

CHAPTER IV.

Some Freshwater Aquarium Fishes

SOME FRESHWATER AQUARIUM FISHES

Many of the readily obtainable native freshwater fishes, and some of the foreign forms, make interesting aquarium inhabitants, living in perfect amity with and harmless to goldfishes. There are others, however, which are best kept by themselves; but all serve as interesting studies to the lover of fluvial life in the household. These will be described, together with the methods for their care and maintenance, beginning with the nest-builders and following with the ordinary pond and river fishes. Mention of a good part of the freshwater Ichthyic fauna is omitted, these being forms that cannot be kept alive in smaller aquaria.

THE INDIAN PARADISE FISH

This beautiful and interesting aquarium fish, *Macropodus venestrus*, is most singular and curious in all its habits. In the Orient, it is bred for the same purpose as the game chicken and contests are arranged upon which considerable sums are often staked. This fish is of such a belligerent disposition that the males will attack each other, and also their mates out of the breeding season, the strong lips and sharp teeth being formidable weapons with which fatal wounds are inflicted.

The appearance of the fish is novel, the curious form, brilliant markings, evasive colors and marvelous fins and tail, differing from any other domesticated fish. In the breeding season the males are of lustrous,

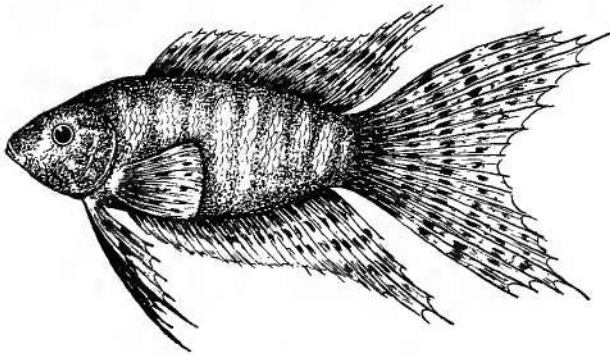


FIG. 35—Indian Paradise Fish
Macropodus viridi-auratus Two-thirds life size

dark olive-green color, overlaid with fleeting, prismatic color flashes which seem to be under control of the fish. The fins and tail are outlined with most brilliant red, yellow and brown. The females are lighter in color and of a more greyish or light-brown hue,

which becomes a greyish-white during the breeding period, and all the fins are shorter and more rounded than those of the males. The illustration, Fig. 35, is the male of the domesticated variety, *Macropodus viridi-auratus*, in nuptial garb.

The Paradise Fish is easily reared and prolific, and will thrive in any

receptacle and water, much plant life and frequent changes of water being unnecessary. The fish is an air-breather and is not dependent upon the oxygen liberated by aquatic plants. It will live in temperatures to 100° F., but, on account of its tropical origin, succumbs to those under 38° or 40° F. It is of such lively habit that the aquarium should be kept covered to prevent its leaping out of the water. The sexes should also be separated except in the breeding season, as the full-grown pugnacious male frequently kills its mate and will exterminate any other fish in the same vessel.

The nest-building habit of this fish is most curious. The spawnings occur a number of times during the season, the floating nests being formed of air bubbles coated with gelatinous matter expelled from the mouth of the male. The eggs are deposited by the female, fecundated by the male, carefully placed in the fairy nest and permitted to hatch, he guarding and caring for them until the fry make their appearance. Then the nest is destroyed and the young fishes are carefully tended until they are old enough to care for themselves; the male assuming the whole duty and keeping the female away from the young. When of sufficient age, the fry should be fed with the same food as young goldfishes and later will thrive on the prepared fish foods together with a frequent diet of earthworms or small particles of raw meat and liver, though the fish prefers and thrives best on living food. Daphnia, small worms, young snails, gnats, small houseflies, moths and other insects are generally fed.

THE STICKLEBACK

This most interesting little fish inhabits streams which reach the ocean, some forms frequenting brackish and salt water. It is one of the most belligerent of freshwater fishes and may be bred in the aquarium, but should

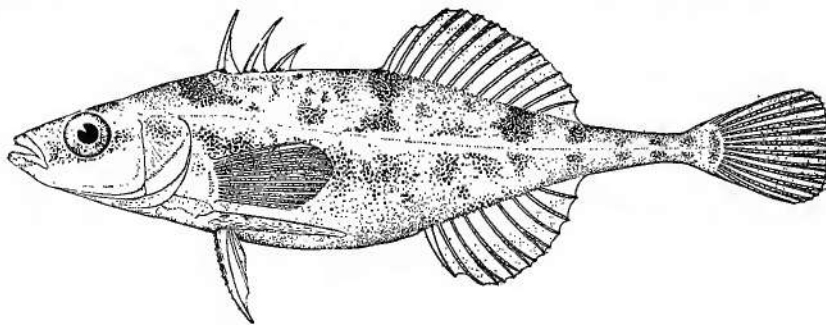


FIG. 36—Four-spined Stickleback, *Apeltes quadratus*

be isolated from other kinds. Its nest-building is very interesting and varies considerably in the natural state. Some build upon the bottom of

the streams hidden among the weeds and water plants, others under submerged boughs to which the nest is attached, or upon stones and projecting ledges. The building is done solely by the male who assumes bright colorings at this period. All kinds of material are collected and are matted together to form the bottom, and held in place by sand and small pebbles. Leaves, stems, twigs and other available materials are glued together with a mucilaginous substance which is exuded from the body of the fish. Next the sides and roof are formed, leaving only a circular opening through which the female deposits the spawn. The male guards the young fishes, not even permitting the female to approach the nest after spawning. He assaults every living thing that comes into the neighborhood with his sharp dorsal and ventral fins and teeth. About the tenth day after the spawn has hatched, he begins to demolish the nest but keeps vigil over the young for a month or more until they are able to take care of themselves, when both he and the young disappear together.

