

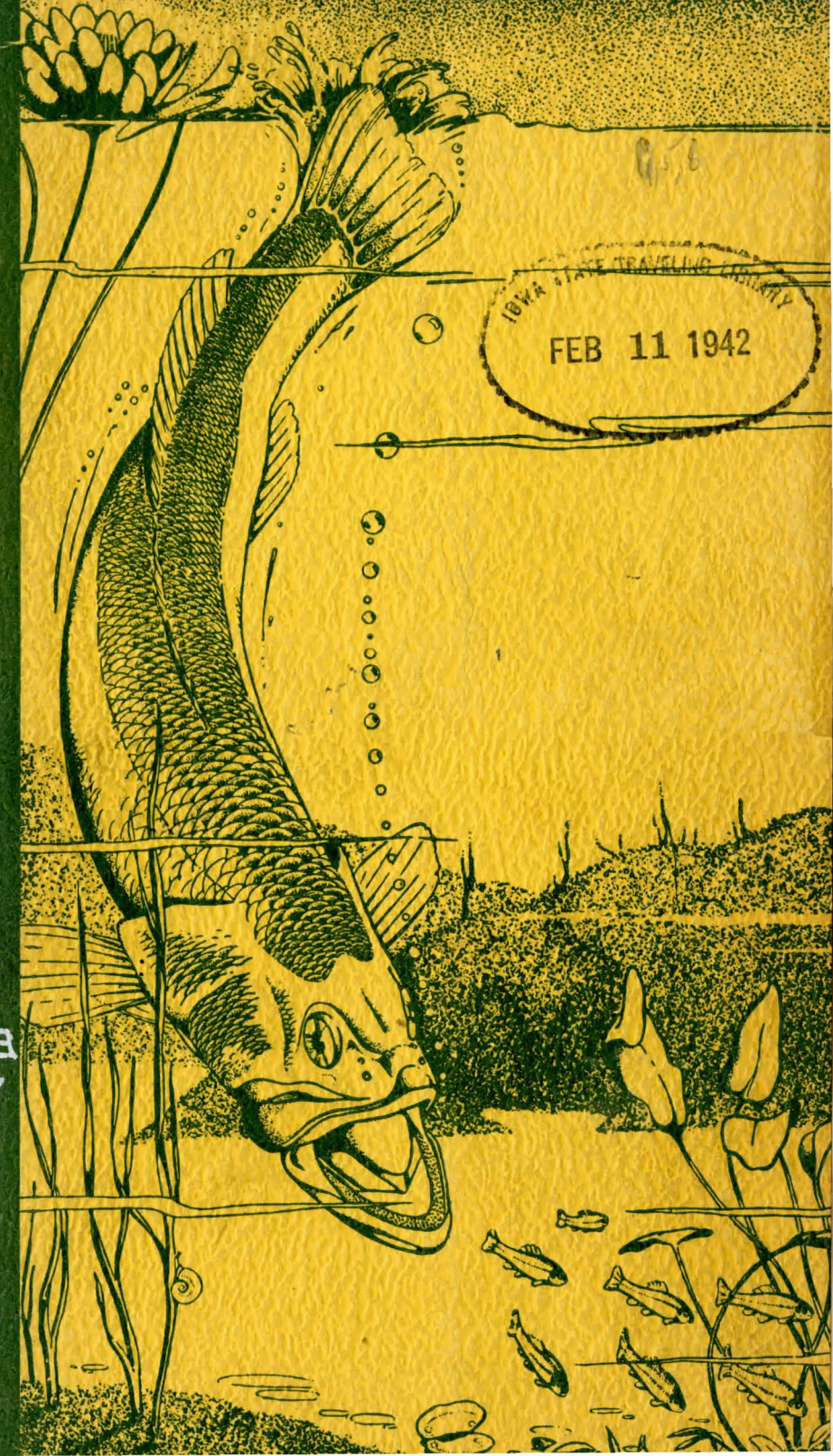
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Some Common Iowa Fishes

W. W. Aitken

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Some Common Iowa Fishes

By W. W. Aitken, State Biologist,
Iowa Conservation Commission

A GLANCE into the economic history of mankind reveals that fish have always formed a generous portion of man's diet. Today, coastal fisheries comprise an industry measured in millions of dollars, inland fisheries of the United States have reached a position of tremendous commercial importance, and individual states are aware that organized efforts must be made to keep their own fishing activities abreast of demands imposed by renewed interest in fish for food and for sport in angling.

As Iowa land is worth so many dollars per acre, depending upon the kind and yearly volume of crops it will produce, likewise are lakes and streams worth so much per water-acre, the value contingent upon the kind and number of fish that can live in a given acreage of water.

Suitable crops must be planted and land must be properly tilled to produce satisfactory results; similarly the lakes and streams of Iowa need adequate care, supervision, and management to bring maximum fish yields.

A certain amount of decaying vegetation is washed from the farm lands into the lakes and streams. A definite amount of this nitrogenous material is necessary to promote the growth of plant life in the water, which, in turn, affords food and cover for minute animal life, and for those fishes that feed on aquatic plants. However, if an excessive amount of foreign material is allowed to wash from the farm land, the water areas will become unsuited to native aquatic life. The natural fish foods will be eliminated, silt will quickly fill the lake beds, and, where once abounded gamy, well-flavored fish will be found nothing but sluggish, muddy-tasting kinds.

Wise and careful agricultural practices will directly improve the lakes and streams of Iowa; not, of course, to the point where the water areas will be restored to their original state, but to such a degree that good fish environment will not be totally lost. Farm management is closely linked with fish management.

By crop selection, by improved farming methods, and by the installation of mechanical soil-saving devices, silt loss will be reduced to a minimum. In conjunction with such improvement policies, trees should be permitted to grow in natural abundance along lake shores and stream banks in accordance with the best methods of forestry. Cattle should be restrained from indiscriminate wading and grazing in the shallows and lake margins. The trampling of spawning areas and the cropping of marginal vegetation eliminates fish life.

In fact, every major phase of farming affects lake and stream values. Better management of land will result in better crops and, as a natural consequence, a better crop of fish will be produced.

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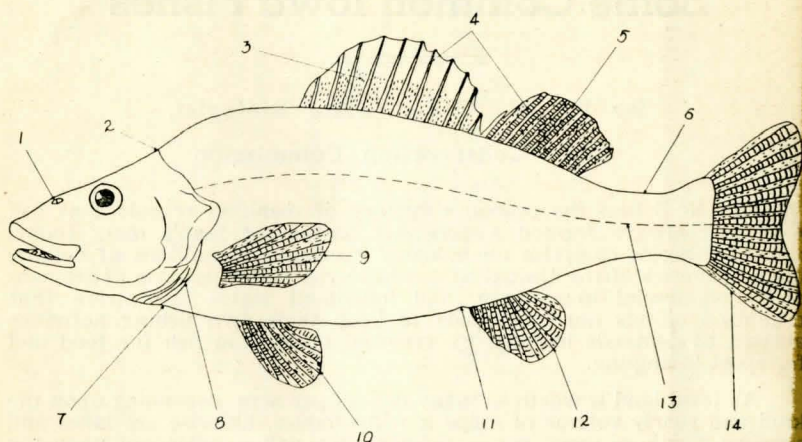
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MAR-27 '62

The notes on food habits and reproduction are also based on personal observations supplemented with quotations from Forbes, Richardson, Evermann, Clark, Jordan, Thompson, Juday, and others.

