EDIBLE Fishes of New South Wales

By

DAVID G. STEAD

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Department of Fisheries,
New South Wales.

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THE EDIBLE FISHES OF NEW SOUTH WALES:

THEIR PRESENT IMPORTANCE AND THEIR POTENTIALITIES.

BY

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AUTHOR OF "FISHES OF AUSTRALIA," &C., &C.

WITH 81 PLATES AND 1 MAP.

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THE EDIBLE FISHES OF NEW SOUTH WALES.

Introduction.

From an economic standpoint, the fishes of New South Wales are at present of great importance; but their present importance is as nothing compared to their vast possibilities; and I am confident that I am justified in saying that the future will demonstrate that they are to be numbered amongst this State's greatest national assets. Rich in a variety of fine edible forms, these waters are no less rich in quantity, and many of our species—more particularly those of a pelagic or oceanic nature, such as the Mackerels—occur in such overwhelming abundance as to make their capture and treatment (in a commercial way) on a large scale a comparatively simple matter for people of enterprise, knowledge, and resource. In stating this, I am thinking chiefly of fishes which are not at present of any importance in the markets of New South Wales—fishes which, though present in our coastal waters in incalculable numbers, are not usually captured unless they make their appearance in the more restricted waters of our harbors and estuaries (the latter being the principal localities in which fishing for market is carried on). But, apart from these, those species which are just now of principal value in the fisheries of New South Wales, may be captured in quantities immensely greater than those at present marketed, all that is needed to bring this about being a more improved fashion of handling the

fish after capture, better means of despatch to selling centres, and—most important of all—a comprehensive and up-to-date scheme of distribution to the people. No very complete or satisfactory system of fish supply, as far as the individually small consumers are concerned, has so far been evolved, notwithstanding that it is recognised on all sides that the public desire for fresh fish is so deep-seated that the present supply might be very considerably augmented without there being any danger of it exceeding the demand.

Exclusive of the Sharks and Rays, about five hundred species of fishes are at present known to inhabit the waters of New South Wales; and of these, about two hundred and fifty may be regarded as edible* kinds. Very many of the latter are of present commercial importance, while among the others are to be found a considerable number of species which only await the advent of different methods of capture to those at present in vogue to become of the highest importance in our fisheries. (This matter is again referred to by me in dealing with the individual species.)

Though our fisheries are capable of enormous expansion (and here I am referring only to that great portion of the fisheries concerned with the fishes alone), their present value is really very considerable and far greater than most people—even residents in the State—have imagined.

During the last five years an amount of 48,243,238 lb. (or 643,243 baskets) of fish has passed through the fish markets of New South Wales. This amount was distributed throughout the various years as under†:—

Year.	lb.
1903	10,596,000
1904	9,389,250
1905	9,241,650
1906	9,666,289
1907	9,350,049

* I use the term "edible" here in the sense explained by me in the introductory note to the list of fishes farther on.

† All amounts are calculated at the rate of 75 lb. weight per basket.

This would show an average of 9,648,648 lb. per annum; but, in addition to the quantities here given, a very large amount is sold without ever passing through recognised markets, and of which no record is at present obtained. Again, there is a considerable quantity of fish (freshwater)—principally Murray Cod—captured annually in New South Wales rivers and forwarded through several border towns into Victoria. During the last five years this aggregated not less than 636,496 lb., made up as under:—

Year.	lb.
1903	43,792
1904	114,688
1905	122,976
1906	141,456
1907	213,584

More than nine-tenths of the New South Wales fish supply is obtained from the coastal estuaries and lakes by means of hauling and meshing nets. That which yields by far the greatest supply is the estuary of the Clarence River, from which during the last five years a quantity of 8,041,025 lb. has been forwarded to the metropolitan markets, the figures for each year being as follows:—

Year.	lb.
1903	1,647,750
1904	1,086,875
1905	1,594,350
1906	1,931,325
1907	1,780,725

The great bulk of the market supply is made up of the following kinds:—Black Bream, Blackfish, Flathead, Whiting, Jewfish, Mullet, and Snapper; the most numerous being the various species of Mullet (principally Sea Mullet).

* * * * *

Although strictly speaking—not being fishes—they should not be included here, I feel it incumbent upon me also, to make some mention of the edible Crustaceans and Oysters

of New South Wales, playing, as they do, such an important part in our present fisheries. Economically, by far the most important of our edible Crustaceans are the two species of marine Crayfish (or "Spiny Lobster"), known respectively as the Common Crayfish and the Southern Crayfish. The former is the ordinary form, captured in the coastal waters of New South Wales, and is the one most abundantly represented in the fish markets; while the latter is captured but sparingly in these waters, the great bulk of those sold in Sydney coming from Victoria or Tasmania. During the last five years the following quantities of Crayfish have passed through the fish markets:—

Year.	No. of Crayfishes.
1903	53,237
1904	33,084
1905	85,224
1906	58,992
1907	84,900

Total number of Crayfishes for five years, 315,437; or an average of 63,087 per annum.

As is well known in Australia, these Crayfishes attain a large size, and are very highly esteemed as food.

The next Crustacean, in order of size, is the large Murrumbidgee Crayfish (*Astacopsis spinifera*), a lobster-like animal with huge claws, also known as "Murray River Lobster." This is widely distributed, but reaches its greatest abundance and size in the western rivers of New South Wales. Large numbers of these are captured and sold in country towns, but a comparative few finding their way to the markets of Sydney.

Of edible crabs there are a number of species, the two of greatest importance being the Blue Swimming Crab (*Lupa pelagica*) and the Mangrove Crab (*Scylla serrata*). The latter, though not so commonly obtained, is of greater value than the other, as it grows to a considerable size, and is large-clawed; consequently, more "meaty."

Next in economic importance to the Crayfishes are the Prawns, of which New South Wales possesses a number of fine edible species; the most important of which at present are (1) the King Prawn (*Penæus canaliculatus*), and (2) the School Prawn (*Penæus macleayi*). Of these, the former is the larger, attaining a length of as much as 8 inches. During the last five years the following quantities (quarts) of Prawns have passed through the fish markets of New South Wales.*

Year.	Quarts.
1903	213,200
1904	127,000
1905	91,640
1906	119,360
1907	187,120

Total quantity for five years, 738,320; or an average of 147,664 per annum.

In addition to those here mentioned, a very large quantity is annually disposed of, which does not pass through any recognised market.

With edible Oysters, New South Wales is excellently provided, though only one species is of commercial importance, this being the common Rock Oyster† (*Ostrea cucullata*). Among the marine resources of New South Wales, the common Oyster holds a very high and important position, as a very considerable trade results from its cultivation and sale.

During the last five years, the following quantities‡ of Oysters have been produced in the estuarine waters of New South Wales:—

1903	16,311,600
1904	15,135,600
1905	16,629,600
1906	18,007,200
1907	17,310,000

* All quantities of prawns are calculated by me at the rate of 40 quarts = 10 measures, per basket.

† By the term Rock Oyster, it must not be understood that this species is only to be found in rocky positions, as such is not the case.

‡ The quantity is calculated at the rate of 1,200 oysters per bag, which is quite a moderate estimate.

This gives an annual average of nearly 17,000,000 oysters, and although this number very strikingly indicates the present importance of the industry, it may be safely stated that, when all the oyster lands are treated in the same way as a comparative few are at present, the output will be at least quadrupled.

The Oysters produced in New South Wales are already famed for their fine size and excellent quality, and there is, undoubtedly, a great future before the industry.

* * * * *

I mentioned previously that more than nine-tenths of the New South Wales fish supply was obtained from the coastal lakes and estuaries, thereby indicating that the present supply from inland sources was comparatively small. But though this is so, the inland (western) fisheries are destined to play a far more important part than they do at present; and this naturally, as the western districts are more and more opened up, and conveyance becomes an easier matter; but with the aid of artificial propagation on a grand scale by means of suitable hatcheries, the productive power of the waters in these localities will be greatly increased. There is no doubt also that a valuable food-fish like the Murray Cod—the supply of which is never likely to equal the demand—might be profitably farmed in private lakes and lagoons, as is done with other species in various countries, and might be transferred—with every prospect of success, as far as can at present be seen—to more extensive waters in which it does not now exist. A good instance of what might be done in this way has already been afforded us in our experience with Lake George†. In 1893 this was a great sheet of water, 22 miles in length by an average width of 7 miles, and having a mean depth of 8 feet. About forty years previously, the lake was practically dry, but in the year 1862, during a time of great flood rains, it received a huge volume of water, the quantity being more or less sustained for many years. The same floods which filled it also brought a stock of Murray

* Lake George has now practically ceased to exist, having dried up.

Cod, these being transported with the overflow from the ponds of Sir Terence Aubrey Murray, at Collector, this gentleman having stocked his ponds from the Murrumbidgee River. As a result of this introduction, the Murray Cod became firmly established in the waters of Lake George, multiplying to a remarkable extent, and growing rapidly, so that a few years later, and for many years, a regular fishery was carried on, many tons being captured and sold.

The successful results accruing to this fortuitous introduction of Murray Cod open to our view the great possibilities of this fish in its relation to our future food-supply, more especially in view of the trend of recent events. During the last few years there has been a great movement in New South Wales in favor of artificial conservation of water on a large scale and by means of giant dams, the waters so impounded to be used in irrigation for general agricultural purposes. This movement has, to some extent, materialised, and there is in course of construction at the present time, and at a locality in southern New South Wales known as "Barren Jack," a huge dam which will hold back an enormous body of water. This dam is being thrown across the course of the Murrumbidgee River, at a short distance below its junction with the Goodradigbee River. Though there can be little doubt that this work will be more than amply paid for by the added agricultural value which will be given to the hundreds of square miles of fine arable land stretching away at its foot, its value from a fisheries standpoint is not to be lightly passed over. As the latter aspect of the case is so important, and as it has not hitherto been discussed, I feel constrained to go into a few details here, especially in view of the fact that it is contemplated by many that other works of a somewhat similar nature will be undertaken in the near future.

It is calculated that the Barren Jack Dam will impound at normal levels a quantity of 33,612,671,000 cubic feet, or 210,079,193,777½ gallons of water, which will be confined in a surface area of 12,784 acres. Out of this vast area there will be 8,246 acres of 30 feet and less in depth. I might

mention also that it is considered that the Murrumbidgee River will be dammed back for about 40 miles, while the Goodradigbee will be similarly dammed for about 12 miles.

Now, in European lakes (according to such an authority as Sir F. A. Nicholson), where fishes subsist solely upon the natural food supplied by a lake and its sources, 1½ cwt. per acre is considered a medium annual yield. Under the more favorable conditions for the growth of fish food existing in our waters, I think we may safely increase the amount to at least 2 cwt. under ordinary natural conditions; while, with a proper system of cultivation, this amount might be very greatly increased. As I stated before, it is estimated that the total surface area of the Barren Jack Reservoir at normal level will be 12,874 acres, which, at the rate of 224 lb. (2 cwt.) to the acre, would yield 2,863,616 lb. of fresh fish annually. Under present conditions the fishes so captured would consist mainly of Murray Cod and Trout, and this without any special introduction of the species on the part of man, as the Murray Cod already exists in that portion of the Murrumbidgee above the dam, while the Goodradigbee River, which flows into the Murrumbidgee about 3 miles above the dam, has long since demonstrated its capabilities as a trout stream of the first order. On the other hand, if a suitable hatchery and nursery ponds were established (and it must be remembered that all the conditions combine to render hatchery construction in this locality simple in the extreme, quite without those difficulties which might be encountered elsewhere) the possibilities of fish production in this great artificial lake would be immeasurably increased; and under ordinarily favorable circumstances the return should reach annually many millions of pounds weight. If—as appears probable—other huge reservoirs of a similar nature are constructed, there will be presented to us the chance of enormously augmenting our future inland fish supplies.*

*In Europe a lake is considered to be stocked with fishes when it holds them at the rate of about 1 lb. per 50 cubic yards. At this rate, Barren Jack Reservoir would, when fully stocked, support the enormous quantity of 24,898,275 lb., or 11,115 tons. Verily these are huge figures, but investigation will show that they are not exaggerated.

* * * * *

The great and widespread movement towards the elucidation of fisheries problems which has begun to manifest itself during the last few years in the various States of Australia, led by New South Wales, and which must ultimately tend to remove a great many of the disabilities under which we at present labor, has recently taken a very definite and tangible shape. By the action of the Australian (Commonwealth) Government in taking the necessary steps to bring about the formation of an Australian Fisheries Bureau, with also the avowed intention of prosecuting a thorough and searching inquiry of a permanent character into the nature and importance of our boundless marine resources, a great forward step has been taken. The fine investigation ship which is now under construction in New South Wales for the Commonwealth Government must itself be a very powerful instrument in the collection of useful and highly-important data in regard to the identity, occurrence, periodicity, and distribution of our fishes—particularly, I think, those of a pelagic or oceanic nature, of which we possess so many valuable species, and about which we know so little. It is to be sincerely hoped that the Commonwealth Government will prosecute in a liberal and vigorous manner work so well begun, as the amount of benefit to be derived (either directly or indirectly) from properly carried out Fisheries investigation work, is almost incalculable. This has already been found to apply in older countries which had already generations of knowledge and experience to build upon; and this being so, how much more imperative it is for the work to be carried on in waters such as our own, where so little has been learnt.

But even if the Commonwealth Government carries out this work, and does it in the way hoped for, the separate States should not be idle, and each one should have a complete staff of scientific workers whose duty it would be to inquire into and advise upon fisheries problems generally, and more particularly matters with which the individual States are

chiefly interested. While this should undoubtedly be done, any work carried out should be so arranged—as far as practicable—as to dovetail in with work carried out by the higher authority. In addition to this, and for the purpose of generaly disseminating knowledge of our fisheries and the many allied matters, Fisheries Colleges—somewhat after the fashion of those recently founded with such great success in Japan—should be established without delay. These could be placed at convenient spots and should be so constituted as to be in a position to teach all general matters, such as various fishing methods, the preparation of fishery products as food, the various methods and the principles of oyster cultivation, &c., as well as certain biological matters, upon a knowledge of which the successful prosecution of a fishery so often depends. To assist in the carrying out of the work, intelligent young men, possessed of a very necessary amount of patriotism and the desire to learn, should be sent for certain terms, to study the fisheries problems, and the "method of attack" of those problems in other countries. Such men would then, in the ordinary course of events, become the teachers in our Fisheries Colleges; but in any case, whether the latter were established or not, the knowledge thereby gained would be invaluable when adapted to our own conditions. This, I may add, is part of the already successful plan, at present being followed by our hardy and go-ahead neighbors, the Japanese.

* * * * *

Hitherto, the only State in the Commonwealth of Australia that has seriously attacked fisheries work* has been New South Wales; and during the last few years a considerable amount of useful investigation into our fishes and fisheries has been carried out. As far as "outside" marine investigation is concerned, the most important work so far performed by this State was that undertaken by Mr. Frank

* At least as far as marine work is concerned.

Farnell (now the Chairman of the Board of Fisheries for New South Wales) during the year 1898. I here refer to the trawling cruise of the "Thetis." This all-too-short investigation was carried out under very great disabilities; the "Thetis" being a vessel entirely unsuited for the work which she was to perform, though an attempt was made to adapt her to it. Still, notwithstanding the great obstacles to success which were encountered, and the shortness of the cruise—about two months,—the investigation was productive of much information and material which already have been of great use to us, and which will be of considerable assistance and importance in future operations. In that light, therefore, the expedition must be looked upon as having been exceedingly successful, and it is greatly to be deplored that the Government of the day did not authorise the continuance of the work for a much longer period, even with such an unsuitable vessel. It must be added that the carrying out of this trawling was solely due to the great persistence and enthusiasm of Mr. Farnell, then a member of the State Legislature, and who for many years has with great ardour insisted upon the importance and value of Australia's fisheries.

In this connection it will be of interest to mention that shortly after the appointment of the New South Wales Fisheries Commission in 1881 that body took steps to introduce a number of fishing implements of recognised importance in the fisheries of other countries, the idea being to utilise them in these waters, with a view to doing something towards demonstrating the great potentialities of our outside fisheries. This may be looked upon as a highly-important step, and one that would in the ordinary course of events have been productive of very great benefit; but, to a great extent, misfortune awaited this experiment. The newly-born Fisheries Department of the day was housed in the hapless Garden Palace, at Sydney, which, built in the year 1879, came to an untimely end in 1882, being with its contents totally destroyed by fire. By this unfortunate event, which took place on the morning of the 22nd September of the year mentioned, the

whole of the books and documents of this Department, as well as the fishing-gear referred to, and general effects, were irretrievably lost.*

Amongst the implements here referred to were the following:—

(1) A *Purse-seine* net, similar to those used in America in the capture of the Menhaden,† and measuring 185 fathoms in length by about 8½ fathoms (when hung) in depth.

(2) A *Drift-net* of the kind used in the Scotch herring fisheries. (I am informed by my friend Dr. James C. Cox, Commissioner of Fisheries, and who was then President of the New South Wales Fisheries Commission, that this net measured about 3 miles in length).

(3) An *Otter Trawl* of 42 feet width of net. This was tried in the waters of Port Jackson at the end of 1881.

(4) A large *Beam Trawl*, similar to those in use by Grimsby fishermen at that time. (Later, and after the destruction of this net, a *fac-simile* of it was constructed at the order of Dr. Cox, and this was used in some experimental trawling, which was carried on between Botany Bay and Jervis Bay during 1883.)

(5) A *Set-line or Bultow* (called also "trawl-line"), which was procured from America. This set-line was the same in size and general construction as those which were used on the first-class American schooners engaged in the Cod fisheries. It was constructed, under the direction of Captain Collins of the United

* The Linnean Society of New South Wales, which is the principal scientific society of Australia, was also a very heavy loser by this disastrous fire.

† The Japanese use a net very similar to this in construction—really an adaptation of it—in which there are a number of metal rings along the bottom of the net, through which is passed a draw-rope. When a shoal of fish is surrounded the net is, by means of this draw-rope, converted into a large basin.

States Fish Commission, by Captain George Merchant, Jr., an experienced fisherman of Gloucester (U.S.A.). Such a line as this is managed by two men, though it is divided into sections for greater convenience in handling; and, if desirable, two or more set-lines may be made of it). This set-line was composed of the following parts:—Ground-line, nearly 11,150 feet ($2\frac{3}{4}$ miles) in length, to which 2.000 hooks were attached by small lines called gangings, each 3 feet long (the hooks were placed $5\frac{1}{2}$ feet apart); two small anchors; two keg-buoys to mark the position of the line; two buoy-lines, each 100 fathoms long; two flags for the buoys; a "trawl roller" and two pairs of "nippers." (The *trawl roller* is secured to the gunwale of the boat, near the bow, in such a manner that the line passes over it as the bultow is pulled in by the fishermen. The *woollen "nippers"* are held on the hands of the fisherman—one on each hand—who is thus enabled to grasp the line firmly, and to pull with all his strength—an impossible feat for a bare-handed person).

With the exception of the Beam-trawl, none of the fishing-gear abovementioned was replaced.

The Bultow, it may be added, is likely to be used on a large scale in our future outside fisheries. At the present time a few men are using it in the vicinity of Sydney, with splendid results, the catch to a great extent consisting of such an important fish as the Snapper.

A Complete List of The Edible Fishes of New South Wales.

With brief remarks upon each Species.

In the following pages an attempt has been made to bring before the reader a "bird's-eye view" of the whole of the known edible fishes inhabiting the waters of New South Wales—both fluviatile and marine. But before proceeding, perhaps it is necessary for me to explain the exact meaning of the term "edible," as used by me. By that, I mean all of those fishes which—while not being of a noxious or unpleasant character (such as Toad-Fishes, Porcupine-Fishes, &c.)—attain a marketable size, or else occur in sufficient abundance to render them of use as adjuncts to our food supply. Strictly speaking, of course, using the term in its widest application, it would necessarily include a host of small fry, like the Gobies, Blennies, &c.; but with one or two exceptions, such as these are not here taken into account.

The order followed in treating of these fishes is that used by me in my "Fishes of Australia," (1906); and that is the true systematic order, which is as near as possible the natural one. Alphabetical order, which is so convenient in many respects, has here some very grave drawbacks; the principal of which is that fishes having no relation with one another, and which may be very different in habits, &c., are grouped together, through the terminal in the vernacular name being the same. (Familiar instances of this are the Red Cod and the Murray Cod; the first of which is a kind of Cod, while the second is a true Perch.) The binomial nature of our vernacular nomenclature also militates to some extent against an alphabetical arrangement.

THE GIANT HERRINGS.

"Ox-eye," or Big-eyed Herring (*Megalops cyprinoides*).

PLATE I.

The Australian "Tarpon." More abundant in the vicinity of the two great northern rivers, the Clarence and the Richmond. A good food-fish, attaining a length of at least 5 feet.

Giant Herring (*Elops saurus*).

A fine food-fish, attaining a length of about 4 feet. Distribution very similar to preceding. Well and favorably known in America as a game-fish.

THE DORAB.

Dorab (*Chirocentrus dorab*).

A gigantic herring, which reaches a length of fully 12 feet. Rare in the waters of New South Wales.

THE TRUE HERRINGS.

Salmon Herring (*Chanos chanos*).

PLATE II.

Also known as "Milk-Fish." A large species, exceeding a length of 4 feet. Not common in New South Wales.

Hairback, or Gizzard Shad (*Dorosoma nasus*).

PLATE III.

Like the four preceding, this herring is a northern species; at times occurring in shoals. Attains a length of about 15 inches. Very closely allied to the following:

Bony Bream or Pibrie (*Dorosoma erebi*).

An inhabitant of the inland waters of the Murray River system. Very largely used as bait in the capture of Murray Cod. Reaches a length of about 13 inches.

Pilchard or Maray (*Clupanodon neopilchardus*).

PLATE IV.

A fish which is potentially of immense importance, but which is at present but little used. It is by far the most important of the Herring family in the waters of New South Wales, occurring, as it does at certain seasons, in enormous shoals covering vast areas, and comprising incredible numbers. This statement applies to both young and adult stages.

The Australian Pilchard is, to all intents and purposes, practically identical, as a food product, with the Sardine of commerce; and many thousands of pounds might be made out of its capture in the waters of New South Wales annually. At times, so densely packed together are the shoals, that it has been found possible to dip a basket into the sea and lift it out half full of the pilchards. In the pursuit of this and our smaller clupeids, a lucrative fishery awaits persons of enterprise, experience, and resource.

The Pilchard "smokes" well, and a small quantity is so treated annually in New South Wales. Shoals of pilchards are to be found at various times throughout the year, but those consisting of the mature fishes, averaging about 9 or 10 inches in length, are in their greatest magnitude during spring and early summer, notably—in my own experience—during the month of September. These shoals are usually making north.

In regard to bodily shape and structure, the Pilchard is elongate, with the body rather rounded and very "fleshy." It is covered with thin, fairly large, and very deciduous scales. The abdominal scutes, which are such a prominent feature in some of the members of the Herring family are very slightly developed, and the belly is rounded. These features, coupled with the looseness of the scales, are of great importance in assisting to elevate this valuable fish to the rank of a first-class food product.

The Pilchard commonly attains to a length of 9 or 10 inches, individuals of a larger size occurring in most shoals.

In color it is dark blue, bluish-green, or greenish-brown along the upper surface, changing rather suddenly into the brilliant silver color of the sides. Along each side is a series of darker blotches, giving to the fish, when viewed from above, an appearance very similar to that of another important, though very different, species—the Common Mackerel. Curiously enough, too, small bodies of the pilchards are often found among Mackerel of equal size, and *vice versa*.

Herring (*Sardinella castelnaui*).

PLATE V.

This fish, like the preceding, is always with us in greater or lesser abundance, but at times makes its appearance in vast shoals. It is a comparatively short, deep-bodied fish, attaining a length of 8 or 9 inches. The eye is large and possesses a well-developed transparent fleshy lid, just as is seen in the common Sea Mullet and Yellow-tail. The teeth are very minute. The scales are large and highly deciduous. There is a large and simple air-bladder, this showing up silvery through the semi-transparent sides of the freshly-caught herring.

As regards coloration, this fish is a very pretty little species. The upper surface is usually of a bluish-green, the sides being of a most brilliant silver, with, in certain lights, a sheen of gold. This golden sheen is still more apparent on the gill-covers or opercles. The irides are of a beautiful golden or golden-red tint. The fins are transparent, the tips of the dorsal fin and of the caudal lobes being black.

The Herring is one of the fishes of the future as far as New South Wales is concerned, as at present practically no use is made of it.

Freshwater Herring (*Potamalosa novæ-hollandiæ*).

This is another abundant New South Wales clupeid, occurring commonly in all of our eastern streams. It is rather an elongate fish, and attains commonly a length of from 9 to 10 inches; examples of a still larger size being occasionally obtained.

The Freshwater Herring is seen in its greatest abundance during the spawning season, which is about midwinter. At this time huge shoals congregate in the estuaries of the rivers, whither they have made their way to spawn. During the breeding season the normal shape of the fish is greatly altered, so much, indeed, as to give it the appearance of a different species. This is due to the greatly increased depth or height of the fish, brought about by the enormous development of the reproductive organs, both ovaries and milt.

The teeth of the Freshwater Herring are very tiny. The scales are large, smooth, and firmly adherent—not deciduous as in the case of the common Herring. Like the latter fish also, it has well-developed adipose eyelids.

This is a beautiful little fish when fresh, being, with the exception of a narrow greenish strip along the back, of a uniform silvery color. Soon after capture a good deal of its brilliance disappears, the back and sides then being of a straw color, or olive-green, with the belly silvery; a broad silvery, dark-edged, longitudinal band running down the middle of the sides.

The Freshwater Herring is known in different parts under various names. It is one of our gentler sporting-fishes, being often captured by "knights of the rod," and taking a bait freely.

Sandy Sprat (*Hyperlophus sprateïdes*).

This delicate little fish is destined to be of great importance in future fishing operations in the waters of New South Wales, occurring, as it does, always plentifully and at times in really prodigious numbers. It is a pretty little fish, almost transparent when alive, frequenting sandy localities along the New South Wales coast, and attains to a length of 3 or 4 inches. With its relative, the Freshwater Herring, this little clupeid is of some interest scientifically, in that it is one of the so-called "Rough-backed Herrings," which were known to occur in a fossil state long before any existing species were discovered. Reference to this matter will be found in "Fishes of Australia."

Anchovy (*Engraulis antipodum*).

For all practical and economic purposes, there is no difference between our Anchovies and the famous fishes of that name which occur in the Mediterranean Sea. Like the previously mentioned species, we have it always with us, at times congregating in enormous shoals of surpassing magnitude.* Like the Sandy Sprat also, it is a small species, attaining a size usually but little larger than that fish. It is a large-eyed and large-mouthed fish ; in fact, amongst the fishes constituting our Herring family it may be at once distinguished by the relatively enormous gape of the mouth.

At times other than the shoaling season, the Anchovy is to be found frequenting fairly deep water in our harbors, lakes and estuaries.

Other species of the family of Herrings have been recorded from the waters of New South Wales.

THE SALMON FAMILY.

Californian Rainbow Trout (*Salmo irideus*).

PLATE VI.

This magnificent sporting-fish has been successfully acclimatised in upland waters of New South Wales, in many of which it is now quite abundant. Its splendid qualities as a game-fish of the first order have won for it the highest opinions on all hands, and it is now firmly established as one of the useful fishes of New South Wales, owing to the unremitting efforts of the New South Wales Department of Fisheries. It has shown itself to be readily adaptable to our somewhat exacting and unique conditions.

European Brown Trout (*Salmo fario*), Salmon-Trout (*Salmo trutta*), Loch Leven Trout (*Salmo levenensis*), and American Brook Charr (*Salvelinus fontinalis*), have also been introduced to our waters, the first with marked success.

* During March, 1908, there was an enormous shoal of this species on our coast.

THE BEAKED SALMON.

Beaked Salmon (*Gonorhynchus gonorhynchus*).

Not a very common New South Wales fish, although occurring more frequently than has hitherto been imagined. Found in sandy localities, and attaining a length of 18 to 20 inches. The body is elongate and cylindrical. The mouth is beneath the curious pointed snout, and the eye is large.

CATFISHES.

Estuary Catfish (*Cnidoglanis megastomus*).

PLATE VII.

This curious and ugly, somewhat eel-like fish, is very common in the estuaries, harbors, and coastal lakes all along the coast of New South Wales, abounding principally in muddy localities, and attaining a length of about 3 feet. At the back and sides of the head (connected with the dorsal and pectoral fins) are fearful serrated spines, which these creatures know well how to use; and wounds caused by these are exceedingly painful. The capacity of the Estuary Catfish to produce these wounds, coupled with its ugly appearance, has contrived to bring about a feeling of disgust in most people, and by most fishermen it is looked upon as a pest, little better than the troublesome Stingrays. Still, notwithstanding this, the fish is an edible species of no mean order, the flesh being white and of good flavor. For the table it should be boiled, and the skin removed—the head portion being previously cut off.

In life, the colors of this species are rather attractive, the whole of the body being curiously mottled with greyish and brownish tints. A short time after death, however, the skin usually assumes a dirty brown or blackish tint, not at all pleasant to look upon.

Freshwater Catfish (*Copidoglanis tandanus*).

This species, which is well and favorably known as an edible fish in parts of New South Wales, bears a general resemblance to its congener, just mentioned, but is far stouter in build, being comparatively short and thick-set. As in the Estuary Catfish, the second dorsal and anal fins are continuous, forming a long eel-like fringing fin round the tail portion. As I have already indicated, this fish is by no means despised as a food-fish as is its estuarine relative, and perhaps it is necessity which has brought this about. The Freshwater Catfish abounds most commonly in the western waters of New South Wales (those which ultimately find their way into the River Murray), and as the inhabitants of these parts have not the choice of species that residents of the coastal districts are favored with, they cannot afford to be so particular as to appearance—and certainly the Freshwater Catfish is a very unlovely beast.

In some parts of the country this species is known under the name of "Jewfish," but this name is only properly applied to the fish known as *Sciæna antarctica*.

In addition to occurring in our western waters, the Freshwater Catfish is found in the head waters of a number of our northern east-flowing rivers.

Salmon-Catfish (*Galeichthys thalassinus*).

Two species of Salmon-Catfish are at present known to occur in our waters, but the larger form, above-mentioned, is the more common.

This fish is not at present used largely as food. It is found in fair abundance in the lower parts of our great northern rivers.

In form the Salmon-Catfishes are very different to the two species previously mentioned, having a well-developed forked tail and an adipose dorsal fin, as in the typical river catfishes of America.

Galeichthys thalassinus is remarkable in that it has the habit of hatching out its large eggs within the mouth cavity.

EELS.

Common Eel (*Anguilla reinhardtii*).

PLATE VIII.

This fish is found in all of the rivers and estuaries of the eastern watershed of New South Wales, and is the principal eel of the Sydney Fish Markets. Stray specimens of eels have been reported from high up in western waters in New South Wales, and during the year 1907 a photograph of one measuring 2 feet 10 inches, captured at Wilcannia (low down on the River Darling), was forwarded to the Department of Fisheries, but these can only be looked upon as "strays," and nothing more, as no species of true eel is known to habitually dwell in those waters.

The Common Eel not infrequently attains a length of over 3 feet, with a weight of at least 10 pounds; a weight of 3 to 4 pounds is, however, considered a fair average. A gigantic specimen which was taken from a "dam" at Gladesville, near Sydney, during December, 1907, and which is the example here illustrated, measured 4 feet 4 inches in length, and weighed 25 pounds. The girth of this Brobdingnagian was 15 inches.

No special fishery for the capture of this valuable fish, or its allies, at present exists; those that are brought to market being usually captured along with other fishes in hauling-nets—usually on muddy flats. As a food-fish it is prized, the flesh being of good flavor.

The name Long-finned Eel is sometimes applied to this species, to distinguish it from another somewhat similar form known as the "Short-finned Eel" (*Anguilla australis*). In the former, the dorsal fin extends very much farther forward than in the latter. It is questionable, however, in my opinion, as to whether the differences here denoted are more than varietal.

In color the Common Eel is of a dark olive-brown, streaked and spotted with black, the lower surface being whitish.

Amongst other edible eels occurring in the waters of New South Wales, the following may be mentioned:—

Conger Eel (*Leptocephalus labiatus*).
Little Conger Eel (*Congermuræna habenata*).
Silver Eel (*Murænesox cinereus*).
Serpent Eel* (*Ophisurus serpens*).
Green Eel (*Gymnothorax prasina*).
Painted Eel (*Gymnothorax picta*).
Clouded Eel (*Echidna nebulosa*).

Of these, the most important commercially (at present) are the Silver Eel and the Green Eel.

MINNOWS.

Mountain Minnow (*Galaxias coxii*).

The New South Wales Minnows are small, active, highly voracious fishes, distributed most plentifully over the streams of the eastern division. The largest of these is the Mountain Minnow, often miscalled "Mountain Trout." This is a handsomely-colored trout-like fish, reaching commonly a length of about 8 inches. It is said to be of delicious flavor.

THE AUSTRALIAN GRAYLING.

Australian Grayling (*Prototroctes maræna*).

A fine little fish, viewed either as food or as a game-fish. Very trout-like in appearance, and possessing a true adipose fin, as do the real representatives of the Salmon family. There can be little doubt that it is often mistaken in New South Wales waters for trout. It is found at certain seasons occurring in shoals in the upper waters of some of our eastern streams, notably the Grose River and the Kangaroo River.

The Australian Grayling attains a length of about 12 inches.

* There is an example of this Eel in the collection of the Department of Fisheries, New South Wales, which measures no less than 4 feet 8 inches in length.

THE SERGEANT BAKER FAMILY.

Sergeant Baker (*Aulopus purpurissatus*).

PLATE IX.

This handsome and excellent food-fish is distributed freely along the whole seaboard of New South Wales, where, in suitable localities, it may be captured by means of hook and line or the trammel-net.* It attains a length of over 2 feet, and as a table fish is in great request.

In form the body of this species is elongate and rounded. The male may be at once recognised by the fact that the second and third rays of the dorsal fin are produced into long filaments, about double the length of the head.

As will be seen from the following description of the colors, taken from my "Fishes of Australia," the Sergeant Baker is very beautiful. The upper surfaces are purple, with a more or less prevailing tinge of red, and with the edges of the scales crimson; the top of the head being sometimes spotted with the same color. The back and sides have large irregular crimson spots or transverse bands, covering two or three scales in width, not reaching across the abdomen. The sides are of a paler purplish-red than the back, and gradually merge into the pearly-white of the lower or abdominal surface. The dorsal and caudal fins are of a pale yellowish-red, obliquely banded with rows of crimson spots, which are frequently confluent on the caudal lobes. The adipose dorsal fin (which is characteristic of most of the species of the family *Scopelidæ*), is purple along its base and crimson on the upper portion. The anal fin is whitish, or of a pale straw-color; having across it longitudinal orange bands. The ventral and pectoral fins are yellow, with crimson bands across them.

Cucumber-Fish (*Chlorophthalmus nigripinnis*).