There is nothing more interesting in an aquarium than a pair of sticklebacks. They should be supplied with an abundance of building material in the form of aquatic plants, especially myriophyllum, nitella and vallisneria, the long leaves of the latter being especially desirable for the foundation of the nests.

Three species are generally distributed, the Two-spined Stickleback, *Gasterosteus bispinosus*; the Four-spined Stickleback, *Apeltes quadratus*; Fig. 36, and the Ten-spined Stickleback, *Pygosteus pungitius*. The Four-spined form is abundant in the Delaware river.

Daphnia, earthworms, small particles of fresh meat, insects and any of the boiled cereals, sparingly fed, is the best food for the Stickleback in the aquarium.

THE SUNFISH

The ordinary sunfish, *Eupomotis gibbosus*, is one of the most widely distributed of the freshwater fishes. There are many well-known species which differ principally in their really beautiful markings and the shape of the ear or gill-flap. Nearly all the sunfishes are nest-builders; their spawning beds may be recognized by the clean appearance of the gravelly bottoms of streams and ponds, from which all vegetal matter, mud and pebbles have been either carefully removed by agitation with the fins and tail, or carried away in the mouths of the fishes. Often the stems of the surrounding aquatic plants are trained over the beds to form a perfect bower. After depositing the spawn it is carefully watched by the parent fishes,

which become bold and belligerent during this season and will attack all approaching enemies.

The sunfishes acquire the unpleasant habit of nibbling the fins and tails of the goldfishes, if not plentifully fed, for which reason it is best to

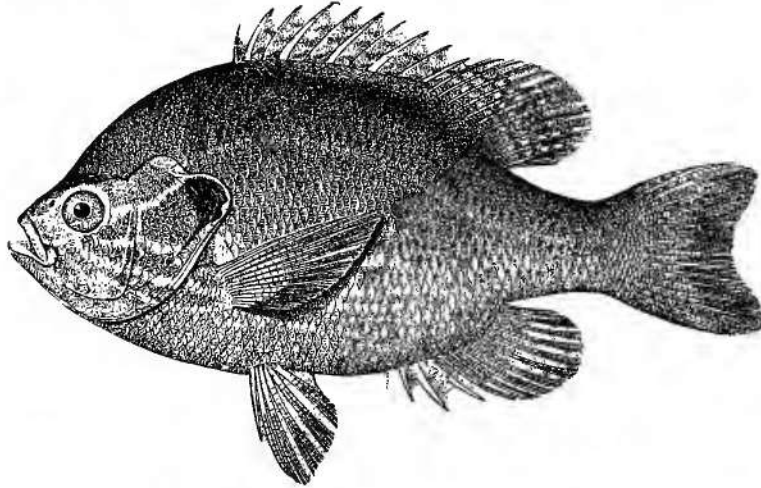


FIG. 37—Common Sunfish, *Eupomotis gibbosus*

keep them separate or to introduce very small ones only into an aquarium in which goldfishes are kept.

The most generally distributed species of sunfishes (Centrarchidæ) are the following: The Common Sunfish, *Eupomotis gibbosus*; Fig. 37, the Blue-spotted Sunfish, *Enneacanthus gloriosus*; the long-eared Sunfish, *Lepomis*

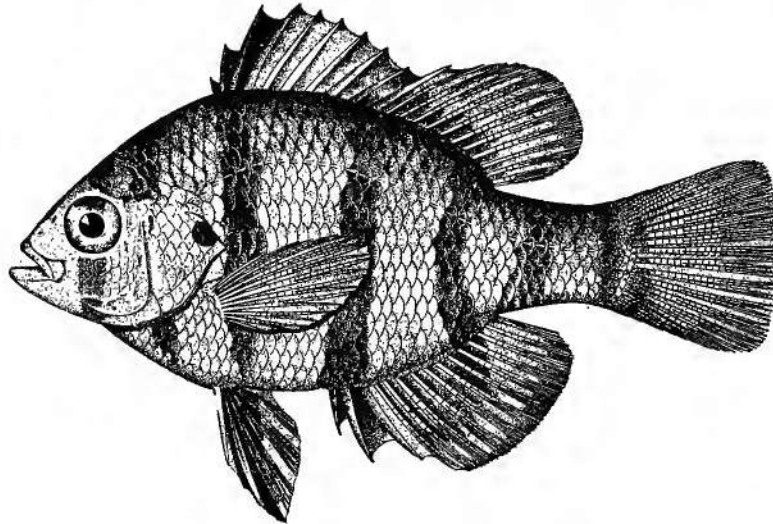


FIG. 38—Black-banded Sunfish, *Mesogonistius chætodon*

auritus; the Black-banded Sunfish, or Chætodon, *Mesogonistius chætodon*, Fig. 38, and other forms popularly known as the Green and Blue Sunfish,

Red-bellied Bream and Crappie. All will survive in the aquarium, and those enumerated occur in the Delaware River. The Chætodon is an especial favorite with aquarists on account of its beautiful markings and lively habits. The sunfish should be occasionally fed with live food, flies, worms, etc.