EXTERNAL PARTS OF FISH



Drawn by W. F. Meissner

Legend: 1. Nostrils, 2. nape, 3. dorsal fin (anterior), 4. rays (spinous and soft), 5. dorsal fin (posterior), 6. peduncle, 7. isthmus, 8. opercle, 9. pectoral fin (front), 10. pelvic fin (back), 11. vent, 12. anal or ventral fin, 13. lateral line, 14. caudal or tail fin.

FUNCTION OF PARTS

FINS: *Pectoral and pelvic:* These fins are located on sides of fish and are used for balancing, for turning to right or left, for descending or ascending, and for stopping.

Dorsal and ventral: These fins add verticalness to the fish and serve as a keel.

Caudal: This fin is the main locomotor organ and adds power to the lateral movements of the body when the fish swims.

SCALES: These are efficient covering. Two types are common:

Ctenoid ("c" is silent): Meaning comb-like, have posterior edge toothed as in yellow pike-perch scales.

Cycloid: have smooth posterior edge, as exhibited by carp scales.

OPERCLE: These flap-like structures of the head cover the gills and are commonly called gill covers. They protect the delicate gill filaments from contacting rough objects.

LATERAL LINE: A distinct line on either side from gill cover to tail is characteristic of most fish. If a scale from this region is examined, one or two holes will be seen. These holes lead to a short tube and all the tubes connect with a lateral canal that runs parallel with the visible lateral line. This lateral line organ has nerve endings leading to the brain and acts as an antenna, detecting sound vibrations in the water. The lateral line probably aids the fish in following currents of water.

MOUTH: Meat-eating fish usually have wide, terminally-located mouths with sharp, conical teeth that are used for grasping prey. These teeth are not used for chewing; the food is swallowed whole.

Plant-eating fish usually have tube-like sucking mouths, and have grinding molars or plates located in the back of the throat, where the food is partly masticated before being swallowed.

EYES: Usually large and lidless. The pupil is large and round permitting a maximum amount of light to enter the eye. In clear water a fish can see about 15 feet. Fish have some discrimination for color.

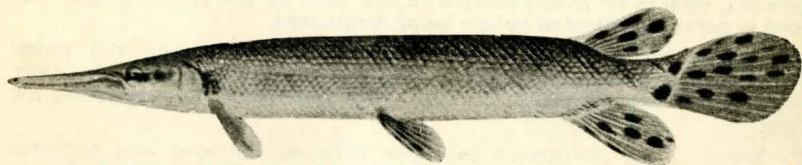
SNOUT: The portion of the head between the eyes and terminal end of the head bears a pair of double nostrils. The openings do not connect with the mouth. A sac-like structure is at the bottom of the nostrils. Currents of water pass into the anterior openings down over these sensory sacs and then out through the posterior nostrils. By means of these organs fish can detect some odors.

BARBELS: Some characteristically bottom-feeding fishes have fleshy feelers around their mouths which may serve as taste organs. At least the fish seem to use them in selecting food particles. In the catfish, these barbels are known to contain taste buds.

COLOR: Color cells are located in the scales and skin of fish. Within these cells colored granules are present which are characteristic for different species of fish. These pigmented granules are black, red and yellow. Orange, blue and green colors are produced by combinations of these three basic pigments with one another. The cells which contain the colored granules are under control of the nervous system, and hence may be changed in size to make certain colors more or less distinct. Thus, although definite patterns are maintained, fish can change color when excited, during the breeding season and when the environment is altered. Like many other animals, fish generally have a coloration that blends with their natural surroundings, tending to make them inconspicuous.

Short-nosed Gar

Lepisosteus platostomus Rafinesque



Courtesy of Natural History Survey of Illinois

Other Common Names: Gar, Billy Gar, Garpike

Description.—Long, round, cigar-shaped with slender, elongate jaws armed with fine needle-like teeth. The body is covered with hard plates in slanting series. The lower jaw is slightly shorter than the upper. Both dorsal and anal fins posteriorly located opposite each other. Upper parts pale olive, belly white. Dark spots on caudal fin; *this fin is rounded*. The long-nosed gar is distinguished from this species by longer jaws, much longer than head, and tail-fin not rounded. A third species of gar, the alligator gar, frequents the lower portion of the Mississippi River; this gar reaches a tremendous size.

Range in Iowa.—The short-nosed gar is common over Iowa and more abundant than the long-nosed species in some of the north Iowa lakes and the Upper Mississippi River region. No gars have been reported in Clear Lake to date.

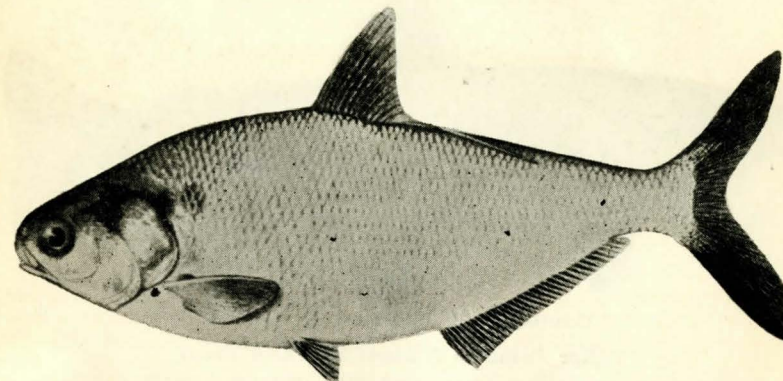
Food Habits.—The gar feeds on other fish, beginning this habit at an early stage. He is a strong, speedy swimmer and his narrow jaws armed with sharp needle-like teeth fit him for a predaceous life. When young the gar is found among weeds in shallow water feeding on game fish fry. The adult gar feeds in both deep and shallow water, either lakes, ponds, or streams.

Reproduction.—This fish spawns in late May and through June in shallow water among weeds and sedges.