This large-eyed fish is one of those of which little was known until the last few years. By the advent of the Trawling Expedition of the "Thetis," in February and March, 1898—

* The design on the back of the cover of this work gives an idea of the working of the trammel-net, which is fully described in my "Fishes of Australia," pp. 245 and 246.

organised by Mr. Frank Farnell, Chairman of the Board of Fisheries for New South Wales—it was shown that this species is exceedingly common in ocean waters of moderate depth along a great part of the New South Wales coast line.

The excessively large eye of the Cucumber-Fish measures, in diameter, about half the length of the head itself.

THE FLUTE-MOUTHS.

Flute-Mouth (*Fistularia depressa*).

Not uncommon along the New South Wales coast, attaining to a length of from 3 to 4 feet.

Another species of Flute-mouth (*Fistularia serrata*) also occurs in these waters.

LONG-TOMS AND GARFISHES.

Slender Long-Tom (*Tylosurus ferox*).

PLATE X (Upper Figure).

This is a very long, slender, pelagic fish, attaining a length of 3 feet or more. Of a very voracious nature, it skims the surface of our coastal waters at a high speed and with somewhat snake-like, sinuous motions, in pursuit of its prey, which consists of small surface organisms, including small fishes such as garfishes and the young of other species. It possesses long, narrow, highly attenuated jaws, closely set with fine, needle-like teeth.

The Slender Long-Tom is not infrequently captured amongst Sea Garfish. As a food-fish it is of delicate flavor, but is a little troublesome owing to the many fine rib-bones, which are not quite fine enough to be consumed with the flesh, as in the case of the two commoner garfishes.

The colors are as follows: back, light green, with three parallel dark lines running along the middle from the back of the head to the beginning of the dorsal fin; sides iridescent, bright, silvery; the upper portions dotted over with green. Beak above, dark green; below, iridescent silvery.

Stout Long-Tom (*Tylosurus macleayana*).

PLATE X (Lower Figure).

This Long-Tom appears in the markets a little more often than the previously-mentioned species, being more abundantly taken in estuarine or lake (coastal) waters. In appearance it is considerably different to the latter, being relatively much shorter or thicker, as well as far more robust in general build. It grows to a length of 3 or 4 feet, but examples of from 2 to 3 feet in length are more commonly seen.

Like the Slender Long-Tom, it is a highly voracious fish; but its jaws are more powerful than in that species, and the teeth are very much stronger, though not so numerous.

Though all examples of both of the common Long-Toms are very readily bought up in the markets, there is in certain quarters a very strong antipathy to them on account of the greenness of their bones; but any feelings of suspicion as to their desirability as food engendered by this character, it is worthy of mention, are quite groundless.

The colors of the Stout Long-Tom are as under:—Back, uniformly dark green; anterior half of the sides, iridescent whitish-silvery, with a fairly well-marked line of demarcation between the dorsal surface and the sides. In the posterior half, the upper part of the sides are yellowish, fading into green.

Two other species of Long-Tom are found in the waters of New South Wales. One of these, which I have named the Barred Long-Tom, or *Tylosurus cæruleofasciatus*, is probably abundant at times at sea. It is undoubtedly a purely pelagic fish.

Sea Garfish (*Hemirhamphus intermedius*).

This highly important food-fish occurs in great abundance in the coastal waters of New South Wales. From an economic standpoint it must be considered as one of our most valuable

food-fishes. Great numbers are captured during the summer months in the lower parts of the harbors and estuaries; the usual means of capture being the so-called garfish net (also known as "Balloo net," from the Port Jackson aboriginal name of "Balloo," which was applied to garfish), a hauling net which possesses a mesh of $1\frac{1}{8}$ inch in the bunt or central portion, the wings or ends being of 2-inch mesh. This may be used either (1) as a simple hauling net, when the garfish are on the weedy bottoms, or (2) as a meshing, or gill, net, when the fishes are in large schools at the surface of the water. In the latter case, the process known as "Bull-ringing" is followed, the net being thrown in a circle right round the school. The Sea Garfish may also be captured by hook and line, in that way affording sport to quite a number of amateur fishermen. From an edible point of view, this species and the River Garfish are second to none, the flesh being white, flaky, firm, and delicious.

These fishes also keep sound, under natural conditions, for a longer period than do most others. Of the two species here mentioned, the Sea Garfish is usually by far the larger, attaining a total length of more than 18 inches, with a weight of up to 10 ounces; the usual "run" of those marketed, is, however, considerably below that size.

The Sea Garfish may be distinguished from the River Garfish in a rough-and-ready manner by the following characteristics. In the former the body is far more elongate or slim; the scales are much smaller and very deciduous, coming off with the least handling; and the upper jaw has a considerably greater length when compared with its width at the base.

The colors of the Sea Garfish are:—Back, bright green, with three narrow dark brown or blackish streaks from the back of the head to the dorsal fin, immediately in front of which the three meet. There is a silvery band, broadest posteriorly, and margined above by a narrower lead-colored band, running along each side. The lower surface is a pale greenish-silvery.

River Garfish (*Hemirhamphus regularis*).

PLATE XI.

This garfish is still more important than the previously-mentioned one, and is one of the principal, as well as one of the most frequently seen, fishes of the fish markets of New South Wales. It naturally abounds in the coastal lakes, harbors, and estuaries; in some instances extending almost up to the regions of fresh water.

As I have pointed out in my "Fishes of Australia," some idea of the great importance of the garfishes in the fisheries of New South Wales alone may be gathered from the fact that about 5,000 baskets of them are marketed annually. The great bulk of these is River Garfish. In addition to this number, great quantities are captured at various places and "hawked" round by the fishermen themselves, without the fish having passed through the markets at all.

The River Garfish attains a weight of from 8 to 9 ounces, with a length of 13 or 14 inches; those usually captured by the fishermen, however, average from 2 to 4 ounces. As previously pointed out, it is more robust in form—though smaller—than the Sea Garfish.

The colors are as follow:—Back, pale green; the upper surface of the head darker, and with golden reflections. Three narrow black vertebral streaks, not extending so far back as the dorsal fin. Two similar but irregular and broader streaks between these and the broad lateral silvery band, which is bordered above by a narrow orange streak. There is a faint black spot at the base of the pectoral fin.

The River Garfish is usually found in considerable abundance on sand-and-mud flats, where these are covered with "sea-grass," upon which it, to a great extent, subsists.

Barred Garfish (*Hemirhamphus far*).

This large garfish appears to be fairly common at times in the waters of the northern portion of our coast. It attains

a length of about 15 inches, and may be at once distinguished from the other species by its general stoutness, coupled with a very long "beak." Future Fisheries' work will probably show this species to be far more common in the waters of New South Wales than has previously been supposed.

Slender Garfish (*Euleptorhamphus longirostris*).

Although I have only one record of the capture of this remarkable species in our waters,* there appears to me to be good reason for thinking that it will be found to be quite abundant in our ocean waters. It is a pelagic species, growing to a length of 18 inches and upwards, and is of a gregarious habit. It is already favorably known as a food-fish in other parts.

Short-beaked Garfish (*Arrhamphus sclerolepis*).

This valuable species is a native of the northern half of our coastline, and becomes more and more plentiful as we proceed in a northerly direction. It is most abundant in the lower portions of the Clarence and Richmond Rivers.

In each of those rivers, as well as in other portions of its habitat, it ascends right into the fresh water.

From all of our other garfishes, this species may be at once distinguished by the relative shortness of its beak, which—comparatively speaking—projects but a short distance beyond the mouth. It is also very stout-looking, and the scales are large and not very deciduous.

This fish attains a length of about 15 inches, examples of that size weighing about 9 ounces. The approximate average of those brought to market is from 3 to 4 ounces.

Like its congeners, the Short-beaked Garfish is a most delicate fish, and is highly appreciated for table purposes. During the cooler months, large numbers are captured and are brought from the Clarence and Richmond Rivers to the Sydney Fish Markets for disposal, there finding a ready sale.

* Stead: Additions to the Fish-Fauna of N.S.W. (No. 1), 1907, p. 4.

In color it is greenish above, being darker towards the head. The lower half is of a dirty whitish tint; or, when fresh, a semi-transparent, pale, yellowish-green. There is a broad silvery band on each side. As in the other garfishes, the end of the beak and the membrane below it are very brightly tinted.

Skipper Garfish (*Scombresox forsteri*).

This fish, though at present rather an uncommon visitor to our fish markets, is one of those which will probably at times be brought in in very considerable numbers when our coastal ocean waters are systematically worked. It is a purely pelagic species, and does not often penetrate the harbours or estuaries. It attains commonly a length of about 12 or 13 inches.

During November, 1906, immense shoals of half-grown Skipper Garfish were present in our waters, and a fisherman who captured a number just inside the Port Jackson heads, considered that he could have obtained twenty boatloads in the one haul.

This species may be identified by the following characters:—The color of the back is a deep bluish-green or an olive-green; while the belly and sides are brilliantly silvery. It possesses a number of small finlets behind both the dorsal and anal fins (somewhat similar to those of the Mackerel family). Instead of there being only one jaw produced so as to form a beak, as in the other garfishes, in the Skipper both are prolonged, and are thin and flexible, reminding one somewhat of the beak of the bird known as the Avocet; excepting that the beak is not curved as it is in the bird mentioned.

Flying Fishes.

Two species of edible Flying Fishes are at present known to occur, at times in considerable numbers, in the waters of New South Wales. The larger of these is *Cypsilurus melanocercus ;* and this attains a length of about 16 inches.

HARDYHEADS.

Hardyhead (*Atherina lacunosa*).

This is a small carnivorous fish (not unlike a Mullet in general appearance), which is very abundantly distributed along the coast of New South Wales. Ordinarily it is to be found in great numbers, spread out over the sandy bottoms and slopes of our beaches in inlets; but at times, huge shoals swarm along the beaches in dense masses.

The average size of full-grown Hardyheads is from 5 to 6 inches. Though small they are excellent for table purposes.

The Hardyhead is closely allied to the well-known British Sand Smelt or Atherine, and is of about the same size.

THE MULLET FAMILY.

Sea Mullet (*Mugil dobula*).

PLATE XII.

This is the largest, as well as the most important, of all our mullets; and is, without doubt, the principal "standby" of the fish markets in New South Wales. It is exceedingly abundant at all times, but during the months of April, May, June, and July enormous shoals of the mature fish congregate together, impelled by the spawning instinct. The Sea Mullet is naturally an inhabitant of the estuaries, where it is to be found in great numbers in the vicinity of muddy bottoms and mud flats. It also grows well and thrives in fresh-water lagoons, &c., but, apparently, does not breed in such localities. The egg of this fish, it may be mentioned, is of a pelagic or freely-floating nature, and is deposited in prodigious numbers at the surface of the ocean, or in the vicinity of harbour entrances, along our coastline. Each female produces an enormous quantity of eggs.

The Sea Mullet grows to a length of about 30 inches, with a weight of about 10 pounds. In my experience all the larger fish in a normal school are females—males of an

equal age with females being much smaller. The largest examples usually come from the various lakes and small lagoons along the New South Wales coast.*

This fine and exceedingly valuable food-fish possesses great potentialities for the future; but even at the present time it is captured and disposed of in large numbers. So good is the flesh, from an edible standpoint, that in addition to being universally used under its rightful title, it is often to be found taking the place—and under the names—of fishes of greater pretentions, and giving as much satisfaction as if it had been the latter. During a recent year in New South Wales, about 45,000 baskets of mullet, of about 75 pounds weight each, were received for disposal in the various fish markets. These were principally Sea Mullet of from about half a pound in weight upwards (but would include also other kinds of mullet), and taking them all through the year they would average, say, about 1 pound in weight, this giving us the imposing total of 3,375,000 individuals. Of course, during the spawning season, when the Sea Mullet are massed together, and may be captured in practically unlimited quantities, the average weight of those captured might be set down at about 3 pounds.

I might mention that large numbers are disposed of at various centres and in country districts, of which it is hardly possible at present to obtain an account, as they do not necessarily pass through any recognised market. The numbers so disposed of would considerably augment those given above.

The Sea Mullet takes the smoke admirably, and makes a fine-quality tinned fish; when the latter, being somewhat allied to, and in the opinion of many, superior to, tinned salmon, though without the reddish tint of the flesh of the latter, and with a suggestion of the flavor of "Fresh (tinned) Herrings."

The mature Sea Mullet is a fish of heavy build; stout, "full in the belly," and with a very broad head, somewhat flattened above. The scales are moderately large and are

* For a fuller reference to this species and its habits, see my "Fishes of Australia," (1906), pp. 74–77.

easily removed: they form about forty transverse rows along the body, from the opercle or gill cover to the root of the tail.

In color the Sea Mullet is as follows:—Steel blue, with a tinge of green or olive, above; sides and lower surfaces silvery. There is a small black spot at the root of the pectoral fin, and a golden spot—diffused on the edges—on the upper angle of the operculum. The dorsal and pectoral fins are a dark bluish-grey, while the caudal and anal fins are yellowish-green.

Green-backed Mullet (*Mugil dussumieri*).

This species will probably be found to occur at times, in considerable numbers, in the waters of our greater northern rivers. At present we have only the one definite record* of its capture, and this was in February, 1905, when a number of specimens running as high as 2 pounds in weight were caught in a net in the lower part of the Clarence River. It is highly probable that this fish penetrates far up into the fresh water.

The Green-backed Mullet is a large-scaled and small-headed species, of robust build. The eyes are partly covered by an adipose lid, but not nearly to such a great extent as in the Sea Mullet.

The back is of a somewhat greenish color, lighter and more silvery on the sides, while the belly is of a silvery white.

Flat-tail Mullet (*Mugil peronii*).

PLATE XIII.

This mullet cannot be claimed to be nearly so important as the Sea Mullet, nor does it grow to such a large size. Still, its value must not be underestimated, as it will, most probably, for many years to come, hold a prominent place amongst our food-fishes. Like the Sea Mullet, it inhabits all the inlets; but unlike that species, does not proceed far in the direction of fresh water. It usually, also, prefers less muddy ground.

* Stead: Additions to the Fish-Fauna of New South Wales (No. 1), 1907, p. 7.

The flesh of the Flat-tail Mullet is of fine flavor when taken fresh, and is often considered to be superior to that of other mullets. This, however, is probably a matter of opinion, as it is hard to find two people, taken casually, who will express the same opinion in regard to the respective flavors of various kinds of fish, particularly if the latter be allied species.

This fish grows exceptionally to a length of about 18 inches (or even more), with a weight of 2 pounds; the usual length of those marketed, however, would range from 9 to 12 inches.

In form the Flat-tail Mullet is more compressed or slab-sided than the Sea Mullet; the scales, too, are somewhat larger, and consequently less numerous; while the eye is devoid of the fleshy lid.

The colors are as follows :—Steel-blue above, silvery on the sides, white below. The scales of the back and sides have each a narrow longitudinal streak along the middle, forming bands; often with golden reflections. There is a small black spot at the root of the pectoral fin, preceded by a bright golden blotch. The second dorsal, anal, and caudal fins are tinged with gold on their outer margins.

Silver Mullet (*Mugil georgii*).

This beautiful mullet, though plentiful in our northern waters and occurring at times in very considerable numbers, has been until quite recently practically unrecognised. In fact it was only described as recently as 1897, by Mr. J. D. Ogilby, the description being founded upon a single small specimen obtained by him at George's River (an arm of Botany Bay) during 1895. Notwithstanding this, there is little doubt in my mind that the species must have appeared in the markets from time to time long before this date, mixed up with consignments of either Flat-tail or Sea Mullet. To my knowledge this has happened since on a number of occasions.

The Silver Mullet is the least, in point of size, of our known mullets, attaining maturity at a small size, full-grown examples being of a length of from 9 to 10 inches. The southernmost water of New South Wales from which we have obtained this species, so far, is Bateman's Bay. From this

locality it is found in gradually increasing numbers as we travel in a northerly direction.

The Silver Mullet must be classed as a particularly handsome species, possessing when taken fresh from the water a most brilliant uniform silvery appearance (with the exception of a narrow strip along the dorsal surface and one on the ventral surface, the former being either a bronze-green, or a deep-brown with intermediate tints, while the latter is whitish-silvery). It is on account of the above-mentioned color that I have applied to this form the name of "Silver Mullet." The irides are of a rich golden tint, splashed with black or brown on the upper parts.

One of the most easily distinguished features of this large-scaled mullet is the shape of the tail, which—unlike the deeply-forked tails of our other species (with the exception of the rare *Mugil waigiensis*)—is, when expanded, scarcely emarginate. The thick upper lip is also remarkable.

Diamond-scaled Mullet (*Mugil waigiensis*).

There is only one record* of the occurrence of this species in our waters, this being based on the capture of one example only at the entrance of the Richmond River. It attains a weight of several pounds, and on some parts of the Queensland coast is well and favorably known as a food-fish.

The species is notable for its exceedingly large scales, and its broad, flat head.

Pink-eye Mullet (*Trachystoma petardi*).†

This is also known as "Richmond Mullet" and "Freshwater Mullet."

After a careful study of the matter, with a good series of specimens, I feel convinced that the mullet described by

* Stead: Additions to the Fish-Fauna of New South Wales (No. 1), 1907 p. 7.

† As will be seen, I have retained Ogilby's genus *Trachystoma*. Though the validity of this genus may ultimately be questioned, I take this course because of the existence of the well-defined patches of villiform teeth on the vomer and palatines. These are referred to in Ogilby's description of the genus (*loc. cit.*). Castelnau gave a very imperfect description of *Mugil petardi*, and he apparently overlooked these teeth, as no mention was made of them.

Ogilby (P.Z.S., 1887, p. 614) as *Trachystoma multidens* is identical with Castelnau's *Mugil petardi* (Researches on the Fishes of Australia, 1875, p. 32). Castelnau's examples were obtained from the Richmond River, where it is the common "Freshwater Mullet"; the same also applying in the Clarence River. Ogilby's description was taken from three specimens obtained from Port Stephens, whence I have also seen specimens.

The "Pink-eye," as it is familiarly called, is an inhabitant of our eastern watercourses. Its distribution appears to be very similar to that of the common Freshwater Perch (q.v.). It is very abundant in our northern rivers and attains a large size, growing to a length of nearly 2 feet.

In this mullet the eye has no adipose lid, the snout is somewhat pointed, and in the adult the body shows a tendency to that fulness so characteristic of the Sea Mullet. The iris is of a pinkish tint—this giving rise to the vernacular name. The most striking feature of this mullet, perhaps, is the large and powerful tail.

As an edible fish the Pink-eye does not rank as high as the Sea Mullet.

Sand Mullet (*Myxus elongatus*).

PLATE XIV.

Also commonly known under the titles "Tallegalane" or "Lano," the latter being a corruption of the former.

Of the three most abundant commercial species of mullet in the waters of New South Wales, this is the least valuable from an edible standpoint, as well as the smallest, growing exceptionally to a length of 15 inches, the average size being very much smaller.

Its distribution along our coastline is very similar to that of the Flat-tail Mullet, with which it agrees to some extent in habit.

As in the "Pink-eye," the "Diamond-scale," and the "Flat-tail," this mullet is devoid of a fleshy eyelid.

In form, the nearest ally of this common food-fish is the Flat-tail Mullet, but it is far more elongate than that species, and the scales are considerably smaller. In color also it approximates closely those of the mullet mentioned (that is, when in clear water), but the golden spot on the upper half of the opercle is not so distinct, being more diffused.

Yellow-eye Mullet* (*Agonostomus forsteri*).

This is not to be considered as an important fish as far as New South Wales is concerned, as it is a southern species, only beginning to appear in any numbers as we approach our southern boundary. I am in a position to record isolated examples, however, from as far in a northerly direction as Lake Macquarie.

The vernacular name is derived from the yellow iris, a very prominent feature in the freshly-caught fish.

THREADFINS.

Threadfins or Tassel-Fishes (*Polynemus*).

Two species are found in northern waters of New South Wales. They are useful as food-fishes, and attain a large size, but are quite uncommon. The species are (1) the THREADFIN (*Polynemus indicus*), and (2) the BLIND TASSEL-FISH (*Polynemus macrochir*).

THE PIKE FAMILY.

Short-finned Pike (*Sphyræna novæ-hollandiæ*).

Common along the coast, usually attaining a length of 2 to 3 feet. Of fairly good flavor, but not much in demand as a food-product. Highly voracious.

* In referring to the occurrence of the Yellow-eye Mullet in the waters of Western Australia, I mentioned in my "Fishes of Australia" that it was usually called "Swan River Herring." In this statement however, although my informants were persons of repute, I appear to have been mistaken; and, although that name may be used in parts, the more general application appears to be "Swan River Pilchard." This is a still more unfortunate misapplication of the latter part of the name, as the fish is not in any way closely related to the Pilchard, which is a species of Herring.

Striped Pike (*Sphyræna lineata*).

PLATE XV.

This handsome Pike is not uncommon along the New South Wales coast. I believe it to be the form which has in the past been referred, by writers dealing with New South Wales fishes, to the species described by the French authors Cuvier and Valenciennes as *Sphyræna obtusata*.* The matter of identity will be discussed, and a complete description will be given, in another place, as it is hardly suitable for this production.

There are three dark longitudinal bands on each side, the first running from the back of the head along the back, and ending on the tail-shaft at the insertion of the caudal fin; the second starting from just above the eye, following the course of the lateral line, and becoming indistinct towards the end of the body; the third, beginning from the lower border of the eye, running along the body a little above the pectoral fin and well below the lateral line, joining the latter below the posterior portion of the second dorsal fin, and following its course on to the base of the caudal fin.

It is from the above-mentioned stripes that I have taken the name "striped," here applied to this species, as well as the specific name (*lineatus*: streaked). The description of them, here given, will enable anyone to positively identify this species, as they are a constant character.

From an edible point of view, I think the Striped Pike is rather superior to its congener, previously mentioned.

THE WHARIO FAMILY.

Whario (*Seriolella brama*).

This well and favorably known food-fish is probably present at times in large numbers in our offshore waters, but, like most of our other fishes of a more or less pelagic habit, little is known of its distribution in our waters.

The Whario or Warehou (New Zealand names) "takes the smoke" admirably.

* I do not deny the existence of *Sphyræna obtusata* itself in our waters.

THE COD FAMILY.

Beardie or Ling (*Lotella callarias*).

Fairly abundant along parts of the New South Wales coastline, particularly in ocean waters of a few fathoms in depth in the vicinity of rocky and weedy localities. It is of some value as an edible fish.

The Beardie is a small-scaled species, of a rich chestnut-brown on the upper parts, being lighter on the lower surface. It attains a length of about 18 inches.

There is a small barbel on the chin.

Red Cod (*Physiculus bachus*).

PLATE XVI.

This fish is somewhat similar in general form to the preceding, but attains commonly a much larger size. It is not at present taken in any abundance on the New South Wales coast, though during the cooler months it appears to be present in fair numbers along the southern portion.

With the exception of the lower parts, the Red Cod is of a uniform reddish or reddish-brown tinge.

THE NANNYGAI FAMILY.

Nannygai (*Beryx affinis*).

PLATE XVII.

This beautiful fish is plentifully distributed along the seaboard of New South Wales, inhabiting water from a few fathoms in depth down to 80 fathoms or perhaps more. (Young examples are often taken in the moderately-deep water of the harbors.) It is essentially a "line fish," and is at times captured in great numbers in the neighbourhood of sunken reefs and rocky bottoms. It takes a flesh bait very readily.

Mr. R. E. Eastway, President of the Amateur Fishermen's Association of New South Wales, states that the best line for the capture of this fish would be a No. 30 thread line. If from a moored boat a length of 100 yards would do, but if used from a steamer drifting, 150 would be required. Two 3/0 hooks on twisted gut, and the sinker, for moored boat, 4 oz., and drifting steamer, 1 lb.

As an edible fish it is usually considered a delicacy, and it always brings a high price in the markets.

In color, the Nannygai is of a most brilliant uniform golden-red, "shot" with violet, and this taken together with its large and handsome saucer-eyes and deeply-forked tail, render it a most conspicuous object.

BULL'S-EYES.

Bull's-eyes (*Pempheris*).

PLATE XVIII.

Two species of the curious large-eyed fishes known as Bull's-eyes are to be found occasionally in our markets, but neither is at present of economic importance. They are the SMALL-SCALED BULL'S-EYE (*Pempheris compressus*) and the LARGE-SCALED BULL'S-EYE (*Pempheris macrolepis*).

Both species attain a length of 8 or 9 inches.

THE BLACKFISH FAMILY.

Blackfish (*Girella tricuspidata*).

PLATE XIX.

Undoubtedly one of the best known fishes of New South Wales is the common Blackfish. Though its flesh is not of the delicate flavor possessed by many of our fishes, it is one of our most important food-fishes; as it is one of the "stock" fishes of the markets, being always present in greater or lesser numbers. It is an estuary fish, and is to be found in all our coastal lakes and estuaries in great numbers at all seasons of the year.

In a commercial way, the Blackfish is usually captured by means of the hauling net (a seine-net), but as it is also a great fighter when hooked, it is much sought after by amateur fishermen with rod and line, or with line only, the bait used being a hairy-looking green seaweed. It is very properly regarded as one of the principal estuary game-fishes.

Mr. R. E. Eastway furnishes me with the following information in regard to the capture of the Blackfish by means of rod and line:—These fish are caught with a rod (a fairly stiff one, 12 feet long, is used), a 3-inch wood Nottingham reel, a No. 60 50-yard thread line, a 3-feet gut cast, on the end of the line, a No. 9 small stout hook, a light float fixed 4 feet from hook, and just enough lead on the cast to cock the float.

The average weight of adult Blackfish obtained for market would run about 1 to 2 pounds, but examples up to a weight of as much as 6 pounds are known.

As showing the great economic value of this fish, I may state that during a recent year a quantity of about 15,000 baskets was marketed in New South Wales. This quantity would be equivalent to about 1,125,000 pounds.

It is of great general interest to mention here, that I have made the discovery that the fish which has been hitherto known here (in literature principally) as "Ludrick," is the female Blackfish. In this, the teeth have a smooth, even, chisel-like cutting edge, whereas in the male they are, as indicated in the specific name, tricuspid.

As long ago as 1846, these chisel-toothed females were described as a distinct species by Richardson, and they have been known here for many years under the technical name of *Girella simplex*. It will, therefore, come as a surprise to many to learn that the differences between the tricuspid-toothed and the chisel-toothed Blackfish are not specific, but merely sexual.

Ogilby, in his "Edible Fishes and Crustaceans of New South Wales," published in 1893, gave a complete description

of what he regarded as the two *species* (Blackfish and Ludrick), and in describing the "Ludrick," said:—

"This species is not nearly so plentiful as is the preceding (Blackfish), from the dark variety of which it may usually be distinguished by its generally lighter colors, and from the lighter variety by the absence of bands, which, if present at any stage of growth, do not appear to be ever persistent, as in its congener, which it resembles in all respects in habits, &c., and with which it is confounded by the fishermen."

As far as coloration is concerned, my experience does not agree with this statement, as I find the bars to be just as often present in the females (that is, the "Ludrick" form) as in the males. Certainly the males appear to be in the majority.

At the time that I wrote my "Fishes of Australia" (1906), I had my doubts as to the existence of the "Ludrick" as a separate species, and consequently did not mention it at all.

So far as I am aware, this is the first record of the occurrence of secondary sexual characteristics (at least as regards the teeth) in any member of the family *Kyphosidæ*—to which the Blackfish belongs.

In the light of my researches, "Ludrick," as a separate species, must now be erased from the list of Australian fishes.

Rock Blackfish (*Girella elevata*).

PLATE XX.

This is a species which is but little known, but which, I have good reason for believing, is quite common. It is somewhat similar in form to the common Blackfish, but may be at once separated from that fish by the much heavier build, the more elevated body, and the "bolder" nose—this being essentially more like that of the Drummer, with which species the Rock Blackfish is sometimes confused by the fishermen. The scales, too, are larger than those of the Blackfish.

The Rock Blackfish grows commonly to a comparatively large size. It is present in its greatest abundance in the vicinity of rocky shores and headlands, in the lower (salter) portions of our harbors and estuaries, and along the "outside" rocks. Like its congener, the Blackfish, it is herbivorous; but, unlike the latter, it subsists upon the gelatinous weeds which abound so plentifully in the regions which it frequents. At all times of the year the prettily-mottled young fry of this species are to be obtained in tidal pools, or in the shallow water around the rocks, along portions of our coastline. I have found them to be plentiful at Bondi, Kurnell (Cook's Landing Place), and Stanwell Park.

This species appears to congregate in shoals, principally about winter time. During June, 1907, large shoals were present near the entrances of Port Jackson and Port Hacking. A quantity of five baskets was taken in one haul on George's Beach, Port Jackson, at this time; while a haul made on Jibbon Beach, Port Hacking, resulted in two and a half baskets being captured. The individuals in these shoals averaged from 4 to 5 pounds in weight.

When freshly taken, the Rock Blackfish is of a dull slaty-blue, shortly becoming uniform brownish or brownish-black (lighter on the lower surface).

Bluefish (*Girella cyanea*).

PLATE XXI.

Though this fish does not appear to be *usually* abundant on the coast of New South Wales, there are times when it occurs in fair quantities. It is to be found in the open ocean waters in the vicinity of reefs and rocky, weedy localities, where it subsists upon a diet of gelatinous weeds, varied with all sorts of rock- and weed-dwelling organisms.

From its congeners, the Blackfish and the Rock Blackfish, the Bluefish may be at once differentiated by its beautiful cerulean blue skin and its particularly elegant shape. Its body is more elongated, the tail is very prettily forked and is large and powerful. Along the upper part of the sides are a number of golden-yellow spots.

The Bluefish grows to a length of from 2 to 3 feet.

Mr. Frank Farnell, Chairman of the Board of Fisheries for New South Wales, who is the Visiting Magistrate for Lord Howe Island (a small dependency of New South Wales, situated at a short distance from this coast, out in the Pacific Ocean), states that this species is exceedingly common around the shores of that island, and that it may be captured with ease and in great numbers. He considers that there is a good prospect for the developing of an extensive fishery in connection with this fine food-fish.

Drummer (*Kyphosus sydneyanus*).

This fish, though quite abundant and growing to a large size, is not esteemed as a food-fish, its flesh being tough and of inferior flavor. Young examples, known as "Silver Drummers," up to a length of 9 or 10 inches, however, are usually considered to be of fair quality.

The Drummer is a rock-dweller and is herbivorous. In appearance it is very different to the other members of this family, being altogether more rotund and "stumpy." There is a knobby protuberance between the eyes.

THE DUSKY PERCH.

Dusky Perch (*Lobotes surinamensis*).

This is a large perch-like fish inhabiting the estuaries of our northern rivers. It reaches a length of 3 or 4 feet, and a weight of 25 or 30 pounds; but being sparsely distributed, is not likely to be of much economic importance, as far as New South Wales is concerned.

THE TRUE PERCHES.

Estuary Perch (*Percalates colonorum*).

PLATE XXII (Lower Figure).

This well-known and important food-fish is an inhabitant of the higher parts of our harbors and estuaries; where

rivers exist, even penetrating right up in to the fresh water. Though captured sparingly at other times, after heavy freshets in our coastal creeks or rivers it is netted in considerable numbers and forwarded to market. The same thing occurs about midwinter, when the fish comes down in numbers to the salter and more open waters to spawn.

It is a fairly deep-bodied fish, with a highly-arched back and somewhat compressed sides. Though a weight of 5 pounds is attained by this fish, examples of that size are quite uncommon, the more usual size, as seen in the markets, varying from about 12 ounces to 2 pounds.

The Estuary Perch is a voracious fish, and practically subsists upon anything in the way of living organisms.

As an edible fish it is of good quality.

In addition to being netted, this Perch may be caught with hand-line or rod.

Freshwater Perch (*Percalates fluviatilis*).

PLATE XXII (Upper Figure).

This perch is closely allied to the preceding, but may be at once distinguished from it by its more elongate and rounder body, which has a fairly even and elliptical outline, while in the Estuary Perch, as previously pointed out, the profile of the back is more gibbous or humped. The tail, too, is larger and altogether more powerful than that of the Estuary Perch. Other important differences between the two species are easily to be seen upon examination being made. (Further reference to these points will be found in my " Fishes of Australia.")

Though in certain localities the Freshwater Perch and the Estuary Perch will be found occurring together—that is where the two species " overlap "—the natural habitat of the former is in the wholly fresh-water portions of our eastern rivers and their tributaries. Here it occurs in great abundance. After continued rains and when the rivers and creeks are swollen, large numbers of the Freshwater Perch are netted in the lower waters, and are forwarded to market.

It is as a game-fish, however, that this fine fish principally merits our attention, and it is confidently asserted by many experienced anglers that it is the finest sporting fish in our rivers, indigenous or introduced. It is strong, active, and a great fighter.

The Freshwater Perch attains a weight of at least 5 pounds.

Golden Perch or Yellow-belly (*Plectroplites ambiguus*).

PLATE XXIII.

Second only in importance to the Murray Cod, this fine Perch, which is so well and favorably known as a food-fish, is found occurring in great abundance in the western river system of New South Wales, where it affects principally the still waters of billabongs and lagoons.

It is a large fish, attaining a weight of 8 pounds or more, and a length of about 2 feet. The head is small; the upper profile rising rapidly to the particularly gibbous back. The tail is fairly large, the fin being rounded, and the scales are of moderate size.

Though taken by hook and line, the usual method of capture is by means of a short meshing-net or gill-net.

Macquarie's Perch (*Macquaria australasica*).

This, though a valuable fresh-water fish, is not to be compared with the Golden Perch as regards importance. Attaining a length of from 12 to 15 inches, it is found in abundance in the higher waters of our western rivers, as well as some of the eastern ones. It often goes under the name of Mountain Perch, as well as being miscalled "Bream" and "Black Bream."

As an edible fish, Macquarie's Perch is to be commended, the flesh being decidedly toothsome.

In distinguishing this species from our other fluviatile perches, it will be noticed that it possesses a very "snub" nose, while the scales are relatively somewhat larger.

Murray Cod (*Oligorus macquariensis*).

PLATE XXIV.

The king of Australian fresh-water fishes, the Murray Cod inhabits the whole of the immense Murray River system, from the limits of tidal influence right up to the small tributaries. In addition, it is to be found in the head waters of some of our larger eastern streams.

As a food-fish, this magnificent species stands second to none. Attaining, as it does, to such large proportions, and being of such good flavor, this excellent fish long ago came into great prominence; and it may be safely said, that the supply is never likely to exceed or even meet the demand.

The capture and disposal of the Murray Cod afford a means of livelihood to a large body of men in various parts of New South Wales, and the annual catch must be very considerable. A large portion of the catch is disposed of in country places, and a considerable amount is forwarded to the Sydney markets. A great quantity also is sent from the Murray to various parts of Victoria. During 1907 the quantity of fresh-water fish—principally Murray Cod—so despatched from New South Wales into Victoria, *via* five Murray River towns (Albury, Corowa, Moama, Mulwala, and Swanhill), amounted to 213,584 pounds.

The Murray Cod may be described as a stoutly-built fish; broad, with a large and wide head, the eyes small (exceedingly variable in relative size) and facing obliquely upwards; the snout obtusely rounded, and the mouth wide and capacious. The tail portion is long, while the caudal fin is rounded. The soft or rayed portions of the dorsal and anal fins are comparatively high.

The colors and their arrangement are variable with location and age. Usually greenish or brownish along the back, with numerous small dark spots scattered over the back and sides, the lower surface being whitish.