THE AMERICAN DACE

The Black-nosed Dace, *Rhinichthys cataractæ*, Fig. 39, is a native of all swift-running streams, preferably those of cold water. There are two varieties most generally distributed which usually inhabit the same streams and rivulets. The Black-nosed Dace, the most abundant form in the valley of the Delaware, is easily distinguished by the black line extending from the

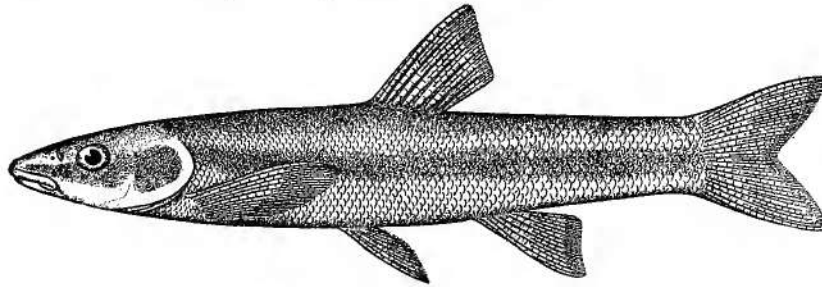


FIG. 39.—Black-nosed Dace, *Rhinichthys cataractæ*

snout along the sides to the tail. It is most remarkably rapid in its movements and in the aquarium is a veritable finny jester. Its movements are so rapid and erratic that it appears like a silvery streak as it darts about in bewildering confusion. In every way it is entirely harmless and may be kept with goldfishes, especially with the fine breeds of sluggish habits, to whom it is of direct benefit in agitating the water.

The spawning season begins early in June, when both the male and the female take to nest-making in some rapid running brook or trout stream, the clearing sometimes being over two feet in diameter. All waste-materials are carefully removed and when the spawn has been deposited it is covered with clean pebbles which the fishes bring down stream in their mouths, the alternate deposits of spawn and pebbles often forming mounds eight inches high. This is done not only to protect the young from enemies, but also to prevent the eggs from washing away in the rapid flowing streams.

The dace will thrive on the usual goldfish foods. Live food should be occasionally fed.

THE CHUB

That species of the Chub popularly known as the Fall-fish, Silverchub, Wind-fish and Corporal, *Semotilus corporalis*, is a most interesting aquarium fish but thrives best in larger tanks, as it often grows to be 15 inches in length. It has the habit of building nests for the spawn and

young, which, in a locality in which the fishes are abundant, measure 4 to 10 feet in diameter. Pebbles and stones, often several pounds in weight, are heaped up to form conical mounds, and, as the fishes are gregarious during the breeding season, quite a number use the same spawning place, which is added to year by year. The purpose of these elaborate structures is to protect the young from their predatory enemies, the Rock and Black bass, perch, catfish, eel and water-snake. In the aquarium they are timid and entirely harmless and will thrive satisfactorily when not overstocked.

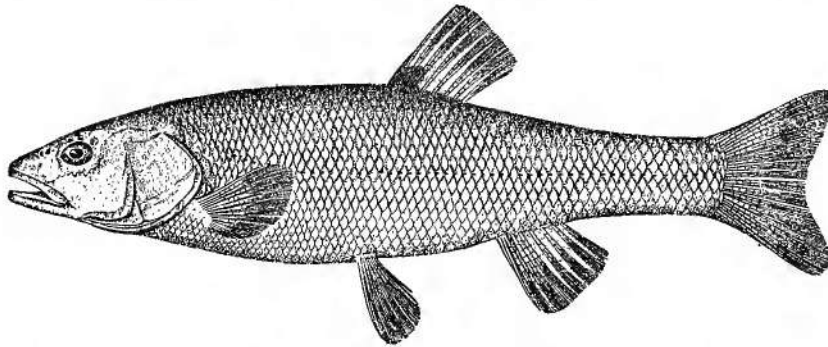


FIG. 40—Creek Chub, *Semotilus atromaculatus*

The Horned-dace or Creek-chub, *Semotilus atromaculatus*, Fig. 40, is abundant chiefly in small brooks. It is more lively in the aquarium than the Corporal.

The chub prefers a vegetable diet, and should be fed on boiled cereals, and occasionally a little of the boiled yolk of an egg.

THE GOLDEN ORFE OR IDE

This fish, Fig. 41, is one of the Carp family, the *Cyprinidae*, developed in Germany from the albino Orfe, *Idus idus*, a handsome, hardy fish but not fully domesticated, its probable migratory habit and consequent restlessness causing it to leap from the water, on which account the tank should be screened or not filled to the top. This applies more to the

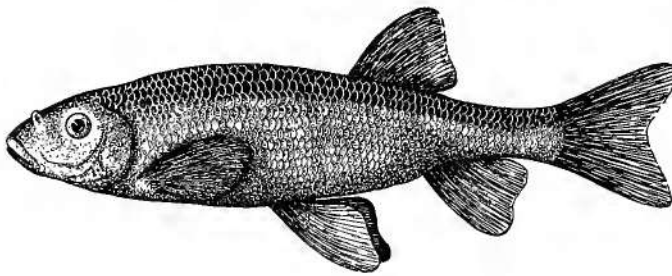


FIG. 41—Golden Ide, *Idus idus*

American bred fish than to the imported German Orfe, *Idus melanotis*; the latter having lost its wild habits by many generations under domestication. Its propagation has been

very successful in the fish ponds at Washington, where an abundant supply is kept, and though a food fish of fair quality it has not been bred for

this use in the United States. Tenacious of life and easily reared in shallow ponds of about 3 feet depth, of either spring or running water and containing abundant plant life, its propagation should be encouraged because it is a very ornamental fish. It is of handsome form with rich salmon-yellow color on the back and silvery white sides, and a very conspicuous inhabitant for the pond or basin as it has retained its habit of swimming in schools and appears to be constantly in motion.