Economic Value and Management.—The gar has been considered worthless for food. However, gar meat smoked approaches smoked sturgeon in flavor and richness and, prepared in this manner, finds favor among the discriminating. The gar is classed as a rough or obnoxious fish, and is destroyed when taken in nets used in carp control. These nets must have from 2-inch to 4-inch mesh to prevent the netting of small pan and game fish. This size mesh naturally permits the young, slender gars to pass through the nets, complicating their control. In areas where gar are abundant at their spawning time they can be taken with a small-mesh net as they are assembled in large numbers in shallow water. The gar is host to young clams in the Mississippi River. Young clams must attach to fish until they become large enough to crawl along in the mud and sand of the stream bed. While too young for survival on the bottom they cling to fish as parasites. In this manner, the gar assists in propagating clams or mollusks which, in turn, furnish food for some of the game fish. Perhaps the gar, in eating young game fish, is only collecting a fee for assisting in producing molluscan food for more desirable fish.

Gizzard Shad

Dorosoma cepedianum (Le Sueur)



Courtesy of Natural History Survey of Illinois

Other Common Names: Hickory Shad, Skipjack

Description.—The body is spindle-shaped and the head is scaleless. Tail fin lobes large, the dorsal fin in adults has last ray very much elongated and thread-like, sometimes reaching to the end of the tail. The abdomen is extremely compressed laterally. The anal fin is long and low. The body color is silvery-bluish above. Eyes are large in a narrow head and the mouth is small and toothless in adults. The length average is 4 to 12 inches. The northern moon-eye resembles this fish in general appearance; however, the moon-eye has sharp teeth on the front edge of thin jaws, and has no "plume" on the dorsal fin.

Range in Iowa.—Found in rivers and sloughs; is rare in many of the natural north Iowa lakes.

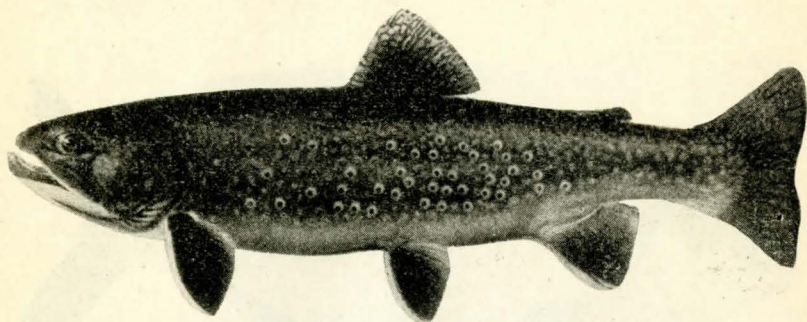
Food Habits.—Young gizzard shad feed on animal life, but lose their teeth as they become adult and finish their existence as vegetarians. Adult shad live almost wholly on small, floating, green plants known as algae. The so-called gizzard stomach does not serve as a grinding organ but acts as a pumping apparatus to force the soft food through the long, convoluted intestine.

Reproduction.—Spawns prolifically in warm shallow sloughs and river bayous. The shad seems to prefer a muddy bottom for spawning.

Economic Value and Management.—This fish is a classical example of a link in the food chain of black bass, feeding on plant material and then in turn being used for food by game fish. If a bass pond has a muddy bottom, gizzard shad can be introduced as forage for the bass. However, the propagation of gizzard shad for forage purposes has not been successful on a very large scale. These fish are characteristically slimy, and this surface film is easily damaged if the fish are handled. They seem to have a very limited ability to adjust themselves to oxygen-volume changes. In the fall they are usually found with young carp in land-locked ponds along flood districts.

Brook Trout

Salvelinus fontinalis (Mitchill)



Courtesy of U. S. Bureau of Fisheries

Other Common Names: Speckled Trout

Description.—Slender, round-like in cross-section. Jaws large. Body sides profusely spotted with regular-sized reddish dots, the spots grading into mottled markings on back, continuing into dorsal fin. Dark body coloring extends well over sides, belly not light. (Coloration depth varies with localities where fish are taken.) Anal, pelvic and pectoral fins margined with white with black line above the white. Scales very small. (The brown trout is easily distinguished from either the brook or rainbow by its whitish belly coloring extending well upon sides. The rainbow's definite markings of "rainbow" rosy-colored, horizontal bands, full length of fish, separate this species from the others.) The brook reaches up to 14 inches or more in Iowa.

Range in Iowa.—Early investigators credit the brook trout as native to Iowa. It is propagated at the Backbone State Hatchery and released in nearby streams that keep a low temperature throughout the summer, and in streams that carry little silt. Its habitat temperature ranges from 46° to 65°F.

Food Habits.—Feeds chiefly on insect life and crustaceans, also takes small fish. In hatcheries, ground meats are fed to get a rapid growth.

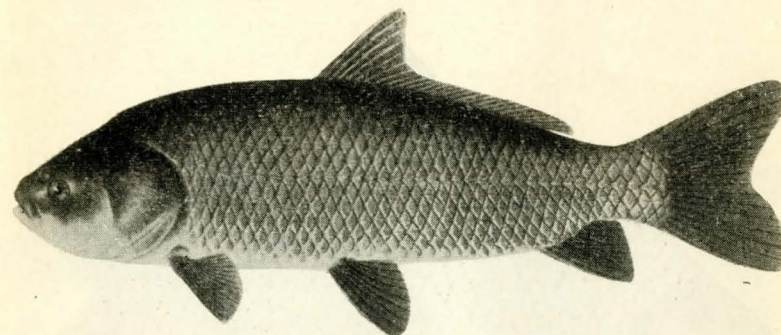
Reproduction.—In Iowa, the brook trout spawns in late December. Eggs are deposited in slight depressions in gravel where water is moving. Cold, spring creeks are ideal sites. Eggs hatch in 50 to 60 days. Temperature controls period required for incubation.

Economic Value and Management.—The brook trout in Iowa is usually smaller than other species, but makes up for small size by his gaminess. Although a native of Iowa, the brook trout does not adapt himself as easily to Iowa stream environment as either the rainbow or brown trout, as these two species seem to thrive in warmer and muddier water.

From 20 to 30 days are required for yolk-sac absorption. The young fish are fed finely-ground meat for an additional 30-day period; after this time they are taken from hatchery troughs, placed in outdoor ponds, and fed coarsely-ground meats and cereals. They reach a 7-inch length in about 14 months.

Big-mouthed Buffalo

Megastomatobus cyprinella (Cuvier and Valenciennes)



Courtesy of Natural History Survey of Illinois

Other Common Names: Common Buffalo, Red-mouthed Buffalo

Description.—Body is robust, outline of black rather regularly curved. Head is blunt and the mouth is large and oblique. Lips are thin and *without barbels*. Body color is dull brownish-olive, much lighter than carp. The under-parts are whitish. The dorsal fin is long and low and the tail fin is not deeply forked. Scales are large as in carp. The weight of buffalo ranges to 80 pounds. Thirty-pound buffalo are not uncommon in the state. A buffalo having a smaller head and mouth is also found in Iowa. It is called the small-mouthed buffalo.