This fine species attains commonly a large size; and specimens of from 100 pounds to 150 pounds in weight, with a length of from 5 to 6 feet, have been obtained.

Wirrah (*Acanthistius serratus*).

A fine-looking fish of rather inferior edible qualities, occurring in rocky situations along the New South Wales coast. It attains to a length of about 20 inches, and is a most voracious feeder. It is not likely to become of economic importance.

Black Rock Cod (*Epinephelus dæmelii*).

PLATE XXV.

This excellent food-fish is to be found in our harbors and along our coastline in rocky places. It attains a large size, examples of a weight of from 70 to 80 pounds having been taken. The usual size of those marketed, however, is far below that, specimens weighing 20 pounds being considered large.

The flesh is of excellent flavor, particularly that of specimens of a few pounds in weight.

In color it is a mottled brownish or blackish, with darker, slightly oblique bars across the body and a black spot on the back of the caudal peduncle.

As a marketable fish there is a great future before this fine species.

Red Speckled Hind (*Epinephelus undulatostriatus*).

PLATE XXVI.

A fine species, of considerable edible value, captured by line; more particularly on the northern half of our coastline, in rocky locations. It is not often obtained at present, and I think it probable that the species will be obtained more plentifully in water of, say, from 80 to 100 fathoms in depth.

I use the name "Hind" for all species of *Epinephelus* which have not yet received a common name at the hands of the fishermen, as "Rock Cod" is misleading.

The Red-speckled Hind is a beautifully-colored species, the ground color being light; speckled over with reddish dots running in undulatory lines. In some, these form continuous reddish streaks.

Brown-spotted Hind (*Epinephelus tauvina*).

PLATE XXVII.

Though I only recorded this fish from our waters as recently as last year* (1907), it has, apparently, been coming into our markets from our northern waters for some years at least.

Attaining a length of about 4 feet, it is a fine edible fish, which is likely to become of considerable importance in the near future.

The brown spots which are freely spread over the skin of this species, appear to become less, and more widely separated, with age.

I have seen one example of the Brown-spotted Hind from as far south as Botany Bay.

Three other species of Hind† are recorded from New South Wales, but are at present rarely seen. They are *Epinephelus septemfasciatus*, *Epinephelus merra*, and *Epinephelus fuscoguttatus*.

Queensland Groper (*Promicrops itaiara*).

PLATE XXVIII.

This mighty fish is one of the giants among the edible fishes of the world, and certainly it is the largest inhabiting the seas of Australia,‡ attaining, as it does, a length of not less than 6 feet, with a weight of from 300 to 400 pounds, or even more.

It is to be found in some abundance along the northern portion of our coastline, being captured principally in the estuaries of the Richmond and Clarence Rivers.

The flesh of this giant perch is tender and of good flavor, and the species is likely to be of great economic importance in the near future.

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* Stead: Additions to the Fish-Fauna of New South Wales (No. 1), 1907, p. 8.

† I have another, which is new to science and which I have not yet described.

‡ Excepting the Spearfish, which is not used as food in New South Wales at present.

This is the same species as that which is familiar to southern Americans (United States) under the name of Spotted Jewfish.

The specimen here illustrated is that mentioned on page 104 of my "Fishes of Australia," and of which the head is in the collection of the Department of Fisheries, New South Wales. It was captured in the estuary of the Clarence River, and weighed about 250 pounds.*

Half-banded Sea Perch† (*Hypoplectrodes semicinctus*).

A small, edible fish of great beauty, which is abundant in our rocky coastal waters. It is captured by hook and line, with a flesh bait.

Banded Sea Perch (*Hypoplectrodes annulatus*).

PLATE XXIX.

A prettily-banded, rough-scaled species, found in similar localities to the preceding, though, apparently, not in such abundance. It attains, usually, a length of about 10 to 12 inches.

Cuvier's Sea Perch (*Hypoplectrodes nigrorubrum*).

An exceedingly beautiful, banded fish, occasionally captured by means of trammel-net or hook and line, in similar locations to the two preceding. Apparently not very common. It grows to about the same size as the Banded Sea Perch.

Bastard Longfin (*Cæsioperca lepidoptera*).

A fish suitable for food, but which is not at present obtained in any abundance on our coast. It grows to a length of 12 inches.

Longfin (*Caprodon longimanus*).

A good fish, but not abundant; found in our coastal waters. It reaches a length of about 15 inches.

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* I am indebted to Mr. A. J. Cripps, a well-known pressman of Sydney (and who appears, for comparison of size, alongside the fish), for the photograph of this fish here reproduced.

† Also termed "Soldier-Fish"; but that name is more properly applied to a small perch known as *Amia* (*Apogon*) *fasciata*.

Anthias pulchellus.

A number of examples of this species, up to 9 inches in length, were first taken by Mr. Farnell's "Thetis" Trawling Expedition in May, 1898. The species was recognised from four different stations, and future work in this direction may show this fish to be abundant.

Callanthias platei.

This fish also is only known from New South Wales waters through the exploring of the "Thetis," when sufficient evidence was obtained to warrant the idea that it may be found, later on, in fair numbers. It is of edible size.

Roundhead (*Paraplesiops bleekeri*).

This handsome fish, which, on account of its conspicuous beauty, always attracts considerable attention from its captors, attains a length of about 12 inches. It is not uncommon in the vicinity of reefs and rocky localities generally, along our coastline, but although of edible value is not important enough to be regarded as a market fish, either present or prospective.

Red Bull's-eye (*Priacanthus macracanthus*).*

This fish, with its great saucer-eyes, does not readily suggest to the casual observer any affinity with the perch, though it is related to that fish. It is a deep-water form, and attains a length of about 12 inches. It is not at present captured in sufficient numbers to be regarded as of importance.

When fresh, it is of a beautiful uniform "Nannygai-pink."

Government Bream (*Genyoroge sebæ*).

Plate XXX.

Though I have only two records of the occurrence of this fine food-fish in New South Wales, reference to which will be found in the paper before referred to, it may prove to be not uncommon in our northern waters. It is a large and handsome Serranid Perch, attaining a considerable size. (The larger of the two specimens seen by me measured 28½

* The Red Bull's-eye was present in considerable numbers in our shallower coastal waters, during the month of March of this year (1907).

inches.) In build it is almost bream-like, and its superb coloration places it amongst the most beautiful of our many charmingly-colored fishes.

The name Government Bream has been applied to this species in Queensland on account of the presence of three large stripes on each side, so arranged as to suggest a resemblance to the broad-arrow.

Black-spotted Sea Perch (*Genyoroge fulviflamma*).

This is closely allied to the Government Bream, but it does not attain to such a large size, the largest which has come under my notice being about 13 inches in length.

It does not often make its appearance in our markets, though, apparently, tolerably common at times in our northern waters.

The term "Black-spotted" has been applied to this fish because of the existence of a large deep-brown or blackish spot on each side, on the posterior half of the body, just beneath the soft part of the dorsal fin.

Another species, which is very closely allied to this, and is very similar in general appearance, is *Lutianus johnii*. This has been recorded from the same portion of our coastline, and if captured by the fishermen would be likely to be classified with the Black-spotted Sea Perch.

Two other species of this genus, known as *Genyoroge bengalensis* and *Genyoroge macleayanus* are recorded from our waters, but little is known in regard to their occurrence; while, if they were captured and sent to market, they would be sold amongst what is loosely termed the "mixed fish."

Pearl Perch (*Glaucosoma scapulare*).

PLATE XXXI.

A northern fish, also known as Epaulette Fish, on account of the presence upon each shoulder of a comparatively large, irregularly oval, bony shield, which is covered with a shining black skin.

The Pearl Perch is a deep-water fish and is possessed of exceedingly large saucer-eyes, as in the case of many deep-water forms. It attains a length of about 2 feet.

No special fishery for this species exists at present, and it is usually captured by parties out "Snappering."

Old Wife (*Enoplosus armatus*).

PLATE XXXII.

This curious fish is perhaps one of the most "unperch-like" of all the Perches. With its high, vertically-striped, highly-compressed body and its pointed snout, it suggests rather the gorgeous Coral-fishes or Chætodons.

It attains exceptionally a length of about 12 inches, though examples of 8 inches in length are considered large.

Though a fine little table-fish it is not often brought to market, as it does not usually take a bait, and adults seldom come within the scope of the fisherman's hauling-net, owing to the habit of keeping in the vicinity of rocks and wharves. In rocky locations it may be taken by means of that very useful implement, the trammel-net.

Long-finned Pike (*Dinolestes lewini*).

The term "Long-finned" is applied to this fish to differentiate it from the Short-finned Pike, which is a fish of another family (previously referred to), and with which it is commonly grouped in the New South Wales fish markets as simply "Pike." The name is given on account of the relative length of the second dorsal and anal fins.

The Long-finned Pike is an edible fish of no mean order, and attains a length of nearly 2 feet. It is sometimes known as Skipjack Pike. It is a highly voracious fish, making great havoc among the shoals of smaller fishes, among which it is usually captured.

This fish abounds chiefly along our south coast.

THE WHITING FAMILY.*

Sand Whiting (*Sillago ciliata*).

PLATE XXXIII.

This is, without a doubt, one of the choicest of the edible fishes, not only of New South Wales but of Australia; and in the estimation of many people, it is absolutely the finest. This being so, the Sand Whiting always commands a good market price; 6d. per pound wholesale being not infrequently paid, with occasionally as much as 9d. per pound.

This whiting is plentifully distributed over the whole of the New South Wales coastline, where it is to be found dwelling upon clean, sandy bottoms in all of the harbors and the larger coastal lakes, as well as on sandy bottoms in fairly shallow water, off the various ocean-beaches. It does not, however, go down into deep water. The localities mentioned are its natural feeding grounds, as it subsists almost wholly upon organisms which make their home in, or upon, the sand.

The usually means employed for the capture of the Sand Whiting is the hauling-net, that is in a commercial way, but large quantities are captured annually by amateur anglers using hand-lines. In fact, this species is always regarded as one of our principal sporting fishes, the gear used by amateurs varying greatly according to individual opinion. Mr. R. E. Eastway suggests the following plan:—The boat should be moored head and stern on the sand flats on a rising tide. A No. 18 varnished silk-twist line, 50 or 100 yards in length, strong 1 yard cast, 2/0 hook, and medium bullet. The line should be thrown from the boat as far as the sinker will carry it, using a whole large worm (not a little bit of it) as bait.

The Sand Whiting attains a weight of about 2½ pounds, specimens of 1 pound and more being quite common

* These fishes are not related to the English Whiting, which a member of the Cod Family.

As showing the present economic value of our whitings (of which this is the one principally obtained), I might mention that from 4,000 to 5,000 baskets of them, or 300,000 to 375,000 pounds, are marketed annually in New South Wales alone.

As I have pointed out in my "Fishes of Australia," the Sand Whiting is of a yellowish-brown sand color along the back, and silvery-white below. All over the sides and back are the most lovely purple, green, and gold reflections, and altogether it is a truly handsome fish. In addition to this, young examples up to about 4 or 5 inches in length, possess a number of dark blotches along the upper half, somewhat similar to those in the next species to be mentioned—the Trumpeter Whiting; but at no time are these blotches so pronounced, or so extensive, as in the last-mentioned whiting.

Trumpeter Whiting (*Sillago maculata*).

PLATE XXXIV.

This whiting, in its habits, is still more of an estuarine or harbor fish than the preceding, living in moderately deep water, and preferring bottoms which are half mud, half sand, or which are wholly muddy.

Like the Sand Whiting, it is greatly valued for its excellence as a food-fish; but, not attaining to such dimensions nor being obtained in such profusion, it is not nearly so important. The usual weight of those marketed ranges from 4 to 5 ounces, and it attains rarely to a weight of 10 or 11 ounces.

It is not so often captured by means of hook and line as is the Sand Whiting, but is obtained with a hauling-net of small mesh.

In addition to the difference in color already noted, this species is generally darker than the Sand Whiting, but at the same time is rather more transparent-looking when fresh. There is a prominent, broad silvery stripe down each side of the fish, this being comparatively indistinct in the

latter. The scales, too, in this kind are more deciduous, and the body is always characterised by the presence on the upper parts of a number of very dark, blackish, irregular blotches, these being, as before pointed out, quite absent in the adult Sand Whiting.

School Whiting (*Sillago bassensis*).

PLATE XXXV.

This fish is very abundant in our ocean waters at depths ranging from a few fathoms down to nearly 90 fathoms. It is also found in considerable abundance, during the warm weather usually, in the deeper water at the entrances of Port Jackson, Port Hacking, &c.

During the trawling of the "Thetis" in 1898, this small whiting was obtained in large numbers on many different occasions, and, judging by this and the abundant evidence which I have since had, there can be no doubt that the School Whiting is exceedingly common along a great part of the coast of New South Wales. On one occasion I saw several hundreds of the young, ranging from about $2\frac{1}{2}$ to $4\frac{1}{4}$ inches in length, captured at one haul of a garfish net on Grotto Beach, at the entrance to Middle Harbour, Port Jackson.

Owing to the possession of a series of rusty-red diagonal blotches with which the upper part of each side is adorned, this fish is sometimes dubbed "Red-spotted Whiting."

Though the smallest of our known whitings, attaining usually, when full-grown, a length of only 9 or 10 inches, the School Whiting is a fine little table fish, of delicious flavor.

I have recently discovered a new species of whiting, which I have named *Sillago robusta*, and which I propose to call the STOUT WHITING. So far I have only one small example, which was captured by Mr. H. C. Dannevig in Rose Bay, Port Jackson. The specimen obtained is apparently immature. It is considerably heavier in build than our other whitings, and the scales have very prettily-pencilled outlines.

Spotted Whiting (*Sillago punctata*).

PLATE XXXVI.

As far as New South Wales is concerned, this is, commercially, the least important of our whitings. It is a southern species, and begins to be abundant as we approach the Victorian coastline. Still, occasionally, a few baskets of Spotted Whiting are forwarded to the Sydney markets from our southern districts.

This species grows to a considerable size, examples of 18 inches or more being not uncommon. In form it is elongate (considerably more so than those previously mentioned), while the scales are very numerous, and correspondingly small.

The term "spotted" is applied to this fish on account of the large number of dark spots with which the sides are ornamented.

THE JEWFISH FAMILY.

Jewfish (*Sciæna antarctica*).

PLATE XXXVII.

This is, at present, one of our most important food-fishes, and it is likely in the future to be of still greater value, as the demand for it is constantly increasing, while our resources, as far as its supply is concerned, are but just tapped.

The Jewfish is a voracious and powerful fish, attaining often a weight of from 60 to 70 pounds, though the average of those principally brought to market would be from about 20 to 30 pounds. Thousands, ranging from 18 inches up to about 5 feet, are captured for food purposes on the coast of New South Wales annually. It is common at all times along our coastline, inhabiting the estuaries and harbors, and also the coastal beaches—particularly in the vicinity of lake-entrances. In some cases it ascends some of our rivers, going right up into fresh water. Though, as I have said, it

is always common, at certain times it makes its appearance in large droves or shoals, consisting of thousands of individuals. An instance of this occurred quite recently (during December, 1907), when great quantities of Jewfish were captured along ocean beaches a little to the south of Sydney.

In " Fishes of Australia " I have already drawn attention to the large, and commercially valuable, " sounds " or air-bladders possessed by this species, which are suitable for the manufacture of isinglass, and, as I stated then, at present thousands of these are thrown away every year with the offal, notwithstanding that they require very little primary treatment beyond drying.

Young jewfish up to a length of about 2 feet are known as " Silver Jews."

The Jewfish is captured by means of both line and net. If the former method is employed, Mr. R. E. Eastway considers that the following should be used:—A No. 27 cord line, 100 yards long; 7/0 or 8/0 hook; a sinker that will just take the line to the bottom, and no more. The hook is best snooded on a piece of the line, although some anglers use hooks for Jewfish-fishing snooded on twisted gut and phosphor-bronze wire.

This handsome and valuable species is a very close ally of the common " Maigre," or " Meagre," of Europe.

Teraglin (*Cynoscion atelodus*).

PLATE XXXVIII.

Though closely allied to the Jewfish, this species does not grow to anything like the size of the latter, a length of 2 feet being considered the common maximum size. It may be at once distinguished from the young of the latter by the smallness of its scales, as well as by the relative position of the small anal fin, which is placed much further back in the Teraglin. Other differences of note also occur, but those given are sufficient to enable the observer to at once separate the two.

The Teraglin is not a constant visitor to the markets, and supplies are intermittent. Usually scarce, at times large shoals make their appearance. It is looked upon as a fine edible fish, and when more is learnt in regard to its movements it will probably be numbered among our most important food-fishes.

Australian Salmon (*Arripis trutta*).

If this species is not one of the most important of New South Wales, it is certainly one of the most abundant. Attaining a length of 2 to 2½ feet, it often reaches a weight of 8 or 9 pounds. It is in no wise related to the true Salmon of Europe or America, but has probably received the name in the first place chiefly because of its somewhat salmon-like markings and form. These salmon- or trout-like markings are still more pronounced in the young or half-grown fish, which has been termed, consequently, "Salmon-Trout," a name by which it is well and familiarly known. Like the true Salmon, this species has the habit of congregating at times in shoals of vast extent.

Though the adult fish is not at present esteemed as a food-fish, the "Salmon-Trout" stage is usually considered to be far more palatable, and is consequently more eagerly sought after. But whatever value is at present placed upon this species, there can be little doubt that it is destined to be of considerable importance in the future fisheries of New South Wales. It is to be obtained easily, and in prodigious numbers.

In addition to being taken by means of the hauling-net (particularly on sandy ocean beaches), the Australian Salmon is now greatly sought after as a game-fish, as it always gives some exciting sport when hooked. When fishing from a boat, the practice of trolling is commonly followed; but large numbers are caught by line off the many fine sea beaches along the New South Wales coastline. The most suitable beach-fishing line is a No. 20, 100-yard white beach-line, a 4/0 hook, snooded on twisted gut or hard-twisted line—one

hook only at the bottom, with a flat sinker above it. One of the principal places for boat fishing is the entrance to Port Hacking, a small port a few miles to the south of the historic Botany Bay.

South Australian Roughy (*Arripis georgianus*).

A southern fish, rare in the waters of New South Wales. It has no affinity with the ordinary "Roughy" of New South Wales, which is a small unimportant fish of the Nannygai family.

THE SILVERBELLIES.

Silverbelly (*Xystæma ovatum*).

A harbor or estuary fish of small size, growing exceptionally to a length of about 10 inches, and possessing highly deciduous scales. Though not an important species, it is a food-fish of no mean order, its flesh being very tender and of good flavor. It is sold under the name of Silver Belly, Silver Biddy, or, occasionally, Silver Bream.

THE TRUMPETERS.

"Real" or "Hobart Town" Trumpeter (*Latris hecateia*).

Rumors of the occurrence of this fine edible fish on the coast of New South Wales have from time to time reached me, but, though this appears to me quite likely, I have not, so far, seen a specimen captured in our waters. Mr. J. C. Batchelor, Commissioner of Fisheries, and also a well-known fish salesman, is particularly emphatic in stating that he has, at odd times, received examples with fish sent in from our southern waters and as high up as the Shoalhaven. I think, therefore, that it may be quite justly added to our Fauna.

Bastard Trumpeter (*Latris ciliaris*).

PLATE XXXIX.

This Trumpeter is fairly abundant in ocean waters along our southern seaboard. It grows to a length of 2 feet or more, and, as a table-fish, is of medium quality. It is captured usually in the vicinity of rocky places.

Silver Bastard (*Latris forsteri**).

This species, which attains about the same size as the preceding, is found at rare intervals in our markets. It is a handsome fish (with yellow longitudinal bands), of considerable edible value. Like the Bastard Trumpeter, it is an inhabitant of our southern districts.

Kelp-Fish (*Chironemus marmoratus*).

A common " rock-fish " of carnivorous habit, growing to a length of about 12 inches. It is to be obtained with hook and line, or by means of the trammel-net, but as a marketable fish is not of much importance at present. Like a number of other rock-fishes, however, its value from an edible point of view warrants a more frequent appearance in our markets; and later on, with a more general use of the trammel-net, this will, no doubt, be brought about.

THE MORWONG FAMILY.

Morwong (*Dactylosparus carponemus*).

Though not commonly seen in any numbers in our markets, this food-fish is fairly abundant along our southern shores in rocky places, where it may be taken either by hook and line, or with the aid of the trammel-net. When outside fishing is more generally carried out, this and the next species will probably be forthcoming in larger numbers.

The Morwong grows to a length of at least 2 feet 6 inches.

* I use the specific name *forsteri* on the supposition that Ogilby's *Latris ramsayi* is identical with Castelnau's *Latris forsteri*.

Jackass-Fish (*Dactylosparus macropterus*).

This is often confused with the Morwong by the uninitiated, and one often hears of Morwong being captured by boating parties, when this species has been taken. As far as New South Wales is concerned, of the two species, the Jackass-Fish appears to be the more abundant. Certainly, more of the latter are brought to market. From the Morwong it may be at once distinguished by the comparatively long attenuated head and the wide, saddle-like purple band over the shoulders—the last character being responsible for its vernacular name. In both of these species of *Dactylosparus* the pectoral fin is of a remarkable shape, one of the lower rays being greatly elongated and somewhat finger-like.

The Jackass-Fish is somewhat smaller than the Morwong attaining a length of from 18 inches to 2 feet.

Red Morwong or Sea Carp (*Cheilodactylus fuscus*).

Plate XL.

This is a well-known and valuable food-fish. It is extremely common along the greater part of the New South Wales coast, frequenting rocky shores, sunken reefs, and bomboras, where it obtains for its sustenance crustaceans, worms, shells, and other rock-haunting animals. Although odd numbers of the Red Morwong are taken with the hauling-net amongst other fishes, it is a trammel-net fish *par excellence*. Large quantities also are taken by means of hook and line.

By very many fishermen this fish is known as "Carp"; but as it has nothing in common with the Cyprinoid known for so long under that name, the use of the name for this fish can only be misleading, and should always be discouraged.

The Red Morwong commonly grows to a length of from 12 to 15 inches. Being abundant, easily caught, and handsome, this fish is always in request by aquarium-keepers; and it certainly makes a most attractive object.

Brown-banded Morwong (*Cheilodactylus spectabilis*).

I published a full description of this Morwong recently in a paper, (already referred to),* wherein I recorded it for the first time from our shores. The record was based upon two examples—one measuring 15½ inches and the other 22½ inches—taken from near the entrance to Port Hacking and at the mouth of the Wonboyn River, respectively. I have received no further evidence respecting this species since then, but think it likely that a greater familiarity with our rock-haunting fishes will prove that it is not altogether uncommon.

Banded Morwong or Magpie Perch (*Goniistius gibbosus*).

PLATE XLI.

An edible fish, but rarely obtained. A most beautiful species, charmingly colored, and quite unique (amongst the Morwongs) in shape. From just behind the eyes the upper profile rises rapidly, the highest point being above the end of the opercle or gill-cover. From this point there is a gradual descent all the way to the tail. The highest point of the back is surmounted by the high spinous dorsal fin, the spines of which are very acute.

Cockatoo Fish (*Aplodactylus lophodon*).

Of all our outside reef fishes this is one of the most abundant. Though this is so, it is not familiar to the average angler, as it does not usually take a bait. The only proper and really effective manner of capture is by means of the trammel-net, but as very few men use this net at present, only a comparative few Cockatoo-Fish are brought to market.

This species is herbivorous, subsisting principally upon the gelatinous seaweeds which abound in rocky situations. Though I have described it as an "outside" species, it is to be obtained commonly in the lower and deeper parts of our harbors.

* Stead: Additions to the Fish-Fauna of New South Wales (No. 1), 1907, pp. 12–15.

The head of this fish is of a most peculiar shape; very suggestive of that of a cockatoo—hence its common name.

As a food-fish the Cockatoo-Fish is of value, and as it grows to a useful size (18 inches or more), the time is not far distant when its use will be far more general than at present.

GRUNTERS AND BOAR-FISHES.

Trumpeter Perch (*Terapon quadrilineatus*).

This small species, though unimportant, is not to be despised as a food-fish, as it is excellent for the table. This has been recognised more of late years, consequently it finds a more ready sale. Properly speaking, it is an estuary or harbour fish, flocking in large numbers round the shores. It attains, commonly, a length of about 8 inches.

In general build the Trumpeter Perch is somewhat similar to the Silver Perch.

Silver Perch or "Grunter" (*Terapon ellipticus*).

PLATE XLII.

This is an important edible fish, inhabiting the western streams of New South Wales in considerable abundance. As a table-fish it is greatly esteemed, while it is also elegant in shape and beautiful in color. In many parts it is familiarly known as "Grunter," on account of the snorting or grunting sound made by it when captured. In this habit it is not unique, as other fishes of the same, and some other, families also possess the faculty of sound-production.

The Silver Perch attains a weight of about 5 pounds. It is usually taken by means of the gill-net.

In color it is of a generally silvery appearance, the edge of each scale being darker; the latter character giving a beautiful imbricate appearance to the scales generally, which are of moderate size.

The outline of this fish is, as the specific name suggests, rather elliptical, the back not being gibbous or humped, as in the Golden Perch.

Queensland Trumpeter or Javelin-Fish (*Pomadasis hasta*).

PLATE XLIII.

Judging by present indications, this fine food-fish is not common in the waters of New South Wales, being essentially a northern species. However, examples appear occasionally in our markets, from the North Coast districts. In our waters it attains a length of about 2 feet.

The Queensland Trumpeter is not related to the true Trumpeters, previously mentioned. Fishes of the genus *Pomadasis* will be familiar to Americans under the collective name of "Burros."

Giant Boar-Fish (*Histiopterus labiosus*).

A veritable "pig" in appearance, this fish, like the familiar animal of that name, is naturally a "grubber," its snout being specially adapted for the purpose of fossicking amongst sand and stones for its prey, which consists mainly of small marine organisms that dwell in sandy localities.

Though an edible fish of considerable value, it does not appear in our markets very often; not because it is not common, but because it frequents outside sandy bottoms, which are—comparatively—seldom fished.

The Giant Boar-Fish grows usually to a length of more than 2 feet.

Richardson's Boar-Fish (*Histiopterus recurvirostris*).

This highly remarkable looking fish is uncommon in New South Wales waters, only occurring, as far as we know, in the most southern portions. Like its congener, just mentioned, it is an outside fish, frequenting the bottom in fairly deep water. It attains a length of about 2 feet, and is highly esteemed as a food-fish. The curious shape of the snout at once arrests attention, as it is drawn out somewhat after the fashion of that of a Sea-horse. The very large eyes, which it possesses, denote the deep-water character of this species.

Short Boar-Fish (*Histiopterus elevatus*).

PLATE XLIV.

Originally described from a specimen measuring $11\frac{1}{4}$ inches in length, captured by means of the trawl-net in 70 fathoms of water off Port Jackson in 1888, this species was subsequently obtained by the "Thetis," in 1898, in sufficient numbers to warrant the idea that future investigation will prove it to be one of our common offshore fishes. It is very different to the two preceding, in that the body is very high and comparatively short.

Farnell's Boar-Fish (*Histiopterus farnelli*).

This species was described from a single example, measuring about 8 inches in length, taken by Mr. Farnell's "Thetis" Expedition, before referred to. It was captured with the trawl at a depth of about 15 fathoms, off Shoalhaven Bight. As no trawling has been carried out since that date, no particulars as to distribution, or relative abundance, are available.

THE BREAM FAMILY.

Snapper (Schnapper) (*Pagrosomus auratus*).

PLATE XLV (Both Figures).

This is generally looked upon as one of the choicest of New South Wales fishes, and it is undoubtedly the highest-priced fish in our markets. At the same time, it is one of the most important, as it occurs abundantly in the waters along our coast. While the young stages are to be found commonly in the deeper water of our estuaries, the adults prefer the sea itself; particularly in the neighbourhood of rocky shores and bomboras.

The Snapper is the principal fish sought for by "outside" fishing parties. It is hardly possible to estimate the quantity taken in this way by amateur anglers; but it is undoubtedly very great. The quantity which passes through our markets is from 300,000 to 400,000 pounds per annum.

In capturing this fish at sea, according to Mr. Eastway, the following adjuncts are the most suitable:—A 200-yard 36- or 27-cord line, with three hooks snooded on hard-twisted line (about 8 inches long), and a $1\frac{1}{4}$ pound sinker. The hooks are fixed above the sinker, and three different sizes should be used, viz., 6/o, 5/o, and 4/o.

The Snapper is exceedingly elegant in form and very beautiful in color, and this, coupled with the fact that it bites well, has no doubt assisted it very materially in winning its well-merited popularity.

As I stated in my "Fishes of Australia," up to about 4 or 5 inches in length, the young fry of the Snapper, which are then characterised by the possession of dark vertical bars on the body, are very often known as "Cockneys." I should have mentioned that the prevailing color of the Snapper throughout life is a most delicious pink; which becomes, usually, richer and a little deeper in tint with increased age.

Beyond the "Cockney" stage and up to a weight of about a pound and a half, the Snapper is known as Red Bream, that is in the restricted sense of the term. At the beginning of this stage, the vertical bars gradually disappear and most beautiful pale-blue spots, which before were quite noticeable, now become very prominent; particularly on the upper surface of the body. Later on in life and up to a fairly large size, this species is known to the fishermen first as "Squire" and then as "School Snapper"; while beyond this stage, we get what is known as the "Old-Man Snapper." At the last-mentioned stage, the fish is characterised by a tremendous, bony protuberance at the top of the head; and, at the same time, a flabby, fleshy nose, of almost human appearance, is formed. At this time, the likeness of the Old Man Snapper's countenance to a human face is often most remarkable, particularly when—as is so often the case—the nose has the bloated appearance of an inebriate's. The Old-Man Snapper is sometimes caught of a weight of over 30 pounds. It is found on sandy bottoms in fairly

deep water, where it subsists chiefly upon starfishes, sand-worms, crustaceans, &c. One would think that the condition of the teeth at this stage might have something to do with this change of habitat, as they are then worn and often decayed.

Black Bream (*Chrysophrys australis*).

PLATE XLVI.

Of all the commercial fishes of New South Wales, this fine food-fish is undoubtedly the most important, while it is also the recognised premier of our coastal sporting-fishes. Wily and careful of nature, often the most tempting baits and finest of tackle have to be used before the Black Bream or "Brim," as it is familiarly called, can be inveigled into taking the angler's hook, and when he is hooked, he is a stubborn and courageous fighter. Handsome in appearance, and of fine flavor and consistency when cooked, as well as growing commonly to a good marketable size, there is little wonder that this fish has climbed so high in the public estimation; while, because of the characters previously mentioned, more devotees amongst our anglers are to be found worshipping at its shrine than falls to the lot of any other Australian fish.

In a commercial way this species is captured usually by net (hauling or meshing), in or near the mouths of our harbours and estuaries, as well as in the coastal (salt water) lakes. In these localities immense hauls are often made. While it may properly be termed an estuary fish, large quantities are distributed at times along our beaches and around the rocky shores of our coastline; but it is rarely taken on what are termed the outside, or Snapper, grounds. It subsists mainly upon small crustaceans and mollusca (being at times highly destructive to young oysters), and is easily able to reduce to fragments even fairly stout shells, by means of the powerful molars on each side of its jaws.

Some idea of its great importance as a food-fish may be gathered when I mention that a weight of about 1,350,000

pounds is at present sold annually through the fish markets of New South Wales. Added to this, of course, would be the large quantities taken by thousands of amateurs, fishing by line, and of which no official record can be kept.

In line-fishing for Black Bream, Mr. Eastway informs me that practically the only lines used are the "varnished silk-twists"; experts using Nos. 30 and 28, medium fishers using 24, 20, and 18, while the general public are satisfied with 16 and 14. To the line is attached a 6-feet long Japanese gut, a 2/0 or 3/0 hook, and a very small bullet, fixed on the gut at a distance of 1 inch from the hook.

The Black Bream attains a weight of at least 6 pounds.

Probably the most productive water for its size on our coast is Lake Macquarie, a little to the south of Newcastle.

Tarwhine (*Chrysophrys sarba*).

PLATE XLVII.

Not nearly so important as the preceding, nor is it of such good flavor. It does not occur in such abundance as the Black Bream, and is found chiefly along the northern half of our coastline. By many it is confused with the Black Bream, but not by the fishermen, who recognise the distinctness of the two species. From its congener it may at once be distinguished, among other characters, by the following:— The scales are slightly smaller; it has a number of golden-yellow longitudinal stripes, which are most prominent along the upper parts of the sides; the spinous rays of the anal fin are very weak, when compared with those of the Black Bream; it has eleven soft rays in the anal fin, as against eight in the latter; while, most noticeable of all, the Tarwhine is, what is termed, more "bull-nosed," having a bold rounded nose, somewhat similar to that of the young Snapper.

The largest Tarwhine yet seen by me was a little under 4 pounds in weight.

Yellow-mouthed Perch (*Lethrinus chrysostomus*).

A large and beautiful fish, of good quality as an edible species. Obtained occasionally in our northern coastal waters,

but not in sufficient numbers to warrant us in looking upon it as of economic importance. It attains a length of about 3 feet.

Three other species of *Lethrinus* (each of which is of value from an edible standpoint) have been recorded from the coastal waters of New South Wales, but they may be looked upon as rarities, and are likely to be found in greater abundance in the waters of Queensland. They are *Lethrinus nematacanthus*, *Lethrinus opercularis*, and *Lethrinus glyphodon*.

GOATFISHES, OR RED MULLETS.

Blue-striped Goatfish (*Upeneus porosus*).

Of the three species of Goatfish or Red Mullet, already known to inhabit the waters of New South Wales, that above mentioned is the only one which is worthy of mention at present as an edible fish. It attains usually to a length of about 10 inches, and the adults are to be found chiefly in fairly deep water in the vicinity of headlands or other rocky localities near to the entrances of our estuaries and harbors. It is an exceedingly beautiful species, with a fairly high, compressed body and large scales. When freshly taken from the water, the body is of a rich carmine on the sides, darker above, and silvery-white below. On each cheek are several narrow vermiculated bands of a most beautiful blue. All these colors fade considerably a short time after death.

The Goatfishes or Red Mullets are not greatly esteemed at present in New South Wales, and there does not appear to be much prospect of them becoming of economic importance in the near future.

THE SWEEP FAMILY.

Sweep (*Scorpis æquipinnis*).

A common fish, of fair quality as a food-fish, attaining a length of 12 or 13 inches. The adults are captured chiefly by line at sea, while the young, up to about 6 inches in length, literally swarm around the rocky portions of the lower parts

of our harbors—more particularly Port Jackson. It possesses a very compressed or narrow, high body: the scales are quite small and adherent, the eye is fairly large and the mouth is small. When freshly captured the body is seen to be somewhat of a uniform silvery blue, but this quickly changes to a dusky blackish tint—hence the vernacular name. Large numbers of the young of this fish are captured by boys around Port Jackson and are taken home and cooked, and there is no doubt that, though small, they make a very tasty dish.

Batfish (*Monodactylus argenteus*).

A common fish, most abundant in our northern harbors and estuaries. Although edible, and said to be of good quality, it is not at present of importance. It is such a deep-bodied fish that (exclusive of fins) the height is nearly as great as the length. It attains a length of 8 or 9 inches.

