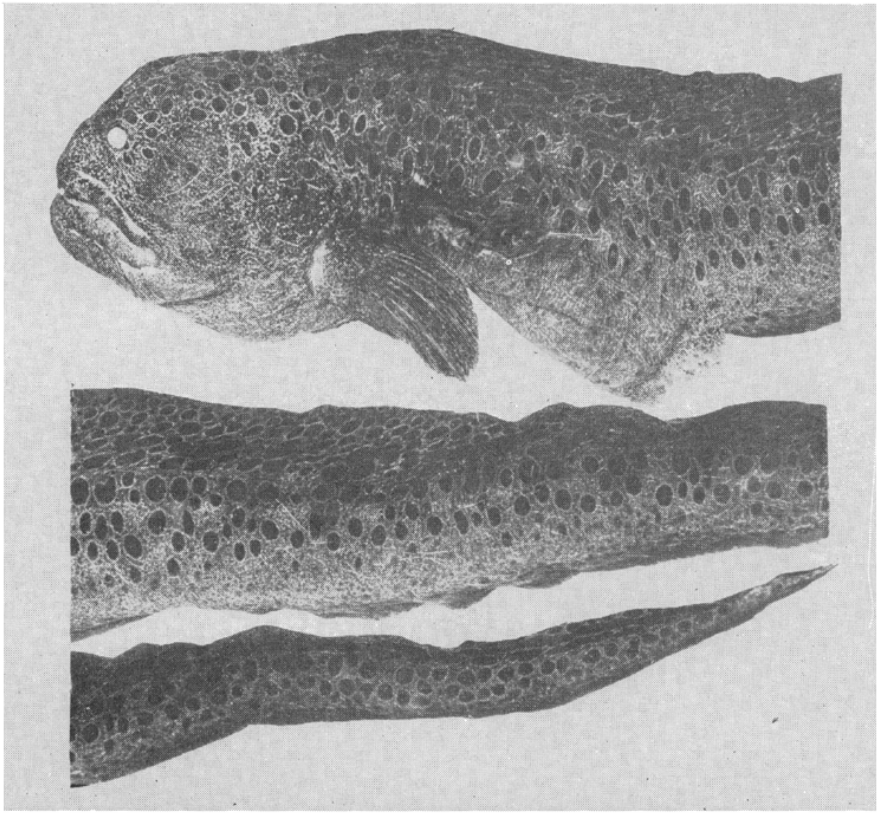


FIGURE 144
Photograph courtesy of Smithsonian Institution

FIGURE 144

WOLF-EEL
Anarrhichthys ocellatus Ayres

Relationship: The only member of the family on the Pacific Coast.

Range: Kodiak Island, Alaska, to San Diego, California (one record from Southern California).

Description: No pelvic fins; body extremely elongate, tail pointed; no dorsal soft rays; no anal spines; dorsal and anal fins merge with the tail fin; teeth strong, canine, at front of jaws, conical to molarlike at sides of jaw and on vomer and palatines; teeth more conical in young becoming strong molars with age; gill membranes attached to isthmus. **Color:** Green or gray, prominent black spots on body and dorsal fin of adults. **Length** to eight feet.

Importance: None. Caught accidentally by some sport and commercial fishermen.

Remarks: This fish is said to bite furiously when caught and to be able to bite a broomstick in two. The young are pelagic and very boldly marked.

3.4.3.27. THE MOLA FAMILY, MOLIDAE

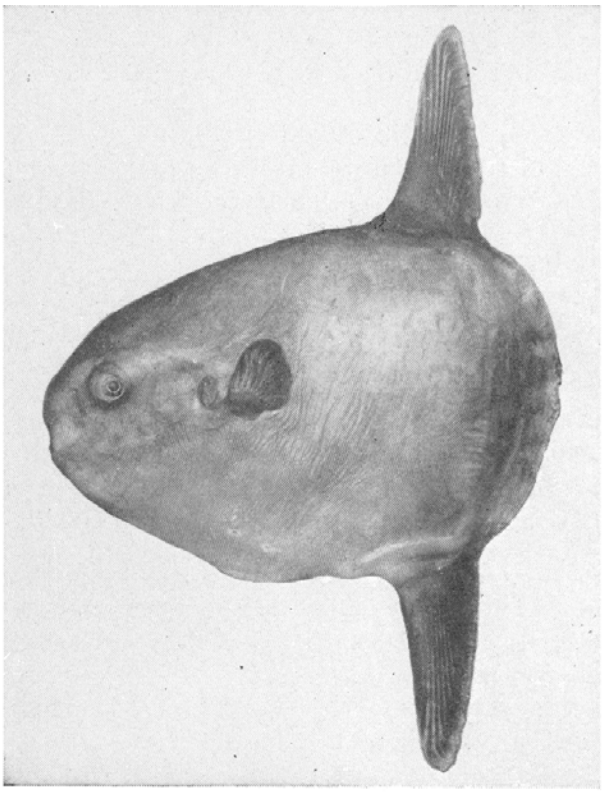


FIGURE 145

MOLA

Mola mola (Linnaeus)

Relationship: The only member of the family commonly found on the Pacific Coast.

Range: Temperate and tropical seas throughout most of the world; north to Alaska on our coast. Sporadically abundant off California.

Description: Body short, deep, flattened; dorsal and anal fins high, set back near tail; no pelvic fins. **Length** to 10 feet and **weight** reputed to about a ton. Individuals seen in California waters are usually less than three feet in length. **Color:** Dark gray or dirty brown mottled with metallic shades above; chin and belly silver to dusky whitish; a grayish band along the bases of the dorsal, anal and caudal fins; sometimes with prominent silvery blotches that fade quicly on death.

Remarks: Not the object of a fishery. of interest because of its bizarre shape and because of the tremendous size it attains. Considered a delicacy by some. It is often seen lying on its side at the surface as though sunning—hence the name "ocean sunfish" sometimes applied to it. At times leaps clear of the water. It has on rare occasions been caught on hook and line. Reference, Fraser-Brunner, 1951.

Unauthorized Name: Ocean sunfish.

4. GLOSSARY

ABDOMINAL: With reference to the belly.

ADIPOSE FIN: A fleshy finlike structure without rays or spines behind the dorsal fin on the midline of the back.

ANAL FIN: The unpaired fin on the midline of the under surface of the body back of the vent.

ANTERIOR: To the front. Opposite of posterior.

BARBEL: A fleshy projection, usually about the head.

BRANCHIOSTEGALS: Bony rays on the under surface of the head which support the membrane enclosing the gill chambers.

CANINE TEETH: Large, conical teeth.

CAUDAL FIN: The tail fin.

CAUDAL PEDUNCLE: That portion of the body behind the base of the last anal ray and to which is attached the caudal fin.

COMPRESSED: Flattened from side to side; deeper than broad.

CORSELET: A patch of scales behind the base of the pectoral fin.

DEPTH: The greatest vertical distance through the body exclusive of the fins.

DORSAL: (1) The upper part of the body, the back. (2) The dorsal fin.

DORSAL FIN: The unpaired fin(s) on the midline of the back (except the adipose fin, if present).

FINLETS: Small more or less unconnected fins following the dorsal and anal fins. Unlike the adipose fin in being specialized rays and not being fleshy.

FRENUM: Herein, a membrane binding the lower lip to the front end of the lower jaw.

GILL: The breathing apparatus.

GILL ARCH: The bony structure to which the gill rakers and filaments are attached.

GILL COVER: The bony cover protecting the gills.

GILL FILAMENTS: The slender, soft, red structures on the outer side of each gill arch.

GILL MEMBRANE: The skin enclosing the gill chambers; supported by the branchiostegals.

GILL OPENING: The external opening leading to the gills.

GILL RAKERS: The bony, tooth- or comb-like protuberances on the opposite side of the gill arch from the gill filaments. Gill rakers are counted on the first arch; the formula "4 + 13," for example, means 4 rakers above the angle of the arch and 13 below.

GILL SLITS: The openings between gill arches. There may or may not be a small slit or pore behind the fourth gill arch.

HEAD LENGTH: The distance from the tip of the snout to the hind edge of the gill cover.

ISTHMUS: The area under the head and between the gill openings where the gill membranes converge. The gill membranes may be attached to or free from the isthmus.

KEEL: A ridge along the side of the tail or caudal peduncle of some fishes.

LATERAL LINE: A series of pores along the side of the body forming what looks like a dotted line. Absent in some fishes and multiple in others.

LATERAL LINE, DORSAL BRANCH: An extra branch of the lateral line running back from the head, usually near the dorsal fin.

MAXILLARIES: The main bones of the upper jaw.

OPERCLE: The principal and hindmost bone of the gill cover.

OVIPAROUS: Producing eggs that hatch outside the parent's body.

OVOVIVIPAROUS: Producing eggs that hatch inside the parent's body, the young drawing nourishment from the egg yolk; no placental attachment as in viviparous animals.

PALATINES: A pair of bones in the roof of the mouth which extend out and back from the vomer.

PECTORAL FINS: The first or uppermost of the paired fins.
PELVIC FINS: The pair of fins below or behind the pectoral fins. Also called ventral fins.
PERITONEUM: The lining of the abdominal cavity.
POSTERIOR: Behind. Opposite of anterior.
PREMAXILLARIES: The paired bones forming the front of the upper jaw.
PREOPERCLE: The bone of the gill cover in front of the opercle.
PYLORIC CAECA: Appendages in the form of blind sacs at the junction of the stomach and the intestines.
RAY: The supporting rod of a fin; may be spiny or soft.
SCALY APPENDAGE: A triangular projection formed from a scale and found just above the base of the pelvic fin in some fishes.
SNOUT: The part of the head in front of the eyes. Its length is measured from the tip of the upper jaw to the front of the eye.
SOFT DORSAL: The part of the dorsal fin which is supported by rays.
SOFT RAY: The supporting rod of a fin which appears to be composed of many small segments placed end to end; sometimes branched.
SPINE: (1) The unsegmented, usually hard and sharp, rods which support parts of fins. (2) Any sharp projecting point.
SPINY DORSAL: The part of the dorsal fin which is supported by spines.
STANDARD LENGTH: The distance from the tip of the snout (or the tip of the lower jaw if it projects beyond the snout) to the end of the vertebral column.
THORACIC: With reference to the chest region.
VENT: The opening at the end of the digestive tract.
VENTRAL: The lower part of the body. Opposite of dorsal.
VENTRAL FINS: See pelvic fins.
VIVIPAROUS: Giving birth to live young.
VOMER: A bone in the roof of a fish's mouth just behind the middle of the upper jaw.