Range in Iowa.—These fish are distributed throughout Iowa in streams, lakes and ponds. They are not as abundant in streams as formerly, having been supplanted by quillback and carp.

Food Habits.—Feeds on muddy bottoms, taking insect larvae and other animal forms living in silt. They are known to feed on algae and other forms of aquatic vegetation and probably for this reason rarely take the hook, although river fishermen report taking this fish on trot-lines.

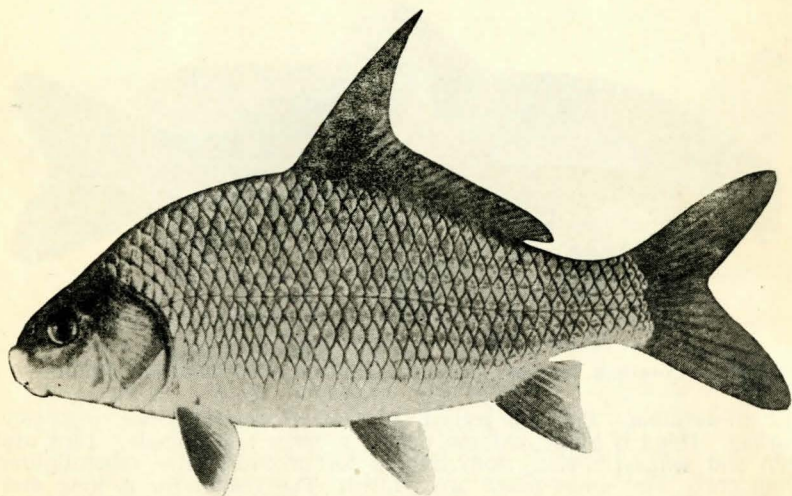
Reproduction.—Buffalo breed in late April and early May in shallow water. They proceed to shallow water in large schools and deposit their eggs with much splashing and tumbling. By late June the young buffalo are about 2 inches long and present a splendid forage morsel for larger game fish fingerling.

Economic Value and Management.—Of all rough fish, the buffalo is most desirable for food and commands a higher price than carp. The meat is whiter, more solid, and less mud-flavored than other bottom feeders.

It has been the practice in Iowa, by the State Fish and Game Department, to control buffalo increase by seining and netting. Gill-netters, using 4-inch mesh, take a considerable number of buffalo from West Okoboji each winter. These fish range from 6 to 25 pounds in weight. Scale growth study shows this size fish to be from 8 to 16 years old. Pond propagation of buffalo has not proved successful. It is believed that buffalo are a type that range widely for food and for this reason require large areas for this cruising habit which, as a consequence, prohibits their successful increase in small lakes and ponds.

Quillback

Carpiodes cyprinus (Le Sueur)



Courtesy of Natural History Survey of Illinois

Other Common Names: Carp-sucker, River Carp, High-fin, Carp-buffalo

Description.—The body differs in shape from the buffalo by being deeper in front of the dorsal fin. The color is silvery, lighter than in either buffalo or carp. The dorsal fin differs from that of the buffalo by having the first dorsal rays much elongated, producing a "high-fin." Two species are common in Iowa, the allied species having a much higher fin than the above. The head is small and scaleless and, like the buffalo, has no barbels.

The quillback averages from $\frac{1}{2}$ to $1\frac{1}{2}$ pounds in Iowa rivers. Rarely reaches 4 or 5 pounds in the streams. The writer collected an 8-pound quillback from Clear Lake in 1935. This is a record for Iowa.

Range in Iowa.—Abundant in all of our muddy streams, and is becoming more widely distributed in the northern lakes and clearer streams.

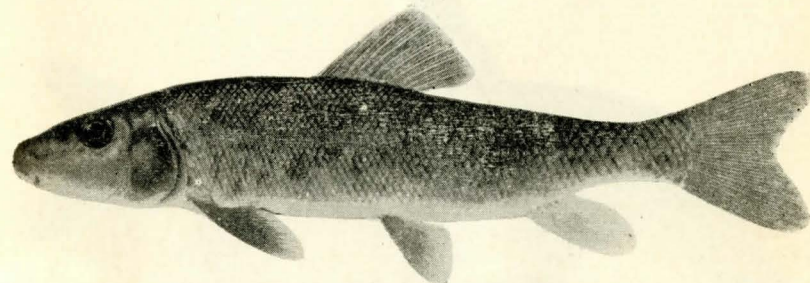
Food Habits.—A bottom feeder, filling its long convoluted intestinal tract with organic debris. The young afford excellent forage for river catfish. When young they are taken in slow moving, shallow water feeding at the same table with young sturgeon, channel catfish and flat-headed chubs.

Reproduction.—They spawn in late April and May, crowding into the shallow, mud bottoms of small tributaries.

Economic Value and Management.—Quillback are in little demand for food. Commercial fishermen in both the Mississippi and Missouri rivers generally throw them away. The meat is very white but the numerous small bones prevent this fish from gaining favor. However, the meat can be ground with a good chopper and then fried hamburger-like. When prepared in this manner quillback are not scorned. Like buffalo, they rarely take the hook.

Common Sucker

Catostomus commersonii Lacépède



Courtesy of Natural History Survey of Illinois

Other Common Names: Fine-scaled Sucker, White Sucker

Description.—The body is long and round in cross-section. Color olive-green to dusky with golden luster, belly whitish. Head is blunt and scaleless. The mouth is sucker-type. The height of dorsal fin about equals the fin width at its base. The body length averages from 12 to 18 inches. In some waters this fish is very dark but can be easily distinguished from the black sucker, as the black sucker has *large scales*.

Range in Iowa.—The sucker is found in nearly all of our clearer streams and creeks. It is fairly abundant in some of our larger lakes.

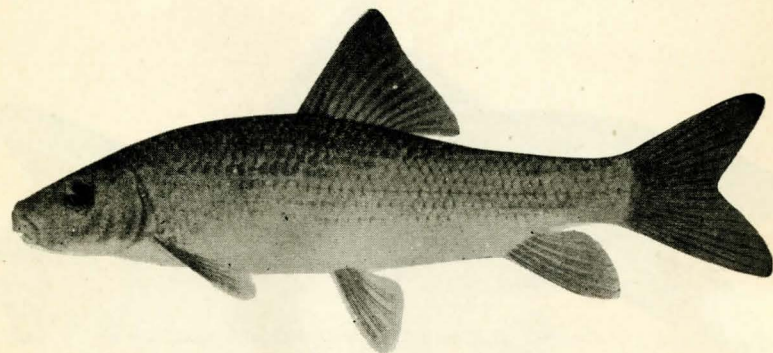
Food Habits.—The food consists of crawling forms that live on sandy and rocky bottoms. However, an examination of the intestinal tract indicates organic refuse furnishes considerable food. Some observers say the sucker preys on yellow pike-perch spawn and for this reason is a detriment to a lake where yellow pike-perch are desired. The Minnesota State Fisheries Division stock pike-perch lakes with suckers as a forage fish for the pike. The results have been reported as satisfactory.