CORAL FISHES.

Butter-Fish (*Ephippus multifasciatus*).

PLATE XLVIII.

This species is very abundant in the estuaries of our northern rivers, and, occasionally, shoals of fair size have been noticed in the waters of Port Jackson. However, as it is not greatly esteemed as a table-fish, it forms but a small portion of the food-supply. The Butter-Fish attains exceptionally a length of 15 or 16 inches.

It is an exceedingly pretty fish. The ground color is bright silver, and on this are displayed, at intervals, broad vertical broken bands of a dark-green color. These bands are composed of large elongated spots, and between them are shorter and narrower bands composed of smaller spots.

Spotted Butter-Fish (*Ephippus argus*).

This Butter-Fish is rare in New South Wales waters. In general form it is somewhat similar to the preceding, but may be at once distinguished by the presence of numerous dark rounded spots, of a fairly large size, on each side.

BLACK TREVALLY.

Black Trevally (*Siganus nebulosus*).

PLATE XLIX.

This is not related to the true Trevallies belonging to the Yellowtail family. The popular name is, therefore, as in a number of other cases, decidedly misleading. Though frequently not to be seen in the markets for months at a time, large shoals occasionally appear in Port Jackson and the waters in the neighborhood, when comparatively small quantities are captured and brought in for sale. Not being recognised as a choice fish, and being usually of small size, it does not command a high price, though finding a ready sale.

The family of fishes to which this one belongs is essentially a somewhat tropical one, and in the present instance, the species is found to be more abundant as we proceed in a northerly direction.

The Black Trevally attains a length of about 10 inches.

A closely allied fish, known as *Siganus javus*, and which is commonly classed with the Black Trevally just mentioned, also occurs on our coast. It is very similar in structure and habits to the latter.

THE POMACENTRIDS.

Scalyfin (*Parma microlepis*).

PLATE L.

This is the only one of the New South Wales Pomacentrids which at present merits any attention as an edible fish. It is a small fish, attaining commonly a length of about 8 inches, and is found swarming around our rocky shores in great numbers. It can hardly be recognised as a market fish, although odd examples are to be seen occasionally mixed in with the products of the trammel-net.

PARROT-FISHES OR WRASSES.

Spotted Pigfish (*Diastodon unimaculatus*).

This is well known to coastal anglers as a fine edible fish; of beautiful appearance, and growing to a length of about 15 inches. Like most of the Parrot-Fishes or Wrasses, it is a rock-fish, dwelling habitually in the vicinity of sunken reefs or rocky headlands. It is one of the species commonly grouped together by New South Wales anglers under the heading of "Redfish," this term applying principally to the Snapper (Red Bream), Nannygai, and the Pigfish. In the Spotted Pigfish the body is of a deep scarlet on the upper parts, and pinkish or yellowish below. On each side and just beneath the first part of the soft portion of the dorsal fin, there is a large pinkish patch; while there is a large dark-blue spot about the centre of the spinous part of the same fin. The scales are very large, as in so many other Labroids.

I think this fish, and the one which follows, are destined to play a more important part in our future fisheries than they do at present, and certainly their value, from an edible standpoint, warrants such a development.

Banded Pigfish (*Diastodon bellis*).

PLATE LI.

As I stated in "Fishes of Australia," this Pigfish is probably not a distinct species, but merely a color variety of the Spotted Pigfish, which is the more common form. In habits it appears to be similar to the latter, but is generally of a somewhat smaller size. It may be distinguished from the Spotted Pigfish by the presence of three rows of large elongate oblong spots on each side.

Crimson Groper (*Harpe vulpina*).

This Wrasse appears to be uncommon, though further knowledge in regard to its haunts may prove the opposite to be the case. It grows to a considerable size, and is possessed of a strikingly beautiful appearance.

Blue-spotted Groper (*Chœrops ommopterus*).

PLATE LII.

This is one of the largest of our Wrasses, attaining a length of nearly 3 feet. It is a denizen of our northern waters, where it appears to be not uncommon. As an edible fish it is of value. The shape alters considerably with age—old examples having a much higher head (and smaller eye) than young or half-grown specimens. The glorious colors of this magnificent fish simply baffle description ; and they must be seen while the fish is fresh, to be properly appreciated.

Groper (*Achœrodus gouldii*).

The Groper is a food-fish of considerable value. It is one of our most abundant Parrot-Fishes, being found in great numbers along the greater part of the New South Wales coastline. It grows to a length of 3 to 4 feet, and is the largest of its family, so far known, to occur in the waters of New South Wales. It is essentially a rock-fish, and subsists upon animal matter. In its capture either hook and line or the trammel-net may be used. Though large examples are not usually considered worthy of ranking as table-fish, those up to about 2 pounds in weight are undoubtedly of good quality, and are sure to come largely into consumption in the near future.

The Groper is a very ponderous-looking fish. Amongst its most noticeable features are the strong canine teeth, two pairs of which project forwards from the anterior portion of each jaw.

Red or Brown Groper (*Achœrodus badius*).

There is little doubt in my mind (as I mentioned in "Fishes of Australia") that the Groper designated popularly as above, is not specifically different from the Blue Groper, but that the only difference is that of sex—the former being normally the female, and the latter the male. It is of a uniform reddish color.

White-spotted Parrot-Fish (*Pseudolabrus gymnogenis*).

PLATE LIII.

This is one of our common rock-fishes, though not often to be seen in our markets. As an edible fish it is likely to become of some importance, when trammel-nets are more freely used along our coastline. It commonly attains to a length of 8 or 9 inches.

Crimson-banded Parrot-Fish (*Pseudolabrus nigromarginatus*).

Though for convenience sake I have used the specific designation which has, in the past, been applied to this fish, I have no doubt that it is specifically identical with *Pseudolabrus gymnogenis*, and that the differences in color and size are no more than sexual, the Crimson-banded Parrot-Fish being the male and the White-spotted Parrot-Fish the female. Contrary to the general rule amongst our fishes in which secondary sexual characteristics occur, the male attains a considerably larger size than the female.

Green Parrot-Fish (*Pseudolabrus laticlavius*).

Common in shallow water, and at moderate depths round rocky shores, lurking amongst seaweed. Grows to a length of 12 or 13 inches. Not likely to become of economic importance.

Lilac-banded Parrot-Fish (*Pseudolabrus cyanogenys*).

At present rare. It attains a length of 18 inches or more.

King Parrot-Fish (*Coris rex*).

Little is known in regard to this rock-fish, which attains a good marketable size—nearly 18 inches.*

Maori (*Coris lineolatus*).

PLATE LIV.

This is one of the most abundant of our Parrot-Fishes, and is a good food-fish. It is easily captured by means of hook and line or the trammel-net, in the vicinity of sunken

* There is a fine specimen of this handsome fish, measuring 17¾ inches, in the collection of the New South Wales Department of Fisheries. It was captured off Fairy Bower (Manly), not far from Sydney Heads.

reefs. The Maori takes the smoke admirably ; and there should be a considerable demand for it later on in the smoked condition. It grows commonly to a length of 15 or 16 inches. The body is elongate and compressed, and is beautifully colored.

This species appears to have received the designation used above on account of the presence of irregular blue bands which traverse the head on each side, giving to the fish the appearance of having been tattooed.

During the spring of the year 1907, enormous shoals of the Maori were present in the ocean waters between Port Jackson and Broken Bay. These were chiefly half-grown fishes.

Rock Whiting (*Odax richardsonii*).

PLATE LV.

This, as I have before pointed out, is not a Whiting, in the proper sense of the word, as restricted to our Australian Whitings of the family *Sillaginidæ ;* though, considering that the latter and the fish under discussion belong to two totally different families, having but little in common with one another, the bodily resemblance is really remarkable.

The Rock Whiting is very abundant along parts of our coastline, more particularly the southern portion, and grows commonly to a length of 12 or 14 inches. It is exquisitely colored.

In some parts of New South Wales and in Victoria, this food-fish is known under the title of " Stranger."

Herring-Kale (*Olisthops cyanomelas*).

PLATE LVI. (Both figures.)

Of all those New South Wales edible fishes which come under the popular general heading of " rock-fish," this species appears to be the most abundant. It is to be found along the greater part of our coastline, wherever weedy, rocky localities exist.

In regard to the value of the Herring-Kale as an edible fish, I may, perhaps, quote from my " Fishes of Australia,"

wherein I stated that this species possesses considerable value, being of good flavor and consistency, and that only a better knowledge of its good qualities is needed to ensure its consumption, as food, on a very much larger scale than at present, the supply—both present and prospective—being practically without limit. In its capture the proper gear would be, as in most other rock-dwellers, the trammel-net. It is seldom taken by hook and line, the principal reason being that it subsists chiefly upon the gelatinous seaweeds obtained in rocky situations.

The Herring Kale furnishes a fine type of species in which secondary sexual characters are displayed. The males are of a uniform bluish-black, with a bright blue, or bluish-green, band near the outer margin of each caudal lobe and on each pectoral fin; the form of the body also is more elongate than that of the female, while the lobes of the caudal fin are more produced, sometimes greatly so. In the female the head and body are beautifully mottled with brown, orange-gold, and blue, while on the sides of the head are orange and bluish vermiculated bands. Viewed in an aquarium the female is seen to be a strikingly beautiful object, and under the same circumstances, it may be pointed out, the male appears to be of a uniform French-grey color (excepting the colored bands on caudal and pectoral fins).

THE YELLOWTAIL FAMILY.

Yellowtail (*Trachurus declivis*).

Exceedingly abundant along the coast of New South Wales, though not much used as food. Notwithstanding this, its flesh is very tasty. Most of those captured by the fishermen and brought to market are immature, and are used as bait by line fishermen in the capture of more highly-prized species. The largest usually seen on this coast would run to about 12 or 13 inches.

This fish is sometimes known as "Scad."

"Cowanyung"* (*Decapterus leptosomus*).

Though the young fry of this species are always present in greater or lesser numbers in our harbor and estuarine waters, the adults are not so often seen. The reason for this is that the adult fish is essentially pelagic in habit, and roams freely in our outside coastal waters. At times vast shoals of these put in an appearance—their individuals ranging up to as much as 18 inches or more in length. Our knowledge in regard to the periodicity of this species (as in the case of a number of others, amongst our pelagic fishes) is unfortunately not sufficiently advanced to enable us to speak authoritatively in regard to its movements, but ample evidence is available to show that it may be looked upon as one of the important fishes of the future—and there is no good reason why it should not be the *near* future.

In a general way, the young of the Cowanyung may be distinguished from the common Yellowtail, among which they are often captured, by the more rounded and shallower, elongate body, and by the general greenish hue of the upper parts; the latter being light-brown or Yellowish in the yellowtail.

Trevally (*Caranx georgianus*).

PLATE LVII.

This is the common "Trevally" of the Sydney fish markets, where it is almost constantly to be seen. It is captured in large numbers by means of hauling-nets, in most of our coastal inlets, always commanding a ready sale in the markets. Notwithstanding its great abundance in the inlets, it is to a certain extent a pelagic fish, making its appearance at intervals in prodigious shoals. The trevally is a smooth-skinned and small-scaled fish, deep-bodied and slab-sided. It grows commonly to a fine marketable size, the ordinary run of what are usually termed large Trevally averaging about 2 or 3 pounds in weight. Much larger ones than that size are, however, often obtained, and examples of as much as 9 pounds in weight, with a length of about 2 feet 6 inches, have been obtained.

* The correct rendering of this name is doubtful.

Like others of the Yellowtail family, this species deteriorates very rapidly after death, if high temperatures prevail, and unless it is gutted. It takes the smoking process well, and large numbers are preserved by this means.

The Trevally is of a beautiful silvery-white on the sides, and bluish above, with golden reflections towards and on the head.

Blue Trevally (*Caranx hippos*).

This is a large fish, attaining apparently a length of about 3 feet. Very little evidence in regard to the occurrence of this fine species in our waters has been forthcoming so far, and it is looked upon as being scarce; but as I have pointed out in the case of others among our food-fishes, of a more or less pelagic or oceanic nature, there has been so little outside work carried out, that we are not justified in accepting present information as conclusive—indeed, far from it. Future investigation will, very probably, I think, reveal the presence of the Blue Trevally in our northern waters, at least, in considerable numbers.

This is the "Cavalla" or "Jack" of the United States, where, according to Jordan and Evermann, it is the most abundant, and one of the most valuable of the genus.

Noble Trevally (*Caranx nobilis*).

I have not met with this Trevally, which was described by Sir William Macleay in 1881. The description was founded on a specimen, captured in Port Jackson, which measured 24 inches.

Silvery Moon-Fish (*Caranx gallus*).

PLATE LVIII.

This species, which is well known as a food-fish in certain tropical parts, has only recently been recorded by me from New South Wales waters, the example upon which the record was based having been captured at Evans River (in salt water), on the northern portion of our coast. This example measured about 18 inches, but the species is known to reach a length of not less than 3 feet.

It appears not unlikely that the Pennant-Fish (sometimes called Diamond-Fish) is the young of the Silvery Moon-Fish. The former makes its appearance in our waters about the end of summer every year.

Samson-Fish (*Seriola hippos*).

PLATE LIX.

Though very plentiful in our waters off-shore, examples of this species are not frequently to be seen in our markets, those that do come in being usually taken by hook and line. It is a fine fish, of great potential value. A length of not less than 2 feet is attained.

Kingfish (*Seriola lalandi*).

It will be of interest to mention that this handsome fish is the celebrated Amber-Fish, or Coronado, of America, under another name. It is a great "game-fish" both here and in America, and there can be no doubt that it is destined to be one of Australia's principal sporting fishes; while from a general economic standpoint it must become of immense importance. At the same time it is not likely to be considered as a first-class fish, its flesh not being of such good flavor or consistency as that of the majority of our food-fishes.

The Kingfish grows to a length of 6 feet, and a weight of about 100 pounds, examples of 4 feet in length being quite common. It is of a highly voracious habit, and is a swift and powerful swimmer. A typical pelagic fish, it moves about in enormous shoals, from which large bodies become detached, entering our harbors either in pursuit of smaller fishes, like the Pilchard, or to escape the attentions of sharks and porpoises (Dolphins), which play great havoc amongst them.

The Kingfish is captured in special large-meshed hauling-nets, or by means of hook and line. It is not very particular as to bait and is easily hooked on a line trailing behind a moving boat. Artificial spinning baits are often used, while many anglers use a living Yellowtail. When hooked it makes a good fight before being landed.

This fish is elongate in form, the body not being highly compressed. The skin has a smooth feeling, the scales being small.

Runner (*Elagatis bipinnulatus*).

PLATE LX.

The only record of the occurrence of this fine species in our waters is that made by me last year,* when I chronicled the capture of a specimen, measuring 27½ inches, which had been captured off North Head, Port Jackson. The species is gregarious, and the example captured was probably one of a large shoal.

Tailer (*Pomatomus saltatrix*).

PLATE LXI.

This is the important food-fish which is so familiar to our American brothers as "Bluefish," and here I might be permitted to illustrate its abundance in the waters of New South Wales by suggesting that, should the American supplies ever give out, the plant for its capture may safely be transferred here, as the supply, both present and prospective, is apparently without limit.

In the following I have quoted largely from my article on the Tailer in "Fishes of Australia," wherein I dealt pretty fully with it.

Though adult Tailer (or Tailor) are adapted for roaming over large areas of water—and do so—the young are found in great profusion in many of the inlets embraced within its habitat. Particularly is this so in Port Jackson, where large numbers of immature examples are enclosed in almost every haul of the "garfish"—or "hauling"—net. Even in the inlets themselves, the young often mass themselves together so as to form large shoals, particularly when small fishes like the young of the Pilchard are present in great quantities. Amongst these the young Tailer, trying to emulate their older relatives, play great havoc. When the Tailer are

* Stead: Additions to the Fish-Fauna of New South Wales (No. 1), 1907, p. 17.

roaming about in the harbor of Port Jackson in shoals, hundreds of men and boys line the wharves, all endeavouring to entice the fish to take their bait—which is not a very difficult feat to accomplish, as a Tailer is usually too hungry to stop to see whether there is anything attached to the bait. Shoals of the full-grown fish also often make their appearance in the harbors, but, as a rule, these prefer the open sea. However, the adults are nearly always present—either singly or in small groups—in the harbors and lakes. In Port Jackson and other localities when a net is hauled ashore, not uncommonly half a mullet will be picked out of the net; usually the head part. When one sees this he knows that "Master Tailer" has been busy; for it is a habit of this fish, that when he cannot take in the whole of a fish he takes as large a portion as he can comfortably—or, perhaps, uncomfortably—swallow: snapping it off with his wonderful steel-trap-like jaws. It is a most absorbing and interesting sight to see two or three Tailer "rushing" a small shoal of mullet on, say, a shallow, sandy flat. They race along with almost lightning speed, sweeping round now and again in the most graceful curves, cleaving the water at the surface with their blue backs, and sending the little ripples and eddies away on each side of them. Though at times great numbers of large fish could be captured by our fishermen, no special fishery for this species yet exists on our coast; the principal reason being that the fish decomposes so rapidly after death, this rendering it what is called a "bad fish for market." This is very regrettable, as a freshly caught and cooked Tailer is of fine flavor and fit to grace the best tables.

By the foregoing remarks I do not wish to imply that the Tailer is not already recognised as an important food-fish, because in the yearly aggregate a considerable amount is sold (and it is well-known that a freshly caught and cooked Tailer is of fine flavor, and is fit to grace the best tables), but these are chiefly captured with other species, and form but an infinitesimal proportion of the enormous shoals which abound in our waters. Under present conditions, if these

fishes were gutted before being forwarded to market, they would arrive in a very different state to that in which they are often to be seen. At the present time, the average fisherman feels rather aggrieved if a few Tailer are enclosed in his net, as they have a troublesome habit of rushing the net, snapping at it with those awful jaws and making holes to let themselves and other fishes out.

As a smoked fish the Tailer is "really excellent," that being the universal opinion; and from an economic point of view, undoubtedly there is a great future before it. In the United States of America, at the present time, great quantities are captured and sold, either in a fresh condition or preserved in a smoked or pickled state; the amount consumed annually in the country mentioned aggregating many millions of pounds in weight.

In New South Wales waters the Tailer attains a length of about 3 feet.

Dart (*Trachinotus russelli*).

PLATE LXII.

This food-fish is not often represented in our markets, being a northern species. Occasionally, however, it makes an appearance in waters as far south as Port Jackson or Botany Bay, when small quantities are forwarded to market. During the winter of 1907, several baskets* were taken in one haul at Botany Bay. As an edible fish it is of considerable value, and as it is very pleasing to the eye, its importance in our future fisheries should be very much greater than at present.

From other edible fishes the Dart may be at once distinguished by its long "swallow-tail," and the greatly produced and pointed dorsal and anal fins. For the benefit of those who are familiar with American food-fishes, it may be mentioned that it is the species of the same genus as this (*Trachinotus*) which are known in America as Pompanos.

The average length of those marketed in New South Wales is from 12 to 15 inches.

* A basket is equal to a weight of about 75 pounds.

Snub-nosed Dart (*Trachinotus ovatus*).

This Dart is much higher in the body, is more snub-nosed, and has shorter fins than the more abundant form just mentioned. It appears to be of rare occurrence in New South Wales waters, but will be found more abundantly on the coast of Queensland.

Queen-Fish (*Scomberoides sancti-petri*).

Somewhat uncommon in New South Wales waters, attaining about 20 inches in length.

Pilot-Fish (*Naucrates ductor*).

This well-known and widely distributed fish is usually only captured (by line) in any numbers during the warmer weather, when the great predaceous sharks are present in large numbers. It is not at present used here for food purposes. It is known to attain a length of about 2 feet.

THE SERGEANT-FISH.

Sergeant-Fish (*Rachycentron canadus*).

PLATE LXIII.

This is a powerful and voracious fish, not uncommon on the New South Wales coast. It attains a large size, and is of some value as a food-fish, though at present sparingly obtained. I have seen three examples of this fish taken at different times, each of which measured about 4 feet in length; while I have observed many others from about 2 feet 6 inches in length, downwards.

The Sergeant-Fish is already known as an edible fish on the coasts of the United States of America.

THE MACKERELS.

Common Mackerel (*Scomber colias*).

PLATE LXIII.

The Mackerel of Australia is identical with the "Thimble-eyed Mackerel," or "Chub Mackerel," of America, and the so-called "Spanish Mackerel" of England. The last mentioned must not be confused with the large mackerels mentioned later under that name.

While this species is already well and favorably known in our waters as a game-fish, and, to a limited extent, as a food-fish, its potential importance in the latter capacity cannot be too highly estimated. As I have already stated in "Fishes of Australia," the Common Mackerel is extensively and abundantly distributed in our waters, only a little enterprise being needed to raise it to a position of great importance amongst our economic fishes, at the same time creating a fishery of boundless extent. Always present in our waters, at certain times it swarms along our coastline and in our harbors and estuaries in countless myriads. Most of those that enter the inlets are immature, the larger fishes usually preferring the open waters of the ocean itself, though occasionally large shoals of those also put in an appearance.

The Common Mackerel usually attains a length of 12 to 14 inches.*

Horse Mackerel (*Sarda chilensis*).

PLATE LXIV.

This large species is not so often seen as the Common Mackerel, but, at irregular intervals, shoals of great extent put in an appearance in our coastal waters, and at these times, comparatively small bodies find their way into our harbors and estuaries, thus coming within the scope of the fisherman's hauling-net. It is of some value as a food-fish

* That is the size of the larger run of those seen in our harbors; but it is likely that the species attains, in our ocean waters, a much greater size. In the waters of Japan, where this Mackerel gives rise to a great fishery, it attains a length of 18 to 20 inches.

in other parts of the world as well as in our own waters, and the comparative few which are brought to New South Wales markets find a ready sale.

The Horse-Mackerel is a strikingly handsome fish, and attains a length exceptionally of nearly 3 feet, the average size of those brought to market being about 18 inches. It is of importance as a game-fish, and is not particular as to bait, being highly voracious.

Bonito (*Gymnosarda pelamis*).

This species is ordinarily somewhat larger than the preceding, and is more robust in form. It is strictly pelagic in habit, and appears to be less abundant than the Horse Mackerel. That, however, may not be the case, as we know so little in regard to the occurrence of our oceanic fishes. A great sporting fish.

Little Tunny (*Gymnosarda alletterata*).

In general form this is somewhat like the Horse Mackerel; the arrangement of the colors, however, is quite different. Little is at present known regarding its occurrence in the waters of New South Wales, and it is regarded at present as rare.

Albacore (*Thunnus* [*Germo*] *germo*).

This is allied to the large Tunnies, from which it differs chiefly in having the pectoral fin very long and sabre-like, in the adult the length of this fin being about two-fifths of that of the body.

We have only one definite record of the occurrence of this fish in New South Wales waters so far, one example a little over 4 feet in length having been taken at Port Macquarie in 1903. Reference to this incident will be found in my "Fishes of Australia." As the fish is highly gregarious, it is probable that there were many others in the vicinity at the time.

Southern Tunny (*Thunnus* [*Germo*] *maccoyi*).

During June of last year (1907) large shoals of this mighty mackerel were discovered to be present in our coastal waters in the immediate vicinity of Port Jackson and Port Hacking; and some of the fishes made their way into the mouth of Port Jackson. The individuals in these shoals averaged from 5 to 7 feet in length, and were of a great weight. The first example taken was harpooned off the mouth of Port Hacking by a party out in pursuit of porpoises (Dolphins). This was examined by me and identified with Castelnau's *Thynnus maccoyi*. I found it to measure 4 feet 10½ inches to the fork of the tail, and it weighed 139 pounds. During the next few days succeeding, a few of those which entered Port Jackson Heads were captured by a fisherman in the vicinity, using a " Kingfish net " ; and these were said to be about 7 feet long. On both occasions, the water off shore was stated to be literally alive with these Tunnies.

Again, during September, the men (Goldsmith Brothers) who harpooned the first one, happened on a large shoal of the young of this species, and about twenty were captured. One of these preserved by me weighed 12¼ pounds.

Though these are the only definite records of the occurrence of this mighty and useful food-fish in New South Wales waters, it is highly probable that they are, and have been often present, but unrecognised, and it seems to me very likely that the young at least have been confused at times with the Bonito.

A statement of the colors as noted by me at the time that I identified the first specimen, mentioned above, will not be out of place:—Upper parts, deep bluish-black, becoming steel-blue towards the sides, and working into a deep-brownish tinge on the top and upper part of the sides of the head; sides ashen-grey, dusted over with darker. (No very distinct line of demarcation between color of back and sides.) Lower surface, coral-white. Iris, yellowish-orange, sparsely dusted over with darker. Projection on each side of tail, orange-yellow with a bluish-green margin. A somewhat leaden or

dull silvery sheen on the sides of the body and on the sides and lower parts of the head. Fins: pectoral, greenish-black, first dorsal likewise; the membrane washed over with greyish. Anal fin with the forepart (edge) greenish-blue, the rest of the fin greyish-white, dusted over with darker. Ventral, somewhat similar to anal. Caudal, greenish-black,— not uniformly so, however, as there was a tendency for a little dirty grey to show through in parts. Finlets, of a bright orange, edged with greenish-black.

I might add that a very fine cast was made of this magnificent specimen at the Technological Museum, Sydney, where it now is. This cast was nicely colored under my observation.

Frigate Mackerel (*Auxis thazard*).

During 1903, and towards the latter end of last year, small shoals of this species made their appearance in the waters of Port Jackson. They were from 12 to 15 inches in length. As this widely-distributed fish usually roams about in large shoals, it is highly probable that they were present in considerable quantities in the vicinity of Port Jackson.

When freshly taken, these examples had the appearance of polished lead, and they appeared to be familiar to some of the Sydney fishermen, who called them "Leadenalls."

Butterfly-Fish (*Gasterochisma melampus*).

PLATE LXV.

First recorded by me from these waters last year, the record being based upon two examples captured a short distance to the southward of Sydney, at the latter end of August, 1906. The larger of these two measured 16 inches.

This remarkable fish is a rather aberrant form of Mackerel. Its body is highly compressed or slab-sided, suggesting that of the Tailer. The ventral fins are exceedingly large and fan-like. The scales are of moderate size, thin and deciduous, and are concentrically striated.

I have received no further evidence of the existence of this species in our waters since the capture of those first recorded.

Spotted Spanish Mackerel (*Scomberomorus guttatus*).

Though they are not turned to much account in our present fisheries, the Spanish Mackerels (of both the known species) must be considered as being amongst the most important of our fishes. Occurring at intervals in prodigious shoals and attaining a large size, they can hardly fail to be of great commercial value in our future fisheries; and there appears to be every probability of a very lucrative fishery being established on this coast.

The Spanish Mackerels are very well known, and greatly esteemed, in the United States of America, as food-fishes, and there is absolutely no reason why they should not come as prominently forward (or even more so) in our own waters, where they are so abundant.

Of elegant and beautiful form, these fishes are the very essence of speed; and they are essentially pelagic or oceanic in habit, roaming freely over large areas of sea.

The Spotted Spanish Mackerel attains a length of about 6 feet, and is very elongate in shape. In color it is bluish above and silvery on the sides, the latter being ornamented with fairly large, somewhat ovate or circular, dark spots.

Barred Spanish Mackerel (*Scomberomorus commersonii*).

PLATE LXVI.*

This species is somewhat higher in the body than the preceding. The color of the body is very like that of the Spotted Spanish Mackerel, but instead of spots, the sides are very prettily ornamented with more or less wavy vertical bars of a deep bluish tint.† It grows to a length of about 4 feet or more.

A large shoal of these was present in our waters at the end of January of this year. One of this shoal, which I handled, measured about 4 feet 6 inches.

* See also the special design on the front of the cover of this work, which gives an impression of a shoal of these fishes in full tilt.

† These bars are broader and straighter in young and half-grown examples.

THE BARRACOUTA FAMILY.

Barracouta (*Thyrsites atun*).

Familiarly known as 'Couta, this large and highly-voracious fish is abundant along the southern portion of the New South Wales coastline. Occasionally large shoals penetrate the waters of Port Jackson (during the cooler months), and even waters much farther in a northerly direction. It attains commonly a length of at least 4 feet; the body being highly compressed, very elongate, and almost band-like, while there are a number of small finlets preceding the powerful caudal fin. The mouth is armed with sharp and formidable teeth, well adapted to the predaceous habits of this species.

Though the Barracouta can never be classed as a first-class table-fish, it is undoubtedly of very great importance and value; and no account of our edible fishes would be complete without mention of it. Although in its fresh state it is at present practically unsaleable in New South Wales, large quantities are sold annually in a smoked state. Many of these are captured in the waters of Victoria, Tasmania, and New Zealand. Their capture is usually effected by means of hook and line; and in this no difficulty is experienced, as the Barracouta is neither particular as to the kind of bait used, nor slow about taking it. As I have mentioned elsewhere, any bright moving object is sufficient to attract the fish, a piece of red flannel fastened to the hook being a first-class bait.

The "'Couta" is the "Snoek" of South African waters.

Australian Hairtail (*Trichiurus coxii*).

This fish is somewhat suggestive of the Barracouta in appearance, and attains about the same length; but differs considerably from that fish, in that there is no caudal fin, the tail tapering to a fine point—hence the generic name *Trichiurus*. It has a long, attenuated, ribbon-like body of a uniform silvery color.

There are no dorsal or anal finlets like those of the Barracouta. The mouth is armed with a number of long, fang-like teeth.

The Hairtail is not often obtained. It probably occurs in abundance in moderate ocean depths.

SWORDFISHES OR SPEARFISHES.

Spearfish (*Tetrapturus indicus*).

PLATE LXVII.

Though there appears to be no prospect of the flesh of this fish being used as food in New South Wales in the near future, the use of Swordfishes and Spearfishes in general for this purpose, in other parts of the world, is sufficient justification for its inclusion here, particularly as my own acquaintance with this fish leads me to the idea that future investigation into its occurrence in our waters will tend to show that it is far more abundant than has previously been thought. Though of a pelagic or oceanic nature, occasionally examples of this Spearfish find their way into the waters of Port Jackson; and during the month of January, 1908, a large one was found dead, jammed between a pontoon and a wharf, at a distance of about 10 miles up from the entrance to the Port—surely an ignominious death for such a lord of the ocean.

The largest of these Spearfishes which has come under my personal notice measured about 12 feet 6 inches.

It may be mentioned that the snout in this species is produced to form a powerful, rounded, spear-like weapon of offence.

The example here illustrated is the one referred to in "Fishes of Australia" (pp. 170 and 171) as having been captured in Port Jackson during 1905.

DOLPHIN-FISHES AND POMFRETS.

Common Dolphin-Fish (*Coryphæna hippurus*).

This large pelagic fish, which grows to a length of fully 6 feet, and which is familiar to many seafarers, is known to occur in our ocean waters at times. Its magnificent colors have often been described, but, as in the case of many others, they can hardly be satisfactorily painted in a word picture.

The Dolphin-Fish appears in the Sydney fish markets at rare intervals.

Pomfret (*Brama raii*).

Sometimes known as Ray's Bream. Though of considerable value in portions of its habitat as a food-fish, it is but little known in New South Wales, being of rare occurrence. It is a deep-bodied fish, growing to a length of from 2 to 4 feet.

THE DORIES.

Australian John Dory (*Zeus australis*).

This excellent edible fish is extremely abundant along the coast of New South Wales in moderate ocean depths. During the trawling carried out by the "Thetis," under Mr. Farnell, in 1898, it was captured on no less than thirty-three occasions, being quite as abundant, apparently, in water ranging from 16 fathoms in depth, down to 84 fathoms. Though this grotesque-looking species is known to be a food-fish of an exceptionally high order, there is no special fishery at present for its capture, the few that do come into the markets being captured by line men, while fishing for other species in the vicinity of reefs.

Such a well-known fish as the John Dory needs but little description, but I may state that it attains a length of not less than 18 inches. Undoubtedly there is a great future before it.

Silver Dory (*Cyttus australis*).

PLATE LXVIII.

Though this magnificent and quaint-looking fish has earned for itself the popular name used above, it is when freshly taken of a beautiful Nannygai-pink. This pinkish or reddish tint, however, quickly fades after capture, leaving the fish of a uniform whitish-silvery. Like the John Dory, it is an outside or ocean fish, and is rarely captured.

The Silver Dory bears a general resemblance to the John Dory, but the whole body is more diamond-shaped. The mouth is highly plescopic, though not to such a degree as that of the latter.

This food-fish attains a length of about 15 or 16 inches, and is considered to be of good quality.

FLOUNDERS AND SOLES.

Large-toothed Flounder (*Paralichthys arsius*).

PLATE LXIX.

This is one of the most abundant of New South Wales flat-fishes. It is distinctly a northern species, and becomes more common as we proceed in a northerly direction from Sydney Harbour (Port Jackson), being particularly abundant in the estuaries of our great northern rivers. It attains a length of about 15 inches, and is a fine table-fish. In the aggregate, considerable quantities of the Large-toothed Flounder are brought to market annually in New South Wales.

Apart from other differences and considerations of color, this species may, as I have already pointed out in "Fishes of Australia," be readily distinguished from its near ally, the Small-toothed Flounder, by (1) the presence of several comparatively-large canine teeth near the front of the jaw (while in the latter the teeth are fairly-uniform in each jaw, being but slightly enlarged at the front of the upper jaw); also (2) the slightly increased number of dorsal and anal rays, as compared

with the Small-toothed Flounder, and the presence upon the lower jaw of a pronounced knob, with (usually) a slight notch beside it; the projection, when occurring at all in the other kind, being not at all prominent.

It may be mentioned that the eyes of both this and the following species are on the left side.

Small-toothed Flounder (*Paralichthys novæ-cambriæ*).

This Flounder appears to be more restricted in its habitat than the Large-toothed Flounder. It is particularly abundant along the central and southern portions of our coastline. Like the preceding species, it is practically an estuary fish, and it occurs in shallow water; at times lying on the "flats" in water that will barely cover its thin body. It is sometimes called "Spotted Flounder," but, generally speaking, in a commercial way no notice is taken of any differences which exist between this and the Large-toothed Flounder, the two being grouped together and sold as simply "Flounder."

The Small-toothed Flounder grows to a length of 16 inches (and a weight of at least 2 pounds), though those brought to market average considerably less than that.

Spiny-headed Flounder (*Platophrys spiniceps*).

This is a species of Flounder which (with the exception of the type specimen) I have not met with so far. It was described by Sir William Macleay, father of Australian Science, from a small example obtained in Port Jackson. Knowledge in regard to extent of growth, distribution, and abundance has yet to be obtained.

The eyes of the Spiny-headed Flounder are on the left side.

Long-snouted Flounder (*Ammotretis rostratus*).

PLATE LXX.

A good food-fish, abundantly distributed along the New South Wales coast, more particularly on that portion lying to the south of Port Jackson. It is the "Sole" of the Melbourne market. The very young fry are very abundant in the

vicinity of sandy sea-beaches in shallow water, but as they become older they make their way into the estuaries, in which the adults are usually found on muddy or sandy bottoms. The color varies considerably according to the situation in which the fish is found, those in sandy localities being much lighter than those on muddy bottoms. The range is from a deep black to a very light brown or fawn color, dusted over with darker. The very young are, almost without exception, of the lighter color. The eyes are on the right side.

