DIVISION OF FISH AND GAME OF CALIFORNIA
BUREAU OF COMMERCIAL FISHERIES FISH BULLETIN No. 28
Handbook of Common Commercial and Game Fishes of California

By
LIONEL A. WALFORD

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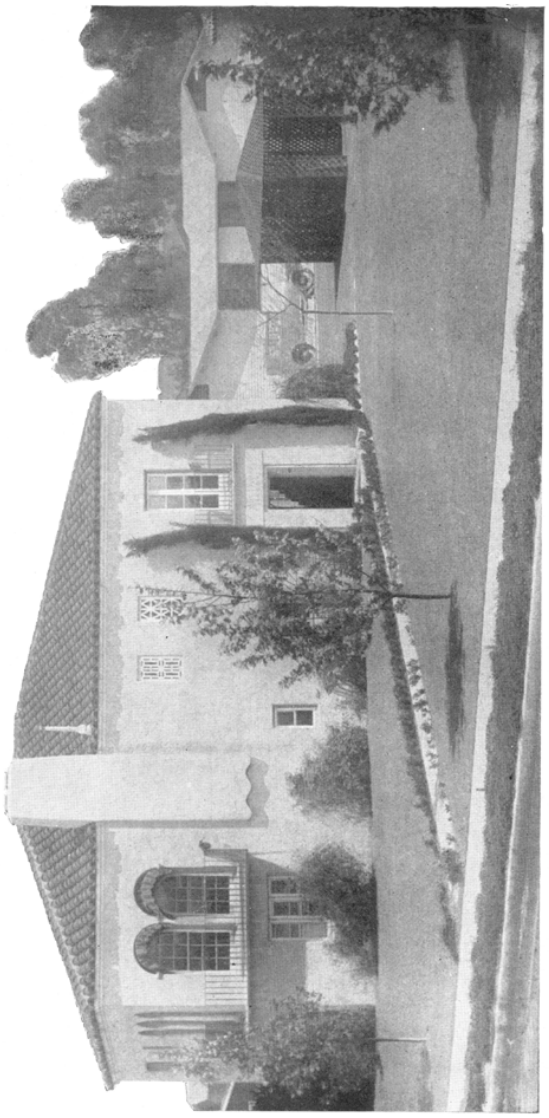

Photo by D. H. Fry, Jr.
The California State Fisheries Laboratory at Terminal Island, where research on the commercial fisheries of the State is carried on.

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1. LIST OF COMMON AND SCIENTIFIC NAMES

* Mentioned only in key; not described in book.

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2. INTRODUCTION

The purpose of this bulletin is primarily to establish official common names of the California fishes which are handled commercially, or which are of particular interest to fishermen or dealers. The authority for this work is derived from a State law enacted in 1919, which provides that "the Fish and Game Commission shall have the power to decide what is the common usage name of any variety."[1] Incidentally, the Bureau of Commercial Fisheries has attempted to provide a handbook for the convenience of marketmen, sportsmen and others who are interested in our natural resources. The restricted number and character of the species considered, the lack of complete keys, and the brevity of the description will make the book of small if any value to the pure scientist, for whom the work is not intended.

The need for this work has arisen out of a confusion of names, which has interfered with obtaining the utmost value possible from the catch records. There are, for example, two species of salmon in California of significant commercial importance. They are both listed in the records as "salmon," although it would be advantageous to salmon investigations to have each species recorded separately. One species has been called the *king salmon*, *Sacramento River salmon*, *Chinook salmon*, *quinnat salmon*, *Columbia River salmon*, *or spring salmon*; the other species when recognized was known as *silver salmon* or *silversides*. Again, the young of the white sea bass was called sea trout in southern California; in the northern part of the State the *sea trout* is an entirely different species, not even closely related to the southern form. A very common category listed on the original records was the *bluefish*, a mythical species which might be Pacific cultus, cabezone, halfmoon, rockfish, opal-eye, sea trout, or corbina, depending on where and by whom the fish was caught. Any number of other examples might be given of this chaotic state of the common names of our fish, but those cited should suffice; the desirability of establishing a definite official name for each species is patent.

The criterion "common usage name" has not been easy to apply. In California as elsewhere throughout the new world, common nomenclature did not grow up with the language as in Europe. The people who settled here naturally named things because of similarities—either real or apparent, superficial or significant—to familiar species in their homelands. Consequently these adopted names are not always expressions of true relationships. The horse mackerel, for example, is not a mackerel; the jack smelt bears little relationship to the true smelts; the white sea-bass is not a bass but a croaker. Where common usage requires, these names have been designated as official. However, where there have been many names for one kind of fish or many species of fish for one name, names least likely to cause confusion with other species have been adopted. Thus, it has been thought wise to call all of the species of the genus Sebastodes "rockfish," with certain individual descriptive adjectives; to abolish the term *bluefish*. Sometimes it has been necessary to assign adjectives to the specific names in order to

[1] State of California Department of Natural Resources, Division of Fish and Game. Laws relating to fish and game, 1929–1931. See "Record of fishing data," section 2, clause 2, p. 101.

distinguish between closely related species, as for example, Mexican corbina, California corbina, king salmon, silver salmon. In some instances it has been expedient arbitrarily to designate entirely new names.

The scope of the book includes primarily the fish of importance and interest to commercial fishermen and dealers, although several species of slight significance are described. Purely game fishes like the trout, calico bass, large-mouthed black bass, are included because of their interest commercially from the legal point of view. The reader might be disappointed not to find some forms which appear occasionally in the markets in negligible quantities, such as the señorita or kelp fish, the dolphin, the cusk eel, or many of the kinds of shark or skate. These we have not felt of sufficient importance to be included in the scope of this bulletin. Where there are many closely related species listed under the same name, as for example, the rockfish, we present only those most frequently seen in the markets. It is our intention to revise this work in later years when there comes a shift in commercial importance of any of the species not described in the present compilation.

The exploitation of certain marine or aquatic animals other than fish also comes within the governance of the Bureau of Commercial Fisheries of the Division of Fish and Game. These are the crustaceans (crabs, shrimps, lobsters, crayfish), the mollusks (abalones, squids, octopi, clams, cockles, scallops, oysters), and certain mammals (whales and seals). The crustaceans of commercial importance and three of the mollusks (squids, octopi, and abalone) are treated in this paper. The other mollusks, and the whales and seals have been the subject of other publications issued by the Bureau.[2]

The article on scientific names and the glossary of fishing gear have been included in the hope of promoting a better understanding of these subjects.

The collection of statistics, the success of which is dependent on a consistent use of fisheries nomenclature, is one of the major tasks of the Bureau of Commercial Fisheries, leading to work of inestimable value in formulating a program of wise conservation. We hope that this bulletin will at least in part accomplish the purpose to which it aspires, and that in the course of years its results will manifest themselves in a wider utility of our catch records.

The collection of photographs for the illustrations in this work has extended over a period of nearly four years. It was begun under the direction of Mr. J. A. Craig, and continued by the present compiler. Many members of the staff of the California State Fisheries Laboratory generously contributed their time and attention to this work. Among those who have left the laboratory, those whose collections deserve special mention, are Mr. Wilbur Follett and Mr. Carl Jackson. The collection of specimens for photography was greatly facilitated by the commercial fishermen and dealers, who freely gave fish for this purpose. Mr. Wallace Adams, while he was with the Steinhart

Aquarium of San Francisco, Mr. George S. Myers of Stanford University, Dr. B. W. Evermann of the California Academy of Sciences, Dr. J. Frank Daniel of the University of California, and Mr. Edward O. Baumann, very kindly aided in obtaining illustrations. Most of the photographs were made by commercial photographers to whom credit is given below each picture in the book. For valuable help in arranging the contents of the bulletin, the author is especially grateful to Miss Kathryn Karmelich of the California State Fisheries Laboratory.

The selection of official common names for our fishes was much simplified through the aid of several staff members of the United States Bureau of Fisheries, including Mr. Elmer Higgins, Mr. J. A. Craig, Mr. O. E. Sette, Dr. W. H. Rich, Mr. H. B. Holmes, and Mr. G. A. Rounsefell; also Dr. J. O. Snyder, Dr. Carl L. Hubbs, Dr. W. F. Thompson, Mr. Wilbur Follett, Mr. George S. Myers, Mr. Alvin Seale, Mr. P. S. Barnhart; staff members of the Bureau of Fish Culture and of the Bureau of Commercial Fisheries, especially Mr. N. B. Scofield, Mr. W. L. Scofield, in charge of the California State Fisheries Laboratory, Mr. H. B. Nidever and Mr. S. H. Dado, and commercial fishermen and fish dealers throughout the State. These people gave freely of their time in criticizing lists of names submitted to them, and because of their familiarity with California fishes, provided many valuable suggestions.

The following list is of references which were found most useful in compiling this work:

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August, 1930.

3. ILLUSTRATIONS OF ANATOMICAL TERMS

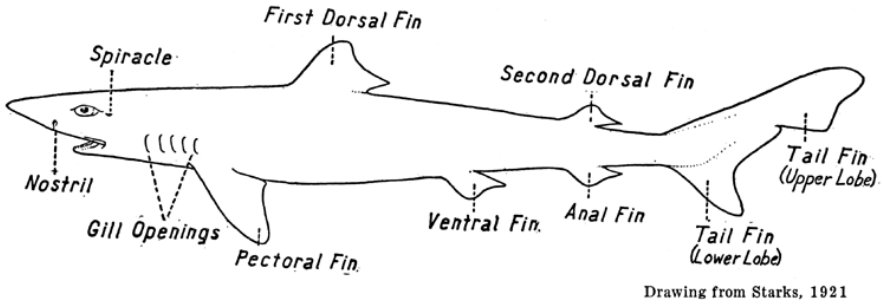

FIG. 1. Example of a shark.

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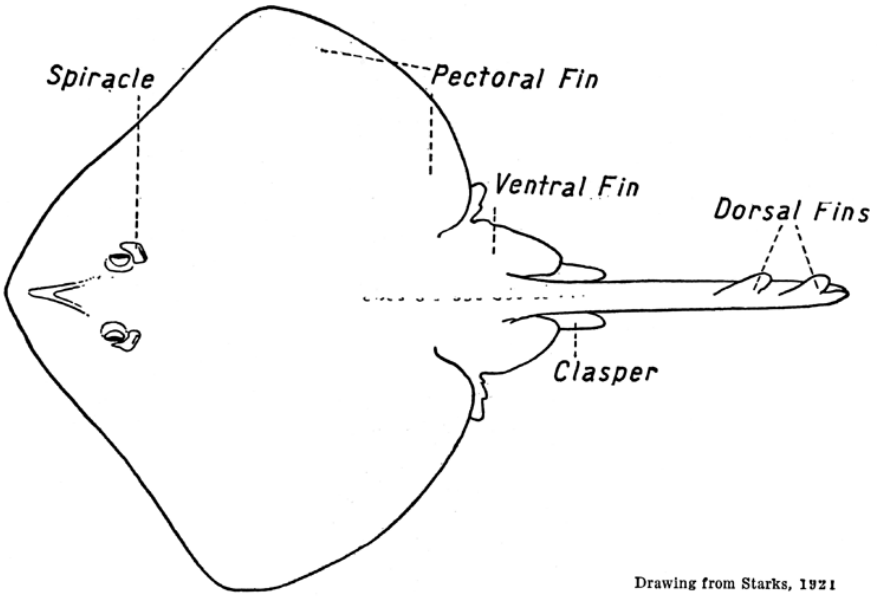

FIG. 2. Example of a skate.

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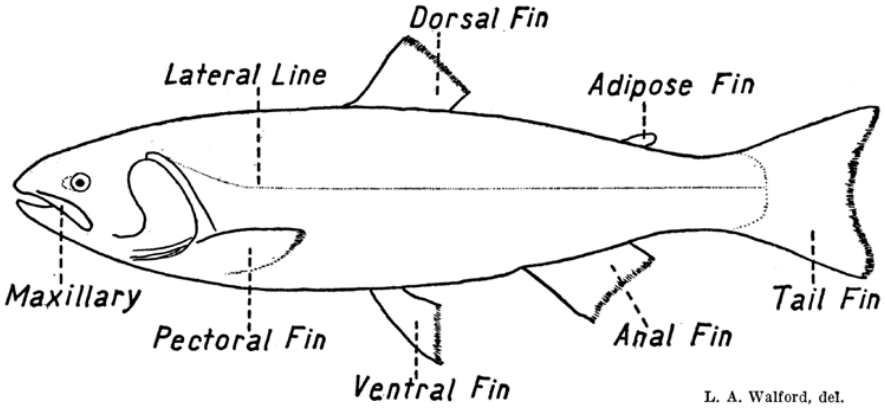

FIG. 3. Example of a fish with an adipose fin.

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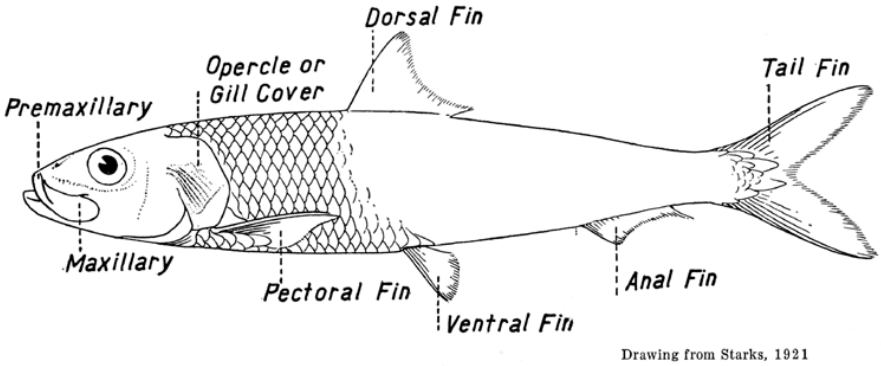

FIG. 4. Example of a fish with one dorsal fin and with the ventral fins attached in back of the middle of the pectoral fins.

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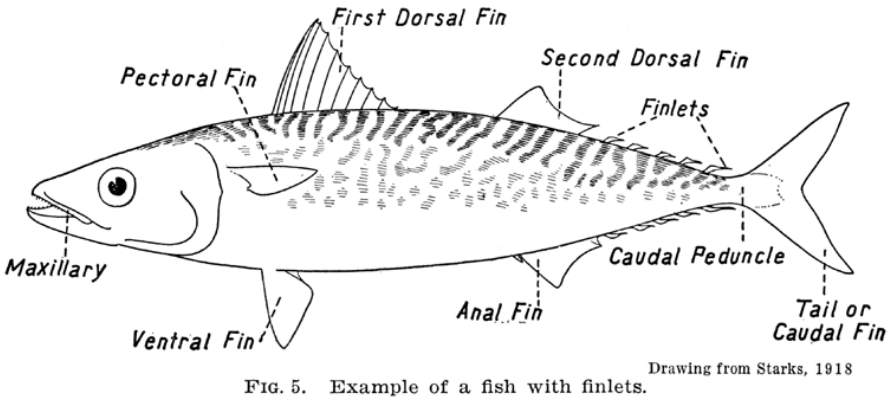

FIG. 5. Example of a fish with finlets.

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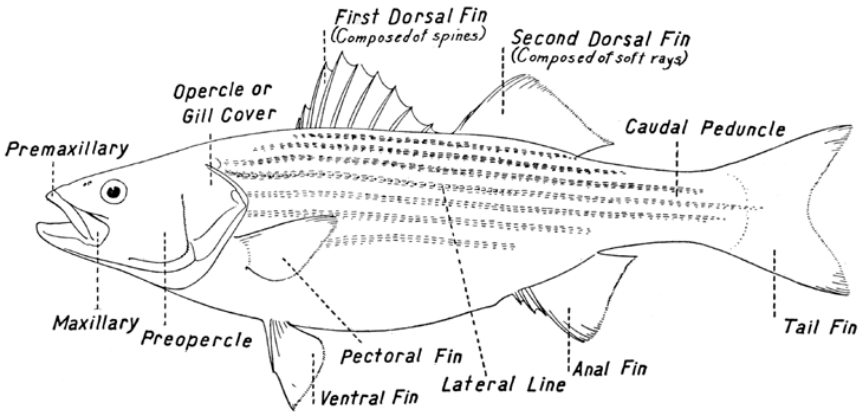

FIG. 6. Example of a fish with two dorsal fins and with the ventral fins attached in front of the middle of the pectoral fins.

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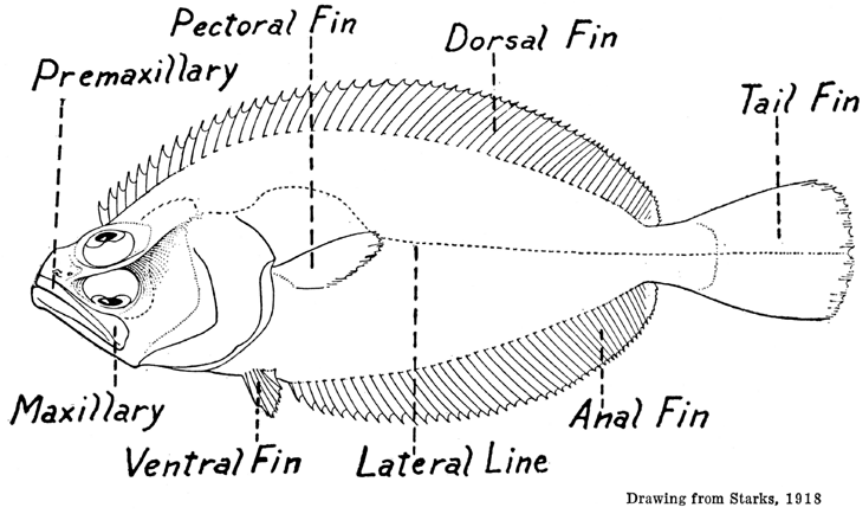

FIG. 7. Example of a fish in which the eyes are on one side of the head.

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4. GLOSSARY OF ANATOMICAL TERMS

NOTE: See drawings on pages 9–11, for illustrations of these terms.

ADIPOSE FIN: A soft, fleshy, usually small second dorsal fin that has no supporting rays running through it.

AIR BLADDER: The sac within the body cavity just below the backbone, which contains gases.

ANAL FIN: The unpaired fin on the mid-line of the under side of the body, just behind the vent.

ANAL SPINE: The spine or spines at the front of the anal fin.

BARBEL: A fleshy projection or appendage found about the mouth and nostrils of some fishes.

CANINE TEETH: Any conical teeth in the jaws conspicuously larger and longer than the rest.

CAUDAL FIN: The tail fin.

CAUDAL PEDUNCLE: That part of the body behind the anal fin, which holds the tail fin.

DEPTH: The greatest vertical diameter of a fish.

DORSAL: The back or upper part of the body. Opposite to VENTRAL.

DORSAL FIN: (Sometimes called the DORSAL). The unpaired fin or fins on the mid-line of the back.

FINLETS: Small unconnected fins which follow the dorsal and anal fins.

GILL FILAMENTS: The long, soft, red, thread-like part of a gill.

GILL COVER: The bony cover which protects the gills. Also called the OPERCLE.

GILL MEMBRANES: The fleshy extension of the lower part of the gill covers. These membranes are strengthened by bones, and may be connected to each other across the isthmus or may be separate. They may be connected to the isthmus or be free from it.

GILL OPENINGS: The external openings leading to and from the gills.

GILLS: The respiratory apparatus of fishes, found within the gill openings.

ISTHMUS: The region between the gill openings on the chest and throat.

LATERAL LINE: A line of pores extending along the side of the body, forming a "dotted line."

MAXILLARY: The upper bones that form the upper jaw, the hind ends of which move downward when the mouth is opened.

OPERCLE: The principal bone that forms the gill cover.

PALATINES: A pair of bones on the roof of the mouth extending out from the vomer and frequently bearing teeth.

PECTORAL FINS (also called PECTORALS): The first or upper of the paired fins.

PYLORIC CÆCA: The glandular appendages in the form of blind sacs which open into the alimentary canal at the junction of the stomach and intestine.

RAY: The supporting rods of a fin, composed of many small parts placed end to end. They are never stiff or sharp, and may be branched. often called SOFT RAYS. *See* SPINE.

SNOUT: That part of the head in front of the eyes.

SOFT DORSAL: The hind part of a dorsal fin which is composed of rays.

SPINE: Any sharp projecting point. The stiff, usually sharply pointed rods, not composed of separate parts placed end to end, which support portions of the fins.

VENT: The opening at the posterior end of the digestive tract.

VENTRAL: Relating to the underside of the body. The opposite of DORSAL. The ventral fins are sometimes called VENTRALS.

VENTRAL FINS: The paired fins placed behind or below the pectoral fins.

VIVIPAROUS: Spoken of fish which bring forth living young.

VOMER: An unpaired bone in the roof of the mouth just behind the middle of the upper jaw.

5. A KEY TO THE IDENTIFICATION OF SOME CALIFORNIA FISHES

(NOTE: To use this self-directing key, simply read the first paragraph, where you will find further directions. All fish which occur in California can not be identified here, and it is urged that strange or unusual species be sent for identification to the California State Fisheries Laboratory at Terminal Island, California. Technical anatomical terms are explained in the drawings on pages 9–11 and in the glossary. Fishes marked with an asterisk (*) are not described in the book.)

1. IF: The mouth is a sucking disk without jaws, the nostril is single and situated in the middle of the snout, and there are from 6 to 14 pore-like external gill openings on each side, the fish is a Lamprey or Hagfish (Class Marispobranchii). (*See* page 29.)

BUT IF: The mouth is normal, with well developed jaws, and there are at least 2 nostrils, not situated in the middle of the snout but on each side, and there are from 1 to 7 external gill openings, *see* section 2.

* * * *

2. IF: There are from 5 to 7 external gill openings (found on the sides or under surface), *see* section 3.

BUT IF: The gill opening is single, or the gills are entirely protected by a bony covering, *see* section 8.

* * * *

3. IF: The gill openings are at least partly on the side of the body, not wholly ventral in position, and the body is not flattened, the fish is a Shark. (*See* pages 30–35.)

BUT IF: The gill openings are altogether on the ventral surface of the body, and the body is flattened, *see* section 4.

* * * *

4. IF: There are 2 dorsal fins, *see* section 5.

BUT IF: There is only 1 dorsal fin, *see* section 7.

* * * *

5. IF: The skin is everywhere perfectly smooth, the fish is an Electric Ray (Family Torpedinidae).*

BUT IF: The skin is rough with large scattered spines, *see* section 6.

* * * *

6. IF: The tail fin is well developed, the fish is a Guitar Fish (Family Rhinobatidae). (*See* page 36.)

BUT IF: The tail fin is absent or is represented only by a slight fold of skin, the fish is a Skate (Family Rajidae). (*See* pages 37–38.)

* * * *

7. IF: There is no dorsal fin in front of the sting, the fish is a Sting Ray (Family Dasybatidae). (*See* page 39.)

BUT IF: There is a single dorsal fin in front of the sting, and the teeth are large, flat and paved, the fish is a Bat Sting Ray (Aëtobatus californicus). (*See* page 40.)

* * * *

8. IF: Ventral fins are present, *see* section 9.

BUT IF: Ventral fins are not present, *see* section 117.

* * * *

9. IF: The ventral fins are attached in front of the middle of the pectoral fins (that is, when the pectoral fin is lying against the side of the body), *see* section 40.

BUT IF: The ventral fins are attached back of the middle of the pectoral fins, *see* section 10.

* * * *

10. IF: There are 2 dorsal fins, *see* section 11.

BUT IF: There is only 1 dorsal fin, *see* section 25.

11. IF: The first dorsal fin is composed chiefly of soft rays, and the second is adipose (soft, fleshy, small, without supporting rays running through it), *see* section 12.

BUT IF: The first dorsal fin is composed of spines and the second chiefly of soft rays, *see* section 21.

* * * *

12. IF: The body is without scales, the skin is smooth, and the dorsal and pectoral fins are each provided with a strong spine, *see* section 13.

BUT IF: The body is covered with scales, and the dorsal and pectoral fins are without spines, *see* section 14.

* * * *

13. IF: The tail fin is cut squarely off at the end, or is slightly rounded inwardly (not forked or rounded deeply), the fish is a Square-Tail Catfish (Ameiurus nebulosus). (*See* page 54.)

BUT IF: The tail is forked or deeply rounded inwardly, the fish is a Fork-Tail Catfish (Ameiurus catus). (*See* page 53.)

* * * *

14. IF: There is a scaly appendage above the base of each ventral fin, *see* section 15.

BUT IF: There is no scaly appendage above the base of each ventral fin, *see* section 20.

* * * *

15. IF: The maxillary does not extend beyond the fore margin of the eye, and the jaws are toothless or nearly so, the fish is a Rocky Mountain Whitefish (Prosopium williamsoni). (*See* page 55.)

BUT IF: The maxillary extends well beyond the fore margin of the eye, and the jaws are with strong teeth, *see* section 16.

* * * *

16. IF: The anal fin has from 14 to 17 rays, and the lining of the mouth is dark, at least in patches, in the adult, *see* section 17.

BUT IF: The anal fin has only from 9 to 12 rays, and the lining of the mouth is never dark, the fish is a Trout. (*See* pages 58–64.)

* * * *

17. IF: There are over 200 scales in a horizontal row along the lateral line, the fish is a Pink Salmon (Oncorhynchus gorbuscha).*

BUT IF: There are less than 160 scales in a horizontal row along the lateral line, *see* section 18.

* * * *

18. IF: There are not more than 80 pyloric cæca (finger-like appendages attached to the hind part of the stomach near the junction of the small intestine), the fish is a Silver Salmon (Oncorhynchus kisutch). (*See* page 57.)

BUT IF: There are many more such appendages (140 to 155), *see* section 19.

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19. IF: There are from 15 to 17 soft rays in the anal fin, and the back and upper fins and tail fin are with small black spots, the fish is a King Salmon (Oncorhynchus tschawytscha). (*See* page 56.)

BUT IF: There are 13 to 14 soft rays in the anal fin, and the back and upper fins and tail fin are without distinct spots, the fish is a Chum Salmon (Oncorhynchus keta).*

* * * *

20. WHEN: The size is small (about 3 inches or less), regardless of species, the fish is called Whitebait. (*See* page 65.)

BUT WHEN: The size is larger (about 4 inches or more), regardless of species, the fish is called surf smelt. (*See* page 66.) (The species of this family are very difficult to distinguish and this key does not attempt it.)

21. IF: The teeth are strong, and a lateral line is present (do not confuse lateral line with silvery or colored stripe (*see* fig. 3, page 10), the fish is a Barracuda (Sphyrœna argentea). (*See* page 71.)

BUT IF: The teeth are small or not present, and there is no lateral line, *see* section 22.

* * * *

22. IF: The anal fin has 2 or 3 spines in front, and the first dorsal fin is composed of strong spines, the fish is a Mullet (Mugil cephalus). (*See* page 70.)

BUT IF: The anal fin has only 1 spine in front and the first dorsal fin is composed of weak spines, *see* section 23.

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23. IF: There are no teeth in the mouth, the fish is a Grunion (Leuresthes tenuis). (*See* page 67).

BUT IF: There are teeth in the mouth, *see* section 24.

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24. IF: There is only one row of teeth in the jaws, and these are forked (*note:* the teeth of these fish must be examined under a magnifying lens), the fish is a Bay Smelt (Atherinops affinis). (*See* page 69.)

BUT IF: The teeth are not forked and are set in bands, the fish is a Jack Smelt (Atherinopsis californiensis). (*See* page 68.)

* * * *

25. IF: The pectoral fin is enlarged to form an organ of flight, the fish is a California Flying fish (Cypselurus californicus). (*See* page 52.)

BUT IF: The pectoral fin is not enlarged to form an organ of flight, *see* section 26.

* * * *

26. IF: Both the upper and lower jaws are exceedingly prolonged to form a snipe-like beak, the fish is a California Needlefish (Strongylura exilis). (*See* page 51.)

BUT IF: Neither jaw is so prolonged, *see* section 27.

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27. IF: A lateral line is present (do not confuse lateral line with a silvery or colored stripe (*see* figure 3, page 10), and the head is without scales, *see* section 34.

BUT IF: A lateral line is absent and the head is without scales, *see* section 28.

* * * *

28. IF: The mouth is extremely large and the maxillary bone extends beyond the eye almost to the edge of the gill cover, the fish is an Anchovy (Family Engraulidae). (*See* section 29.)

BUT IF: The mouth is not extremely large and the maxillary bone does not extend back beyond the eye, *see* section 31.

* * * *

29. IF: The length of the head is greater than the depth of the body, and the length of the base of the anal fin is less that the length of the head, the fish is a Northern Anchovy (Engraulis mordax). (*See* page 50.)

BUT IF: The length of the head is scarcely if at all greater than the depth of the body, and the length of the base of the anal fin is not less than the length of the head, *see* section 30.

* * * *

30. IF: The length of the base of the anal fin is scarcely greater than the length of the head, the fish is a Southern Anchovy (Anchoviella delicatissima).*

BUT IF: The length of the base of the anal fin is considerably greater than the length of the head (about 1 # as long), the fish is a Deep-Bodied Anchovy (Anchoviella compressa). (*See* page 49.)

31. IF: The ventral fins are attached entirely behind the dorsal fin, the fish is a Japanese Herring (Etrumeus micropus).*

BUT IF: The ventral fins are attached partly or entirely under the dorsal fin, *see* section 32.

* * * *

32. IF: The length of the head is much less than the depth of the body, and the body is drawn to a very sharp, saw-toothed edge on the breast and belly, the fish is a Shad (Alosa sapidissima). (*See* page 48.)

BUT IF: The length of the head is not noticeably less than the depth of the body, and the body is not drawn to a very sharp, saw-toothed edge on the breast and belly, the scales being only with low sharp points, *see* section 33.

* * * *

33. IF: There are low raised ridges extending obliquely downward on the gill cover, the fish is a California Sardine (Sardina cœrulea). (*See* page 47.)

BUT IF: There are no such low raised ridges on the gill cover, the fish is a Pacific Herring (Clupea pallasii). (*See* page 46.)

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34. IF: There are teeth on the jaws, vomer and palatines, the fish is a Ladyfish (Albula vulpes).*

BUT IF: The mouth is without teeth, *see* section 35.

* * * *

35. IF: The lips are exceedingly large and covered with small, fleshy projections, the fish is a sucker (Family Catostomidae). (*See* page 41.)

BUT IF: The lips are neither large nor with fleshy projections, *see* section 36.

* * * *

36. IF: The dorsal fin has a strong spine in front, the hind edge of which is saw-toothed, the fish is a Carp (Cyprinus carpio). (*See* page 42.)

BUT IF: The dorsal fin is without a strong saw-toothed spine, *see* section 37.

* * * *

37. IF: The upper lobe of the tail fin is much longer than the lower, and nearly twice as long as the head, the fish is a Split-tail (Pogonichthys macrolepidotus). (*See* page 44.)

BUT IF: The upper lobe of the tail fin is not longer than the lower, and much less than twice as long as the head, *see* section 38.

* * * *

38. IF: There are more than 100 scales in a horizontal row along the lateral line, the fish is a Hardhead (Orthodon microlepidotus). (*See* page 43.)

BUT IF: There are fewer than 100 scales in a horizontal row along the lateral line, *see* section 39.

* * * *

39. IF: There is a central strip of skin connecting the upper lip with the top of the head, the fish is a Hardhead (Mylopharodon conocephalus).*

BUT IF: There is no such strip of skin connecting the upper lip with the top of the head, and the maxillary extends to below or past the fore part of the eye, the fish is a Sacramento Pike (Ptychocheilus grandis). (*See* page 45.)

* * * *

40. IF: Both eyes are on the same side of the head, *see* section 41.

BUT IF: Both eyes are not on the same side of the head, *see* section 62.

* * * *

41. IF: The body tapers backward to a point, the anal and dorsal fins are joined to the tail fin, and the skin and scales extend over the preopercle, the fish is a Tongue Sole (Symphurus atricaudus).*

BUT IF: The body does not taper backward to a point, the dorsal and anal fins are separate from the tail fin, and the edge of the preopercle is evident, *see* section 42.

42. IF: The ventral fin on the eyed side of the body is on the ridge of the abdomen, thus making the ventral fins unsymmetrical, *see* section 43.

BUT IF: The ventral fins are symmetrical, one being on each side of the ridge of the abdomen, *see* section 44.

* * * *

43. IF: The space between the eyes is concave, and rises to a ridge above the lower eye, the fish is a Sand Dab. (*See* page 139.)

BUT IF: The space between the eyes is a sharp, scaleless ridge, the fish is a Speckled Sand Dab (Orthopsetta stigmœa.)*

* * * *

44. IF: The lateral line is with a high arch in front over the pectoral fin (not simply curved upwards), *see* section 45.

BUT IF: The lateral line is without a high, abrupt arch in front, but usually with a small upward curve, *see* section 49.

* * * *

45. IF: The pectoral fin on the eyed side of the body is as long or longer than the head, reaching about to the middle of the body, the fish is a Fan-tail Sole (Xystreurys liolepis). (*See* page 146.)

BUT IF: The pectoral fin on the eyed side is not much over half as long as the head, *see* section 46.

* * * *

46. IF: The maxillary reaches to below the hind border of the lower eye or past it, *see* section 47.

BUT IF: The maxillary does not reach past the middle of the lower eye, *see* section 48.

* * * *

47. IF: The eyes are separated by a high ridge of bone and the teeth are very fine, the fish is a Big-mouthed Sole (Hippoglossina stomata).*

BUT IF: The eyes are separated by a flat area, and the teeth are sharp, the fish is a California Halibut (Paralichthys californicus). (*See* page 138.)

* * * *

48. IF: The depth of the body is about one-third the length without the tail fin, and the scales are fine and smooth, the fish is a Northern Halibut (Hippoglossus hippoglossus). (*See* page 137.)

BUT IF: The depth of the body is about one-half the length without the tail fin, and the scales are rather large and rough, the fish is a Broad-fin Sole (Lepidopsetta bilineata). (*See* page 149.)

* * * *

49. IF: The body is covered with rough, scattered plates, and the dorsal and anal fins are with alternate black and orange marks, the fish is a Starry Flounder (Platichthys stellatus). (*See* page 150.)

BUT IF: The body is covered with ordinary scales and the vertical fins are not marked with black and orange, *see* section 50.

* * * *

50. IF: The maxillary reaches to or past the hind border of the lower eye, the fish is an Arrow-toothed Sole (Atheresthes stomias). (*See* page 141.)

BUT IF: The maxillary does not reach as far as the hind border of the lower eye, *see* section 51.

* * * *

51. IF: The pectoral fin on the eyed side is much longer than the head, the fish is a Rex Sole (Errex zachirus). (*See* page 143.)

BUT IF: The pectoral fin on the eyed side is not as long as the head, *see* section 52.

* * * *

52. IF: The maxillary reaches at least as far as vertically below the middle of the lower eye, *see* section 53.

BUT IF: The maxillary does not reach to vertically below the middle of the lower eye, *see* section 55.

53. IF: The first rays of the dorsal fin are at least twice as long as the eye, and for most of their length not connected to each other by membrane, the fish is a Fringe Sole (Psettichthys melanostictus). (*See* page 145.)

BUT IF: The first rays of the dorsal fin are not as long as the eye, *see* section 54.

* * * *

54. IF: There are over 30 rows of scales between the lateral line and the back at the widest place, the fish is a Round-nosed Sole (Eopsetta jordani). (*See* page 144.)

BUT IF: There are less than 20 rows of scales between the lateral line and the back at the widest place, the fish is a Slender Sole (Lyopsetta exilis). (*See* page 142.)

* * * *

55. IF: The eyes are separated by a high bony ridge on which are from 1 to 3 short spines, *see* section 56.

BUT IF: The eyes are not separated by a high bony and spiny ridge, *see* section 59.

* * * *

56. IF: There are at least 9 rays of dorsal fin extending over on the blind side of the body to a level with the corner of the mouth, the fish is a California Turbot (Pleuronichthys decurrens). (*See* page 153.)

BUT IF: There are not more than 6 rays of the dorsal fin on the blind side of the body, not extending as far as a level with the corner of the mouth, *see* section 57.

* * * *

57. IF: The ridge between the eyes is high and very sharp-edged, ending behind in a sharp spine that stands at least as high above the surrounding level of the head as the diameter of the pupil, and there are two spines on the front of the ridge, the first extending forward to vertically above the point of the snout, the fish is a Sharp-ridged Turbot (Pleuronichthys verticalis). (*See* page 154.)

BUT IF: The ridge between the eyes is not so high and sharp as described above, *see* section 58.

* * * *

58. IF: The bony spines at the front of the ridge that separates the eyes are scarcely developed, the fish is a Mottled Turbot (Pleuronichthys cœnosus).*

BUT IF: There are two short, blunt spines developed at the front of the ridge that separates the eyes, and there is usually present a dark spot on the lateral line at the middle of the body and one at each edge of the body near the base of the anal and dorsal fins toward the tail, the fish is a Spotted Turbot (Pleuronichthys ritteri).*

* * * *

59. IF: The depth of the body is about one-half the entire length including the tail fin, the fish is a Diamond Turbot (Hypsopsetta guttulata). (*See* page 152.)

BUT IF: The depth of the body is less than one-half the entire length, *see* section 60.

* * * *

60. IF: There are teeth on both sides of the lower jaw, and the scales are large and rough to the touch when the finger is passed toward the head, the fish is a Scaly-fin Sole (Isopsetta isolepis). (*See* page 148.)

BUT IF: There are teeth (small and blunt) on the blind side of the lower jaw only, and the scales are small and smooth, *see* section 61.

61. IF: The ventral fins are longer than the longest diameter of the eye, the fish is a Pointed-nosed Sole (Parophrys vetulus). (*See* page 147.)

BUT IF: The ventral fins are not over one-half as long as the longest diameter of the eye, the fish is a Slippery Sole (Microstomus pacificus).*

* * * *

62. IF: The ventral fins have 5 rays preceded by a more or less evident spine and are not united to each other, *see* section 63.

BUT IF: The ventral fins have more or less than 5 rays (but not 5) with or without a spine, and are not connected with each other, *see* section 114.

* * * *

63. IF: A narrow bone can be felt which extends back from just below the lower part of the eye across the cheek just under the skin, *see* section 64.

BUT IF: No such bone can be felt, *see* section 69.

* * * *

64. IF: There is no slit behind the fourth gill, and the anal fin has from 5 to 11 soft rays, *see* section 65.

BUT IF: There is a definite slit behind the fourth gill, and the anal fin has 12 or more soft rays, *see* section 66.

* * * *

65. IF: The dorsal fin has 12 spines, the fish is a Sculpin (Scorpæna guttata). (*See* page 126.)

BUT IF: The dorsal fin has 13 or 14 spines, the fish is a Rockfish (Sebastodes). (*See* pages 114–125.)

* * * *

66. IF: The body is uniformly covered with scales, *see* section 67.

BUT IF: The body is without scales, covered with smooth skin, and the dorsal fin has 11 spines, the fish is a Cabezone (Scorpænichthys marmoratus). (*See* page 127.)

* * * *

67. IF: The dorsal fin is divided into 2 parts well separated from each other, and there are 2 nostrils on each side of the snout, the fish is a Sablefish (Anoplopoma fimbria). (*See* page 128.)

BUT IF: The dorsal fin is continuous, with merely a notch between the rays and the spines, and there is only 1 nostril on each side of the snout, a small pore above it, *see* section 68.

* * * *

68. IF: The jaws are provided with strong canine teeth (large conical teeth in the front part of the jaws), and there is only 1 lateral line, the fish is a Pacific Cultus (Ophiodon elongatus). (*See* page 130.)

BUT IF: The jaws are not provided with canine teeth, and there are several lateral lines, the fish is a California Sea-Trout (Hexagrammos decagrammus). (*See* page 129.)

* * * *

69. IF: The dorsal and anal fins are each followed by finlets (5 to 9 small, unconnected fins), *see* section 70.

BUT IF: The dorsal and anal fins are not followed by finlets, *see* section 75.

(NOTE: The inadequacy of existing keys and of sufficient data, the large number of different species, and the difficulty of distinguishing between them, prevent our offering a key for the separation of these species. A few examples of this group are described in this work.)

70. IF: There is a single keel on the mid-line of each side of the caudal peduncle, and the body is without distinct vertical bars, *see* section 71.

BUT IF: The mid-line of the caudal peduncle is without a keel, but there are 2 low keel-like projections on each side of the mid-line, and the upper part of the side of the body is marked with dark, wavy, irregular, vertical bars, the fish is a Pacific Mackerel (Pneumatophorus japonicus diego). (*See* page 72.)

* * * *

71. IF: The *lower* part of the sides is marked with 4 or 5 horizontal dark stripes which are parallel to the lower outline of the body, the fish is a Skipjack (Katsuwonus pelamis). (*See* page 74.)

BUT IF: The lower part of the sides is without distinct horizontal stripes, *see* section 72.

* * * *

72. IF: The pectoral fin is at least as long as the head, reaching almost to or past the front of the anal fin, *see* section 73.

BUT IF: The pectoral fin is shorter than the head, not reaching nearly as far back as the anal fin, *see* section 74.

* * * *

73. IF: The pectoral fin reaches much beyond the front of the anal fin, the fish is an Albacore (Germo alalunga). (*See* page 77.)

BUT IF: The pectoral fin does not extend past the front of the anal fin, the fish is a Yellowfin Tuna (Neothunnus macropterus). (*See* page 76.)

* * * *

74. IF: The upper part of the sides is marked with several dark oblique or horizontal stripes, the fish is a Bonito (Sarda chiliensis). (*See* page 73.)

BUT IF: The upper part of the sides is without stripes or bars, the fish is a Bluefin Tuna (Thunnus thynnus). (*See* page 75.)

* * * *

75. IF: There are teeth on the vomer (unpaired bone in the mid-line of the roof of the mouth, just behind the middle of the upper jaw), *see* section 76.

BUT IF: The vomer is without teeth, *see* section 89.

* * * *

76. IF: The lateral line toward the tail is armed with a series of sharply keeled scales or plates, the fish is a Horse Mackerel (Trachurus symmetricus). (*See* page 81.)

BUT IF: The lateral line is without sharply keeled scales, *see* section 77.

* * * *

77. IF: The dorsal fin has from 35 to 39 soft rays, and the caudal peduncle has a low ridge-like keel, the fish is a Yellowtail (Seriola dorsalis). (*See* page 80.)

BUT IF: The dorsal fin has fewer than 25 soft rays, and the caudal peduncle is without a keel, *see* section 78.

* * * *

78. IF: There are gill filaments (the thread-like part of a gill) growing on the inner side of the gill cover, *see* section 79.

BUT IF: There are no gill filaments growing on the inner side of the gill cover, *see* section 84.

* * * *

79. IF: The soft parts of the dorsal and anal fins are so covered with scales that the rays are hidden, the fish is a Halfmoon (Medialuna californicnsis). (*See* page 112.)

BUT IF: The soft parts of the dorsal and anal fins are not covered with scales, *see* section 80.

80. IF: The side of the body is marked with distinct horizontal stripes, the fish is a Striped Bass (Roccus lineatus). (*See* page 88.)

BUT IF: The side of the body is without distinct stripes, *see* section 81.

* * * *

81. IF: The longest spine of the first dorsal fin is shorter than the longest ray of the second dorsal, and the two fins are merely in contact with each other, scarcely united, the fish is a Black Sea-bass (Stereolepis gigas). (*See* page 89.)

BUT IF: The longest spines of the first dorsal fin are as long or longer than the rays of the second, and the two fins are definitely united by a membrane, *see* section 82.

* * * *

82. IF: The third dorsal spine is at least three times as long as the second, and longer than the fourth, *see* section 83.

BUT IF: The third dorsal spine is not over twice as long as the second, and a little shorter than the fourth, the fish is a Kelp Bass (Paralabrax clathratus). (*See* page 91.)

* * * *

83. IF: The head, body and fins are covered with scattered small round spots, the fish is a Spotted Rock Bass (Paralabrax maculatofasciatus).*

BUT IF: The body and fins are without spots, but sometimes the cheeks are with small spots, the fish is a Rock Bass (Paralabrax nebulifer). (*See* page 90.)

* * * *

84. IF: The dorsal fin is scarcely longer than the anal fin and has from 5 to 8 spines, *see* section 85.

BUT IF: The dorsal fin is much longer than the anal fin, and has from 10 to 13 spines, *see* section 86.

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85. IF: The dorsal fin has 5 or 6 spines, the fish is a Crappie (Pomoxis annularis).*

BUT IF: The dorsal fin has 7 or 8 spines, the fish is a Calico Bass (Pomoxis sparoides). (*See* page 83.)

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86. IF: The dorsal fin has 12 or 13 spines, the fish is a Sacramento Perch (Archoplites interruptus). (*See* page 84.)

BUT IF: The dorsal fin has only 10 spines, *see* section 87.

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87. IF: There is a small black flap on the upper edge of the gill cover, and the greatest depth of the body is a little over one-third the length, incluing the tail fin, the fish is a Sunfish. (*See* page 85.)

BUT IF: The gill cover is without such a flap, and the body is more elongate, the depth being less than one-third, almost one-fourth the total length including the tail fin, *see* section 88.

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88. IF: There are about 17 rows of scales on the cheek, and the maxillary in the adult does not extend beyond the eye, the fish is a Small-mouthed Black Bass (Micropterus dolomieu). (*See* page 86.)

BUT IF: There are only about 10 rows of scales on the cheek, and the maxillary in the adult does extend beyond the eye, the fish is a Large-mouthed Black Bass (Micropterus salmoides). (*See* page 87.)

* * * *

89. IF: The anal fin has 1 or 2 spines in front (sometimes must be carefully examined to be seen, and the front of the fin scraped with the fingernail), *see* section 90.

BUT IF: The anal fin has 3 spines in front (third spine sometimes imbedded in the membrane and might be mistaken for a soft ray), *see* section 100.

90. IF: The lateral line ends under the soft part of the dorsal fin, *see* section 91.

BUT IF: The lateral line ends at or on the tail fin, *see* section 92.

* * * *

91. IF: The color is chiefly dark brown, the fish is a Blacksmith (Chromis punctipinnis). (*See* page 109.)

BUT IF: The color is chiefly vermillion or bright orange, sometimes marked with bright blue, the fish is a Garibaldi (Hypsypops rubicundus). (*See* page 110.)

* * * *

92. IF: The dorsal fin is continuous, without a notch between the spines and the rays, the fish is an Ocean Whitefish (Caulolatilus princeps). (*See* page 131.)

BUT IF: There is a notch between the spiny portion of the dorsal fin and the soft portion, or if the two portions are entirely separated, *see* section 93.

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93. IF: The lower jaw projects beyond the tip of the snout, *see* section 94.

BUT IF: The tip of the snout projects beyond the tip of the lower jaw, *see* section 96.

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94. IF: The base of the second dorsal fin is about equal in length to the base of the anal fin, and the two dorsal fins are well-separated, the fish is a Queenfish (Seriphus politus). (*See* page 92.)

BUT IF: The base of the second dorsal fin is very much longer than that of the anal fin, and the two dorsal fins are at least in contact with each other, *see* section 95.

* * * *

95. IF: The pectoral fin reaches about as far back as the tips of the ventral fins, and the teeth in the middle of the upper jaw are not prominently large, the fish is a White Sea-bass (Cynoscion nobilis). (*See* page 93.)

BUT IF: The pectoral fin does not reach as far back as the tip of the ventral fins, and there are one or two long teeth pointing backward at the middle of the upper jaw, the fish is a Short-fin Sea-bass (Cynoscion parvipinnis).*

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96. IF: There is a single short barbel or appendage at the tip of the lower jaw, *see* section 97.

BUT IF: There is no barbel at the tip of the lower jaw, *see* section 98.

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97. IF: There is an enlarged, thick spine at the front of the anal fin, and the first spine of the first dorsal fin is not longer than the spines just behind it, the fish is a Yellowfin Croaker (Umbrina roncador). (*See* page 97.)

BUT IF: There is no enlarged spine at the front of the anal fin, and the first dorsal spine is longer than the others, the fish is a California Corbina (Menticirrhus undulatus). (*See* page 98.)

* * * *

98. IF: There is a large thick spine at the front of the anal fin, *see* section 99.

BUT IF: There is no enlarged spine at the front of the anal fin, the fish is a Kingfish (Genyonemus lineatus). (*See* page 96.)

99. IF: There is a large black spot at the base of the pectoral fin, and the pectoral fin is as long as the head, reaching past the tips of the ventrals, the fish is a Spotfin Croaker (Roncador stearnsi). (*See* page 95.)

BUT IF: There is no such spot at the base of the pectoral fin, but a dark spot is usually present on the hind edge of the gill cover, and the pectoral fin is much shorter than the head, and does not reach to the tips of the ventrals, the fish is a Black Croaker (Sciœna saturna). (*See* page 94.)

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100. IF: The anal fin has more than 17 soft rays, *see* section 101.

BUT IF: The anal fin has 16 or fewer soft rays, *see* section 112.

* * * *

101. IF: The soft parts of the dorsal and anal fins when raised are so densely covered with scales that the rays are nearly hidden, the fish is a Halfmoon (Medialuna californiensis). (*See* page 112.)

BUT IF: The soft parts of the dorsal and anal fins are not covered with scales, the fish is a Salt-water Perch (Family Embiotocidae). (*See* section 102.)

* * * *

102. IF: The base of the spiny portion of the dorsal fin is longer than the base of the soft portion, having from 16 to 18 spines, and the fish is found in fresh water, the fish is a Fresh-water Viviparous Perch (Hysterocarpus traski).* (Fresh water species.)

BUT IF: The base of the spiny portion of the dorsal fin is shorter than the base of the soft portion, having from 8 to 11 spines, and the fish occurs in salt water, *see* section 103.

* * * *

103. IF: The body is brilliantly colored with blue and orange or red stripes, *see* section 104.

BUT IF: The body is not so brilliantly colored; if the color is brown or chiefly silvery, steely or blackish, *see* section 105.