Spawning takes place in April or May, the eggs, being about 1-10 inch in diameter, adhere to the aquatic plants, on which they hatch in 5 or 6 days. Success in hatching depends upon an even temperature of about 56° F.; and should be conducted in shaded ponds. With a healthy plant growth feeding need not be resorted to until the fry is a month old, when they should be given a small quantity of cooked corn-meal mixed with flour and boiled oatmeal, with an occasional ration of finely divided fish flesh, bivalve, crayfish or other animal food. The young attain a length of 3 inches in six months, growing in natural waters to 12 to 15 inches in a year and to a weight of 1 to 1½ pounds. In the aquarium the growth is slow, not over an inch a year.

The Golden Orfe is a beautiful aquarium inhabitant and is harmless to goldfishes. For pond culture, on country estates, it is preferable to the common goldfish, as its habits are more interesting.

THE TENCH

This handsome freshwater food fish, *Tinca tinca*, is one of the most generally bred of the European pond fishes, especially in England, whither it was introduced from the Continent, as it is not indigenous to the natural waters of Great Britain. It has also been successfully cultivated in the United States, the breeding fishes and fry having been distributed by the U. S. Commission of Fish and Fisheries.

It belongs to the carp family, (Cyprinidæ) but differs from the other members of this numerous family both in body conformation and its very small scales. All the fins have a rounded outline, the dorsal is without a spine and the male possesses a thick outer ray on the ventrals which serves a sexual purpose. The tench thrives best in enclosed preserved waters having a clay or mud bottom with abundant vegetation, is extremely prolific and grows to a weight of 3 and 4 pounds. It is a food fish, the meat being of a sweet and pleasant flavor and it will thrive in any fresh water pond,

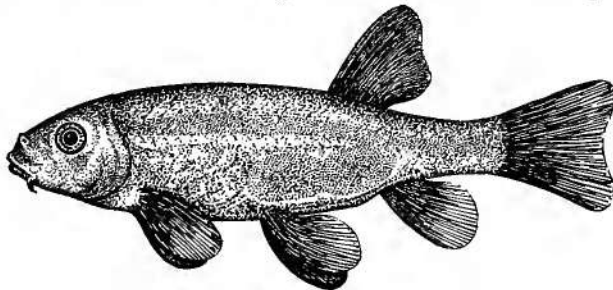


FIG. 42—Young Golden Tench. *Tinca auratus*.

lake or pool which never seem to be too thick, muddy or fetid for it to inhabit. Like the carp it buries itself in the mud during the winter months and there remains in a semi-torpid state until the advent of warm weather.

The young are most beautiful aquarium inmates though more timid than goldfishes. Their colors are so delicate and fleeting as to be almost prismatic, when the fishes are viewed in a strong light. In form they are long, slender and rather flat-sided; the mouth is narrow, the eyes large and the small nostrils are erect. The fins are clear transparent white in fine contrast with the handsome colors of the body. Two forms are generally bred, the Green and the Golden tench.

The Common or Green Tench, *Tinca cæruleus*, is a finely scaled handsome fish, especially the young when about 2 to 3 inches in length. The colors are rich olive-green on the back and abdomen with a fine metallic golden-green lustre which fairly scintillates with prismatic colors when viewed in the aquarium with the light at the back of the observer.

The Golden Tench, *Tinca auratus*, is an albino variety of the Common Tench originally bred in Silesia, and is of bright orange color, spotted with brown dots on the sides, fins and tail. The small fishes, Fig. 42, are so nearly transparent when viewed towards the light that all the interior organs and the very functions of life may be seen through the transparent substance of the skin. When viewed with the light at the back of the observer, the colors are most charming and resemble an opal more than any other object. With the exception of the Goldfish and the Paradise fish, the Tench is probably the handsomest aquarium fish, very hardy, easily kept, and perfectly harmless, and should find a place in every aquarium. It may be fed with the usual goldfish foods. Its culture should be encouraged, as it is a very fine pond fish of lively habit.

THE CARP

The Carp, *Cyprinus carpio*, is one of the most widely distributed of the pond fishes. A number of forms have been produced by European breeders of which the following are the more interesting.

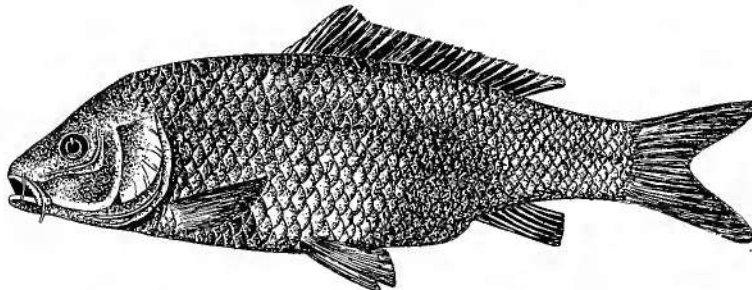


FIG 43—Young Scaled Carp, *Cyprinus carpio communis*

SOME FRESHWATER AQUARIUM FISHES

The Scaled Carp, *Cyprinus carpio communis*, Fig. 43, was originally introduced into Europe from Central Asia, and has been extensively cultivated in natural and artificial ponds and slow-flowing streams. It is distinguished from its kindred breeds by its regular concentrically arranged scales. The color is variable but is usually brownish with a bluish tinge along the back and a golden or coppery reflection along the scales.