The Long-snouted Flounder grows commonly to a length of about 10 inches, and exceptionally to about 12 inches.

Southern Flounder* (*Rhombosolea flesoides*).

This is, as the vernacular name implies, a southern species, most abundant on the coasts of Tasmania and Victoria, where it is extensively used as food. It occurs also on the southern portion of the New South Wales coast, but is not at present of sufficient importance in these waters to be recognised as a commercial fish.

The Southern Flounder grows to a length of about 12 or 13 inches. The eyes are on the right side.

Crested Flounder (*Lophonectes gallus*).

A small species, which is extremely abundant in moderately deep water at sea. It was first taken by the great "Challenger" expedition, and a little later (1882) one example was taken in the waters of Port Jackson in a large Otter Trawl, which was then being tried for the first time. At this trial Sir William Macleay was present, and it is worth mentioning that in the one short drag of the net no less than seven species of Flounders and Soles were taken. In 1898, and during the trawling cruise of the "Thetis," this species was found to be particularly abundant off the New South Wales coast, in depths ranging from 10 to 84 fathoms. Specimens captured ranged up to 7½ inches in length.

* In my "Fishes of Australia," the name Southern Flounder is applied to the species known as *Rhombosolea monopus*. Though this species does, apparently, occur in the waters there indicated, the species *flesoides* is the most abundant form.

The first rays of the dorsal fin are elongated, giving somewhat the appearance of a crest, hence the vernacular name here used. The eyes are on the left side.

In color the Crested Flounder is of a light brown, with some indistinct darker markings, all the fins being minutely speckled.

Small-headed Flounder (*Læops parviceps*).

This species was taken on our coast by the "Challenger" expedition. Nothing is known regarding distribution or habits, and I have not personally met with this flounder so far. It is probably a deep-water fish. Eyes on the left side.

Small-headed Sole (*Solea microcephala*).

PLATE LXXI.

This fish is to be found in our estuarine waters, usually on muddy bottoms, and is not uncommon. Relatively speaking it is the thickest (stoutest) of our flat-fishes, though it is a small species of little importance at present. It grows usually to a length of 7 to 8 inches. The eyes are on the right side.

In color the Small-headed Sole is of a light brown, with about 12 irregular cross-bands, much broader than the interspaces. The fins are very dark.

Narrow-banded Sole (*Aseraggodes macleayana*).

PLATE LXXII.

Originally taken in 1880 from the waters of Port Jackson, we now know that this useful food-fish extends over a great part of our coastline, it having been obtained from Port Macquarie, on the north, to a locality off Shoalhaven River on the south. From the latter locality, in 15 fathoms of water, it was trawled by the "Thetis," while the northern record is my own. It is most common in sea water of a few fathoms in depth, though it has been taken in absolutely fresh water in the Richmond River. Through the operations of the "Thetis" in 1898, it was found to be quite abundant in certain localities ranging down to as much as 20 fathoms.

It attains a length of about 11 inches, and may be considered as likely to be of some use as an adjunct to our food-supply in the near future.

The eyes of this fish are on the right side.

In color the Narrow-banded Sole is of a light brown, crossed by narrow dark-brown irregular bands, about as wide as the interspaces, extending on to the fins. Some of the bands are forked.

Peacock Sole (*Achirus pavoninus*).

This beautifully ornamented species is not of present economic importance. It appears to be purely an estuarine fish, affecting sandy bottoms, and occurring in the waters along the greater part of our coastline. It is rarely seen in our markets, and is not often captured. A length of about 7 inches is commonly attained. This flat-fish is closely allied to the American "Hog-choker." The eyes are on the right side.

Black Sole (*Synaptura nigra*).

PLATE LXXIII.

Of all the New South Wales flat-fishes the Black Sole is at present the most important. It is plentifully distributed along our shores, being most abundant in the comparatively shallow waters of our estuaries and coastal lakes, where it seeks the muddy bottoms. Though always to be seen in the fish markets, where it finds a ready sale at a high price, it is captured in its greatest abundance during the warmer months of summer, which is its spawning period. It is fairly thick, for a sole, and attains a length of about 14 inches, with a weight of about 2 pounds, that being the size of the largest seen by me. The average size of those marketed, however, would be about 9 to 10 inches.

In the capture of the Black Sole, the spear and the hauling-net are commonly used. However, if the soles are known to be congregated together in large numbers, the trammel-net may be used with great execution.

In shape, the outline of the Black Sole is of a fairly regular oval. The scales are very highly ctenoid, and make

beautiful objects for the microscope. (An illustration of one of these will be found on page 12 of my "Fishes of Australia.") The eyes are on the right side.

The normal colors of this fine food-fish are as follows:— The blind side is whitish or yellowish-white. The upper side is of a rich olive-brown, mottled over with large, irregular, darker blotches. There is a very great amount of variation in the colors and their arrangement according to the situation, and I have seen "Black" Soles taken on clean sandy ground which were of a light fawn color.

Zebra Sole (*Synaptura zebra*).

Rarely met with, and at present of no importance. It is of a yellowish ground color, with a number (about eleven) of brown zebra-like broad cross-bands.

The eyes are on the right side.

Many-banded Sole (*Synaptura fasciata*).

This flat-fish was described in 1882 by Sir William Macleay from a single small example measuring 5 inches, trawled in the waters of Port Jackson on the occasion before referred to. Since then it has been captured occasionally in the same harbor in moderately deep water and up to a length of about 8 inches. It is probable that the species is to be found usually in fairly deep water at sea. In support of this idea, I might mention that a single specimen was taken in the trawl at a depth of 28 fathoms by the "Thetis," in 1898. The eyes are on the right side.

The color is a pale brown, with about twenty dark, narrow cross-bars, about equidistant from one another, distributed over the head and body.

Tongue-Fish (*Symphurus unicolor*).

PLATE LXXIV.

Though not at present of special importance, the Tongue-Fish is quite common on sandy bottoms at shallow depths along the coast of New South Wales, where it attains a length of about 13 inches. In form it is that of a very long oval,

pointed at the tail end, and is well-named "tongue" fish. The upper part of the snout is produced backwards over the mouth, into a long hook-shaped flap, known as the "rostral hook." The eyes are on the left side.

The color is a pale yellowish-brown, with numerous round spots of a creamy tint.

In capturing the Tongue-Fish, it is necessary to have a net which is so arranged as to "bite" the bottom well, owing to the habit of this species of clinging so close to the sand.

THE RED ROCK COD FAMILY.

Red Gurnet Perch (*Sebastapistes percoides*).

This is a rock-frequenting fish usually obtained by hook and line in the vicinity of reefs at sea. It enters but little into the food-supply of New South Wales, as it only appears in any numbers along the most southern portion of our coast-line, being usually rather uncommon in the vicinity of Sydney.

Like so many of the scorpænoid fishes, the Red Gurnet Perch is exceedingly beautiful in coloration.

It attains exceptionally a length of about 12 inches.

Thetis-Fish (*Sebastodes thetidis*).

This name has been given to a fish, allied to the preceding, which was first captured during the trawling of Mr. Farnell's "Thetis" Trawling Expedition in 1898. As it may prove later to be of some importance, I have included it in this list. It was obtained on four occasions by the "Thetis," in depths ranging from 55 to 78 fathoms, and up to a length of about 12 inches.

Red Rock Cod (*Scorpæna cruenta*).

PLATE LXXV.

Under the name of Red Rock Cod are commonly included two species, that mentioned above, and an allied form known as *Scorpæna cardinalis*. As the latter is rather rare, it is

with *Scorpæna cruenta* that we are more directly concerned here. This is a very common object in the fish markets of New South Wales, and, as its flesh is usually considered to be of very good quality, the fish always finds a ready sale.

It is a large-eyed species, of somewhat fierce—or, perhaps I should say, grotesque—mien. Between the eyes is a deep groove, and scattered over the skin of the head and the rounded, robust body, are numerous short, skinny appendages. The head is heavily armed, and is covered with hard bony ridges and sharp spines. The grotesque shape of this fish, coupled with its beautiful protective coloration, are very effective aids to concealment when it is amongst rocks and weeds—its natural surroundings—and must assist it greatly also, in obtaining a large part of its food, which consists of small rock-frequenting organisms generally.

As I mentioned in "Fishes of Australia," the general color is a rich carmine—very bright towards the back, while the lower parts are a pearly-white. There is a broad transverse pink spot, which is narrowest in the middle, immediately at the back of the head on the occiput. The lower surface of the head is a pale red, marbled with yellow, with which color the lips are banded. On the sides are scattered many dark chocolate-colored spots, particularly over the lower portions.

The Red Rock Cod is usually captured by means of hook and line, with a flesh bait. It may also be taken with that valuable net, the "Trammel," which, as I have before mentioned, is so little used here at present.

It commonly grows to a length of 12 inches, though examples up to 18 inches in length are not infrequently obtained.

Bynoe's Rock Cod (*Scorpæna bynoensis*).

This is a smaller species than the common Red Rock Cod, to which it is closely allied. It is of little economic importance at present in New South Wales waters, as it is rarely obtained, and it does not appear to me probable that it will ever add largely to our food supply.

Bullrout (*Notesthes robusta*).

PLATE LXXVI.

Though but little used, the Bullrout is of considerable value from an edible point of view. The reason that it is not usually regarded with favor is because of the dread in which it is held, on account of its power of inflicting the most painful of wounds, by means of two sharp spines on each side of the head. These spines are erectile at will, when they become really formidable weapons. One of them is short and triangular, while the other is long and thornlike. Owing to the Bullrout's habit of lurking quietly in muddy localities amongst weed, the unwary wader is liable to feel the fish before he sees it; and if he once feels it he is never likely to forget it.

This fish is distributed along the greater part of the New South Wales coastline, inhabiting the estuaries, particularly their upper portions, and penetrating right up into the fresh waters of creeks and rivers. As instances of this, I might mention that specimens are sometimes taken in the salt water of Botany Bay, while at the same time they are captured in the fresh water above the Canterbury Dam, while the species is found occurring in the waters of the Hawkesbury River from the lower part of its estuary right up into the Nepean. It appears to be most abundant, however, in the regions of brackish water.

In appearance, the head of this grotesque-looking fish is strangely suggestive of a rhinoceros, there being a prominent "hump" on the snout before the eyes.

As I mentioned in "Fishes of Australia," there is an idea in certain quarters that the flesh of the Bullrout is poisonous, but this fear is altogether unwarranted, the flesh being both wholesome and usually palatable.

The color is brownish, marbled with blackish.

The Bullrout grows to a length of 10 to 12 inches.

FLATHEADS.

Dusky Flathead (*Platycephalus fuscus*).

PLATE LXXVII.

Somewhat repulsive in appearance, the Flatheads, generally, must undoubtedly claim a highly important place among the food-fishes of the States of the Commonwealth of Australia in general, and of New South Wales in particular. As far as New South Wales is concerned, that which is of the greatest value at present is the Dusky or Common Flathead, being, as it is, one of the principal market fishes. A quantity of about 525,000 pounds weight (or 7,000 baskets) is brought to market annually, and in addition a very considerable quantity is captured by anglers using handlines.

As an edible fish, it is of very good quality, the flesh being white, firm, and flaky, though just a little dry.

This Flathead is a fish of the estuaries, and it is plentifully distributed along the whole of the New South Wales coastline, being found most abundantly in water of from 3 or 4 fathoms in depth up to a few inches at low tide, and on bottoms which are composed wholly, or in part, of mud. (I have described the habits of this species in "Fishes of Australia," page 197).

In color it varies according to situation, from a dark-brown or blackish with cross-bands of black in muddy localities, to a light sandy-grey with somewhat darker bands in sandy places.

The Dusky Flathead attains a large size, specimens of a length of 4 feet being not unknown; those of a length of from 2 to 2½ feet, however, are considered large, while the average of those marketed would be much less.

Being of a highly carnivorous nature, nothing comes amiss to this hungry fish, even the young of its own species being occasionally taken.

Mr. R. E. Eastway, the authority before-quoted, considers that in fishing for common Flathead with hook and line, the following is most suitable:—A No. 12 varnished silk twist, or a No. 40 thread, line, about 50 yards long; with a 4/o or 5/o hook, on twisted gut, phosphor-bronze wire, or gimp. A medium running sinker is best for most places; but if the boat is moored, the bait should be kept on the move all the time.

Rock Flathead (*Platycephalus lævigatus*).

This Flathead does not enter largely into consumption in New South Wales, as it—being a southern species—only begins to occur in abundance (as far as New South Wales is concerned) along the southernmost portion of the coastline.

It is a smaller species than the preceding, and is much narrower and rounder in the body.

Sand Flathead (*Platycephalus bassensis*).

PLATE LXXVIII.

Sometimes known as Red Flathead. It is captured in abundance by line at sea, on sandy bottoms, in water of from a few fathoms deep down to moderate ocean depths. It is an important food-fish growing to a large size, and occurring in such abundance as to warrant a much greater amount of attention being given to its capture than is the case at present.

This species is reddish in color, with bluish spots distributed over the upper surface.

Long-spined Flathead (*Platycephalus longispinis*).

This is the smallest of our commercial species. It is usually captured by line at sea in much the same situations as the Sand Flathead, though not so abundantly. Only the largest examples may be termed marketable as the species only grows to a length of 12 or 13 inches, and is sexually mature at a length of 7 or 8 inches. The name "Spikey" is applied to this fish by the comparatively few fishermen who come in contact with it, on account of the huge and

dangerous spine on the lower side of each gill-cover, and with which a very nasty wound may be inflicted.

Tiger Flathead (*Platycephalus* sp.).

This Flathead attains a fairly large size. It is occasionally captured by line, in fairly deep water at sea, and has been termed "Tiger" by some of the fishermen, because of the sharp teeth, which are more prominent in this species than in its allies. The eyes are prominent and large, and the body is covered thickly with small vermilion spots. [In regard to identity, I prefer to leave the species open at present. The New South Wales Flatheads are in need of a general revision; and I think it not unlikely that this species is yet undescribed. In any case I will leave it open until I am able to bestow more attention to the whole family of Australian Flatheads (*Platycephalidæ*).]

The Tiger Flathead is probably more abundant in a southerly direction.

Ogilby's "Sand Flathead" (*Platycephalus arenarius*).

In 1886 Ogilby described a flathead under the above name, which was trawled in Middle Harbour, Port Jackson. The type measured 10 inches. Ogilby stated about the same time that it was the Sand Flathead of the Sydney market. In this, however, he is, I think, somewhat mistaken, as the fish commonly known in our markets as Sand Flathead is the species previously mentioned by me.

This fish may be at once identified by its colors, which are as follows:—Light yellowish-brown above, white below. Spines and rays of dorsal fins with chestnut bands. Ventral and pectoral rays banded. Ground color of tail fin pure white; the upper half with three or four oblique parallel brown bands, the lower with two much broader black stripes.

Variegated Flathead (*Platycephalus cirronasus*).

A rather small and comparatively short and stout species, of little importance, and rarely obtained. It is found in the vicinity of rocky localities.

GURNARDS OR GURNETS.

Butterfly Gurnard (*Lepidotrigla papilio*).

As far as records go, this is a small species of no present importance as an edible fish.

Mulhall's Gurnard (*Lepidotrigla mulhalli*).

This Gurnard is very common on outside grounds, within the 100-fathom line along the coast of New South Wales; but rarely coming to market, as such localities are not systematically fished.

It attains a length of about 9 inches.

Thetis Gurnard (*Lepidotrigla modesta*).

This is one of the fishes obtained for the first time by the "Thetis," in 1898. It appears to be fairly common along parts of the coast within the 100-fathom line, but is of rather a small size. I have not so far met with this species.

Another species of this genus, *Lepidotrigla pleuracanthica*, which, apparently, does not attain a large size, has been taken at intervals in our waters, though never in any abundance.

Kumu Gurnard (*Chelidonichthys kumu*).

PLATE LXXIX.

This is the most abundant of the New South Wales Gurnards, occurring commonly in our coastal waters, and penetrating to the lower portions of our harbors and estuaries. Notwithstanding this, it is never seen in any abundance in the markets, as it does not often come within the scope of the fisherman's net, owing to its habit of (in the estuaries at least) frequenting rough ground. The occasional examples which do find their way to market are sold with the "mixed fish."

It is an excellent table-fish, and grows to a length of nearly 2 feet; two good points which, added to its abundance, should render it an important food-fish in our future fisheries.

Sharp-beaked Gurnard (*Pterygotrigla polyommata*).

Though this Gurnard is not so often obtained as the preceding, there is good reason for thinking that it is almost as abundant—at least along the southern half of the coast-line. Normally it is to be found, in its greatest abundance, in deeper water than that in which the Kumu Gurnard is principally found, though stray specimens are captured occasionally in the deeper water of our harbors. The most northerly locality from which I have obtained this species, so far, is Camden Haven. From here it becomes more abundant as we proceed south. At times it is very abundant on sandy bottoms in deep water, from about 20 to about 60 fathoms, in the vicinity of Sydney, New South Wales, when considerable numbers are captured by line.

The Sharp-beaked Gurnard is heavier in build than the Kumu Gurnard; the eyes are larger also, suggesting a deep-water existence, while the head is more heavily armed with strong and sharp spines. Two of the latter, which are powerful, flattened, and project in front of the snout; hence the name here used. The general color is a beautiful reddish-pink, the lower parts whitish, and with a broad silver band along each side.

It attains a length of at least 20 inches.

As I pointed out in "Fishes of Australia," this fish is often called "Flying" Gurnard, a name which properly applies to the next species.

FLYING GURNARDS, OR SEA ROBINS.

Flying Gurnard (*Cephalacanthus spinarella*).

Sometimes familiarly known as "Sea Robin." It is well known to mariners on account of its habit of coming to the surface in shoals, skimming along, and taking flying leaps into the air, somewhat after the fashion of the true Flying-fishes, which are, normally, surface-fishes.

It may be distinguished by its squarish head, the upper surface and sides of which are entirely hard and bony, and from the hinder portion of which, on each side, is an enormous

acute spine directed backwards. The pectoral fins, which, as in the true Flying-fishes, form the so-called "wings," are greatly enlarged in the adult, though comparatively short in the young. The body is somewhat stout and squat, and the scales are exceedingly rough.

Though not likely to become of economic importance on this coast, this species is already favorably known as an edible fish. It attains a length of 12 inches, or more.

NOTOTHENIOID FISHES.

Congolly or Sandy (*Pseudaphritis urvillii*).

A somewhat Whiting-like fish of no present importance. It has a most curious geographical distribution, occurring both in the Murray River, in fresh water, and along the sea-coast as well. It has an elongate, cylindrical body, and grows to a length of about 12 inches.

BLENNIES.

River Blackfish (*Gadopsis marmoratus*).

PLATE LXXX.

One is usually inclined to regard the Blennies as, altogether, a "little people," and quite beneath notice from an edible point of view, but there are a few giants among them. The largest of all is well known to Europeans as the "Sea Wolf," or "Sea Cat"; and the greatest Australian Blenny is the River Blackfish, familiar to many country-folk by the name of "Slippery."

This is a fresh water fish occurring in the upland streams of the southern tableland of New South Wales, where it attains a length of at least 24 inches. It is of considerable value as an edible fish, and of some importance as a game-fish, fighting well when hooked.

The exact systematic position of the genus *Gadopsis* is still, I think, open to some doubt, though it appears to have more in common with the Blennies than with any other group of fishes.

THE AUSTRALIAN ROCKLING.

Australian Rockling (*Genypterus blacodes*).

PLATE LXXXI.

This eel-shaped fish is rarely taken on the coast of New South Wales. It is a southern species, occurring more plentifully in the waters of Victoria, and growing to a length of over 3 feet. As in the other members of this family of fishes, there are no true ventral fins, these being replaced by a pair of bifid filaments or barbels, which are placed beneath the lower jaw. In this connection, I may mention that in an example of the Australian Rockling which I received some time ago and which was captured at Ulladulla, N.S.W., the barbels were conspicuous by their absence, their loss having, apparently, been brought about by some accident, as there is a very pronounced contusion in the vicinity of, and a little behind the position in which they should naturally be.*

THE LEATHERJACKETS.

Yellow Leatherjacket (*Monacanthus ayraudi*).

Of the many species of Leatherjacket inhabiting the coastal waters of New South Wales, this is one of the most abundant. Always to be captured in greater or lesser numbers, at fairly frequent intervals vast shoals make their appearance. While undoubtedly a veritable pest to line fishermen, its good quality as an edible fish is rapidly bringing it to the fore, and I feel sure that the time is not far distant when it will be in very great demand as an article of food, and when it will be looked upon as one of our important food-fishes. Even at the present time quite a considerable quantity is consumed annually, and boiled or fried leatherjacket is a common item on the "bill of fare," whereas only a few years ago most

* I have previously drawn attention to this: *vide* my "Additions to the Fish-Fauna of New South Wales" (No. 1), 1907, p. 25.

people would not look at them. Those captured, particularly those of a larger size, are principally taken by hook and line. The young are very commonly taken by the fishermen in the estuaries, when hauling their nets for other species. The professional fisherman, it may be added, cordially detests leatherjackets of whatever species, as they become entangled in the meshes of the net by the large dorsal spine, thereby causing considerable waste of time and labor in extricating them.

The Yellow Leatherjacket may grow to a length of as much as 2 feet, but examples of half that length would be nearer the average of those captured.

Orange-spotted Leatherjacket (*Monacanthus hippocrepis*).

This large and handsome species is essentially an outside fish, and is captured by line in the vicinity of reefs and rocky shores. It is a fairly large fish, attaining a length of about 18 inches, and is useful as a food-fish, though not nearly so important as the Yellow Leatherjacket.

I described the colors of this beautiful fish in "Fishes of Australia," and may, perhaps, again refer to them here.

When alive it possesses the most lovely tints, the upper or dorsal surface being of an olive-green or yellowish-green, and shading into a lighter tint below. On the middle of each side is a large, irregular blotch, of a bright orange color, within which a horseshoe-shaped band is sometimes present. The lips are surrounded by two or three dull, blue, yellow-edged bands, and the sides of the abdomen with narrow waving bands of an intense blue.

River Leatherjacket (*Monacanthus trachylepis*).

While the two previously mentioned species are denizens of the lower portions of the harbors and the outside grounds, the River Leatherjacket is to be found abundantly all the year round in the higher parts of our estuarine and harbor waters as well as in the coastal lakes. At the same time, and whether they remain there for any length of time or not, there is no doubt that the adults appear in our ocean waters at times (in the warmer months) in vast numbers.

From an edible point of view the flesh of this species is, like that of the Yellow Leatherjacket, of considerable value.

This is the species mentioned by Ogilby under the name of Yellow-finned Leatherjacket.

Many other species of Leatherjackets occur in our waters, and a number of them may be regarded as of more or less importance as edible fishes.

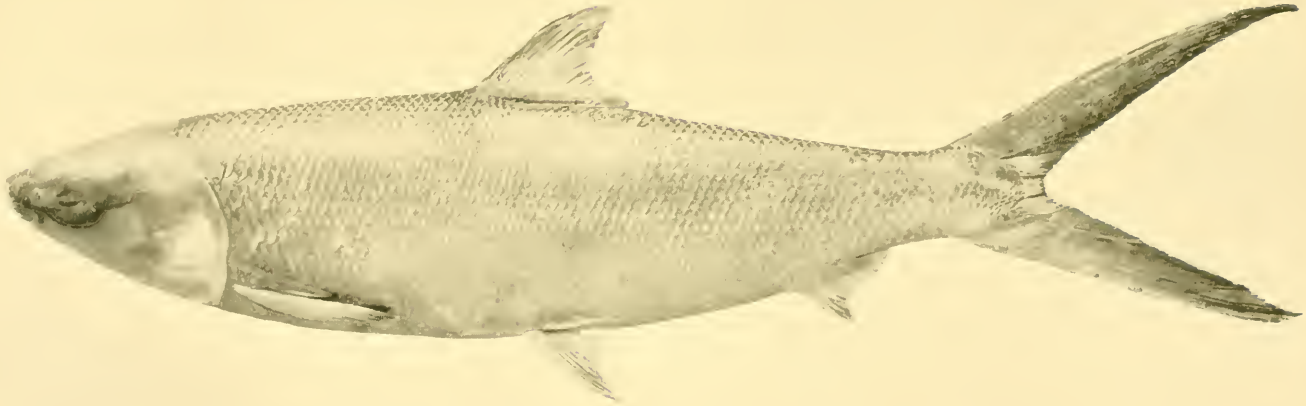
SHARKS AND RAYS.

It is not my intention to deal exhaustively with these fishes, and, generally speaking, they are popularly regarded as being altogether "outside the pale" from an edible standpoint. But this is not altogether the case, as there is, even at the present time, a slight, and perhaps growing, demand for the pectoral flaps or "wings" of the Common Stingray (*Trygonoptera testacea*), while for many years there has been a small export of dried shark's fins, per medium of the Chinese merchants. In addition to these, there are three fishes which may, and I think should, come into prominence in the near future, when deep-sea fishing is carried out in a practical manner. Those which I refer to are three species of true skate : the Common Skate (*Raja australis*), the Great Skate (*Raja scabra*), and another known as *Raja nitida*. The first is very common along our coast, where it attains a length of about 20 inches. It was described by Sir William Macleay in 1884, and during the short trawling cruise of the "Thetis" in 1898, it was found to be exceedingly abundant at depths ranging from 10 to 84 fathoms. The second is a much larger species, often weighing over 60 pounds. In regard to *Raja nitida*, the third species mentioned, little is known. It was dredged by the "Challenger" Expedition off Twofold Bay at a depth of 120 fathoms.

PLATES.

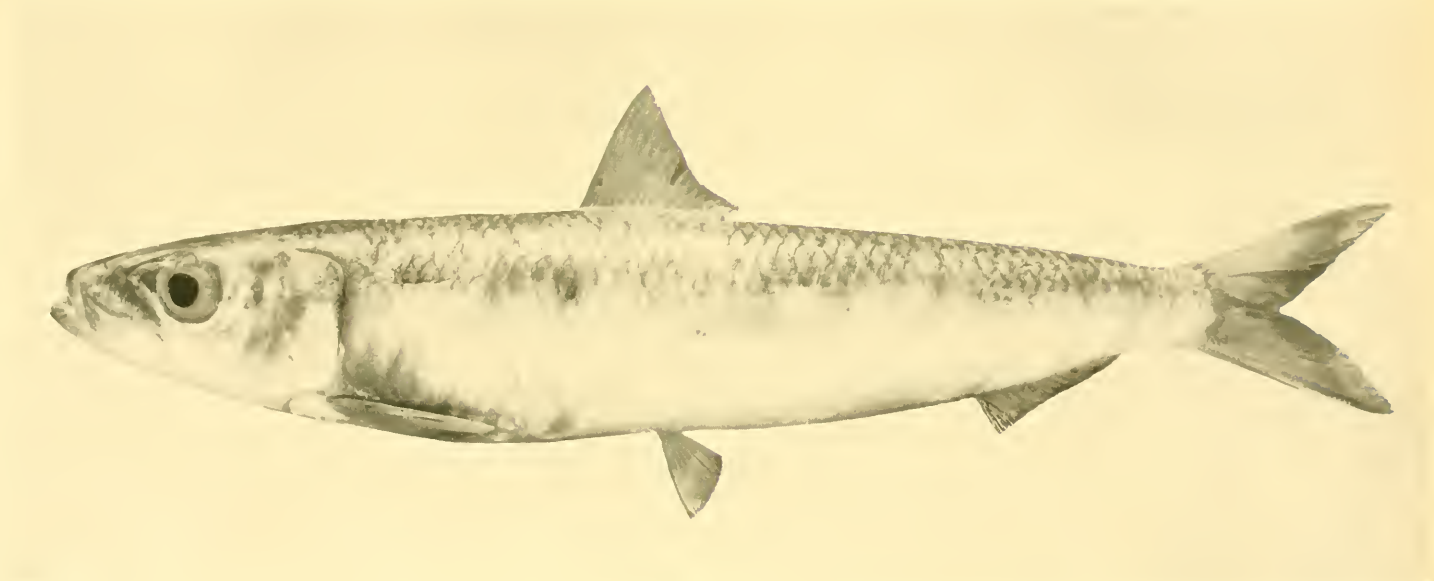
Ox-eye, or Big-eyed Herring (*Megalops cyprinoides*).

(The "Tarpon" of Australia.)



Salmon Herring (*Chanos chanos*).

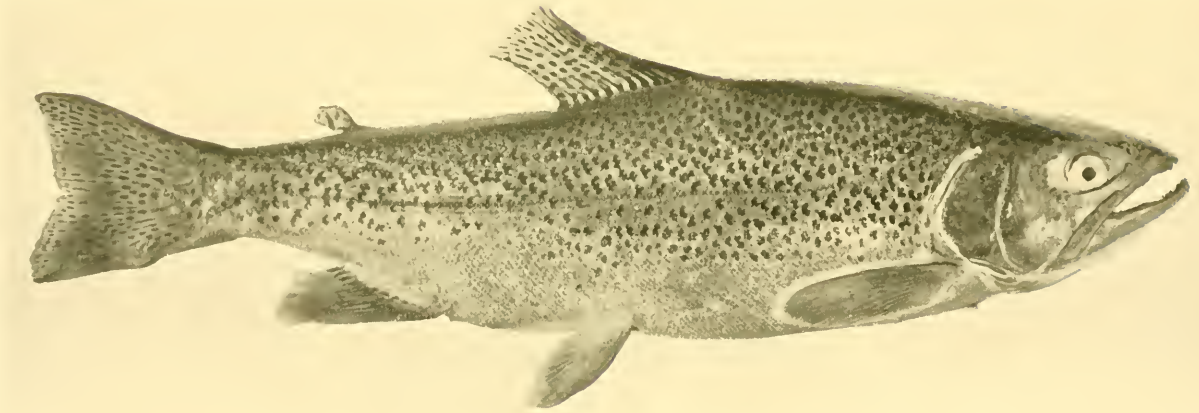
Hairback, or Gizzard Shad (*Dorosoma nasus*).



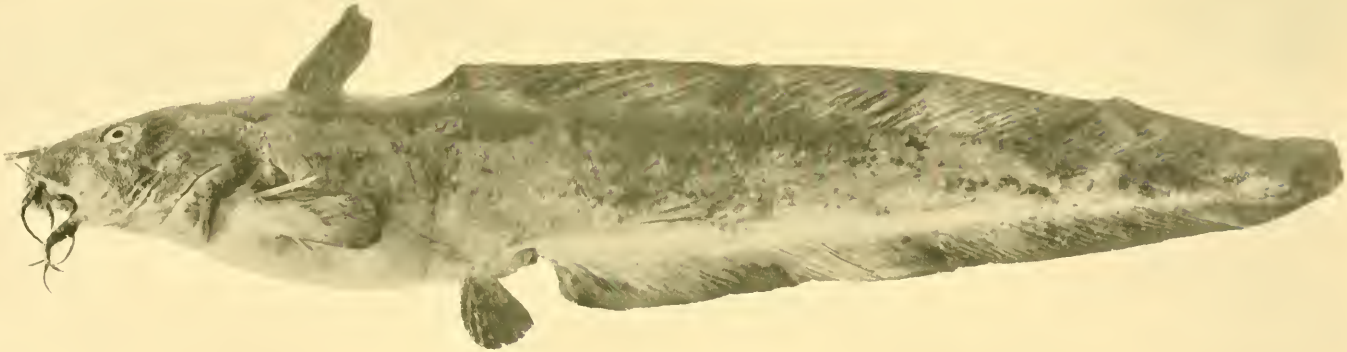
Pilchard, or Maray (*Clupanodon neopilchardus*).

(A fish with a great future.)

Herring (*Sardinella castelnaui*).



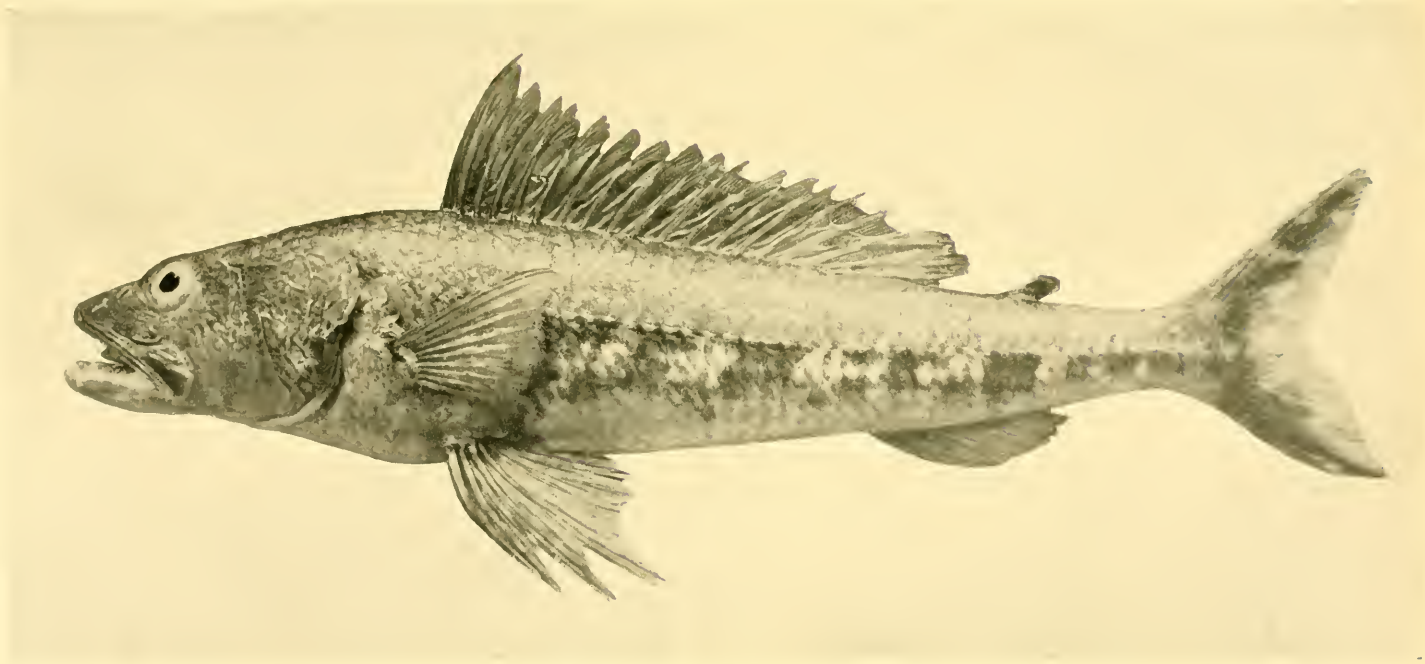
California Rainbow Trout (*Salmo irideus*).