* * * *

104. IF: The anal fin has not more than 25 soft rays, and the distance between the front of the ventral fin and the front of the anal fin is greater than the length of the head, the fish is a Rainbow Perch (Hypsurus caryi). (*See* page 104.)

BUT IF: The anal fin has more than 27 soft rays, and the distance between the front of the ventral fin and the front of the anal fin is less than the length of the head, the fish is a Striped Perch (Tœniotoca lateralis). (*See* page 105.)

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105. IF: There is a cluster of enlarged scales between the pectoral and ventral fins, and the color is chiefly brownish, usually tinged with blue above, the fish is a Black Perch (Embiotoca jacksoni). (*See* page 103.)

BUT IF: There is no such cluster of enlarged scales below the pectoral fin, and the color is chiefly silvery or brassy, often overlaid with blackish, or with brassy or blackish vertical or horizontal bars, *see* section 106.

* * * *

106. IF: The fifth or the sixth spine of the dorsal fin is as high or higher than the first soft ray, *see* section 107.

BUT IF: The fifth or sixth spine of the dorsal fin is lower than the first soft ray, *see* section 109.

107. IF: The ventral fin is tipped with black and the eye is large, about one-third the length of the head, the fish is a Wall-eyed Perch (Hyperprosopon argenteum). (*See* page 101.)

BUT IF: The ventral fins are not tipped with black, and the eye is smaller, less than one-third the length of the head, *see* section 108.

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108. IF: The scales are large (between 36 and 50 in a horizontal row along the lateral line), and the color is silvery with several blackish horizontal stripes along the rows of scales with about 3 light yellow vertical bars, or is almost entirely sooty black, the fish is a Shiner (Cymatogaster aggregatus).*

BUT IF: The scales are smaller (between 60 and 75 in a horizontal row along the lateral line), and the color is greenish above, silvery on the sides, with spots and blotches of light orange brown or coppery red, and the tail, anal and ventral fins are reddish, the fish is a Red-tail Perch (Holconotus rhodoterus).*

* * * *

109. IF: The first soft ray of the dorsal fin is at least twice the height of the last spine, the fish is a Fork-tail Perch (Damalichthys vacca). (*See* page 107.)

BUT IF: The first soft ray of the dorsal fin is less than twice the height of the last spine, *see* section 110.

* * * *

110. IF: The sides are marked with vertical brassy bars, alternating with series of similarly colored spots, or the color is entirely brassy, the fish is a Barred Perch (Amphistichus argenteus). (*See* page 102.)

BUT IF: The sides are without distinct bars or series of spots, and the color is never distinctly brassy, *see* section 111.

* * * *

111. IF: The lips are exceedingly enlarged and fleshy, the fish is a Rubberlip Perch (Rhacochilus toxotes). (*See* page 108.)

BUT IF: The lips are not noticeably enlarged, the color is plain silvery without black spots or orange streaks, and the tail is not reddish, the fish is a Pacific White Perch (Phanerodon furcatus). (*See* page 106.)

* * * *

112. IF: The teeth are large and canine-like, and slope obliquely forward, and the color is chiefly scarlet or rose, the fish is a California Sheepshead (Pimelometopon pulcher). (*See* page 113.)

BUT IF: The teeth are small and not canine-like, do not noticeably slope obliquely forward, and the color is greenish or grayish-silvery, *see* section 113.

* * * *

113. IF: The teeth are freely movable, being attached to the membrane only, each tooth being divided into 3 points at its tip, the fish is an Opal-eye (Girella nigricans). (*See* page 111.)

BUT IF: The teeth are fixed, not movable, are single-pointed, slender and crowded, the fish is a Sargo (Anisotremus davidsoni). (*See* page 99.)

* * * *

114. IF: The ventral fins each have more than 5 rays preceded by a more or less evident spine, *see* section 115.

BUT IF: The ventral fins each have fewer than 5 rays, with or without a spine, *see* section 116.

115. IF: The dorsal fin is divided into 3 well-separated fins, the anal into 2, and a barbel is present under the tip of the lower jaw, the fish is a Tomcod (Microgadus proximus). (*See* page 133.)

BUT IF: The dorsal fin is divided into 2 fins, the first short, the second long and with a deep notch; the anal fin is similar to the second dorsal fin, and the lower jaw is without a barbel, the fish is a Hake (Merluccius productus). (*See* page 132.)

* * * *

116. IF: The upper jaw is prolonged into a sword, the fish is a Marlin (Makaira mitsukurii). (*See* page 78.)

BUT IF: The upper jaw is not prolonged into a sword; if the body is more or less eel-shaped, does not taper to a point behind, is with ordinary scales, not bony plates, and the dorsal fin is composed entirely of spines or of both spines and of soft rays, but not entirely of soft rays, the fish is a Blenny Eel (Group Blenniodea). (*See* pages 134–135.)

* * * *

117. IF: The membranes on the lower edge of the gill covers are united to the isthmus (that part which separates the gill openings below), *see* section 118.

BUT IF: The membranes of the gill covers are free from the isthmus, *see* section 119.

* * * *

118. IF: The gill openings are reduced to small pores, the fish is a Moray Eel (Gymnothorax mordax). (*See* page 136.)

BUT IF: The gill openings are larger than pores; if the body is more or less eel-shaped, the jaws are not drawn out into a tube or beak, the body does not taper to a slender point, the dorsal fin is long and single, and the teeth are not pebble-like, the fish is a Blenny Eel (Group Blenniodea). (*See* pages 134–135.)

* * * *

119. IF: The upper jaw is prolonged into a sword, the fish is a Broadbill Swordfish (Xiphias gladius). (*See* page 79.)

BUT IF: The upper jaw is not prolonged into a sword, *see* section 120.

* * * *

120. IF: The body is ovate, deep, compressed, the depth being about one-half the length, the fish is a California Pompano (Palometa simillima). (*See* page 82.)

BUT IF: The body is more or less eel-shaped, the dorsal fin is long and single, and the membranes of the lower edge of the gill covers are united to each other, the fish is a Blenny Eel (Group Blenniodea). (*See* pages 134–135.)

6. DESCRIPTIONS AND ILLUSTRATIONS OF FISHES

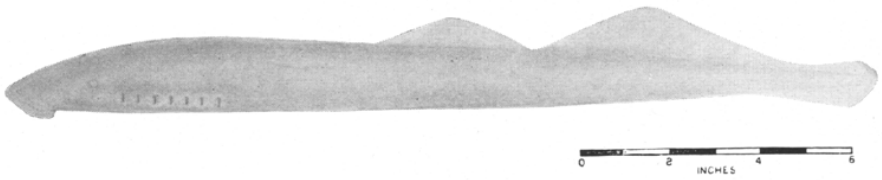


FIG. 8.

FIG. 8

LAMPREY

Example of the group: Entosphenus tridentatus.

Relationship: Belongs to the lamprey family (Petromyzonidae), in the class of lampreys (Marsipobranchii), in which there is also classed at least one other species found in California. Not a fish and hence is not closely related to the true eel, the moray eel or the blenny eel. Another member of the same class is the California hagfish (Polistotrema stoutii), an animal very destructive to fish caught in gill nets or on set lines.

Distinguishing Characters: The absence of paired fins; the absence of jaws, the mouth being a sucking disk; the presence of 7 external gill openings on each side close behind the head; the presence of a single nostril on top of the head on the mid-line just in front of the eyes. This species is characterized by the presence of 3 conspicuous teeth in the upper part of the mouth, the middle one smallest. **Color:** Uniform dark brown, occasionally mottled with lighter or darker shades. The young known as ammocœtes are quite different in appearance from the adults. They are blind and toothless, living like worms in the dirt of the stream bottoms. After about the end of the third year of this stage, the lampreys metamorphose into the adult form. Attains a length of over 20 inches.

Distribution: From southern California northward to Alaska. Ascends streams from the ocean to spawn. Has become landlocked in Goose Lake and Clear Lake.

Fishing Season: Spring and early summer during the spawning migration.

Importance: of negligible importance either commercially or to sportsmen. Eats food fish by attaching to the body with the sucker-like mouth, puncturing the skin and sucking the blood of the victims. The hagfish, common in Monterey Bay, rasps the flesh of fish caught on submerged gear, leaving only the skins behind.

Fishing Gear: Caught by snagging or by hand; taken with traps in rivers.

Unauthorized names: Eel, river eel.

SHARKS

Relationship: About 24 species of sharks, representing 11 families, occur in the waters off California. Closely allied to the sharks are the skates, which belong to the same subclass (Elasmobranchii). A few examples will suffice to help the reader to identify the sharks as a group and some of the commoner kinds are presented in the following pages.

Distinguishing Characters: All of the sharks have from 5 to 7 gill openings which occur at least partly on the side of the body; the body is not flattened into a disc; the skeleton is composed entirely of cartilage, rather than of bones; the body covering is usually of shagreen, the scales being small, strongly implanted, and feel rough when the finger is rubbed along the side of the body toward the head. **Color:** varies according to species; usually gray, blue, brown or white.

Distribution: Sharks are widely distributed throughout the world. Various species are found along the entire California coast.

Fishing Season: Taken as a group, these fish are caught all year round with a peak during the winter and spring months. There are probably different seasons for individual species, but at present (1930) these are not known.

Importance: An absurd prejudice against this group of palatable fish has prevented its attaining any significant commercial importance. Sold almost entirely in the fresh fish markets. Rather small amounts are used in manufacturing fish meal and fish glue.

Fishing Gear: Taken with hook and line, and with all kinds of nets.

Unauthorized names: Stacche, canis, dogfish, paloma.

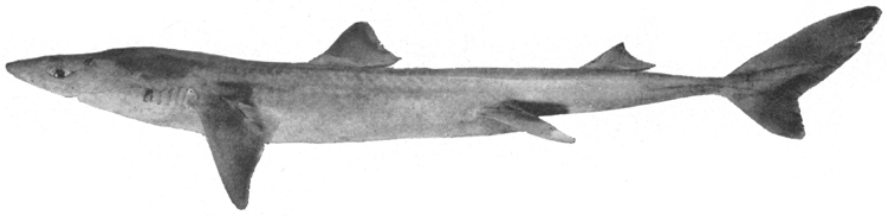


Photo by Lauck, San Francisco.

FIG. 9.

FIG. 9

GRAYFISH

Squalus suckleyi.

Relationship: Belongs to the dogfish family (Squalidae) in which are classed closely related species throughout the world, but probably no others in California waters.

Distinguishing Characters: The absence of an anal fin; the presence of a spine in front of each dorsal fin. **Color:** Slaty gray, shading into white on the lower parts. Attains a length of about 4 feet.

Distribution: Point Conception northward to the Aleutian Islands.

Fishing Season: *See* page 30.

Importance: Is one of the commonest of the sharks seen in the markets of San Francisco.

Fishing Gear: *See* page 30.

Unauthorized names: Dogfish, dog shark.

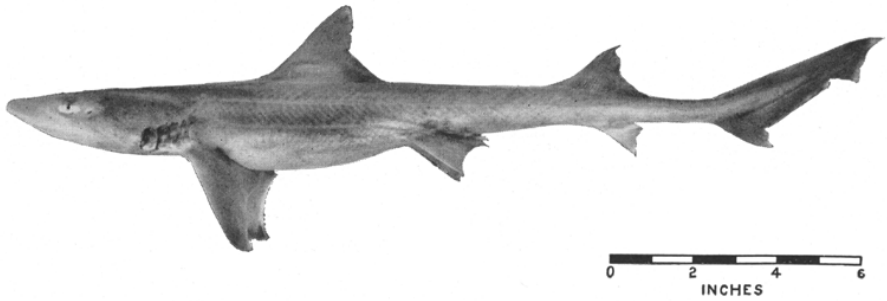


Photo by J. M. Hawthorne, Los Angeles.

FIG. 10.

FIG. 10

SMOOTH-HOUND SHARK

Rhinotriacis henlei.

Relationship: Belongs to the family of typical sharks (Galeidae), in which are classed many kinds of sharks which are found on our coast. Is very closely related to Mustelus californicus, from which it is not readily distinguished.

Distinguishing Characters: The first dorsal fin being entirely in front of the ventral fins; the second dorsal fin being opposite the anal fin; the absence of spines on the back; the notch below the tip of the upper lobe of the tail fin; the lower lobe of the tail fin being only slightly projecting; the very fine teeth having sharp points in this species, being blunt and pavement-like and without points in M. californicus; the pectoral fin when held close to the body usually reaching to under the middle of the base of the first dorsal fin in this species, the fin not reaching that far back in M. californicus. **Color:** Brownish or purplish gray above, silvery on the sides and whitish below. Attains a length of about 2 feet; M. californicus probably attains a greater length.

Distribution: San Francisco southward, its range not definitely known. Commonly seen in the San Pedro markets, where it is one of the three most important sharks.

Fishing Season: *See* page 30.

Importance: This species along with its near relative probably forms the largest proportion of the sharks in California.

Fishing Gear: *See* page 30.

Unauthorized names: Mud shark, smooth-hound, Henle's shark, dogfish, paloma, sand shark.

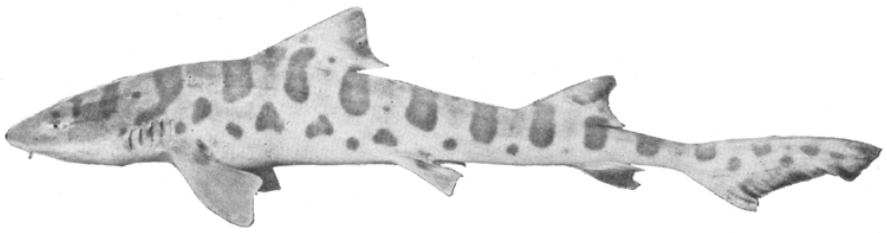


Photo by J. M. Hawthorne, Los Angeles.

FIG. 11.

FIG. 11

LEOPARD SHARK

Triakis semifasciata

Relationship: Belongs to the family of typical sharks (Galeidae), in which are classed many kinds of sharks found on our coast.

Distinguishing Characters: *See* page 30. The black crossbars which extend across the back down to the middle of the side, and the spots which occur on the lower part of the side. **Color:** Gray, with the crossbars and spots as described above; belly pale. Attains a length of 5 feet or more.

Distribution: San Francisco to Ballenas Bay on the coast of Lower California.

Fishing Season: *See* page 30.

Importance: One of the sharks most commonly seen in the markets of southern California. Sold entirely in the fresh fish markets. One of the commonest sharks caught by anglers.

Fishing Gear: *See* page 30.

Unauthorized name: Cat shark.

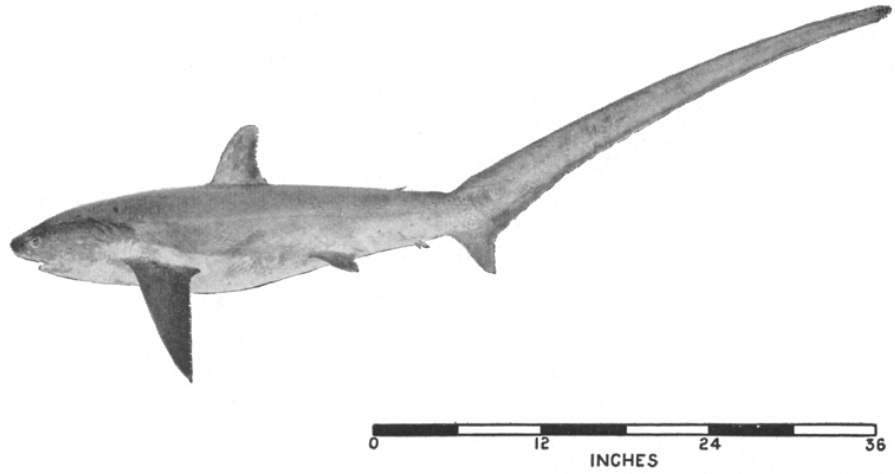


Photo by J. M. Hawthorne, Los Angeles.

FIG. 12.

FIG. 12

THRESHER

Alopias vulpes.

Relationship: Is in a family by itself, the Alopiidae, of which this species is said to be the only existing member.

Distinguishing characters: The great length of the upper lobe of the tail fin, which is as long or almost as long as the rest of the body. **Color:** Purplish or bluish gray with a metallic luster above, becoming paler on the sides and white on the underparts; fins purplish or bluish gray. Attains a length of over 20 feet.

Distribution: Widely distributed throughout the world. Has been recorded on our coast as far north as Coos Bay, Oregon, and is said to extend at least as far south as the Isthmus of Panama. Very common in the fish markets of San Pedro at certain seasons of the year.

Fishing Season: *See* page 30.

Importance: Is probably the commonest of the larger sharks seen in the fresh fish markets of southern California. of high reputation as a game fish.

Fishing Gear: *See* page 30.

Unauthorized name: Long-tail shark.

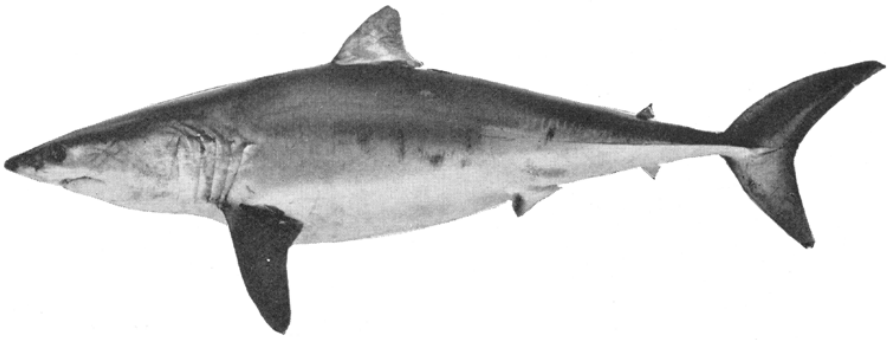


Photo by J. M. Hawthorne, Los Angeles.

FIG. 13.

FIG. 13

BONITO SHARK

Isurus glaucus.

Relationship: Belongs to the mackerel shark family (Lamnidae), in which are classed some of the largest and most voracious of the sharks. Members of this group are found distributed throughout the world, particularly in warm seas.

Distinguishing Characters: The 5 external gill openings; the keel on each side of the caudal peduncle; the teeth being long and slender, without saw-toothed edges and without small projecting branches at the bases; the gill slits ending at about the level of the front of the pectoral fin, not nearly meeting at the throat; the front of the first dorsal fin being near a verticle from the hind edge of the pectoral fin; the front of the second dorsal fin being in advance of the anal fin. **Color:** Dusky slate blue above, shading into white on the lower part of the sides and underparts. Attains a length of about 12 feet.

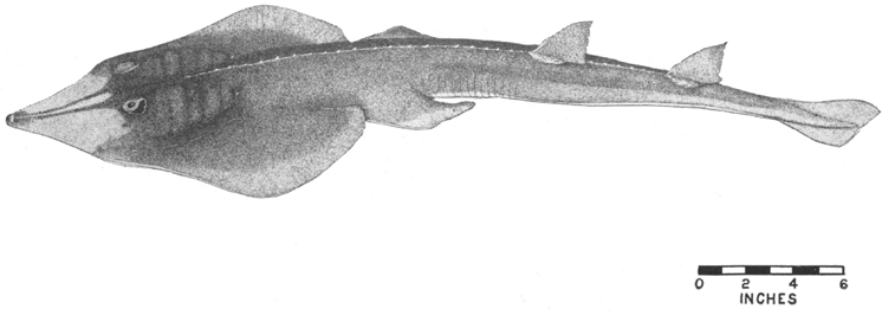
Distribution: Southern California, Japan and Hawaii; also occurs in the Atlantic Ocean.

Fishing Season: *See* page 30.

Importance: One of the commonest of the larger sharks seen in the fish markets of southern California.

Fishing Gear: *See* page 30.

Unauthorized names: Mackerel shark, spriglio.



From "The Elasmobranch Fishes," by J. Frank Daniel, University of California Press, 1922.

FIG. 14.

FIG. 14

THE GUITAR FISHES

Example of the group: Rhinobatus productus.

Relationship: Belongs to the guitar fish family (Rhinobatidae), in which are also classed at least two other species which occur on our coast. These fish are closely allied to the skates, sharks, sting rays and bat rays, all of which belong to the same subclass (Elasmobranchii). often mistaken for sting rays or "stingarees" by pleasure fishermen.

Distinguishing Characters: The 5 external gill openings being on the ventral side of the body; the body being rather flattened; the tail fin being rather well-developed; the tail being thick and having 2 dorsal fins on top of it; the skin being covered with rough scales (shagreen) in this species, or with irregular tubercles or prickles instead of shagreen in one other species; the rows of hooked spines along the middle of the back and tail, and the small group of spines on the shoulder; the head being more or less spade-shaped. **Color:** Plain dull grayish above, white below. This species attains a length of about 4 feet, and is the largest of the guitar fishes found on our coast. The smallest of our species scarcely exceeds 2 feet.

Distribution: This group occurs from Point Conception south to about Agua Verde Bay on the coast of Lower California. Occasionally taken as far north as San Francisco. Occurs in the surf and in sloughs.

Fishing Season: Taken irregularly throughout the year.

Importance: Not taken commercially in large quantities. Surf fishermen and other anglers often take these fish incidentally.

Fishing Gear: Hook and line, round haul nets, beach seines.

Unauthorized name: Shovel-nosed shark.

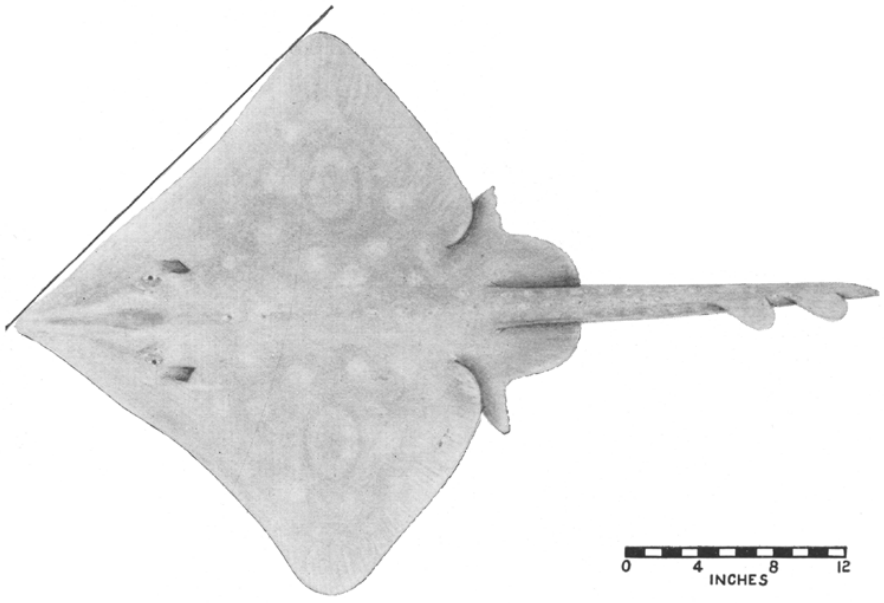


FIG. 15.

FIG. 15

THE BIG SKATE

Raja binoculata.

Relationship: Belongs to the skate family (Rajidae), in which are also classed all of the other skates found on our coast. The sting rays or "stingarees," the guitar fishes, the eagle rays, and the electric rays are in different families. Belongs to the same subclass as the sharks (Elasmobranchii).

Distinguishing Characters: The gill openings being entirely on the ventral surface of the body; the body and fins being flat; the 2 separate dorsal fins near the tip of the tail; the outer edge of the ventral fins, when the front edge is held at right angles to the tail, being only slightly curved or almost straight; the upper part of the body being everywhere covered with very small prickles, which are absent in the young; the presence of from 1 to 3 rows of irregular spines along the top of the tail. **Color:** Olive brown or drab, with a large dusky spot surrounded by a light area at the base of the pectoral fin; light spots as large as the eye are scattered over the body and form a ring around the pectoral spot. Attains a length of over 6 feet.

Distribution: Southern California northward to Alaska. Not common south of Point Conception.

Fishing Season: Caught throughout the year, with largest landings during the winter and spring months.

Importance: Commercially not taken in large quantities, although it probably forms a fair proportion of the skate catch. Sold entirely in the markets.

Fishing Gear: Hook and line, drag nets, round hauls.

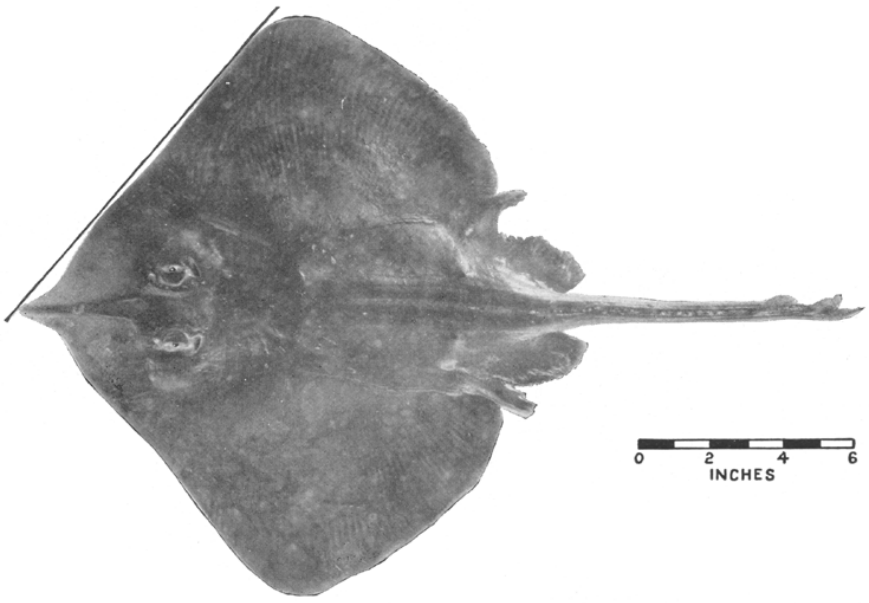


Photo by J. M. Hawthorne, Los Angeles.

FIG. 16.

FIG. 16

CALIFORNIA SKATE

Raja inornata.

Relationship: Belongs to the skate family (Rajidae), in which are also classed all of the other skates found on our coast. The sting rays or "stingarees," the guitar fishes, the eagle rays and the electric rays belong to different families. In the same subclass as the sharks and other rays.

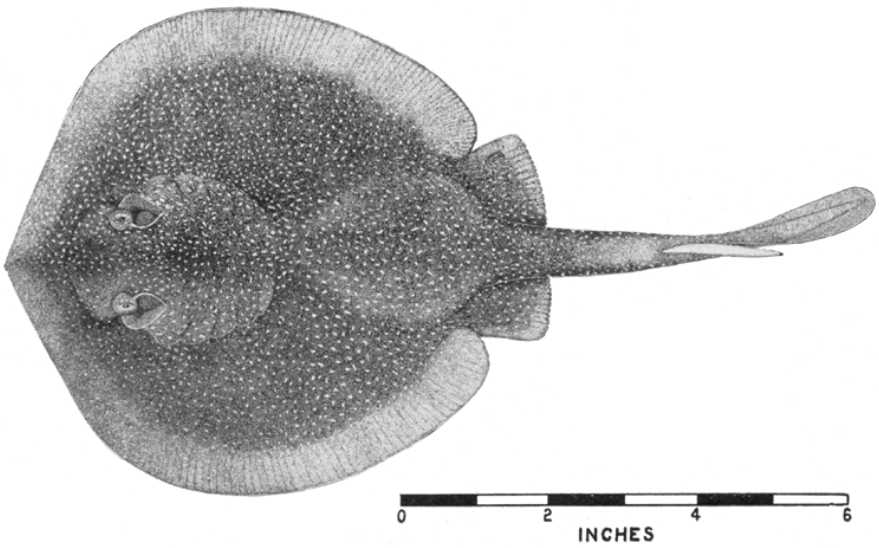
Distinguishing Characters: The gill openings being entirely on the ventral surface of the body; the body and fins being flat; the 2 separate dorsal fins near the tip of the tail; the ventral fins having a deep notch, which may be seen when the fins are held with the outer edge at right angles to the tail; the snout being only slightly projecting—hardly more than the length of the eye; the middle of a straight line drawn from the snout to the outer angle of the pectoral fin nearly or quite touching the body (as in the picture); the presence of prickles on the snout and between the eyes; the presence of enlarged spines in from 1 to 5 rows on the top of the tail. **Color:** Dark brown, with usually a small dark ring at the base of each pectoral, and sometimes with 2 other pale spots on the pectorals. Attains a length of about 2 ½ feet.

Distribution: San Diego northward to the Straits of Juan de Fuca.

Fishing Season: Taken throughout the year, with largest catch during the winter and spring months.

Importance: Probably forms the greater part of the catch recorded as *skate*, although it is not taken in large quantities. Sold entirely in the fresh fish markets.

Fishing Gear: Small round haul nets, hook and line, drag nets.



From "The Elasmobranch Fishes," by J. Frank Daniel, University of California Press, 1922.

FIG. 17.

FIG. 17

STING RAY

Example of the group: Urolophus halleri (The Round Sting Ray).

Relationship: Belongs to the sting ray family (Dasybatidae), in which are classified at least 2 other species which occur in California. These fish are closely allied to the skates and the sharks, which belong to the same subclass (Elasmobranchii). The bat sting ray belongs to a separate family.

Distinguishing Characters: The 5 external gill openings being on the ventral side of the body; the body being much flattened; the rather short, thick tail with usually a long spine or sting on top (the sting is sometimes duplicated); the absence of dorsal fins. This species may be known from the others of its local relatives by the tail being shorter than the rest of the body, and the width of the body being less than the entire length. **Color:** Dark brown or slaty brown, often with lighter spots or blotches. Attains a length of over 15 inches.

Distribution: On this coast sting rays occur from San Francisco southward. This species is found from Point Conception to Panama Bay, most local commercial catches being delivered at San Diego.

Fishing Season: Taken irregularly throughout the year.

Importance: Taken commercially in small quantities. of interest to bathers because of the menace of its sting. Starks (1918.1) says, "Should a person be so unfortunate as to be stung by one of these rays, he will appreciate the advice to hold the wounded part in hot water . . . and continue (this treatment) . . . even for several hours."

Fishing Gear: Round haul nets. Amateur fishermen find sport in spearing these fish.

Unauthorized name: Stingaree.

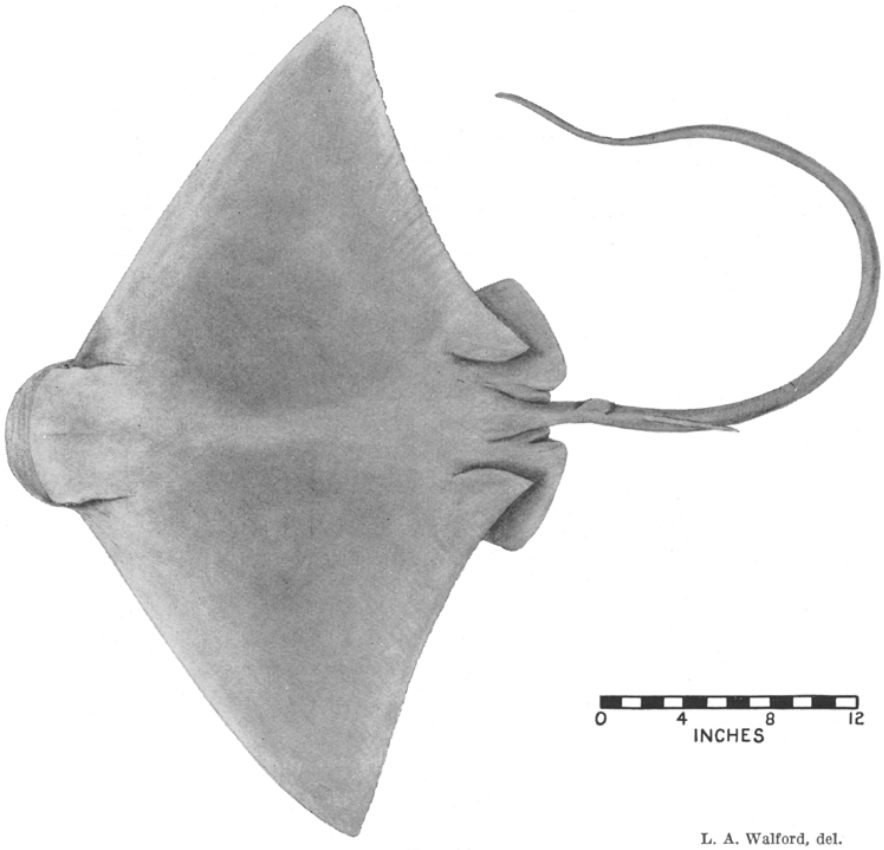


FIG. 18.

FIG. 18

BAT STING RAY

Aëtobatus californicus.

Relationship: Is the only representative of the eagle ray family (Myliobatidae) occurring on the coast of California. Closely allied to the skates, sharks, sting rays, and guitar fishes, all of which belong to the same subclass (Elasmobranchii).

Distinguishing Characters: The 5 external gill openings being on the ventral side of the body; the body being flattened; the tail being whip-like, without a tail fin; the single dorsal fin just in front of the sting; the back of the tail having a long spine or sting which is often duplicated; the skin being perfectly smooth, without spines or prickles; the eyes being at the edge of the head; the teeth being large and flat, forming a tile-like pavement. **Color:** Uniform dark slate or mud color above and white below. Attains a width of over 4 feet.

Distribution: Cape Mendocino southward to about Santa Maria Bay on the coast of Lower California.

Fishing Season: Taken irregularly throughout the year.

Importance: Taken commercially only occasionally. Alleged to be very destructive to oyster beds and crabs, and therefore is the object of special exterminating parties by sport fishermen, mostly in the San Francisco Bay region.

Fishing Gear: Hook and line, seines.

Unauthorized names: Eagle ray, California sting ray, stingaree.

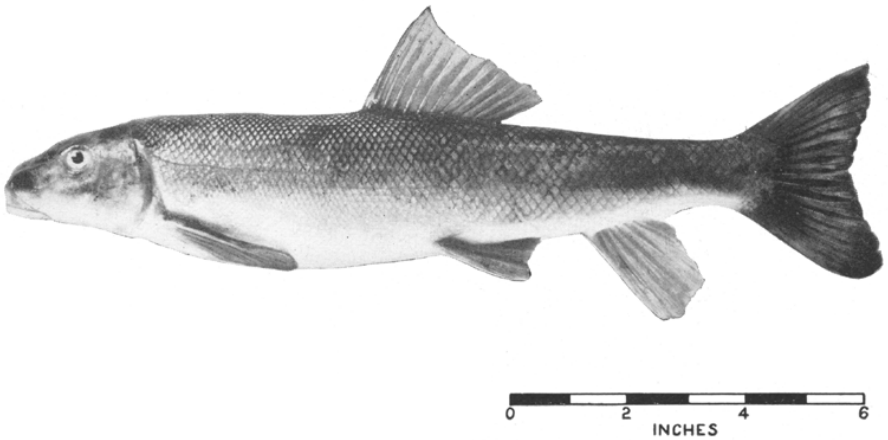


Photo by Lauck, San Francisco.

FIG. 19.

FIG. 19

SACRAMENTO SUCKER

Catostomus occidentalis.

Relationship: Belongs to the sucker family (Catostomidae), in which are classed certain other closely related but commercially unimportant species which are found in California.

Distinguishing Characters: The single dorsal fin being composed entirely of soft rays, of which there are from 12 to 14; the absence of teeth in the mouth; the mouth being ventral in position and with exceedingly thick lips which are covered with small fleshy projections (papillae); the absence of a notch at the corner of the mouth between the upper and lower lips. **Color:** Brownish, becoming yellowish below; fins yellowish. Attains a length of about 20 inches.

Distribution: This species is widely distributed in the streams and lakes of the Sacramento-San Joaquin River Basin, all other streams entering San Francisco Bay, and in the Russian River Basin. Enters brackish water during the high water of the winter and spring. The other species of sucker are distributed variously throughout the State.

Fishing Season: Caught mostly during the winter and spring months.

Importance: Commercially of slight significance. Sold largely by Chinese; some salted and dried. Not considered a game fish by sport fishermen.

Fishing Gear: Caught by commercial fishermen only incidentally while seeking other species with gill nets and fyke nets. Also taken in considerable quantities with beach seines in overflowed districts in the delta country about the Sacramento and San Joaquin rivers.

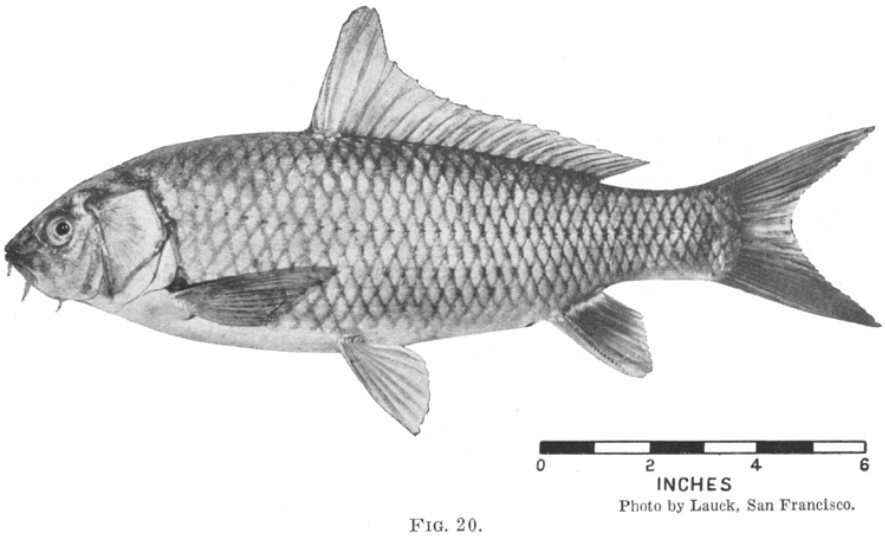


FIG. 20.

FIG. 20

CARP

Cyprinus carpio.

Relationship: Belongs to the carp family (Cyprinidae), in which are also classed the split-tail, pike, hardhead and many small minnows of little if any commercial importance, which occur in the State.

Distinguishing Characters: The single dorsal fin with a large, strong, sharp spine in front, the back edge of which has low saw-teeth; the short anal fin having less than 15 rays with a similar saw-toothed spine; the presence of 1 pair of barbels on each side of the mouth; the large, strong scales. **Color:** Dark brown, almost black, becoming whitish on the undersurface; scales tipped with darker, giving the appearance of many narrow stripes, criss-crossing obliquely in both directions. Attains a length of about 30 inches. Great variation in color, in size and number of scales, and in shapes of fins.

Distribution: Streams, creeks, lakes, sloughs, irrigation ditches and reservoirs throughout the State wherever it has been successfully planted. An introduced species.

Fishing Season: All year round, with larger catches during the winter and spring.

Importance: Not taken commercially in large quantities. Sold chiefly in the Chinese markets; small amounts are salted and dried. Not considered a game fish by many sportsmen.

Fishing Gear: Hook and line, gill nets, beach seines.

Unauthorized name: German carp.

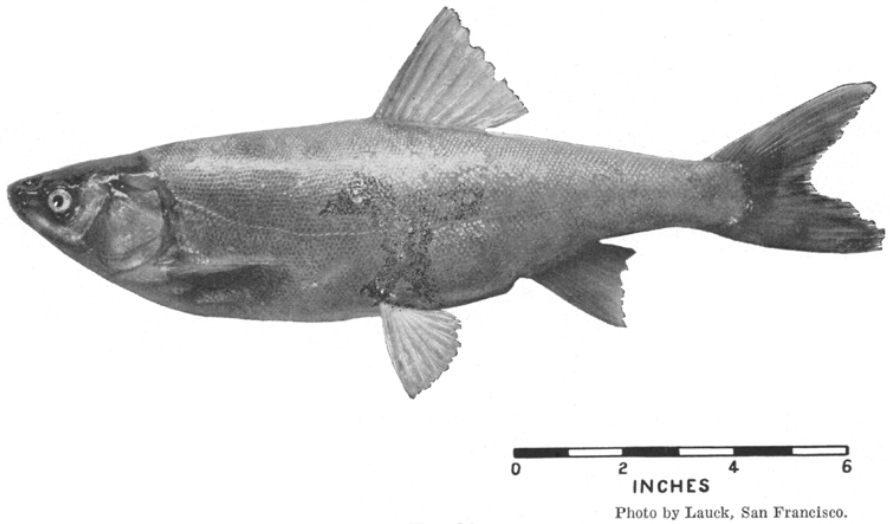


Photo by Lauck, San Francisco.

FIG. 21.

FIG. 21

HARDHEAD

Orthodon microlepidotus.

Relationship: Belongs to the carp family (Cyprinidae), in which are also classed the split-tail, Sacramento pike, the carp and certain other species of minnows which occur in the State and which are of little if any commercial significance. Another fish of the same family but different genus, also called *hardhead*, is Mylopharodon conocephalus. (*See* key, page 16, for distinguishing characters of this fish.)

Distinguishing Characters: The single, short dorsal fin near the middle of the body, which is composed entirely of soft rays, of which there are about 11; the absence of teeth in the jaws; the scales being small, over 100 extending in a horizontal row along the lateral line; the intestine being long, usually about 7 times the length of the body; the lining of the body cavity (peritoneum) being black. **Color:** Blackish above, becoming paler below. Attains a length of about 16 inches.

Distribution: Lower Sacramento and San Joaquin rivers and neighboring streams and sloughs. Occurs also in Clear Lake.

Fishing Season: October to May, with larger landings during December and January. Probably caught by amateur fishermen all year round.

Importance: Not caught in large quantities by commercial fishermen. Sold almost entirely in the fresh fish markets, small amounts being salted and dried. Not considered a game fish by pleasure fishermen.

Fishing gear: Fyke nets; beach seines in overflowed districts in the delta country of the Sacramento and San Joaquin rivers. Pleasure fishermen catch these fish incidentally with hook and line.

Unauthorized name: Blackfish.

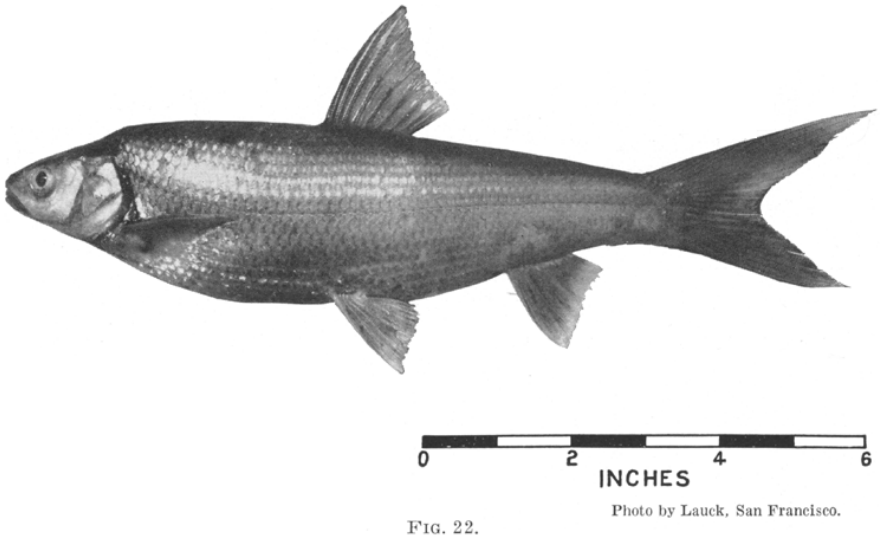


Photo by Lauck, San Francisco.

FIG. 22.

FIG. 22

SPLIT-TAIL

Pogonichthys macrolepidotus.

Relationship: Belongs to the carp family (Cyprinidae), in which are also classed the carp, pike, hardhead, and many small minnows which are of little if any commercial importance.

Distinguishing Characters: The single, short dorsal fin composed entirely of soft rays; the absence of teeth in the mouth; the upper half of the tail being noticeably longer than the lower half, and nearly twice the length of the head. **Color:** Variable; uniformly silvery, or muddy with a metallic luster. Attains a length of about 15 inches.

Distribution: Streams of central California, being rather common in the Sacramento and San Joaquin rivers. Occurs in Clear Lake. often taken in brackish water in Suisun and San Pablo Bays.

Fishing Season: Caught during the late fall, winter and spring months.

Importance: Taken commercially in small numbers. Sold almost entirely in the fresh fish markets. Not considered a game fish by sportsmen.

Fishing Gear: Fyke nets; beach seines in the overflowed districts in the delta country of the Sacramento and San Joaquin rivers. Pleasure fishermen catch these fish incidentally with hook and line.

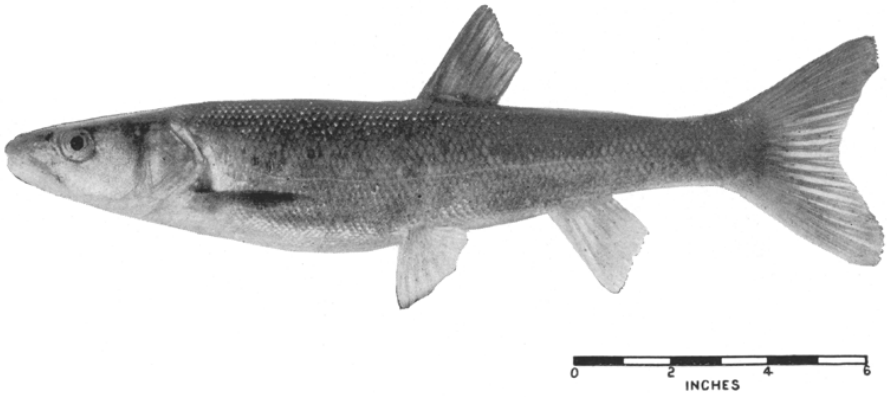


Photo by Gabriel Moulin, San Francisco.

FIG. 23.

FIG. 23

SACRAMENTO PIKE

Ptychocheilus grandis.

Relationship: Not a true pike, but belongs to the carp family (Cyprinidae), in which are also classed the split-tail, hardhead, carp, and many small minnows which occur in the State and which are of little if any commercial importance.

Distinguishing Characters: The single, short dorsal fin without spines; the absence of teeth in the mouth; the short anal fin with only about 8 soft rays; the presence of less than 100 scales in a row extending along the lateral line; the large mouth, the maxillary bone extending to below or past the fore part of the eye; the lining of the body cavity (peritoneum) being pale. **Color:** Muddy greenish with silvery reflections, shading into silvery on the under surface; fins reddish or yellowish, becoming brighter in the spring. Attains a length of about 4 feet.

Distribution: Streams of central and northern California, occasionally entering the brackish water of San Francisco Bay. Occurs also in Clear Lake.

Fishing Season: Caught irregularly throughout the year.

Importance: Commercially not taken in large quantities. Regarded as fair game fish by pleasure fishermen. Considered a pest in trout streams where it is said to eat the young trout.

Fishing Gear: Caught commercially with fyke nets. Considerable quantities are taken with beach seines in overflowed districts of the delta country about the Sacramento and San Joaquin rivers. Amateur fishermen use hook and line with worms or spinners for bait.

Unauthorized names: Pike, squawfish.

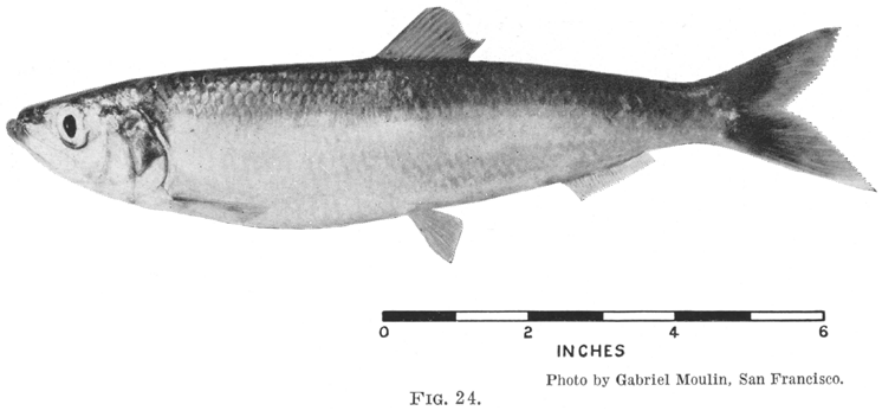


Photo by Gabriel Moulin, San Francisco.

FIG. 24.

FIG. 24

PACIFIC HERRING

Clupea pallasii.

Relationship: Belongs to the herring family (Clupeidae), in which are also classed the California sardine and the shad, as well as numerous other species which occur in other parts of the world.

Distinguishing Characters: The single, short dorsal fin near the middle of the back; the absence of scales on the head; the absence of a lateral line; the absence of ridges on the gill cover; the breast and belly not being sharply saw-toothed as in the shad but with low, sharp points. **Color:** Pinkish purple above, becoming silvery on the sides and below; sides without black spots. Attains a length of about 18 inches.

Distribution: From Alaska southward to San Diego, occurring in California in Tomales Bay, San Francisco Bay, Monterey Bay and San Diego Bay, during the fishing season. Occurs in schools. Greatest California landings made at San Francisco.

Fishing Season: From November to June, with largest landings being made from January to April.

Importance: The tenth largest fresh fish market fishery in northern California in 1928. Relatively small amounts are smoked and preserved.

Fishing Gear: Gill nets, round haul nets; taken with beach nets in Tomales Bay.