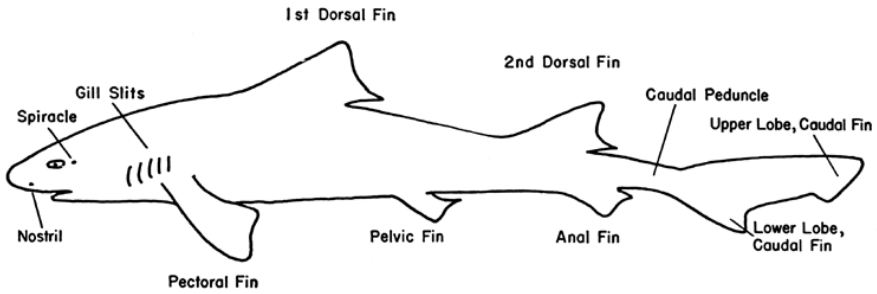


FIGURE 146. External parts of a shark

FIGURE 146. External parts of a shark

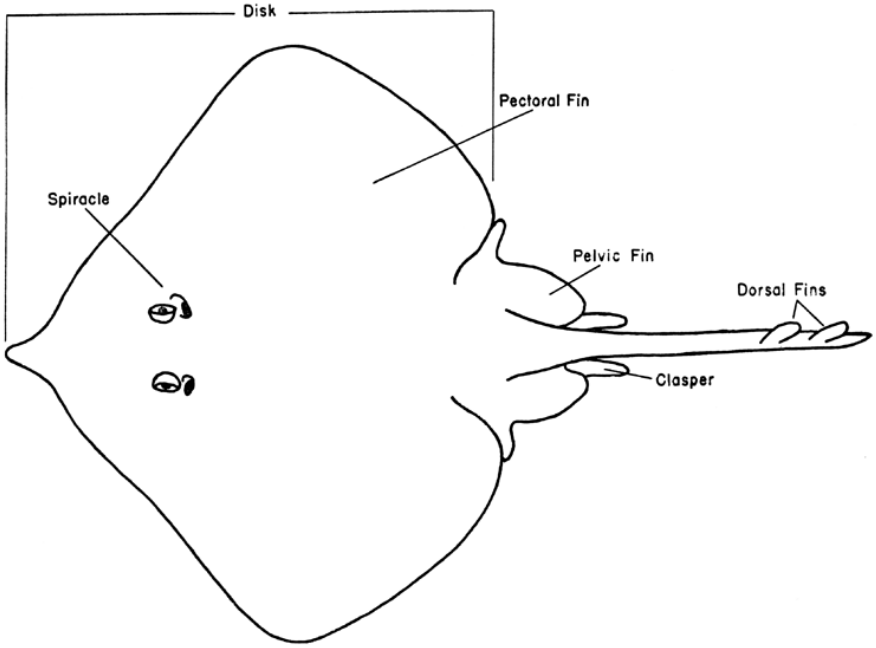


FIGURE 147. External parts of a ray

FIGURE 147. External parts of a ray

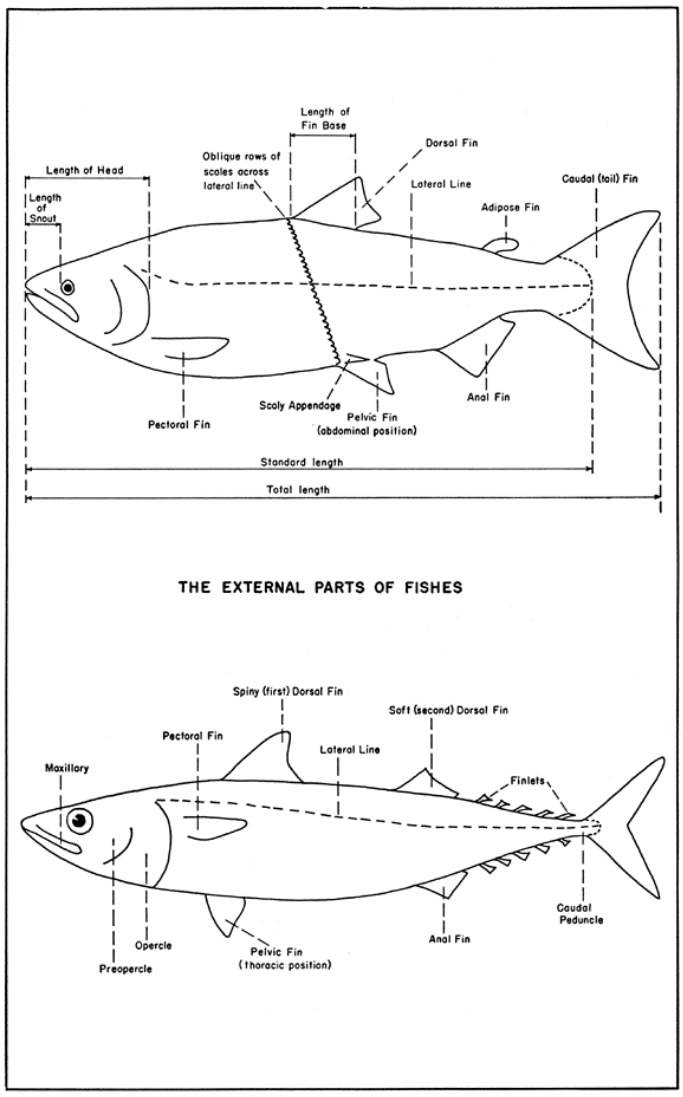

Length of Fin Base
Dorsal Fin
Oblique rows of scales across lateral line
Length of Head
Lateral Line
Caudal (tail) Fin
Length of Snout
Adipose Fin
Anal Fin
Scaly Appendage
Pelvic Fin (abdominal position)
Pectoral Fin
Standard length
Total length
THE EXTERNAL PARTS OF FISHES
Spiny (first) Dorsal Fin
Soft (second) Dorsal Fin
Pectoral Fin
Lateral Line
Maxillary
Finlets
Caudal Peduncle
Anal Fin
Opercle
Pelvic Fin (thoracic position)
Preopercle

FIGURE 148

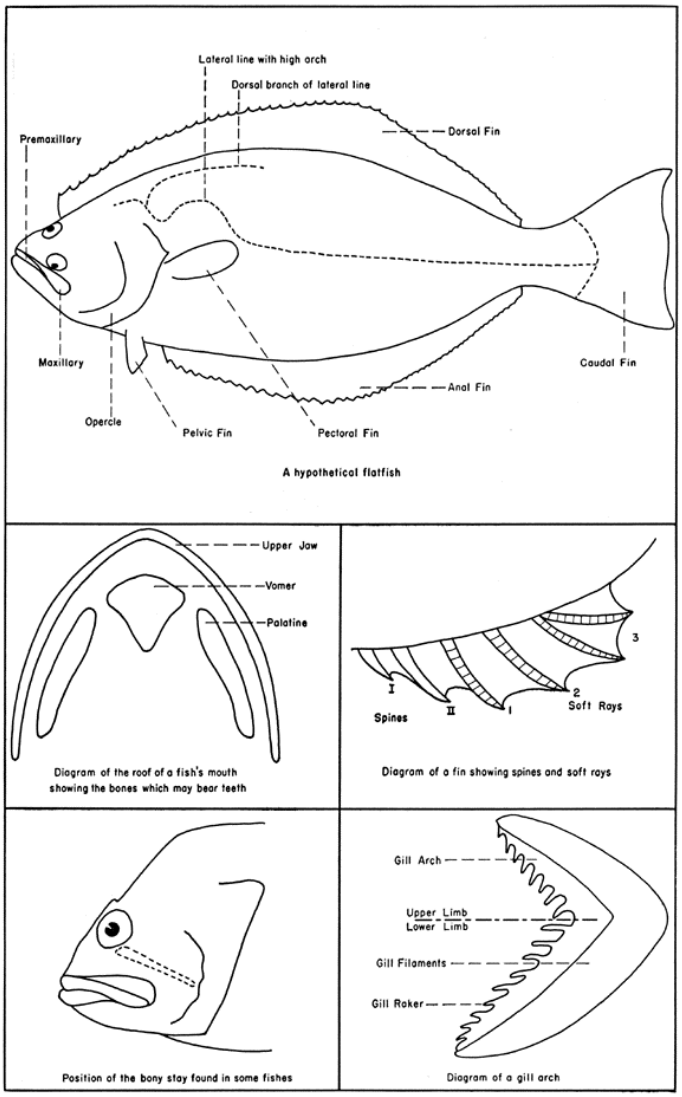

Lateral line with high arch
Dorsal branch of lateral line
Premaxillary
Dorsal Fin
Maxillary
Caudal Fin
Anal Fin
Opercle
Pelvic Fin
Pectoral Fin
A hypothetical flatfish
Upper Jaw
Vomer
Palatine
Diagram of the roof of a fish's mouth showing the bones which may bear teeth
3
I
2
II
1
Spines
Soft Rays
Diagram of a fin showing spines and soft rays
Position of the bony stay found in some fishes
Gill Arch
Upper Limb
Lower Limb
Gill Filaments
Gill Raker
Diagram of a gill arch

FIGURE 149

A KEY TO SOME ADULT MARINE FISHES OF CALIFORNIA

This key is designed as an aid in identifying only the more common marine fishes found in the sport and commercial catch of California. It is by no means complete, though it does include a few species not discussed in the text.

The characters used are those of adult fish, and colors, when mentioned, refer to those evident in freshly-caught specimens.