The Mirror Carp, *Cyprinus carpio specularis*, Fig. 44, has very large irregularly disposed scales. Some forms have very few scales, sometimes restricted to one row along the lateral line, or in others to a line along the back with a few large scales scattered at random over the sides. Some have a dorsal, a ventral and a lateral line of scales on an otherwise scaleless body, these differences being produced by the careful selection and propagation of breeders.

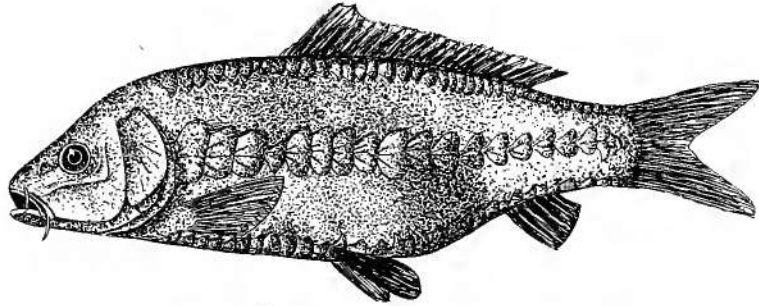


FIG. 44—Young Mirror Carp, *Cyprinus carpio specularis*

The color of the back is a decided bluish tone tinged with green and grey, which extends over the sides. The abdomen and the fins are white.

The Leather Carp, *Cyprinus carpio coriaceus, sive nudus*, Fig. 44A has either a few scales on the back or none at all, and possesses a thick soft

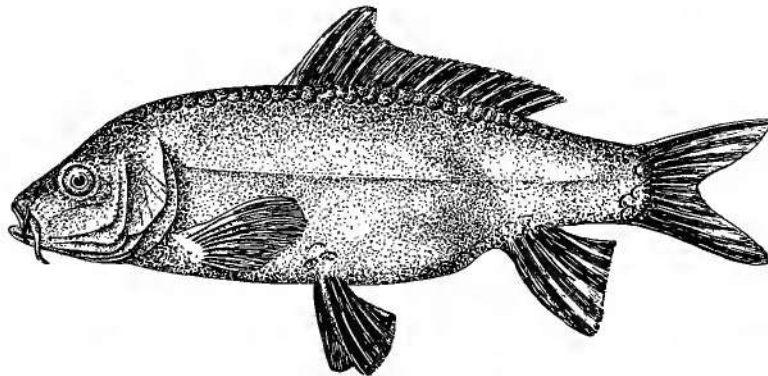


FIG. 44A—Young Leather Carp, *Cyprinus carpio coriaceus*

leathery skin, which feels velvety to the touch. Those of golden-brown, color and devoid of scales are most highly prized by European breeders.

The Golden Carp, *Cyprinus carpio aureus*, is an albino form of the Scaled Carp, at one time extensively bred in Germany for ornamental purposes but has been largely superseded by the Common goldfish.

The Crusian Carp, *Carassius carassius*, Fig. 45 is a variable form closely related to *Cyprinus carpio* and differs somewhat in form and in the absence of barbels. It is a shorter fish of more hunch-backed appearance. Its habits are also similar to the common carp, and it will live in localities wherein the impurities are sufficient to destroy most other of the fresh-

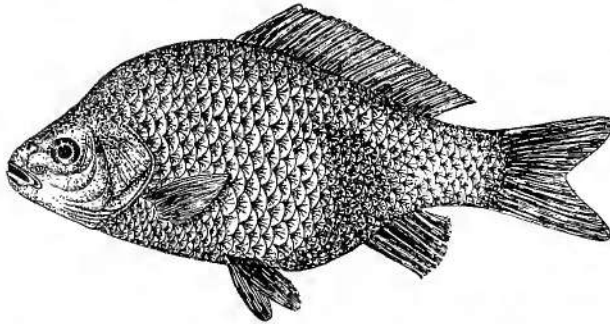


FIG. 45—Young Crusian Carp, *Carassius carassius*

oblongus and *C. humilis*, all variations produced by domestication, selection and breeding.

Small specimens of all the Carp breeds make interesting aquarium fishes. In 1877, and for some years thereafter, attempts were made to generally introduce the Scaled and Leather Carp in the United States, as their easy propagation recommended them for regions remote from a supply of better-flavored fishes, but the results were not satisfactory and in the past years the attempt has been abandoned. The introduction of carp into many streams is now forbidden by acts of state legislation.

All carp will excavate the banks of ponds in search for food which consists of the tender shoots and roots of aquatic plants and the tiny entomostraca and insects of fresh water, for which it burrows into the mud and the banks of streams and ponds. In the aquarium it will thrive on goldfish foods. The carp is destructive to the spawn of other fishes.