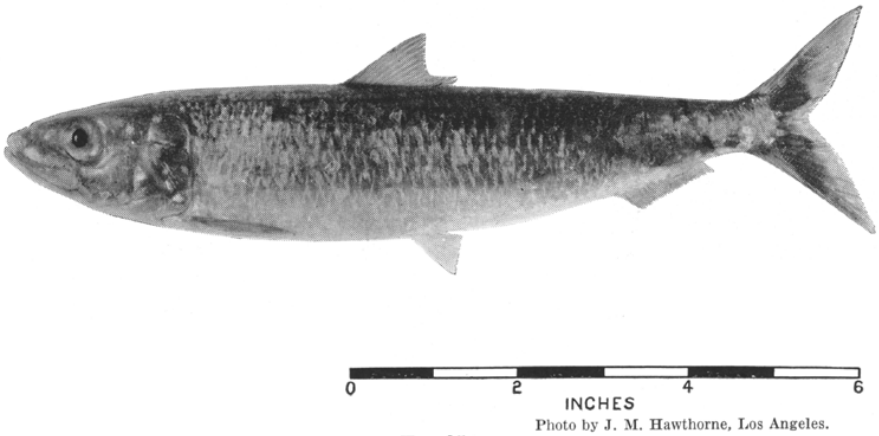


Photo by J. M. Hawthorne, Los Angeles.

FIG. 25.

FIG. 25

CALIFORNIA SARDINE

Sardina cœrulea[3]

Relationship: A true sardine, belonging to the herring family (Clupeidae), in which are also classed the herring and the shad.

Distinguishing Characters: The single, short dorsal fin near the middle of the back; the absence of scales on the head; the absence of a lateral line; the mouth opening at the tip of the head, neither jaw projecting; the gill cover having low raised ridges running obliquely downward; the breast and belly not being drawn to a sharp, saw-toothed edge, although the scales on the breast and belly have spines which can be felt when the finger is moved toward the head. **Color:** Dark green above with many small dark spots, shading into bright silvery on the sides and below; the green color having opalescent reflections, the silvery part iridescent; a series of round black spots of varying degrees of distinctness often extends backward under the scales. Attains a length of about 14 inches.

Distribution: From British Columbia southward into the Gulf of California, with largest California landings being made at Monterey, Los Angeles, San Francisco and San Diego. Occurs in schools or "shoals."

Fishing Season: Caught throughout the year with certain legal restrictions for different districts, with maximum landings in the fall and winter months.

Importance: The largest fishery in the State. Mostly canned; rather small amounts appear in the fresh fish markets and some are smoked, salted and pickled. Extensively used as bait, the young for live bait fishing.

Fishing Gear: Purse seines, and lampara or round haul nets.

[3] Hubbs (Calif. Acad. Sci. Proc., vol. 18, no. 11, p. 261–265, 1929) has indicated a new genus (Sardinops) for this fish, but for the purposes of this bulletin, the older, more familiar form is used.

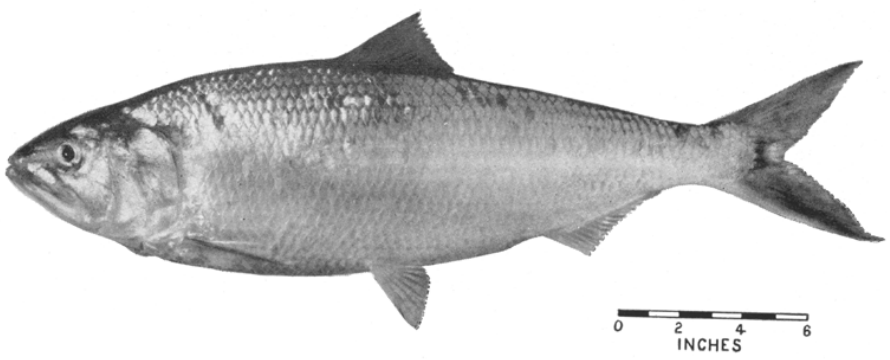


Photo by Gabriel Moulin, San Francisco.

FIG. 26.

FIG. 26

SHAD

Alosa sapidissima.

Relationship: Belongs to the herring family (Clupeidae) in which are also classed the sardine and the herring. Introduced into California waters in 1871 from the Atlantic coast.

Distinguishing Characters: The single, short dorsal fin near the middle of the back; the absence of scales on the head; the absence of a lateral line; the deep body, which is drawn to a sharp saw-toothed edge on the breast and belly; the head length being much less than the body depth. **Color:** Deep bluish above, becoming silvery on the sides and below; an irregular number of dark spots extends along the back under the scales. Attains a length of about 30 inches.

Distribution: British Columbia south to San Diego, the largest California landings being made at Contra Costa County. Not common south of San Francisco. Usually taken in streams, which it ascends to spawn.

Fishing Season: Caught mostly during the spring, with scattered catches during the other months.

Importance: The sixth largest fishery in northern California in 1928. Essentially a market fish, relatively small amounts being canned, cured and smoked. The roe is a delicacy which is sold in the markets as well as canned.

Fishing Gear: Gill nets.

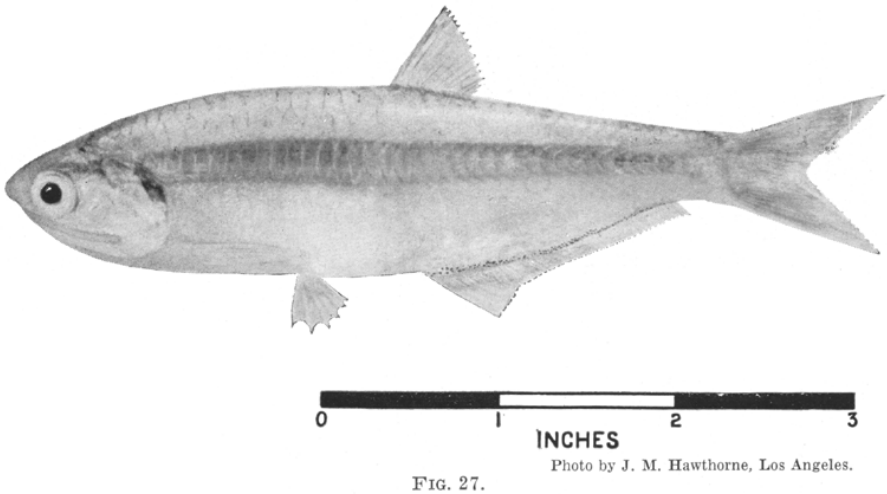


Photo by J. M. Hawthorne, Los Angeles.

FIG. 27.

FIG. 27

DEEP-BODIED ANCHOVY

Anchoviella compressa.

Relationship: Belongs to the anchovy family (Engraulidae), in which are also classed 2 other species which occur in California, the southern and the northern anchovies.

Distinguishing Characters: The short, single dorsal fin; the extremely large mouth, the maxillary bone extending backward far behind the eye almost to the edge of the opercle; the deep, thin body; the length of the base of the anal fin being much greater than the head length. **Color:** Pale translucent green, a bright horizontal silvery band extending the length of the body and shading downward on the lower part of the side. Attains a length of about 5 inches.

Distribution: Point Conception to Lower California, abundant about San Diego.

Fishing Season: Not caught in sufficient amounts to have a definite "season."

Importance: Used probably entirely as bait in live-bait fishing. Rarely appears in the markets.

Fishing Gear: Round haul nets.

Unauthorized name: Sprat.

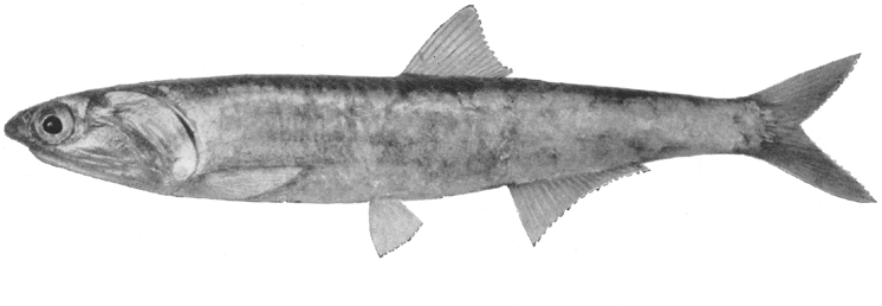


Photo by J. M. Hawthorne, Los Angeles.

FIG. 28.

FIG. 28

NORTHERN ANCHOVY

Engraulis mordax.

Relationship: Belongs to the anchovy family (Engraulidae), in which are also classed 2 other species which occur in California, the southern and deep-bodied anchovies. There are 2 subspecies of this fish, Engraulis mordax nanus and Engraulis mordax mordax. The former occurs only in San Francisco Bay, the latter along the entire coast as described below.

Distinguishing Characters: The short, single dorsal fin; the extremely large mouth, the maxillary extending backward far behind the eye, almost to the edge of the gill cover; the head length being greater than the depth of the body; the anal fin being shorter than the head. **Color:** Opalescent above with bluish and greenish reflections; silvery on the sides and below. Attains a length of about 7 inches.

Distribution: Vancouver Island southward to Cerros Island on the coast of Lower California. Occurs in schools. Caught commercially in California from San Francisco southward.

Fishing Season: Caught irregularly throughout the year with most landings during the summer months.

Importance: The most valuable of our anchovies, yet commercially not taken in large quantities. Used mostly as bait, either alive or salted. Small amounts are kippered and salted. Used extensively as bait on the pleasure fishing boats.

Fishing Gear: Round haul nets.

Unauthorized name: California anchovy.

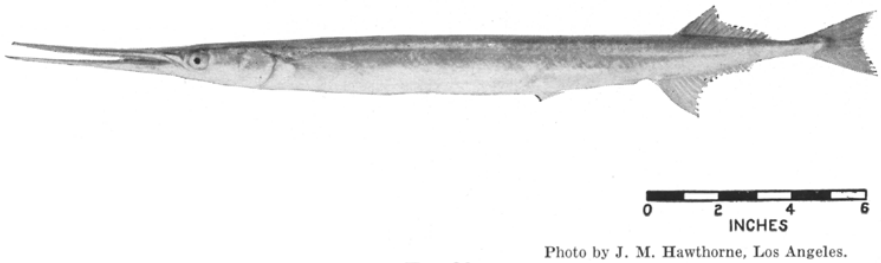


Photo by J. M. Hawthorne, Los Angeles.

FIG. 29.

FIG. 29

CALIFORNIA NEEDLEFISH

Strongylura exilis.

Relationship: Is the only representative of the needlefish family (Belonidae) which occurs on the coast of California.

Distinguishing Characters: The single dorsal fin; both jaws being exceedingly prolonged into a long snipe-like bill. **Color:** Green above; silvery below; a bluish band extending horizontally along the side of the body. Attains a length of about 3 feet.

Distribution: Point Conception southward to Cerros Island on the coast of Lower California.

Fishing Season: Taken occasionally and irregularly throughout the year.

Importance: Taken only in small quantities both commercially and by pleasure fishermen.

Fishing Gear: Taken incidentally with round haul nets.

Unauthorized names: Garfish, billfish.

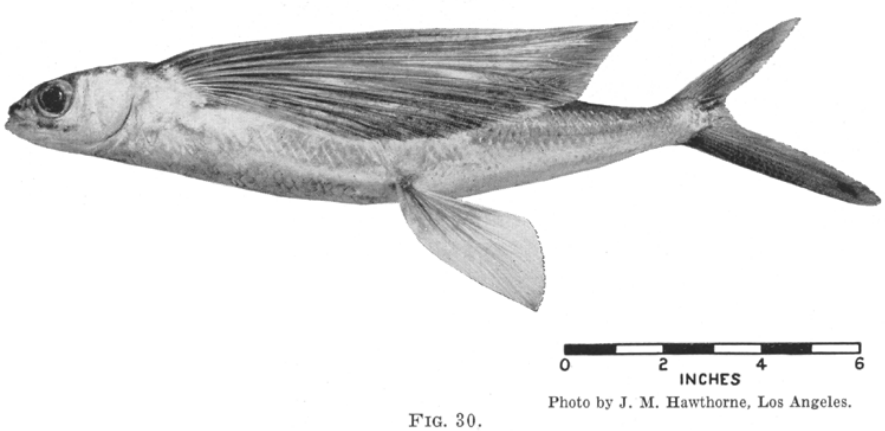


Photo by J. M. Hawthorne, Los Angeles.

FIG. 30.

FIG. 30

CALIFORNIA FLYING FISH

Cypselurus californicus.

Relationship: Belongs to the flying fish family (Exocoetidae), of which this is the only California representative.

Distinguishing Characters: The single dorsal fin; the pectoral fins being enlarged to form organs of flight. **Color:** Deep blue on the back and sides; belly abruptly silvery; pectoral fins blackish. Attains a length of about 18 inches.

Distribution: From Point Conception southward to Cape San Lucas. Occurs in schools.

Fishing Season: Taken occasionally during the summer months. Not caught in sufficient numbers to have a definite and consistent season.

Importance: Taken in rather small quantities for the fresh fish markets. Sportsmen use these fish held aloft by a kite as bait for tunas. Intangible perhaps, nevertheless significant, is the attraction which the sight of these fish holds for tourists.

Fishing Gear: Taken by gill nets and round haul nets.

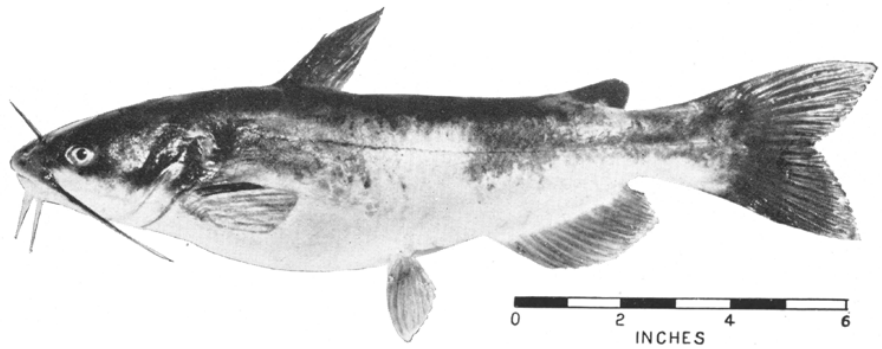


Photo by Lauck, San Francisco.

FIG. 31.

FIG. 31

FORK-TAIL CATFISH

Ameiurus catus.

Relationship: Belongs to the catfish family (Ameiuridae), in which is also classed the square-tail catfish. Introduced into California in 1874.

Distinguishing Characters: The smooth skin; the absence of scales; the two dorsal fins, the first of one spine and soft rays, the second being adipose (small, fleshy, without supporting spines or rays); the pectoral fin having a stout spine; the several barbels about the mouth and nostrils; the tail being deeply forked as contrasted to one cut straight across or only slightly rounded inwardly or outwardly. **Color:** Pale olive bluish, silvery below, sometimes clouded or mottled with darker shades. Attains a length of over 18 inches.

Distribution: Sacramento and San Joaquin rivers and certain lakes in central and northern California where these fish have been planted. Descends into brackish water during the high water of the winter and spring.

Fishing Season: Taken during the fall, winter and spring months with certain legal restrictions. See fish and game laws for exact season.

Importance: Commercially of rather minor significance in point of poundage, although these fish command a high price. Probably the most abundant of the catfish in this State. Highly prized by pleasure fishermen.

Fishing Gear: Caught commercially with set lines in Clear Lake and fyke nets in other districts with certain legal restrictions. Pleasure fishermen use hook and line with any kind of bait (with certain legal restrictions).

Unauthorized names: Channel catfish, horned pout, white catfish, common catfish, Potomac catfish.

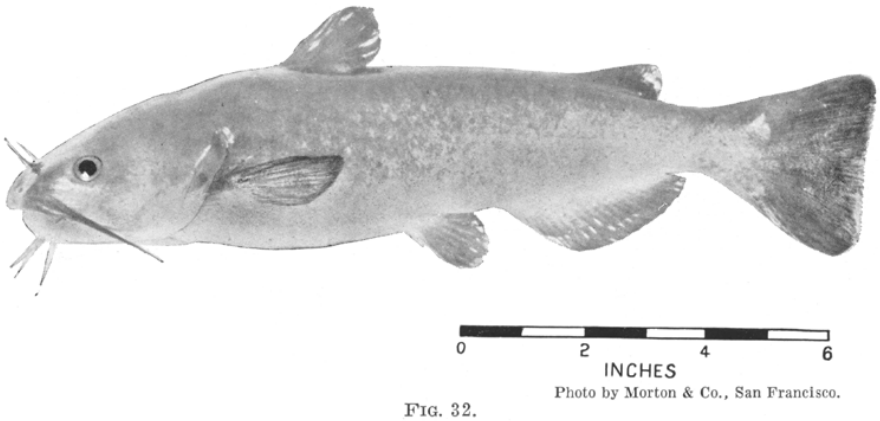


Photo by Morton & Co., San Francisco.

FIG. 32.

FIG. 32

SQUARE-TAIL CATFISH

Ameiurus nebulosus.

Relationship: Belongs to the catfish family (Ameiuridae), in which is also classed the fork-tail catfish. Introduced into California in 1874.

Distinguishing Characters: The smooth skin; the absence of scales; the two dorsal fins, the first being composed of one spine and several soft rays, the second being adipose (small and fleshy without supporting rays or spine); the pectoral fin having a stout spine; the several barbels about the mouth and nostrils; the tail being cut straight across or only slightly rounded inwardly or rounded outwardly, as contrasted to one forked or deeply rounded inwardly. **Color:** Blackish or dark brown, tinged with yellowish and shading into a paler shade below. Attains a length of about 15 inches.

Distribution: Sacramento and San Joaquin rivers, and certain lakes in central and northern California where these fish have been planted. Descends into brackish water during the high water of the winter and spring.

Fishing Season: Taken during the fall, winter and spring months with certain legal restrictions. See fish and game laws for exact season.

Importance: Commercially of rather minor significance in point of weight, although these fish command a high price. Probably less abundant than the forktail catfish. Highly prized by pleasure fishermen.

Fishing Gear: Caught commercially with set lines in Clear Lake and with fyke nets in other districts with certain legal restrictions. Pleasure fishermen use hook and line with any kind of bait (with certain legal restrictions).

Unauthorized names: Bullhead, horned pout, small catfish, black catfish, Sacramento catfish, yellow catfish.

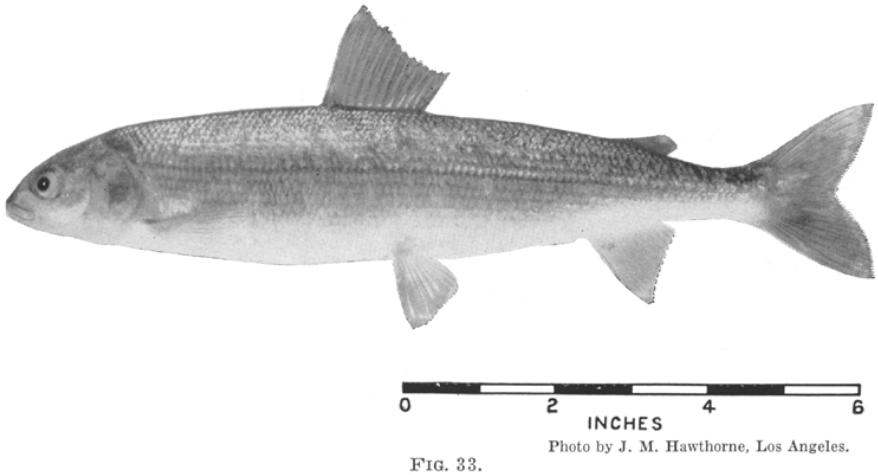


Photo by J. M. Hawthorne, Los Angeles.

FIG. 33.

FIG. 33

ROCKY MOUNTAIN WHITEFISH

Prosopium williamsoni.

Relationship: Belongs to the salmon family (Salmonidae), in which are classed the salmon, trouts and ciscoes. The only species of true whitefish found in California. The ocean whitefish (*see* page 131) is a marine fish and belongs to a different family.

Distinguishing Characters: The 2 separate dorsal fins, the first being composed of soft rays, the second being adipose; the presence of a scaly appendage above the base of the ventral fin; the maxillary not reaching beyond the front margin of the eye; the usual absence of teeth (very minute when present); the large scales, there being from 83 to 90 in a horizontal row along the lateral line; the upper jaw projecting slightly beyond the lower. **Color:** Greenish above, becoming silvery on the sides and below; dorsal fins edged with black. Attains a weight of about 4 pounds.

Distribution: Clear, cold lakes and rivers of the east slope of the Sierra Nevada, and west slope of the Rocky Mountains; from the Fraser and Columbia rivers to the Truckee, and other streams of the Lahontan Basin of Nevada.

Fishing Season: In general, from May to October, with certain legal restrictions by districts.

Importance: Prohibited to commercial fishermen, being reserved entirely to sportsmen. One of the less abundant of the mountain game fish.

Fishing Gear: Hook and line with flies or ordinary bait.

Unauthorized names: Mountain herring, grayling.

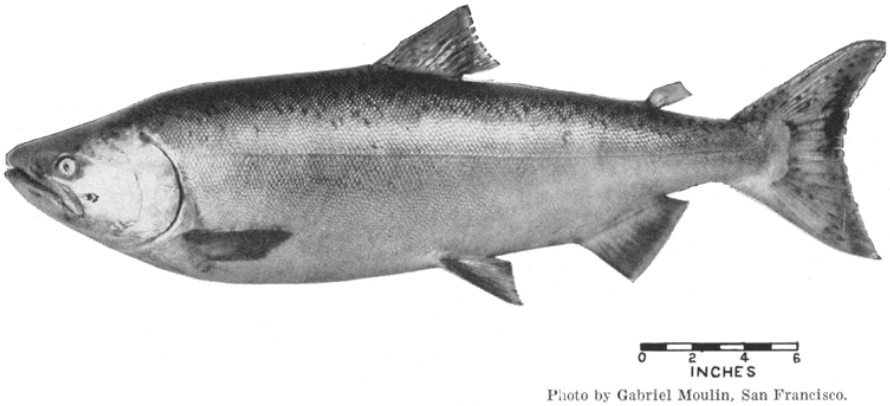


Photo by Gabriel Moulin, San Francisco.

FIG. 34.

FIG. 34

KING SALMON

Oncorhynchus tschawytscha.

Relationship: Belongs to the salmon family (Salmonidae), in which are also classed the trout, as well as other species of salmon, 3 of which occur in California—the silver, the pink and the chum salmons.

Distinguishing Characters: The 2 dorsal fins, the first being composed chiefly of soft rays, the second being adipose; the maxillary extending to behind the eye; the presence of a scaly appendage above the base of the ventral fin; the usual presence of round black spots on the back, dorsal fin and tail; there being from 140 to 155 pyloric cæca (finger-like appendages attached to the hind part of the stomach near the junction with the small intestine); the anal fin having from 14 to 17 rays, as compared with from 9 to 12 rays in the trout. **Color:** Dark gray tinged with bluish above, becoming silvery on the sides and below; back and fins with spots as described above; flesh red in the spring, becoming paler in the fall as the spawning season approaches. At that time the body becomes deeper and one or both jaws of the male becomes prolonged and hooked. Attains a weight of about 75 pounds in California.

Distribution: Southern California north to Alaska, and south to northern Japan on the Asiatic side. Not common south of Monterey. Ascends all large streams to spawn, especially the Sacramento, Eel, Klamath and Smith rivers.

Fishing Season: Caught during all the months of the year with certain legal restrictions by districts.

Importance: The third largest fishery in northern California in 1928. At present less than half the catch is salted, smoked, cured, and canned, but in years past the bulk of the catch was mild-cured and canned. Mostly sold in the fresh fish markets. Forms the largest part of the salmon catch. Regarded by sportsmen as a very desirable species. A few years ago this was the leading fishery of California.

Fishing Gear: Troll lines in the ocean; gill nets and beach seines in the rivers, with certain legal restrictions. Caught by sportsmen in the ocean by trolling with small fish or spoons as bait; in streams by trolling, or with hook and line with spinners.

Unauthorized Names: Sacramento River salmon, chinook salmon, quinnat salmon, Columbia River salmon, spring salmon.

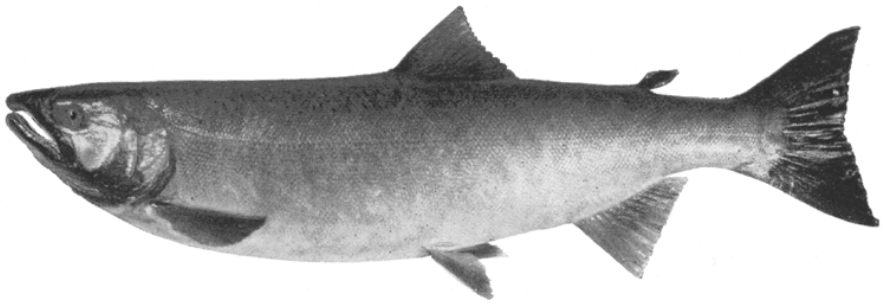


Photo by Lauck, San Francisco.

FIG. 35.

FIG. 35

SILVER SALMON

Oncorhynchus kisutch.

Relationship: Belongs to the salmon family (Salmonidae), in which are also classed the trout, as well as other species of salmon, 3 of which occur in California—the king, the pink and the chum salmons.

Distinguishing Characters: The 2 dorsal fins, the first being composed chiefly of soft rays, the second being adipose; the maxillary extending to at least the hind border of the eye; the presence of a scaly appendage above the base of the ventral fin; the back and dorsal fins sometimes with obscure spots; the almost complete absence of spots on the tail and head; there being only between 45 and 80 pyloric cæca (finger-like appendages extending from the hind part of the stomach near the junction with the small intestine), and these larger than in the king salmon; the anal fin having from 14 to 17 rays as compared with 9 to 12 rays in the trout. **Color:** Bluish green above, shading into silvery on the sides and undersurface; the males red during the spawning season; other sexual changes as in king salmon (*see* page 56). Attains a weight of about 15 pounds and a length of about 30 inches.

Distribution: Monterey Bay to Alaska, and southward on the Asiatic side to Japan. Ascends rivers and creeks from the ocean to spawn.

Fishing Season: September to December, with certain legal restrictions by districts.

Importance: At present forms a smaller proportion of the salmon catch than does the king salmon. The salmon fishery is the third largest in northern California.

Fishing Gear: Troll lines in the ocean; gill nets and beach seines in the rivers, with certain legal restrictions. Caught in sport fishing by trolling with small fish or spoons as bait; taken in streams by trolling or with hook and line, using spinners.

Unauthorized names: Silversides, coho salmon.

TROUT

Relationship: Belongs to the salmon family (Salmonidae), in which are classed the salmon, the ciscoes and the Rocky Mountain whitefish. There are over 20 species of trout of the genus Salmo in western America, and these are difficult to distinguish. A few of the commoner ones, representative of the principal groups of trout, are presented in the following pages. The eastern brook trout, an introduced species, and the Dolly Varden, a native species, belong to a different genus, Salvelinus.

Distinguishing Characters: The 2 separate dorsal fins, the first being composed of soft rays, the second being adipose; the presence of a scaly appendage above the base of each ventral fin; the strong teeth in the jaws and on the tongue; the short anal fin, having from 9 to 12 developed rays.

Distribution: Streams and lakes of western America, especially the clear streams of the foothills or mountains. The eastern brook trout and the brown trout are introduced species, the former from eastern United States, the latter from Europe. Many individuals of the native species descend to the ocean where they spend part of their lives, returning to their streams to spawn.

Fishing Season: In general, from May to October, with certain legal restrictions by districts. Caught at the mouths of many coastal streams during the winter, with certain legal restrictions.

Importance: Prohibited to commercial fishermen, being reserved to sportsmen. Private individuals or companies under legal restrictions may operate trout farms and sell the fish, or the right to catch them. The Dolly Varden trout is imported occasionally from Alaska, steelhead from other regions. These farms and importations are the source of supply to hotels and restaurants. The most highly prized fresh water sport fish in the west.

Fishing Gear: Hook and line.

The author wishes to express thanks to Messrs. Richard S. Croker and D. H. Fry, Jr., for their assistance in collecting the specimens of trout for photography and for suggestions in writing this section.

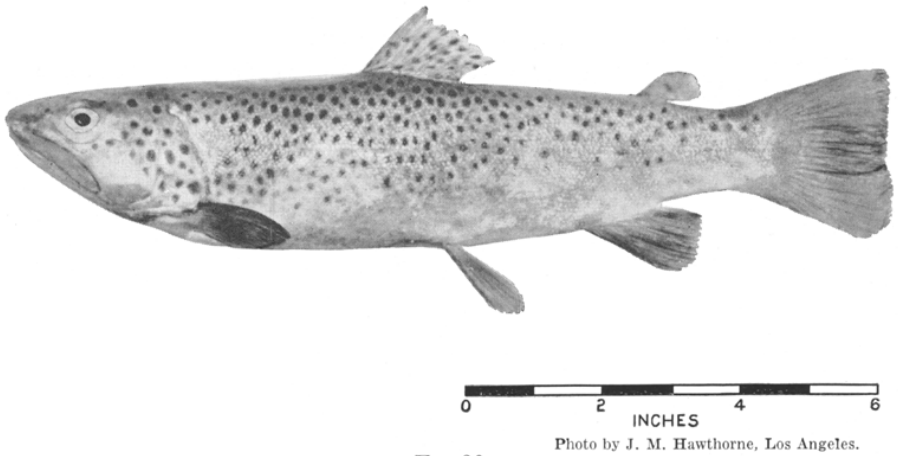


Photo by J. M. Hawthorne, Los Angeles.

FIG. 36.

FIG. 36

BROWN TROUT

Salmo trutta.

Relationship: *See* page 58. A native of Europe.

Distinguishing Characters: *See* page 58. The scales being rather large and easily visible to the naked eye (as contrasted with the eastern brook trout); there being from 118 to 140 scales extending in a horizontal row along the lateral line; the adipose fin being large, its width more than one-half its length; the presence along the side of the body of several orange or reddish spots surrounded by larger, pale areas. **Color:** Brown on the back and sides, becoming pale brown or white on the belly; back and dorsal fins with dark spots, the sides with reddish or orange spots as above described; large variations in the color are often due to crossing with the Loch Leven trout (Salmo trutta levenensis). Attains a weight of 8 pounds or more.

Distribution: Streams and lakes throughout the State wherever it has been planted.

Fishing Season: *See* page 58.

Importance: One of the most abundant trout in the State. Opinions among sportsmen differ widely as to its desirability.

Fishing Gear: *See* page 58.

Unauthorized names: Von Behr trout, European brown trout, German brown trout.

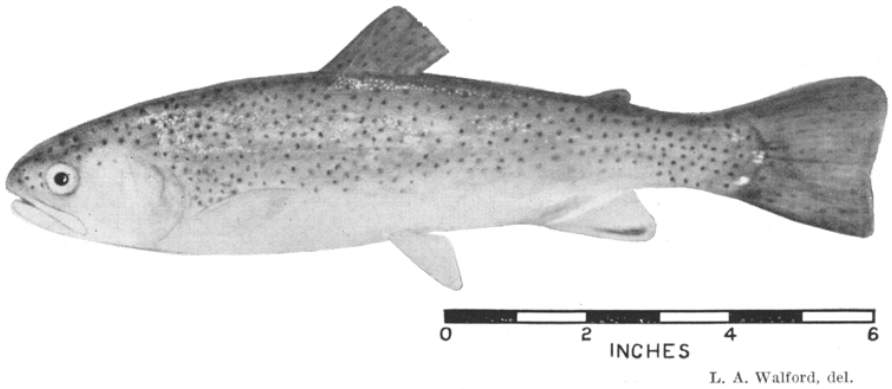


FIG. 37.

FIG. 37

CUT-THROAT TROUT

Salmo clarkii.

Relationship: *See* page 58. Is typical of the "cut-throat series" of trout, in which is also grouped the black-spotted trout of Lake Tahoe.

Distinguishing Characters: The rather small scales, there being from 160 to 170 in a horizontal row extending the length of the body; the presence of a narrow band of small teeth on the bone at the base of the tongue; the presence of rather large, irregular and profusely scattered black spots on the back, upper part of the sides, on the dorsal, adipose and tail fins, and often on the head; the presence of a deep red blotch on the throat. **Color:** Variable; entirely metallic; dark steel blue, gray or olivaceous above and on the sides, becoming silvery white below; middle of side usually with a diffuse pale rosy wash, which extends on to the side of the head; spots as above described. Attains a weight of over 20 pounds, the size being limited largely by the habitat.

Distribution: Coastwise streams and lakes from Mad River north to British Columbia and possibly into southeastern Alaska.

Fishing Season: *See* page 58.

Importance: Not widespread in California, but very abundant in streams which they do inhabit.

Fishing Gear: *See* page 58.

Unauthorized names: Black-spotted trout, Columbia River trout.

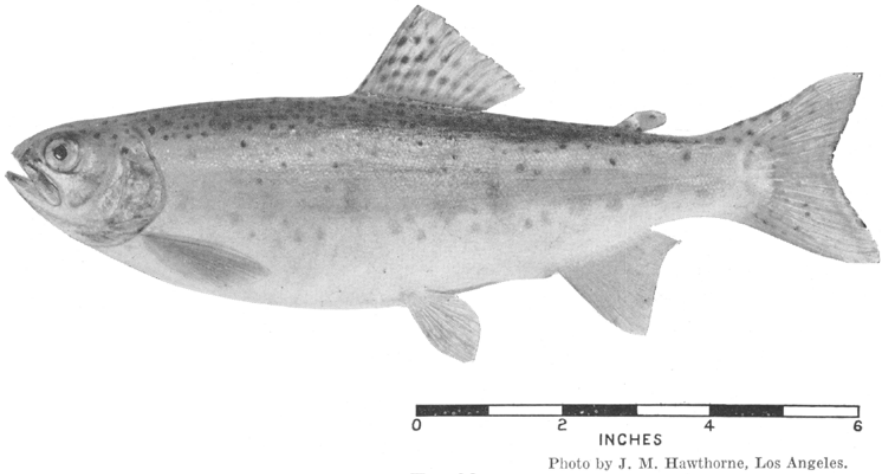


Photo by J. M. Hawthorne, Los Angeles.

FIG. 38.

FIG. 38

RAINBOW TROUT

Salmo irideus.

Relationship: *See* page 58. Very closely related to the McCloud River rainbow trout (Salmo shasta), from which it is extremely difficult to distinguish this species. A phase of the California steelhead trout. *See* page 62.

Distinguishing Characters: The back and dorsal fins being covered with many dark spots; the sides having a horizontal pink band extending the length of the body; the anal fin usually tipped with white on the fore corner. **Color:** Grayish green above, becoming silvery on the lower part of the sides and below; the back and sides speckled and striped as above described; the color varies extremely as the amount of light that reaches the water. Attains a weight of about 12 to 15 pounds in large lakes, although in small streams it may not exceed 10 inches in length and a weight of a few ounces.

Distribution: Mountain, coastal and foothill streams and lakes throughout the State, wherever it is native or has been planted by the Division of Fish and Game of California.

Fishing Season: *See* page 58.

Importance: This species along with the McCloud River rainbow trout is probably the most abundant and widespread trout in the State, being the species most commonly propagated and sold by commercial trout farms. Relatively large numbers are imported from trout farms in Utah, Colorado, Idaho and Oregon, for local consumption.

Fishing Gear: *See* page 58.

Unauthorized name: Specled trout.

Photo by D. H. Fry, Jr.

FIG. 39.

FIG. 39

STEELHEAD TROUT

Salmo irideus.

Relationship: *See* page 58. A phase of the rainbow trout (*which see*), in which, by reason of its running to sea, it has changed its form and color. Sea-run individuals of the cut-throat trout (Salmo clarkii) are also called by this name.

Distinguishing Characters: *See* page 58. Rainbow steelhead is characterized by the body being more slender than in the typical rainbow trout (*see* page 61); the color being much more silvery; there being fewer spots on the back and sides. **Color:** Steel blue above with highly burnished, silvery sides; head and body usually with small black spots; dorsal, adipose and caudal fins with spots; remaining fins immaculate. Attains a weight of about 30 pounds. The cut-throat steelhead (Salmo clarkii) closely resembles the rainbow steelhead (S. irideus), and differs chiefly in the number of scales (160 to 200 in a horizontal row along the lateral line as compared with 110 to 145).

Distribution: Coastal streams of California, from Ventura County northward.

Fishing Season: In the Klamath River, the run starts in the late summer and in the fall; in the Eel River later in the fall and in the winter; in the central streams during the winter; late winter in southern California. Certain legal restrictions limit the season by districts.

Importance: Very highly prized by anglers. Taken commercially in other States shipped into California under strict regulations, and sold.

Fishing Gear: *See* page 58.

Unauthorized name: Salmon trout.

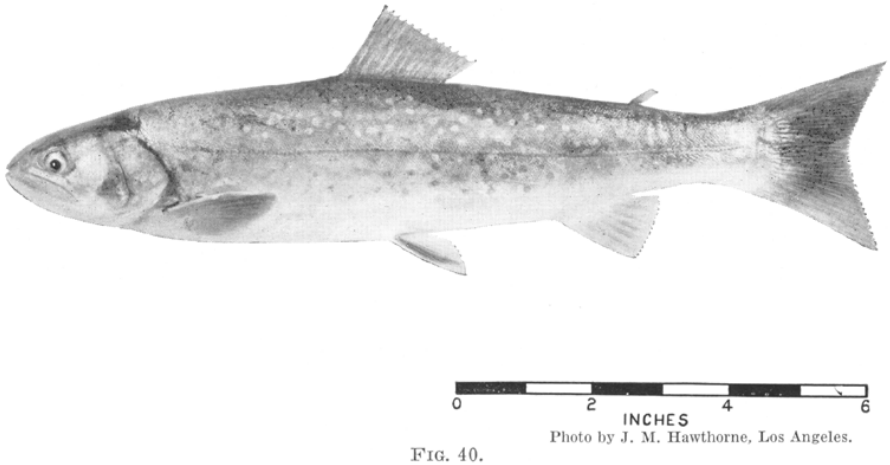


Photo by J. M. Hawthorne, Los Angeles.

FIG. 40.

FIG. 40

DOLLY VARDEN TROUT

Salvelinus malma.

Relationship: *See* page 58. More closely related to the eastern brook trout than to the other trout described in this book. The only species of this genus native to California.

Distinguishing Characters: *See* page 58. The presence on the sides of red spots almost as large as the pupil of the eye and of smaller and paler spots on the back. **Color:** Silvery gray above, without the marbling which characterizes the eastern brook trout; spots as above described; lower fins orange or reddish, with a white stripe in front, followed usually by a dark one. Attains a weight of about 12 pounds, although in California it probably does not get so large.

Distribution: Northern California in the McCloud River northward to the Aleutian Islands and eastward to Montana and Idaho. Sometimes, though not always, descends to the sea, and is often taken in salt and brackish water.

Fishing Season: *See* page 58.

Importance: Not abundant in California. Occasionally imported from Alaska (where it is considered more or less a pest), and sold in the markets here.

Fishing Gear: *See* page 58. Taken in Alaska with gill nets.

Unauthorized name: Charr.

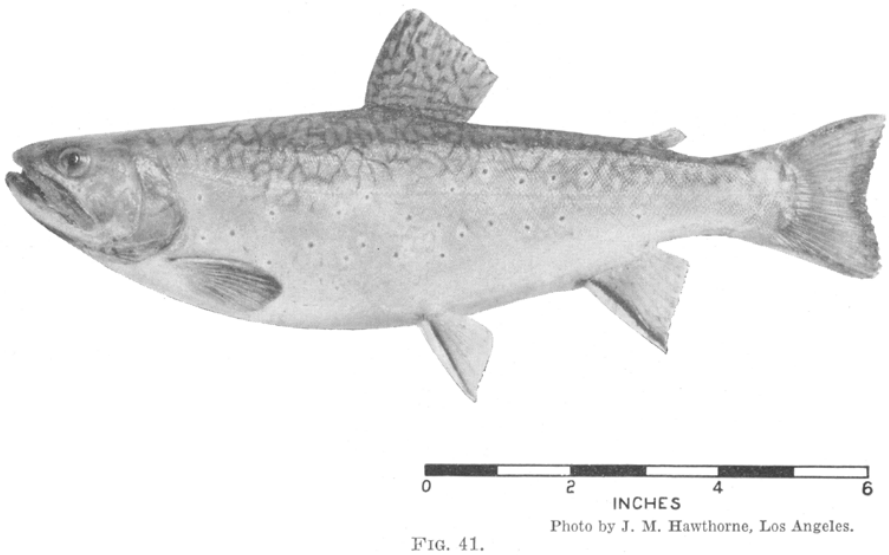


Photo by J. M. Hawthorne, Los Angeles.

FIG. 41.

FIG. 41

EASTERN BROOK TROUT

Salvelinus fontinalis.

Relationship: *See* page 58. More closely related to the Dolly Varden trout than to the other species of trout described in this book.

Distinguishing Characters: *See* page 58. The red spots along the side of the body; the front edge of the lower fins being white, followed by a black bar; the back and upper part of the sides being marbled; the scales being small, almost imperceptible. **Color:** Grayish olive of various shades, shading into white on the lower part of the sides and below; the back and sides marked as above described. Attains a weight of about 5 pounds.

Distribution: Mountain streams and small lakes throughout the State wherever it has been planted by the Division of Fish and Game of California.

Fishing Season: *See* page 58.

Importance: One of the most popular trout in the State.

Fishing Gear: *See* page 58.

Unauthorized names: Charr, speckled trout, brook trout.

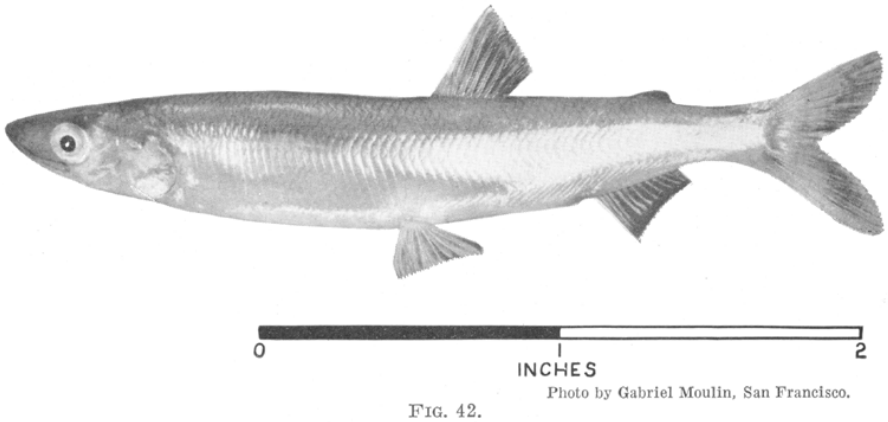


Photo by Gabriel Moulin, San Francisco.

FIG. 42.

FIG. 42

WHITEBAIT[5]

Allosmerus attenuatus.

Relationship: Belongs to the true smelt family (Osmeridae), in which are classed several related species found on our coast, among them the surf smelt (*which see*).

Distinguishing Characters: The 2 dorsal fins, the first being composed of soft rays, the second being adipose and very small; the absence of scales on the head; the absence of a scaly appendage above the base of the ventral fin; the ventral fins being attached distinctly in advance of the front of the first dorsal fin; the anal fin having from 15 to 19 rays; the presence of small canine teeth on the roof of the mouth. **Color:** Pale greenish, almost colorless; a bright horizontal silvery band extending along the side. Attains a length of about 9 inches.

Distribution: San Francisco to at least as far north as central Oregon, with larger California landings in Humboldt and Del Norte counties.

Fishing Season: Caught all year round with larger landings during the summer.

Importance: of slight significance commercially. Sold entirely in the fresh fish markets. Used extensively in restaurants and sold as "small fry" on menu cards. Used as bait both by commercial and by amateur fishermen.

Unauthorized names: Smelt, surf smelt, frittura, small fry, perlin.

[5] Other species of small fish are also sold under this name, but this species forms the greater part of the *whitebait* category.

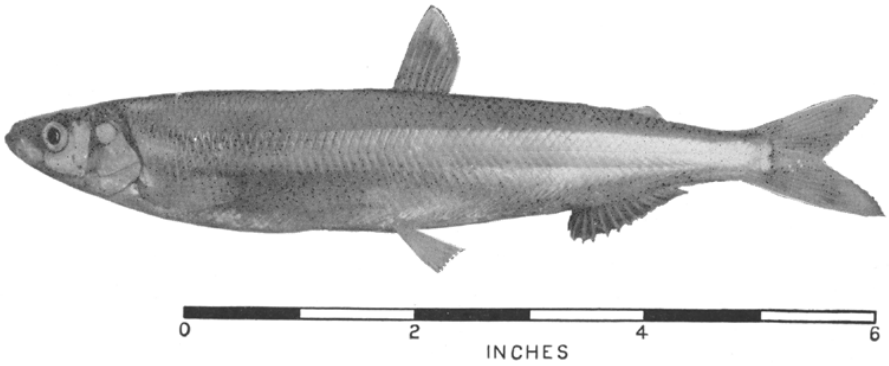


Photo by Gabriel Moulin, San Francisco.

FIG. 43.

FIG. 43

SURF SMELT

Hypomesus pretiosus.

Relationship: Belongs to the smelt family (Osmeridae), in which occur the true smelts found on our coast and the whitebait. There are several members of this family, but this species and the whitebait are probably the most abundant California members.

Distinguishing Characters: The 2 dorsal fins, the first being composed of soft rays, the second being adipose; the absence of a scaly appendage above the base of the ventral fin; the minute teeth on the tongue, vomer and jaws; there being from 66 to 76 scales in a horizontal row along the lateral line; the ventral fins being attached behind the front of the first dorsal fin. **Color:** Pale greenish, becoming silvery on the sides and below. Attains a length of about 10 inches.

Distribution: Central California northward to southern Alaska.

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

Importance: of minor significance commercially. Used as bait both by commercial and by amateur fishermen. Sold entirely in the fresh fish markets.

Fishing Gear: Round haul nets, beach seines. Caught in the surf by pleasure fishermen with dip nets.

Unauthorized names: Surf fish, nightfish, perlin. The young are sold in the markets mixed with other small fish, mostly with Allosmerus attenuatus, **as white-bait.**

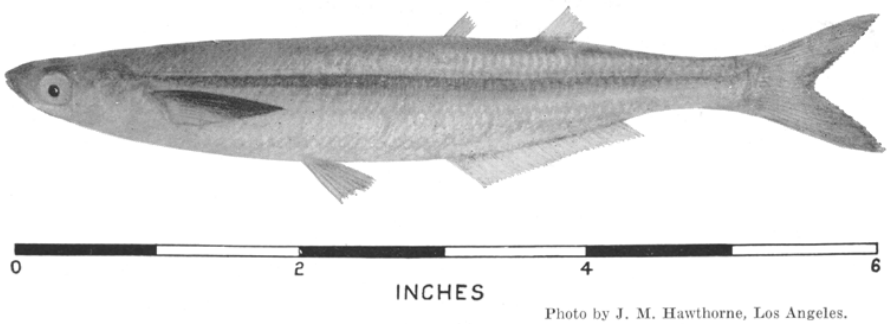


Photo by J. M. Hawthorne, Los Angeles.

FIG. 44.

FIG. 44

GRUNION

Leuresthes tenuis.

Relationship: Belongs to the silverside family (Atherinidae), in which are also classed the jack smelt and the bay smelt.

Distinguishing Characters: The 2 separate dorsal fins, the first composed of weak spines, the second of soft rays; the single spine on the front of the anal fin; the slender body; the absence of teeth in the mouth; the capability of the front of the upper jaw (premaxillary) of being drawn out for a considerable distance to form a tube; the front of the first dorsal fin being back of the vent. **Color:** Grayish green above, silvery below; a bright silvery band tinged with blue and bordered above with violet extends the length of the body. Attains a length of about 7 inches.

Distribution: From San Francisco to Ballenas Bay on the coast of Lower California, but not common north of Point Conception. Comes on the beaches to spawn during the high tides of the periods of the full and dark of the moon between March and August.

Fishing Season: Caught occasionally by commercial fishermen during the fall and winter months. Consult fish and game laws for legal season.

Importance: Commercially a fish of very minor importance. of interest to amateur fishermen because of its remarkable spawning habits.

Fishing Gear: Round haul nets. Amateur fishermen pick these fish off the beaches by hand during the spawning action.

Unauthorized names: Smelt, little smelt, least smelt.

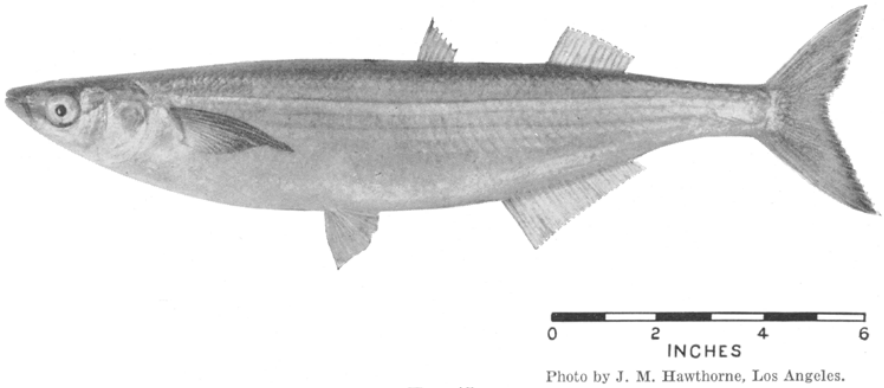


Photo by J. M. Hawthorne, Los Angeles.

FIG. 45.

FIG. 45

JACK SMELT

Atherinopsis californiensis.

Relationship: Not a true smelt, but belongs to the silverside family (Atherinidae), in which are also classed the bay smelt and the grunion. For a description of a true smelt, *see* surf smelt.

Distinguishing Characters: The 2 separate, small dorsal fins, the first of weak spines, the second of soft rays; the single spine on the front of the anal fin; the small teeth being without points and set in bands; the front of the spiny dorsal fin being in front of the vent; the two jaws being even. **Color:** Grayish green above, with a bluish tinge; the sides and belly silvery; a metallic band tinged with blue and edged above with bright blue extends the length of the body. Attains a length of about 16 inches.

Distribution: From Puget Sound to Cerros Island on the coast of Lower California; not common north of California. Largest amounts delivered to Los Angeles. Occurs in schools. Caught usually within 3 miles of the shore.

Fishing Season: Caught all year round with no definite period of largest landings.