Terms are defined in the glossary (page 150) and anatomical parts are illustrated in Figures 146 to 149 (pages 152 to 154).

SECTION A

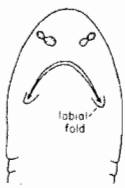
1		Mouth a sucking disk, no jaws	2
		Mouth normal, jaws well developed	3
2	(1)	Gill openings 10 or more on each side. Hagfish, family Eptatretidae	
		Gill openings 7 on each side. Lamprey, family Petromyzontidae.	
3	(1)	External gill openings 5 to 7. Shark or ray. Section B (page 155).	
		External gill openings 1	4
4	(3)	Eye on each side of head	5
		Both eyes on same side of head. Section F (page 167).	
5	(4)	Pelvic fins present	6
		Pelvic fins absent. Section E (page 166).	
6	(5)	Pelvic fins attached back of middle of pectoral fins (abdominal; figure 148, top). Section C (page 159).	
		Pelvic fins attached in front of middle of pectorals (thoracic; figure 148, bottom). Section D (page 161).	

SECTION B

Sharks and Rays

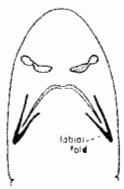
(Includes all species known from California)

1		Gill openings wholly or at least partly on sides of body; pectoral fins not attached to sides of head	2
		Gill openings entirely on under surface of body; pectoral fins attached to sides of head	30
2	(1)	External gill openings 5 on each side	3
		External gill openings 6 or 7 on each side	28
3	(2)	Anal fin present	4
		No anal fin	25
4	(3)	A spine at front of each dorsal fin. Horn shark, *Heterodontus francisci* (page 12).	
		Dorsal fins without spines	5
5	(4)	First dorsal fin above or behind pelvics	6
		First dorsal fin in front of pelvics	8
6	(5)	Labial folds well defined (Figures 150 and 151)	7
		No such labial folds. Swell shark, *Cephaloscyllium uter* (page 17).	



FILETAIL CATSHARK

FIGURE 150



BROWN CATSHARK

FIGURE 151

7 (6) Fold on lower jaw about twice as long as that on upper (Figure 150). Filetail catshark, *Parmaturus xaniurus* (page 17).
Fold on lower jaw slightly shorter than that on upper (Figure 151). Brown catshark, *Apristurus brunneus* (page 17).

8 (5) Caudal fin crescent-shaped (Figure 152); a keel on each side of caudal peduncle 9
Caudal fin not crescent-shaped, the upper lobe considerably larger; no keel on caudal peduncle except as noted under 21 12

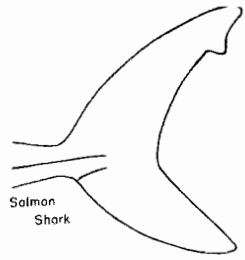


FIGURE 152

9 (8) Gill openings extremely long, nearly meeting under throat; teeth small, numerous. Basking shark, *Cetorhinus maximus* (page 16).
Gill openings not as above; teeth large, relatively few 10

10 (9) Teeth, particularly in upper jaw, triangular with sawtooth edges (Figure 153). Man-eater, *Carcharodon carcharius* (page 15).
Teeth without sawtooth edges 11

11 (10) Origin of first dorsal above hind edge of pectoral base; teeth with basal cusps (Figure 154). Salmon shark, *Lamna ditropis* (page 15).
Origin of first dorsal behind pectoral base; teeth without basal cusps (Figure 155). Bonito shark, *Isurus glaucus* (page 15).

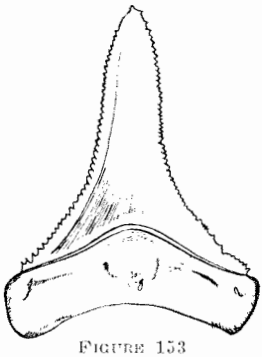


FIGURE 153

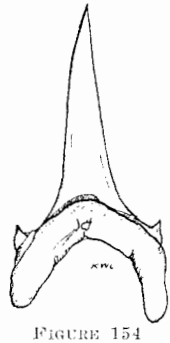


FIGURE 154

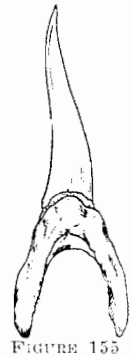


FIGURE 155

12 (8) Tail about as long as rest of body. Thresher. *Alopias vulpinus* (page 14).
Tail not more than $\frac{1}{3}$ of total length 13

13 (12) Head greatly expanded laterally (Figure 156) 14
Head normally formed 16

14 (13) Head shaped like a hammer or mallet; lobe of second dorsal about twice as long as the fin is high 15
Head shaped like a broad spade; lobe of second dorsal little longer than height of fin. Bonnethead, *Sphyrna tiburo* (page 22).

FIGURE 156. After Fraser-Brunner, 1950

15 (14) Front margin of head rounded centrally. Common hammerhead, *Sphyrna zygaena* (page 22).
Front margin of head notched centrally. Scalloped hammerhead, *Sphyrna lewini* (page 22).

16 (13) Spiracle present (may be small and difficult to see) 17
Spiracle absent 22

17 (16) Sides with blackish crossbars and spots. Leopard shark, *Triakis semifasciata* (page 18).
Sides not so marked 18

18 (17) Teeth in bands or pavement, sometimes blunt, sometimes with small cusps 19
Teeth not in bands or pavement, bladelike 21

19 (18) Teeth flat, blunt, pavementlike, without points 20
Teeth small, pavementlike but each with several small sharp points. Brown smoothhound, *Rhinotriacis henlei* (page 19).

20 (19) Lower lobe of tail small, gently rounded. Gray smoothhound, *Mustelus californicus* (page 19).
Lower lobe of tail expanded as a pointed lobe. Sicklefin smoothhound, *Mustelus lunulatus* (page 19).

21 (18) A low fleshy keel on each side of caudal peduncle; teeth with sawtooth edges and notched on outer margin (Figure 157). Tiger shark, *Galeocerdo cuvieri*.
No keel on caudal peduncle; teeth sharp but without sawtooth edges. Soupfin, *Galeorhinus zyopterus* (page 20).

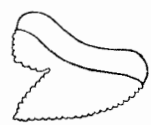


FIGURE 157

22 (16) Teeth smooth-edged; prominent labial fold on both jaws. Sharpnose shark, *Scoliodon longurio*.
Teeth serrated at least in upper jaw; labial fold absent or greatly reduced on lower jaw 23

23 (22) First dorsal fin nearer pelvics than pectorals. Blue shark, *Prionace glauca* (page 21).
First dorsal fin nearer pectorals than pelvics 24

24 (23) Width of mouth much greater than length of snout in front of mouth (Figure 158). Roundnose shark, *Carcharhinus azureus*.
Width of mouth about equal to length of snout in front of mouth (Figure 159). Bay shark, *Carcharhinus lamiella*.


Roundnose Shark
FIGURE 158


Bay Shark
FIGURE 159

25 (3) Body flattened, raylike; gill openings crowed in a deep notch behind head. Angel shark, *Squatina californica* (page 24).
Body and gill openings not as above; appearance typical sharklike 26

26 (25) A strong spine at the front of each dorsal fin. Dogfish, *Squalus acanthias* (page 23).
Dorsal fins without spines 27

27 (26) Dorsal fins widely separated, the first well ahead of the pelvics. Sleeper shark, *Somniosus pacificus*.
Dorsal fins close together, the first over the pelvics. Bramble shark, *Echinorhinus brucus*.

28 (2) External gill openings 6 on each side 29
External gill openings 7 on each side. Sevengill cowshark, *Notorynchus maculatum* (page 12).

29 (28) First gill opening continuous across throat; mouth terminal. Frill shark, *Chlamydoselachus anguineum*.
First gill openings not meeting on throat; mouth inferior with snout projecting. Sixgill cowshark, *Hexanchus griseum* (page 12).

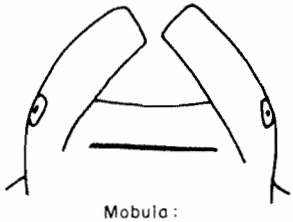
30 (1) Dorsal fin one or absent 31
Two dorsal fins 36

31 (30) No dorsal fin 32
One dorsal fin 34

32 (31) Tail fin present. Round stingray, *Urobatis halleri* (page 28).
No tail fin 33

33 (32) Tail longer than disk, whiplike. Sting strong, well back on tail. Diamond stingray, *Dasyatis dipterurus* (page 28).
Tail very short, less than one-third length of disk. Sting small, occasionally absent. Butterfly ray, *Gymnura marmorata* (page 28).

34 (31) Hornlike forward projections on head (Figure 160) 35
Head without projections. Bat ray, *Holorhinus californicus* (page 29).



Mobula:
Underside of head
FIGURE 160

35 (34) Mouth on under surface; both jaws with teeth. Mobula, *Mobula lucasana*.
Mouth at front of head; no teeth in upper jaw. Manta, *Manta hamiltoni*.

36 (30) Skin entirely smooth, without spines or prickles. Electric ray, *Torpedo californica*.
Skin more or less rough, with scattered spines 37

37 (36) Tail fin well developed (Figure 161) 38
Tail fin absent or reduced to a slight fold of skin (Figure 162) 40

FIGURE 161

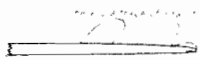


FIGURE 162

38 (37) Front of disk triangular; only one row of spines down middle of back 39
Front of disk broadly rounded; 3 rows of strong spines down middle of back. Thornback, *Platyrhinoidis triseriata* (page 24).

39 (38) Disk about two-thirds as long as rest of body; color plain. Shovelnose guitarfish, *Rhinobatos productus* (page 24).
Disk about as long as rest of body; dark markings conspicuous. Mottled guitarfish, *Zapteryx exasperata* (page 24).