Reproduction.—Spawns in late April in shallow ripples where water is swift. In lakes the sucker prefers sandy bottoms. It is not as prolific as the carp, averaging about 50,000 eggs in a season.

Economic Value and Management.—The sucker is sought in early spring as fresh meat by farmers and townsfolk who live on eastern Iowa streams. This fish takes hooks baited with worms. The meat is flaky and sweet. The State Conservation Commission classes the sucker as a game fish and it is not removed from waters seined for carp, gar and other such fish.

Northern Redhorse

Moxostoma aureolum (Le Sueur)



Courtesy of Natural History Survey of Illinois

Other Common Names: Sucker, Redhorse, Slough Carp, Short-headed Redhorse, Common Redhorse, Mullet

Description.—Long and laterally compressed, yet round-like in section as the sucker. Scales are large. The head is small, short, and conical. The dorsal fin has 12 or 13 rays. Sides of body have yellowish tinge. Caudal and lower fins are red. The lips are thick and right-angled with creases which give a rough, milled appearance. When the lower lip is closed a wide angle is produced. Their common weight is about 1 pound although they range to several times larger.

Range in Iowa.—Found in clearer streams with sandy bottoms such as the Maquoketa River. However, they may be found in muddy sloughs that have been flooded in spring. They cannot survive heavy stream pollution and are not as abundant in Iowa as formerly.

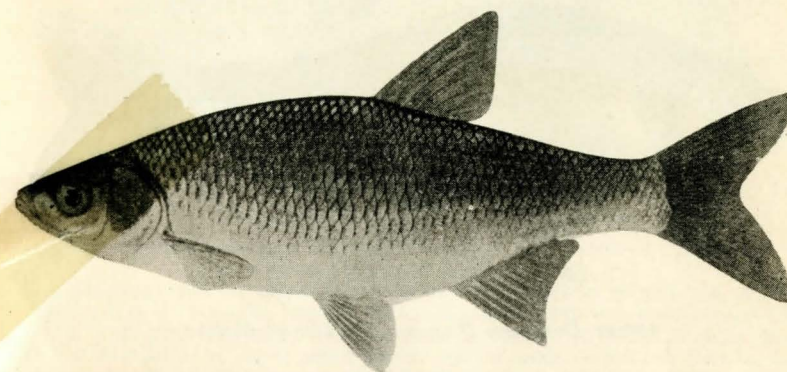
Food Habits.—The redhorse is a bottom feeder, taking snails, insect larvae and small mollusks. These forms are not abundant in polluted areas.

Reproduction.—Spawns in April and May in shallow streams and is sometimes mistaken by the casual observer for carp. After the spawning season the females are often found along stream banks in a weakened condition or dead.

Economic Value and Management.—This fish is used for food in early spring before game fish are taken. The elimination of silt and pollution from our streams, and the creating of deep pools for game fish, will restore our population of northern redhorse. Their lower population ratio in relation to other fish, even under ideal conditions, will never make them important on the market or in the creel.

Golden Shiner

Notemigonus crysoleucas (Mitchill)



Courtesy of Natural History Survey of Illinois

Other Common Names: Bream, Roach

Description.—Color dark greenish-olive above with golden reflections. Small pointed head, compressed body and strongly decurved lateral line distinguish this species. Each scale at exposed base has dark marking. The lower fins are yellow. Mouth slants upward. Length 6 to 12 inches.

Range in Iowa.—The golden shiner is abundant in the upper Mississippi River area and can be found in many ponds and sloughs of eastern and southeastern Iowa. The distribution can be considered general over the state.

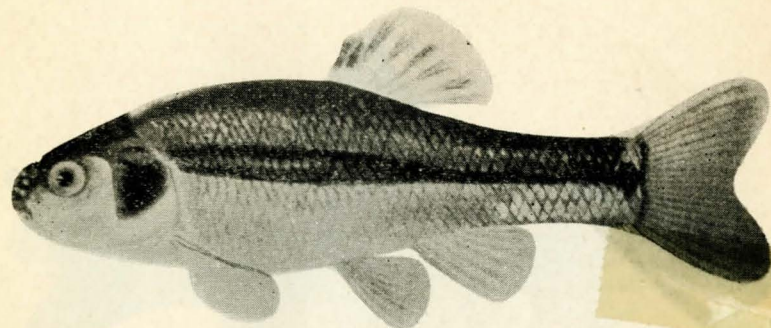
Food Habits.—The golden shiner feeds on aquatic larvae, insects, water fleas, small fish and vegetable matter. The digestive tract of this fish is adapted to a plant diet even though other types of food are taken.

Reproduction.—The spawning season extends through May, June and July. They seem to prefer the mud bottoms of weedy ponds and sloughs for spawning. The young shiners are quite slender as fingerling and do not have the more robust appearance shown in the adult stage.

Economic Value and Management.—The golden shiner has little, if any, value for food. However, the young fish are readily taken by the large-mouthed black bass and are thus an important forage minnow in the Mississippi River. They are used by some fish culturists in black bass ponds as forage for the young bass. The Municipal Fish Hatchery at Tulsa, Okla., propagates the golden shiner very successfully.

Fathead Minnow

Pimephales promelas Rafinesque



Courtesy of Natural History Survey of Illinois

Other Common Names: Blackhead Minnow

Description.—The body is short, thick and heavy forward. Color is dusky. The head is short and blunt and in the spring of the year the males have a black head with many tubercles. The dorsal fin has a dusky cross-bar and the males have a large black blotch. The upper part of the body is dark with a black stripe along the sides. Average length of the minnow is about 2½ inches.

Range in Iowa.—Common in north Iowa lakes. This minnow is abundant in Center Lake and because it increases rapidly in lake water is used for stocking the artificial lakes of southern Iowa. A few specimens of this minnow can be found in many of the smaller streams of the state, especially those that flow over muddy bottoms.

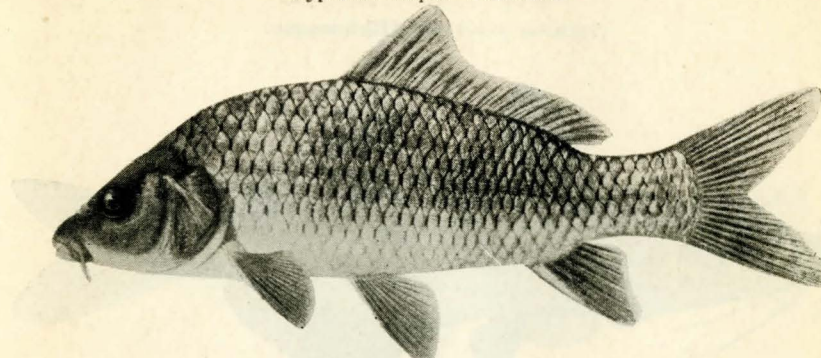
Food Habits.—Insect larvae, and other small aquatic organisms that live in stagnant or muddy water are used for food. The fathead minnow also feeds on some algae.