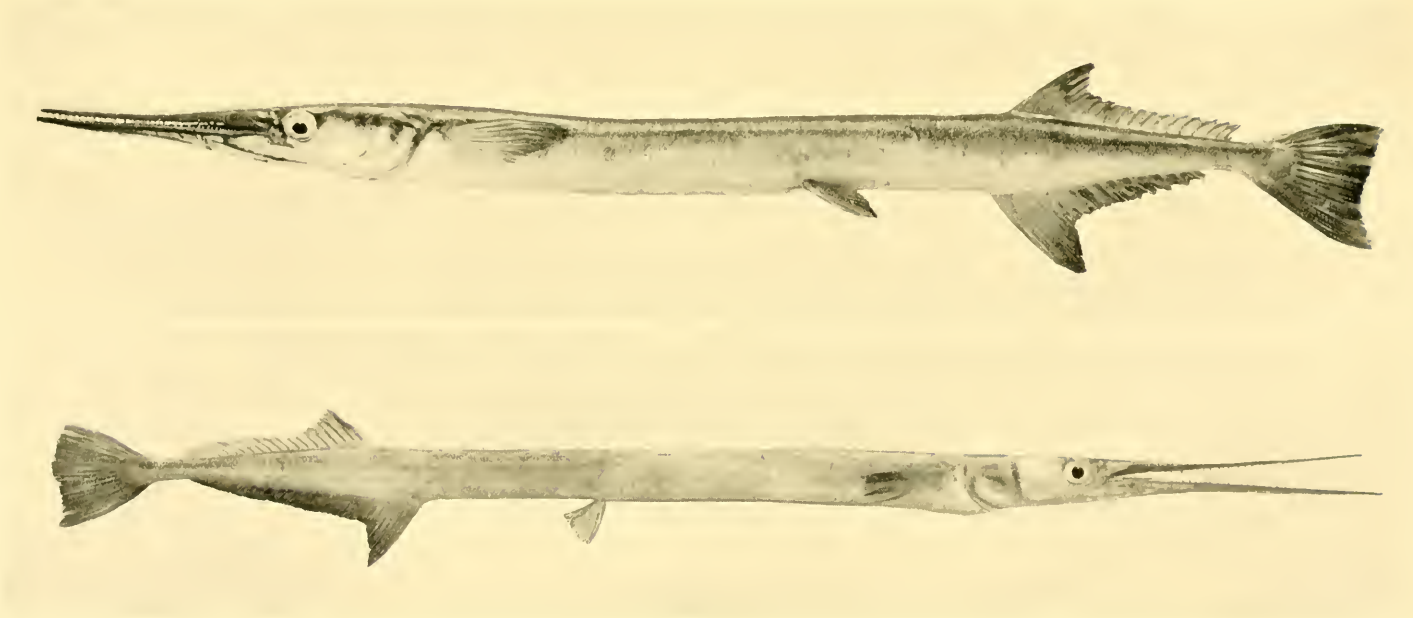
Estuary Catfish (*Cnidoglanis megastomus*).

Common Eel (*Anguilla reinhardtii*).

(Weight, 25 pounds; length, 4 feet 4 inches.)



Sergeant Baker (*Aulopus purpurissatus*).

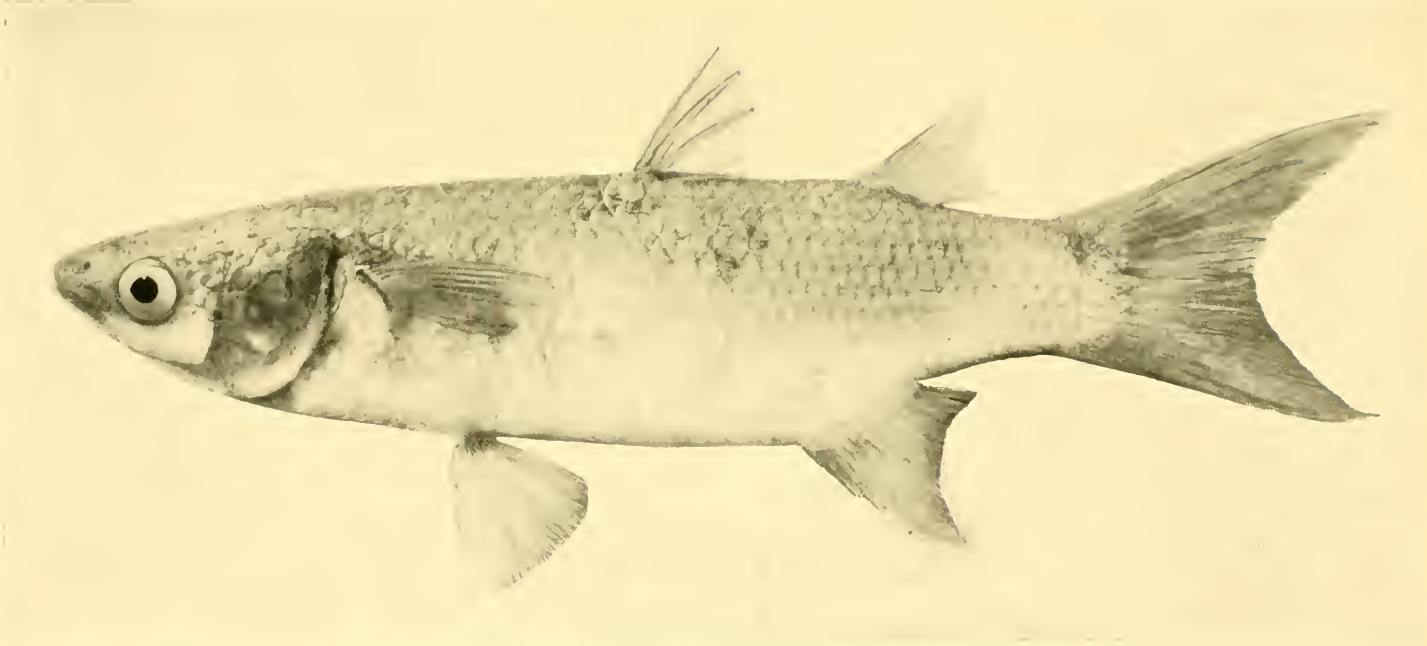


Upper : Stout Long-Tom (*Tylosurus macleayana*).

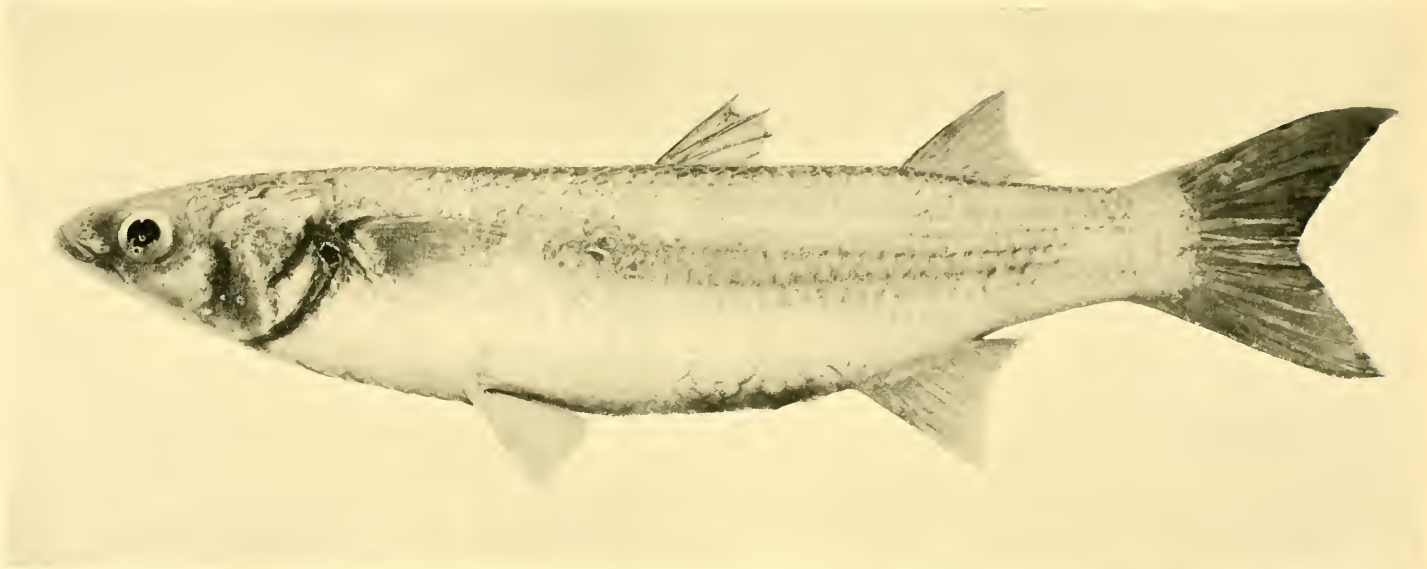
Lower: Slender Long-Tom (*Tylosurus ferox*).

River Garfish (*Hemirhamphus regularis*)

Sea Mullet (*Mugil dobula*).

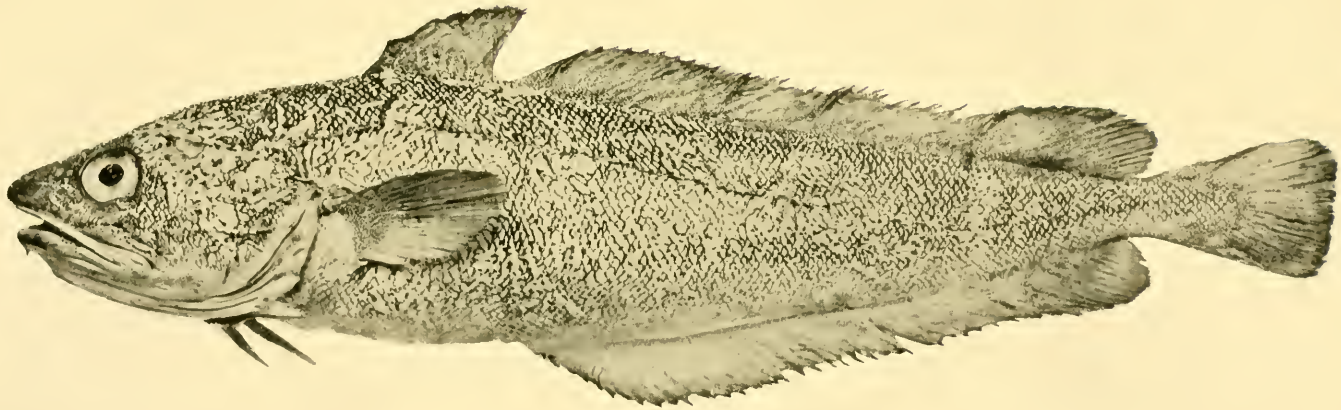


Flat-tail Mullet (*Mugil peronii*).



Sand Mullet (*Myxus elongatus*).

Striped Pike (*Sphyræna lineata*).

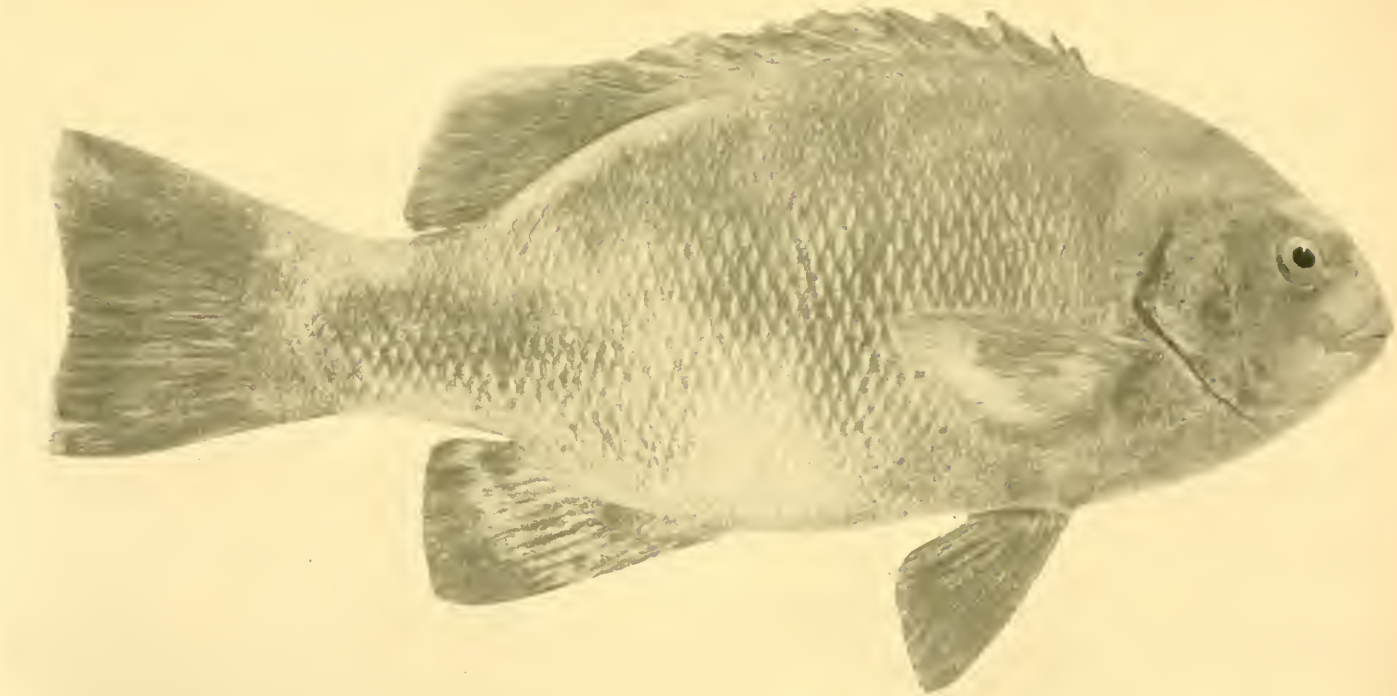


Red Cod (*Physiculus bachus*).

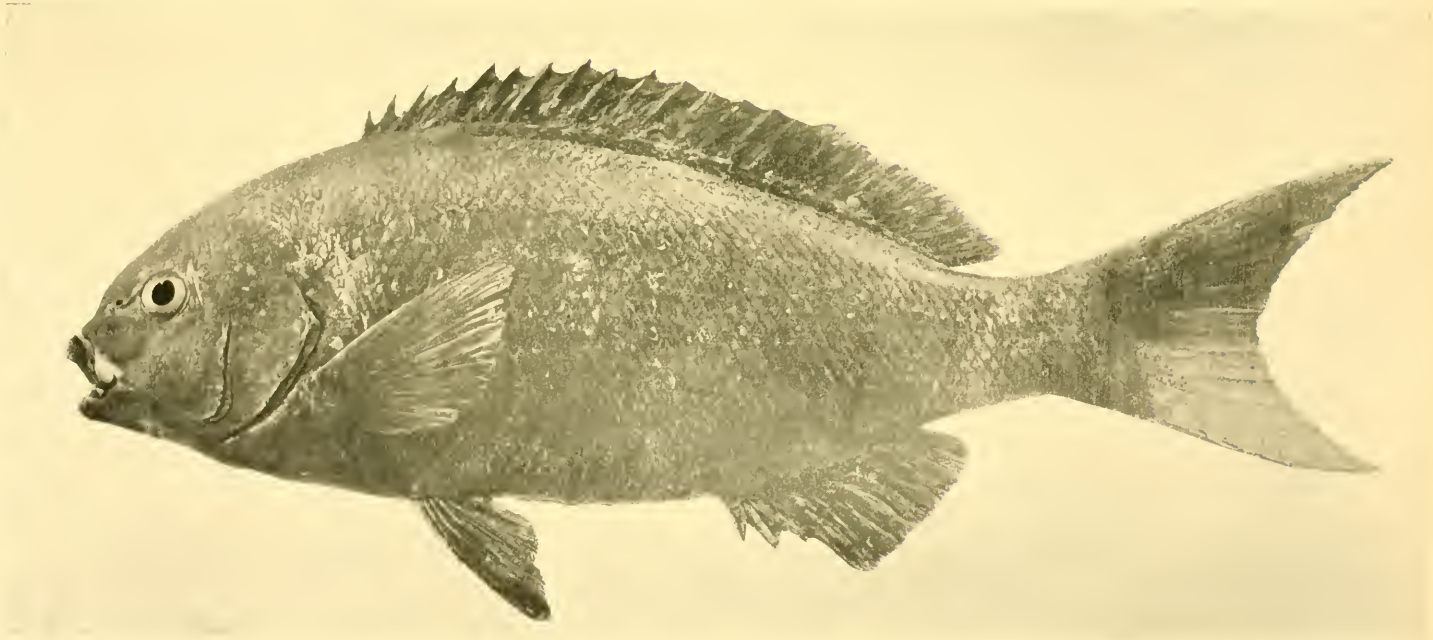
Nannygai (*Beryx affinis*).

Small-scaled Bull's-eye (*Pempheris compressus*).

Blackfish (*Girella tricuspidata*).

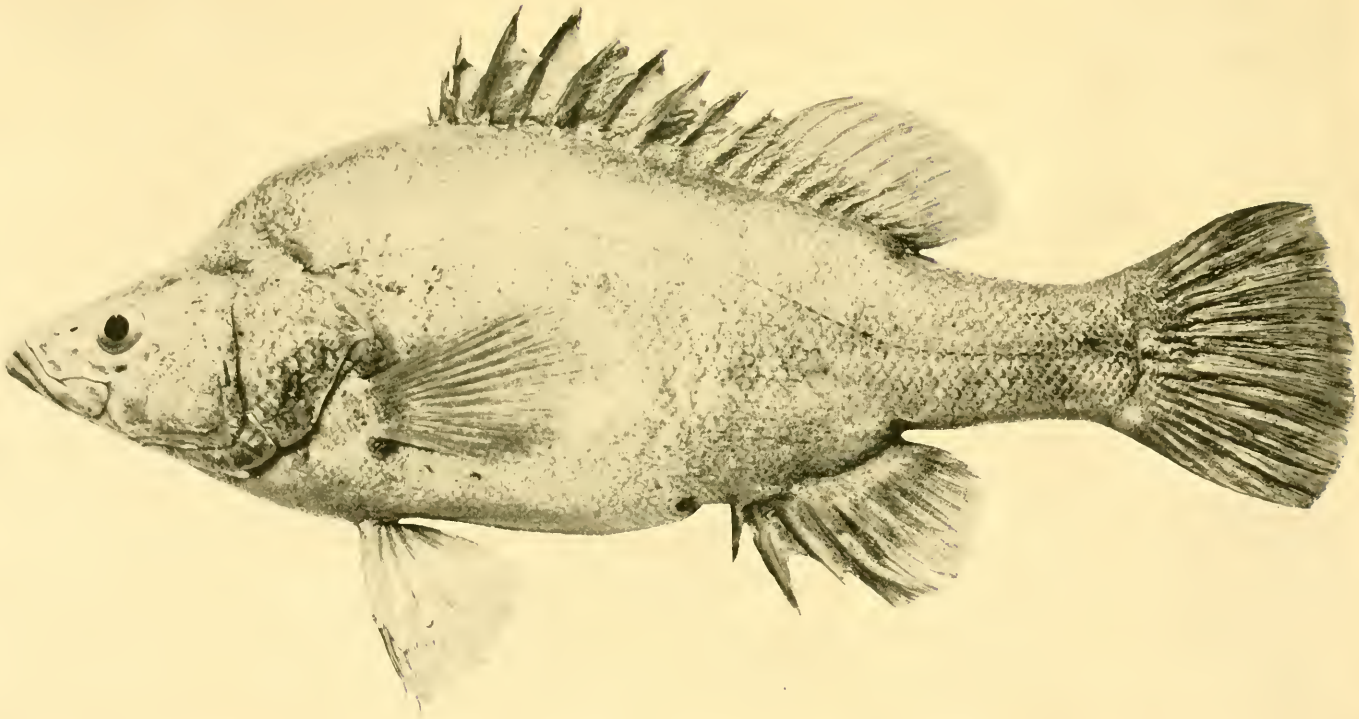


Rock Blackfish (*Girella elevata*).

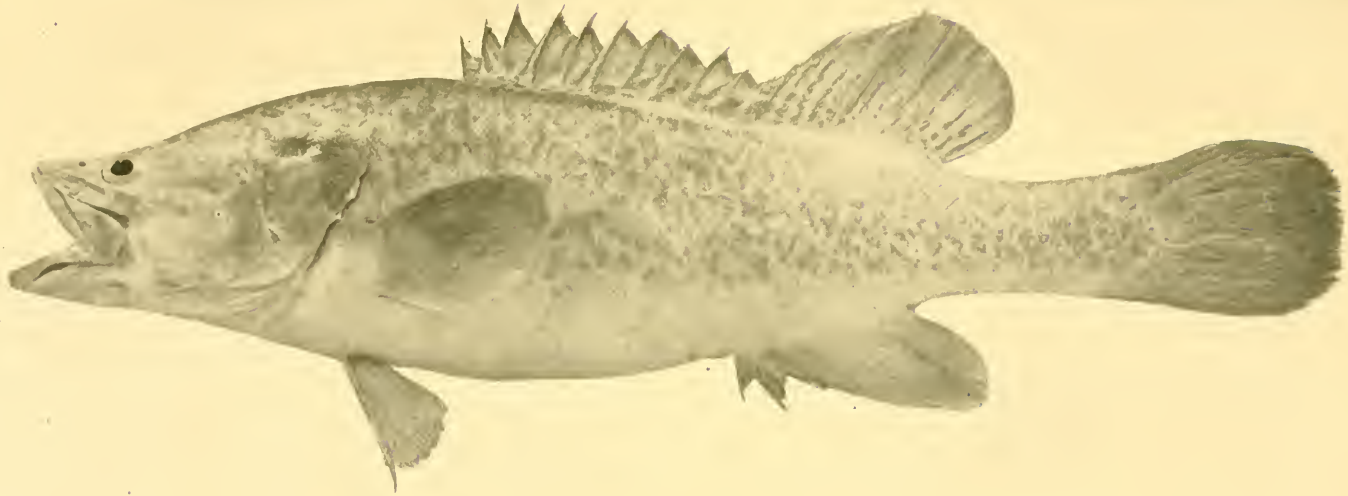


Bluefish (*Girella cyanea*).

Upper Figure: Freshwater Perch (*Percalates fluviatilis*).
Lower Figure: Estuary Perch (*Percalates colonorum*).



Golden Perch, or Yellow Belly (*Plectroplites ambiguus*).

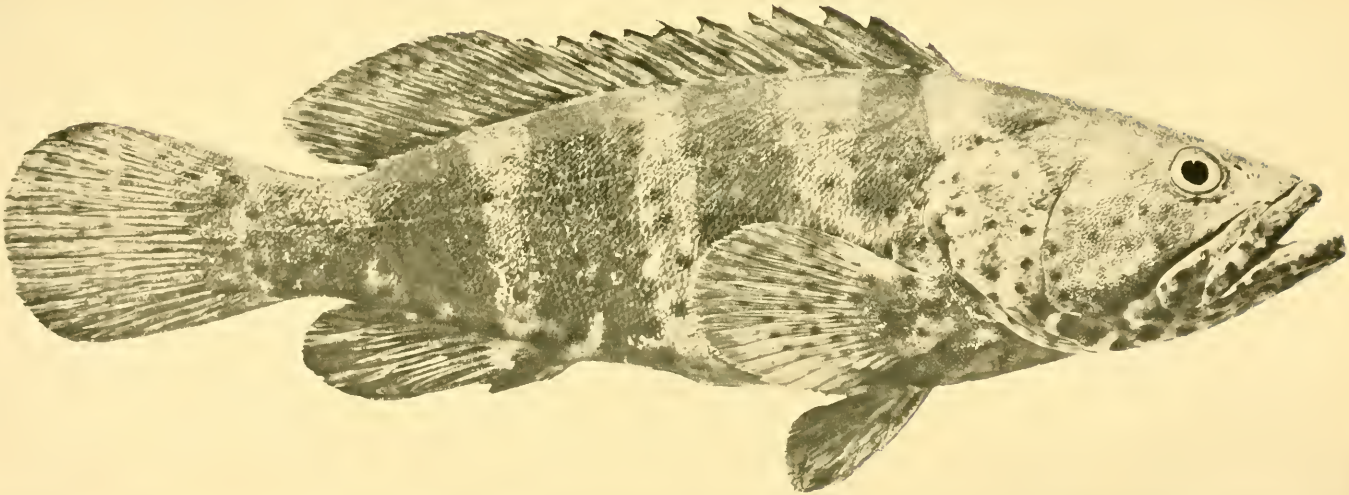


Murray Cod (*Oligorus macquariensis*).

(Attains a weight of 150 pounds.)

Black Rock Cod (*Epinephelus dæmelii*).

Red Speckled Hind (*Epinephelus undulatostriatus*).

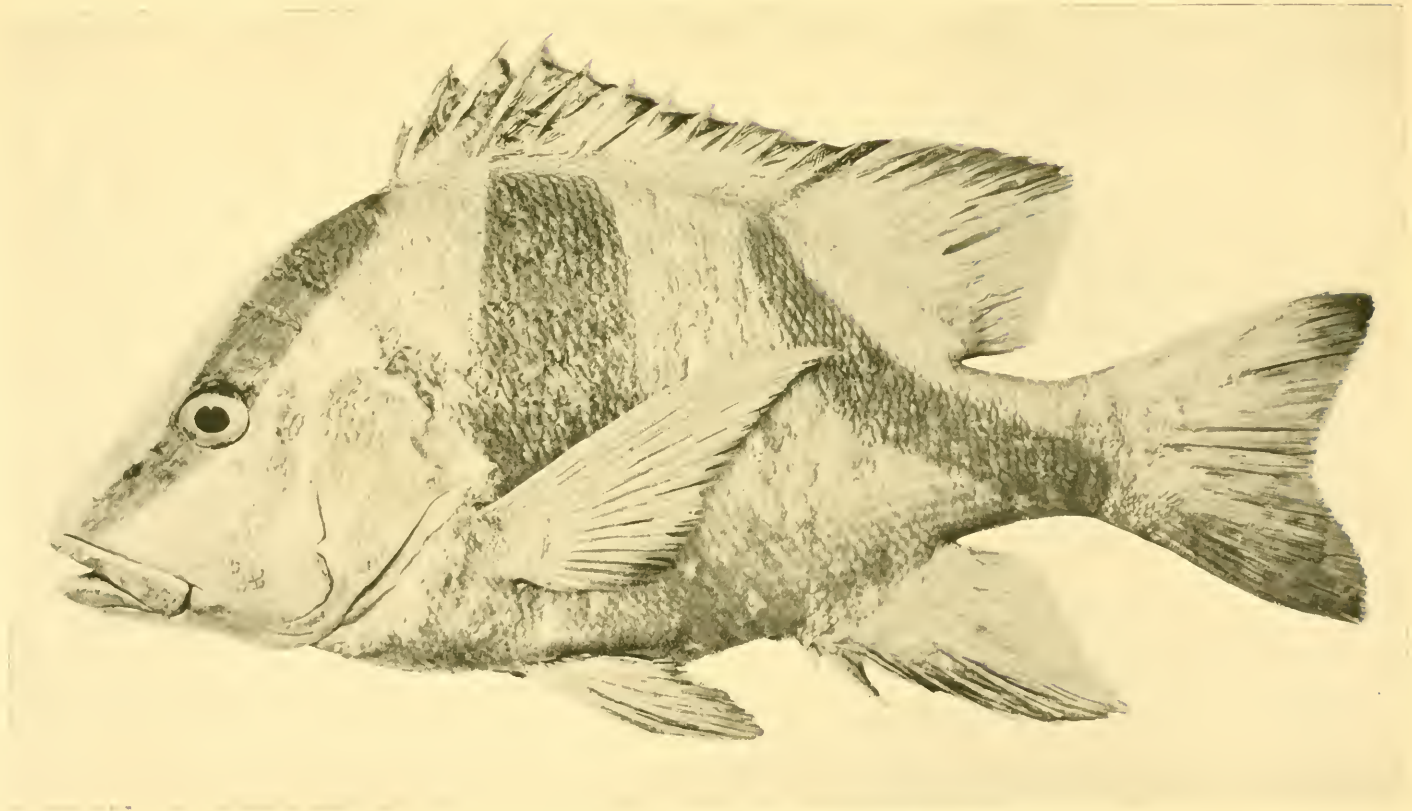


Brown-spotted Hind (*Epinephelus tauvina*).

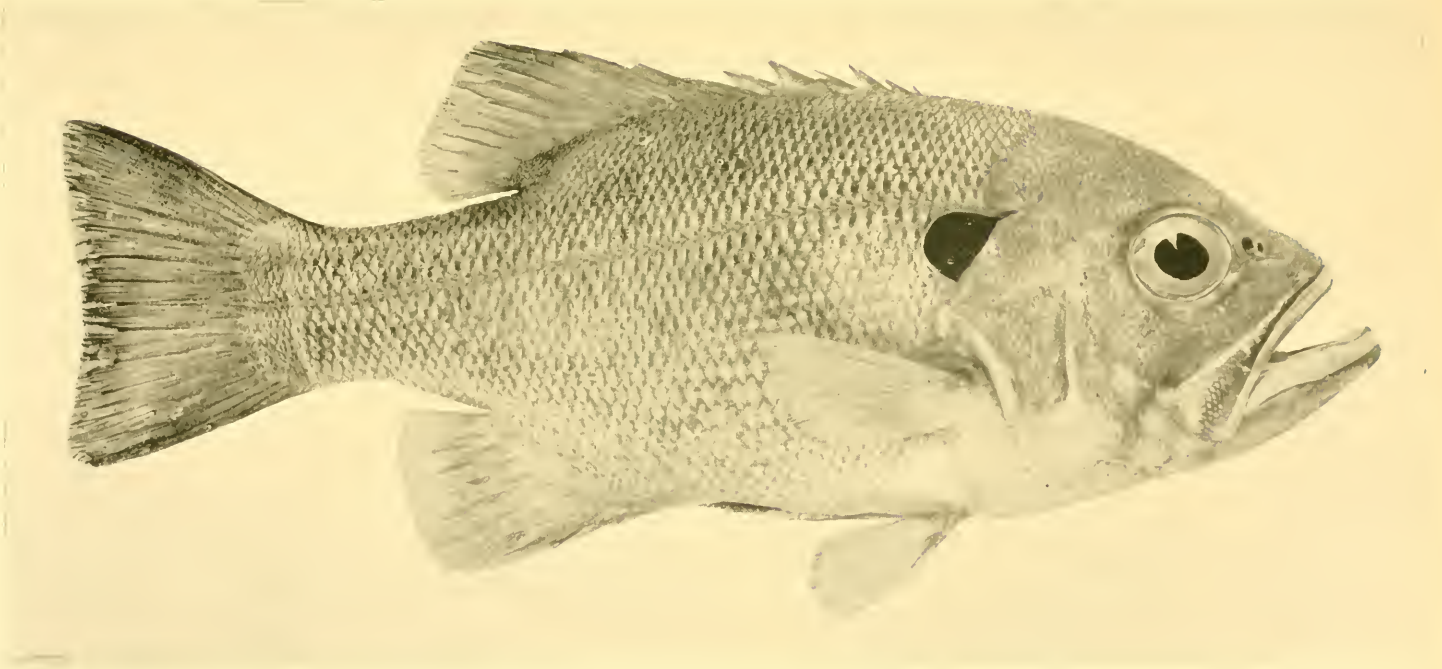
Queensland Groper (*Promicrops itaiara*).

(Attains a weight of more than 400 pounds.)

Banded Sea Perch (*Hypoplectrodes annulatus*).

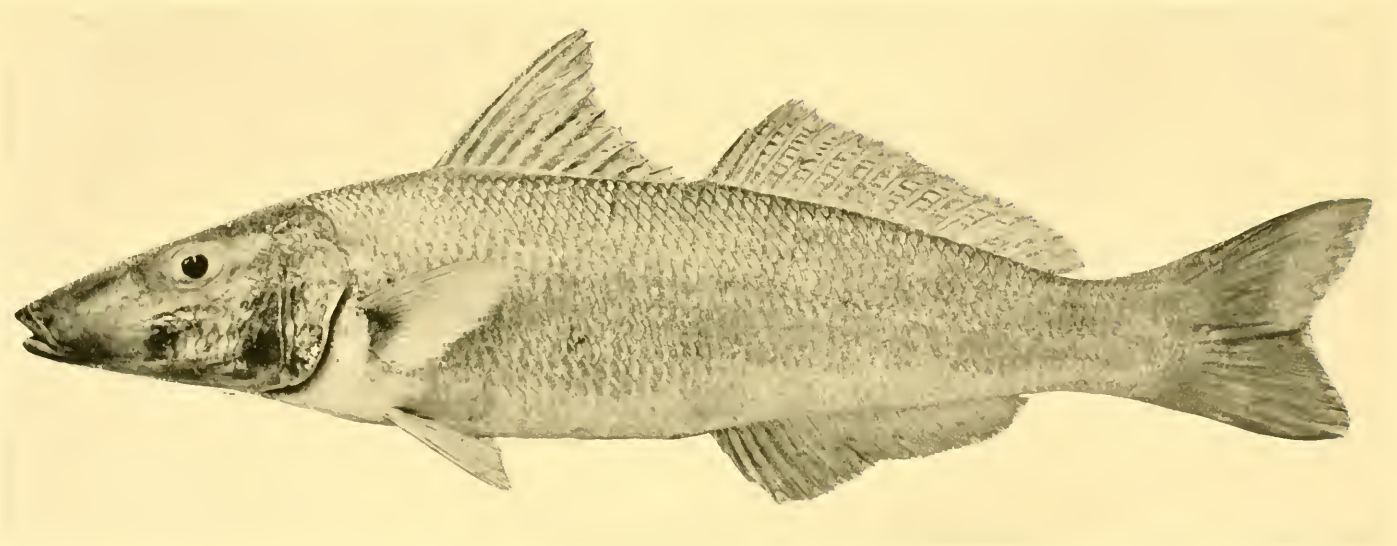


Government Bream (*Genyoroge sebæ*).



Pearl Perch (*Glaucosoma scapulare*).

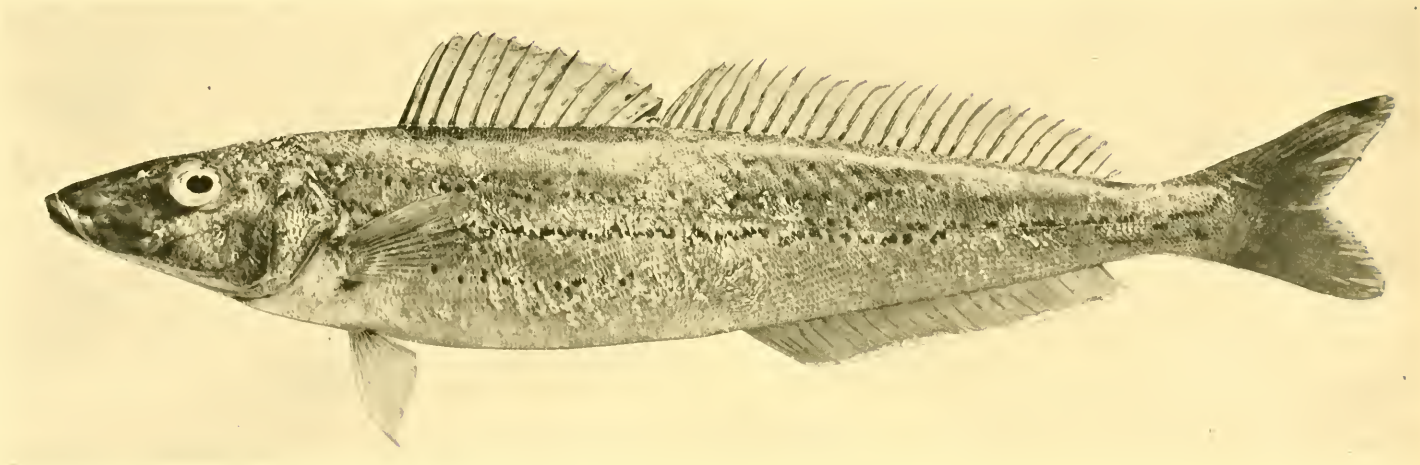
Old Wife (*Enoplosus armatus*).