40 (37) A line from tip of snout to outer angle of pectoral (A to B in Figure 163) passes at least partly outside the body edge 41
A line from tip of snout to outer angle of pectoral passes entirely inside the body edge 43

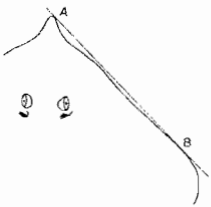


FIGURE 163

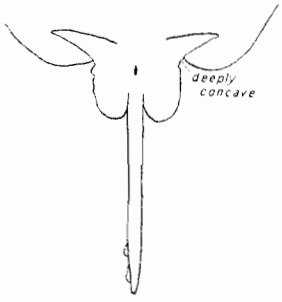


FIGURE 164

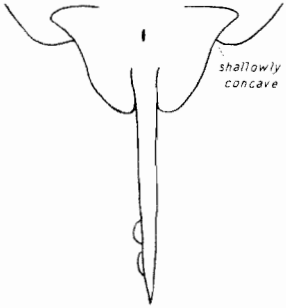


FIGURE 165

41 (40) Outer margin of pelvic fins deeply concave when held at right angles to the tail (Figure 164) 42
Outer margins of pelvic fins shallowly concave, nearly straight when held at right angles to tail (Figure 165). Big skate, *Raja binoculata* (page 27).

42 (41) Front margin of disk deeply concave; snout sharply pointed. Longnose skate, *Raja rhina* (page 27).
Front margin of disk not deeply concave, line A to B about as shown in Figure 163; tip of snout projects slightly. California skate, *Raja inornata* (page 26).

43 (40) Shoulders with 2 or more prominent spines 44
Shoulders without prominent spines. Roughtail skate, *Raja trachura*.

44 (43) Spines around inner edges of eyes; about 6 spines on shoulders. Starry skate, *Raja stellulata*.
No spines around inner edges of eyes; 2-4 spines on shoulders. Sandpaper skate, *Raja kincaidi*.

SECTION C

Fish With Abdominal Pelvic Fins

(Pelvic girdle not connected with the shoulder girdle, the pelvic fins not attached to breast or throat)

1 Gill cover fleshy, no hard bones. Ratfish, *Hydrolagus collici* (page 30).
Gill cover and body with hard bones 2

2 (1) Adipose fin present 3
No adipose fin 17

3 (2) Body scaleless, dorsal fin very long and high. Lancetfish, *Alepisaurus borealis* (page 47).
Body with scales 4

4 (3) Cheeks with scales. Lizardfish, *Synodus lucioceps* (page 47).
Cheeks without scales 5

5 (4) Scaly appendage above pelvic fin base (Figure 148), no lateral line. Trout family, Salmonidae 6
No scaly appendage above pelvic fin base, lateral line present. Smelt family, Osmeridae 12

6 (5) Anal fin with 9 to 12, rarely 13, rays (last ray may be branched at base but is counted as one); lining of mouth never dark 7
Anal fin with 13 or more (rarely 12) rays; lining of mouth dark at least in patches in adults 8

7 (6) Teeth at tip of tongue but none on its back; no red dash under each side of lower jaw. Steelhead rainbow trout, *Salmo gairdneri* (page 43).
Teeth on back as well as tip of tongue; usually a red dash under each side of lower jaw. Cutthroat trout, *Salmo clarki* (page 43).

8 (6) More than 170 oblique rows of scales across lateral line; large black blotches on back and tail. Pink salmon, *Oncorhynchus gorbuscha*.
Less than 170 rows of scales across the lateral line; variable black spotting 9

9 (8) Fewer than 100 pyloric caeca 10
More than 100 pyloric caeca 11

10 (9) Under 30 gill rakers on the first arch; black spots on back and upper lobe of tail. Silver salmon, *Oncorhynchus kisutch* (page 42).
More than 30 gill rakers on the first arch; finely speckled with black on back and tail. Sockeye salmon, *Oncorhynchus nerka*.

11 (9) Anal fin with 15 to 19 rays; definite black spots on back and both lobes of tail. King salmon, *Oncorhynchus tshawytscha* (page 40).
Anal fin with 13 or 14 (rarely 12, 15-17) rays; no defined spots on back and tail. Chum salmon, *Oncorhynchus keta*.

12 (5) Teeth on vomer caninelike, few in number, not covering whole head of bone 13
Teeth on vomer not caninelike, rather numerous, forming a convex series along entire head of bone 14

13 (12) Gill rakers on first arch relatively long, 10-11 + 22-26; anal rays 15-17. Whitebait smelt, *Allosmerus elongatus* (page 38).
Gill rakers on first arch, 4-6 + 13-16; anal rays 17-22. Eulachon, *Thaleichthys pacificus* (page 39).

14 (12) Mouth relatively large, maxillary extending beyond midpoint of pupil 15
Mouth relatively small, maxillary not extending beyond midpoint of pupil 16

15 (14) Pectoral fin shorter than head, not reaching pelvic insertion. Night smelt, *Spirinchus starksi* (page 38).
Pectoral fin longer than head, reaching beyond pelvic insertion. Sacramento smelt, *Spirinchus thaleichthys*.

16 (14) 54-62 scales along lateral line. Freshwater smelt, *Hypomesus olidus*.
66-76 scales along lateral line. Surf smelt, *Hypomesus pretiosus* (page 39).

17 (2) Dorsal fin single (may be followed by finlets) 18
Two dorsal fins (finlets never present) 33

18 (17) Dorsal and anal fins followed by finlets. Saury, *Cololabis saira* (page 44).
Dorsal and anal fins not followed by finlets 19

19 (18) Upper lobe of caudal fin much longer than lower; large bony plates cover body. Sturgeon, family Acipenseridae.
Caudal fin not as above; body without plates 20

20 (19) Pectoral fin enlarged to form an organ of flight. Flyingfish, family Exocoetidae (page 46).
Pectoral fin not so enlarged 21

21 (20) Both jaws greatly prolonged to form a snipelike beak. California needlefish, *Strongylura exilis* (page 45).
Either neither jaw prolonged or only the lower 22

22 (21) Lower jaw only greatly prolonged. Halfbeak, family Hemiramphidae (page 44).
Neither jaw greatly prolonged 23

23 (22) Lateral line present (do not confuse with a silvery or colored stripe). Bonefish, *Albula vulpes* (page 31).
No lateral line 24

24 (23) Mouth very large; maxillary extends almost to edge of gill cover. Anchovy family, Engraulidae 25
Mouth not unusually large; maxillary does not extend beyond eye 28

25 (24) Gill covers broadly united across throat by a membrane under the head (difficult to see and easily torn). Anchoveta, *Cetengraulis mysticetus* (page 37).
Gill covers separate, not united by a membrane across throat 26

26 (25) Head length greater than depth of body. Northern anchovy, *Engraulis mordax* (page 36).
Head length little if any greater than depth of body 27

27 (26) Length of anal base scarcely greater than head length. Slough anchovy, *Anchoa delicatissima* (page 37).
Length of anal base considerably greater than head length. Deepbody anchovy, *Anchoa compressa* (page 37).

28 (24) Head more or less scaly. Small minow-like fishes of inshore brackish and fresh waters. California killifish, *Fundulus parvipinnis*.
Head without scales 29

29 (28) Pelvics attached entirely behind dorsal. Round herring, *Etrumeus acuminatus* (page 32).
Pelvics attached partly or entirely under dorsal. Herring family, Clupeidae 30

30 (29) Last dorsal ray greatly prolonged. Thread herring, *Opisthonema libertate* (page 34).
Last dorsal ray not prolonged 31

31 (30) Head length much less than depth of body. Shad, *Alosa sapidissima* (page 35).
Head length not notably less than depth of body 32

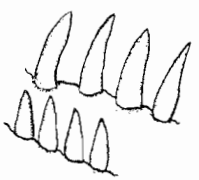
32 (31) Gill cover with low oblique ridges, Pacific sardine, *Sardinops caerulea* (page 33).
No such ridges. Pacific herring, *Clupea pallasi* (page 34).

33 (17) Lateral line present (do not confuse with a silvery or colored streak). Barracuda, *Sphyraena argentea* (page 80).
No lateral line 34

34 (33) Anal fin with 2 or 3 spines and 8 or 9 rays. Mullet, *Mugil cephalus* (page 79).
Anal fin with 1 spine and 22 or 23 rays. Silverside family, Atherinidae .. 35

35 (34) Jaws with teeth .. 36
No teeth in jaws. Grunion, *Leuresthes tenuis* (page 78).

36 (35) Jaw teeth in bands, not forked (Figure 166). Jacksmelt, *Atherinopsis californiensis* (page 76).
One row of forked teeth in jaws (Figure 167; must be examined with a magnifying glass). Topsmelt, *Atherinops affinis* (page 77).



Jacksmelt
FIGURE 166

Topsmelt
FIGURE 167

SECTION D

Fishes With Thoracic Pelvic Fins

(The pelvics placed under or slightly behind the pectoral base, with the pelvic girdle attached to the breast or throat, or placed in front of the pectoral base)

1 Pelvic fins completely joined. Family Gobiidae. Maxillary greatly extended. Mudsucker, *Gillichthys mirabilis* (page 143).
Pelvic fins separate .. 2

2 (1) No anal fin; body silvery, scaleless, ribbonlike; dorsal fin red. Ribbonfish, *Trachipterus rexsalmonorum* (page 49).
Anal fin present .. 3

3 (2) A narrow bone extends just under the skin from below the eye back across the cheek (Figure 149; may be hard to find without dissection but can usually be located by running fingernail or a needle across cheek) 4
There is no such bone .. 12

4 (3) Five lateral lines .. 5
One lateral line .. 7

5 (4) Fourth lateral line ends above posterior end of anal fin .. 6
Fourth lateral line short, ending above pelvic fin. Whitespotted greenling, *Hexagrammos stelleri* (page 142).

6 (5) A single pair of large fringed flaps above eyes. Rock greenling, *Hexagrammos superciliosus* (page 142).
A pair of small unfringed flaps above eyes; a very small pair just back of head, each about on a line between eye and dorsal origin (this pair may occasionally be absent). Greenling seatrout, *Hexagrammos decagrammus* (page 142).