Reproduction.—This minnow is an intermittent spawner, depositing eggs throughout May, June, July, and August. In bass propagation ponds, sticks are slanted about 45 degrees in shallow water. Stones and broken tile are also scattered in similar places for the same purpose. The female glues her eggs to these objects where they are carefully guarded by the male until the young emerge. In natural water the eggs are deposited on weeds. If weeds are not present natural propagation will be greatly curtailed if not almost wholly eliminated.

Economic Value and Management.—An excellent bait minnow. In Iowa the fathead minnow is the most suitable forage minnow for black bass. They begin spawning several weeks ahead of the bass. By the time the young bass are large enough to take young minnows, the young fatheads are abundant in the ponds and the periodic spawning habits of this minnow keep a constant supply of young forage fish available. Usually from one to two thousand brood minnows per pond-acre are stocked. This number supplies food for a season's production of bass, ranging from six to ten thousand fingerling bass.

Carp

Cyprinus carpio Linnaeus



Courtesy of Natural History Survey of Illinois

Other Common Names: German Carp, Leather Carp, Mirror Carp, European Carp

Description.—A large fish said to have reached 80 pounds. Average weight 2 to 10 pounds, though 30 to 35-pound carp are common in Clear Lake and the Okobojis. The back is arched, the ventral side nearly straight. Color is dark olive-green above and yellowish below. Nose blunt, mouth small. Two pairs of barbels present on upper lip, the rear pair at corners of mouth, large. These barbels are quite prominent in small specimens. The first rays of the dorsal and anal fins are heavy serrated spines. There are three types in Iowa—the German carp, a fully scaled type; the mirror carp, partly scaled; and the leather carp, devoid of scales.

Range in Iowa.—There are few bodies of water where this fish is not present. Carp thrive in polluted areas because they are tolerant to low oxygen conditions and because the food types they take are found in polluted water. The carp is not a native of America.

Food Habits.—A bottom feeder suckling all sorts of material from the ooze. Carp take soaked corn readily as well as all types of meat. They are equipped with heavy grinding molars that enable them to maserate the food before it enters the digestive tract. The stomach and intestine are typical for plant-eating fish. The wide range of food used by carp is no doubt one reason why this fish thrives in so many places.

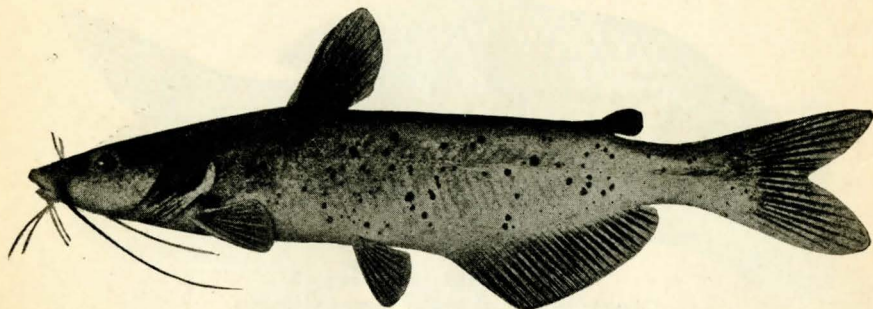
Reproduction.—Carp are very prolific, depositing as many as half a million eggs in a single season. They spawn in May and June in shallow water, scattering their eggs with a great amount of splashing among weeds and upturned roots of the heavier vegetation. The eggs cling in small bunches to these objects in the water where they are left without any further parental care. They hatch in about 10 days or 2 weeks and grow rapidly from the fry stage.

Economic Value and Management.—The propagation of carp has long been extolled; however, carp elimination, or at least their control, is of paramount importance in Iowa waters. Carp are taken by commercial fishermen and sold to eastern markets; yet they bring such a low price per pound that "carp farming" is not practical unless it is done on a large scale. Carp taken in the winter time and smoked command a good price. The carp catch in the Mississippi basin amounts to many thousands of dollars each year.

Carp are hooked on many kinds of soft bait and even take minnows.

Channel Catfish

Ictalurus punctatus (Rafinesque)



Courtesy Ohio Department of Agriculture

Other Common Names: Fiddler, Catfish, Barbed Trout, Spotted Blue Cat

Description.—The body is slender and the color is coppery above, with a silvery luster below. Dark spots are scattered over the sides, hence the name *punctatus*. The head is small and narrower than in some other catfish and bullheads. Tail fin is forked. Upper jaw overreaches lower jaw. Spine on dorsal fin is sharply serrate and maxillary barbels reach well past gill covers. The anal fin is rounded as distinguished from the longer and lower shaped anal fin of the blue catfish. Note: All catfish, as well as trout, have a small fleshy fin on the back near the tail fin. Average weight from 1 or 2 pounds up to 25 pounds.

Range in Iowa.—Widely distributed over the state. Prefers clearer streams than other catfish. They are stocked by the Conservation Commission in inland streams.

Food Habits.—Feed principally on slow moving bottom forms, also take animal and vegetable wastes carried by streams. Worms are generally used for bait.

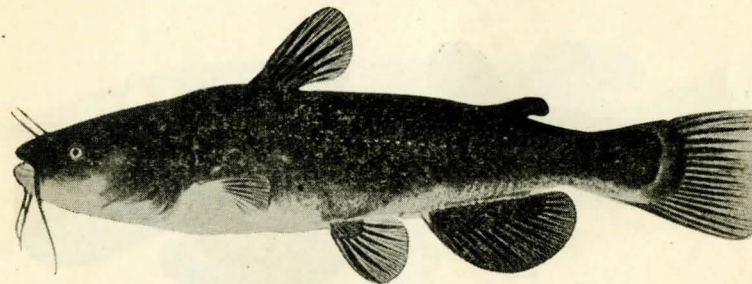
Reproduction.—Channel catfish spawn from about June 1 to June 20, selecting places in moving water beneath overhanging tree roots or depressions in the stream banks. In the pond propagation of this fish, pairs are segregated and the eggs are taken from spawning boxes each day to prevent the parent fish from eating their own spawn. It is not known to what extent this habit prevails in the wild state.

Economic Value and Management.—Channel catfish are most desired by catfish anglers as they are the best flavored of the catfish tribe. They find a ready market at all times of the year and are extremely important to the commercial fishing industry.