Importance: Forms the greater part of the catch of smelt, which was in 1928 ninth in importance in the fresh fish markets of southern California. Sold entirely in the fresh fish markets.

Fishing Gear: Round haul nets, beach seines, gill nets, circle gill nets. Amateur fishermen on the pleasure piers and boats catch the jack smelt by hook and line fishing, and also by snagging them on fish hooks after throwing in chum and jerking the line through the water.

Unauthorized names: Smelt, silverside, California smelt, horse smelt, blue smelt.

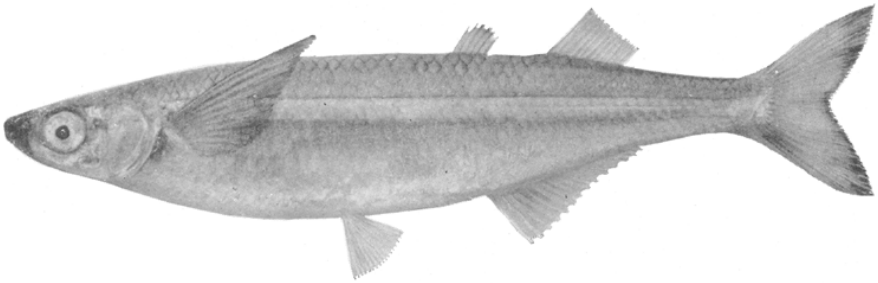


Photo by J. M. Hawthorne, Los Angeles.

FIG. 46.

FIG. 46

BAY SMELT

Atherinops affinis.

Relationship: Belongs to the silverside family (Atherinidae), in which are also classed the jack smelt and grunion.

Distinguishing Characters: The 2 separate, small dorsal fins, the first of spines, the second of soft rays; the single spine at the front of the anal fin; the forked teeth in a single series; the front of the first dorsal fin being usually behind the vent; the tip of the upper jaw projecting very slightly over the tip of the lower. **Color:** Bluish gray above, bright silvery below; a narrow brighter silvery band edged above with bright blue or purple extending the length of the body. Attains a length of about 12 inches.

Distribution: From northern Oregon southward to about Magdalena Bay on the coast of Lower California. Occurs in schools, often along with the jack smelt. Caught usually rather close to the shore.

Fishing Season: Taken all year round with no definite period of maximum catch.

Importance: Commercially a fish of slight significance.

Fishing Gear: Caught commercially with round haul nets, beach seines, gill nets, circle gill nets. Pleasure fishermen on the pleasure piers snag these fish by jerking the line through the water after throwing chum in to attract them. Taken also with hook and line.

Unauthorized names: Panzarotto, least smelt, little smelt, smelt, rainbow smelt.

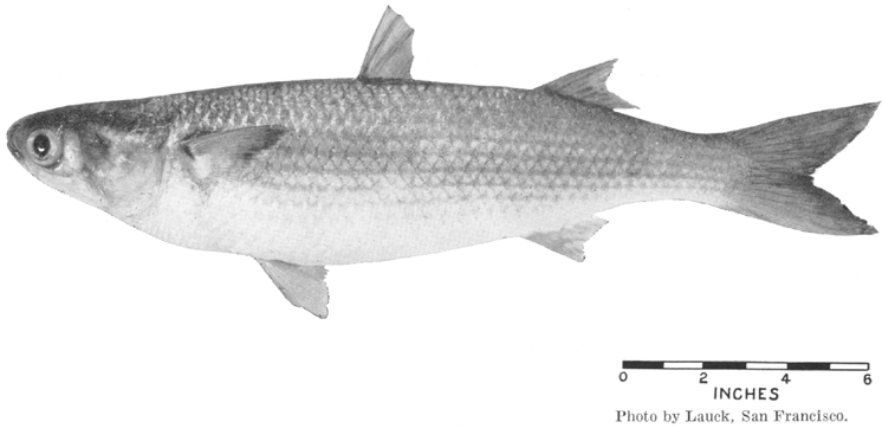


Photo by Lauck, San Francisco.

FIG. 47.

FIG. 47

MULLET

Mugil cephalus.

Relationship: Is the only member of the mullet family (Mugilidae) which occurs in this State, the nearest close relatives being found in Lower California and southward.

Distinguishing Characters: The 2 separate dorsal fins, the first of usually 4 spines, the second of soft rays; the teeth being very small or absent; the absence of a lateral line; the very broad, slightly convex space between the eyes being almost one-half the length of the head; the large scales. **Color:** Deep grayish olive on the back shading into silvery on the sides and below, a dark horizontal stripe extending along each row of scales above and on the sides. Attains a length of about 2 feet.

Distribution: Monterey to Chile on our coast, and in warm seas throughout the world. Not abundant north of Los Angeles County. Occurs in the Salton Sea. Usually occurs in bays, lagoons or sloughs, in schools.

Fishing Season: Caught all year round with no consistent period of maximum landings.

Importance: of slight significance commercially.

Fishing Gear: Beach seines, bag seines or chinchorros. Not often if ever taken with hook and line.

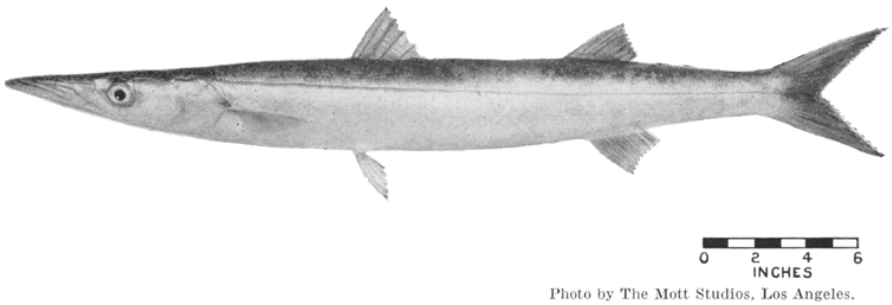


Photo by The Mott Studios, Los Angeles.

FIG. 48.

FIG. 48

BARRACUDA

Sphyræna argentea.

Relationship: Is the only representative of the barracuda family (Sphyraenidae) on the Pacific coast north of Cape San Lucas.

Distinguishing Characters: The slender, cigar-shaped body; the very pointed lower jaw extending beyond the upper; the two well-separated dorsal fins, the first being composed of spines, the second of soft rays; the strong and unequal teeth. **Color:** Metallic blackish gray above, silvery below the lateral line; tail fin tinged with yellowish. Attains a length of about 40 inches and a weight of about 12 pounds. Consult fish and game laws for legal minimum size.

Distribution: Cape San Lucas northward to Monterey Bay, the greatest amount being delivered to Los Angeles County. Occasionally found as far north as Puget Sound. Occurs usually in large schools.

Fishing Season: Caught in California from March until October, with maximum landings in May and June. Caught south of California during the other months.

Importance: Is the most important fish of the fresh fish markets in southern California. In 1928, ranked seventh among the fishes of the State. Almost entirely sold in the fresh fish markets, relatively small amounts being made into fish cakes, and some dried. Not used for canning. Considered by sportsmen a very desirable species.

Fishing Gear: Gill nets, purse seines, lamparas, round haul nets, live bait method, jigs. Caught by sport fishermen with feather and bone jigs and with plugs, or by fishing with live bait from boats, barges and to some extent from piers. Also caught by jigging from piers.

Unauthorized names: Scoots, scooters.

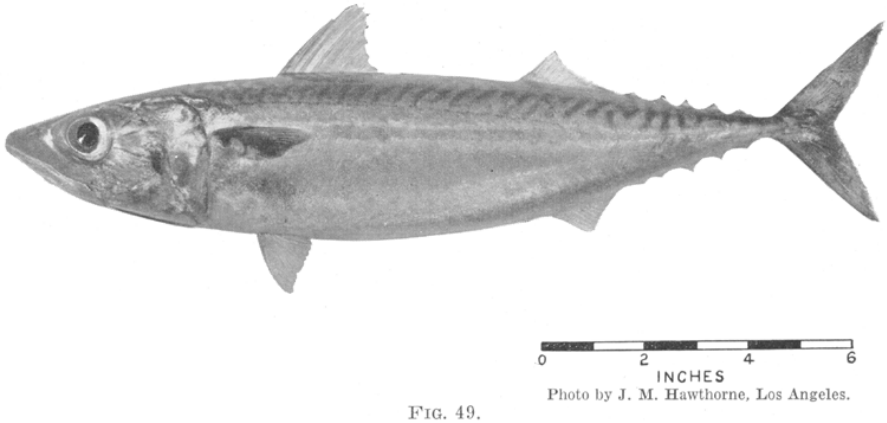


Photo by J. M. Hawthorne, Los Angeles.

FIG. 49.

FIG. 49

PACIFIC MACKEREL

Pneumatophorus japonicus diego.

Relationship: Belongs to the mackerel family (Scombridae), in which are also classed the albacore, skipjack, bonito, and the bluefin and yellowfin tunas.

Distinguishing Characters: The series of 5 or 6 finlets which follows the second dorsal fin and also the anal fin; the rather high first dorsal fin being separated by a considerable distance from the much lower second dorsal fin; the very fine scales visible only on close examination; the 2 very small keels on each side of the tail; the series of about 30 wavy, blackish streaks interspersed with spots which extend vertically down the back to just below the lateral line. **Color:** Dark green with metallic reflections, shading into iridescent silvery on the sides and below; wavy bars as described above. Attains a length of about 20 inches.

Distribution: Puget Sound southward to along the coast of Lower California and possibly farther south, the southernmost limit not being definitely recorded. Not common north of Santa Cruz County. Said by some to be the same species that occurs on the east coast of Asia. Largest California landings made at Los Angeles. Occurs in large schools.

Fishing Season: Caught all year round, with greatest landings being made from July to November in 1928.

Importance: The second greatest fishery in the State in 1928. Mostly canned, a relatively small amount being salted. Sold also in the fresh fish markets.

Fishing Gear: Purse seines, round hauls, gill nets, hook and line. Sport fishermen take these fish from piers, pleasure boats and barges with hook and line.

Unauthorized names: American mackerel, greenback mackerel, right mackerel, striped mackerel, zebra mackerel.

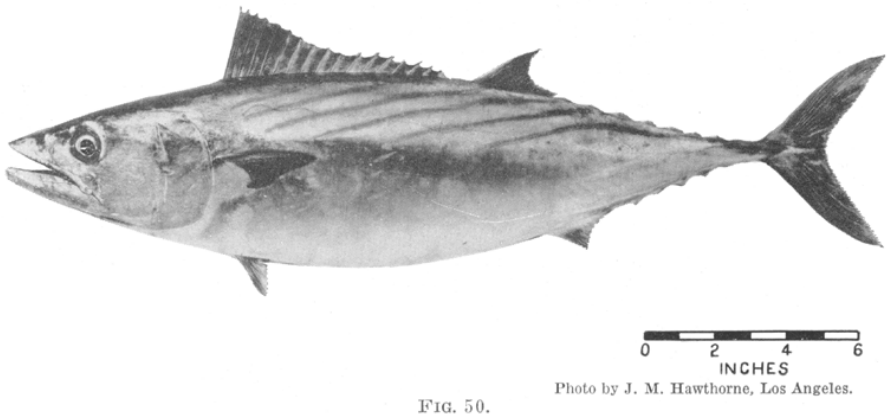


Photo by J. M. Hawthorne, Los Angeles.

FIG. 50.

FIG. 50

BONITO

Sarda chiliensis.

Relationship: Belongs to the mackerel family (Scombridae), in which are also classed the albacore, skipjack, bluefin and yellowfin tunas, the Pacific mackerel.

Distinguishing Characters: The series of 6 to 8 finlets which follow the second dorsal fin and also the anal fin; the several narrow blackish stripes which extend obliquely or horizontally along the back above the lateral line; the fleshy keel on each side of the tail. **Color:** Dark blue above with greenish reflections and a metallic luster, shading into silvery below; stripes on back as above described; young with vague darker vertical bars. Attains a length of about 30 inches.

Distribution: Coast of Oregon southward to Mexico; occurs also in Chile; the largest California landings made at Los Angeles. Not common north of Point Conception. Occurs in schools.

Fishing Season: Caught all year round, with maximum landings during the warm summer months.

Importance: Among market fish this species ranked ninth in the State in 1928. During 1929, considerable amounts were canned.

Fishing Gear: Purse seines, round hauls, gill nets, hook and line with live bait. Sport fishermen catch these fish from piers, pleasure boats and barges with hook and line, using live bait or jigs.

Unauthorized names: Skipjack, striped tuna.

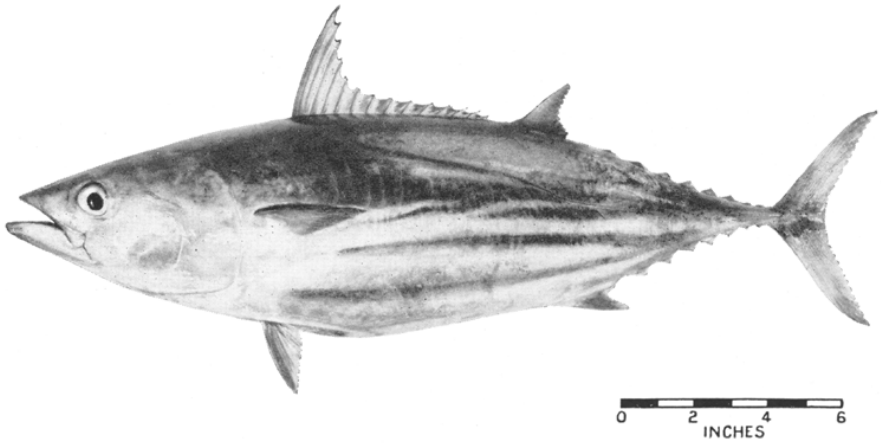


Photo by J. M. Hawthorne, Los Angeles.

FIG. 51.

FIG. 51

SKIPJACK

Katsuwonus pelamis.

Relationship: Belongs to the mackerel family (Scombridae), in which are also classed the bonito, bluefin and yellowfin tunas, albacore, Pacific mackerel.

Distinguishing Characters: The series of 7 to 9 finlets which follow the second dorsal and also the anal fin; the absence of scales, except some large closely adherent ones around the body in the region of the pectoral fin; the low keel on each side of the tail; the 4 or 5 dark horizontal stripes which extend along the lower part of the side of the body. **Color:** Bright blue above (becoming dull after the fish dies), shading into silvery on the sides and below, with the stripes as above described. Attains a length of about 25 inches.

Distribution: On the Pacific coast of America from Point Conception to at least as far south as the Galapagos Islands; caught mostly south of San Diego. Forms a very extensive fishery in Japan. Said to be the same species that is found in the Atlantic Ocean.

Fishing Season: Caught locally from August to December, and delivered from Mexico irregularly during the year.

Importance: The fourth largest fishery in the State in 1928. Used entirely for canning.

Fishing Gear: Live bait methods, purse seines.

Unauthorized names: Oceanic bonito, striped tuna, skippy.

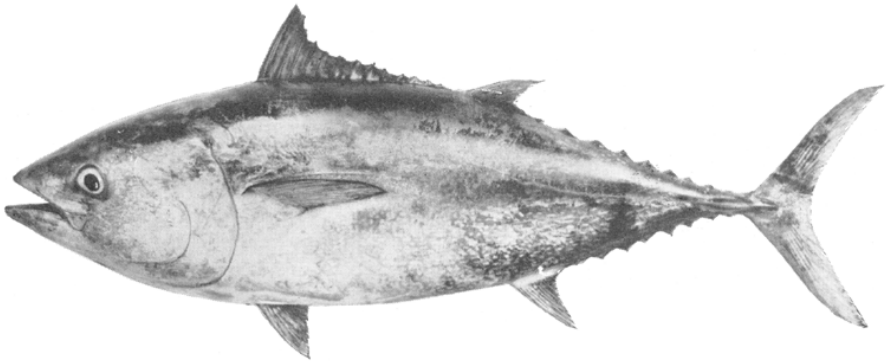


Photo by J. M. Hawthorne, Los Angeles.

FIG. 52.

FIG. 52

BLUEFIN TUNA

Thunnus thynnus.

Relationship: Belongs to the mackerel family (Scombridae), in which are also classed our albacore, skipjack, bonito and yellowfin tuna, as well as the Pacific mackerel.

Distinguishing Characters: The series of 8 or 9 finlets which follow the second dorsal fin and also the anal fin; the pectoral fin being shorter than the head; the absence of conspicuous horizontal or oblique stripes on the body. **Color:** Deep blue above, shading into iron gray on the sides and silvery below. Sides with many small silvery spots, some of which form irregular, broken, vague, vertical stripes; finlets yellow; the whole fish beautifully iridescent when freshly caught. Attains a weight of over 250 pounds.

Distribution: Oregon to Guadalupe Island and possibly southward; not common north of Point Conception. Said to be the same species as is found throughout the world.

Fishing Season: May to December, with occasional catches during the other months.

Importance: The fifth largest fishery in the State in 1928. Used mostly for canning, although considerable quantities are sold in the markets. Considered by many sportsmen to be the most attractive of the marine game fishes.

Fishing Gear: Taken commercially with purse seines. Sportsmen troll with a flying fish held aloft by a kite, as bait.

Unauthorized names: Tuna, tunny, great tunny, leaping tuna.

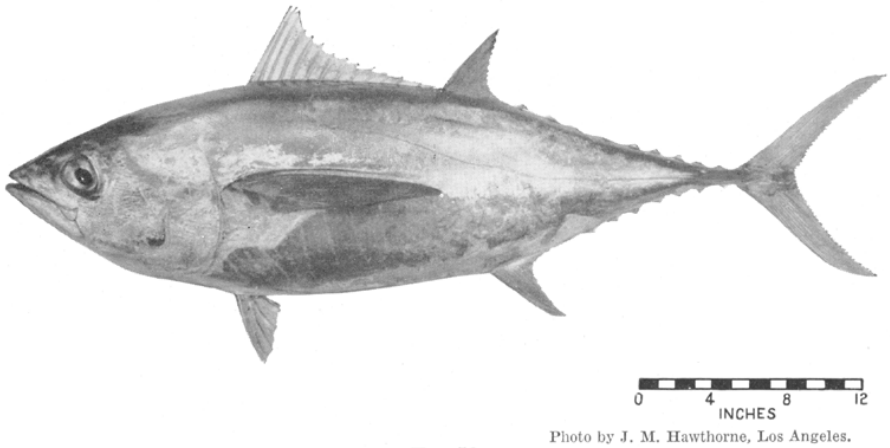


Photo by J. M. Hawthorne, Los Angeles.

FIG. 53.

FIG. 53

YELLOWFIN TUNA

Neothunnus macropterus.

Relationship: Belongs to the mackerel family (Scombridae), in which are also classed our albacore, bonito, skipjack and bluefin tuna, as well as the Pacific mackerel.

Distinguishing Characters: The series of 8 or 9 finlets which follow the second dorsal fin and also the anal fin; the pectoral fin being longer than the head and reaching or almost reaching the front of the anal fin, but not past it as in the albacore. **Color:** Entirely metallic, dark blue above, shading into iron grayish below, with vague lighter gray markings on the sides and below; finlets yellow. Is said to attain a weight of between 300 and 400 pounds.

Distribution: Santa Barbara Channel southward to at least as far as the Galapagos Islands; Hawaii and Japan. Not common on our coast north of San Diego.

Fishing Season: Caught all year round with maximum landings during the spring and fall months.

Importance: The third largest fishery in the State and the largest tuna fishery in 1928. Used almost entirely for canning, although some quantities are sold in the markets.

Fishing Gear: Purse seines; trolling with feather or bone jigs or with plugs; hook and line with live bait. Sportsmen find this a very attractive game fish, and troll with a flying fish held aloft by a kite, as bait.

Unauthorized names: Yellowfinned albacore, tuna.

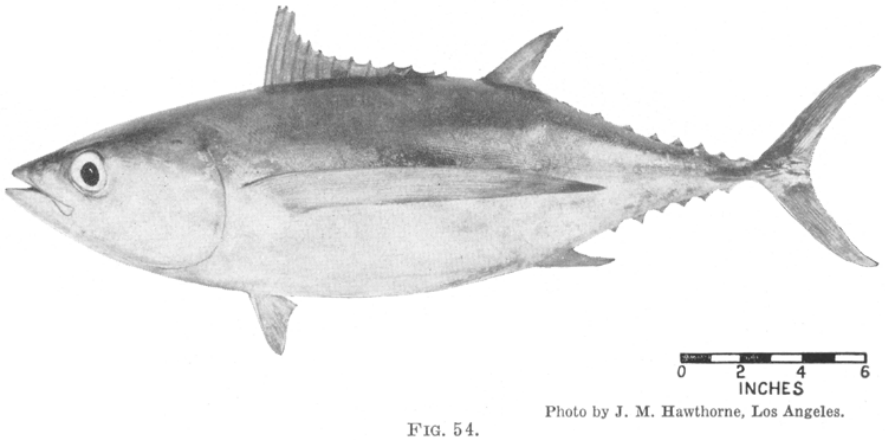


Photo by J. M. Hawthorne, Los Angeles.

FIG. 54.

FIG. 54

ALBACORE

Germo alalunga.

Relationship: Belongs to the mackerel family (Scombridae), in which are classed the bonito, bluefin and yellowfin tunas, the skipjack, and the Pacific mackerel.

Distinguishing Characters: The series of 8 or 9 finlets which follow the second dorsal fin and also the anal fin; the great length of the pectoral fins, which reach considerably past the front of the anal fin. **Color:** Dark steel blue above, shading into dull silvery below. Is said to attain a weight of 80 pounds, although the largest specimen recorded by the Tuna Club of Catalina Island, California, was 66¼ pounds. Consult fish and game laws for legal minimum size limit.

Distribution: Puget Sound to Lower California, and occasionally southward, Japan and Hawaii. Considered by many to be the same species as is found in the Atlantic Ocean. Usually found in the open sea, not close to the shore.

Fishing Season: June to December, with a period of largest landings in July and August, and smaller and scattered landings from September to as late as March.

Importance: of all our tunas the most highly esteemed by canners. Considered by sportsmen to be a very desirable species. Almost entirely canned, rarely appearing in the fresh fish markets.

Fishing Gear: Caught commercially as well as by sport fishermen with bone, rag or feather jigs towed about 100 feet astern of the fishing boats when going at a speed of from 4 to 7 knots. Commercial fishermen also use the *bonito method*.

Unauthorized names: Abrego, long-finned tuna.

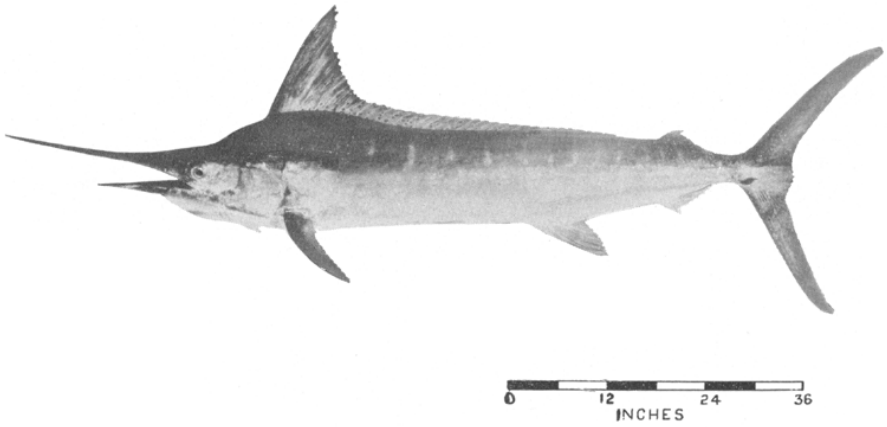


Photo by the Crescent Photo Shop, Avalon.

FIG. 55.

FIG. 55

MARLIN

Makaira mitsukurii.

Relationship: Belongs to the sailfish family (Istiophoridae), in which are classed several other species which are distributed in different parts of the world. Some ichthyologists claim there are several species in California.

Distinguishing Characters: The large size; the upper jaw being prolonged into a rounded "sword" without sharp edges, in contrast to one flattened and with sharp edges; the long first dorsal fin which extends almost the whole length of the back; the short second dorsal; the 2 small keels on each side of the tail. **Color:** Purplish blue above, becoming silvery on the sides and below, the body being crossed with narrow light blue stripes extending down from the back; dorsal fins violet with bright blue spots. Attains a length of about 12 feet and a weight of about 340 pounds.

Distribution: Locally caught off the islands of southern California. Said to be the same species that occurs off the coasts of Hawaii and Japan.

Fishing Season: Approximately from June to December, with a peak about September. The fact that in the statistical records this species has not been separated from the broadbill swordfish permits only of an estimation of its fishing season.

Importance: of lesser importance commercially than the broadbill swordfish. Although in former years this fish has been of slight significance, the eastern demand is causing the development of a distinct fishery for this fish and the broadbill. Highly prized by sportsmen, by whom it is caught more frequently than is the broadbill.

Fishing Gear: Taken commercially with harpoons in the open ocean. Sport fishermen usually use hook and line with a flying fish held aloft by a kite, as bait, but recently (1929) have been using harpoons. Consult fish and game laws for legal restrictions.

Unauthorized names: Swordfish, spearfish, spikefish, sailfish.

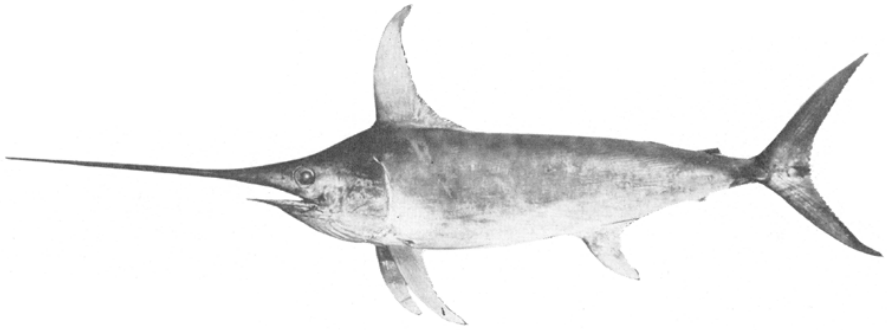


Photo by the Crescent Photo Shop, Avalon.

FIG. 56.

FIG. 56

BROADBILL SWORDFISH

Xiphias gladius.

Relationship: This is the true swordfish, and belongs in a family by itself (Xiphiidae). The only member of the family and belongs to a worldwide species.

Distinguishing Characters: The upper jaw being prolonged into a flattened and sharp-edged "sword," as distinguished from a rounded one as in the marlin; the high, short first dorsal fin, which does not extend as far back as the anal fin; the wide, single keel at the base of the tail. **Color:** Metallic purplish above, shading into paler on the sides and silvery grayish below; sides without cross bars. Attains a weight of over 1000 pounds; largest specimen recorded by the Tuna Club of Catalina Island, California, up to 1929 was 573 pounds.

Distribution: Caught from Santa Cruz Island southward along the southern California coast. Said to occur in warm seas throughout the world.

Fishing Season: Probably from June to November, with a peak in August and September. The fact that in the past this fish has not been separated in the records from the marlin, prevents our knowing at this time (1930) the exact season.

Importance: Commercially of more importance than the marlin. Although in past years a minor fishery, it has recently been stimulated by a growing eastern demand and a growing local popularity. Very highly prized by sportsmen, although not taken by them as much as the marlin.

Fishing Gear: Taken commercially in the open ocean with harpoons. Sportsmen usually use hook and line with a flying fish held aloft by a kite, as bait, and occasionally with harpoons. Consult fish and game laws for legal restrictions.

Unauthorized name: Swordfish.

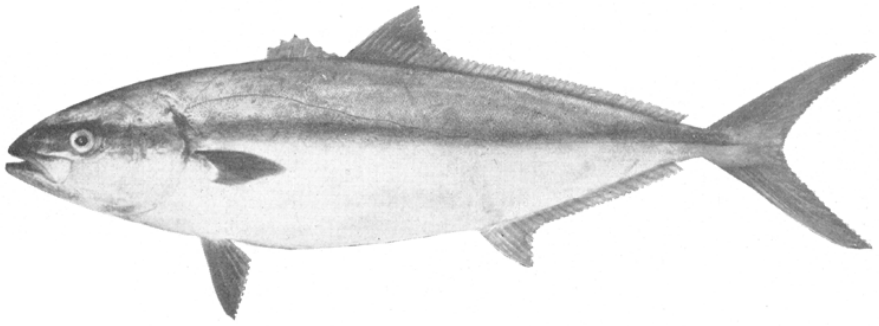


Photo by J. M. Hawthorne, Los Angeles.

FIG. 57.

FIG. 57

YELLOWTAIL

Seriola dorsalis.

Relationship: Belongs to the jack family (Carangidae), in which is also classed the horse mackerel and many tropical species not found in our waters.

Distinguishing Characters: The 2 dorsal fins, the first being composed of spines, the second of soft rays, the two being practically in contact; the longest spines of the first dorsal fin being less than half the height of the first soft rays; the blunt, low keel on each side of the caudal peduncle. **Color:** Bright metallic blue above, becoming silvery on the sides and below; a yellowish brown horizontal band extends along the side of the body from the eye to the tail. Attains a weight of about 60 pounds.

Distribution: From Point Conception southward to the Galapagos Islands. Largest California landings made at San Diego.

Fishing Season: All year round, with greatest amount caught during the summer months.

Importance: The third most abundant species in the fresh fish markets of southern California in 1928, and the twelfth in the State. During 1929 considerable amounts were canned. Very highly esteemed by sportsmen.

Fishing Gear: Caught commercially by hook and line with live bait, purse seines, gill nets, jigs. Caught by sport fishermen with hook and line using live bait, from boats, barges and occasionally from fishing piers.

Unauthorized names: Amber Jack, amber fish.

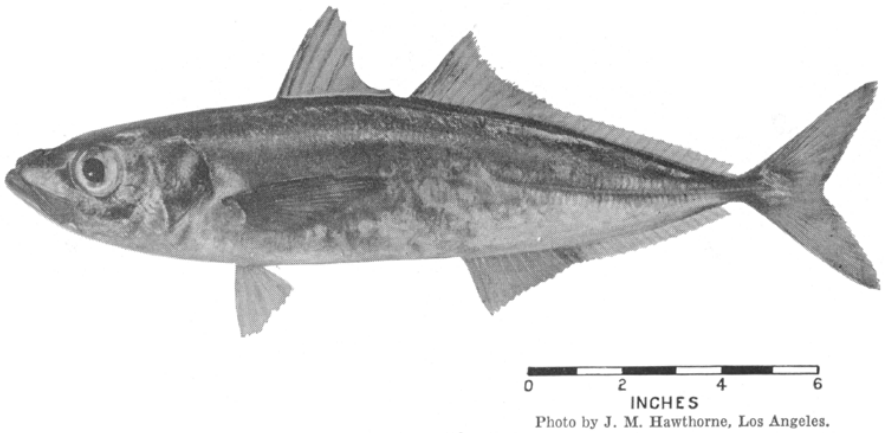


Photo by J. M. Hawthorne, Los Angeles.

FIG. 58.

FIG. 58

HORSE MACKEREL

Trachurus symmetricus.

Relationship: Belongs to the jack family (Carangidae), in which is also classed the yellowtail, as well as many tropical species which do not occur in our waters.

Distinguishing Characters: The 2 dorsal fins being close together, the spiny portion being almost as high or as high as the soft portion; the sharp bony keel along the middle of each side of the tail, which extends for about one-third the length of the body; the lateral line bending abruptly downward just above the vent. **Color:** Dark green above, mottled with lighter shades, shading into silvery on the sides and below; everywhere with an iridescent luster. Attains a length of over 18 inches.

Distribution: Monterey southward to Chile, the largest California landings being made at Los Angeles. Occasionally taken as far north as San Francisco. Claimed by some ichthyologists to belong to a world-wide species.

Fishing Season: All year round, with no distinctive period of maximum landings.

Importance: of rather minor importance in the fresh fish markets, ranking about twelfth in the markets of southern California in 1928.

Fishing Gear: Purse seines, round hauls; sometimes taken on hand lines.

Unauthorized names: Spanish mackerel, saurel, agii.

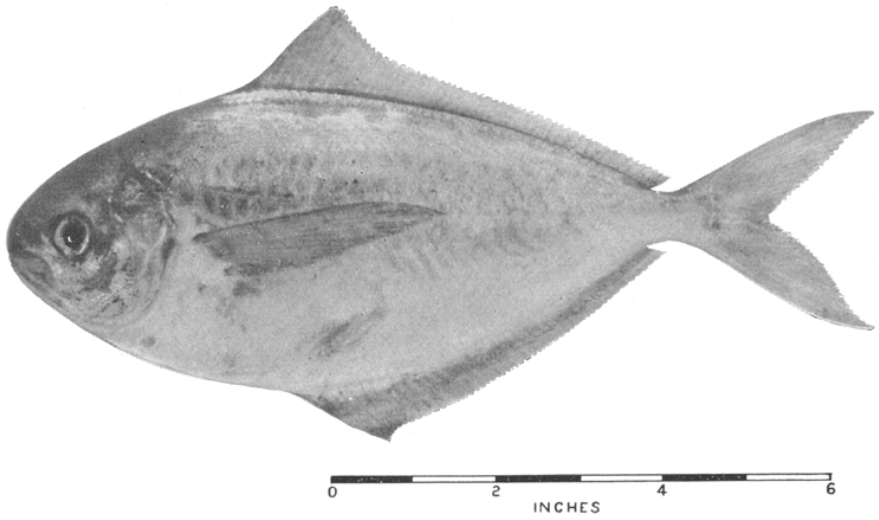


Photo by J. M. Hawthorne, Los Angeles.

FIG. 59.

FIG. 59

CALIFORNIA POMPANO

Palometa simillima.

Relationship: Is not a true pompano, but belongs to the butterfish or harvestfish family (Stromateidae), of which this species is the only representative recorded on the coast of California. For a description of a pompano-like fish, *see* yellowtail.

Distinguishing Characters: The deep, thin body; the absence of ventral fins; the long, low, single dorsal fin, and the anal fin of about the same length and shape. **Color:** Dull green shading into bright silvery below, the whole fish gleaming with iridescence. Attains a length of about 10 inches.

Distribution: San Diego to Puget Sound, with most California landings being made at Los Angeles.

Fishing Season: Caught irregularly throughout the year, with larger landings being recorded during the winter and spring months.

Importance: of negligible commercial significance, although it brings a remarkably high price. Sold entirely in the fresh fish markets.

Fishing Gear: Caught commercially with round haul nets.

Unauthorized name: Butterfish.

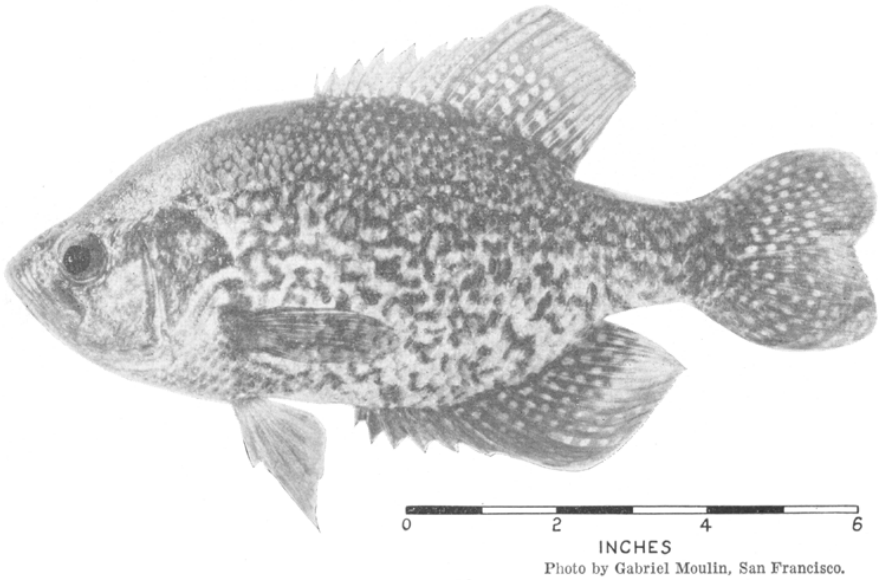


FIG. 60.

FIG. 60

CALICO BASS

Pomoxis sparoides.

Relationship: Belongs to the sunfish family (Centrarchidae). Very closely related to the crappie (Pomoxis annularis), from which species it differs in the number of dorsal spines. Both the calico bass and the crappie are introduced species, being native of eastern States.

Distinguishing Characters: Occurs in fresh water; the single dorsal fin without a notch between the spiny portion and the soft portion; the dorsal fin having 7 or 8 spines (in contrast to 5 or 6 in the crappie); the dorsal fin being scarcely longer than the anal fin; the presence of 6 spines on the front of the anal fin. **Color:** Silvery olive, mottled with dark green or blackish, the dark markings gathered in irregular small bunches, and covering the whole body. Attains a length of about 12 inches.

Distribution: Lakes, streams and ponds throughout the State wherever it has been planted.

Fishing season: Generally taken during the summer months, with certain legal restrictions. Consult fish and game laws for exact season.

Importance: Prohibited to commercial fishing, being reserved entirely to sportsmen. Certain legal restrictions limit the catch for sportsmen, by whom it is rather highly esteemed.

Fishing Gear: Caught by angling with many kinds of bait and with artificial lures.

Unauthorized names: Crappie, black crappie, strawberry bass.

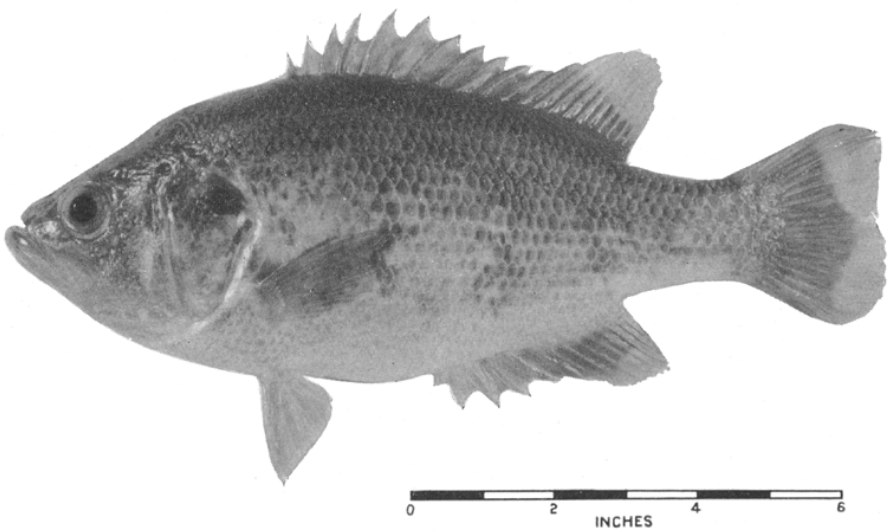


Photo by Gabriel Moulin, San Francisco.

FIG. 61.

FIG. 61

SACRAMENTO PERCH

Archoplites interruptus.

Relationship: Belongs to the sunfish family (Centrarchidae), in which are also classed the large-mouthed and small-mouthed black basses, the crappie, calico bass, bluegill sunfish. This is the only representative of the family which is native to our coast.

Distinguishing Characters: Occurs in fresh water; the single dorsal fin with 12 or 13 spines; the dorsal fin being longer than the anal fin; the presence on the tongue of low teeth in 2 patches which join farther back; the maxillary extending beyond the pupil. **Color:** Variable; sometimes very dark with small pale blotches, or nearly plain silvery, with 2 or 3 alternating rows of dusky blotches. Attains a length of between 1 and 2 feet, but this size is very unusual.

Distribution: Sacramento-San Joaquin Basin, Clear Lake, Kern Lake.

Fishing Season: Generally taken during the summer months, with certain legal restrictions. Consult fish and game laws for exact season.

Importance: Prohibited to commercial fishing, being reserved entirely to sportsmen, against whom there are also certain legal restrictions. Not very abundant, but rather highly esteemed by anglers.

Fishing Gear: Caught by angling with many kinds of bait and with artificial lures.

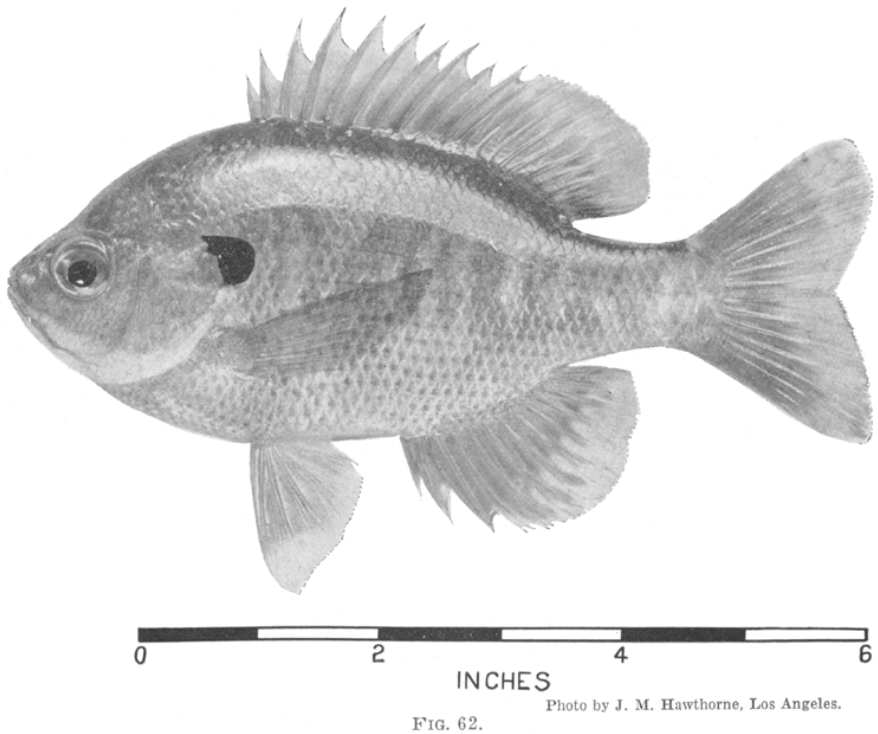


FIG. 62.

FIG. 62

BLUEGILL SUNFISH

Helioperca incisor.

Relationship: Belongs to the sunfish family (Centrarchidae), in which are also classed the Sacramento perch, calico bass, crappie, large-mouthed and small-mouthed black basses. An introduced species, being native to the Great Lakes and to central and eastern United States. The green sunfish (Apomotis cyanellus) has also been introduced into California, but is less abundant than the bluegill. It is distinguished from the latter species by the fact that the black opercular spot occurs only on the hard or bony portion of the gill cover, does not appear on the fleshy extension.

Distinguishing Characters: Occurs in fresh water; the single, rather long dorsal fin with about 10 spines; the dorsal spines being almost or quite as high as the soft rays; the presence of a flexible black flap on the upper edge of the gill cover, slightly smaller than the little finger nail. **Color:** Dark greenish olive on the back, becoming paler on the sides and below, the sides with 3 or 4 darker greenish bars; opercles and cheeks bluish, with the black flap, as above described. Attains a length of from 12 to 14 inches in the East, but in this State the size is probably much smaller.

Distribution: Clear Lake, and lakes, ponds and quiet streams of the Sacramento-San Joaquin Basin, and other parts of the State wherever this species has been planted.

Fishing Season: Taken in general during the summer months, with certain legal restrictions. Consult fish and game laws for exact season.

Importance: Prohibited to commercial fishermen, being reserved with certain legal restrictions entirely to sportsmen. Considered one of the gamiest fishes for its size.

Fishing Gear: Caught by angling with many kinds of bait.

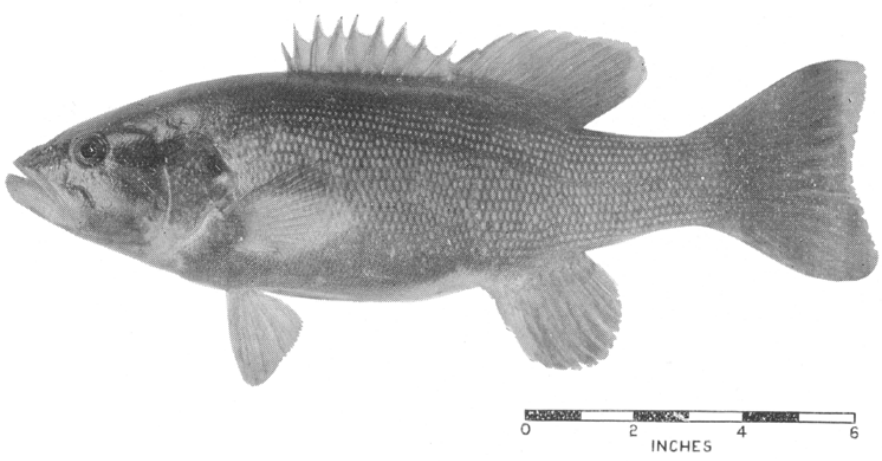


Photo by Gabriel Moulin, San Francisco.

FIG. 63.

FIG. 63

SMALL-MOUTHED BLACK BASS

Micropterus dolomieu.

Relationship: Belongs to the sunfish family (Centrarchidae), in which are also classed the Sacramento perch, the bluegill sunfish, calico bass, crappie, and large-mouthed black bass. An introduced species, being native to eastern United States.

Distinguishing Characters: Occurs in fresh water; the single dorsal fin with about 10 spines and with from 13 to 15 soft rays; the dorsal fin being noticeably longer than the anal fin; the maxillary bone not extending beyond the eye in the adult; the presence of about 17 rows of scales on the cheek (in contrast to 10 rows in the large-mouthed species). **Color:** Dull golden green, with a bronze luster above, becoming paler below and white on the belly; young with darker spots. Attains a weight of about 9 pounds, although specimens over about 6 pounds are exceptional in this State.

Distribution: Lakes, streams, ponds, and sloughs throughout the State, wherever it has been planted.

Fishing Season: Taken in general during the summer months, with certain legal restrictions. Consult fish and game laws for exact season.

Importance: Prohibited to commercial fishing, being reserved entirely to sportsmen, for whom there are also certain legal restrictions. Considered a very excellent game fish. Not as numerous in this State as the large-mouthed species.

Fishing Gear: Caught by angling with many kinds of bait or with artificial lures.

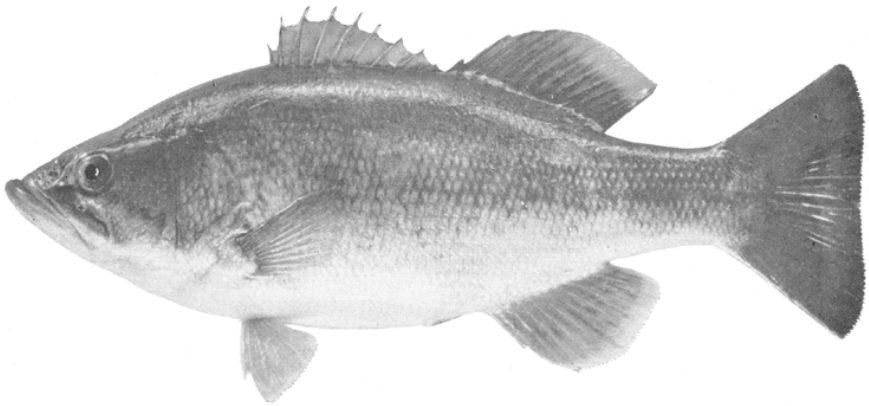


Photo by J. M. Hawthorne, Los Angeles.

FIG. 64.

FIG. 64

LARGE-MOUTHED BLACK BASS

Micropterus salmoides.[6]

Relationship: Belongs to the sunfish family (Centrarchidae), in which are also classed the small-mouthed black bass, Sacramento perch, calico bass, crappie and bluegill sunfish. An introduced species, being native to rivers and lakes from the Great Lakes to Florida, Texas and Mexico.

Distinguishing Characters: Occurs in fresh water; the single dorsal fin with about 10 spines, a notch being between the spines and the rays; the dorsal fin being much longer than the anal fin; the maxillary bone extending beyond the eye in the adult; the presence of about 10 rows of scales on the cheek. **Color:** Variable; generally dark green above, becoming greenish silvery on the sides and below; body with irregular darker blotches. The largest specimen recorded in the eastern part of the United States was 30 pounds, but this is a very unusual size, 18-pound specimens being considered very large. In California waters this species scarcely exceeds 9 or 10 pounds.

Distribution: Lakes, streams, ponds and sloughs througout the State, wherever it has been planted.

Fishing Season: Taken in general during the summer months with certain legal restrictions. Consult fish and game laws for exact season.

Importance: At present writing this fish is prohibited to commercial fishing, being reserved entirely to sportsmen, by whom it is very highly esteemed as a game fish. Certain legal restrictions limit the catch for sportsmen.

Fishing Gear: Caught by angling with many kinds of bait or with artificial lures.

[6] There is considerable dispute over the reference of this fish to Micropterus, but for the purpose of this bulletin, the more commonly used form is given.

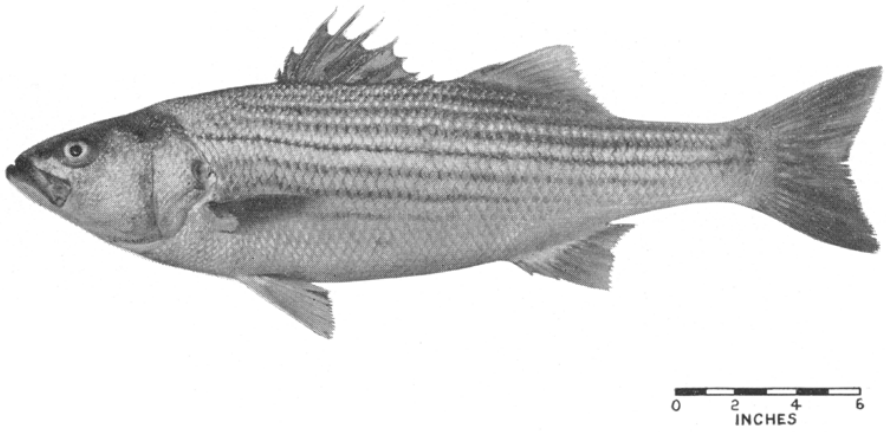


Photo by Gabriel Moulin, San Francisco.