THE TESSELLATED DARTER

The Tessellated Darter, *Boleosoma nigrum ohmstedti*, Fig. 46 is a most singular and beautifully marked small fish of belligerent habits. The name is derived from its habit of lying motionless on the bottom of clear streams and suddenly springing upon its prey with marvelous rapidity. In the aquarium it is best kept with such freshwater fishes as are able to

SOME FRESHWATER AQUARIUM FISHES

take care of themselves, like the sunfish, catfish, tiny eels, the young of the spiny-rayed fishes, etc.; and should be fed on small live food and boiled cereals.

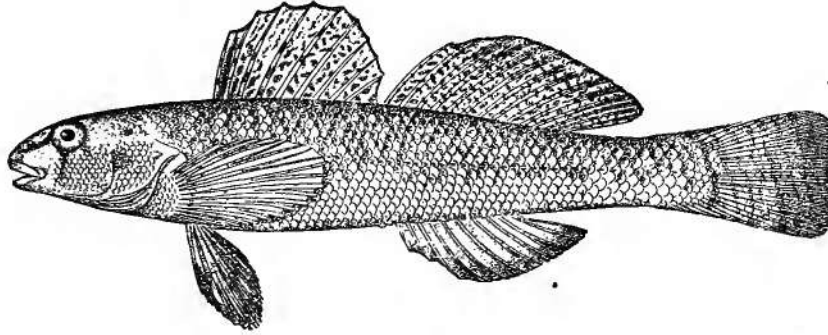


FIG. 46—Tessellated Darter, *Boleosoma nigrum olmstedii*

THE SUCKER

The Common Sucker, *Catostomus commersonii*, Fig. 47, will also thrive in the aquarium. Its habits are similar to the Carp, and the young

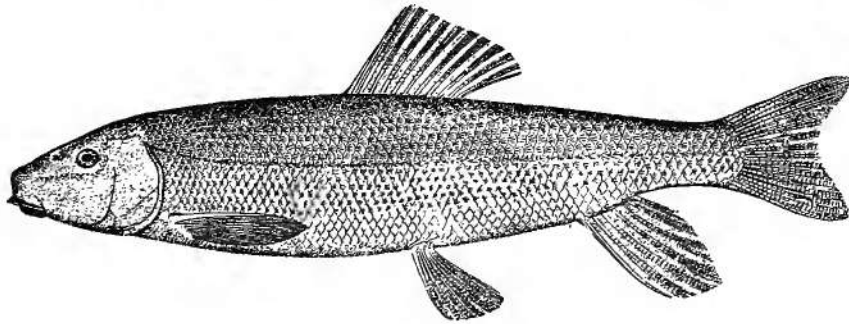


FIG. 47—Common Sucker, *Catostomus commersonii*

may be kept with goldfishes. Any of the goldfish foods may be fed, boiled oatmeal, flaked rice, or fine corn meal mush being the usual food, varied occasionally with small particles of earthworms, mussels and small snails.

THE KILLIFISH

Two species of the Killifish are vivacious little aquarium inmates. These are the Common or Green Killifish, *Fundulus heterochtus*, and the Barred Killifish, *Fundulus diaphanus*, Fig. 48, which inhabits brackish water. Both thrive in the aquarium. The Barred form is marked with steel-blue and silvery-white bars, and has a peculiar metallic lustre. It is entirely harmless and very lively in its habits. Its food should be a mixed animal and vegetable diet, sparingly fed.

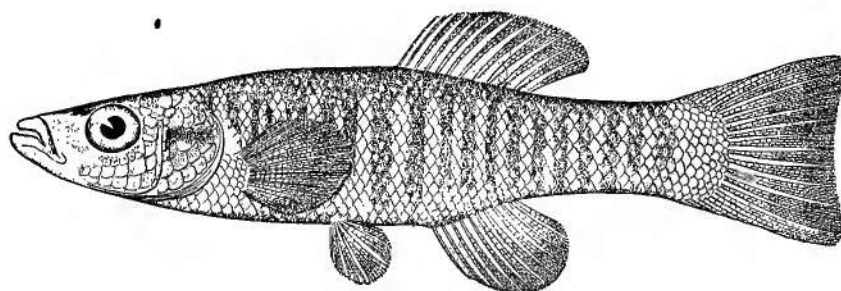


FIG. 48—Barred Killifish, *Fundulus diaphanus*

THE BRILLIANT CHUBSUCKER OR MULLET

This fish is known as the Chubsucker, *Erimyzon sucetta*, Fig. 49, and may be recognized by its clear green back, lemon-yellow sides, and white

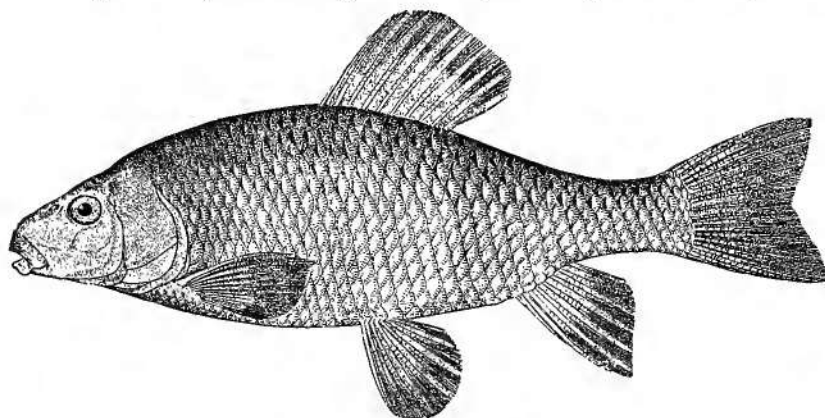


FIG. 49—Chub-sucker or Mullet, *Erimyzon sucetta*

abdomen. It is quite generally distributed in flowing water in most of the river systems of the Eastern, Middle and Southern states. It can be kept with other freshwater fishes and thrives satisfactorily in the aquarium. Its food is the same as that of the Sucker.