7 (4) Dorsal fins 2, well separated. Sablefish, *Anoplopoma fimbria* (page 138).
Dorsal continuous, notched, or 2, narrowly separated .. 8

8 (7) Dorsal spines 20 or more; jaws with strong canine teeth. Lingcod, *Ophiodon elongatus* (page 139).
Less than 20 dorsal spines; jaws without strong canine teeth .. 9

9 (8) Anal spines three. Rockfish family, Scorpaenidae .. 10
No anal spines. Sculpin family, Cottidae .. 11

10 (9) Dorsal spines 12. Sculpin, *Scorpaena guttata* (page 137).
Dorsal spines 13 (rarely 14). Rockfish, genus *Sebastodes* (page 120).
Dorsal spines 15-17. Channel rockfish, *Sebastolobus alascanus* (page 136).

11 (9) Antlerlike spine on preopercle (Figure 168); pelvic rays 4. Staghorn sculpin, *Leptocottus armatus* (page 140).
No antlerlike spine; pelvic rays 5, body scaleless. Cabezon, *Scorpaenichthys marmoratus* (page 141).

FIGURE 168

12 (3) Pelvic fins with fewer than 5 rays ... 13
Pelvic fins with more than 5 rays ... 15
Pelvic fins definitely with 5 rays and 1 spine ... 18

13 (12) Upper jaw prolonged into a sword. Striped marlin, *Makaira mitsukurii* (page 90).
Upper jaw not prolonged ... 14

14 (13) Tail rounded; body with many luminous organs, not scaled. Midshipman, genus *Porichthys* (page 144).
Tail forked; body without luminous organs, scaled. Kelpfish, *Heterostichus rostratus* (page 145).

15 (12) Barbel on lower jaw ... 16
No barbel on lower jaw ... 17

16 (15) Vent below first dorsal; barbel short, about ½ diameter of eye. Tomcod, *Microgadus proximus* (page 49).
Vent below second dorsal; barbel long, at least equal to diameter of eye. Pacific cod, *Gadus macrocephalus* (page 49).

17 (15) Dorsal fin single, body deep, compressed, spotted with silver, fins red; no teeth in jaws. Opah, *Lampris regius* (page 48).
Dorsal fins 2, second deeply notched; body rounded in cross-section; sharp teeth in jaws. Hake, *Merluccius productus* (page 48).

18 (12) Soft dorsal and anal fins followed by 4 or more finlets ... 19
Either no finlets or only one ... 30

19 (18) Spiny and soft dorsals widely separated ... 20
Spiny and soft dorsals joined or nearly joined ... 21

20 (19) Body covered with scales; 2 small keels on caudal peduncle; dorsal finlets 4-6. Pacific mackerel, *Pneumatophorus diego* (page 84).
Scales only on fore part of body and along lateral line; one prominent keel on caudal peduncle; dorsal finlets 8. Frigate mackerel, genus *Auxis* (page 86).

21 (19) Lower part of sides with 4 or 5 dark horizontal stripes. Skipjack, *Katsuwonus pelamis* (page 86).
Lower part of sides not striped ... 22

22 (21) Scales only on fore part of body and along lateral line; round black spots above and slightly behind pelvics. Black skipjack, *Euthynnus lineatus* (page 86).
Body covered with scales; no such spots ... 23

23 (22) Upper part of sides with several dark stripes ... 24
Upper part of sides not striped ... 25

24 (23) Gill rakers on lower limb of first arch 15 or more. California bonito, *Sarda lineolata* (page 85).
Gill rakers on lower limb of first arch 10 or less. Mexican bonito, *Sarda velox* (page 85).

25 (23) Spiny dorsal much longer than head; strong teeth in jaws ... 26
Spiny dorsal much shorter than head; no teeth in jaws ... 27

26 (25) Gill rakers on lower limb of first arch 10-12. Sierra, *Scomberomorus sierra* (page 85).
Gill rakers on lower limb of first arch 15-20. Monterey Spanish mackerel, *Scomberomorus concolor* (page 85).

27 (25) Pectoral long, extending beyond anal insertion ... 28
Pectoral short, rarely reaching to anal insertion ... 29

28 (27) Vent round; ventral surface of liver striated. Albacore, *Thunnus germo* (page 89).
Vent oval; faint marginal striations on ventral surface of liver. Bigeye tuna, *Parathunnus sibi* (page 88).

29 (27) Vent round, pectoral not reaching beyond the 11th or 12th dorsal spine; ventral surface of liver striated. Bluefin tuna, *Thunnus saliens* (page 88).
Vent oval, pectoral reaching past the insertion of soft dorsal, ventral surface of liver plain. Yellowfin tuna, *Neothunnus macropterus* (page 87).

30 (18) Bony shields along all or part of lateral line; single finlet may follow dorsal and anal fins 31
Lateral line without bony shields; no finlets 32

31 (30) Shields along entire lateral line; accessory lateral line runs close to base of first dorsal fin, usually ending at front of second dorsal (Figure 169). Jack mackerel, *Trachurus symmetricus* (page 83).
Shields along last half only; no accessory lateral line. Mexican scad, *Decapterus hypodus* (page 82).

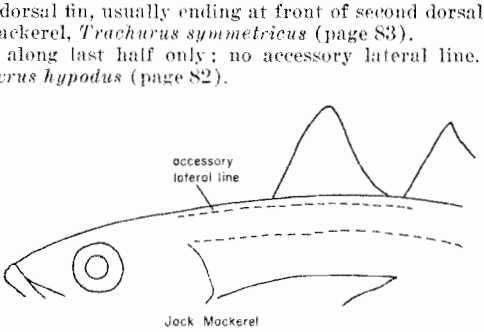


FIGURE 169

32 (30) A low ridge-like keel runs along side of caudal peduncle; first half of lateral line very wavy. Yellowtail, *Seriola dorsalis* (page 82).
No keel on caudal peduncle; first half of lateral line without notable undulations 33

33 (32) No anal spines; single extremely long dorsal consisting entirely of rays. Dolphinfish, *Coryphaena hippurus* (page 81).
Anal fin with 1 or 2 spines at the front (may be difficult to see; scrape the front of the fin if in doubt) 34
Anal fin with 3 spines in front (may be difficult to see; scrape the front of the fin if in doubt) 44

34 (33) Lateral line ends under the soft part of the dorsal fin 35
Lateral line ends at or on the caudal fin 36

35 (34) Color chiefly bluish grey or black. Blacksmith, *Chromis punctipinnis* (page 114).
Color chiefly bright orange. Garibaldi, *Hypsypops rubicunda* (page 115).

36 (34) Dorsal fin continuous; no notch between rays and spines. Ocean whitefish, *Caulolatilus princeps* (page 101).
Either a notch between spiny and soft portions of dorsal fin or two separate dorsal fins. Croaker family, Sciaenidae 37

37 (36) Lower jaw extends to or beyond tip of snout 38
Snout extends beyond tip of lower jaw 40

38 (37) Dorsal fins 2, well separated; anal fin with 18 or more rays. Queenfish, *Seriphus politus* (page 94).
Spiny and soft portions of dorsal at least in contact; anal fin with 11 or less rays 39

39 (38) A distinct raised ridge on midline of belly. No prominent caninelike teeth in middle of upper jaw. White seabass, *Cynoscion nobilis* (page 95).
No distinct raised ridge on midline of belly. Middle of upper jaw with 1 or 2 prominent caninelike teeth. Mexican corvinas, species of *Cynoscion* (page 95).

40 (37) One short barbel at tip of lower jaw 41
Either no barbel or several minute ones at tip of lower jaw 42

41 (40) Anal fin with 1 (rarely 2) weak spine at front. California corbina, *Menticirrhus undulatus* (page 99).
Anal fin with 2 strong spines at front. Yellowfin croaker, *Umbrina roncador* (page 97).

42 (40) First dorsal with 11 or fewer spines ... 43
First dorsal with 12 or more spines. White croaker, *Genyonemus lineatus* (page 100).

43 (42) Large black spot at base of pectoral fin; dorsal soft rays 21 to 24. Spotfin croaker, *Roncador stearnsi* (page 96).
No such spot at base of pectoral: dorsal soft rays 25 to 28. Black croaker, *Cheilotrema saturnum* (page 98).

44 (33) Soft parts of dorsal and anal fins densely scaled. Halfmoon, *Medialuna californiensis* (page 119).
Soft parts of dorsal and anal fins not scaled ... 45

45 (44) Anal soft rays 14 or less* ... 46
Anal soft rays 15 or more (18 to 35 for all species except under item 74). Surfperch family, Embiotocidae* ... 58

46 (45) Maxillary fully exposed when mouth is closed. Bass family, Serranidae ... 47
Large part of maxillary sliding under bone above it when mouth is closed ... 53

47 (46) Sides with 6-8 definite horizontal stripes. Striped bass, *Roccus saxatilis* (page 71).
Sides not so striped ... 48

48 (47) More spines (usually 11) than soft rays (usually 10) in dorsal fin. Black sea bass, *Stereolepis gigas* (page 72).
More rays than spines in dorsal fin ... 49

49 (48) Anal soft rays 7 or 8 ... 50
Anal soft rays 11 or 12 ... 52

50 (49) Third, 4th and 5th dorsal spines about the same length; head and body without golden or brownish spots. Kelp bass, *Paralabrax clathratus* (page 73).
Third dorsal spine the longest; spots as described below ... 51

51 (50) Cheek and region behind eye spotted; about 70 scales along lateral line. Sand bass, *Paralabrax nebulifer* (page 74).
Head and body (except belly) heavily spotted; about 90 scales along lateral line. Spotted bass, *Paralabrax maculatofasciatus* (page 75).

52 (49) End of tail jagged; gill rakers on lower limb of first arch about 18. Broomtail grouper, *Mycteroperca xenarchus* (page 72).
End of tail smooth; gill rakers on lower limb usually 10 or 11. Gulf grouper, *Mycteroperca jordani* (page 72).