FIG. 65.

FIG. 65

STRIPED BASS

Roccus lineatus.

Relationship: Belongs to the sea-bass family (Serranidae), in which are also classed the black sea-bass, rock bass and the kelp bass. A species successfully introduced from the Atlantic coast.

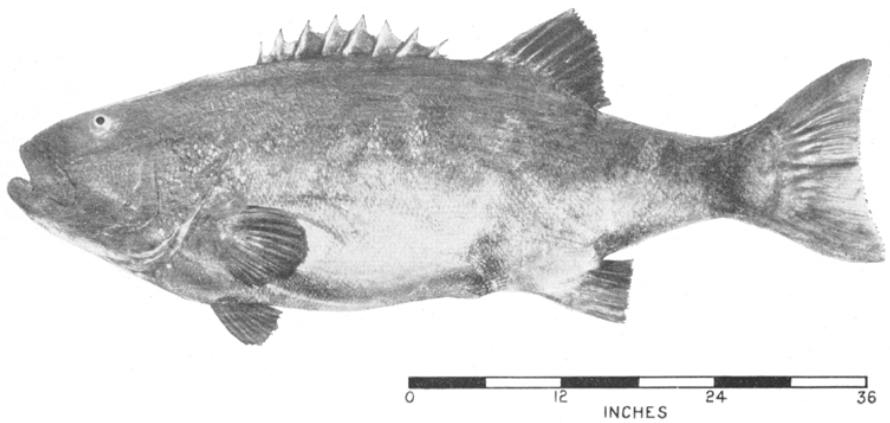
Distinguishing Characters: The 2 dorsal fins, the first being composed of spines, the second of soft rays; the anal fin having 3 spines; the ventral fins being placed not far behind the point of attachment of the pectoral fins; the presence of a series of 7 or 8 horizontal blackish stripes on the side of the body. **Color:** Brownish or steel bluish, with brassy reflections, becoming silvery on the sides and below; stripes as described above, one of which follows the lateral line. Attains a weight of between 70 and 80 pounds.

Distribution: Monterey Bay northward to Coos Bay, Oregon, with the largest California landings being made in San Francisco Bay and adjacent river localities. Has been planted at several points south of Monterey Bay, but has not yet (1930) established itself. A few specimens are recorded from the Columbia River.

Fishing Season: Caught commercially during all months not included in the closed season, with maximum landings in March, April and August. Certain legal restrictions limit the commercial catch. Taken legally by amateur fishermen all year round, with certain limitations in respect to size and number.

Importance: Commercially of considerable importance in the fresh fish markets of central California, chiefly because of the high price which it brings. Sportsmen find this a particularly attractive fish.

Fishing Gear: Caught commercially with gill nets. Sportsmen use hook and line, with pieces of sardines, clams, live bait, or by trolling with artificial minnows, plugs, spoons.



From a photo by A. G. Boxell, Avalon.

FIG. 66.

FIG. 66

BLACK SEA-BASS

Stereolepis gigas.

Relationship: Belongs to the sea-bass family (Serranidae), in which are also classed the striped bass, the rock bass, the kelp bass.

Distinguishing Characters: The spiny portion of the dorsal fin being scarcely connected with the soft portion, there being 11 spines and about 10 soft rays; the presence of teeth on the vomer; the spines of the dorsal fin being shorter than the soft rays in the adult; the pectoral fins reaching past the ventral fins in the adult. **Color:** Blackish or dark brown above, shading into paler on the sides and below. The young have several dark spots on the back, sides and dorsal fin, which disappear with age; the shape of the fish changes also with age, the dorsal spines becoming relatively shorter until they are less than one-half the height of the soft rays, and the body becoming more elongate. Attains a length of about 7 feet or more and a weight of 500 or 600 pounds.

Distribution: San Diego north to the Farallon Islands, but not common north of Point Conception. Largest landings made at San Diego.

Fishing Season: Caught all year round with no distinct "fishing season."

Importance: Commercially of rather minor significance. Sold entirely in the fresh fish markets, mostly as *fillet*. Prized highly by sportsmen as a game fish.

Fishing Gear: Hook and line with live bait; set lines. Sportsmen use live bait.

Unauthorized names: Jewfish, giant bass.

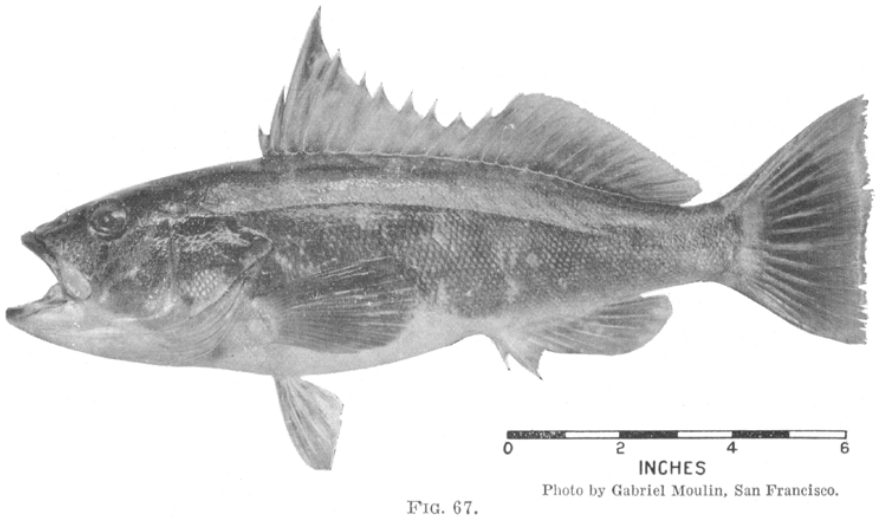


FIG. 67.

FIG. 67

ROCK BASS

Paralabrax nebulifer.

Relationship: Belongs to the sea-bass family (Serranidae), in which are classed the black sea-bass, striped bass and kelp bass.

Distinguishing Characters: The spiny portion of the dorsal fin being continuous with the soft portion, there being about 10 spines; the soft rays of the dorsal fin being higher than the last 4 or 5 spines; the hind part of the upper edge of the maxillary bone being exposed when the mouth is closed; the anal fin having 3 spines; the third spine of the dorsal fin being over twice as long as the second, and longer than the fourth. **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, which disappear as the fish grows older. Attains a length of about 18 inches.

Distribution: Monterey to Magdalena Bay; not common north of Point Conception.

Fishing Season: Caught all year round with maximum landings between May and September.

Importance: Forms rather a small proportion of the catch recorded in the past as *rock bass*, which has included the kelp bass catch.

Fishing Gear: Hook and line, live-bait methods, trolling. Amateur fishermen catch these fish from pleasure boats, piers and barges, using live bait as well as pieces of fish. Taken largely in kelp or along the edges of kelp beds.

Unauthorized names: Johnny verde, kelp bass.

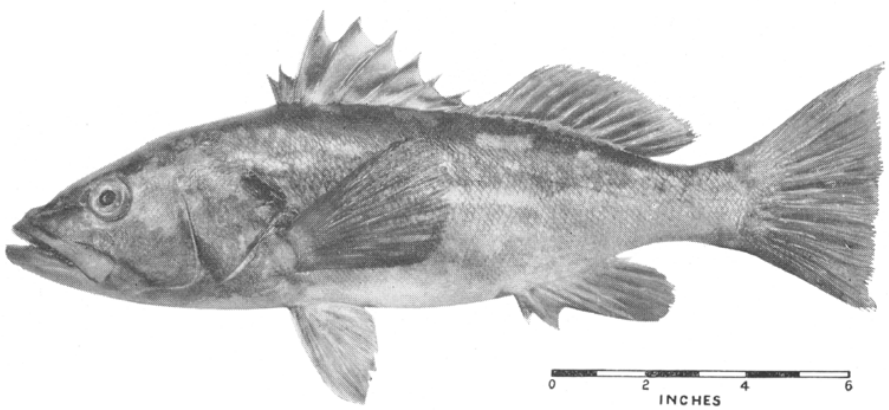


Photo by J. M. Hawthorne, Los Angeles.

FIG. 68.

FIG. 68

KELP BASS

Paralabrax clathratus.

Relationship: Belongs to the sea-bass family (Serranidae), in which are also classed the black sea-bass, the striped bass and the rock bass.

Distinguishing Characters: The spiny portion of the dorsal fin being connected to the soft portion, but with a notch between them; the upper edge of the maxillary bone being fully exposed when the mouth is closed; the anal fin having 3 spines in front; the longest spine of the dorsal fin being longer than the soft rays; the third spine of the dorsal fin being scarcely as long as the fourth spine, and about twice as long as the second spine. **Color:** Dark gray above, or brownish, or greenish gray, the upper part of the side being mottled and barred with broad blotches of brownish or dark gray; lower part of the sides and underparts silvery tinged with yellow; fins all tinged with yellow. Attains a length of about 18 inches.

Fishing Season: Caught all year round with maximum landings between May and September.

Distribution: San Francisco southward to about Cerros Island on the coast of Lower California. Not abundant north of Point Conception; the largest California landings made at Los Angeles.

Importance: Ranked with the rock bass (from which it has not been separated in the records) tenth among the fishes sold exclusively in the fresh fish markets of southern California in 1928. Forms the largest proportion of the "rock bass" catch.

Fishing Gear: Commercially with hand lines, live bait method, trolling. Amateur fishermen take these fish from pleasure boats, piers and barges, using live bait as well as pieces of fish. Taken mostly in kelp or along the edges of kelp beds.

Unauthorized names: Rock bass, sand bass, cabrilla.

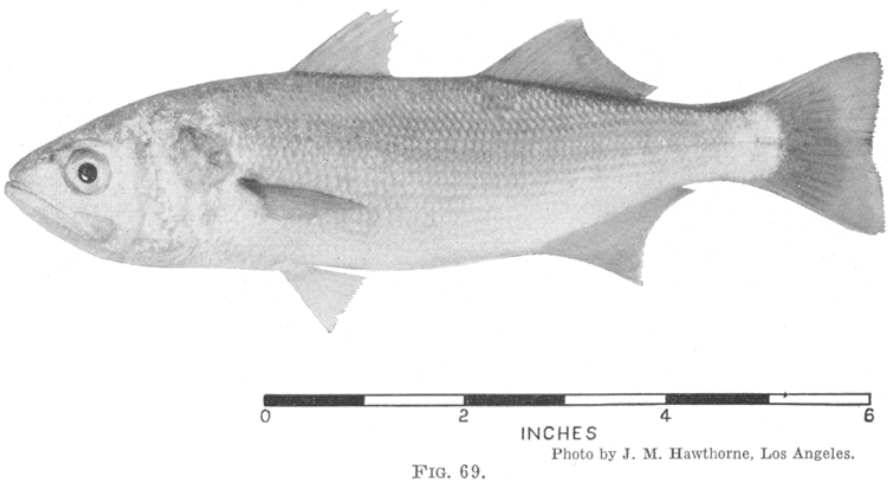


Photo by J. M. Hawthorne, Los Angeles.

FIG. 69.

FIG. 69

QUEENFISH

Seriphus politus.

Relationship: Belongs to the croaker family (Sciænidae), in which are also classed our yellowfin, spotfin and black croakers, California corbina, kingfish and white sea-bass.

Distinguishing Characters: The 2 separate dorsal fins; the lateral line extending to about the end of the tail fin; the absence of teeth on the roof of the mouth (vomer); the lower jaw projecting slightly beyond the tip of the upper jaw; the undersurface of the head from the tip of the lower jaw to a little back of the end of the maxillary bone being keeled; the base of the anal fin being almost equal in length to the base of the second dorsal fin. **Color:** Entirely metallic; bluish above, shading into silvery on the sides and underparts; fins yellowish. Attains a length of about 12 inches.

Distribution: Point Conception southward to about Port San Bartholome on the coast of Lower California. Found occasionally as far north as San Francisco. Occurs in schools, often with kingfish or other small fish. Common on sandy shores.

Fishing Season: Caught all year round, probably with larger landings during the winter and spring months.

Importance: of slight significance commercially. Sold in the markets with the kingfish, it forms less than 5 per cent of the "kingfish" catch. Used often as bait.

Fishing Gear: Taken commercially with round haul nets. Caught by amateur fishermen from pleasure piers, boats and barges with hook and line or by jigging.

Unauthorized names: Kingfish, herring, tom-cod, shiner, sea-trout.

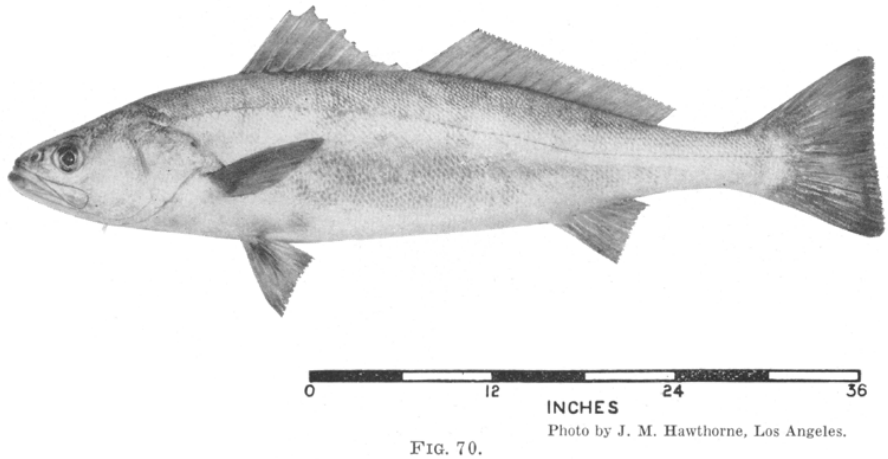


Photo by J. M. Hawthorne, Los Angeles.

FIG. 70.

FIG. 70

WHITE SEA-BASS

Cynoscion nobilis.

Relationship: Not a true sea-bass, but belongs to the croaker family (Sciænidae), in which are also classed our yellowfin, spotfin and black croakers, the California corbina, the queenfish and the kingfish. Closely related to the weakfish of the east coast, to the Mexican corbina and totuava.

Distinguishing Characters: The spiny portion of the dorsal fin being scarcely connected to the soft portion; the lateral line extending about to the end of the tail fin; the absence of teeth on the roof of the mouth; the lower jaw projecting slightly beyond the tip of the snout; the base of the second dorsal fin being much longer than the base of the anal fin; the pectoral fin being more than half the length of the head. **Color:** Entirely metallic; bluish gray above, frosted silvery below; the young with 3 or 4 faint cross bars, back and sides with very small dark points; base of the pectoral fin with a dusky spot. Is said to reach a weight of 90 pounds or more, but the largest specimen recorded so far (1929) by the Tuna Club of Catalina Island was 60 pounds.

Distribution: Puget Sound southward to the Gulf of California; not common north of San Francisco.

Fishing Season: Caught all year round, with maximum landings during the warm summer and fall months.

Importance: Ranked seventh among the market fish of southern California in 1928. Highly esteemed by sportsmen.

Fishing Gear: Round hauls, lamparas, purse seines, gill nets, hook and line with live bait. Caught by sportsmen with hook and line, using live bait, and by trolling.

Unauthorized names: The young are sometimes miscalled "sea trout."

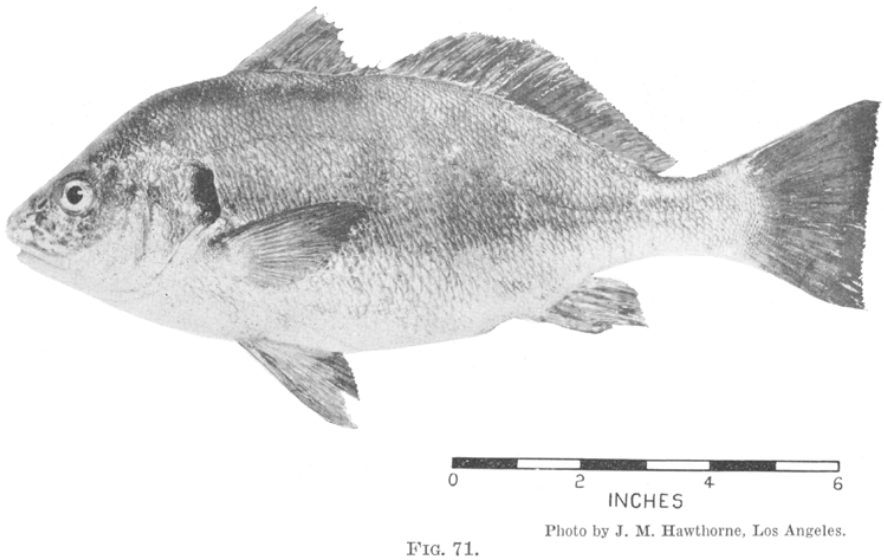


Photo by J. M. Hawthorne, Los Angeles.

FIG. 71.

FIG. 71

BLACK CROAKER

Sciœna saturna

Relationship: Is in the croaker family (Sciænidae), in which are also classed our yellowfin croaker, spotfin croaker, corbina, queenfish, kingfish, white sea-bass, and many other close relatives which are found in other parts of the world.

Distinguishing Characters: The 2 spines at the front of the anal fin; the spiny portion and the soft portion of the dorsal fin being connected, and with a rather deep notch; the lateral line extending about to the end of the tail fin; the absence of teeth on the roof of the mouth; the tip of the snout projecting beyond the lower jaw; the absence of a barbel on the tip of the lower jaw; the pectoral fins being shorter than the head; the black spot on the edge of the opercle. **Color:** Bluish above, becoming silvery below, the whole overlaid with smoky black and with a coppery tinge; a vague pale band extending across the body in the region between the 2 dorsal fins; fins dark. Attains a length of about 15 inches.

Distribution: Point Conception to Cerros Island on the coast of Lower California.

Fishing Season: Caught irregularly all year round.

Importance: of very slight commercial significance, not being brought to the markets in great numbers.

Fishing Gear: Round haul nets, gill nets, beach seines, hook and line. Caught by amateur fishermen with hook and line from pleasure piers, boats and barges.

Unauthorized names: Chinese croaker, surf fish, black perch, blue bass, black bass.

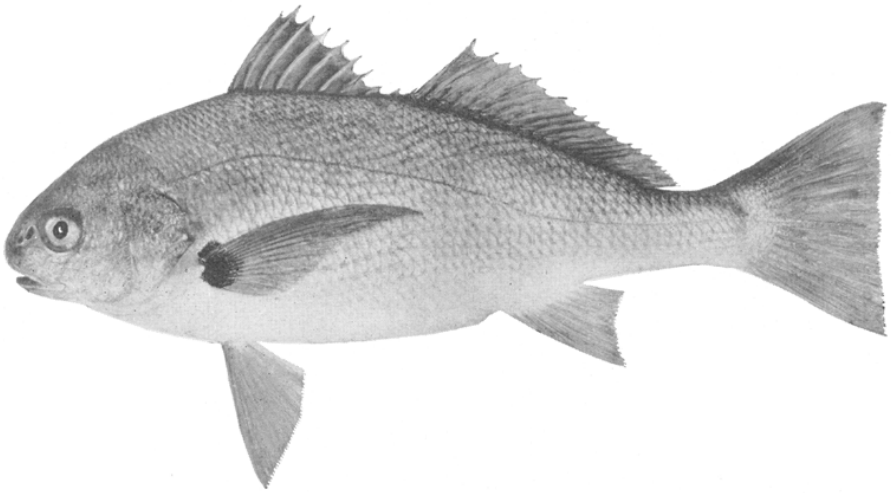


Photo by J. M. Hawthorne, Los Angeles.

FIG. 72.

FIG. 72

SPOTFIN CROAKER

Roncador stearnsi.

Relationship: Belongs to the croaker family (Sciænidae), in which are also classed our California corbina, yellowfin and black croakers, queenfish, kingfish, and white sea-bass.

Distinguishing Characters: The 2 spines at the front of the anal fin, the second being at least one-half the length of the first soft ray; the 2 dorsal fins being connected by a low membrane; the lateral line extending about to the end of the tail fin; the absence of teeth on the roof of the mouth; the tip of the snout projecting beyond the lower jaw; the absence of a barbel on the tip of the lower jaw; the large black spot at the base of the pectoral fin; the pectoral fin being as long or almost as long as the head. **Color:** Entirely metallic, with steel gray above, shading into bright silvery below; or brilliantly brassy above, becoming silvery on the sides and below; inconspicuous wavy dark lines follow the rows of scales upwards and backwards; base of pectoral fin with spot as described above. Attains a weight of 5 or 6 pounds.

Distribution: Point Conception southward along the coast of southern California, occasionally being taken as far north as San Francisco. Usually caught rather close to the shore, often in the surf of sandy beaches or in sloughs.

Fishing Season: Caught by sportsmen all year round.

Importance: At present writing (1930) it is contrary to the law to catch this species with nets, or to buy or sell it. Reserved exclusively for sportsmen, by whom it is held in esteem.

Fishing Gear: Caught with hook and line from pleasure piers, boats or barges, or in the surf.

Unauthorized names: Spot, surf fish, golden croaker.

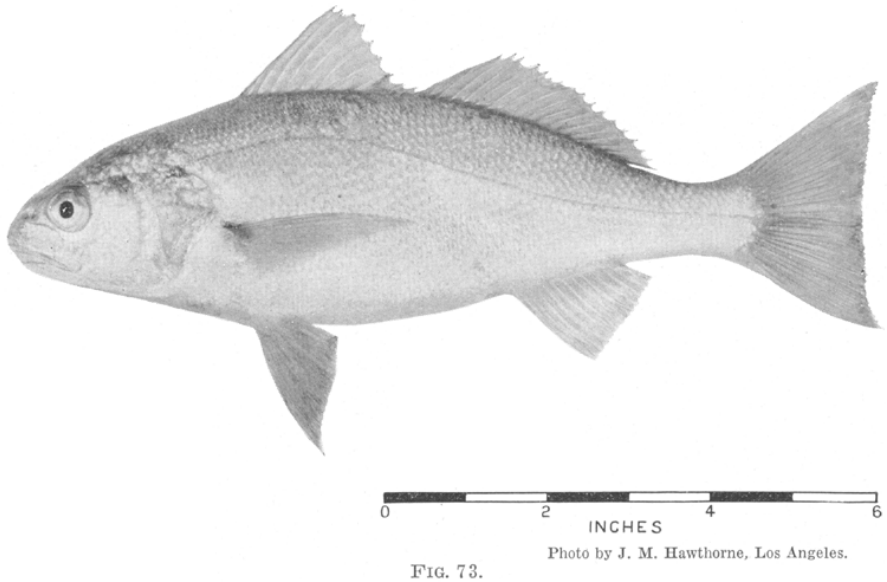


Photo by J. M. Hawthorne, Los Angeles.

FIG. 73.

FIG. 73

KINGFISH

Genyonemus lineatus.

Relationship: Belongs to the croaker family (Sciænidae), in which are also classed our yellowfin, spotfin and black croakers, queenfish, California corbina and white sea-bass.

Distinguishing Characters: The 2 small spines on the front of the anal fin; the spiny portion of the dorsal fin and the soft portion being separated by a deep notch; the lateral line extending to about the end of the tail fin; the absence of teeth on the roof of the mouth; the tip of the snout projecting beyond the lower jaw; the absence of a barbel on the tip of the lower jaw; the absence of an excessively enlarged spine on the anal fin. **Color:** Entirely metallic, with a frosted silvery appearance; grayish above with a brassy tinge; fins, except the ventrals, yellowish; faint wavy lines follow the scales upward and backward. Attains a length of about a foot.

Distribution: San Francisco to Cerros Island on the coast of Lower California. Occurs in schools along with the queenfish and other small fish. Usually caught rather close to the shore.

Fishing Season: Taken all year round with greatest catch during the winter and early spring months.

Importance: of minor significance commercially. Smaller specimens are used as bait by live bait boats.

Fishing Gear: Caught commercially by round haul and gill nets. Caught by anglers from pleasure piers, boats and barges with hook and line.

Unauthorized names: Tom-cod, shiner, herring, white croaker, carbinette, chenfish.

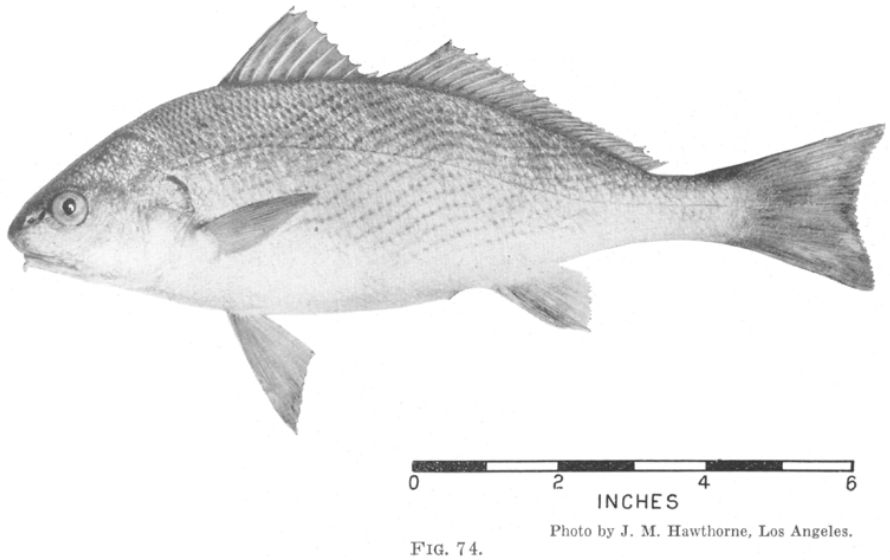


Photo by J. M. Hawthorne, Los Angeles.

FIG. 74.

FIG. 74

YELLOWFIN CROAKER

Umbrina roncador.

Relationship: Is in the croaker family (Sciænidae), to which also belong our California corbina, spotfin and black croakers, queenfish, kingfish, and white sea-bass.

Distinguishing Characters: The 2 spines at the front of the anal fin, the second being rather large and thick, over one-half the length of the first soft ray; the spiny portion and the soft portion of the dorsal fin being connected by a low membrane; the lateral line extending about to the end of the tail fin; the absence of teeth on the roof the mouth; the tip of the snout projecting beyond the lower jaw; the short barbel on the tip of the lower jaw. **Color:** Metallic grayish or greenish, with brassy and golden reflections above, shading into bright silvery below; back and sides with many wavy dark lines extending upward and backward following the rows of scales; dorsal fins dark, the others yellow. Attains a length of about 15 inches.

Distribution: Point Conception southward to Port San Bartholome on the coast of Lower California; occasionally found as far north as San Francisco. Usually caught close to the shore, often in the surf of sandy beaches or in sloughs.

Fishing Season: Caught by sportsmen all year round.

Importance: At present writing (1930), it is contrary to the law to catch this species with nets or to buy or sell it. Reserved exclusively for sportsmen, by whom it is considered a desirable species.

Fishing Gear: Caught with hook and line from pleasure piers, boats or barges.

Unauthorized name: Surf fish.

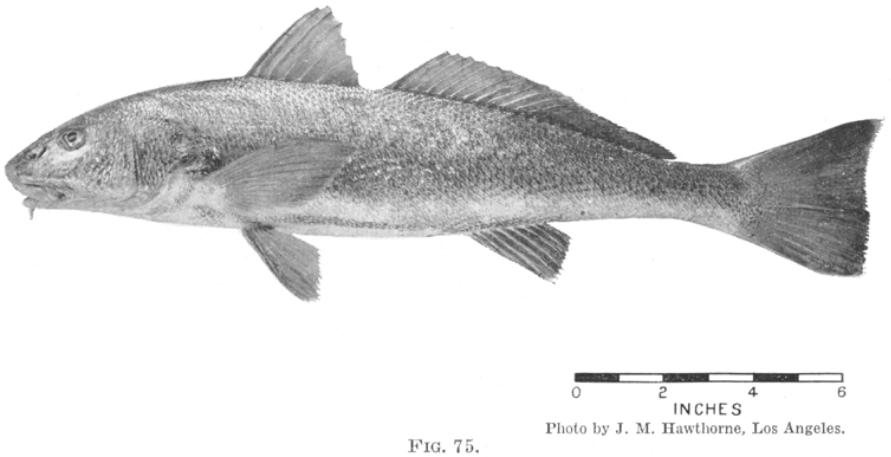


Photo by J. M. Hawthorne, Los Angeles.

FIG. 75.

FIG. 75

CALIFORNIA CORBINA

Menticirrhus undulatus.

Relationship: Belongs to the croaker family (Sciænidae), in which are also classed our yellowfin croaker, spotfin and black croakers, queenfish, kingfish, white sea-bass, and many other close relatives which occur in other parts of the world.

Distinguishing Characters: The single small spine at the front of the anal fin; the 2 dorsal fins being connected by a low membrane; the lateral line extending on to the tail fin; the absence of teeth on the roof of the mouth; the tip of the snout projecting beyond the lower jaw; the short barbel on the tip of the lower jaw; the long, slender body. **Color:** Entirely metallic; steel blue on the back shading into gray on the side and becoming white below; many vague, dark, wavy lines made by dark points in the center of each scale run upward and backward on the back; the back sometimes has faint cross bars; many small black dots are on the lower part of the sides. Attains a length of 18 or 20 inches.

Distribution: Point Conception southward into the Gulf of California. Occasionally found as far north as San Francisco. Usually caught close to the shore in the surf of sandy beaches.

Fishing Season: Caught by sportsmen throughout the year.

Importance: At present writing (1930), it is contrary to the law to catch this species with nets, or to sell or buy it. Reserved exclusively to sportsmen, by whom it is held in rather high esteem.

Fishing Gear: Caught with hook and line from pleasure piers or in the surf of sandy beaches.

Unauthorized names: California whiting, corvina, surf fish.

Photo by J. M. Hawthorne, Los Angeles.

FIG. 76.

FIG. 76

SARGO

Anisotremus davidsoni.

Relationship: Belongs to the grunter family (Hæmulidae), and is the only member of this family inhabiting the waters of California.

Distinguishing Characters: The absence of teeth on the center of the roof of the mouth (vomer); the anal fin having 3 spines and about 10 or 11 soft rays; the dorsal fin having 11 or 12 spines; the deep body; the dark vertical band which extends across the body; the dark spot on and above the base of the pectoral fin; the fine teeth, which are set in bands. **Color:** Entirely silvery metallic; iridescent with a grayish tinge above, plain silvery below; back, head and sides sometimes with vague dark blotches; dark band on body and spot above the base of the pectoral fin as above described; tail fin, soft dorsal and anal fins with a yellowish tinge. Attains a length of over 12 inches.

Distribution: Point Conception southward to Port San Bartholome on the coast of Lower California.

Fishing Season: Caught incidentally during the warm summer and fall months.

Importance: of negligible significance commercially.

Fishing Gear: Taken incidentally with round hauls, and with hook and line.

Unauthorized names: Perch, blue bass, black croaker.

SALT-WATER PERCH

Family Embiotocidae.

Relationship: These fish are not true perches but constitute the viviparous surf fish family (Embiotocidae), the California members of which comprise about 17 salt water and one fresh water species, most of which appear in the commercial catch. The general similarity in appearance of these fish makes some of them unusually difficult to distinguish as separate species. The forms most commonly seen in our markets are presented in the following pages.

Distinguishing Characters: The oval or oblong and compressed body; the absence of teeth on the roof of the mouth (vomer); the 3 spines in the fore part of the anal fin; the dorsal and anal fins not being densely covered with scales; the single, rather long dorsal fin with not more than 11 spines except in the fresh water species. **Color:** Varies according to species; usually silvery; some species striped with red or blue. The young of all the fish of this family are born alive. Range in size from 6 to 18 inches.

Distribution: From Alaska southward to along the coast of Lower California, the distribution differing for individual species. Three species inhabit Japan. Usually occur in bays or in the surf of sandy beaches or in rocky places.

Fishing Season: Taken by commercial fishermen all times of the year except during the closed season. (*See* fish and game laws.)

Importance: of rather minor commercial significance. Sold entirely in the fresh fish markets. Highly esteemed by many anglers.

Fishing Gear: Round haul nets, beach seines, gill nets. Amateur fishermen use hook and line.

Unauthorized names: Perch, surf fish, porgee, pogie, muccar, Chinafish, poci, China pompano.

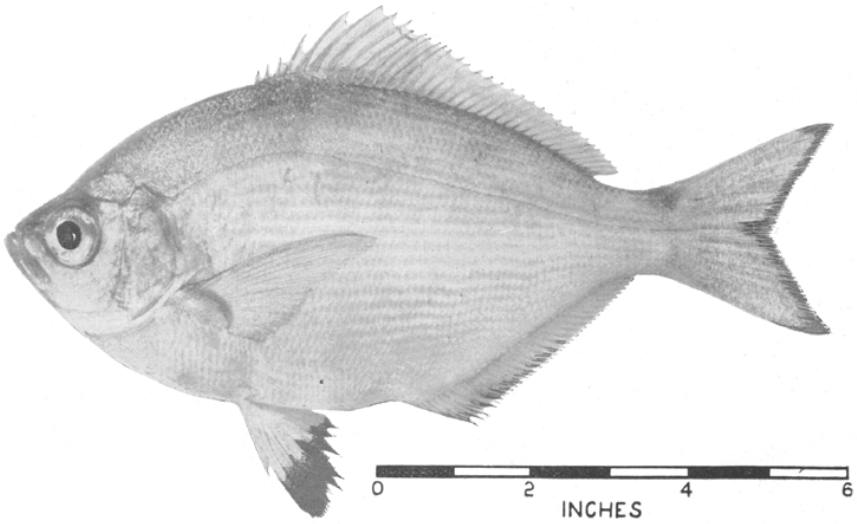


Photo by J. M. Hawthorne, Los Angeles.

FIG. 77.

FIG. 77

WALL-EYED PERCH

Hyperprosopon argenteum.

Relationship: *See* page 100.

Distinguishing Characters: *See* page 100. The mouth when closed being distinctly parallel to the outline of the lower surface of the head; the ventral fins being tipped with black; the very large eye, being about two-fifths the length of the head; the highest spine of the dorsal fin being at least as high as the soft rays. **Color:** Steel bluish above, shading into bright silvery on the sides and below; the sides with faint bars which fade soon after death. Is said to reach a length of about 12 inches.

Distribution: From Oregon and Washington southward into northern Lower California.

Fishing Season: *See* page 100.

Importance: The second most important perch in southern California, according to published records.[7]

Fishing Gear: *See* page 100.

Unauthorized names: Surf fish, silver perch.

[7] Clark, Frances N. Salt water perch in the San Pedro wholesale fish markets, Calif. Fish Game, vol. 16, no. 2, pp. 139–143. 1930.

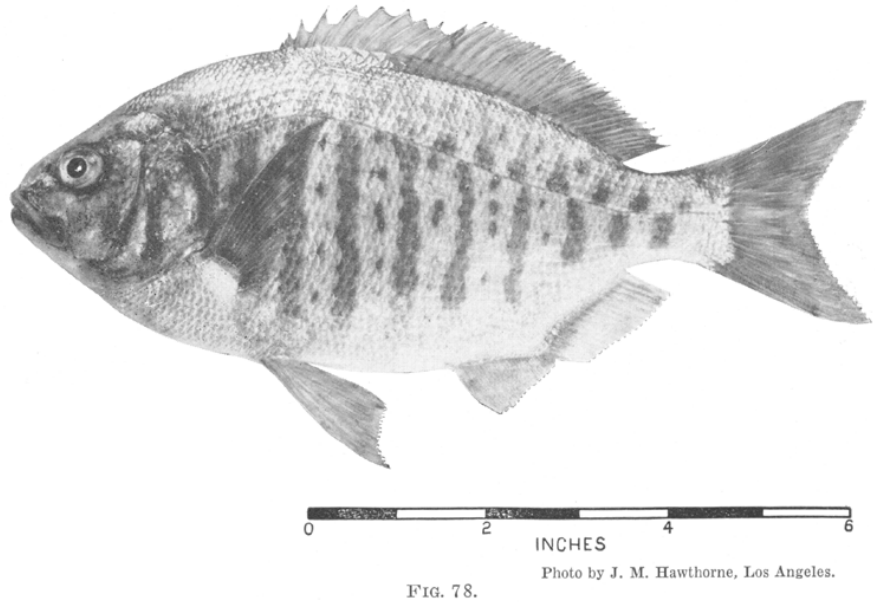


Photo by J. M. Hawthorne, Los Angeles.

FIG. 78.

FIG. 78

BARRED PERCH

Amphistichus argenteus.

Relationship: *See* page 100.

Distinguishing Characters: *See* page 100. The series of brassy vertical bars on the sides, alternating with series of spots; the tail being curved inwardly; the spines of the dorsal fin being at least three-fourths the height of the soft rays. **Color:** Entirely metallic, with a bluish or grayish tinge above, becoming plain silvery on the sides and below, with bars as above described; occasionally specimens are found which are entirely brassy, without spots or bars. Attains a length of 15 inches or more.

Distribution: San Francisco south to San Diego. Occurs in the surf of sandy beaches and in bays.

Fishing Season: *See* page 100.

Importance: Forms a small proportion of the commercial catch of salt-water perch. Rather frequently caught by surf anglers, to whom this species is the most important of the salt-water perches.

Fishing Gear: *See* page 100. Caught incidentally by trawlers while fishing for flounders and soles.

Unauthorized names: Surf perch, silver perch.

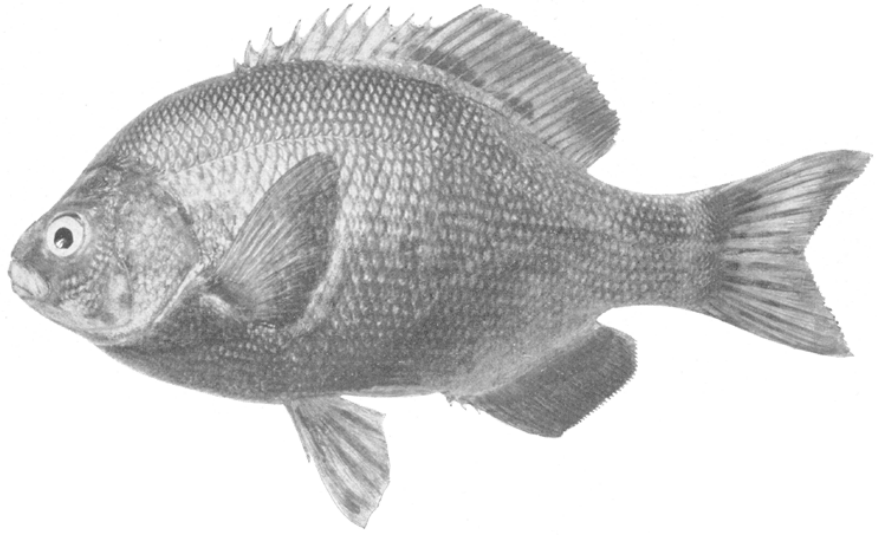


Photo by Lauck, San Francisco.

FIG. 79.

FIG. 79

BLACK PERCH

Embiotoca jacksoni.

Relationship: *See* page 100.

Distinguishing Characters: *See* page 100. The cluster of enlarged scales between the pectoral fin and the ventral fins; the rather thick, reddish brown lips. **Color:** Various shades of brown, the scales tinged with blue above and tipped with very dark brown. Attains a length of about 14 inches.

Distribution: Cerros Island on the coast of Lower California northward as far as Vancouver Island.

Fishing Season: *See* page 100.

Importance: Forms a rather large proportion of the commercial catch of salt-water perch in San Francisco. Less common in the markets of southern California.

Fishing Gear: *See* page 100.

Unauthorized names: Common surf fish, bay perch, pogie.

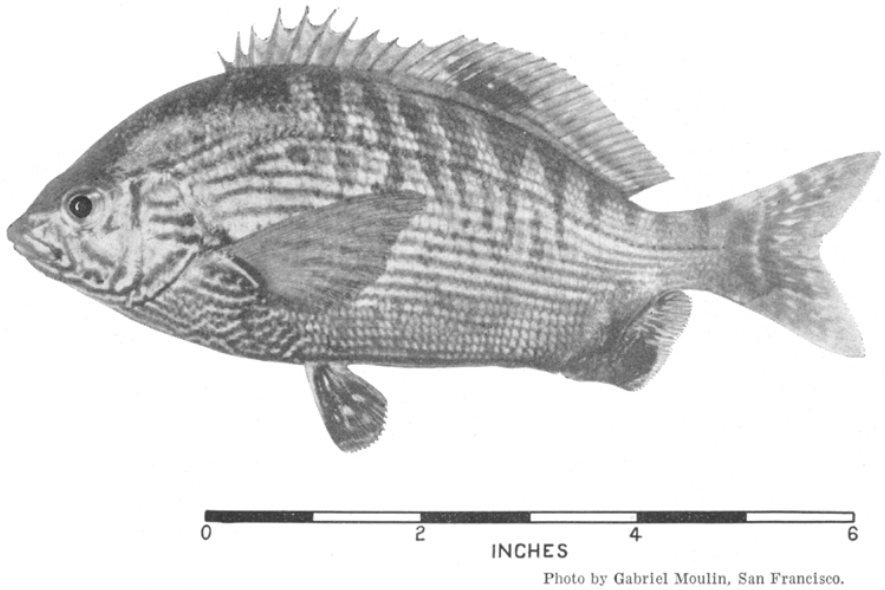


Photo by Gabriel Moulin, San Francisco.

FIG. 80.

FIG. 80

RAINBOW PERCH

Hypsurus caryi.

Relationship: *See* page 100.

Distinguishing Characters: *See* page 100. The long addomen; the higest spine of the dorsal fin being at least three-fourths as high as the first soft ray; the short anal fin having about 24 soft rays; the tail being forked. **Color:** Longitudinally striped with red, orange and blue; the cheeks with irregular streaks of orange and sky blue. The vivid colors fade soon after the fish is taken from the water; ventral fins tipped with blue; pectoral fins reddish; other fins brightly colored. Attains a length of about 12 inches.

Distribution: Occurs along the entire coast of California, but not common south of Point Conception.

Fishing Season: *See* page 100.

Importance: Is commonly seen in the markets of San Francisco, forming a fair proportion of the commercial catch of salt-water perch in that region. Not very common in southern California.

Fishing Gear: *See* page 100.

Unauthorized names: Striped perch, bugara.

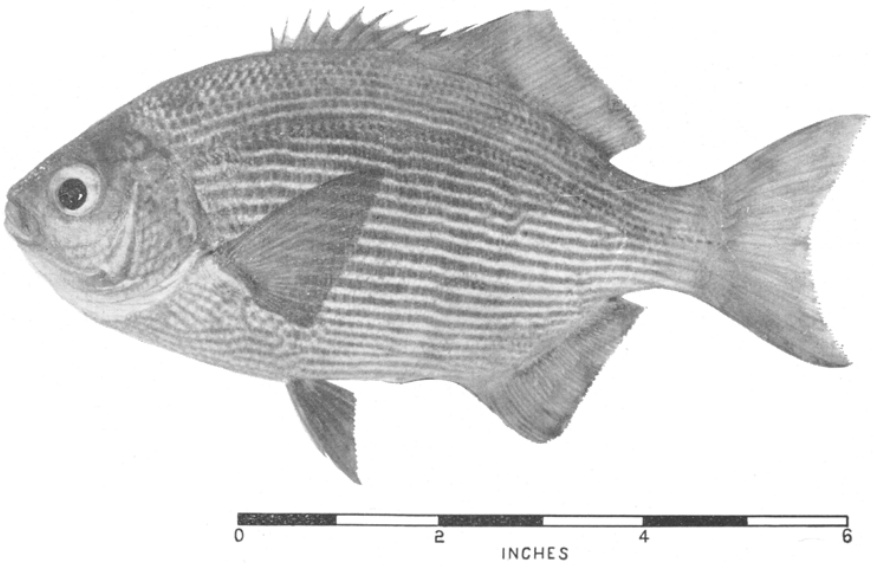


Photo by Gabriel Moulin, San Francisco.

FIG. 81.

FIG. 81

STRIPED PERCH

Tœniotoca lateralis.

Relationship: *See* page 100.

Distinguishing Characters: *See* page 100. The tail being not forked but curved inwardly (lunate); the highest spine of the dorsal fin being scarcely more than one-half the height of the first soft ray; the anal fin having about 31 soft rays. **Color:** Longitudinally striped with dull orange and bluish along the rows of scales, the color being darker on the back and becoming brighter on the sides and below; the colors fade considerably soon after the fish is taken from the water. Attains a length of about 15 inches.

Distribution: Vancouver Island to San Diego. Not common south of Point Conception.

Fishing Season: *See* page 100.

Importance: Forms a fair proportion of the perch catch delivered to the San Francisco markets.

Fishing Gear: *See* page 100.

Unauthorized names: Blue perch, rainbow perch, squawfish, crugnoli.

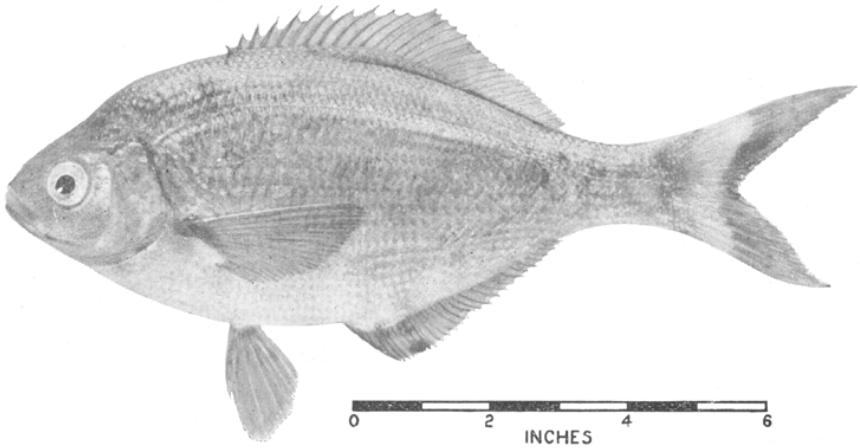


Photo by J. M. Hawthorne, Los Angeles.

FIG. 82.

FIG. 82

PACIFIC WHITE PERCH

Phanerodon furcatus.

Relationship: *See* page 100.

Distinguishing Characters: *See* page 100. The almost horizontal mouth; the absence of distinct bars or series of spots on the sides; the last spine of the dorsal fin being almost as high or higher than the soft rays. **Color:** Entirely silvery, with a dark hue above; the base of the dorsal fin usually with a thin dark streak; ventral fins without black markings. Attains a length of about 12 inches.

Distribution: Vancouver Island southward to San Diego.

Fishing Season: *See* page 100.

Importance: Forms the largest proportion of the commercial salt-water perch catch in southern California, according to published records.

Fishing Gear: *See* page 100.

Unauthorized name: Split-tail perch.

Clark, *op. cit.*

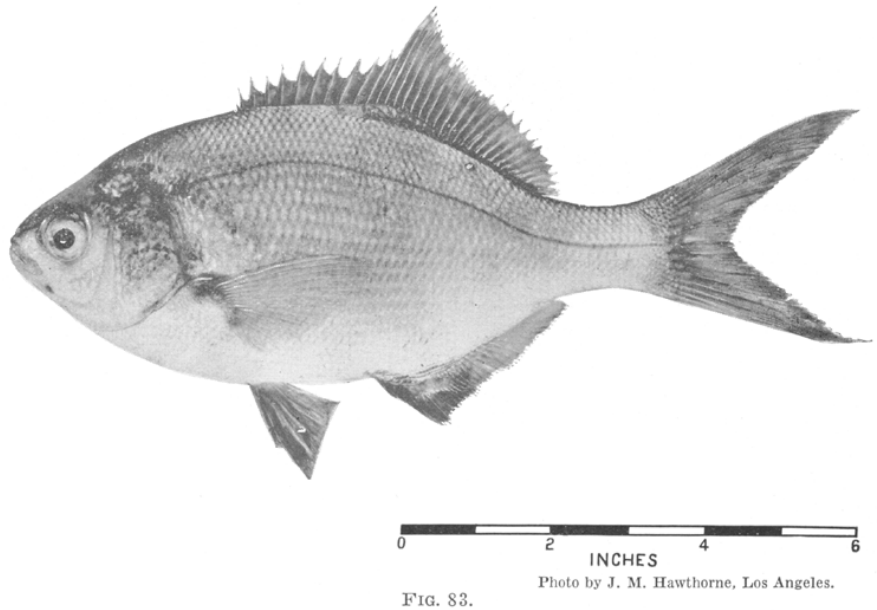


Photo by J. M. Hawthorne, Los Angeles.

FIG. 83.

FIG. 83

FORK-TAIL PERCH

Damalichthys vacca.

Relationship: *See* page 100.

Distinguishing Characters: *See* page 100. The last spine of the dorsal fin being only about one-half the height of the first soft rays; the lips not being exceedingly thick. **Color:** Entirely metallic, the back and sides overlaid with smoky blackish; silvery on the lower part of the sides and below; body sometimes vaguely blotched with black, sometimes almost entirely brownish gray, the scales on the sides being silvery and tipped with brown; some specimens almost entirely silvery, without black or brown; fins dusky. Attains a length of about 15 inches.

Distribution: Vancouver Island to San Diego.

Fishing Season: *See* page 100.

Importance: Forms rather a small proportion of the salt-water perch catch.

Fishing Gear: *See* page 100.

Unauthorized names: White perch, porgee, pile perch, split-tail perch.