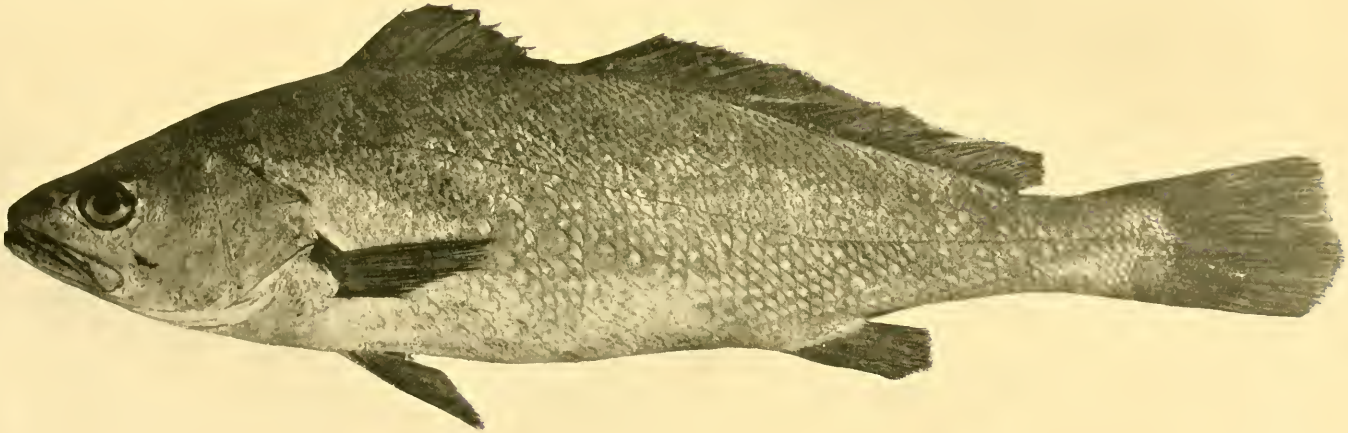
Sand Whiting (*Sillago ciliata*).

Trumpeter Whiting (*Sillago maculata*).

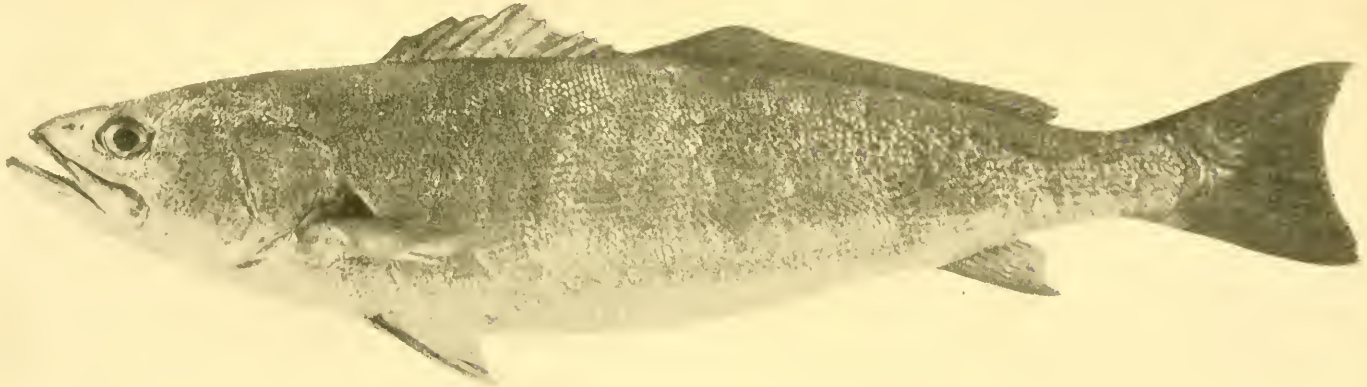
School Whiting (*Sillago bassensis*).



Spotted Whiting (*Sillago punctata*).

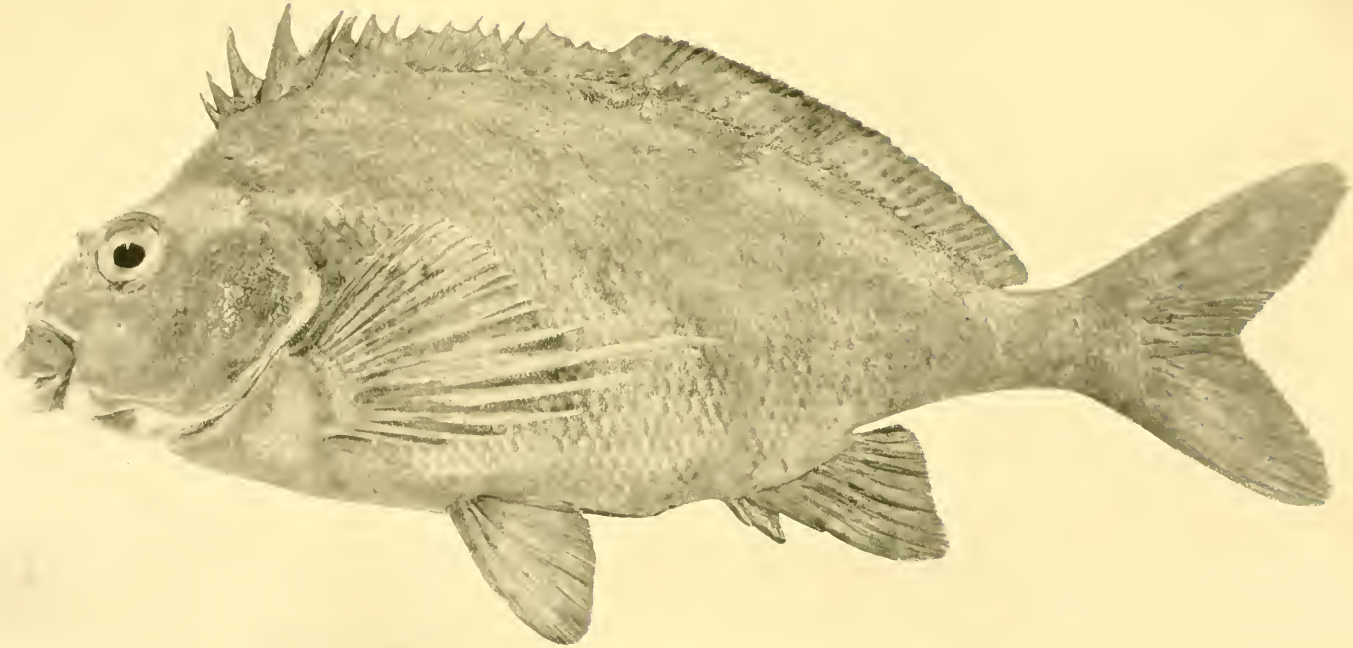


Jewfish (*Sciæna antarctica*).

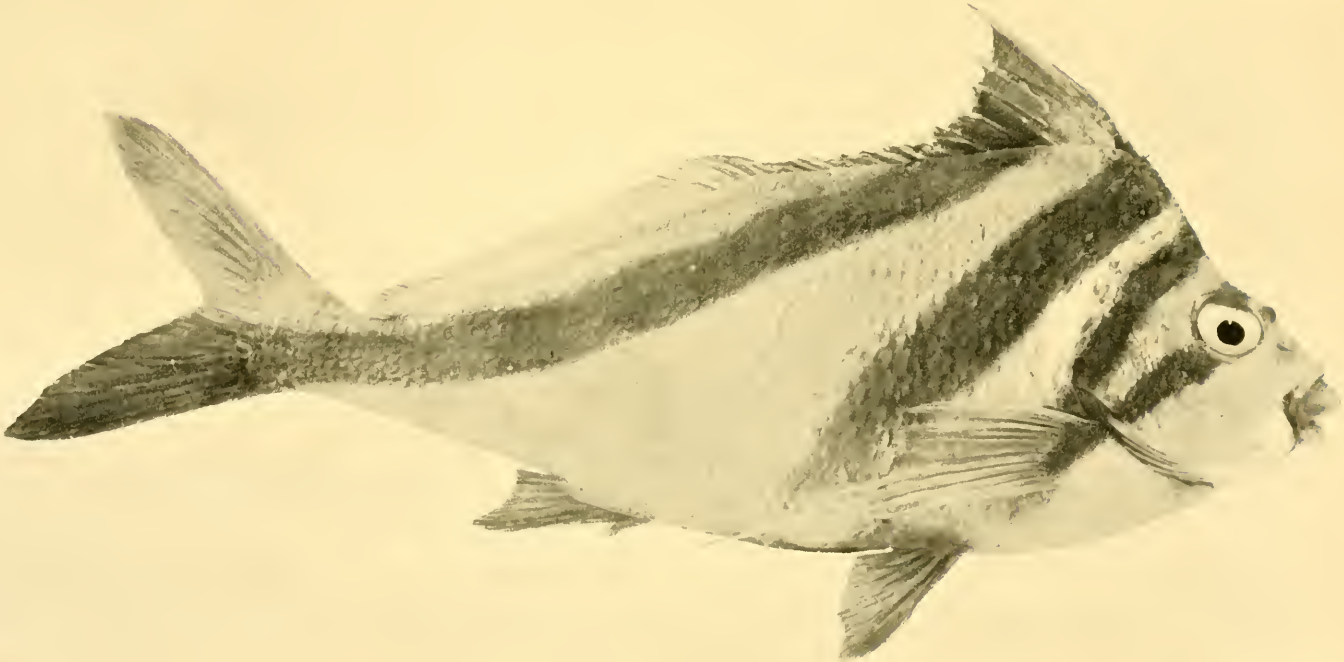


Teraglin (*Cynoscion atelodus*).

Bastard Trumpeter (*Latris ciliaris*).

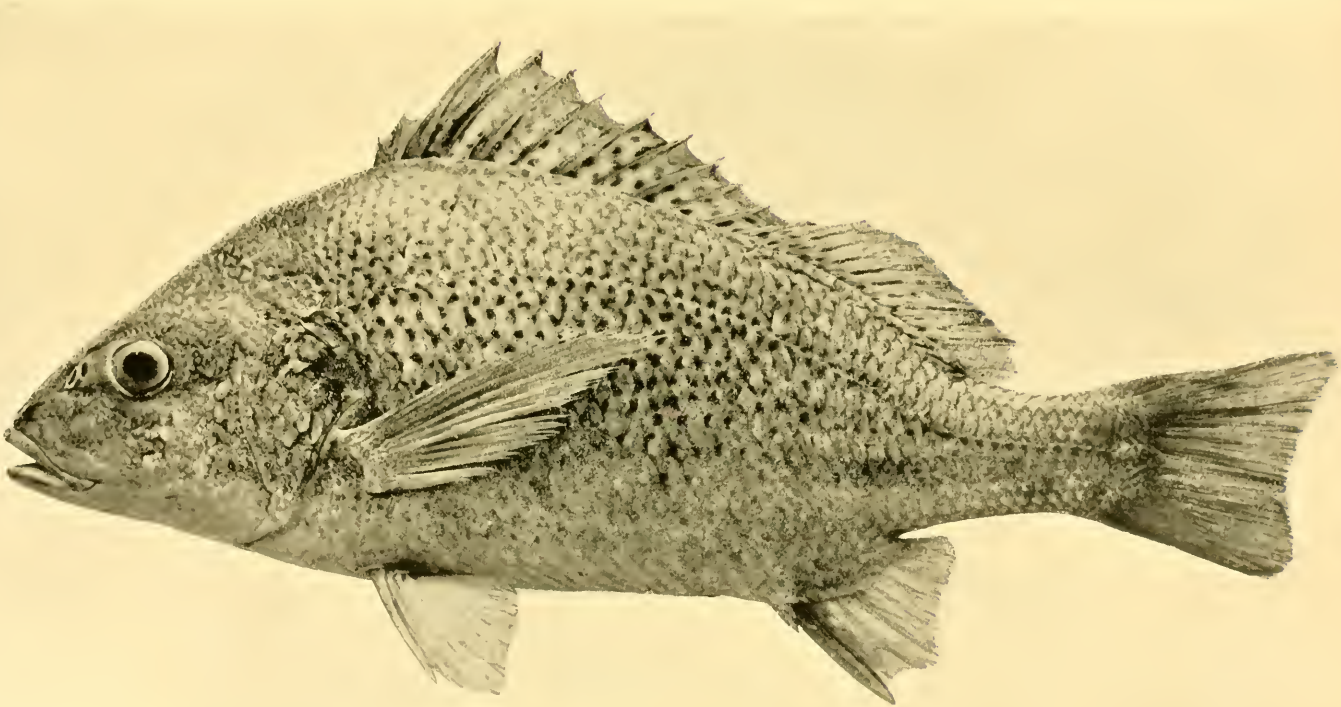


Red Morwong, or Sea Carp (*Cheilodactylus fuscus*).

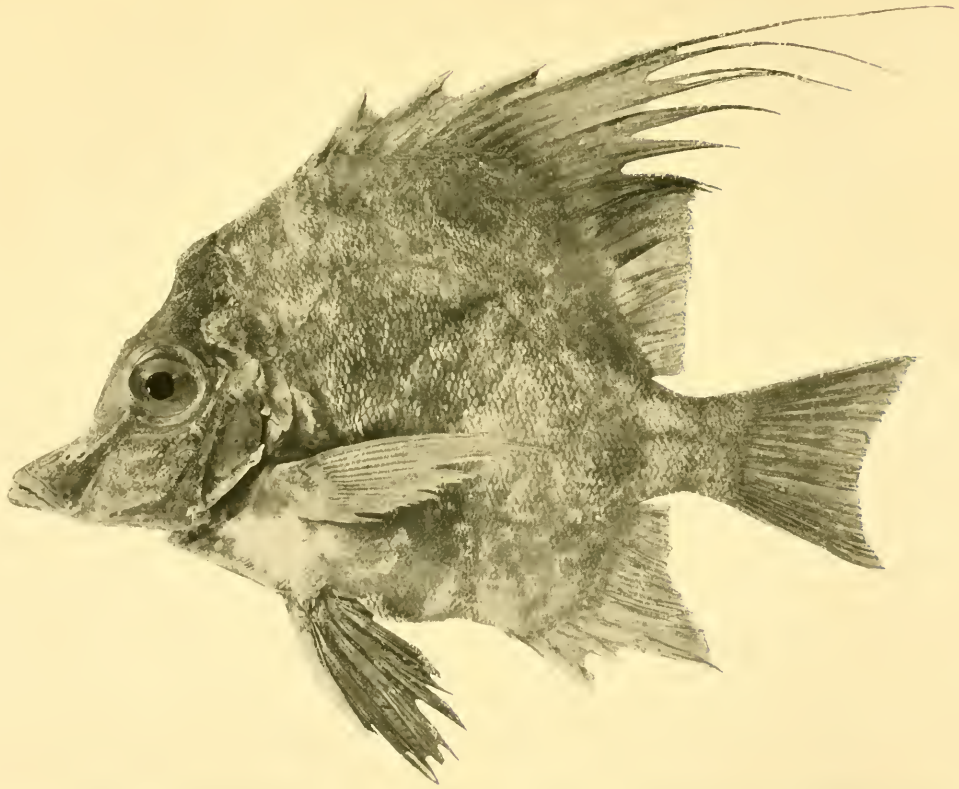


Banded Morwong (*Goniistius gibbosus*).

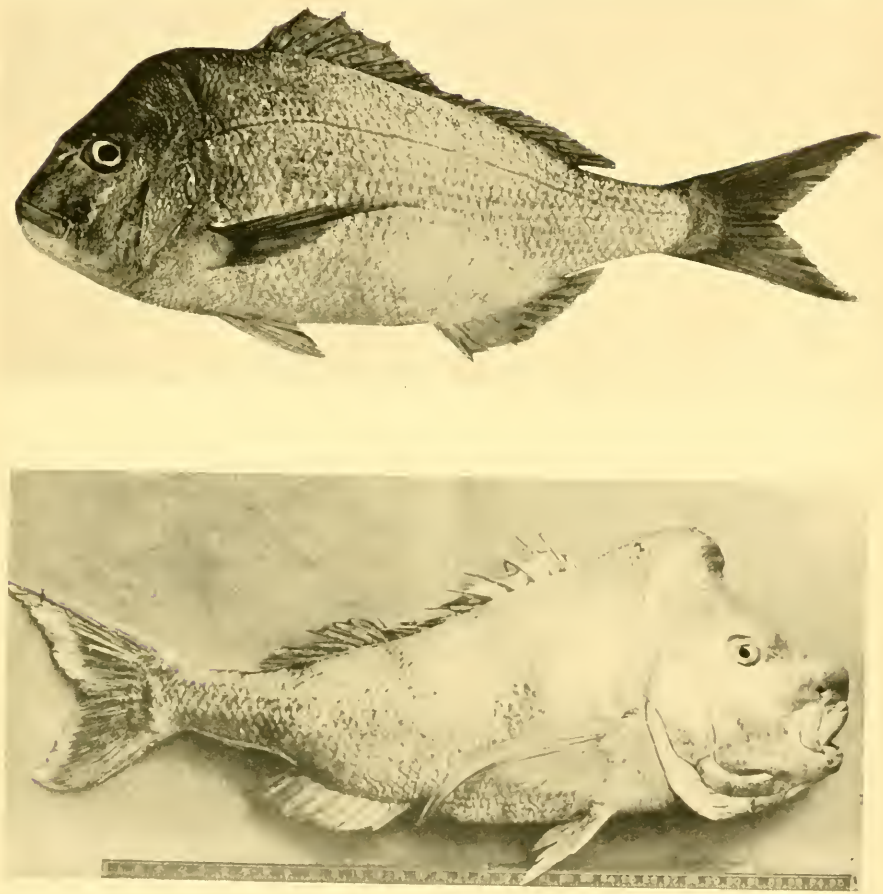
Silver Perch (*Terapon ellipticus*).



Queensland Trumpeter, or Javelin-Fish (*Pomadasis hasta*).

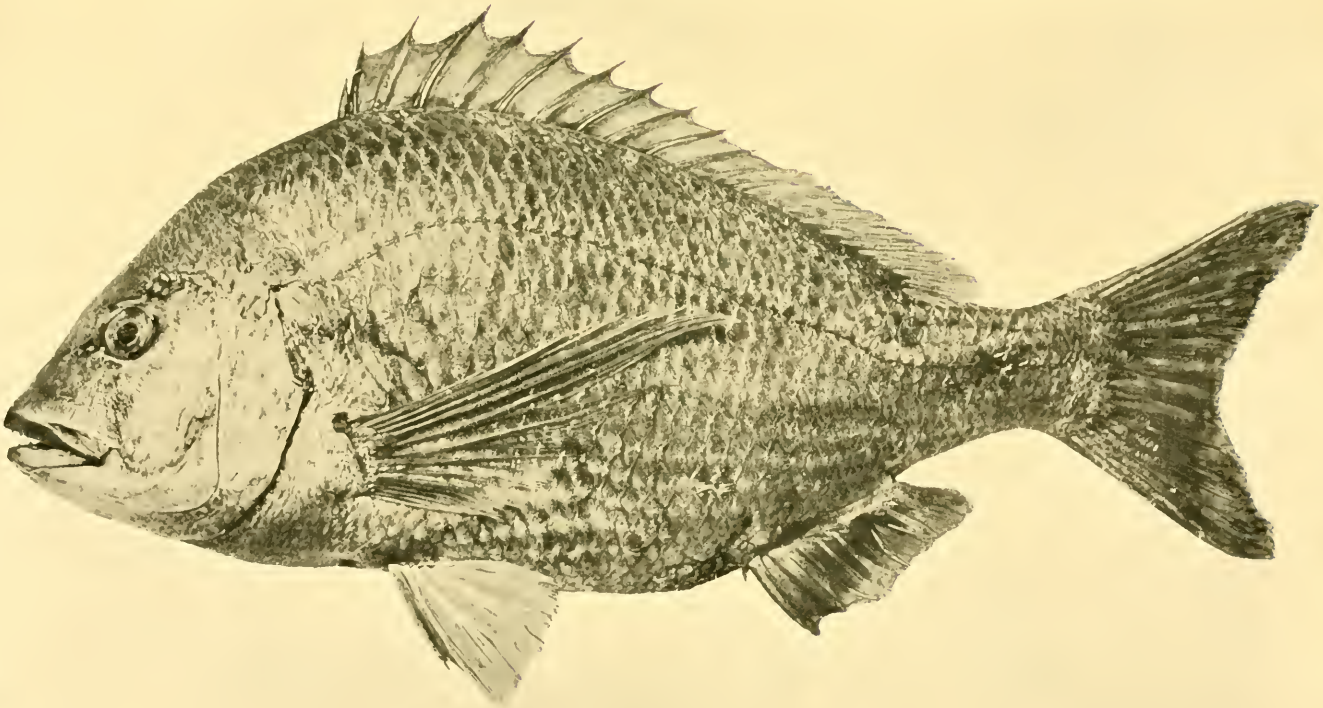


Short Boarfish (*Histiopterus elevatus*).



Snapper (*Pagrosomus auratus*).

Upper: "School" Snapper.
Lower: "Old Man" Snapper.

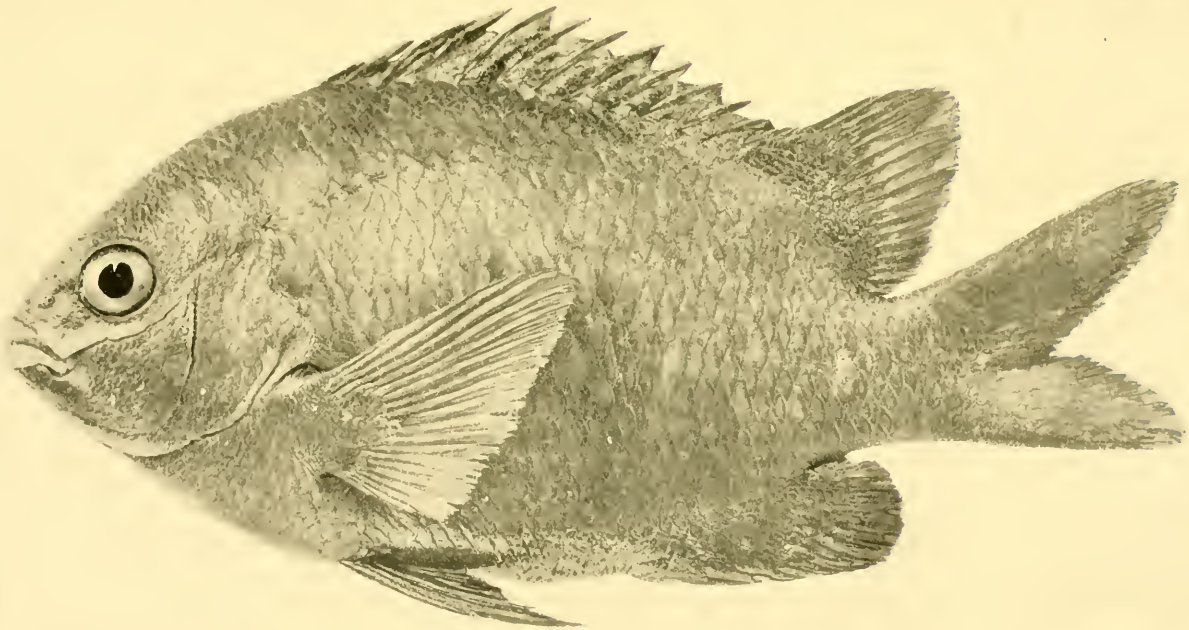


Black Bream (*Chrysophrys australis*).

Tarwhine (*Chrysophrys sarba*).

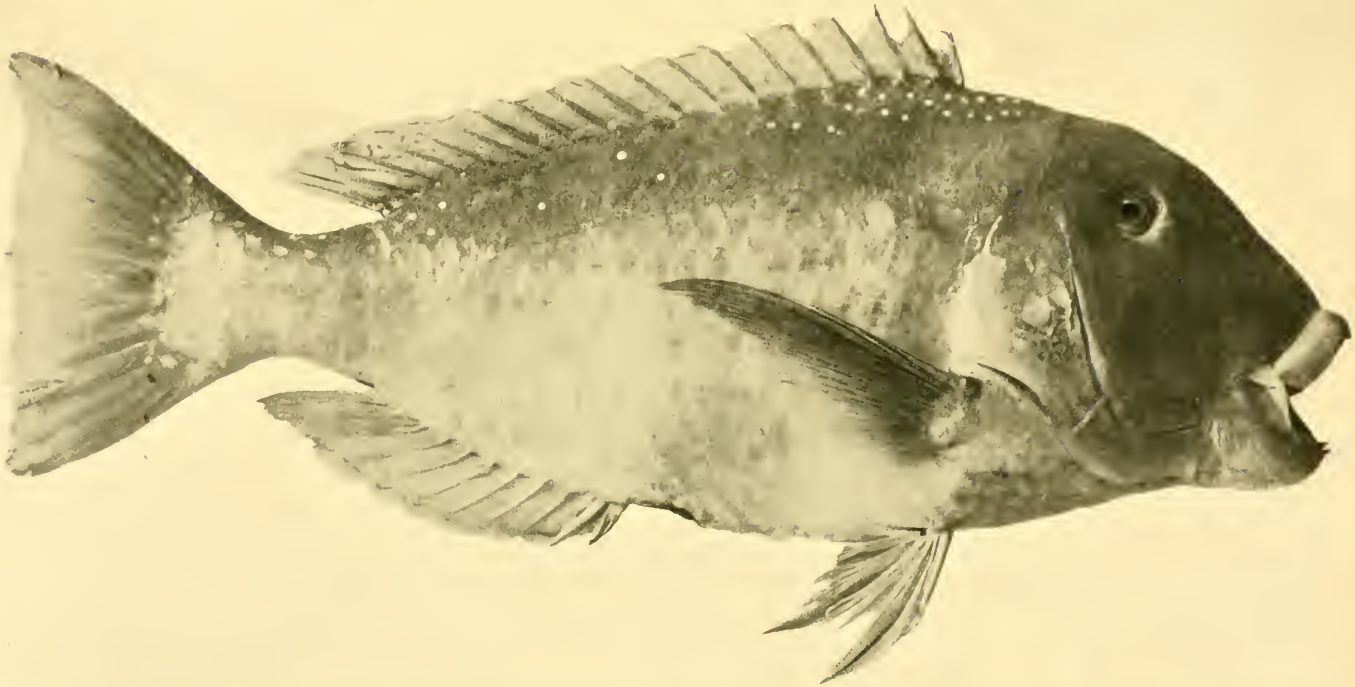
Butter Fish (*Ephippus multifasciatus*).

Black Trevally (*Siganus nebulosus*).

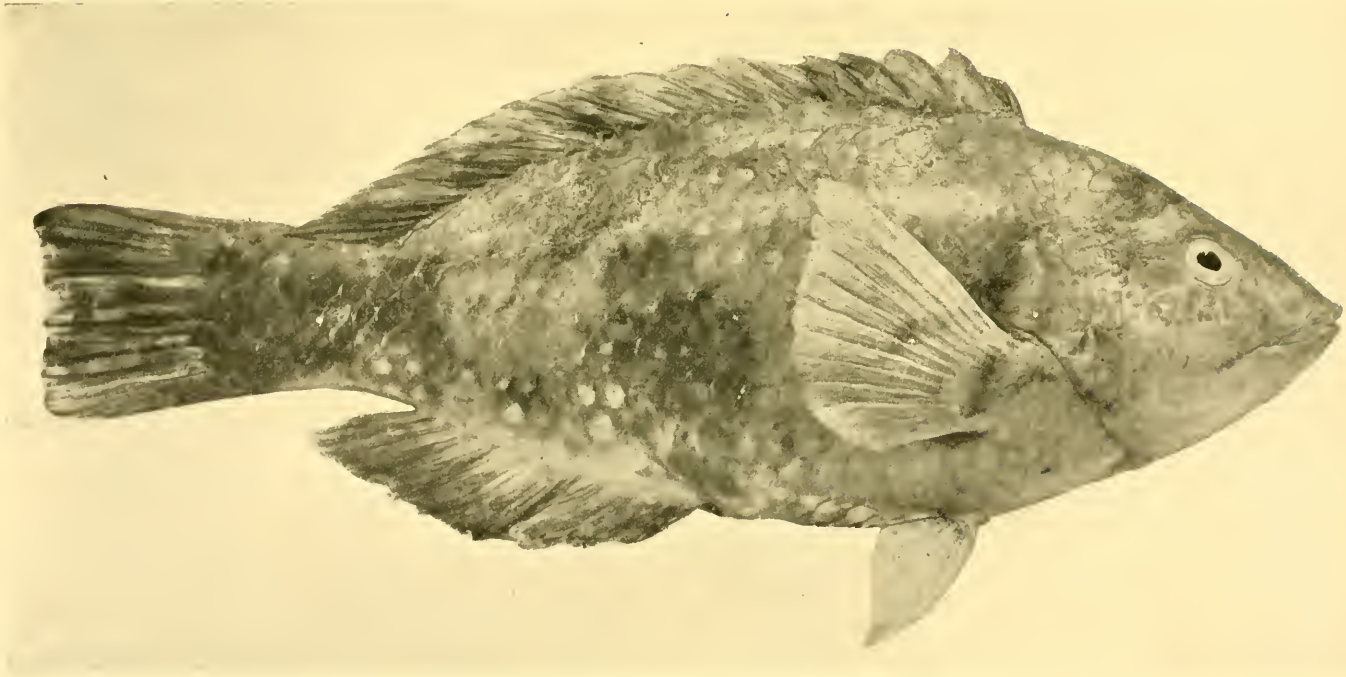


Scalyfin (*Parma microlepis*).

Banded Pigfish (*Diastodon bellis*).



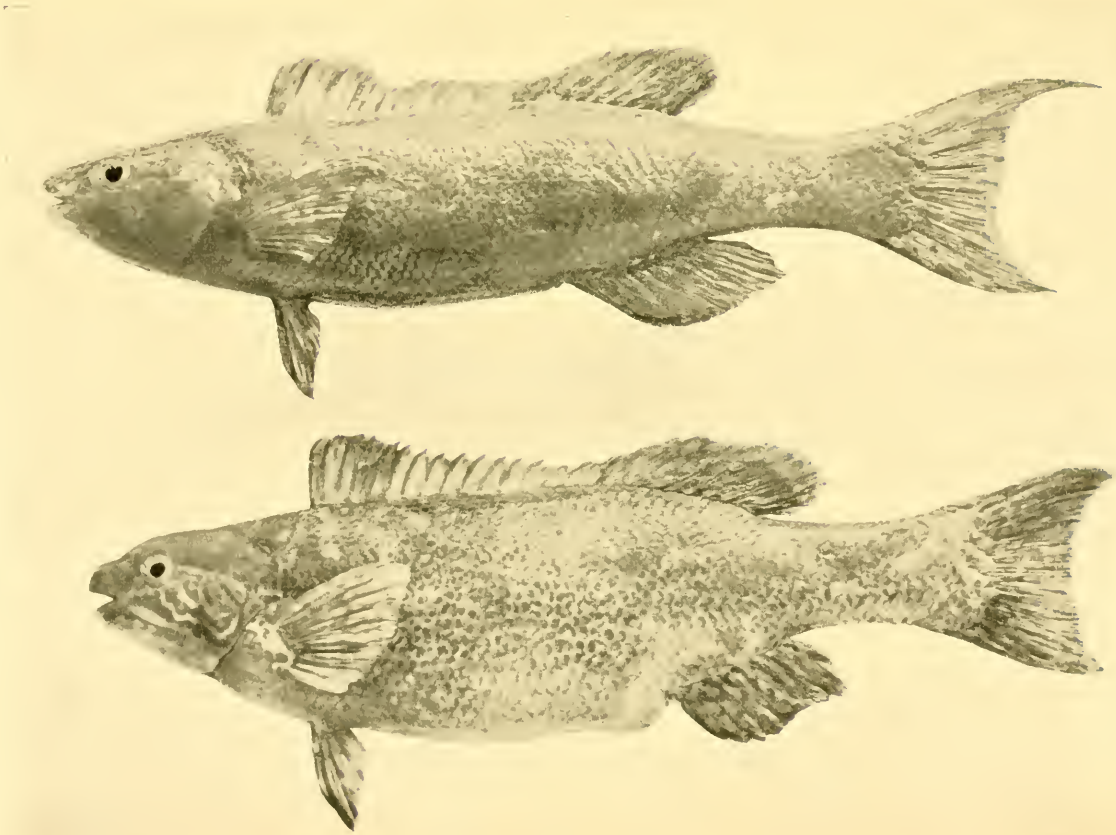
Blue-spotted Groper (*Chœrops ommopterus*).



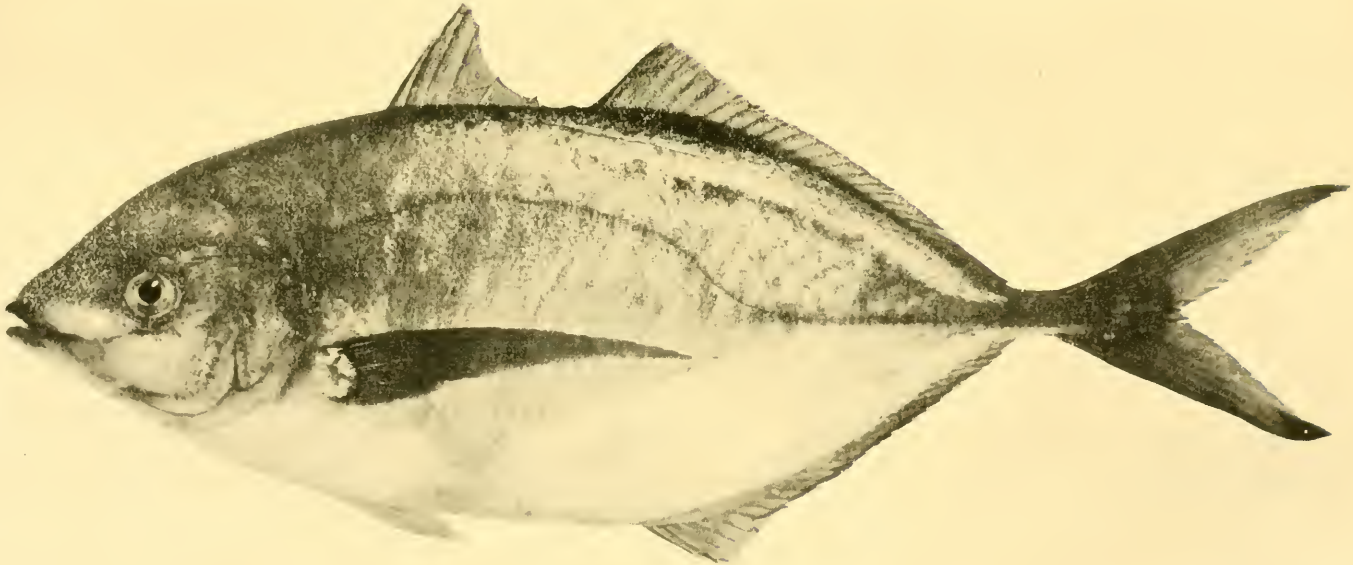
White-spotted Parrot-Fish (*Pseudolabrus gymnogenis*).