THE MINNOWS

The Minnows or cyprinoids are among the smallest of freshwater fishes. There are many well-known species some of which thrive in the aquarium, but others, whose natural habitat is swift-running water, are difficult to keep alive except in tanks in which the water is constantly changing. Some of the hardy forms are easily tamed and soon learn to come to the surface of the water to be fed. The most generally distributed species are the Black-striped minnow, *Notropis procne*; the Silver-fin, *Notropis analostanus*, Fig. 50, and the Red-fin, *Notropis cornutus*.

SOME FRESHWATER AQUARIUM FISHES

These are all abundant in the small tributary streams of the Delaware, and when young are difficult to identify as they all look much alike. The adults, however, are different and develop brilliant colors during the

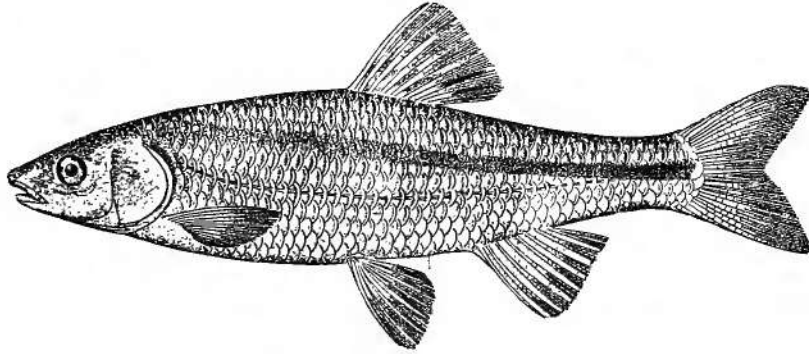


FIG. 50—Silver Fin, *Notropis anisostanus*

spring or breeding season. The young of almost all species of freshwater fishes are often called minnows. The minnows thrive best on boiled cereals and small particles of earthworms, dessicated meat, shellfish, etc.

THE SHINER OR ROACH

This beautiful fish, *Abramis crysoleucas*, Fig. 51, may be kept in the aquarium and is perhaps the most hardy of all of our Minnows or Cyprinoid fishes. Instances of a long survival of this fish in the aquarium are

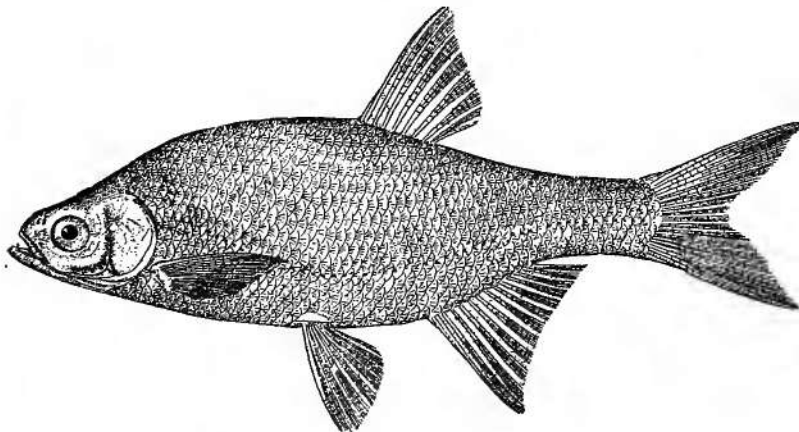


FIG. 51—Shiner or Roach, *Abramis crysoleucas*

frequently mentioned, and, as it is of interesting habit, it will reward the fancier to introduce it, but not together with the finely bred goldfishes, as it tears their tails and fins. Its food is like that of the minnows.

THE CATFISH

This fish is so well-known that little need be said in its description. Several species are most generally distributed, the White Catfish, *Ameiurus*

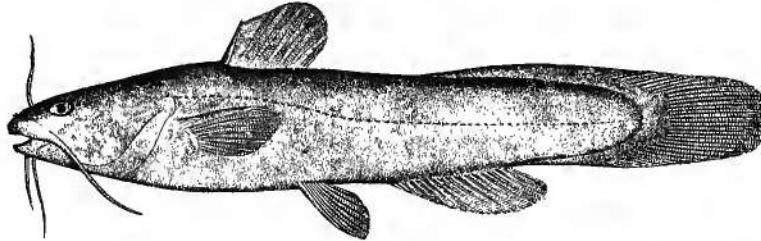


FIG. 52.—Stone-catfish or Little Mad Tom, *Schilbeodes insignis*

catus, the Horned Pout or Common Bullhead *Ameiurus nebulosus*, and the Little Mad Tom, *Schilbeodes insignis*, Fig. 52. They are very annoying to goldfishes and should not be put into aquaria with them. Small particles of animal food, dessicated meat, mussels, etc., together with boiled cereals are the best food.