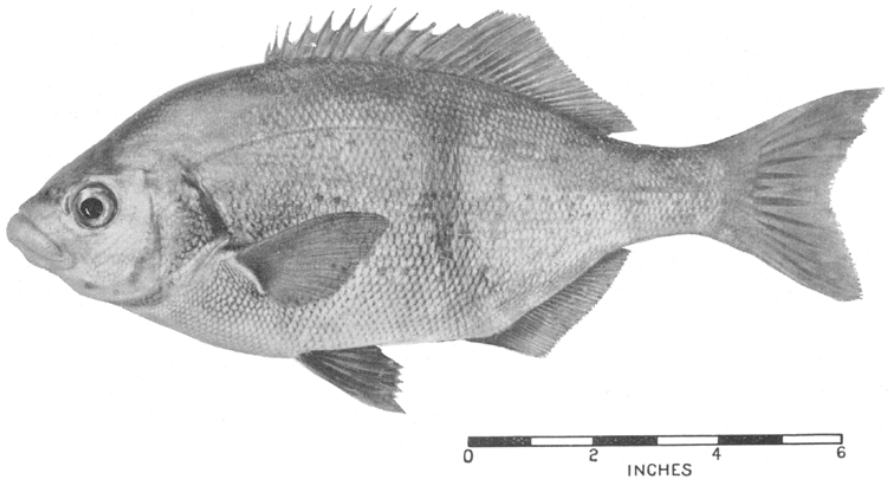


Photo by Gabriel Moulin, San Francisco.

FIG. 84.

FIG. 84

RUBBERLIP PERCH

Rhacochilus toxotes.

Relationship: *See* page 100.

Distinguishing Characters: *See* page 100. The exceedingly thick lips; the last spine of the dorsal fin being only about one-half as high as the soft rays. **Color:** Silvery, the back with a bluish or purplish tinge or overlaid with smoky blackish, the scales sometimes tipped with blackish on the sides and below; pectoral fins yellowish; the ventral, dorsal and anal fins tipped with black or dusky; lips white or pink. Attains a length of about 18 inches.

Distribution: San Francisco to San Diego.

Fishing Season: *See* page 100.

Importance: Forms a rather small proportion of the commercial salt-water perch catch.

Fishing Gear: *See* page 100.

Unauthorized names: Porgee, alfione, pile perch.

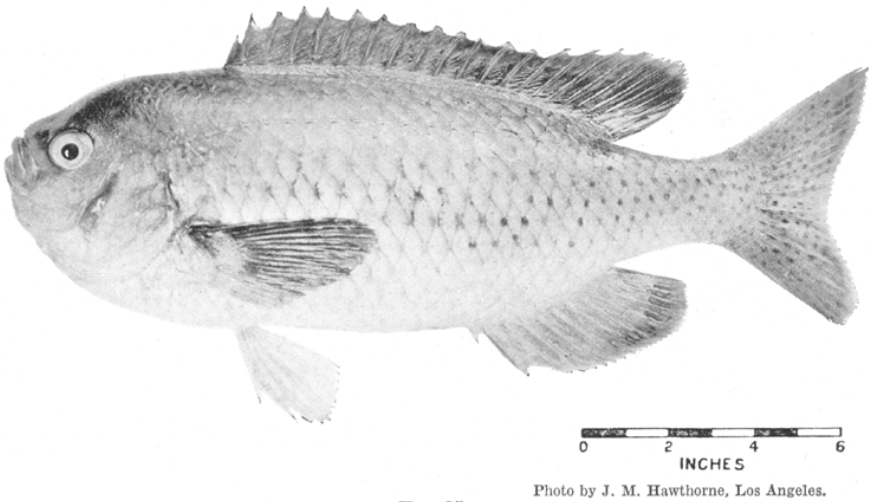


Photo by J. M. Hawthorne, Los Angeles.

FIG. 85.

FIG. 85

BLACKSMITH

Chromis punctipinnis.

Relationship: Belongs to the demoiselle family (Pomacentridae), in which is also classed the garibaldi, a species which is rarely seen in our markets. Several other members of this family occur in the warm seas of America, but no others are found in California.

Distinguishing Characters: The single, rather long dorsal fin having more spines than rays (about 13 spines and only about 11 rays); the absence of teeth on the center on the roof of the mouth (vomer); the presence of 2 spines on the front of the anal fin; the lateral line ending under the soft part of the dorsal fin; the large scales. **Color:** Dark slate above and on the sides, becoming a pewter shade on the underparts, the whole fish being tinged with violet; a series of small dark brown or blackish spots follow the lateral line; the soft portion of the dorsal fin, the base of the tail (caudal peduncle) and tail fin are with similar small spots; fins all dark. Attains a length of over 10 inches.

Distribution: Point Conception to Guadalupe Island on the coast of Lower California. Occurs in the kelp about rocks.

Fishing Season: Not caught in sufficient numbers to have a definite "fishing season."

Importance: of slight commercial significance.

Fishing Gear: Caught incidentally with round haul nets and purse seines. Taken by amateur fishermen with hook and line.

Unauthorized names: Perch, blue perch, kelp perch, rock bass.

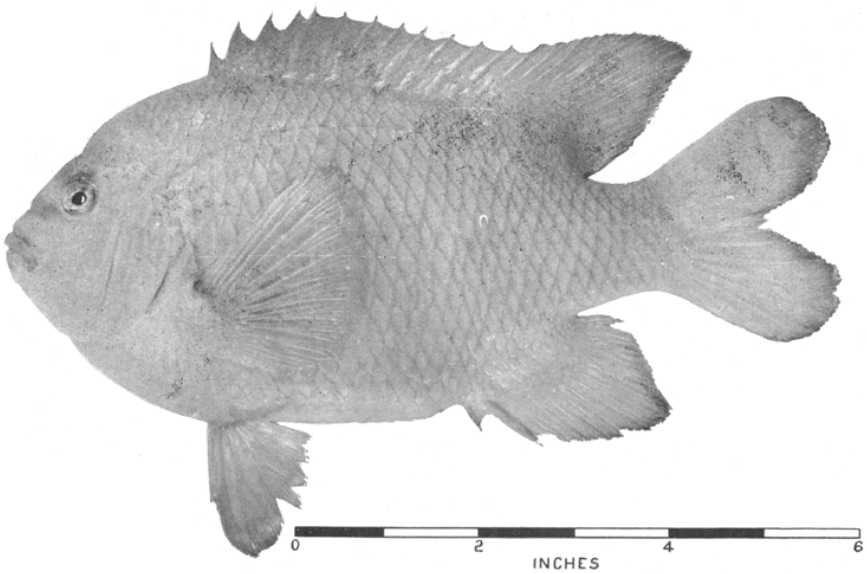


Photo by J. M. Hawthorne, Los Angeles.

FIG. 86.

FIG. 86

GARIBALDI

Hypsypops rubicundus.

Relationship: Belongs to the demoiselle family (Pomacentridae), in which is also classed the blacksmith. Several other species of this family occur in the warm seas of America, but except for the blacksmith, no others are found in California.

Distinguishing Characters: The single dorsal fin with 12 spines and about 16 soft rays; the absence of teeth on the roof of the mouth (vomer and palatines); the anal fin having 2 spines in front; the lateral line ending under the soft part of the dorsal fin. **Color:** Uniform orange; the young with numerous, intensely bright blue markings. Attains a length of about 14 inches.

Distribution: Rocky places from Point Conception southward to Todos Santos Bay.

Fishing Season: Taken irregularly throughout the year, more frequently during the winter months.

Importance: of slight importance commercially or to amateur fishermen, by whom it is taken only occasionally. Probably the most brilliant species in the submarine gardens visited by the glass-bottom boats of Catalina Island.

Fishing Gear: Taken incidentally in round haul nets and with hook and line.

Unauthorized names: Garibaldi perch, ocean goldfish.

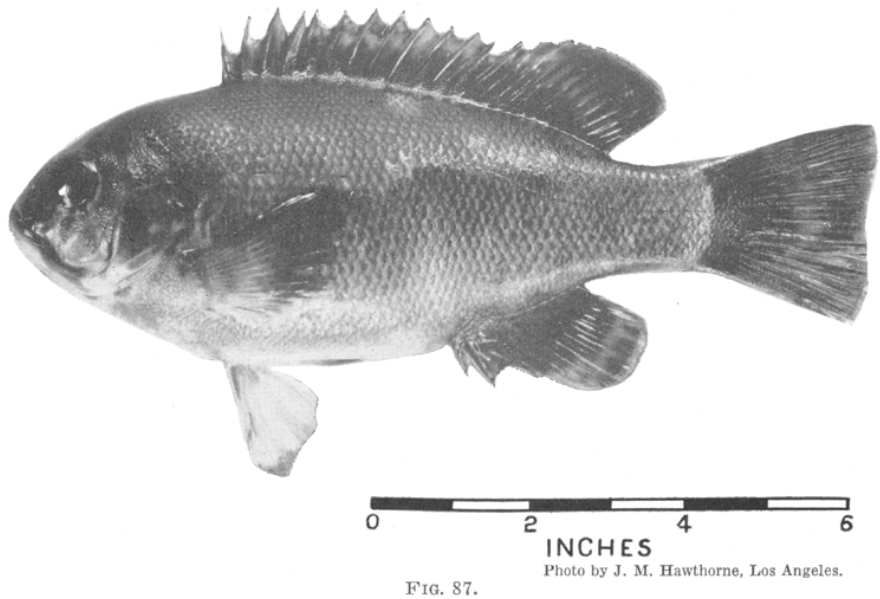


FIG. 87.

FIG. 87

OPAL-EYE

Girella nigricans.

Relationship: Belongs to the rudderfish family (Kyphosidae), in which are also classed the halfmoon and certain tropical fishes which do not occur in our waters.

Distinguishing Characters: The 3 spines on the anal fin; the absence of teeth in the center of the roof of the mouth (there are, however, minute teeth on each side of the roof of the mouth); the teeth in the jaws being in 2 bands, the outer band being narrow, the inner broad; the teeth in the outer band each being divided into 3 points at the tip and freely movable, being attached to the membrane only; the dorsal fin having 13 or 14 spines; the anal fin having about 12 soft rays. **Color:** Olive green, becoming brownish or grayish below; eye opalescent blue; young with a whitish spot on each side of the back. Attains a length of about 17 inches.

Distribution: San Francisco to Cape San Lucas. Found usually close to the shore in rocky places. The young are abundant in tide pools.

Fishing Season: Caught irregularly all year round, mostly during the winter months.

Importance: of slight importance, either commercially or to sport fishermen.

Fishing Gear: Taken incidentally with round haul nets and with hook and line. Caught by amateur fishermen with hook and line, using bits of clam, fish or abalone as bait.

Unauthorized names: Green perch, black perch, blue-eyed perch, blue fish, Catalina perch, button perch, blue bass, greenfish.

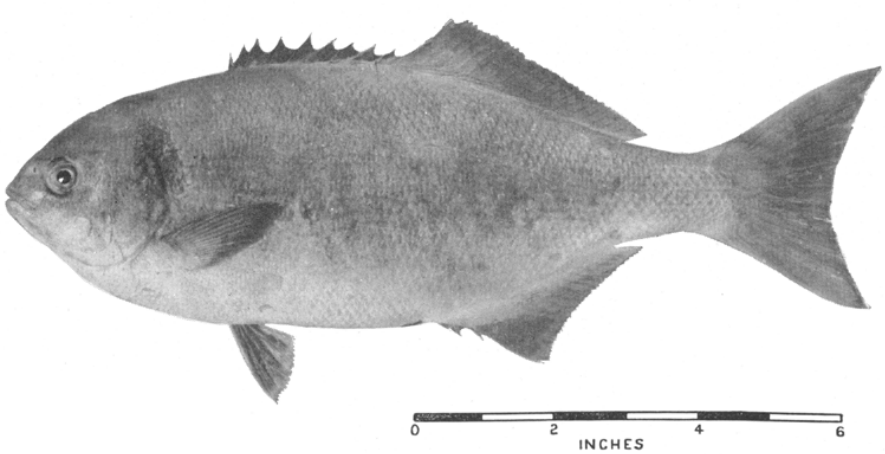


Photo by J. M. Hawthorne, Los Angeles.

FIG. 88.

FIG. 88

HALFMOON

Medialuna californiensis.

Relationship: Belongs to the rudderfish family (Kyphosidae), in which is also classed the opal-eye.

Distinguishing Characters: The 3 spines on the anal fin; the soft portion of the dorsal fin being connected with the spiny portion, the spines being all shorter than the first soft rays; the soft portions of the dorsal and anal fins being so covered with scales that the rays are hidden. **Color:** Slaty black above, with a metallic luster, becoming paler, sometimes mottled below. Attains a length of about 12 inches.

Distribution: Point Conception southward to Cerros Island on the coast of Lower California. Occurs usually in rocky places.

Fishing Season: Not caught in sufficient numbers to have a definite season. Taken irregularly throughout the year.

Importance: Commercially of rather minor importance.

Fishing Gear: Small round haul nets, hook and line. Amateur fishermen take this fish with hook and line.

Unauthorized names: Blue perch, blue bass, medialuna.

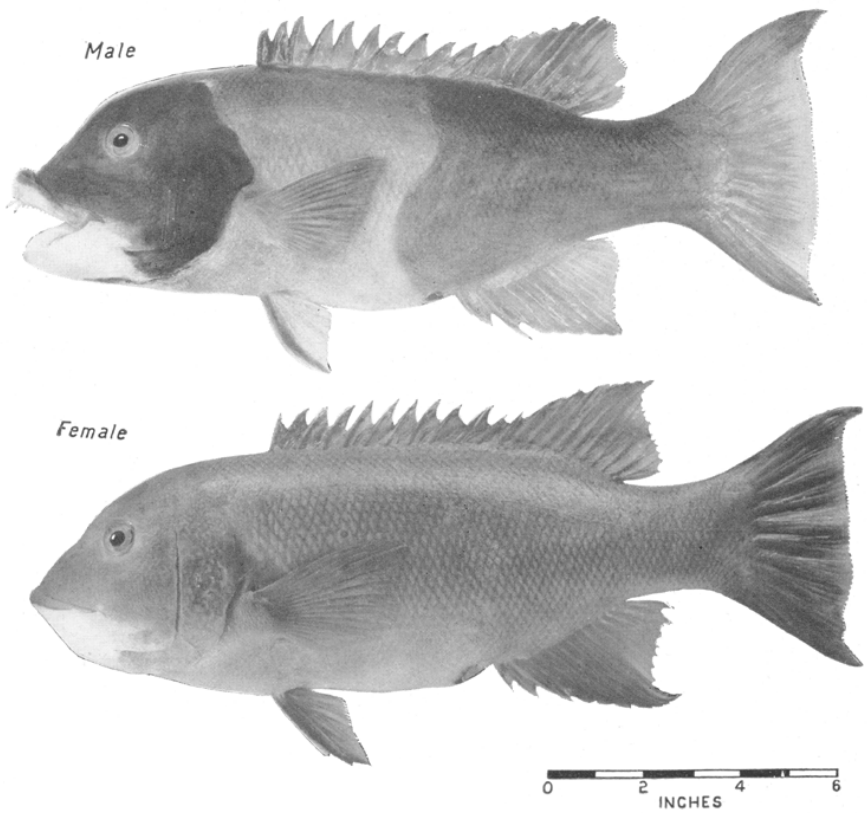


FIG. 89. Photo by J. M. Hawthorne, Los Angeles.

FIG. 89

CALIFORNIA SHEEPSHEAD

Pimelometopon pulcher.

Relationship: Belongs to the wrasse-fish family (Labridae), in which are also classed certain other kelp fish which are found on our coast and which are of insignificant, if any, commercial importance.

Distinguishing Characters: The large and canine-like teeth which slope obliquely forward; the single, rather long dorsal fin, with about 11 or 12 stout spines in front, which are of almost equal length and which are shorter than the soft rays. **Color:** Males—Head, dorsal and anal fins, tail and last half of the body black or purplish black in the adults; lower jaw white; rest of body varying from crimson to blackish with purplish or coppery luster. Females—Dusky rose colored with the black areas more obscure or almost absent, sometimes all black (rare). The young seem to be without contrasting colors, are usually rose or crimson; during the breeding season, the forehead of the male attains a very prominent fatty hump. Attains a weight of about 15 pounds.

Distribution: Point Conception southward into the Gulf of California. Usually caught close to the shore. Largest landings made at Los Angeles.

Fishing Season: Taken all year round with maximum catches during the late fall and early winter months.

Importance: of minor significance commercially. Used extensively as bait by lobster fishermen. often kills and maims lobsters in lobster traps.

Fishing Gear: Hook and line, and incidentally caught in lobster pots.

Unauthorized names: California redfish, fathead, humpy.

ROCKFISH

Sebastodes sp.

Relationship: These fish belong to the rockfish family (Scorpænidae), in which is also classed the sculpin. There are about 54 species of rockfish on the west coast of North America, of which at least 50 occur in California. The general similarity in appearance of these fish makes them unusually difficult to distinguish as separate species. Some of the commoner California kinds are presented in the following pages. The easily recognized species have been given distinctive names, and it is hoped that when the taxonomy of the group has been adequately revised, we will be able to provide names for all these fish.

Distinguishing Characters: The bony support extending back from the lower part of the eye across the cheek just under the skin; the body being covered with scales; the rather long, single dorsal fin with a notch between the spiny portion and the soft portion; the strong, sharp spines on the dorsal and anal fins, 13 spines being on the dorsal and 3 on the anal; the absence of a slit behind the fourth gill. **Color:** Varies according to species; usually warm shades—red, yellow and orange, sometimes brownish or blackish.

Distribution: From at least as far south as the Gulf of California north to Alaska, and southward on the Asiatic side to southern Japan.

Fishing Season: Caught all year round with a peak during the winter and spring months. There are probably different seasons for individual species, but at present writing (1930) these are not known.

Importance: Taken as a group, ranked third in importance among the market fish in the State in 1928. The eighth largest fishery in the State. Sold entirely in the fresh fish markets; not used in canning, drying or salting.

Fishing Gear: Hook and line, set lines, long lines, and hand lines both commercially and by sport fishermen.

Unauthorized names: Rock cod, bluefish, red snapper, gopher, red rock cod, tambor, chucklehead, salmon grouper, grouper, cifulatano, bolina, black snapper, scorpion, cows, Chinafish, pelican, sconeggi, scranni.

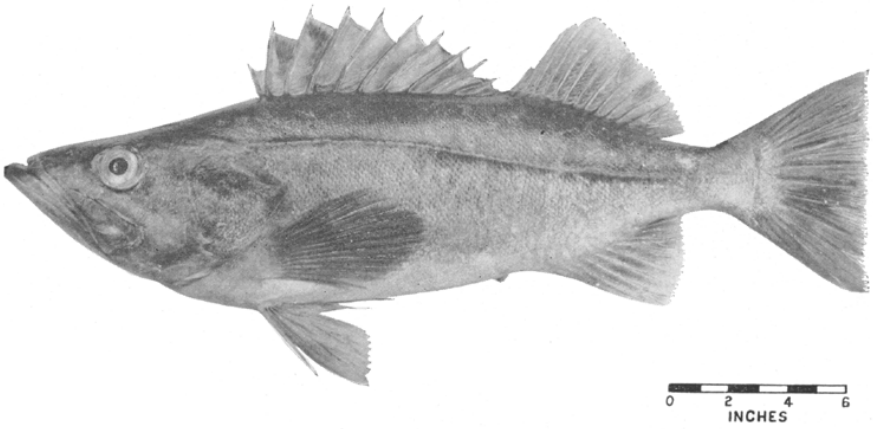


Photo by J. M. Hawthorne, Los Angeles.

FIG. 90.

FIG. 90

BOCACCIO

Sebastodes paucispinis.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being very broad and slightly convex; the absence of spines on the top of the head; the sharp, projecting lower jaw; the rather high anal fin with 9 soft rays and 3 spines. **Color:** Dark brown above, shading into dull orange reddish or pale pink below; everywhere somewhat flushed with red; often with black spots on the body, which may indicate a melanistic tendency.[9] Attains a length of about 30 inches.

Distribution: San Francisco to San Diego, occasionally being found as far north as Washington.

Fishing Season: *See* page 114.

Importance: One of the most important rockfish in the State.

Fishing Gear: *See* page 114.

Unauthorized names: Rock cod, grouper, salmon grouper.

[9] Melanism is an unusual development of black color in the skin—the opposite of albinism.

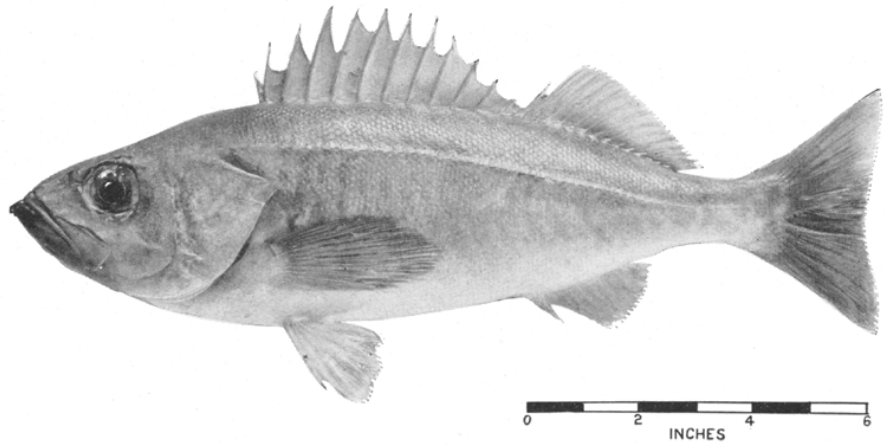


Photo by J. M. Hawthorne, Los Angeles.

FIG. 91.

FIG. 91

CHILI-PEPPER

Sebastodes goodei.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being broad and convex; the absence of spines on the top of the head; the rather slender body; the lower jaw projecting beyond the upper; the anal fin having 3 spines and 8 soft rays, the last spine being about one-half the height of the first soft ray. **Color:** Brick red with a brownish tinge above, shading into pink below; a narrow, clear pink stripe extending the length of the lateral line; lining of the body cavity (peritoneum) white with small, scattered black dots. Attains a length of about 18 inches.

Distribution: San Francisco to San Diego. More commonly seen in southern California than northward.

Fishing Season: *See* page 114.

Importance: The second most important species of rockfish in southern California, according to records on file at the California State Fisheries Laboratory.

Fishing Gear: *See* page 114.

Unauthorized name: Red rock cod.

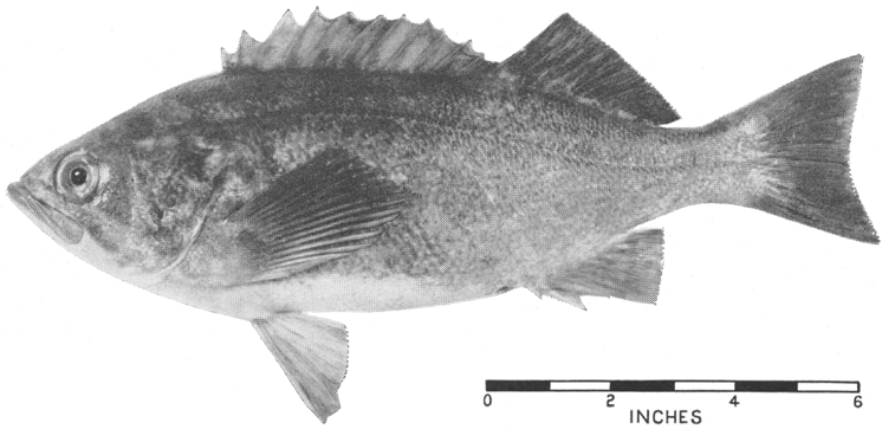


Photo by Lauck, San Francisco.

FIG. 92.

FIG. 92

BLACK ROCKFISH

Sebastodes mystinus.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being broad and convex; the absence of spines on top of the head; the low dorsal spines being not higher than the soft rays; the anal fin usually having 9 soft rays. **Color:** Slaty black, becoming paler below and white on the belly; back and sides often vaguely blotched with darker and lighter shades; fins all blackish; lining of body cavity (peritoneum) black. Attains a length of over 20 inches.

Distribution: San Diego northward to Puget Sound, but not common south of Point Conception. Usually caught in rather shallow water.

Fishing Season: *See* page 114.

Importance: One of the most important of the rockfishes of northern California. Forms a large part of the rockfishes in the markets of San Francisco and Monterey.

Fishing Gear: *See* page 114.

Unauthorized names: Bluefish, priestfish, black rock cod, blue perch, nervi, black snapper, black bass, neri.

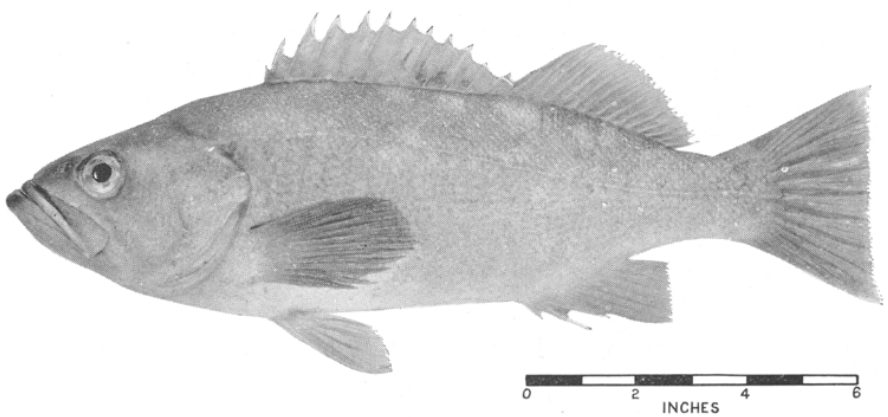


Photo by J. M. Hawthorne, Los Angeles.

FIG. 93.

FIG. 93

YELLOW-TAILED ROCKFISH

Sebastodes flavidus.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being convex and without spines; the anal fin having 3 spines and 9 soft rays; the lining of the body cavity (peritoneum) being white; the pectoral fins reaching to the tips of the ventrals, but not quite to the vent; the fins, especially the tail fin being deep yellowish overlaid with dusky. **Color:** Grayish brown above, becoming gray on the sides and white below; back vaguely mottled and spotted with gray or yellowish. Attains a length of about 24 inches.

Distribution: San Diego to Cape Flattery.

Fishing Season: *See* page 114.

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

Fishing Gear: *See* page 114.

Unauthorized names: Yellowtail, rock cod, gialota.

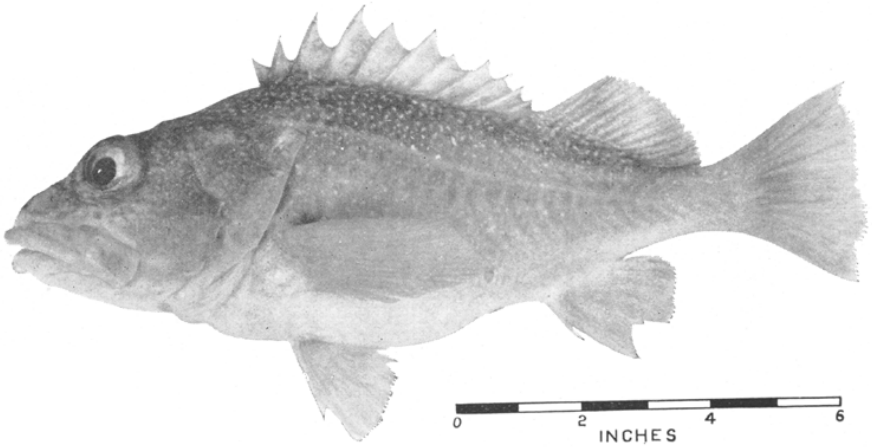


Photo by J. M. Hawthorne, Los Angeles.

FIG. 94.

FIG. 94

STARRY ROCKFISH

Sebastodes constellatus.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The body being covered with many small, white spots, and having 3 larger white spots as shown in the picture. **Color:** Orange or vermillion, shading into yellowish on the sides and becoming white or pink on the underparts; back sometimes overlaid with blotches of brownish; spots as described above. Attains a length of about 15 inches.

Distribution: San Francisco to San Diego. Said to be taken usually in rather deep water.

Fishing Season: *See* page 114.

Importance: Forms rather a small proportion of the rockfish catch, although it is commonly seen in the markets of southern California.

Fishing Gear. *See* page 114.

Unauthorized names: Spotted rockfish, rock cod.

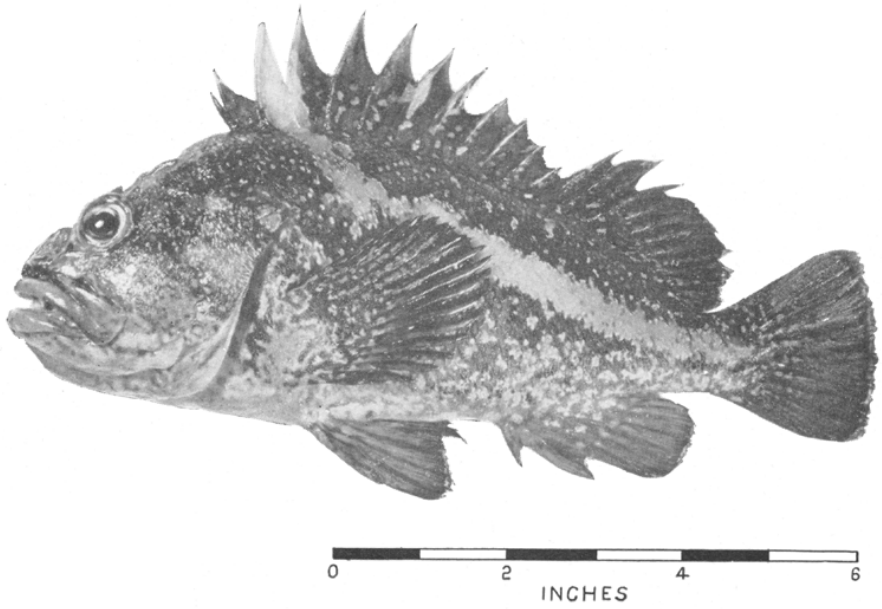


Photo by Lauck, San Francisco.

FIG. 95.

FIG. 95

CHINA ROCKFISH

Sebastodes nebulosus.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being narrow and concave; the presence of 5 pairs of strong spines on top of the head; the broad, irregular, yellow band which follows the lateral line and joins a yellow bar which extends down obliquely from the membrane between the third and fourth dorsal spines. **Color:** Blackish or yellow overlaid with smoky black and everywhere speckled with yellowish or whitish spots which are sometimes tinged with blue; underparts yellow; a yellow band along the lateral line as above described. Attains a length of about 12 inches.

Distribution: Vancouver Island to Point Conception. Caught in rather deep water.

Fishing Season: *See* page 114.

Importance: Commonly seen in the markets of San Francisco, but not in large numbers. Commands a good price because highly prized by Chinese.

Fishing Gear: *See* page 114.

Unauthorized names: Cifulatano, black and yellow rock cod, gopher.

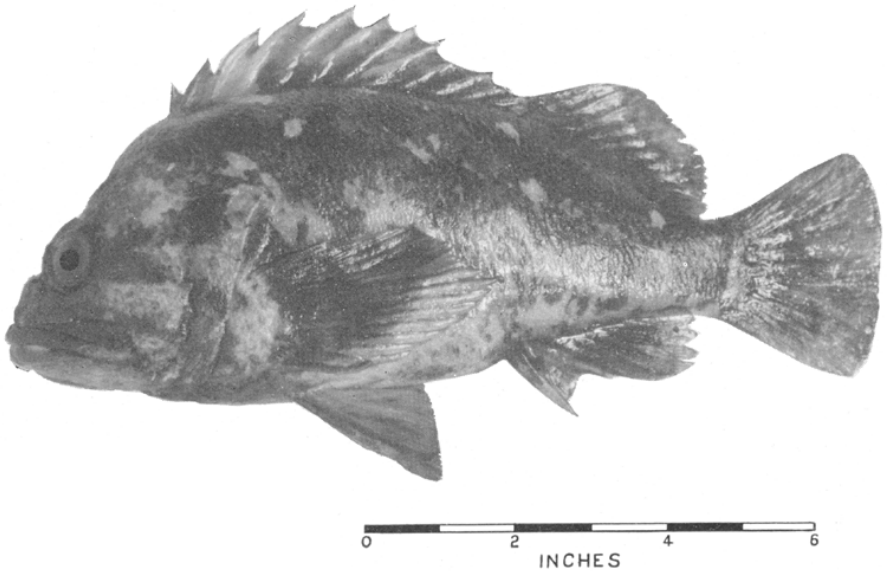


Photo by Gabriel Moulin, San Francisco.

FIG. 96.

FIG. 96

BLACK AND YELLOW ROCKFISH

Sebastodes chrysomelas.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being concave; the 5 pairs of strong spines on top of the head, 1 pair being above the nostrils, 2 pairs above the eyes, and 2 pairs back of the eyes; the lower jaw not projecting; the broad pectoral fin with thick rays. **Color:** Slaty black or dark brown above, with a yellowish tinge, becoming yellow below; membrane between the third and fourth spines yellow; a yellow or orange blotch occurring under this membrane, under the membrane between the seventh and eighth spines, below the junction between the spines and the soft dorsal, and under the end of the soft dorsal; pectoral and ventral fins yellow, the latter tipped with black. Obscure dark stripes radiate from the eye. Attains a length of about 15 inches.

Distribution: San Diego northward to Puget Sound; not common south of Monterey.

Fishing Season: *See* page 114.

Importance: One of the most highly esteemed of the rockfishes of northern and central California. Apparently not taken in large numbers.

Fishing Gear: *See* page 114.

Unauthorized names: Rock cod, cifulatano, gopher.

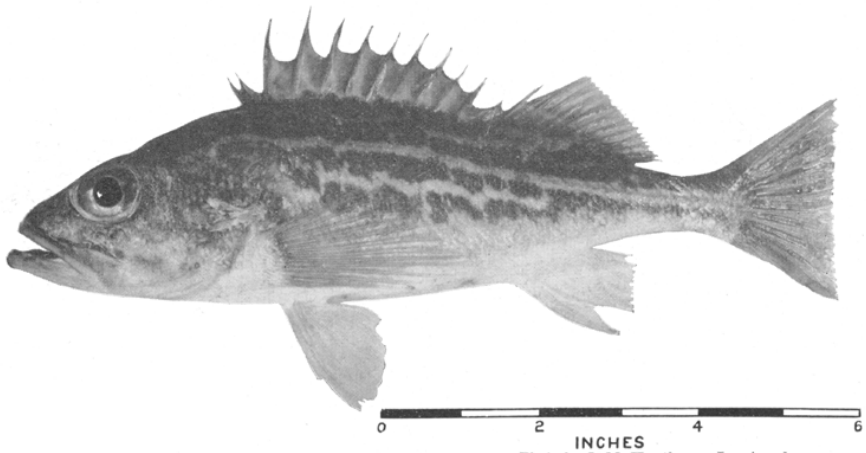


Photo by J. M. Hawthorne, Los Angeles.

FIG. 97.

FIG. 97

STRIPED ROCKFISH

Sebastodes elongatus.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being narrow and concave; the slender body; the presence of 3 pairs of spines on top of the head; the 4 horizontal, irregular, bright green bands which run the length of the body and join to form 2 bands near the tail. **Color:** Pink, becoming white on the undersurface; a pale pink stripe extending along the lateral line; green bands as above described. Attains a length of about 12 inches.

Distribution: Puget Sound southward to Lower California.

Fishing Season: *See* page 114.

Importance: Forms rather a small proportion of the rockfish catch, although it is commonly seen in the markets of southern California.

Fishing Gear: *See* page 114.

Unauthorized name: Red rock cod.

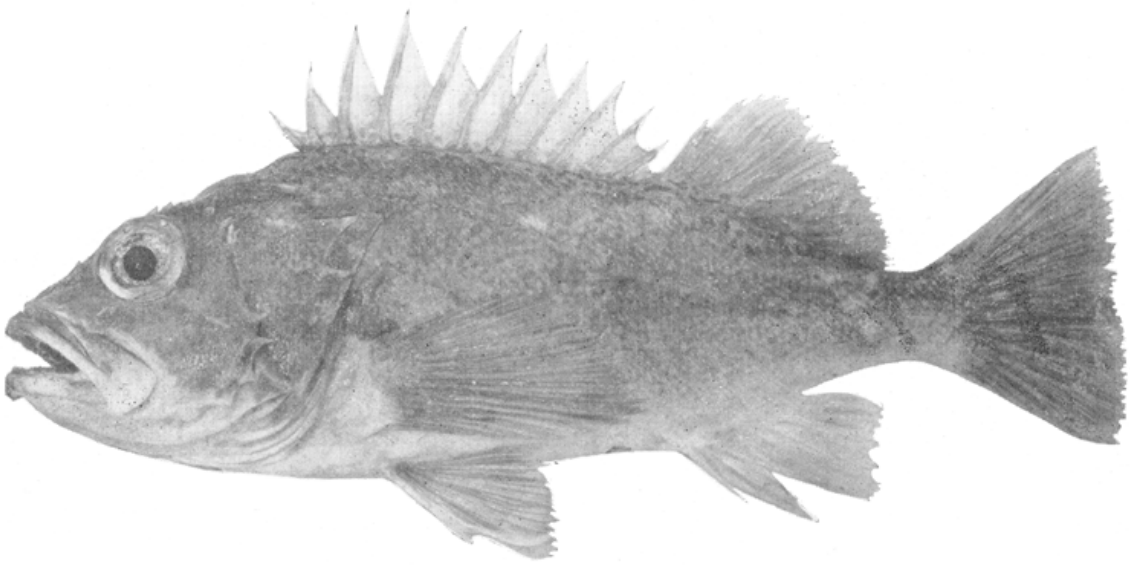


Photo by J. M. Hawthorne, Los Angeles.

FIG. 98.

GREEN-SPOTTED ROCKFISH
Sebastodeschlorostictus.

Relationship: See page 114.

Distinguishing Characters: See page 114. The irregular spots of yellowish green which mottle the back; the space between the eyes being rather broad and slightly concave; the presence of 6 pairs of spines on top of the head, 1 pair being well back of the eyes; the lower jaw having a knob at its tip and not projecting beyond the upper jaw. **Color:** Flesh pink vaguely mottled with rose color above, becoming pink or whitish below; spots on the back as above described; 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; back sometimes with 4 pink roundish spots of various degrees of distinctness. Attains a length of about 15 inches.

Distribution: San Francisco to San Diego. Said to be taken usually in rather deep water.

Fishing Season: See page 114.

Importance: Commonly seen in the markets, but not in large numbers.

Fishing Gear: See page 114.

Unauthorized names: Red rock cod, bolina, chucklehead, cernie.

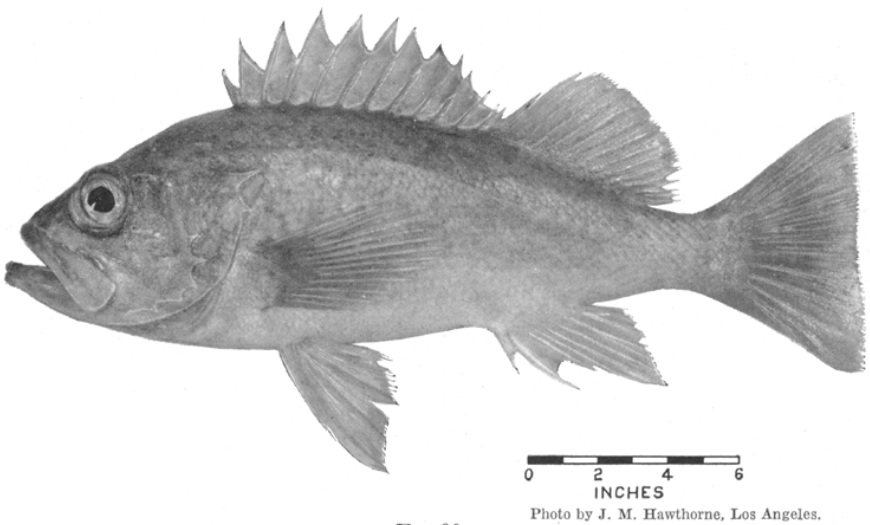


Photo by J. M. Hawthorne, Los Angeles.

FIG. 99.

FIG. 99

ROCKFISH

Sebastodes miniatus.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being slightly concave, with 3 pairs of low spines above the eyes followed by 1 pair back of the eyes on top of the head; the lower jaw projecting only slightly, with a knob at the tip; the rough scales on the lower jaw. **Color:** Mottled above with irregular areas of vermillion, flesh color and dark gray, shading into flesh color below; fins vermillion, the dorsal fin being gray at the base; lining of the mouth red; lining of the body cavity (peritoneum) white. Attains a length of about 24 inches.

Distribution: San Francisco to San Diego.

Fishing Season: *See* page 114.

Importance: The most important species of rockfish in southern California according to records on file at the California State Fisheries Laboratory.

Fishing Gear: *See* page 114.

Unauthorized names: Red rock cod, salmon grouper, red snapper.

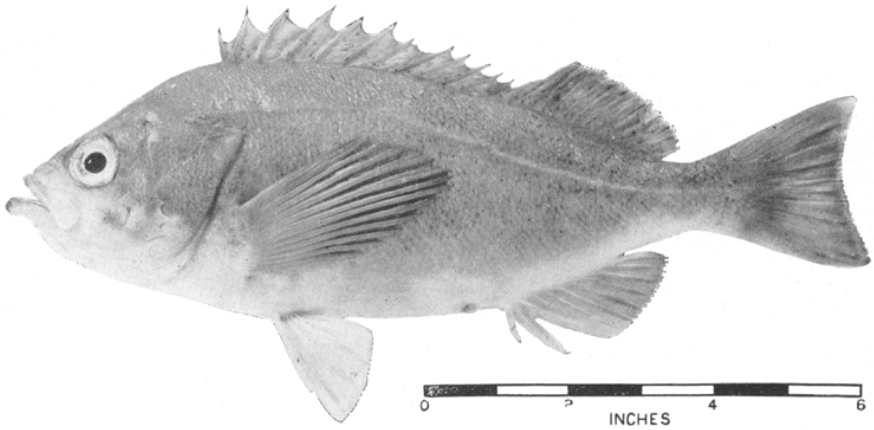


Photo by J. M. Hawthorne, Los Angeles.

FIG. 100.

FIG. 100

ROCKFISH

Sebastodes ovalis.

Relationship: *See* page 114.

Distinguishing Characters: *See* page 114. The space between the eyes being rather wide and slightly convex; the presence of 5 pairs of low spines on top of the head, the first pair near the nostrils, 3 pairs above the eyes, and 1 pair back of the eyes on top of the head; the spines near the nostrils being rather strong, the others low, weak, and difficult to see; the lower jaw projecting beyond the tip of the upper; the second spine of the anal fin being longer than the third spine; the lining of the body cavity being black. **Color:** Grayish olive, becoming whitish on the underparts; everywhere tinged with reddish or pink, especially below; back, sides and membrane of the dorsal fin covered with many small, round, black spots. Attains a length of about 14 inches.

Distribution: San Diego to San Francisco. Said to occur in rather deep water.

Fishing Season: *See* page 114.

Importance: One of the five or six most important of the rockfishes seen in our markets.

Fishing Gear: *See* page 114.

Unauthorized name: Widowfish.

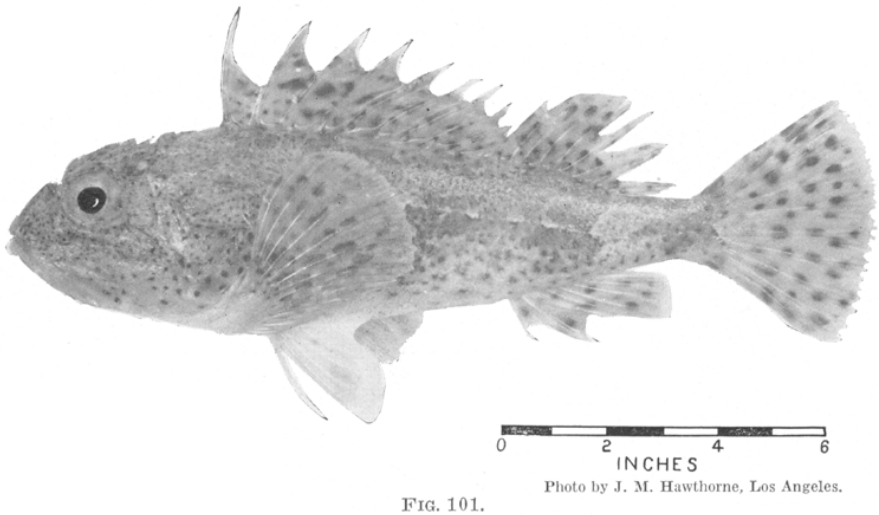


Photo by J. M. Hawthorne, Los Angeles.

FIG. 101.

FIG. 101

SCULPIN

Scorpœna guttata.

Relationship: Not a true sculpin, but belongs to the rockfish family (Scorpænidae), in which are also classed the rockfish (Sebastodes). For a description of a true sculpin, *see* cabezone.

Distinguishing Characters: The bony support which extends back from the lower part of the eye across the cheek just under the skin; the absence of a slit behind the fourth gill; the body being uniformly covered with scales; the dorsal fin having 12 sharp spines in front; the many spines on the top of the head and on the opercle; the tail fin being rounded on the end; the anal fin having 3 stout spines and about 5 soft rays. **Color:** Back and sides mottled with reddish brown and gray and covered with many small round reddish brown and dark brown spots; underparts bright pink, the belly without spots; chin and throat with white or pink markings; ventral fins pinkish, without spots. Attains a length of about 17 inches.

Distribution: Monterey southward into the Gulf of California. Very common in bays and about beach piers and along rocky shore lines.

Fishing Season: Caught all year round with no consistent period of largest catch.

Importance: Commercially of minor significance. Sold entirely in the fresh fish markets. Rather highly esteemed by anglers.

Fishing Gear: Hook and line, set lines. Caught with hook and line by sport fishermen off breakwaters, pleasure piers, barges.

Unauthorized names: Scorpion, bullhead.

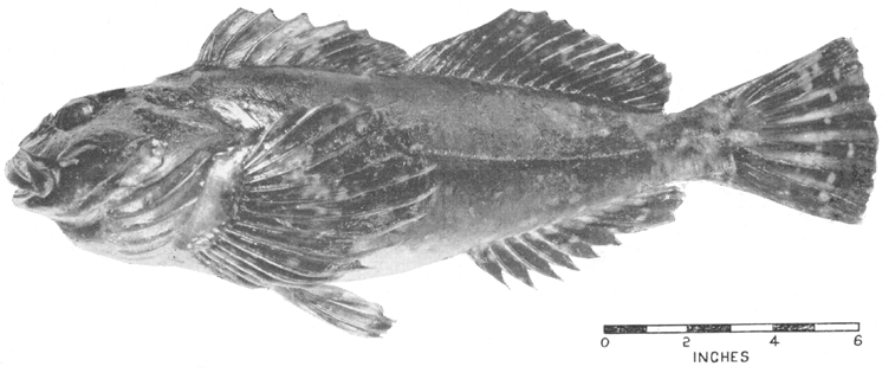


Photo by J. M. Hawthorne, Los Angeles.

FIG. 102.

FIG. 102

CABEZONE

Scorpœnichthys marmoratus.

Relationship: Belongs to the sculpin family (Cottidae), in which are classed several smaller species which are found on our coast, none of which are of commercial significance. Some of these smaller forms are used as bait, but are rarely used as food because of their size.

Distinguishing Characters: The presence of a broad, bony support extending from the lower part of the eye across the cheek just under the skin; the absence of scales on the body; the skin having a wrinkled appearance; the anal fin being without spines but composed of thick, soft rays; the presence of a fleshy flap on the middle of the snout and a pair of longer ones just back of the eyes; the stout spine just before the eye; the broad mouth with many small, sharp teeth; the presence of about 11 spines on the dorsal fin. **Color:** Extremely variable; dark brown, reddish or green above, becoming paler below and turquoise green or whitish on the belly; vaguely mottled and blotched with darker and paler shades; often everywhere sparsely spotted with yellowish or reddish; lining of mouth and flesh a translucent turquoise green. Attains a weight of 20 to 25 pounds.

Distribution: Puget Sound to San Diego.

Fishing Season: Caught irregularly throughout the year.

Importance: of negligible commercial significance. Highly esteemed by many anglers. Although the flesh is of excellent quality the roe is said to be poisonous.

Fishing Gear: Hook and line.

Unauthorized names: Bullhead, blue cod, sculpin.

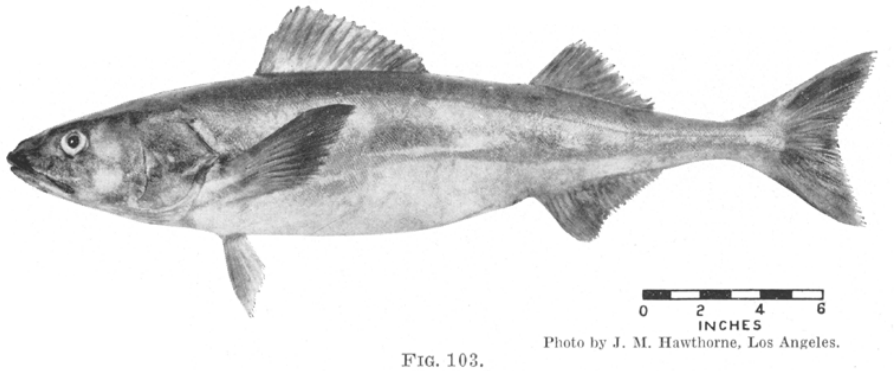


Photo by J. M. Hawthorne, Los Angeles.

FIG. 103.

FIG. 103

SABLEFISH

Anoplopoma fimbria

Relationship: Belongs to the skilfish family (Anoplopomatidae), of which there is only one other species and genus in the waters of our coast and that one extremely rare in California.

Distinguishing Characters: The bony support which extends from the lower part of the eye across the cheek just under the skin; the presence of a slit behind the fourth gill; the 2 separate dorsal fins, the first being composed entirely of spines, the second of soft rays; the very narrow maxillary bone slipping partly under the cheek bone when the mouth is closed; the 2 pairs of nostrils (instead of one pair). **Color:** Blackish, dark gray or greenish gray on the back and sides, becoming paler below and on the underparts; lining of body cavity (peritoneum) blackish. Attains a length of over 3 feet.