53 (46) Spiny and soft portions of dorsal separate; sides with 6-8 horizontal stripes. Salema, *Xenistius californiensis* (page 92).
Spiny and soft portions of dorsal broadly joined; sides not so striped ... 54

54 (53) Definite slit behind last gill; teeth not projecting forward or caninelike ... 55
Slit absent or reduced to a pore; caninelike teeth project forward from both jaws ... 56

55 (54) Distinct black band across the body; teeth immovable, singlepointed. Sargo, *Anisotremus davidsoni* (page 93).
No black band across body; teeth freely movable, each with 3 points. Opaleye, *Girella nigricans* (page 118).

56 (54) Dorsal with 9 (rarely 10) spines, body slender; lateral line dropping abruptly under back portion of dorsal fin ... 57
Dorsal with 12 spines; body not slender; lateral line gently curved. Sheep-head, *Pimelometopon pulchrum* (page 117).

57 (56) Black blotch at base of caudal; dorsal spines very weak, not sharp, 13 dorsal soft rays. Señorita, *Oxyjulis californica* (page 116).
No such blotch; males with a blue bar behind pectoral; dorsal spines sharp, 11 or 12 dorsal soft rays. Rock wrasse, *Halichoeres semicinctus* (page 116).

* Surfperch, genus *Micrometrus* (item 74) may occasionally have 13 or 14 anal soft rays.

58 (45) Pelvic fins tipped with black 59
Pelvic fins not tipped with black 60

59 (58) Lower lip with a frenum (Figure 170), longest dorsal spine about as long as longest soft ray. Sharpnose seaperch, *Phanerodon atripes* (page 106).
Lower lip without a frenum (Figure 171) ; longest spine longer than longest soft ray. Walleye surfperch, *Hyperprosopon argenteum* (page 103).

FIGURE 170

FIGURE 171

60 (58) Anal fin with a definite row of small scales extending along its base to the last ray (Figure 172) 61
Anal fin without a row of small scales along the posterior half of its base (Figure 173) 65

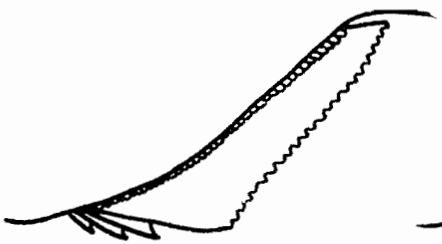


FIGURE 172

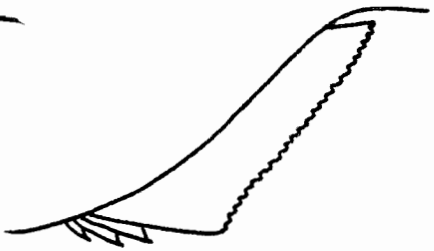


FIGURE 173

61 (60) A row of enlarged scales between pectoral and pelvic fins, dorsal soft rays 19-22. Black perch, *Embiotoca jacksoni* (page 109).
No such row of enlarged scales, dorsal soft rays 23-28 62

62 (61) Posterior groove of lower lip interrupted by a frenum (Figure 170) 63
Posterior groove of lower lip not interrupted by a frenum (Figure 171) 64

63 (62) Lower jaw somewhat shorter than upper; longest dorsal spines generally lower than contour of the soft rays; body walls usually with a series of brassy olive vertical bars alternating with vertical series of spots; frenum broad. Barred surfperch, *Amphistichus argenteus* (page 104).
Lower jaw slightly projecting; longest dorsal soft rays and spines about the same height, body walls with a series of bronze speckles which may approximate narrow vertical bars; frenum narrow. Calico surfperch, *Amphistichus koelzi* (page 104).

64 (62) Longest dorsal spine about the same height as general contour of soft dorsal; 18 (17-20) scales from anterior end of vent to lateral line. Calico surfperch, *Amphistichus koelzi* (page 104).
Dorsal spines higher than general contour of soft rays; 22 (20-22) scales from anterior end of vent to lateral line. Redtail surfperch, *Amphistichus rhodoterus* (page 104).

65 (60) Lower lip without a frenum, its posterior groove continuous across chin 66
Lower lip with a frenum 70

66 (65) Lower lip thick, lobed or incised behind. Rubberlip perch, *Rhacochilus toxotes* (page 107).
Lower lip thin or moderate, entire behind 67

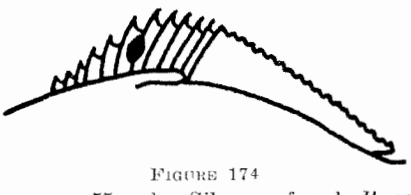


FIGURE 174

67 (66) An inky blotch in spiny dorsal (Figure 174). Spotfin surfperch, *Hyperprosopon anale* (page 103).
No such blotch 68

68 (67) Lateral line with 50 or fewer scales 69
Lateral line with more than 55 scales. Silver surfperch, *Hyperprosopon ellipticum* (page 103).

69 (68) Least depth of caudal peduncle 7.90 (7.2-8.6) in standard length; distance from upper end of pectoral base to first dorsal spine 3.74 (3.3-3.9) in standard length. Shiner perch, *Cymatogaster aggregata* (page 112).
Least depth of caudal peduncle 9.15 (8.4-9.9) in standard length; distance from upper end of pectoral base to first dorsal spine 4.24 (3.9-4.7) in standard length. Island perch, *Cymatogaster gracilis* (page 112).

70 (65) Abdomen extremely elongate and straight; body striped horizontally with red, orange and blue. Rainbow seaperch, *Hypsurus caryi* (page 105).
Abdomen normal, not elongate 71

71 (70) Anal soft rays 15-24 72
Anal soft rays 27-34 75

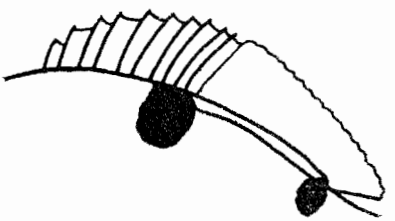


FIGURE 175

72 (71) Two large chocolate spots on body near base of dorsal (Figure 175). Pink seaperch, *Zalembius rosaceus* (page 111).
No such spots 73

73 (72) Large conspicuous black triangle in the axilla 74
Axilla with small amount of peppery black pigmentation, or lacking this entirely. Kelp perch, *Brachyistius frenatus* (page 113).

74 (73) Dorsal fin with 9 (8-11) spines and 14 (12-16) soft rays; body depth from first dorsal spine to pelvic 2.2 (2.0-2.4) in standard length. Dwarf perch, *Micrometrus minimus* (page 113).
Dorsal fin with 8 (7-9) spines and 17 (16-19) soft rays; body depth 2.7 (2.4-2.8) in standard length. Reef perch, *Micrometrus aurora* (page 113).

75 (71) Four or five rows of large scales between lateral line and lower edge of scale sheath at junction of spiny and soft portions of dorsal fin (one small scale may be found above the larger ones). White seaperch, *Phanerodon furcatus* (page 106).
Six or more scales between lateral line and lower edge of scale sheath at junction of spiny and soft portions of dorsal fin 76

76 (75) Color plain; first dorsal soft rays sharply elevated above spines and following rays. Pile perch, *Rhacochilus vacca* (page 108).
Body reddish, striped horizontally with blue; dorsal soft rays longer than spines but the first rays not sharply elevated above those following. Striped seaperch, *Embiotoca lateralis* (page 110).

SECTION E

Fish Without Pelvic Fins

1 Upper jaw prolonged into a sword. Swordfish, *Xiphias gladius* (page 91).
Upper jaw not prolonged into a sword 2

2 (1) Pectoral fins absent; body eel-like. Moray, *Gymnothorax mordax* (page 50).
Pectoral fins present (may be minute) 3

3 (2) Snout long, tubular; body encased in bony plates. Pipefish, family Syngnathidae.
Snout and body not as above 4

4 (3) Body elongate, eel-like 5
Body not elongate 8

5 (4) Body tapers to a point 6
Body not tapering to a point, caudal fin evident, rounded 7

6 (5) Jaws and vomer with coarse molar teeth; gill membranes attached to isthmus; jaws about even; color gray or green, mottled or spotted. Wolf-eel, *Anarrhichthys ocellatus* (page 148).
No molarlike teeth; gill membranes free from isthmus; lower jaw projects beyond upper; color bright silver. Pacific cutlassfish, *Trichiurus nitens.*

7 (5) Anal spines present, dorsal with spines and soft rays, one lateral line; pectoral large. Monkeyface-eel, *Cebidichthys violaceus* (page 146).
No anal spines; dorsal with spines only; 4 lateral lines; pectoral very small. Rock-eel, *Xiphister mucosus* (page 147).

8 (4) Caudal fin widely forked. Pompano, *Palometa simillima* (page 81).
No apparent caudal fin; body short, deep, square-cut behind; dorsal and anal fins high, set far back on body. Mola, *Mola mola* (page 149).

SECTION F

Fish With Both Eyes on Same Side of Head

(Includes all flatfishes known from California)

1 Dorsal and anal fins joined to caudal. Tonguefish, *Symphurus atricauda* (page 70).
Dorsal and anal fins separate from caudal ... 2

2 (1) Pelvic fin of eyed side on belly ridge; pelvics thus not symmetrical ... 3
Pelvic fins symmetrical, one on either side of belly ridge ... 5

3 (2) Pectoral fin of eyed side longer than head. Longfin sanddab, *Citharichthys xanthostigma* (page 52).
Pectoral fin of eyed side shorter than head ... 4

4 (3) Gill rakers on lower limb of first arch 13 or more. Lower eye longer than snout. Pacific sanddab, *Citharichthys sordidus* (page 52).
Gill rakers on lower limb of first arch 10 or less. Lower eye no longer than snout. Speckled sanddab, *Citharichthys stigmaeus* (page 52).

5 (2) Lateral line with a high arch over the pectoral fin ... 6
Lateral line slightly curved or nearly straight over pectoral fin ... 10

6 (5) Pectoral fin of eyed side almost as long as or longer than head. Fantail sole, *Xystreurys liolepis* (page 53).
Pectoral fin on eyed side little more than half the head length ... 7

7 (6) Lateral line with a dorsal branch. Rock sole, *Lepidopsetta bilineata* (page 63).
Lateral line without a dorsal branch ... 8

8 (7) Maxillary reaches below or past hind border of lower eye ... 9
Maxillary does not reach past middle of lower eye. Pacific halibut, *Hippoglossus stenolepis* (page 56).