Kansas and Nebraska Fish and Game Departments propagate this fish successfully. The eggs are taken daily from the spawning kegs and placed in aerating troughs similar to trout troughs. In about 2 weeks the young catfish hatch. Two or three weeks later they are placed in ponds where they are fed ground meat scraps, butter-milk, ground fish and similar foods. They can be stocked either the first fall or the following season and become large enough to take when 3 years old.

Black Bullhead

Ameiurus melas (Rafinesque)



Courtesy of Natural History Survey of Illinois

Other Common Names: Bullhead, Common Bullhead

Description.—Color dark green or brown to black, underparts either white or yellow. Head is short and wide, profile above flattened and angled to dorsal fin. Tail fin slightly notched, anal fin rounded and shorter than in either the yellow or brown species. The webbing of the fins is jet black. Adipose fin is small, chin barbels black. Although specimens 12 to 14 inches long are common the length averages shorter and they are called runt bullheads in many parts of the state. For this reason they are not stocked by the State Conservation Commission in new lakes.

Range in Iowa.—This is probably the most abundant species in the state. They are found everywhere from lakes and streams to small creeks and stagnant pools, thriving in shallow, stagnant water.

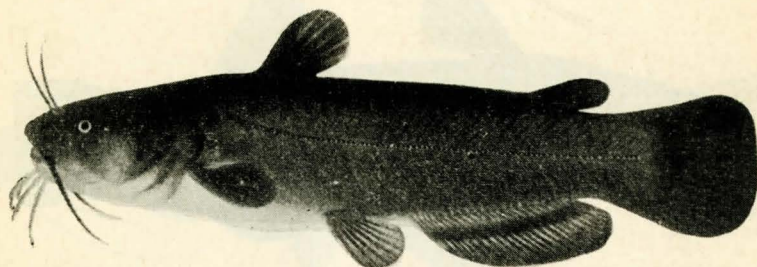
Food Habits.—These, like the other species of bullheads, feed on plant and animal forms of many kinds. They have been indicted as a menace to young pike-perch but studies have not been extensive enough to verify this conclusion. They are easily taken on worms, or meat chunks of about any variety.

Reproduction.—The black bullhead spawns on sandy or silt covered bottoms in June and even as late as early July in East Okoboji and Spirit Lake. The parental care is similar to that of the yellow species. The "clouds" of fry rolling along in the shallow shore waters of the larger Iowa lakes would convey the thought of over-population within a short time. However, the black bullhead seems rather susceptible to winter-kill, as many can be found washed ashore each spring when the ice goes out.

Economic Value and Management.—A large percentage of Iowa fishermen enjoy taking this fish for food. They are also taken in quantities on the Mississippi River for the commercial market. A bullhead dinner at a local eating house along the Mississippi River is most likely to consist of black bullheads. Over-population of this fish in small areas is common and this, no doubt, accounts for their dwarfiness. For this reason, they should not be stocked in small lakes or ponds. In the larger lakes of Iowa, the black bullhead attains a fair size, but in small lakes the average is scarcely large enough to be desirable.

Yellow Bullhead

Ameiurus natalis (Le Sueur)



Courtesy of Natural History Survey of Illinois

Other Common Names: Mud Cat, Yellow Belly, Lake Bullhead

Description.—The body is stouter than that of any other bullhead. The mouth is wide and head is broad. Dorsal fin is small and low. A groove extends from head region to base of dorsal fin. Body color is yellowish green to darker. Tail fin is rounded and lower barbels are whitish. The black bullhead is distinguished from this species by a squarish to slightly notched tail fin and by the shorter and rounded anal fin. Other differences are obvious but these characters mentioned can be easily noted in young specimens. Yellow bullheads range in size much larger than either the black or brown species and are commonly taken 14 inches long.

Range in Iowa.—Not as common over the state as the other species, they are fairly common in the Mississippi River and some of the northern Iowa lakes. This species is stocked in the artificial lakes of southern Iowa. The yellow bullhead seems to prefer clearer water than the other bullheads, although Forbes found that the yellow bullhead in Illinois showed a preference for muddy water.

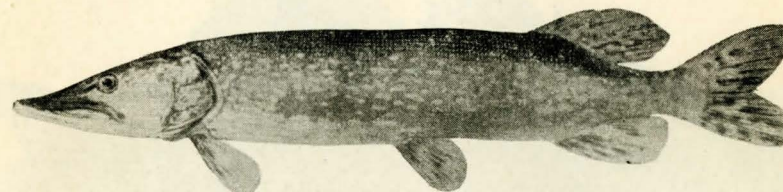
Food Habits.—This fish eats what is at hand—snails, clams, insects, larvae, worms, small fish and fragments of meat. It is apparently a scavenger, yet this fish is not common in polluted waters of the state.

Reproduction.—Spawns in late May and through June, in water 1 to 2 feet deep. The eggs hatch in about a week. The parent guards the young for some time after they hatch. While the fry are schooled in shallow water the parent keeps rolling a murky "smoke" screen between them and the lurking predators ranging the deeper water.

Economic Value and Management.—Because this bullhead excels the others in flavor and size it is eagerly sought by "pole and line" anglers. This fish should thrive in the new Iowa fishing lakes as spawning beds have been built in certain shallow bays to induce productivity. Other devices have been installed to produce ideal food conditions. This species should not be stocked in small mud-bottomed ponds that are barren of vegetation.

Northern Pike

Esox lucius Linnaeus



Courtesy of Natural History Survey of Illinois

Other Common Names: Pike, Pickerel, Grass Pike, Great Northern Pike, Snake

Description.—Body elongate, head flattened, lower jaw protruding. The single dorsal fin is in posterior position where top body line breaks to form caudal peduncle. Color of back and sides bluish-grey. Belly whitish. Lower half of gill cover is scaleless. (Muscalunge has lower half of both cheek and gill covers naked; pickerel has cheeks and gill covers fully scaled.) Body marked with white spots, fins spotted with black. Length ranges to 3 feet or more.

Range in Iowa.—Not as common in our polluted streams as formerly. Fairly common over the state and common in the boundary waters and the northern lakes.

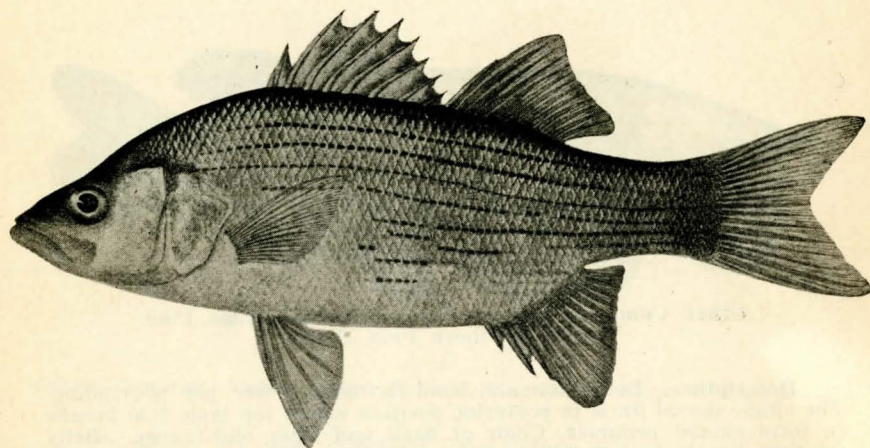
Food Habits.—A voracious meat eater, feeding on many types of game fish and minnows, together with frogs, crayfish, large insects, mice or any hapless rodent falling into the water. The larger pike range the deeper waters and by means of their speed and sharp teeth have little difficulty in securing other fish for food. They merit the name "Tigers."