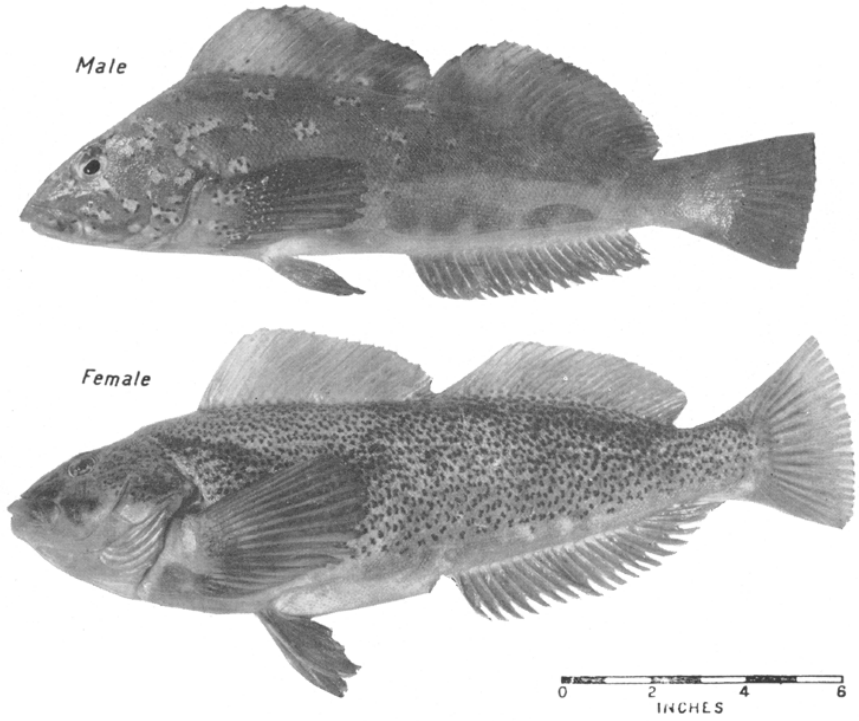
Distribution: Southern California to Alaska, with largest California landings at San Francisco.

Fishing Season: Caught all year round with the smallest monthly catches during the winter months.

Importance: In 1928 ranked twelfth among the market fishes caught in northern California. About one-tenth of the total catch is smoked, the rest sold in the fresh fish markets.

Fishing Gear: Long lines, hook and line, set lines.

Unauthorized names: Coal fish, skilfish, black cod, butterfish, candlefish, blue cod, bluefish, coal cod.



Upper photo by Lauck; lower by Gabriel Moulin, San Francisco.

FIG. 104.

FIG. 104

CALIFORNIA SEA-TROUT

Hexagrammos decagrammus.

Relationship: Not a trout, but belongs to the greenling family (Hexagrammidae), to which also belongs the Pacific cultus. Two other species of sea-trout of the same genus as this fish occur in California. For a description of a true trout, *see* page 58.

Distinguishing Characters: The bony support which extends back from the lower fore part of the eye across the cheek just under the skin; the long dorsal fin with about 21 spines; the absence of canine teeth in the mouth; the 5 lateral lines. **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; lips with bluish spots; back and sides sometimes with small blue spots; back, sides and head of the females rather closely and uniformly covered with round, reddish brown spots. Attains a length of about 18 inches.

Distribution: Kodiak Island to Point Conception, the largest California landings being made at San Francisco.

Fishing Season: Probably taken throughout the year, but not in sufficient quantities to have a "season."

Importance: Commercially a fish of very minor significance. Considered a rather desirable catch by anglers.

Fishing Gear: Hook and line, set lines, long lines, paranzella trawls. Sportsmen use hook and line with bits of fish or claims as bait.

Unauthorized names: Rock trout, rockfish, greenling, bluefish.

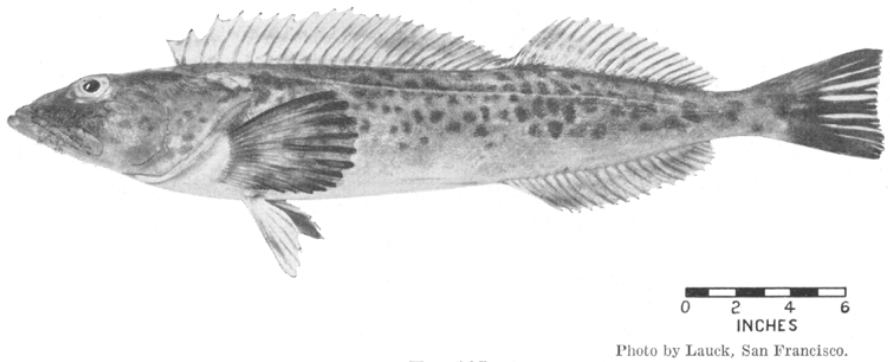


Photo by Lauck, San Francisco.

FIG. 105.

FIG. 105

PACIFIC CULTUS

Ophiodon elongatus.

Relationship: Belongs to the greenling family (Hexagrammidae), in which is also classed the sea-trout.

Distinguishing Characters: The bony support which extends back from the lower part of the eye across the cheek just under the skin; the long, single dorsal fin with about 25 spines; the large, canine-like teeth; the single lateral line. **Color:** Extremely variable; dark brown or bluish black above, becoming a turquoise green on the lower part of the sides and underparts; *or* pale brown, tan or gray above, becoming whitish on the sides and below; back and sides more or less mottled with darker shades and covered with many small, rusty brown or yellowish spots; flesh a turquoise green in the dark specimens. Attains a length of about 4 feet and a weight of about 40 pounds.

Distribution: Sitka, Alaska, to Point Conception and occasionally southward. Largest California landings made in San Francisco.

Fishing Season: Caught throughout the year, generally with heaviest catch from February to April and from August to October.

Importance: About the fourteenth most important species in the fresh fish markets of northern and central California in 1928. Not used commercially for canning, smoking or drying, being entirely sold in the fresh fish markets. Held in esteem by sportsmen.

Fishing Gear: Hook and line, set lines, long lines, paranzella trawls. Caught by sportsmen from rocky shores with hook and line and with bits of clam or fish as bait.

Unauthorized names: Cultus cod, greenling, ling cod, cod, blue cod, bluefish, white cod, buffalo cod, leopard cod, codfish, green cod, bocalao, card, testoni.

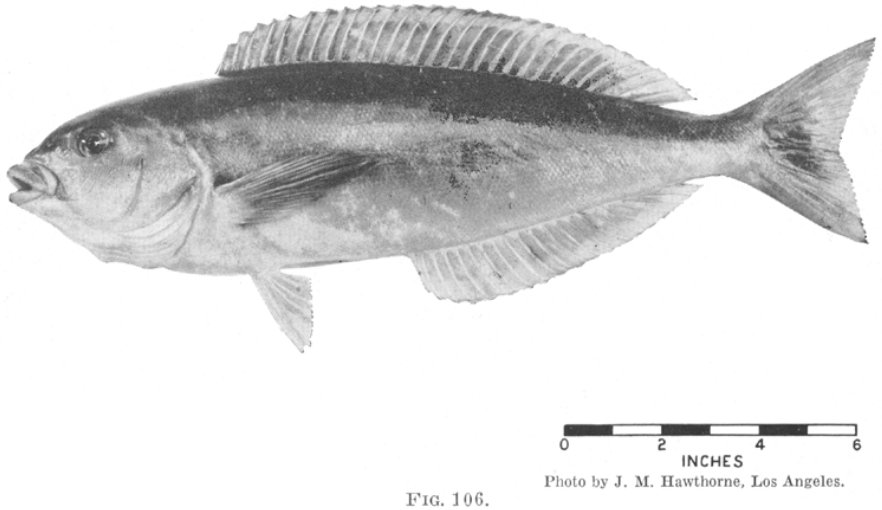


Photo by J. M. Hawthorne, Los Angeles.

FIG. 106.

FIG. 106

OCEAN WHITEFISH

Caulolatilus princeps.

Relationship: Not a true whitefish nor a close relative of the whitefish of the High Sierras or the Great Lakes (Rocky Mountain whitefish, *see* page 55), but belongs to the blanquillo family (Malacanthidae), of which there is no other member recorded on the Pacific coast of North America.

Distinguishing Characters: The long, rather even dorsal fin without a notch between the spines and rays; the long, rather even anal fin with 2 spines in front; the absence of teeth on the roof of the mouth. **Color:** Warm brown above and on the sides, shading into paler below; fins tinged with yellowish or greenish; pectoral fins blue with a yellowish streak in the center. Attains a length of about 40 inches.

Distribution: Monterey south to the Galapagos Islands; not common north of Point Conception. Usually taken near the rocky islands off the coast. Largest California landings made at Los Angeles.

Fishing Season: Caught all year round with no consistent period of maximum landings.

Importance: of rather minor commercial significance. Sold entirely in the fresh fish markets.

Fishing Gear: Taken principally by rockfish fishermen on rockfish gear. Amateur fishermen catch these fish with hook and line from pleasure boats and barges.

Unauthorized name: Blanquillo.

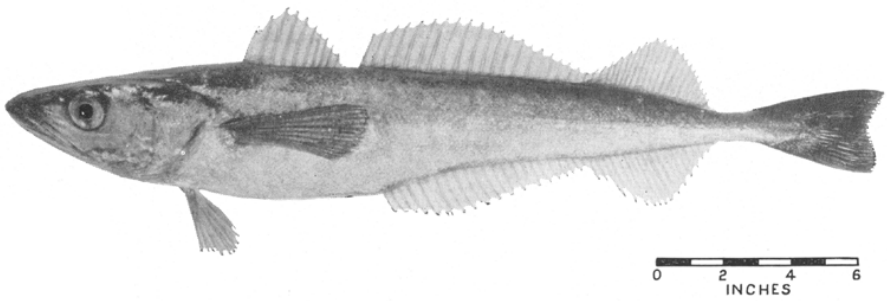


Photo by Lauck, San Francisco.

FIG. 107.

FIG. 107

HAKE

Merluccius productus.

Relationship: Belongs to the hake family (Merlucciidae), of which there are no other members on our coast.

Distinguishing Characters: The ventral fins having 7 rays; the 2 separate dorsal fins, the first being short and composed of spines, the second long and with a deep notch toward the tail end; the similarity between the second dorsal fin and the anal fin; the rather large scales which easily come off; the body tapering down to a thin caudal peduncle. **Color:** Entirely metallic; blackish or iron gray above, shading into silvery below; lining of mouth black. Attains a length of about 3 feet.

Distribution: Puget Sound to southern California, the largest California landings being made at San Francisco and Santa Cruz.

Fishing Season: Caught throughout the year with largest total landings between May and August.

Importance: of minor significance commercially. Sold only in the fresh fish markets; not canned, cured or dried.

Fishing Gear: Paranzella trawls, hook and line, gill nets.

Unauthorized names: Whitefish, haddock, butterfish, mellusa, meluzette.

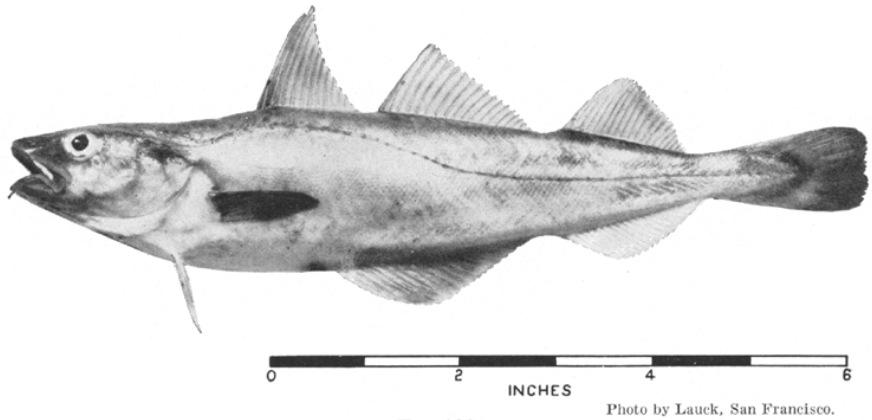


FIG. 108.

FIG. 108

TOMCOD

Microgadus proximus.

Relationship: Is the only species of the codfish family (Gadidae) caught commercially on the California coast. The larger codfish of northern seas, the pollack and the haddock, are all more or less close relatives.

Distinguishing Characters: The 3 separate dorsal fins; the 2 separate anal fins; the barbel under the tip of the lower jaw. **Color:** Translucent brownish gray above, shading into silvery on the sides and below; fins dusky, the dorsals and second anal with dark points. Attains a length of about 12 inches.

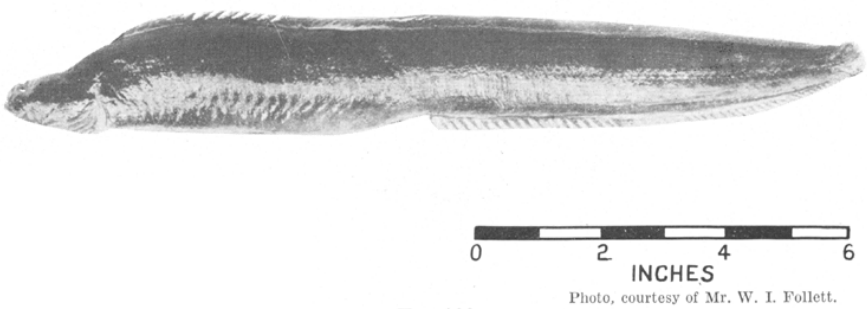
Distribution: Monterey to Unalaska, with almost the entire California catch being landed at San Francisco.

Fishing Season: Caught irregularly throughout the year with no consistent season.

Importance: Commercially of slight importance. Sold entirely in the fresh fish markets.

Fishing Gear: Taken commercially with paranzella nets. Caught by amateur fishermen incidentally with hook and line.

Unauthorized name: Piciata.



Photo, courtesy of Mr. W. I. Follett.

FIG. 109.

FIG. 109

BLENNY EEL

Xiphister mucosus.

Relationship: Not a true eel, nor a close relative of the moray eel (*see* page 136), but belongs to the family of northern blennies or "eels" (Stichaeidae), in which are classed many small tide-pool fish, few of which are used as food.

Distinguishing Characters: The absence of ventral fins; the single dorsal fin which extends nearly the whole length of the back; the body being covered with small, well-imbedded scales which are rather difficult to see; the presence of several lateral lines, each with a series of cross-branches; the pectoral fins being no longer than the eye. **Color:** Blackish green, becoming pale on the belly and side of head; 3 olive brown streaks radiate from the eye; old individuals sometimes blotched with yellow. Attains a length of about 18 inches.

Distribution: San Simeon Bay northward to Alaska. Caught usually rather close to the shore among rocks and algæ.

Fishing Season: Not caught in sufficient numbers to have a "fishing season," but brought into the markets occasionally throughout the year.

Importance: of slight significance commercially. One of the principal "eels" of the San Francisco Bay region. Certain legal restrictions govern the catch of these fish.

Fishing Gear: Caught incidentally by paranzella trawls: also taken in traps. A stick with a hook on the end is the device used by amateurs for fishing these animals from beneath rocks.

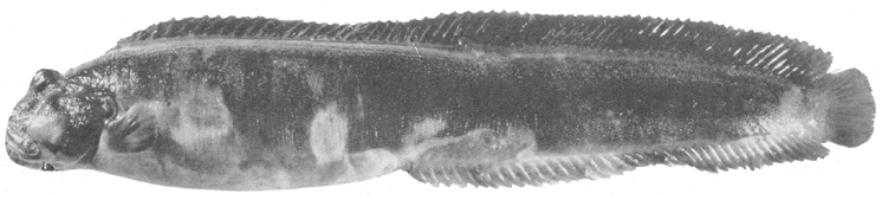


Photo by Lauck, San Francisco.

FIG. 110.

FIG. 110

BLENNY EEL

Cebidichthys violaceus.

Relationship: Not a true eel nor a close relative of the moray eel (*see* page 136), but belongs to the family of northern blennies (Stichaeidae), in which are classed a large number of small tide-pool fishes, few of which are used as food.

Distinguishing Characters: The absence of ventral fins; the single dorsal fin which extends nearly the whole length of the back; the small scales which cover the body; the short head; the pectoral fin being longer than the eye; the fore part of the dorsal fin being composed of spines; the anal fin being similar to the dorsal fin in appearance, with 1 or 2 spines; the head often having a fleshy hump composed of 2 lobes. **Color:** Dull green, or brownish green, mottled with darker and becoming paler on the undersurface. Sides often with scattered orange or reddish spots of various sizes, which fade after the fish dies. Attains a length of about 30 inches.

Distribution: Point Conception northward to Crescent City. Mostly brought into San Francisco and Monterey.

Fishing Season: Not caught in sufficient numbers to have a "fishing season," but brought into the markets occasionally throughout the year.

Importance: of very minor significance commercially. Sold mostly in the fresh fish markets of Chinatown, where it is considered a delicacy. One of the principal "eels" of the San Francisco Bay region. Certain legal restrictions govern the catch of these fish.

Fishing Gear: Taken incidentally by commercial fishermen with paranzella trawls. Caught by amateur fishermen with a specially made stick on the end of which is attached a baited hook. Also taken in traps.

Photo by Brown Studio, San Pedro.

FIG. 111.

FIG. 111

MORAY EEL

Gymnothorax mordax.

Relationship: Belongs to the moray family (Murænidae), in which are also classed a number of related species which are found in warm seas, mostly in the Western Hemisphere, but no others in California.

Distinguishing Characters: The absence of ventral fins; the absence of pectoral fins; the absence of scales; the dorsal and anal fins being reduced to low, fleshy ridges; the gill openings being reduced to slits; the well-developed jaws and sharp teeth. **Color:** Dark brown with many small, vague paler markings and spots; throat and sometimes belly with dark horizontal streaks. Attains a length of about 5 feet.

Distribution: Point Conception to Cerros Island on the coast of Lower California.

Fishing Season: Caught irregularly throughout the year in small numbers.

Importance: Not of significant commercial importance. Not usually considered a welcome addition to one's catch, chiefly because of its viciousness.

Fishing Gear: Caught incidentally in traps in certain ocean districts and with hook and line.

Unauthorized names: Eel, conger eel, marina, muraena.

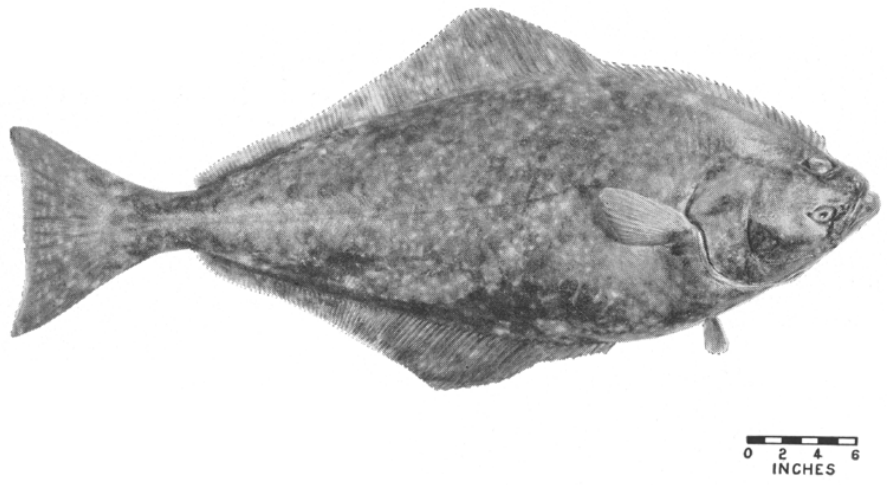


Photo by J. M. Hawthorne, Los Angeles.

FIG. 112.

FIG. 112

NORTHERN HALIBUT

Hippoglossus hippoglossus.

Relationship: Belongs to the flounder family (Pleuronectidae), in which are classed the flounders, turbots, California halibut and nearly all of the species officially designated *sole*. A true halibut.

Distinguishing Characters. Both eyes being on one side of the head; the eyed side of the body only having color, the other side being white; the lateral line having a high arch in front over the pectoral fin (not simply curved upward); the pectoral fin on the eyed side of the body being shorter than the head; the maxillary not reaching past the middle of the lower eye; the fine, smooth scales. **Color:** Nearly uniform dark brown, often with vague pale blotches as in the illustration. Attains a weight of about 500 pounds.

Distribution: Bering Sea to San Francisco, and occasionally farther south, the largest California landings being made at Del Norte and Humboldt counties. Considered by many ichthyologists to be the same species which occurs also in abundance in the North Atlantic Ocean.

Fishing Season: Landings are distributed rather evenly between February and November, inclusive.

Importance: In poundage of rather minor importance in California, but one of the more valuable and desirable species. Sold entirely in the fresh fish markets. Forms about one-fourth the total catch classed as *halibut*, which includes the California halibut, and which ranked eleventh among the market fishes of California in 1928.

Fishing Gear: Long lines, set lines, paranzella trawls. Not often caught by sportsmen.

Unauthorized names: Halibut, right halibut, genuine halibut, real halibut, alabato.

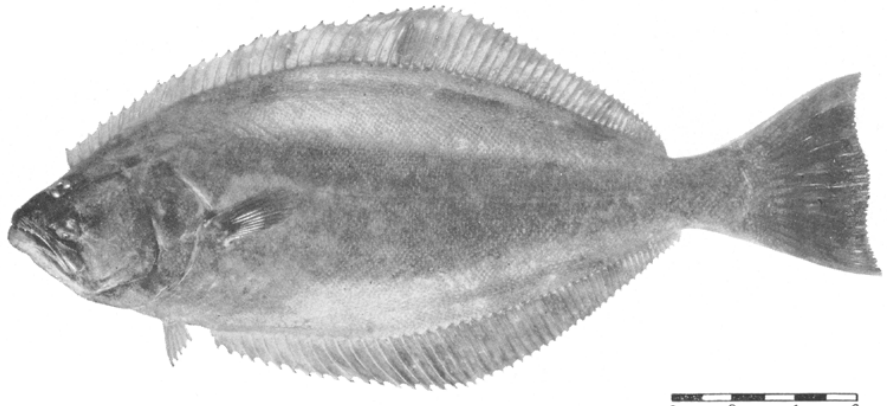


Photo by J. M. Hawthorne, Los Angeles.

FIG. 113.

FIG. 113

CALIFORNIA HALIBUT

Paralichthys californicus.

Relationship: Belongs to the flounder family (Pleuronectidae), in which are also classed the flounders, turbots, northern halibut, and nearly all the fish officially designated *sole*.

Distinguishing Characters: Both eyes being on the same side of the head; one side of the body being blind and white; the lateral line having a high abrupt arch in front, not simply curving upward; the pectoral fin on the eyed side of the body being shorter than the head; the maxillary bone reaching to the hind border of the lower eye or past it; the small eyes; the rather wide, flat area between the eyes. **Color:** Uniform greenish brown, sometimes mottled with darker and lighter shades; sometimes with small vague white spots, especially in the young. Attains a weight of about 60 pounds.

Distribution: San Francisco southward to the Gulf of California, the largest landings being made at San Diego.

Fishing Season: Caught all the year round with a maximum catch north of the Mexican border between February and May, and south of the border between July and October.

Importance: The catch heretofore recorded as *halibut* but including the northern and southern California halibuts, ranked eleventh among the market fishes of the State in 1928. Forms about three-fourths of the total *halibut* catch.

Fishing Gear: Trammel nets, paranzella trawls, hook and line. Caught by amateur fishermen from pleasure piers, barges and boats, with hook and line, using live bait or pieces of fish or clams.

Unauthorized names: Halibut, chicken halibut, bastard halibut, southern halibut, alabato.

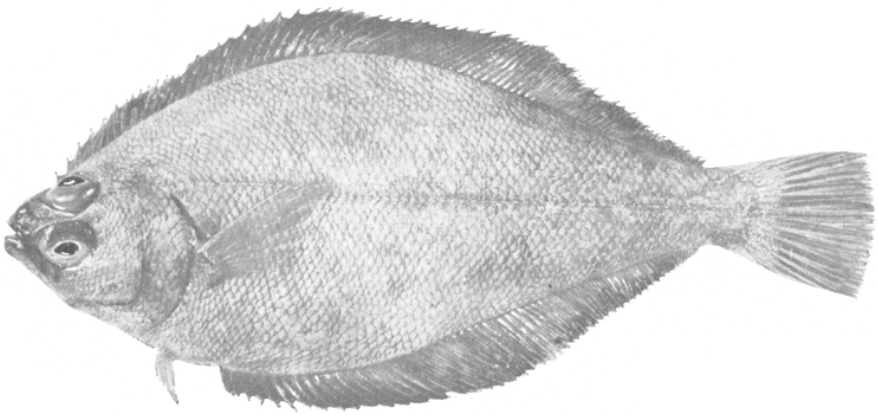


Photo by Lauck, San Francisco.

FIG. 114.

FIG. 114

SAND DAB

Orthopsetta sordida.

Relationship: Belongs to the turbot family (Bothidae), in which are also classed at least 3 other very closely related but commercially unimportant species which occur in California. These fishes are very closely related to the flounder family (Pleuronectidae), to which belong all the soles described in this paper.

Distinguishing Characters: Both eyes being on the same side of the head; the large scales which easily come off; the ventral fin on the eyed side being attached on the ridge of the abdomen, that on the blind side being attached on the side of the ridge, so that the 2 fins are not symmetrical; the almost straight lateral line. **Color:** Brown of various shades, sometimes with dull orange spots and blotches. Attains a length of about 12 inches.

Distribution: British Columbia to Lower California, the largest California landings being made at San Francisco.

Fishing Season: Caught all year round with no consistent periods of maximum landings.

Importance: The eleventh most important fish in the markets of northern California in 1928. Sold entirely in the fresh fish markets.

Fishing Gear: Paranzella trawls. Amateur fishermen often take this species with hook and line.

Unauthorized name: Soft flounder.

SOLE

Relationship: None of the several species sold commercially under this name in California is a true sole, the name *sole* having been designated official because of common usage. Belongs to the flounder family (Pleuronectidae), in which are also classed the flounders, turbots and halibuts. There is only one species of true sole on this coast, and that does not enter into the commercial catch. The forms most commonly seen in our markets are presented in the following pages.

Distinguishing Characters. Both eyes being on one side of the head, the other side being blind; the ventral fins being symmetrical, *i. e.*, there is one on each side of the ridge of the abdomen. *See* pages 141–149 for descriptions of individual species.

Distribution: Found along the entire coast. Related species are widely distributed throughout the world. The distribution differs for each species.

Fishing Season: Taken as a group, these fishes are caught all year round with a peak during the winter months. There are probably different seasons for each species, but at the present writing (1930) these are not known.

Importance: The sixth largest fishery in the State, and the largest for the fresh fish markets, where they are sold exclusively.

Fishing Gear: Paranzella trawls, hook and line, trammel nets.

Unauthorized names: English sole, flounder, petrale.

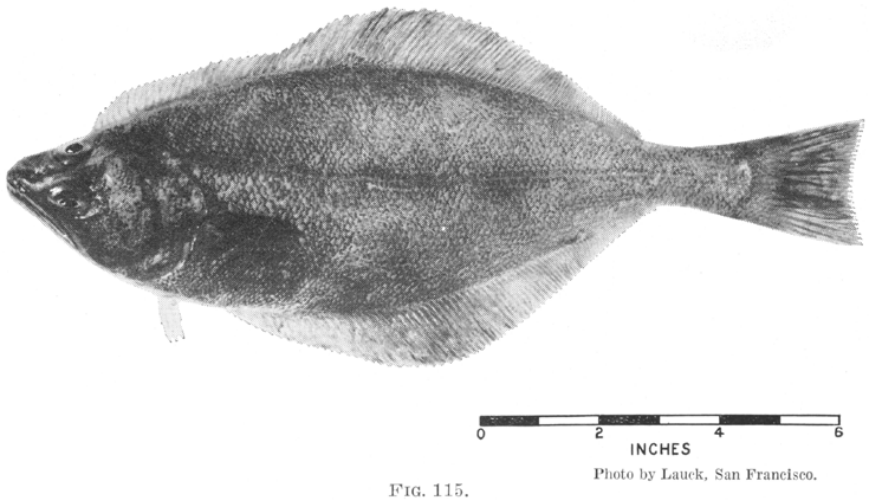


Photo by Lauck, San Francisco.

FIG. 115.

FIG. 115

ARROW-TOOTHED SOLE

Atheresthes stomias.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The lateral line not having a high, abrupt arch above the pectoral fin but simply curved upward; the maxillary bone reaching to vertically beyond the lower eye. **Color:** Plain olive brown, the edges of the scales being darker; blind side white, dusted with dark points. Attains a length of about 2 feet.

Distribution: San Francisco northward to the Bering Sea.

Fishing Season: *See* page 140.

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

Fishing Gear: *See* page 140.

Unauthorized name: Arrow-toothed halibut.

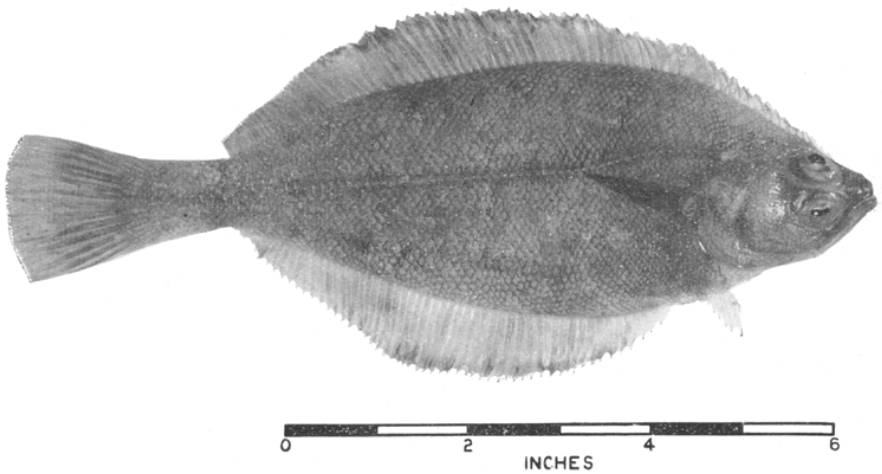


Photo by Lauck, San Francisco.

FIG. 116.

FIG. 116

SLENDER SOLE

Lyopsetta exilis.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The absence of a high, abrupt arch in the fore part of the lateral line over the pectoral fin; the maxillary reaching to below the middle of the lower eye but scarcely if at all past; the rays of the dorsal fin above the eye being shorter than the eye; there being less than 20 rows of scales between the lateral line and the back at the widest place. **Color:** Pale brown with dark points forming edgings on each scale; sometimes with bronze spots; fins mostly dark. Attains a length of about 12 inches.

Distribution: From San Diego northward to Puget Sound in deep water.

Fishing Season: *See* page 140.

Importance: One of the least important of the flatfishes.

Fishing Gear: *See* page 140.

Unauthorized name: Slender flounder.

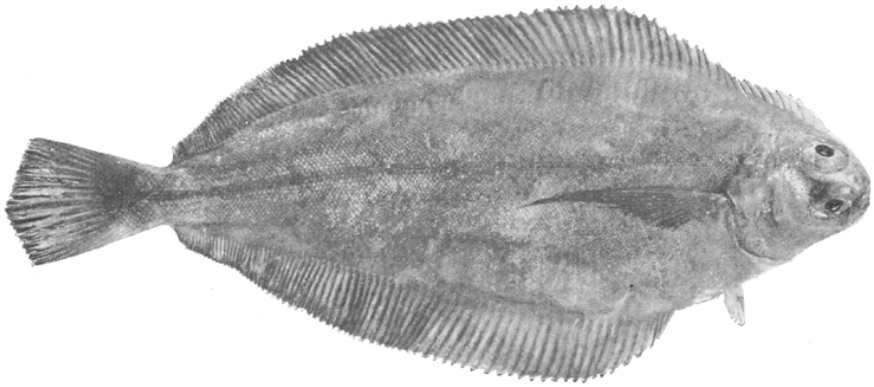


Photo by Lauck, San Francisco.

FIG. 117.

FIG. 117

REX SOLE

Errex zachirus.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The absence of a high, abrupt arch in the lateral line just over the pectoral fin; the pectoral fin on the eyed side being slender and much longer than the head. **Color:** Uniform light brown on the eyed side, white on the blind side; fins a darker shade of brown. Attains a length of about 12 inches.

Distribution: San Francisco northward to the Bering Sea. Occasionally taken as far south as southern California.

Fishing Season: *See* page 140.

Importance: One of the most important of the smaller flatfishes.

Fishing Gear: *See* page 140.

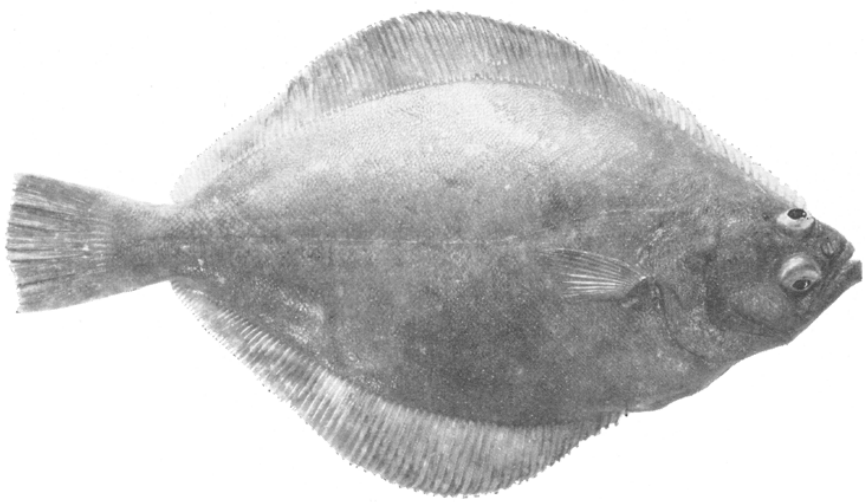


Photo by Lauck, San Francisco.

FIG. 118.

FIG. 118

ROUND-NOSED SOLE

Eopsetta jordani.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The absence of a high, abrupt arch in the lateral line over the pectoral fin, the lateral line being simply curved upward; the maxillary bone reaching to below the middle of the lower eye; the pectoral fin being shorter than the head; the rays of the dorsal fin above the eye being shorter than the eye; the rather deep body; there being over 30 rows of scales between the lateral line and the back at the widest place. **Color:** Uniform brown on the eyed side, with occasionally vague paler blotches; blind side white. Attains a length of about 20 inches.

Distribution: Point Conception northward to Puget Sound; occasionally south to San Diego.

Fishing Season: *See* page 140.

Importance: One of the three most important of the *soles*.

Fishing Gear: *See* page 140.

Unauthorized names: Jordan's flounder, English sole, California sole. Large specimens of around 5 pounds in weight are called petrales.

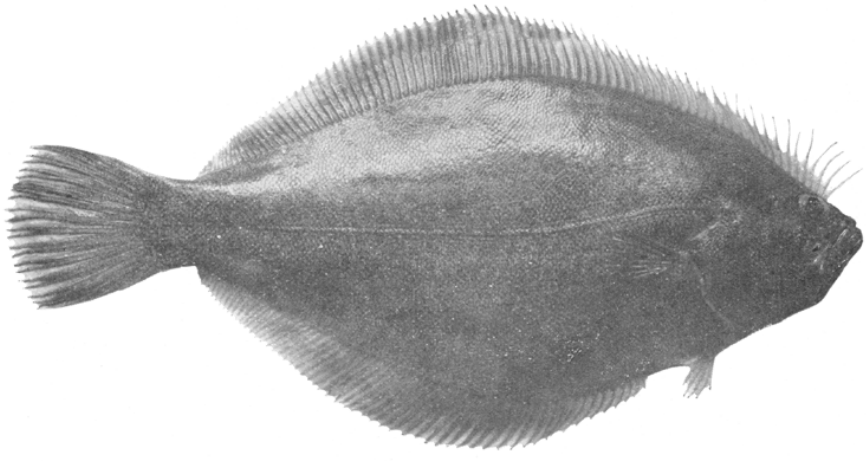


Photo by Lauck, San Francisco.

FIG. 119.

FIG. 119

FRINGE SOLE

Psettichthys melanostictus.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The absence of a high, abrupt arch in the fore part of the lateral line over the pectoral fin; the maxillary bone reaching to vertically below the middle of the lower eye; the pectoral fin being shorter than the head length; the first rays of the dorsal fin being at least twice as long as the eye and for most of their length not connected to each other by membrance. **Color:** Grayish brown, vaguely mottled with darker, and everywhere finely speckled with dark brown; blind side white. Attains a length of about 20 inches.

Distribution: Point Conception northward to Sitka, Alaska.

Fishing Season: *See* page 140.

Importance: Forms a fair proportion of the *sole* catch.

Fishing Gear: *See* page 140.

Unauthorized names: Spotted flounder, sand sole.

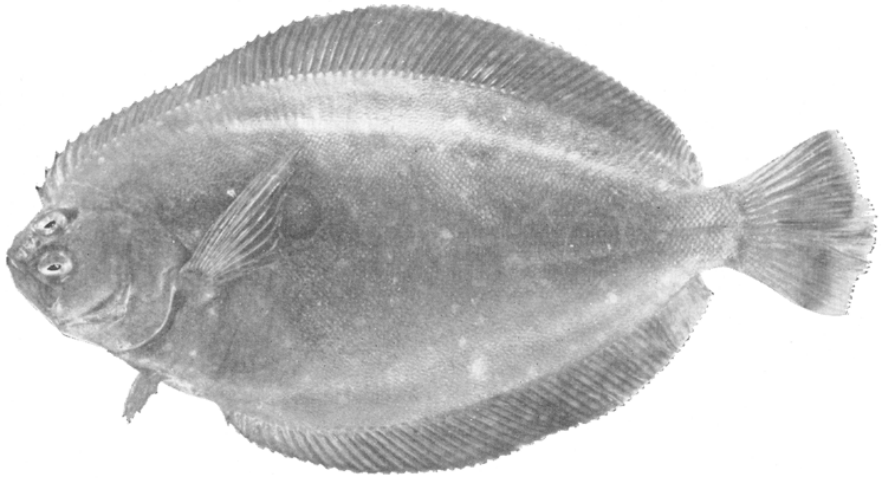


Photo by J. M. Hawthorne, Los Angeles.

FIG. 120.

FIG. 120

FAN-TAIL SOLE

Xystreurys liolepis.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The presence of a high, abrupt arch in the fore part of the lateral line over the pectoral fin; the pectoral fin on the eyed side of the body being almost as long as the head, reaching to about the middle of the body. **Color:** Brown, mottled with darker, sometimes with large, round, black blotches; sometimes mottled with many gray and reddish brown blotches; fins blotched with dark, the pectoral on the eyed side with oblique bars. Attains a length of about 15 inches.

Distribution: Point Conception to San Diego. Has been taken as far south as the Gulf of California.

Fishing Season: *See* page 140.

Importance: A flounder of rather minor importance commercially.

Fishing Gear: *See* page 140.

Unauthorized name: Long-finned flounder.

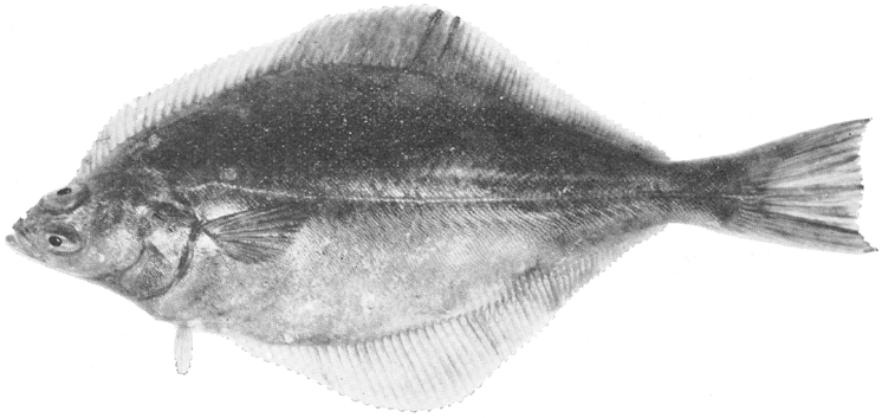


Photo by Lauck, San Francisco.

FIG. 121.

FIG. 121

POINTED-NOSED SOLE

Parophrys vetulus.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The absence of a high, abrupt arch in the fore part of the lateral line over the pectoral fin; the maxillary bone not reaching as far as vertically below the middle of the lower eye; the absence of a high spiny ridge between the eyes; the depth of the body being less than one-half the entire length; the presence of teeth only on the blind side of the lower jaw; the ventral fins being longer than the long diameter of the eye; the long, rather pointed snout. **Color:** Uniform brown; the dorsal and anal fins tipped with a darker shade. Attains a length of about 18 inches.

Distribution: Southern California north to Alaska; not important south of central California.

Fishing Season: *See* page 140.

Importance: Probably forms the largest proportion of the *sole* catch.

Fishing Gear: *See* page 140.

Unauthorized names: Common sole, California sole.

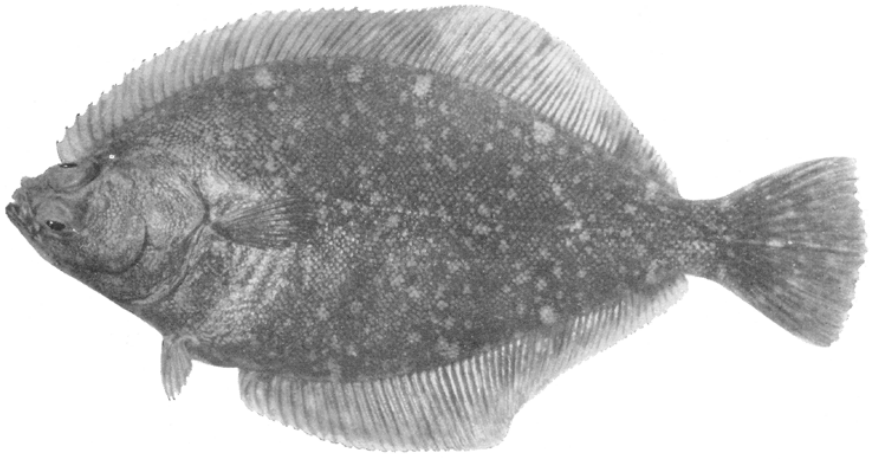


Photo by Gabriel Moulin, San Francisco.

FIG. 122.

FIG. 122

SCALY-FIN SOLE

Isopsetta isolepis.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The absence of a high, abrupt arch in the front of the lateral line just over the pectoral fin; the line being simply curved upwards; the maxillary bone not reaching as far back as vertically below the middle of the lower eye; the depth of the body being less than one-half the entire length, including the tail; the presence of teeth on both sides of the lower jaw instead of only on the blind side; the rather large scales, the body being rough to the touch when the finger is passed toward the head. **Color:** Brownish, mottled and blotched with darker and sometimes with lighter spots, as in the illustration; white on the blind side. Attains a length of about 15 inches.

Distribution: Point Conception to Puget Sound.

Fishing Season: *See* page 140.

Importance: Commonly seen in the markets of San Francisco, but not often in large numbers. Forms a rather small proportion of the *sole* catch.

Fishing Gear: *See* page 140.

Unauthorized name: Scaly-finned flounder.

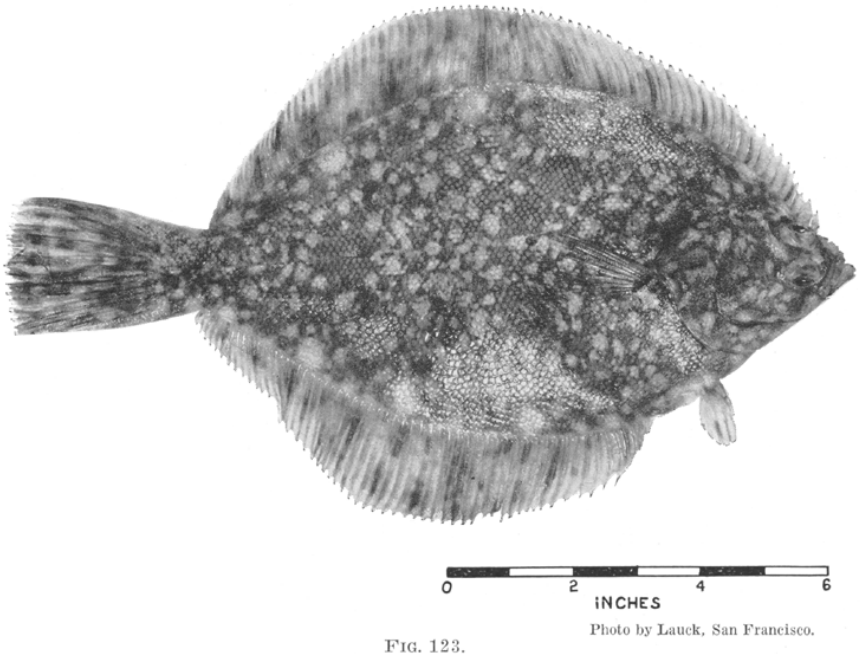


Photo by Lauck, San Francisco.

FIG. 123.

FIG. 123

BROAD-FIN SOLE

Lepidopsetta bilineata.

Relationship: *See* page 140.

Distinguishing Characters: *See* page 140. The high abrupt arch in the front of the lateral line just over the pectoral fin; the pectoral fin on the eyed side being shorter than the head; the maxillary bone not reaching past the middle of the lower eye; the depth of the body at the widest place being about one-half the length of the body without the tail. **Color:** Dark brown with vague pale blotches, mottled and spotted with various shades of light brown. Attains a weight of 5 or 6 pounds.

Distribution: Southern California north to Bering Strait; not common south of Monterey.

Fishing Season: *See* page 140.

Importance: Forms a rather insignificant proportion of the catch of *sole*.

Fishing Gear: *See* page 140.

Unauthorized names: Double-lined flounder, flounder.

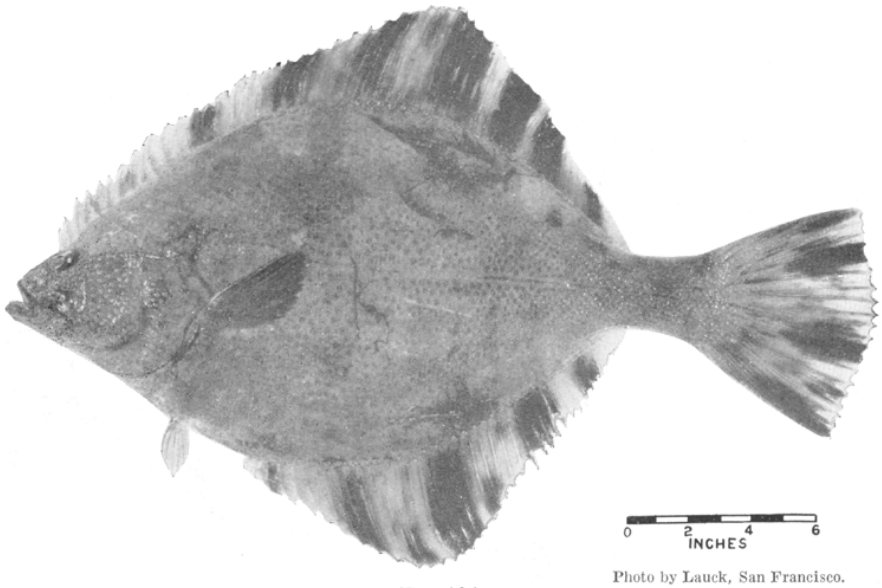


Photo by Lauck, San Francisco.

FIG. 124.

FIG. 124

STARRY FLOUNDER

Platichthys stellatus.

Relationship: Belongs to the flounder family (Pleuronectidae), in which are also classed the turbots, halibuts and nearly all of the fishes officially designated *sole*.

Distinguishing Characters: Both eyes being on the same side of the head; the rough, scattered plates which cover the body; the dorsal and anal fins being marked alternately with black and orange. **Color:** Dark brown or almost black, vaguely mottled with darker shades; dorsal and anal fins and tail fin marked as above described. Is said to attain a weight of about 20 pounds, although the usual size seen in the markets is considerably less than that.

Distribution: Southern California north to the Arctic Ocean and on the Asiatic side south to the Amur River. Sometimes ascends large rivers.

Fishing Season: Caught throughout the year with no consistent period of largest landings.

Importance: of minor commercial significance.

Fishing Gear: Taken commercially with paranzella trawls. Sport fishermen catch this fish with hook and line.

Unauthorized names: English sole, sole, great flounder, rough jacket.

TURBOT

Species of Pleuronectidae.

Relationship: The California species sold as turbot belong to the flounder family (Pleuronectidae), in which are also classed the halibut, the flounder, and all of the species officially designated sole. The true turbot of another family (Bothidae) is a European species, named because of its shape after the Latin turbo: a top or whirl. The local species are so named because of their similarity in shape to the European form.

Distinguishing Characters: Both eyes being on the same side of the head; the ventral fins being symmetrical, *i. e.*, there is one on each side of the ridge of the abdomen. (*See* individual descriptions on the following 3 pages.)

Fishing Season: Caught irregularly throughout the year, with no consistent well-defined season.

Importance: Commonly seen in the markets, but not in large numbers. Forms a rather insignificant proportion of the flatfish catch of the State.

Fishing Gear: Paranzella trawls, hook and line, trammel nets.

Unauthorized names: Sole, flounder.