9 (8) High bony ridge between eyes. Bigmouth sole, *Hippoglossina stomata* (page 54).
Space between eyes flat. California halibut, *Paralichthys californicus* (page 55).

10 (5) Lateral line with a dorsal branch (examine both sides of body; it is sometimes difficult to see) ... 11
Lateral line without dorsal branch ... 18

11 (10) First dorsal rays elongated, not connected by membrane for about half their length. Sand sole, *Psettichthys melanostictus* (page 60).
First dorsal rays not as described above ... 12

12 (11) Origin of 5 or more dorsal rays on blind side; high bony ridge between eyes ... 13
Dorsal rays originate on body midline or with 1 or 2 slightly on one side; ridge between eyes moderate or absent ... 16

13 (12) Origin of dorsal as low as corner of mouth; 9 or more rays on blind side. Curlfin turbot, *Pleuronichthys decurrens* (page 68).
The 5 or 6 rays on blind side do not extend down as far as corner of mouth ... 14

14 (13) Ridge between eyes high, very sharp-edged; sharp, prominent spines at each end; mouth overhung by blunt spine. Hornyhead turbot, *Pleuronichthys verticalis* (page 69).
Ridge not as described above ... 15

15 (14) Front of ridge with 2 short blunt spines; a distinct dark spot on middle of lateral line and one on each edge of body by hind portions of dorsal and anal fins. Spotted turbot, *Pleuronichthys ritteri* (page 69).
Spines at front of ridge little if at all developed; not distinctly spotted as described above. C-O turbot, *Pleuronichthys coenosus* (page 69).

16 (12) Body depth excluding fins about half the entire length including tail. Diamond turbot, *Hypsopsetta guttulata* (page 67).
Depth less than half entire length 17

17 (16) Body and fins with scales. Scaly-fin sole, *Isopsetta isolepis* (page 61).
No scales on fins; those on body chiefly smooth to the touch. English sole, *Parophrys vetulus* (page 62).

18 (10) Dorsal and anal fins with alternate black and orange to whitish stripes. Starry flounder, *Platichthys stellatus* (page 66).
Fins not so marked 19

19 (18) Pectoral fin on eyed side much longer than head. Rex sole, *Glyptocephalus zachirus* (page 65).
Pectoral fin on eyed side shorter than head 20

20 (19) Gill opening extends well above pectoral base 21
Gill opening barely extends above pectoral base 23

21 (20) Mouth very large, maxillary extending to or beyond hind border of lower eye. Arrowtooth halibut, *Atheresthes stomias* (page 57).
Mouth moderate, maxillary extending about to middle of lower eye 22

22 (21) Scales small, about 30 rows above lateral line. Petrale sole, *Eopsetta jordani* (page 59).
Scales large, about 20 rows above lateral line. Slender sole, *Lyopsetta exilis* (page 58).

23 (20) Teeth on blind side only. Dover sole, *Microstomus pacificus* (page 64).
Teeth equally developed on both sides. Deepsea sole, *Embassichthys bathybius* (page 64).

6. REFERENCES

Alverson, Dayton L. and Arthur D. Welander 1952. Notes on the scorpaenid fishes of Washington and adjacent areas, with a key for their identification. Copeia, no. 3, p. 138–143.

Arora, Harbans Lall 1951. An investigation of the California sand dab, Citharichthys sordidus (Girard). Calif. Fish and Game, vol. 37, no. 1, p. 3–42.

Barnhart, Percy Spencer 1936. Marine fishes of Southern California. Berkeley, Univ. Calif. Press, 209 p.

Beebe, William, and John Tee-Van 1941a. Fishes from the tropical eastern Pacific. Part 2. Sharks. Zoologica, vol. 26, pt. 2, p. 93–122.

1941b. Fishes from the tropical eastern Pacific. Part 3. Rays, mantas and chimaeras. Zoologica, vol. 26, pt. 3, p. 245–280.

Bigelow, Henry B., and William C. Schroeder 1948. Fishes of the western North Atlantic. Chap. 3. Sharks. Sears Found. Mar. Res., Mem. 1, p. 59–576.

Bolin, Rolf L. 1944. A review of the marine cottid fishes of California. Stanford Ichthy. Bull., vol. 3, no. 1, p. 1–135.

Budd, Paul L. 1940. Development of the eggs and early larvae of six California fishes. Calif. Div. Fish and Game, Fish Bull. 56, 50 p.

Bureau of Marine Fisheries 1949. The commercial fish catch of California for the year 1947 with an historical review 1916–1947. Calif. Div. Fish and Game, Fish Bull. 74, 267 p.

1953. The commercial fish catch of California for the year 1951 with an evaluation of the existing anchovy case pack requirements. Calif. Dept. Fish and Game, Fish Bull. 89, 68 p.

Byers, Robert D. 1942. Salmon caught in Mexican waters. Calif. Fish and Game, vol. 28, no. 4. p. 217.

Calhoun, A. J. 1952. Annual migrations of California striped bass. Calif. Fish and Game. vol. 38, no. 3, p. 391–403.

1953. Distribution of striped bass fry in the Sacramento-San Joaquin delta and Suisun Bay in 1951. Calif. Fish and Game, vol. 39, no. 3. (in press)

Clark, Frances N. 1929. The life history of the California jack smelt, Atherinopsis californiensis. Calif. Div. Fish and Game, Fish Bull. 16, 22 p.

1940. A true smelt found near Los Angeles harbor. Calif. Fish and Game, vol. 26, no. 2, p. 180.

1952. Review of the California sardine fishery. Calif. Fish and Game, vol. 38, no. 3, p. 367–380.

Clark, Frances N., and Julius B. Phillips 1952. The northern anchovy (Engraulis mordax mordax) in the California fishery. Calif. Fish and Game, vol. 38, no. 2, p. 189–207.

Clemens, W. A., and G. V. Wilby 1946. Fishes of the Pacific Coast of Canada. Fish. Res. Bd. Canada, Bull. 68, 368 p.

Collyer, Robert C., and Parke H. Young 1953. Progress report on a study of the kelp bass, Paralabrax clathratus. Calif. Fish and Game, vol. 39, no. 2, p. 191–208.

Douglas, P. A. 1953. Survival of some fishes recently introduced into the Salton Sea, California. Calif. Fish and Game, vol. 39, no. 2, p. 264–265.

Fitch, John E. 1949a. Some unusual occurrences of fish on the Pacific coast. Calif. Fish and Game, vol. 35, no. 1, p. 41–49.

1949b. Observations and notes on some California marine fishes. Calif. Fish and Game, vol. 35, no. 3, p. 155–158.

1951. Studies and notes on some California marine fishes. Calif. Fish and Game, vol. 37, no. 2, p. 111–120.

1952a. The decline of the Pacific mackerel fishery. Calif. Fish and Game, vol. 38, no. 3, p. 381–389.

1952b. Distributional notes on some Pacific coast fishes. Calif. Fish and Game, vol. 38, no. 4, p. 557–564.

Follett, W. I. 1952. Annotated list of fishes obtained by the California Academy of Sciences during six cruises of the U. S. S. *Mulberry* conducted by the United States Navy off Central California in 1949 and 1950. Calif. Acad. Sci., Proc., 4 ser., vol. 27, no. 16, p. 399–432.

Fraser-Brunner, A. 1950a. The fishes of the family Scombridae. Ann. Mag. Nat. Hist., ser. 12, vol. 3, p. 131–163.

1950b. A synopsis of the hammerhead sharks (Sphyrna), with description of a new species. Australian Mus., Records, vol. 22, no. 3, p. 213–219.

1951. The ocean sunfishes (family Molidae). Brit. Mus. Nat. Hist., Zool., Bull., vol. 1, no. 6, p. 87–121.

Fry, Donald H., Jr., and Eldon P. Hughes 1951. The California salmon troll fishery. Pac. Mar. Fish. Comm., Bull. 2, p. 7–42.

Garman, Samuel 1913. The Plagiostomia (Sharks, skates and rays). Harvard Mus. Comp. Zool., Mem., vol. 36, 528 p.

Ginsburg, Isaac 1952. Flounders of the genus Paralichthys and related genera in American waters. U. S. Fish and Wildl. Serv., Fishery Bull., vol. 52, no. 71, p. 267–351.

1953. The taxonomic status and nomenclature of some Atlantic and Pacific populations of yellowfin and bluefin tunas. Copeia, no. 1, p. 1–10.

Godsil, H. C. 1948. A preliminary population study of the yellowfin tuna and the albacore. Calif. Div. Fish and Game, Fish Bull. 70, 90 p.

Godsil, H. C., and Robert D. Byers 1944. A systematic study of the Pacific tunas. Calif. Div. Fish and Game, Fish Bull. 60, 131 p.

Godsil, H. C., and Edwin K. Holmberg 1950. A comparison of the bluefin tunas, genus Thunnus, from New England, Australia and California. Calif. Div. Fish and Game, Fish Bull. 77, 55 p.

Hagerman, Frederick B. 1952. The biology of the Dover sole, Microstomus pacificus (Lockington). Calif. Dept. Fish and Game, Fish Bull., 85, 48 p.

Hallock, Richard J., George H. Warner and Donald H. Fry, Jr. 1952. California's part in a three-state salmon fingerling marking program. Calif. Fish and Game, vol. 38, no. 3, p. 301–332.

Halstead, Bruce W., and Norman C. Bunker 1952. The venom apparatus of the ratfish, Hydrolagus colliei. Copeia, no. 3, p. 128–138.

1953. Stingray attacks and their treatment. Amer. Jour. Trop. Med. and Hyg., vol. 2, no. 1, p. 115–128 (reprint dated sic January 1952).