THE EEL

Eels abound in all the waters of the temperate and torrid zones, but it has been established that they always visit brackish and salt water to spawn. They are very tenacious of life, a modification of their gills enabling them to go considerable distances overland in their Spring migrations or in search of food. The Common American Eel, *Anguilla*

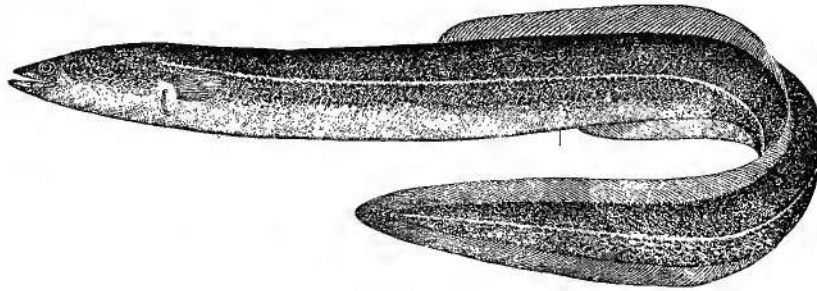


FIG. 53.—Common Eel, *Anguilla chrysypa*

chrysypa, Fig. 53, is of slow growth, rarely exceeding 12 inches during the first year, but attaining a length of over 4 feet and a weight exceeding 5 pounds. Its food consists of all insect and animal life as well as putrescent vegetal and animal substances. They are good scavengers but destructive to the spawn of all fishes. In the aquarium they will nibble at the fins of other fishes and should not be kept with goldfishes unless they are of very small size. Eels will eat almost anything and everything fed to them.

THE SPINY-RAYED FISHES

The Bass, Perch, Pike, Pike-perch, and other predaceous spiny-rayed fishes need not receive mention here, as their belligerent habits preclude their being kept in aquaria with other fishes. They thrive only in large tanks having a constant flow of fresh water. Very small specimens are sometimes kept in aquaria, but it is difficult to keep them alive.

COLLECTING IN STREAMS AND PONDS

One of the chief pleasures incidental to the household aquarium for other than goldfishes, is the collecting of the plant and animal inhabitants of running streams and standing water for home study, observation and classification, and the pleasant outings with congenial companions which this occupation affords. Very few and simple appliances are required; these being a close-meshed pond net with a long sectional handle, upon which a small garden hoe and a wire scoop may be fastened, a collapsing dredging net, a fishing line and minnow hooks, a can of two gallons capacity, a number of small tin cans with perforated lids and small bottles for catching and holding the water inhabitants; and, for the collecting of plants otherwise out of reach, a wire dredging hook or grapple fastened to a strong cord. Larger cans are required to transport fishes, covered with gauze, not with a lid, and if ice is necessary it should be put into the gauze cover, not into the water.

In collecting, a certain indication of abundant animal life is the presence of a considerable plant growth, and a careful examination of the floating and submerged leaves, the overhanging foliage, the bottom and the stones is advisable before rendering the water muddy with nets and scoop, which should be turned out on a clear space rather than in the grass, as the contents can then be better searched and the catch seen. The route should also be up-stream that the water may be clear. In addition to identifying the plants and preserving such as may be desired, a thorough examination of them, as well as of the mud and gravel, should be made as these are the home of many insects, larvæ, and molluscs. The dredge will also yield many of the latter not otherwise readily obtained.

The late summer and fall months are the best for making collections for the household aquarium, as those collected in the spring may not survive the summer heat.

The lower forms of life are present in all bodies of water but in rapid streams minnows, shiners, sunfishes, dace, chub, suckers, newts, salamanders and crayfishes will be found; and in springwater streams trout, troutlets, sticklebacks, dace, pickerel and bass; also fontinalis, chara, and sometimes anacharis of the long-leaved variety. In ditches many insects and their larvæ abound; also catfishes, sunfishes, killifishes, carp, eels, tadpoles, mussels and some varieties of the snails; while the ponds afford sunfishes, catfishes, chub, carp, eels, frogs and tadpoles; and in these latter two most of the desired aquatic plants will be found, and a great variety of bivalve and univalve molluscs, together with many of the insects and their larvæ. In ponds, ditches and pools the tiny entomastraca, which form the natural food for young fishes, may be found.

PHOTOGRAPHING FISHES. The photographing of the ichthyfauna in the natural element and surroundings is a recent achievement of the instantaneous processes but the difficulties are so many that good results are extremely rare. Probably the best work in this line was done by R. W. Shufeld, of the Medical Corps, U. S. Army. The usual conditions are unfavorable to proper light, the incessant movements of the fishes makes focusing difficult, the refraction of the glass front of the aquarium is troublesome and the reflection produces a mirror as likely to show the camera and operator as the contents of the aquarium. By the use of a glass plate behind the fish, to restrict its movement, one element of difficulty may be partially obviated; but a specially constructed very narrow miniature aquarium, fitted to a tripod and backed by a screen will lead to more satisfactory results, as it may be set in the open air and in favorable light. The apparent plant life, to form a natural background, may consist of a sepia drawing secured to the back of the aquarium; the front being constructed of the thinnest portrait glass; but even this interposes a slight screen to the contents and sometimes interferes with a perfectly clear picture.

The constant, almost imperceptible movement of the fins and the rarity with which they are all fully expanded compelled the abandonment of this method of illustrating this volume and forced the author to adopt the considerable labor of making accurate pen drawings. The restlessness of the subject prevented the taking of snapshots with every detail of form and fin at their best so as to serve as types of the most perfect fishes of the recognized breeds.