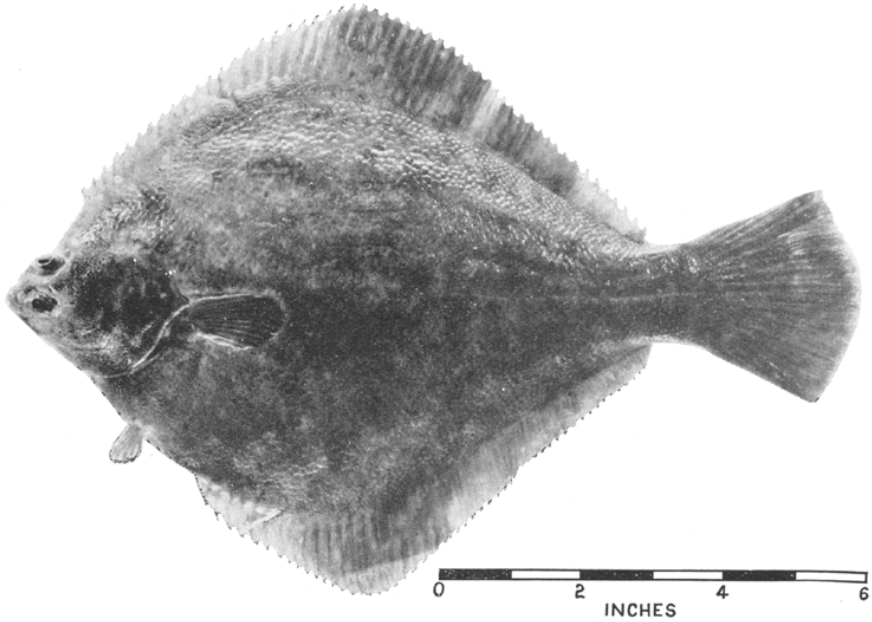


Photo by J. M. Hawthorne, Los Angeles.

FIG. 125.

FIG. 125

DIAMOND TURBOT

Hypsopsetta guttulata.

Relationship: *See* page 151.

Distinguishing Characters: *See* page 151. The absence of a high, abrupt arch in the fore part of the lateral line over the pectoral fin; the pectoral fin being shorter than the head; the maxillary bone not reaching as far back as vertically below the middle of the lower eye; the absence of a high, bony and spiny ridge between the eyes; the depth of the body being about half the entire length including the tail fin. **Color:** Dark greenish brown, mottled with paler shades. Attains a weight of about 3 pounds.

Distribution: Cape Mendocino southward to about Magdalena Bay on the coast of Lower California. Most commonly taken in bays and sloughs.

Fishing Season: *See* page 151.

Importance: Probably the most abundant turbot in southern California, but of slight commercial importance.

Fishing Gear: *See* page 151.

Unauthorized name: Diamond flounder.

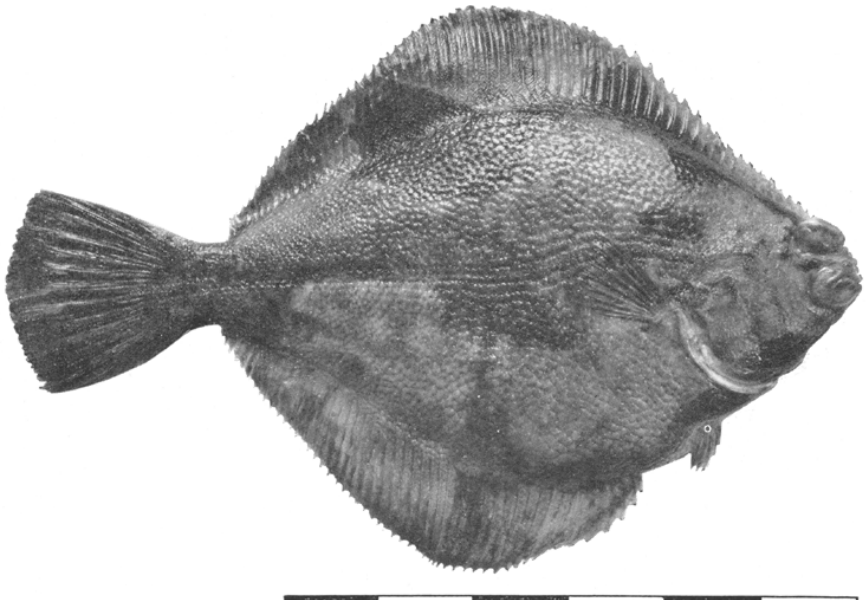


Photo by Lauck, San Francisco.

FIG. 126.

FIG. 126

CALIFORNIA TURBOT

Pleuronichthys decurrens.

Relationship *See* page 151.

Distinguishing Characters: *See* page 151. The absence of a high arch in the fore part of the lateral line over the pectoral fin; the maxillary bone not reaching to vertically below the middle of the lower eye; the high, bony ridge between the eyes with 2 blunt bony spines, one opposite the hind edge of the lower eye, the other opposite the front of the upper eye, the latter having bony prominences on either side; at least 9 rays of the dorsal fin extending over to the blind side of the body. **Color:** Yellowish or reddish brown, vaguely mottled with brownish and grayish. Attains a length of about 8 inches.

Distribution: Santa Barbara Islands northward, occasionally being taken as far north as Oregon.

Fishing Season: *See* page 151.

Importance: Comprises the greatest part of the turbot catch in central and northern California.

Fishing Gear: *See* page 151.

Unauthorized name: Curl-finned flounder.

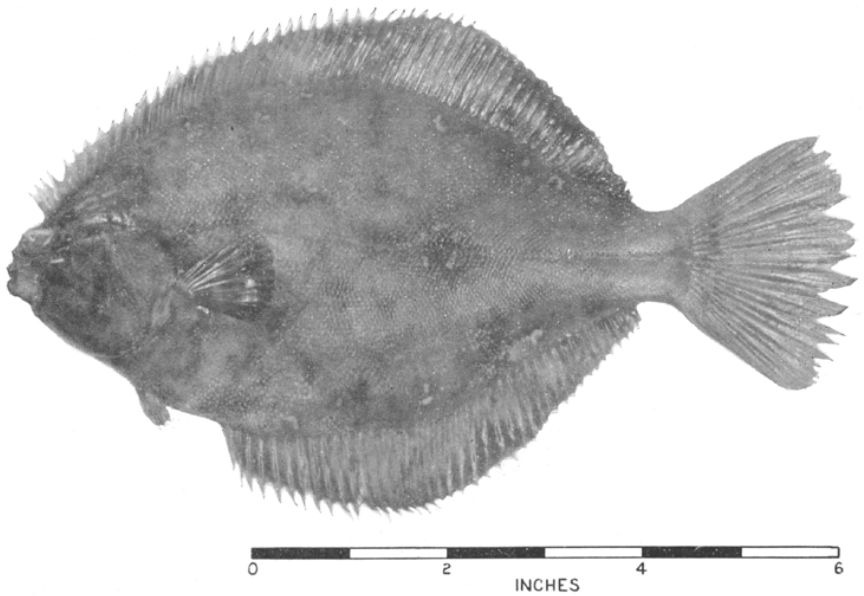


Photo by J. M. Hawthorne, Los Angeles.

FIG. 127.

FIG. 127

SHARP-RIDGED TURBOT

Pleuronichthys verticalis.

Relationship: *See* page 151.

Distinguishing Characters: *See* page 151. The absence of an abrupt arch in the fore part of the lateral line over the pectoral fin; the maxillary bone not reaching to vertically below the lower eye; the eyes being separated by a high, bony and sharp-edged ridge which ends behind in a sharp spine that stands out above the surrounding level of the head about as high as the diameter of the pupil of the eye; the presence of 3 spines on the front of the ridge, one of which is noticeably sharper than the others; not more than 5 rays of the dorsal fin extending over to the blind side of the head. **Color:** Chocolate brown, mottled with grayish and irregularly spotted with light gray; fins gray, mottled with blackish. Attains a length of about 10 inches.

Distribution: Coast of California southward to the Gulf of California, the northern limits not being definitely recorded. Said to occur in rather deep water.

Fishing Season: *See* page 151.

Importance: Probably the least abundant of the turbots.

Fishing Gear: *See* page 151.

Unauthorized name: Sharp-ridged flounder.

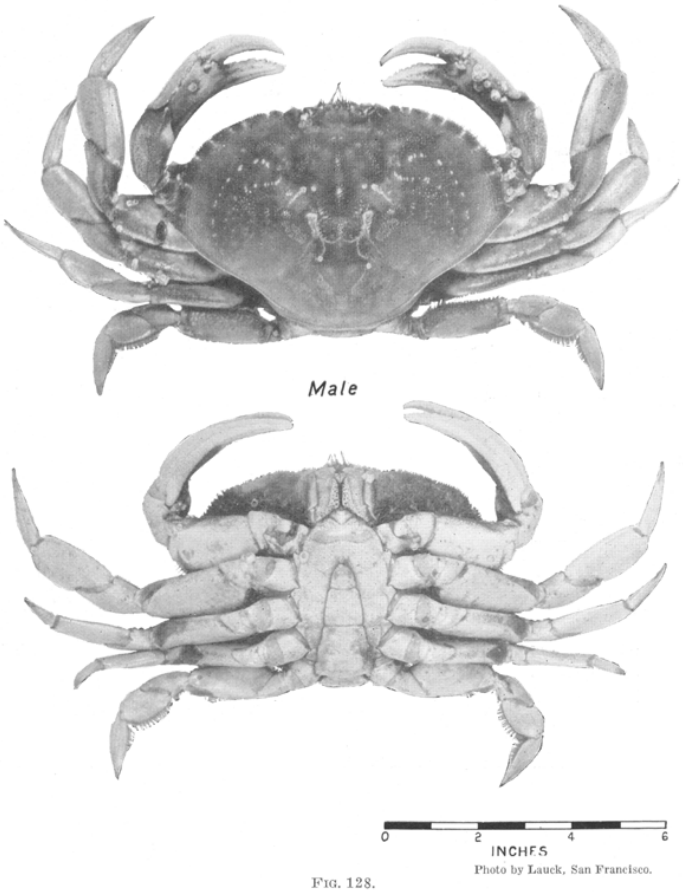


Photo by Lauck, San Francisco.

FIG. 128.

MARKET CRAB

FIG. 128

MARKET CRAB

MARKET CRAB

Cancer magister.

Relationship: Like the spiny lobster, crayfish and shrimp, the crab is a crustacean. Belongs to the family Cancridae, in which are also classed several smaller species on our coast, none of which appears in significant numbers in our markets. The small crabs seen on the rocks near the beaches are, for the most part, of different families from the Cancridae and are rarely, if ever, used as food.

Distinguishing Characters: The oval-shaped body; the saw-toothed edge of the front of the carapace or "shell"; the fine granulations on the back; the white tips on the fingers of the "claws" or chelipeds. The females, which are protected by law, can be distinguished by the abdomen being much broader than in the male. The abdomen is the flap-like process, which in its natural position folds closely against the underside of the body. **Color:** Upper surface light reddish brown; legs and lower surface somewhat yellowish. Attains a width of over 8 inches; consult fish and game laws for legal size. One of the largest edible crabs on the Pacific coast of America.

Distribution: Alaska to Magdalena Bay, but not common south of Monterey Bay. Largest landings made at San Francisco. Found on sandy bottoms in water ranging from 5 to 10 fathoms in depth.

Fishing Season: Catch rather evenly distributed during late fall and early summer months, with largest landings during the winter. Consult fish and game laws for closed season.

Importance: The fourth largest fishery in northern California and the eleventh in the state in 1928. Sold only in the markets; not canned.

Fishing Gear: Taken by hoop nets and traps, both by commercial and by pleasure fishermen.

Unauthorized names: Dungeness crab, cerbe.

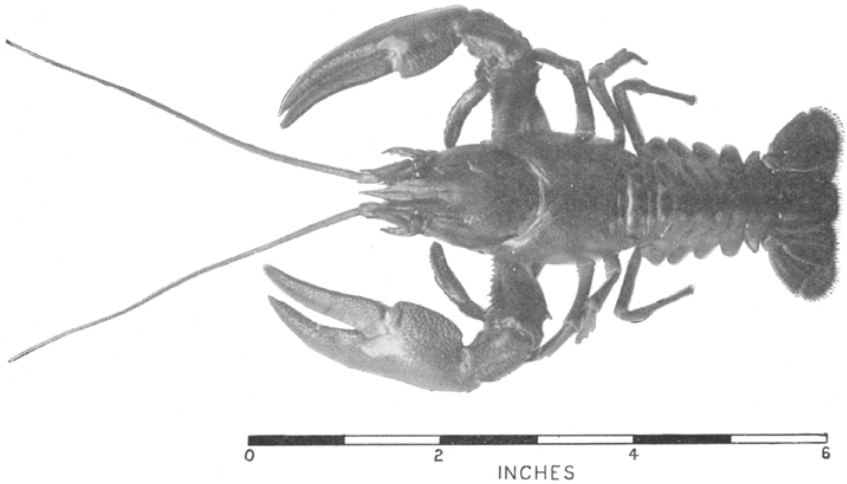


FIG. 129.

FIG. 129

CRAYFISH

Example: Astacus trowbridgei.

Relationship: Not a fish but a crustacean, in which class are arrayed the shrimps, crabs and spiny lobster. Belongs to the crayfish family (Astacidae), a group of fresh water forms. On the western slope of the United States occur 5 species, the differences between which are found chiefly in the sexual organs and in the number and arrangement of spines. The species illustrated is an example of the group.

Distinguishing Characters: Occurs in fresh water; the 2 fore walking appendages enlarged and with well-developed "claws" or chelae; the lobster-like form. **Color:** Pale greenish, more or less flushed with reddish; some species dirty brick red. Attains a length of about 12 inches, excluding the antennae, but this size is exceptional.

Distribution: Various western species of this group are found in fresh water streams and lakes from California to British Columbia and as far eastward as the upper Misouri River. This particular species occurs from central California northward to the Columbia River.

Fishing Season: Taken throughout the year, but mostly after the first rains. Legally protected in certain districts of California.

Importance: of slight significance as a commercial fishery, though the most important fresh water crustacean in North America. Sold chiefly by restaurants which specialize in sea or aquatic foods.

Fishing Gear: Hoop nets, occasionally being taken with hook and line.

Unauthorized names: Crawfish, crawdad, ecrevisse.

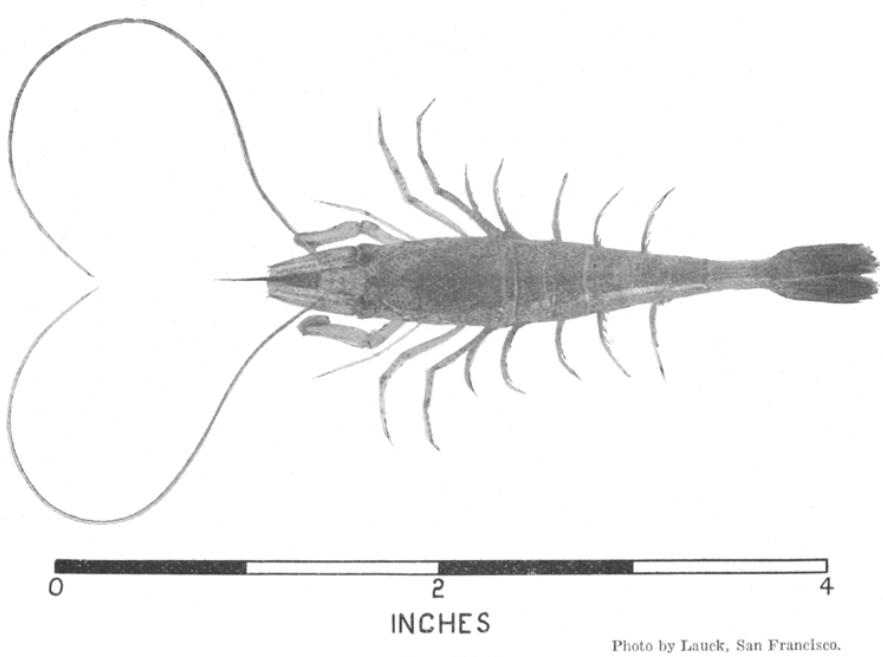


Photo by Lauck, San Francisco.

FIG. 130.

FIG. 130

CALIFORNIA SHRIMP

Crago franciscorum.

Relationship: Like the spiny lobster, crab and crayfish, this species is one of the crustaceans. Belongs to the family Cragonidae, in which are classed several other edible shrimps found along our coast, no others of which equal this species in importance.

Distinguishing Characters: The narrow, rather weak claw-bearing segments of the first pair of legs, in which the thumb, when bent, is almost parallel to the hand; the length of the hand being about 4 ½ times the width. **Color:** Yellowish or greenish gray mottled with many small dark spots. Attains a length slightly over 3 inches excluding the antennae.

Distribution: San Diego to Alaska, with the largest California catches being made in San Francisco Bay.

Fishing Season: Caught all year round with maximum landings during the spring and summer months.

Importance: The sixth largest fishery in northern California in 1928, and the thirteenth in the State. Sold almost entirely in the fresh fish markets, a relatively small number being dried in certain districts where this is permitted.

Fishing Gear: Caught commercially by Chinese shrimp nets and by shrimp trawls, with certain legal restrictions by districts.

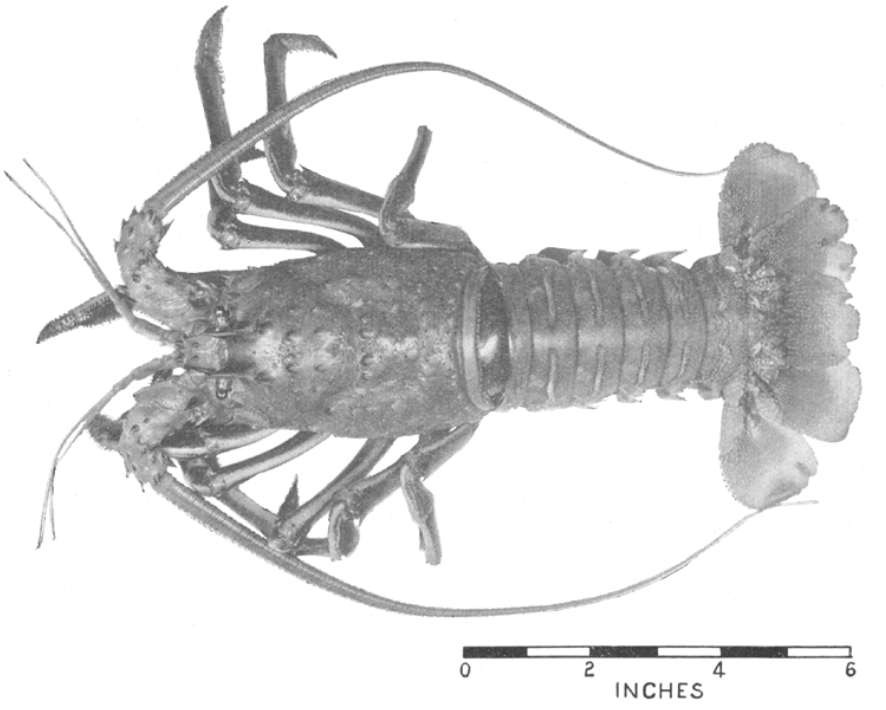


Photo by J. M. Hawthorne, Los Angeles.

FIG. 131.

FIG. 131

SPINY LOBSTER

Panulirus interruptus.

Relationship: Belongs in the class Crustacea (*see* page 174), in which are also classed the shrimps, crabs and crayfish. Not a true lobster, but belongs to the spiny lobster family (Palinuridae), of which there are no other members occurring north of Turtle Bay.

Distinguishing Characters: The elongated body with a distinct thorax and abdomen; the similarity between the walking appendages; the absence of "claws" on the fore walking appendages; the long, stiff, spiny outer antennae; the strong spines on the back and joints. **Color:** Variable; ranges from greenish chocolate to dull orange; the legs longitudinally striped with lighter shades on the upper and lower surfaces. The largest specimen recorded was 17 pounds, but this size is very exceptional, 10-pound specimens being rare. Consult fish and game laws for legal size limit.

Distribution: Point Conception to the Gulf of Tehuantepec.

Fishing Season: Taken during the fall and winter months. Consult fish and game laws for closed season.

Importance: The eighth largest market fishery in southern California in 1928, and the third most important crustacean in the State.

Fishing Gear: Caught commercially with traps. Sportsmen fishing in shallow water occasionally snag specimens on hook and line.

Unauthorized names: Crawfish, bug, lobster, langouste.

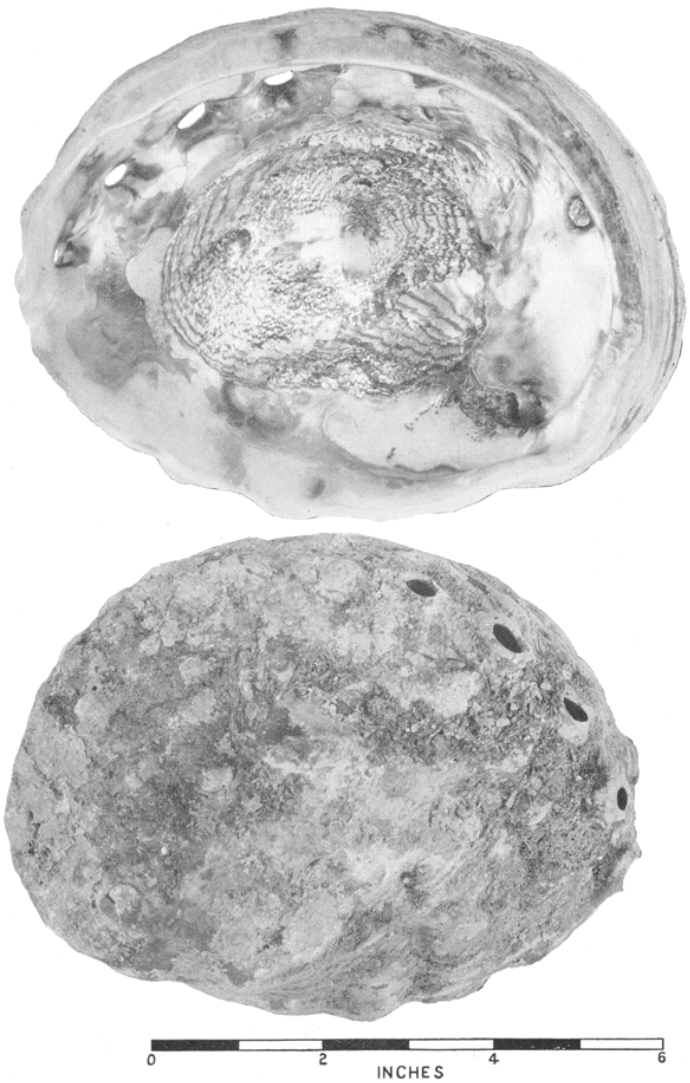


Photo by J. M. Hawthorne, Los Angeles.

FIG. 132.

RED ABALONE

FIG. 132

RED ABALONE

RED ABALONE

Haliotis rufescens.

Relationship: Like the squid, clam, oyster, snail, and octopus, the abalone is a mollusk. Belongs to the abalone family (Haliotidae), in which also are classed at least 5 other species on the coast of California, 3 being of commercial interest.

Distinguishing Characters: The large oval shell with 3 to 4 holes with raised edges near the left margin; the outside of the shell being sculptured with low, irregular radiating waves; the narrow red border which extends around the edge of the shell. **Color:** Inside surface iridescent, with prominent dark green markings. Attains a length of about 12 inches. Consult fish and game laws for legal size limit.

Distribution: Point Saint George to Lower California, the largest landings being made at Monterey.

Fishing Season: Consult fish and game laws for legal season.

Importance: The abalones, of which this species is the most important, constituted the eighth largest fresh fish market fishery in northern California in 1928. Sold entirely in the markets.

Fishing Gear: Taken commercially chiefly by divers with prying instruments. Amateurs with prying instruments seek this species along the shore during very low tide. Legal restrictions govern both the method of taking and the number which may be taken.

Photo by J. M. Hawthorne, Los Angeles.

FIG. 133.

CORRUGATED ABALONE

FIG. 133

CORRUGATED ABALONE

CORRUGATED ABALONE

Haliotis corrugata.

Relationship: *See* page 161.

Distinguishing Characters: The deep, almost circular shell, the outside layer of which is markedly corrugated; the edge of the shell being scalloped; the presence of 3 or 4 large, somewhat tubular holes; young specimens are considerably flatter than older ones; in very old individuals the corrugations are obliterated by adventitious growth, and the tubular extensions of the holes become worn down. **Color:** Outside surface variable, often dull green or reddish chestnut; inside surface iridescent, with a distinct rosy hue, the edge having a narrow border of blue. Attains a length of about 7 inches. Consult fish and game laws for legal size limit.

Distribution: Monterey southward to San Quentin Bay, Lower California.

Fishing Season: *See* page 161.

Importance: of negligible commercial significance.

Fishing Gear: Prying instruments. Legal restrictions limit both the method of taking and the number which may be taken.

Unauthorized name: Pink abalone.

Photo by J. M. Hawthorne, Los Angeles.

FIG. 134.

BLACK ABALONE

FIG. 134

BLACK ABALONE

BLACK ABALONE

Haliotis cracherodii.

Relationship: *See* page 161.

Distinguishing Characters: The deep, convex shell with usually from 5 to 8 holes; the shell being rather smooth on the outside. **Color:** Greenish black. Attains a length of slightly over 6 inches. Consult fish and game laws for legal size limit.

Distribution: Point Arena to Lower California.

Fishing Season: *See* page 161.

Importance: of very slight commercial significance, forming a small proportion of the abalone catch.

Fishing Gear: Prying instruments. Legal restrictions limit both the method of taking and the number which may be taken.

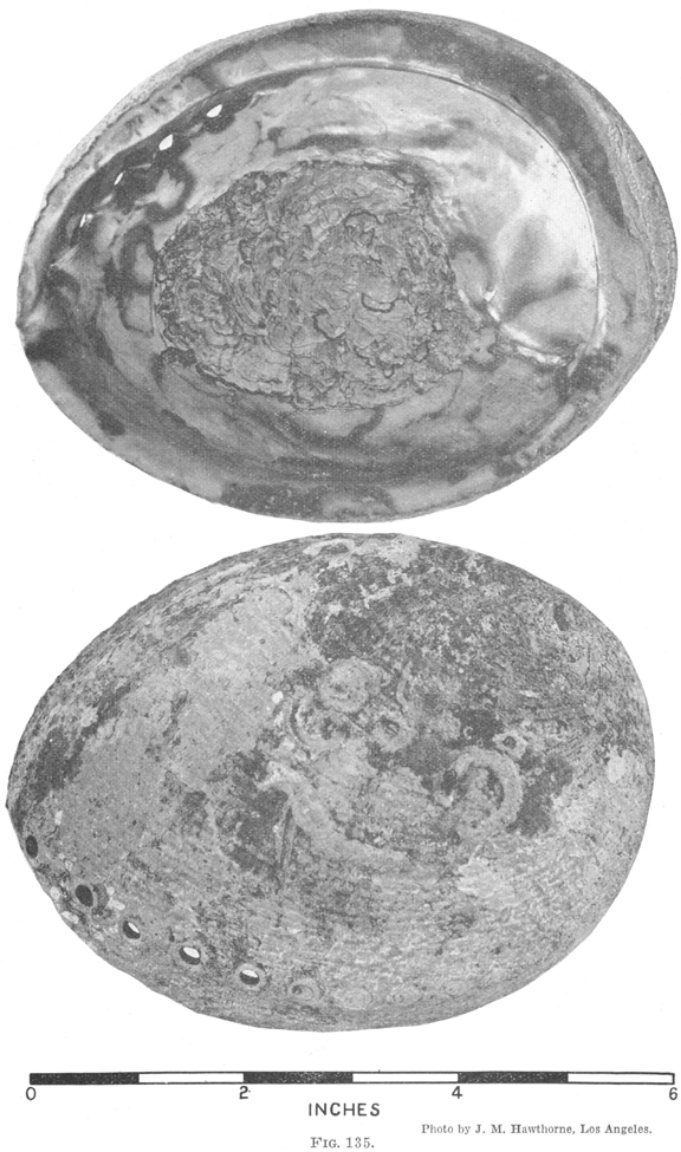


Photo by J. M. Hawthorne, Los Angeles.

FIG. 135.

SOUTHERN GREEN ABALONE

FIG. 135

SOUTHERN GREEN ABALONE

SOUTHERN GREEN ABALONE

Haliotis fulgens.

Relationship: *See* page 161.

Distinguishing Characters: The presence of 30 to 40 rounded spiral ridges (these sometimes are obscured by the calcareous skeletons of other animals such as wormmollusks and barnacles), which are nearly equal in size on the outside of the shell; the edges of the holes, of which there are 5 or 6, projecting slightly above the surface of the shell. **Color:** Outside surface dull reddish brown; inside surface iridescent, with various shades of green predominating. Attains a length of about 7 inches. Consult fish and game laws for legal size limit.

Distribution: Farallon Islands to the Gulf of California; rare north of Point Conception.

Fishing Season: *See* page 161.

Importance: of slight commercial significance, forming a rather small proportion of the total abalone catch.

Fishing Gear: Prying instruments. Legal restrictions govern both the method of taking and the number which may be taken.

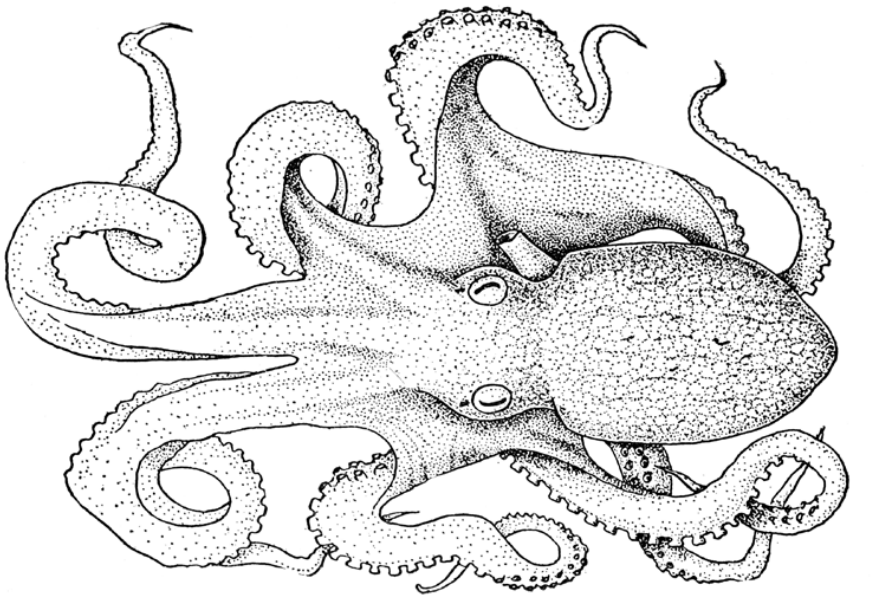


FIG. 136. Drawing by Dr. Harold Heath.

FIG. 136

OCTOPUS

Polypus hongkongensis.[10]

Relationship: Like the abalone, oyster, clam, snail, and squid, the octopus is a mollusk. This species belongs to the octopus family (Polypodidae), in which is also classed another, smaller species, Polypus bimaculatus, which occurs along the shores of southern California. This latter species, which can be identified by the presence of large, round, purplish spots in front of the eyes, is occasionally exploited by fishermen during the low tides.

Distinguishing Characters: The 8 long tentacles at the head end, with suckers on the inner surfaces; the short, almost globular body; the tentacles being longer than the body. **Color:** Milky whitish or translucent grayish, the outer surface being overlaid with blackish, brownish or purplish dots. Polypus hongkongensis attains a total expanse of about 16 feet and Polypus bimaculatus of about 20 inches.

Distribution: Alaska to San Diego on this side of the Pacific, and southward to China on the Asiatic side, for Polypus hongkongensis; San Pedro to Panama for Polypus bimaculatus.

Importance: of negligible commercial importance. Highly prized as food by many people.

Fishing Season: Caught throughout the year with no consistent period of greatest landings.

Fishing Gear: Taken commercially with devilfish pots, occasionally with drag nets. Sometimes can be taken by hand or with gaff hooks from tidepools during the low tides.

Unauthorized names: Cuttlefish, inkfish, devilfish, polpa, squarefish.

[10] This name has been disputed by some scientists, who claim that the species should be called Octopus apollyon.

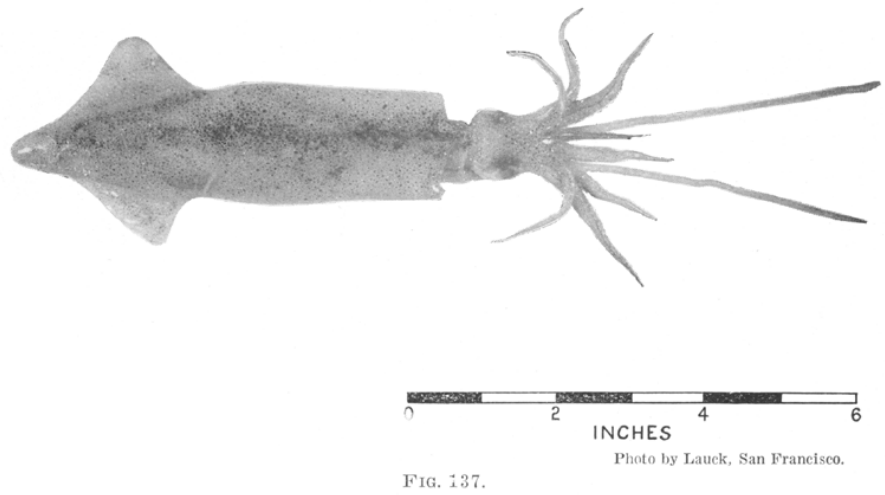


FIG. 137.

FIG. 137

SQUID

Loligo opalescens.

Relationship: Like the abalone, oyster, clam, snail, and octopus, the squid is a mollusk. Belongs to a squid family (Loliginidae), of which this species is the only representative on the California coast. A close relative and one less numerous, is the short squid (Rossia pacifica), which is of a different family (Sepiolidae) and recognizable by its short body, the width of the body, including the fins, being as great or greater than the length excluding the tentacles.

Distinguishing Characters: The slender, elongated body; the 8 rather short arms with suckers on the inner surface, and 2 long arms with suckers on the ends; the triangular fins on each side of the body at the tail end. **Color:** Milky whiteish with numerous small brownish purple spots, many of which are surrounded by larger opalescent spots which fade some time after death. Attains a length of about 10 inches.

Distribution: Puget Sound to San Diego, almost the entire California catch being landed at Monterey. Occurs in schools.

Fishing Season: Caught irregularly all year round with the largest landings about May.

Importance: The tenth largest fishery in northern California in 1928. Although in times past the squid has not been fully appreciated, its value as a comestible fresh sea food is beginning to be recognized. Sold in the fresh fish markets either fresh or salted. Large amounts are dried by Chinese; relatively small amounts are canned. Used for bait in catching fish.

Fishing Gear: Round haul nets.

Unauthorized name: Calamai.

APPENDIX
A GLOSSARY OF NAMES OF FISHING GEAR USED IN CALIFORNIA[11]

NOTE.—In order to learn what legal restrictions apply to any of these types of gear or methods, the laws relating to the fish and game should be consulted.

Bait Net: A round haul net with a small-sized mesh designed to catch small fish for bait.

Bass Trap: A box with two openings in opposite ends with funnel-like projections extending inside to prevent the escape of the impounded fish.

Beach Seine: An impounding net of rather shallow depth, one end of which is held on shore while the other end is used to draw the net around the fish. The net and its contents are then hauled onto the shore, care being taken that the lead line always touches the bottom. Usually the mesh is small in the main body of the net and large on the wings. *See also* **Chinchola** *and* **Chinchorro.**

Beam Trawl: A net made in the form of a bag with the mouth held open by a frame or beam, and dragged on the bottom. This net requires one boat to operate it.

Blanket Net: An impounding net suspended by one end from an outrigger of a boat and pulled in from the bottom by a line drawn from the deck.

Bonito Method: *See* **Live Bait Fishing.**

Brail: Also called **Dip Net** or **Scoop.** A dip net used either entirely by hand, or partly by hand and partly by power, used to dip fish from an impounding net. *Also:* A stick or pole used to keep the wings of a trawl or beach seine spread.

Brailing: The process of scooping or dipping impounded fish from a net with a scoop, dip net or brail.

Cast Net: A small circular net, heavily weighted with lead around its edge and with a retrieving line in its center. It is operated by one man, and, when thrown out into the water, settles like an open umbrella. It is drawn out of the water by the retrieving line, taking the form of a closed umbrella, the leads gathering together and impounding the fish.

Chinese Shrimp Net: A funnel-shaped bag net of very fine mesh, held stationary on the bottom by stakes, the mouth being held open by poles or brails. It is set so that the current carrying the shrimps flows into it. It is of Chinese origin and is used only in San Francisco Bay on this coast.

Chinchola: A beach seine with a bag in its center. Also called **Chinchorro.**

Chinchorro: *See* **Chinchola.**

Chum: Chopped bait, composed usually of fish, thrown overboard to attract fish. *See* **Chumming.**

Chumming: Throwing quantities of bait into the water to attract the desired fish to the surface or to cause them to school.

Circled Gill Net: A gill net which is used to surround a school of fish and is thus left until the impounded fish become "gilled" in the meshes. The process is hastened by frightening the fish with various devices.

Cork Line: The rope at the top of an impounding or entangling net, which, having floats made of cork or other buoyant material attached to it, supports the net vertically in the water. Sometimes called **Head Rope.**

Crab Net: A kind of hoop net, usually with two hoops, one smaller than the other, and with a basket on the bottom which is used to hold the bait.

Crawfish Trap: *See* **Lobster Pot.**

Devilfish Trap: A box made of chicken wire or a wicker basket, with a funnel opening constructed to permit of easy entrance of the catch and to prevent its escape. Used to catch octopus. Fish scrap is generaly used for bait.

[11] This glossary gives definitions as applied locally in California only.

Dip Net: A small hoop net used generally for taking small fish.

Diver: *See* **Drift Net,** when applied to nets. A person who fishes for abalones below the surface of the water, attired in a diving suit.

Drag Net: A trawl net. *See* **Paranzella.**

Drift Line: A line to which are attached several hooks, and held parallel to the surface of the water by buoys. This line drifts with the current and may float at the surface or be submerged.

Drift Net. An entangling net which is not attached or anchored to anything, so that it drifts with the current or stream. A buoy is used as a marker. This net may float at the surface, or it may be submerged, when it is called a **Diver.**

Foot Rope: A leaded or heavily weighted rope attached to the lower wall of a trawl net for the purpose of holding the bottom part of the net on the ground. Sometimes used as a synonym for **Lead Line.**

Fyke: The funnel-shaped entrance to a fish trap.

Fyke Net: A series of mesh funnels, their mouths kept open by hoops, opening into each other and finally into a closed sack forming a trap. The whole is covered by webbing. This net is fastened to the bank or to the bottom. There are many variations of this net.

Gaff Hook: An instrument consisting of a stick bearing a hook at one end.

Gill Net: A net suspended vertically in the water, having meshes large enough to permit only the heads of the fish to pass through and to catch them by their gill covers when they attempt to escape. There are four types: **Drift, Set, Circled** and **Submerged.**

Hand Lines: Long, single lines with a weight on the end and with from one to several hooks. These are operated from the deck of boats, piers, beaches.

Harpoon: A barbed spear used to strike large fish such as the swordfish. It may be thrown by hand or shot from a gun.

Head Rope: The rope on a trawl net upon which cork is fastened for the purpose of holding the top part of the net in suspension. Sometimes used as a synonym of CORK LINE.

Hoop Net: A small, round, impounding net without a handle, operated by ropes, pulleys or by hand, used to catch crabs or small fish. Always used with bait for crustacea, usually with chum or bait for fish.

Jacking: Attracting fish to the surface at night by means of a light. This method is not used by commercial fishermen.

Jig: (1) A lure made of feathers, bone, wood, abalone shell, or other shining material, to which is attached a barbed or barbless hook. It is drawn quickly through the water on the end of a line to attract certain kinds of fish. (2) A gang hook.

Jigging: Fishing over the side with a short line to which is attached a single or gang hook.

Lampara: This is also called a **Round Haul Net.** An impounding net with a bag in the center. The size of the mesh on the wings is large and there is a gradation to smaller mesh toward the center of the net. In operation, the net is laid out in a circle surrounding the fish to be taken. The ends are then pulled on board until the catch is concentrated in the bag, from which it is landed on board the boat with a brail or scoop. The bag is also called the bunt or sack.

Lead Line: The rope at the bottom of an entangling or impounding net, which, being weighted with lead, causes the net to hang vertically in the water. *See also* **Foot Rope.**

Live Bait Fishing: Fishing with live bait or jigs after chumming with live bait.

Lobster Pot: Also called **Crawfish Trap.** A box made slats or chicken wire and of a shape such that it will not easily tip over. The entrance or funnel on the top is constructed so as to permit of easy entrance, and to prevent the exit of the lobsters. Used to catch spiny lobsters.

Long Line: An extremely long set line, generally used for halibut or other bottom fish.

Otter-Board Trawl: A funnel-shaped net, in which the mouth is kept open and the net spread by means of two large boards (otter- or trawl-boards), one on each side of the mouth of the net. The towlines or warps are attached to the boards and so arranged that the pressure of the water causes them to flare apart. One boat is used to draw the net along the bottom.

Paranzella Net: A large funnel-shaped net which is dragged on the bottom by means of two boats pulling, one from each wing. Used to take flatfishes or other bottom fishes.

Plug: A trolling lure made of bone, painted wood, shell, or other bright material.

Pole Line Fishing: Hook and line fishing with the line attached to a pole. All kinds of acceptable bait are used in this method, but commercially its use is very restricted. This gear may also be used for jigging and chum or live bait fishing.

Purse Lampara. *See* **Ring Net.**

Purse Seine: An impounding net built like a long shallow curtain without any bag in the middle. In operation, the net is circled around a school of fish and the bottom of the seine closed by pulling the purse line at the bottom of the net, thus forming a trap or purse. The seine is then hauled in until the catch is concentrated in one end of the seine, from where the fish can be landed on to the boat with a brail. The seine is carried on a turntable which facilitates its loading and unloading.

Ring Net: A net having a combination of the features of a lampara and a purse seine, with the coarse ends and fine center of the lampara, and the simple design and purse rings of a purse seine. It is hauled very much like a lampara.

Round Haul Net: *See* **Lampara.**

Scoop: *See* **Brail.**

Set Lines: Long lines with many hooks, either weighted down and extending along the bottom, or submerged and kept between the surface and the bottom, parallel to the surface, by means of floats.

Set Net: An entangling net, either gill or trammel, which is attached to some fixed object, such as the shore, the bottom, or an anchored boat. It may be set on the surface, or it may be submerged. It can only be set on the bottom when there is little current.

Snagging: Fishing with hook and line without bait on the hook, in which the fish are attracted by chumming, and caught by snagging on the hook. A snag or jig hook consists of a number of hooks attached to an eyed weight fastened to a hand line. It is operated by jigging up and down and snagging the fish which come in contact with it.

Spear: Heavy barbed forks or single-pointed instruments for striking fish. This method is used only by amateur fishermen.

String Net: A modification of a gill net in which a string from the cork line to the lead line causes the mesh to hang slack. It may be a set or a drift net, but is usually the former.

Submerged Gill Net: A gill net which is set below the surface of the water.

Trammel Net: An entangling net in two or three layers, the inner or middle one being slack and fine-meshed, the outer stretched and of coarse mesh. The fish swim into the net, striking the small mesh. In trying to extricate themselves, they push through the large mesh, making a pocket from which they can not escape. Used as a drift net in rivers and as a set net in the ocean.

Trawl Net: A net made in the form of a bag in which the mouth is kept open by various devices, the whole being dragged on the bottom for the purpose of taking flatfishes or other bottom fishes. Also called a **Drag Net.** *See* **Paranzella.**

Trolling: A method of fishing, employing a troll line.

Troll Line: A line with bait or artificial lure drawn through the water behind a moving boat.

Trot Line: A set line running from bank to bank of a river or strait.

THE MEANING OF SCIENTIFIC NAMES

To the average reader there is something formidable about the scientific names of animals and plants—something to be associated with long-haired scientists who have little sympathy with the needs of the layman. Yet the value and convenience of a well-arranged universal language is so great that the layman should come to know its use.

The purpose of having scientific names is primarily two-fold: first, to provide a universal language of names of living things among readers of all nations; second, to express relationship between living things.

If I, an American, wish to gather a collection of literature in all languages on the barracudas, for example, I have only to ascertain the scientific name of the family of barracudas, which is Sphyrænidae, and search through the indices of as many books as I wish. Thus, my library might contain books in Japanese, Turkish, Italian, French or any language in which the Sphyrænidae may be treated. If I am interested in the *content* of any of these works, I need only to have them translated. The reason for the remarkable cooperation among scientists of all nations lies in the existence of rather rigid rules adopted by the International Zoological Congress, which maintains the International Commission on Zoological Nomenclature. Scientists ignore the rules of this congress at the expense of their reputations, for the inestimable value of this code causes conservative zoologists to guard it zealously.

Knowledge of the relationship between animals is important because it helps in grouping together species which resemble each other for study and comparison. This relationship is expressed in six main divisions: the phylum or subkingdom, the class, the order, the family, the genus, and the species.

We begin with the entire collection of living things in the world, which we divide into two groups: plants and animals. Broad anatomical similarities between individual species form the basis of a second grouping into divisons known as the subkingdoms or *phyla* (singular *phylum*) of which from 15 to 20, among animals, are recognized at present. Systematists are continually discovering bases for new groupings, and the number fluctuates continually. As an illustration of a phylum, we have all of the animals with paired, jointed appendages, a chitinous or horny covering of the body, and with their bodies partly divided into segments or joints, grouped into the phylum Arthropoda (jointed footed), and we can speak of all of these animals as arthropods.

Each phylum is divided into smaller divisions called *classes*, which, because of certain common characters, bind groups together. Thus, the phylum Arthropoda is divided into five classes: the insects (flies, beetles, ants, butterflies, etc.), all forming one class; the crustacea (lobsters, shrimps, crabs, barnacles, etc.) forming another; the spiders a third; the centipeds and millipeds a fourth; and another, less commonly known group called the Onychophora (claw-bearing)—small caterpillar-like animals with antennae and claw-bearing appendages—a fifth.

Within each class, the broadest division of related groups is the *order*, of which there are many. Thus, the animals in the class Crustacea which have ten pairs of jointed appendages constitute one order—the Decapoda (ten feet), which includes the crabs, shrimps and lobsters.

A finer grouping is made of the members of the orders, and the next broadest division is the *family*, of which there are many more than orders. For example, all decapods in which the first and third legs are alike, with straight abdomens ending in a broad tail-fan are classified in the family Palinuridae (named after Palinurus, the most typical genus). The family name always ends in the suffix *-idae*, plural of the Latin patronymic suffix *-ides*, which means *the son of*. The last syllable of an included genus, usually the best known, is substituted by this suffix to form the family name.

Each family is split up into smaller groups of related species called *genera* (singular *genus*), although sometimes the members of a family are so closely related as to constitute only one genus. The family Palinuridae, for example, is divided into six genera, of which one is represented on the coast of California—Panulirus (an anagram of Palinurus, the type genus, which is named after a promontory off the coast of Lucania).

The final division is into *species*, which is a group of similar animals or plants which do not differ in size, shape, color or other anatomical characters beyond the limits of individual variation, and which may interbreed and reproduce their characters

in their offspring. The word *kind* might be thought of as being synonymous with *species*. The scientific name of an animal, as it is written, is made up of two essential names: first, the name of the *genus*, always begun with a capital letter; and second, the name of the *species*, written without an initial capital letter. Thus, the California spiny lobster is named Panulirus interruptus, and from this name, we know that this species is related to the various kinds of Panulirus found in other parts of the world.

often there are variations within a species, and if these are constant and significant, then we may make a still finer division into *subspecies*, in which case the name of the subspecies would appear after the name of the species. For example, the name of the Pacific mackerel is here called Pneumatophorus japonicus diego, the name *diego* being indicative of the subspecies.

The scientific name is written in italics, and is usually followed by a name printed in Roman type, which is the name of the man who named that species. The scientific name of the California spiny lobster, for example, is properly written Panulirus interruptus (Randall). The name of the genus is always a noun; the name of the species an adjective which must agree with the noun in number and gender according to the rules of Latin grammar. Thus, the Latin name of the fish called the *halfmoon* is Medialuna californiensis, which when translated, means California halfmoon. The name Sphyrœna in the scientific name of the barracuda means little hammer, and is taken directly from the common name of the barracuda, which the ancient Romans used. The species name, argentea, means *silvery*, and thus the whole name Sphyrœna argentea means *silvery little hammer*.

The International Commission on Zoological Nomenclature has decreed that once a scientific name has been created, it may not be changed. This is called the *law of priority*, and is the cause of frequent discussions as to which of two names was created first, and very often is the cause of changes in names formerly thought to be well-established. Scientists sometimes find in individual species what they consider sufficient peculiarities to form bases for the establishment of new genera, or even families. Sometimes differences between groups in one species may seem significant enough to recognize two separate species.

Each class, order, family, genus, and species may be divided into subdivisions if there are sufficient differences between groups to warrant such a division. So, we might summarize the classification of the spiny lobster as follows:

Phylum Arthropoda: Animals with jointed appendages; a chitinous or horny external covering of the body and with the body divided into segments.

Class Crustacea: Arthropods breathing by means of gills and with two pairs of antennae.

Subclass Malacostraca: Crustaceans with a constant number (nineteen) of body segments.

Order Decapoda: Malacostracans in which the first three legs on the thorax serve as maxillipeds (foot-jaws).

Suborder Reptantia: Decapodans with the first abdominal segment being distinctly smaller than the rest; the abdominal legs more or less reduced, seldom used for swimming.

Family Palinuridae: Reptantians with the third pair of legs like the first. The carapace without a rostrum.

Genus Panulirus (the spiny lobster): Palinurids with the stalk of the eye small and free.

Species Panulirus interruptus: California spiny lobster.

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(Note: The important references are in bold-faced type.)

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