Halstead, Bruce W., and F. Rene Modglin 1950. A preliminary report on the venom apparatus of the bat-ray Holorhinus californicus. Copeia, no. 3, p. 165–175.

Hart, John Lawson, and J. Laurence McHugh 1944. The smelts (Osmeridae) of British Columbia. Fish. Res. Bd. Canada, Bull. 64, 27 p.

Herald, Earl S. 1953. The 1952 shark derbies at Elkhorn Slough, Monterey Bay, and at Coyote Point, San Francisco Bay. Calif. Fish and Game, vol. 39, no. 2, p. 237–243.

Herald, Earl S., and Wm. Ellis Ripley 1951. The relative abundance of sharks and bat stingrays in San Francisco Bay. Calif. Fish and Game, vol. 37, no. 3, p. 315–329.

Hildebrand, Samuel F. 1943. A review of the American anchovies (family Engraulidae). Bingham Oceanog. Coll., Bull., vol. 8, art. 2, 165 p.

1946. A descriptive catalog of the shore fishes of Peru. U. S. Nat. Mus., Bull. 189, 530 p.

Holloway, John E., Norman C. Bunker and Bruce W. Halstead 1953. The venom of Urobatis halleri (Cooper), the round stingray. Calif. Fish and Game, vol. 39, no. 1, p. 77–82.

Hubbs, Carl L. 1925. A revision of the osmerid fishes of the North Pacific. Biol. Soc. Washington, Proc., vol. 38, p. 49–55.

1926. Notes on the blennioid fishes of western North America. Mich. Acad. Sci., Arts, Lets., Papers, vol. 7, p. 351–394.

1948. Changes in the fish fauna of western North America correlated with changes in ocean temperature. Jour. Mar. Res., vol. 7, no. 3, p. 459–482.

Hubbs, Carl L., and Elizabeth M. Kampa 1946. The early stages (egg, prolarvae and juvenile) and the classification of the California flyingfish. Copeia, no. 4, p. 188–218.

Hubbs, Carl L., and Leonard P. Schultz 1939. A revision of the toadfishes referred to Porichthys and related genera. U. S. Nat. Mus., Proc., vol. 86, no. 3060, p. 473–496.

Hubbs, Carl L., and Arne Wick 1951. Toxicity of the roe of the cabezon, Scorpaenichthys marmoratus. Calif. Fish and Game, vol. 37, no. 2, p. 195–196.

Hubbs, Carl L., and Robert L. Wisner. 1953. Food of marlin in 1951 off San Diego, California. Calif. Fish and Game, vol. 39, no. 1, p. 127–131.

Hubbs, Clark 1952. A contribution to the classification of the blennioid fishes of the family Clinidae, with a partial revision of the eastern Pacific forms. Stanford Ichthy. Bull., vol. 4, no. 2, p. 41–165.

Johnson, W. C., and A. J. Calhoun 1952. Food habits of California striped bass. Calif. Fish and Game, vol. 38, no. 4, p. 531–534.

Jordan, David Starr, and Barton Warren Evermann 1896–1900. The fishes of north and middle America. U. S. Nat. Mus., Bull. 47, 4 vols. 3313 p.

Kishinouye, Kamakichi 1923. Contributions to the comparative study of the so-called scombroid fishes. Coll. Agric., Imp. Univ. Tokyo, Jour., vol. 8, no. 3, p. 293–475.

McHugh, J. L. 1951. Meristic variations and populations of northern anchovy (Engraulis mordax mordax). Scripps Inst. Oceanog., Bull., vol. 6, no. 3, p. 123–160.

1952. The food of the albacore (Germo alalunga) off California and Baja California. Scripps Inst. Oceanog., Bull., vol. 6, no. 4, p. 161–172.

McHugh, J. L., and John E. Fitch 1951. An annotated list of the clupeoid fishes of the Pacific Coast, from Alaska to Cape San Lucas, Baja California. Calif. Fish and Game, vol. 37, no. 4, p. 491–495.

Marine Research Committee 1952. California cooperative sardine research program, Progress report, 1 January 1951 to 30 June 1952. Calif. Dept. Fish and Game, 51 p.

Miller, Daniel J. 1952. Notes on the embryology and behavior of the flyingfishes (Cypselurus) off the coast of Southern and Baja California. Calif. Fish and Game, vol. 38, no. 4, p. 549–555.

Norman, J. R. 1934. A systematic monograph of the flatfishes (Heterosomata). Brit. Mus. Nat. Hist., vol. 1, 459 p.

O'Connell, Charles Patrick 1952. The life history of the cabezone, Scorpaenichthys marmoratus Girard. Stanford Univ., Masters thesis, 122 p. (typewritten)

Orcutt, Harold George 1950. The life history of the starry flounder Platichthys stellatus (Pallas). Calif. Div. Fish and Game, Fish Bull. 78, 64 p.

Phillips, J. B. 1936. Big-eyed bass taken at Monterey. Calif. Fish and Game, vol. 22, no. 1, p. 48–49.

1951a. Pacific cod off Central California. Calif. Fish and Game, vol. 37, no. 3, p. 351.

1951b. Round herring off Central California. Calif. Fish and Game, vol. 37, no. 4, p. 512.

Ripley, Wm. Ellis, and others 1946. The biology of the soupfin Galeorhinus zyopterus and biochemical studies of the liver. Calif. Div. Fish and Game, Fish Bull. 64, 93 p.

Rivas, Luis Rene 1951. A preliminary review of the western North Atlantic fishes of the family Scombridae. Bull. Mar. Sci. Gulf and Caribbean, vol. 1, no. 3, p. 209–230.

Roedel, Phil M. 1948. Common marine fishes of California. Calif. Div. Fish and Game, Fish Bull. 68, 153 p.

1952. A review of the Pacific mackerel (Pneumatophorus diego) fishery of the Los Angeles region with special reference to the years 1939–51. Calif. Fish and Game, vol. 38, no. 2, p. 253–273.

1953a. The jack mackerel, Trachurus symmetricus: a review of the California fishery and of current biological knowledge. Calif. Fish and Game, vol. 39, no. 1, p. 45–66.

1953b. official common names of certain marine fishes of California. Calif. Fish and Game, vol. 39, no. 2, p. 251–262.

Roedel, Phil M., and John E. Fitch 1952. The status of the carangid fishes Trachurus and Decapterus on the Pacific coast of Canada and the United States. Copeia, no. 1, p. 4–6.

Roedel, Phil M., and Wm. Ellis Ripley 1950. California sharks and rays. Calif. Div. Fish and Game, Fish Bull. 75, 88 p.

Schaefer, Milner B. 1952. Comparison of yellowfin tuna of Hawaiian waters and of the American West Coast. U. S. Fish and Wildl. Serv., Fishery Bull., vol. 52, no. 72, p. 353–373.

Schaefer, Milner B., and John C. Marr 1948. Contributions to the biology of the Pacific tunas. U. S. Fish and Wildl. Serv., Fishery Bull., vol. 51, no. 44, p. 187–206.

Schultz, Leonard P. 1933. The age and growth of Atherinops affinis oregonia Jordan and Snyder and of other subspecies of bay-smelt along the Pacific coast of the United States. Univ. Wash. Publ. Biol., vol. 2, no. 3, p. 45–102.

1936. Keys to the fishes of Washington, Oregon and closely adjoining regions. Univ. Wash. Publ. Biol., vol. 2, no. 4, p. 103–228.

Scofield, W. L. 1952. The Tomales Bay herring fishery. Calif. Fish and Game, vol. 38, no. 4, p. 499–504.

Shapovalov, Leo, and William A. Dill 1950. A check list of the fresh-water and anadromous fishes of California. Calif. Fish and Game, vol. 36, no. 4, p. 382–391.

Shimada, Bell M. 1951. An annotated bibliography on the biology of Pacific tunas. U. S. Fish and Wildl. Serv., Fishery Bull., vol. 52, no. 58, 58 p.

Skogsberg, Tage 1939. The fishes of the family Sciaenidae (croakers) of California. Calif. Div. Fish and Game, Fish Bull. 54, 62 p.

Starks, Edwin Chapin 1917. The sharks of California. Calif. Fish and Game, vol. 3, no. 4, p. 145–153.

1918. The skates and rays of California, with an account of the rat fish. Calif. Fish and Game, vol. 4, no. 1, p. 1–15.

Tarp, Fred Harald 1952. A revision of the family Embiotocidae (the surfperches). Calif. Dept. Fish and Game, Fish Bull. 88, 99 p.

Wales, Joseph H. 1952. Life history of the blue rockfish, Sebastodes mystinus. Calif. Fish and Game, vol. 38, no. 4, p. 485–498.

Walford, Lionel A. 1928. Northern halibut in Southern California. Calif. Fish and Game, vol. 14, no. 1, p. 89.

1931. Handbook of common commercial and game fishes of California. Calif. Div. Fish and Game, Fish Bull. 28, 183 p.

1932. The California barracuda (Sphyraena argentea). Calif. Div. Fish and Game, Fish Bull. 37, 120 p.

1935. The sharks and rays of California. Calif. Div. Fish and Game, Fish Bull. 45, 66 p.

1937. Marine game fishes of the Pacific coast from Alaska to the Equator. Berkeley, Univ. Calif. Press., 205 p.

Walker, Boyd W. 1952. A guide to the grunion. Calif. Fish and Game, vol. 38, no. 3, p. 409–420.

1953. New records of Pacific sardine and Pacific mackerel in the Gulf of California. Calif. Fish and Game, vol. 39, no. 2, p. 263–264.

Weisel, George F. 1948. Observations on the mudsucker, Gillichthys mirabilis. Calif. Fish and Game, vol. 34, no. 2, p. 81.

Whitley, Gilbert Percy 1940. The fishes of Australia. Pt. 1. The sharks, rays, devil-fish, and other primative fishes of Australia and New Zealand. Royal Zool. Soc., New South Wales, 280 p.

INDEX TO COMMON NAMES

D

E

F

G

H

I

J

K

L

M

N

O

INDEX TO SCIENTIFIC NAMES

D

E

F

G

H

I

R

S

T

U

V

X

Z