Maori (*Coris lineolatus*).

Rock Whiting (*Odax richardsonii*).



Herring-Kale (*Olisthops cyanomelas*). *Upper:* Male; *Lower:* Female.

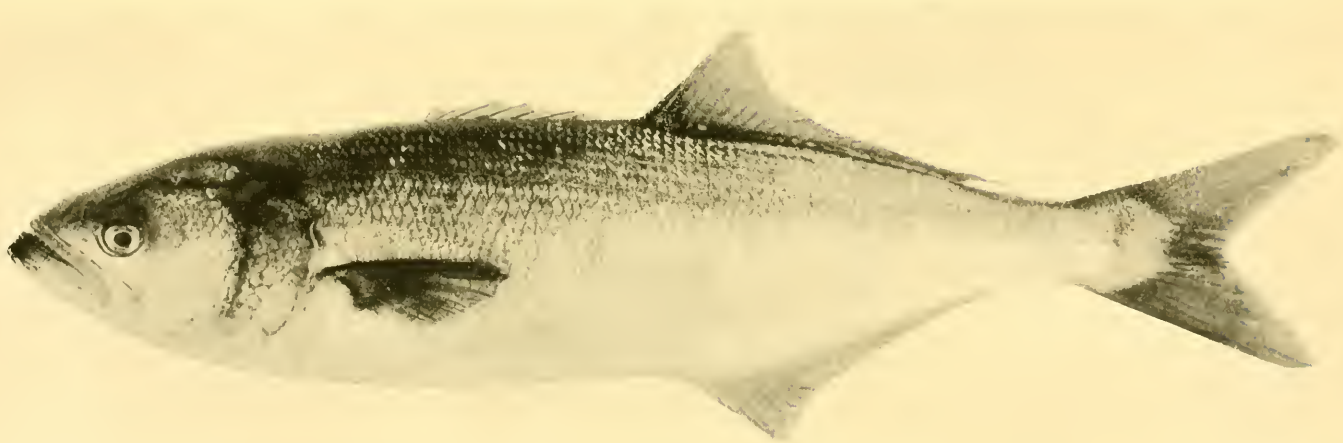


Trevally (*Caranx georgianus*).

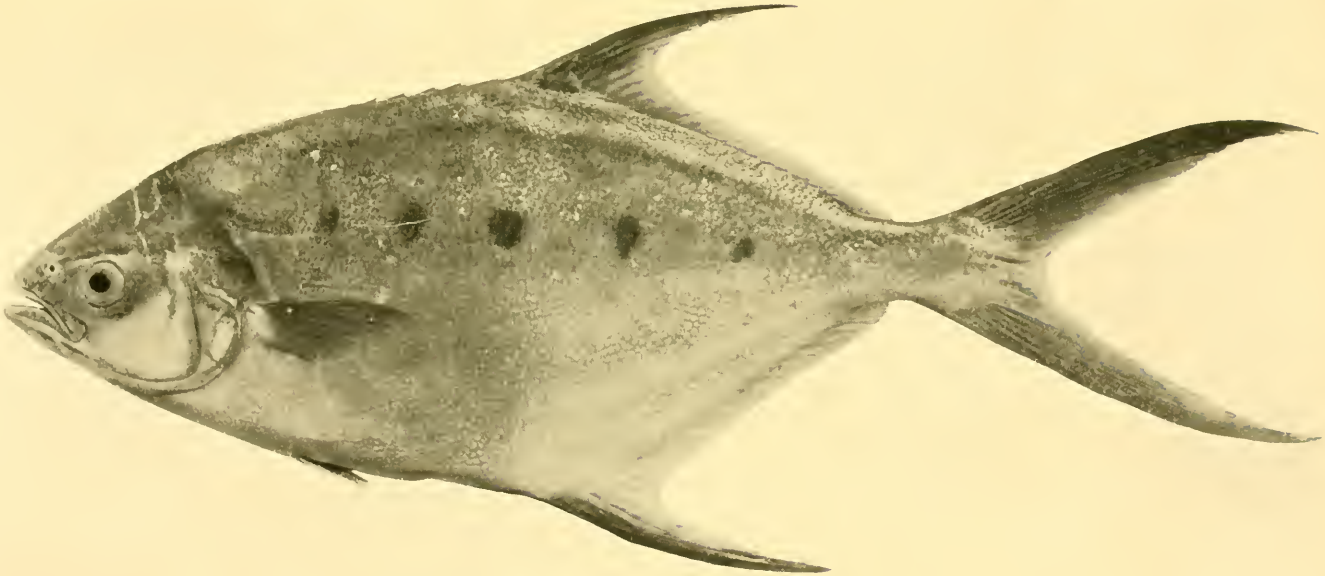
Silvery Moon-Fish (*Caranx gallus*).

Samson-Fish (*Seriola hippos*).

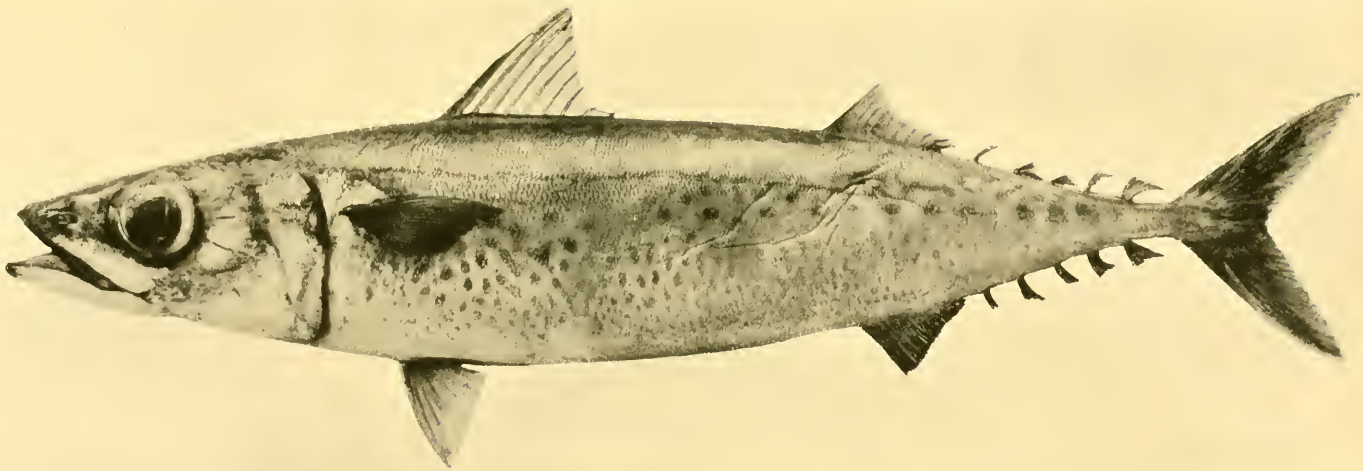
Runner (*Elagatis bipinnulatus*).



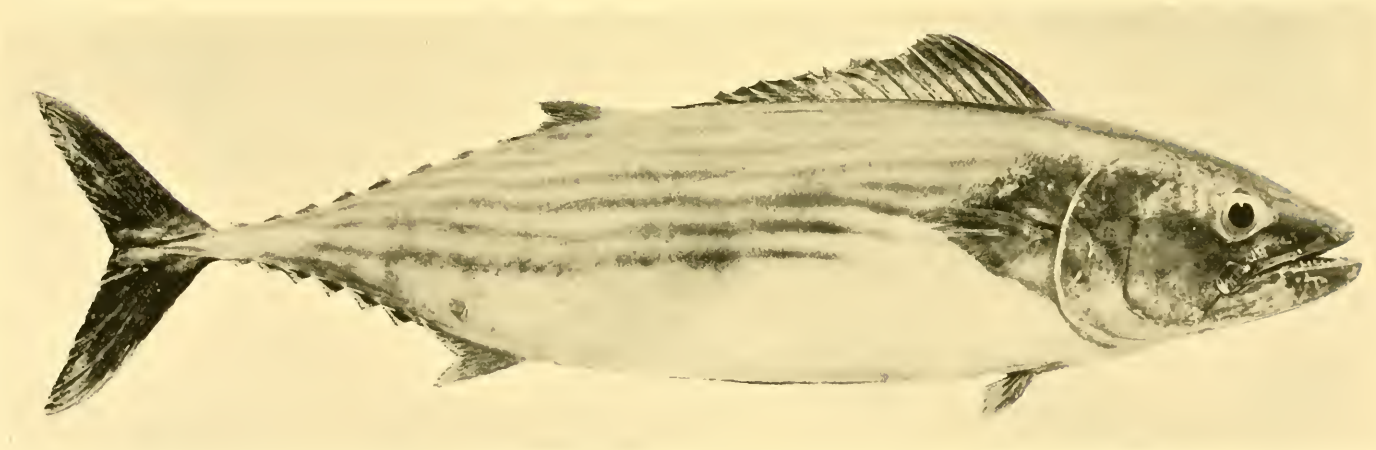
Tailer (*Pomatomus saltatrix*).



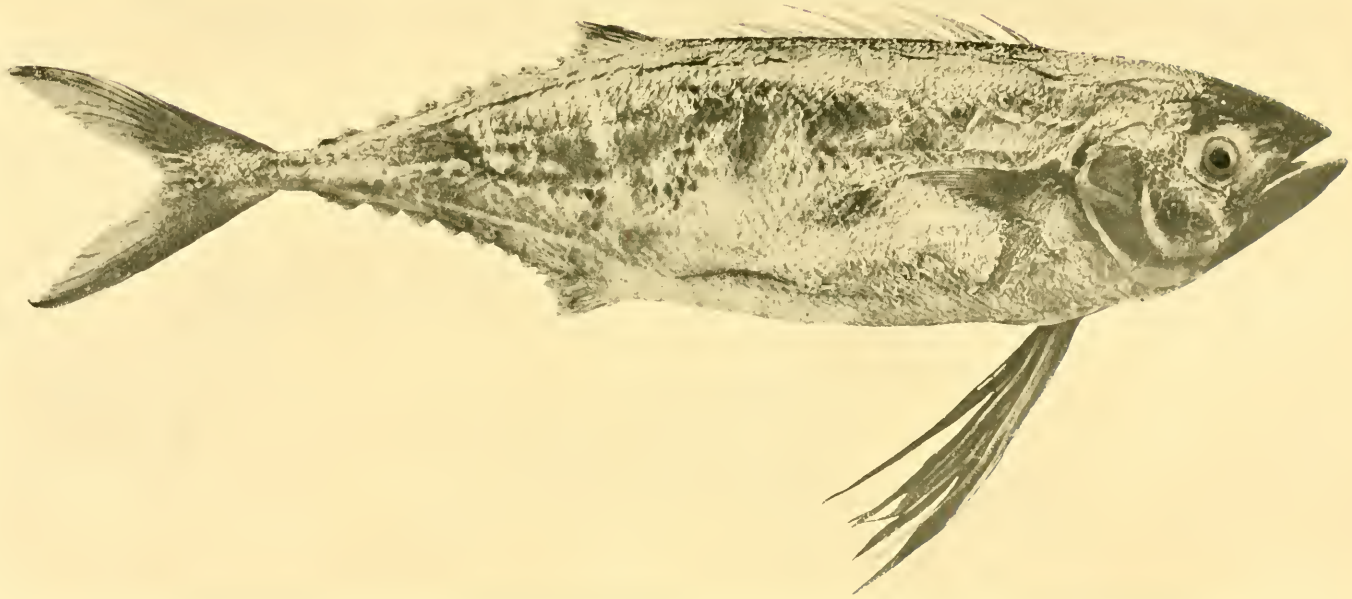
Dart (*Trachinotus russelli*).



Common Mackerel (*Scomber colias*)



Horse Mackerel (*Sarda chilensis*).



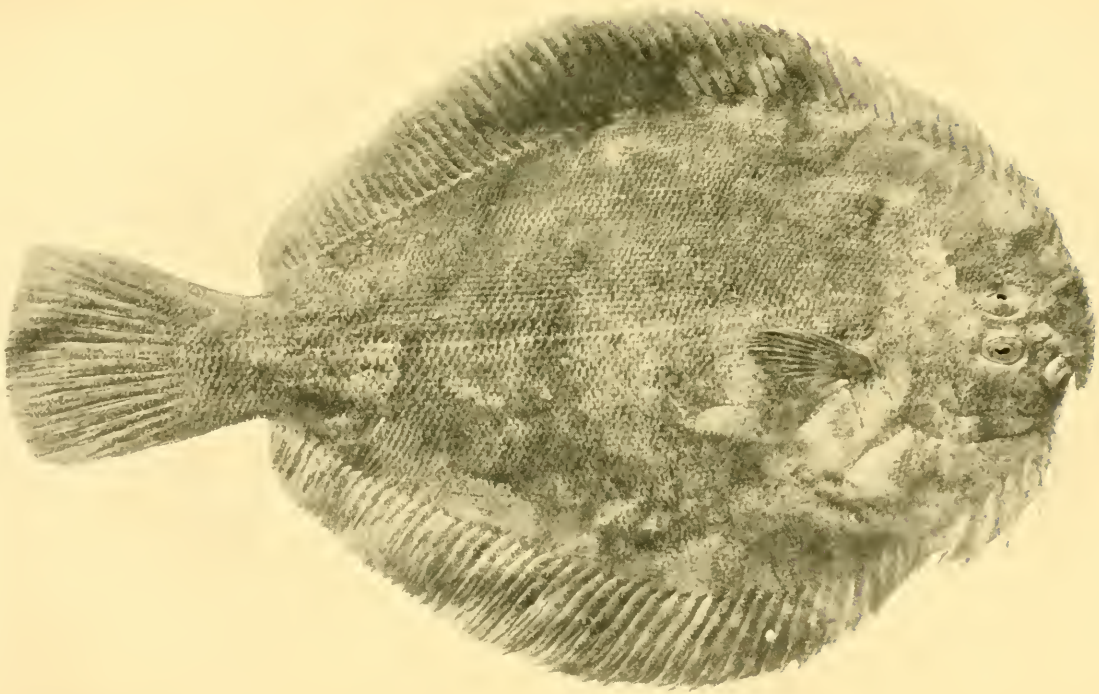
Butterfly-Fish (*Gasterochisma melampus*).

Barred Spanish Mackerel (*Scomberomorus commersonii*).

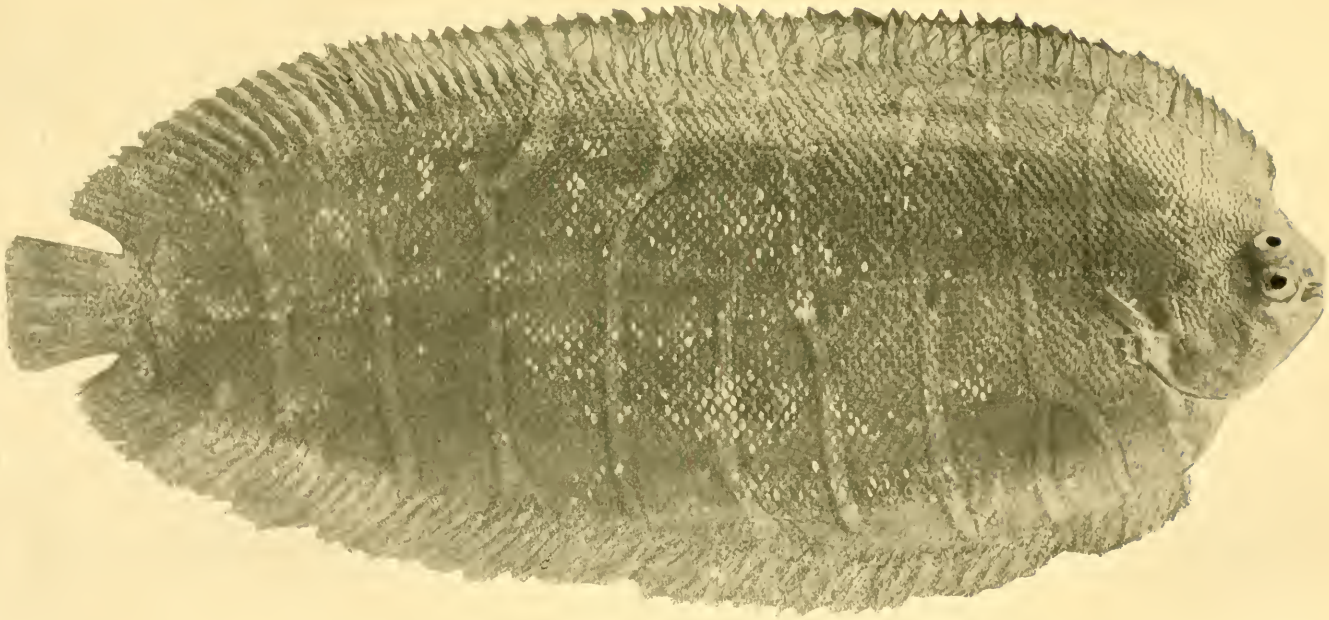
Spearfish, or Swordfish (*Tetrapturus indicus*).

Silver Dory (*Cyttus australis*).

Large-toothed Flounder (*Paralichthys arsius*).

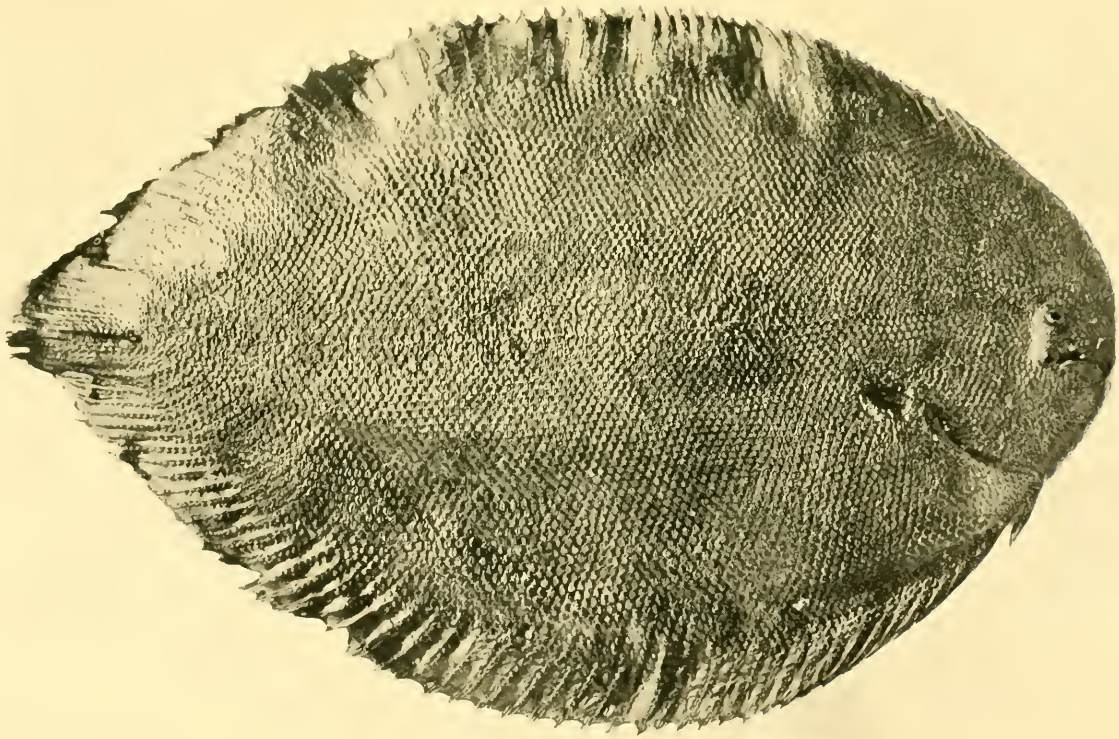


Long-snouted Flounder (*Ammotretis rostratus*).

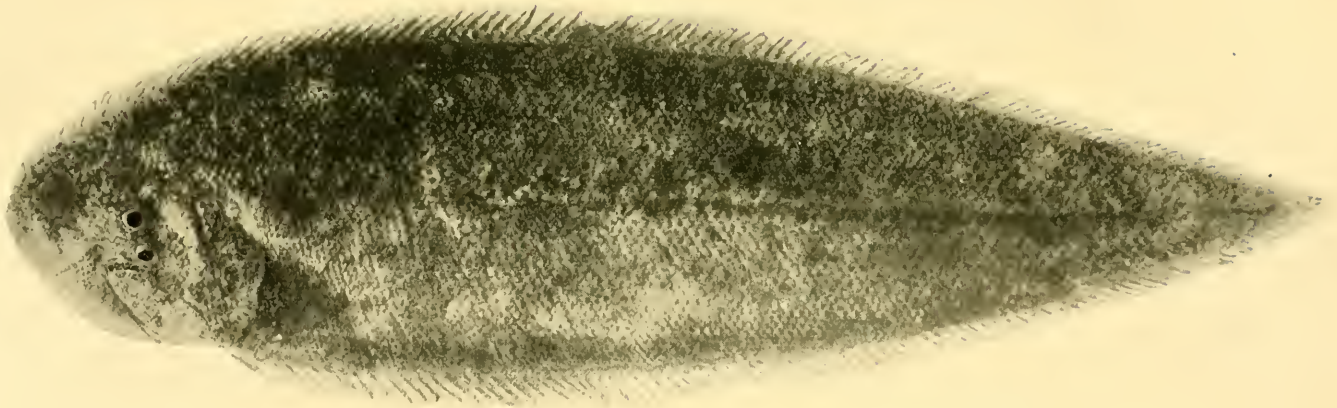


Small-headed Sole (*Solea microcephala*).

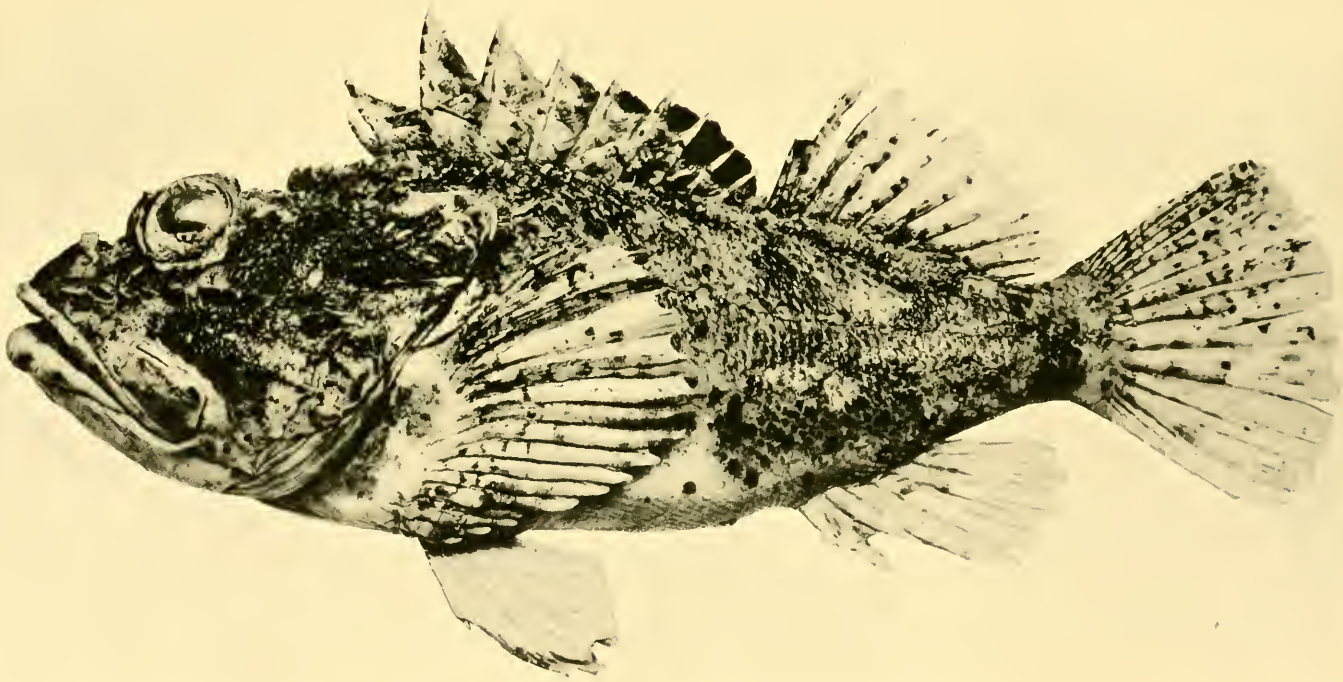
Narrow-banded Sole (*Aseraggodes macleayana*).



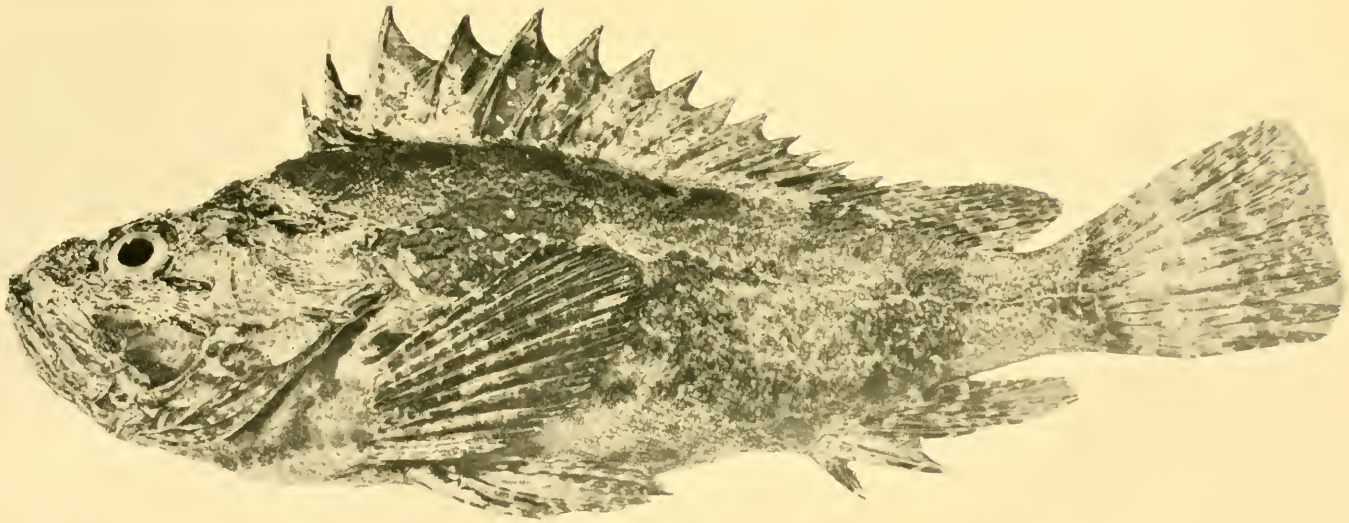
Black Sole (*Synaptura nigra*).



Tongue-Fish (*Symphurus unicolor*).

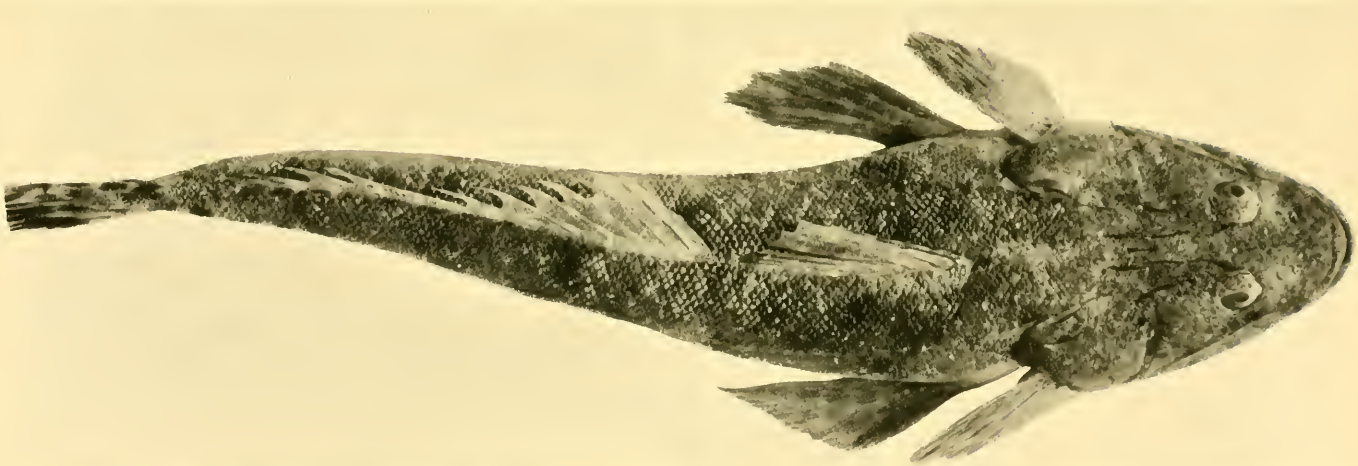


Red Rock Cod (*Scorpæna cruenta*).



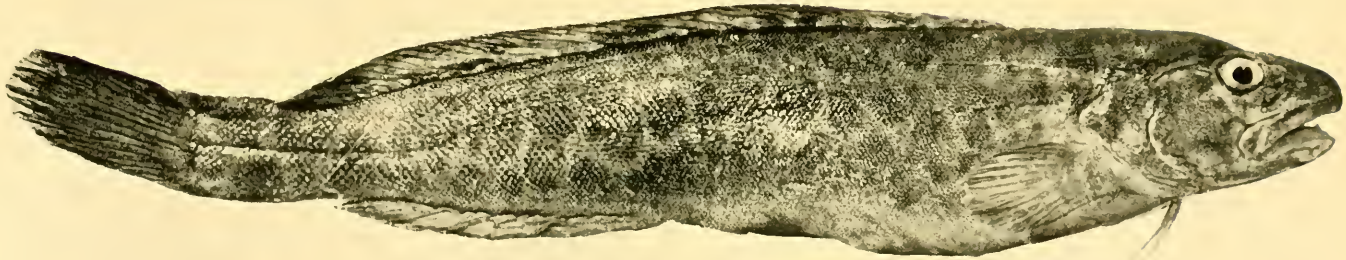
Bullrout (*Notesthes robusta*).

Dusky Flathead (*Platycephalus fuscus*).

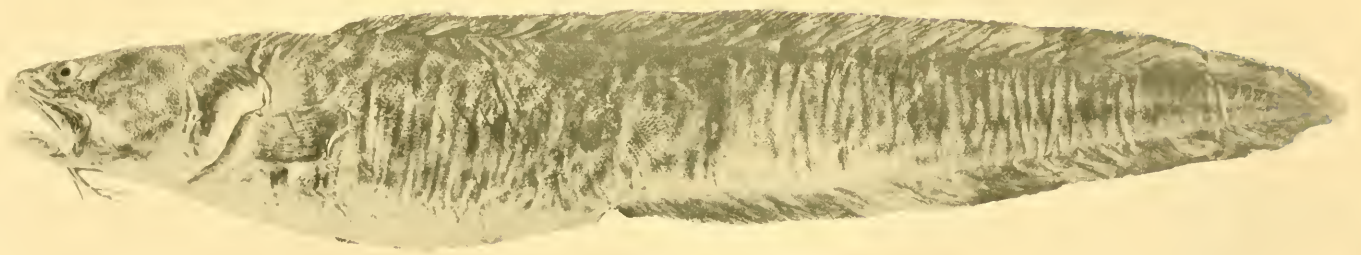


Sand Flathead (*Platycephalus bassensis*).

Kumu Gurnard (*Chelidonichthys kumu*).



River Blackfish (*Gadopsis marmoratus*).



Australian Rockling (*Genypterus blacodes*).

MAP OF NEW SOUTH WALES
Scale of Miles
EXPLANATION.
RED.—Area drained by Eastern streams.
BROWN.—Area drained by Western streams.
YELLOW.—Area drained by Southern streams.
NOTE.—The Eastern streams all find their way to the coast of New South Wales: the Western ones all ultimately combine in the Murray River, which enters the Southern Ocean at South Australia: while those flowing South pass through Victoria to the Tasman Sea.
QUEENSLAND
SOUTH AUSTRALIA
VICTORIA
SOUTH PACIFIC OCEAN
TASMAN
DARLING RIVER
LACHLAN RIVER
MURRUMBIDGEE RIVER
MURRAY OR HUME RIVER
BOURKE
COBAR
WILCANNIA
DUBBO
ORANGE
FORBES
HAY
WAGGA WAGGA
GOULBURN
SYDNEY
MAITLAND
ARMIDALE
TAMWORTH
GRAFTON
NORTHERN TERRITORY
QUEENSLAND
WESTERN AUSTRALIA
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
TASMANIA

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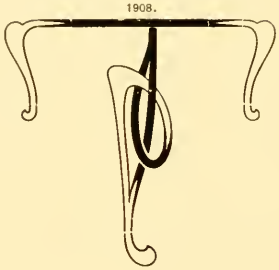

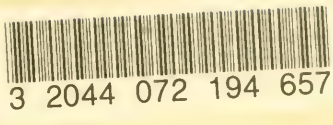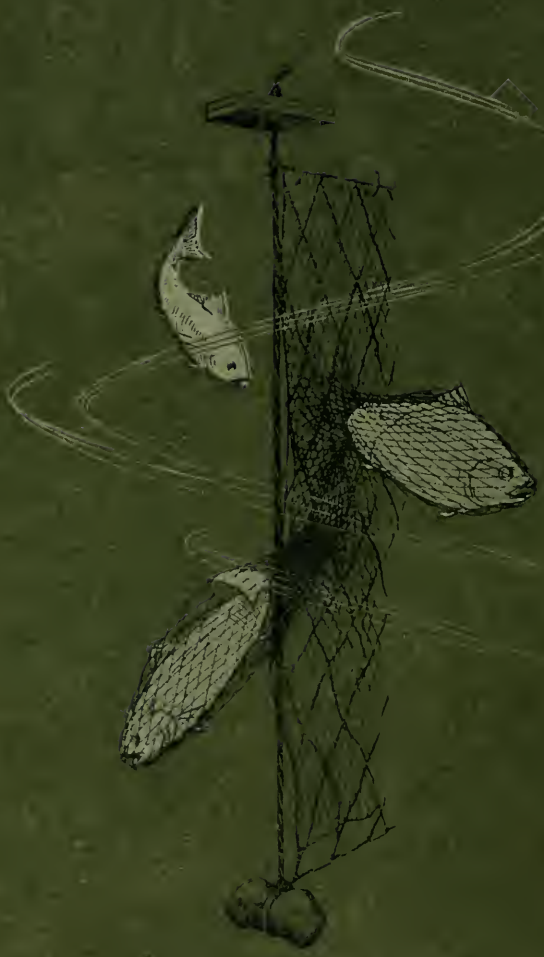
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