Reproduction.—Northern pike spawn in March soon after the ice clears from the water. They seek the shallow areas, pushing up small ditches that may lead to weedy sloughs where the spawn is left without further care. The declining water levels of the northern Iowa lakes have eliminated many hundreds of acres of pike spawning ground. When water levels return to normal and these spawning areas are again available, these gamy carnivores will again become abundant.

Economic Value and Management.—The flesh is flaky and of good flavor, but contains many small bones. Anglers delight in hooking this fish because the pike rarely fails to stage a splendid fight before he is taken from the water. The decrease of the pike in lakes that once supported this fish in numbers can be attributed to the lower water levels and drying up of the spawning areas adjoining the lakes and not to carp infestation or other such environmental changes. Natural propagation cannot be expected of any fish unless the desired type of spawning ground is available. Physical changes over which man has no control, will dictate the kind of fish suitable for the lake in question; likewise, such conditions that can be controlled will be a factor in determining species of fish most suited to the environment.

White Bass

Lepibema chrysops (Rafinesque)



Courtesy Ohio Department of Agriculture

Other Common Names: Silver Bass, Striped Bass, Streaker, Perch-bass

Description.—Body deep and compressed. Head small, lower jaw protruding. Color silvery to whitish on belly. About seven narrow dark bars extend along sides. Dorsal fins separated. Anal spines graduated. (In the allied species, the yellow bass, the first spine in anal fin is short, the other two spines about equal length, the jaws are about equal, and the dorsal fins are well notched but not separated.) Reaches a weight of several pounds.

Range in Iowa.—Common in Okoboji Lakes, Spirit Lake, Clear Lake, and Mississippi River. Once common in Storm Lake. Not abundant in other parts of the state.

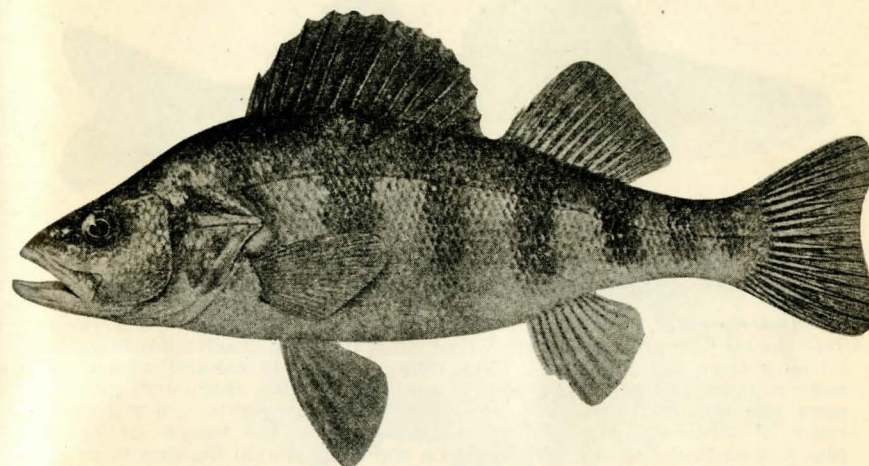
Food Habits.—Feeds on insects, insect larvae, small crustaceans, small fish and other small animal forms. Feeds in schools and is a very greedy type. In early spring feeds on same insect larvae as yellow pike-perch.

Reproduction.—Spawns in late April and throughout May. This bass does not build nests, but deposits the eggs at random over weedy and gravelly bottoms. The eggs find places of attachment on stones and vegetation.

Economic Value and Management.—This fish is an acceptable prize, especially when water is cold. During hot months its meat is rather soft and not very palatable. The white bass has not been successfully propagated in ponds. Its culture is desirable to replenish stock where this fish once abounded in numbers. No doubt muddy bottoms and subsequent loss of vegetation has hindered natural reproduction of this fish. Should be stocked only where a reasonable amount of ideal spawning ground is present.

Yellow Perch

Perca flavescens (Mitchill)



Courtesy Ohio Department of Agriculture

Other Common Names: Ringed Perch, American Perch

Description.—Body compressed laterally; color brassy-green to yellow with seven dusky bars on sides. Back elevated, highest in front of dorsal fin. Opercle strongly pointed. Dorsal fins separate. Tail fin not deeply notched.

Range in Iowa.—Scattered throughout the larger streams of the state; abundant in the Okobojis and Spirit Lake. Is more strictly a lake fish than a stream denizen.

Food Habits.—Feeds on small fish, insect larvae, crustaceans, and other forms of animal life. Always seems hungry and for this reason is easily taken.

Reproduction.—Spawns in early April. The eggs are laid in ribbon-like bands in shallow water where they are glued to weeds, stones, or other available objects.

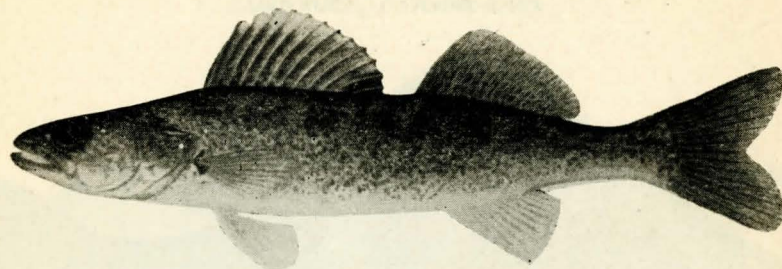
Economic Value and Management.—The flesh is firm, flaky, and devoid of small bones and thus makes a delectable table dish.

Yellow perch can be stocked in lakes having depth enough to prevent winter-kill. They are active throughout the winter months and for this reason must have an ample oxygen supply to support their natural activities.

They can be successfully propagated in old gravel pits that are 10 feet or more deep. If such a place is used they should be removed in the fall to larger areas. A stock of yellow perch in a lake will necessarily require plenty of minnow life if desirable size is to be obtained. An abundant growth of Sago pond-weed, coon-tail, and some more or less emergent types of aquatic vegetation to provide suitable food cover and environment will have a determining influence on stocking results.

Yellow Pike-perch

Stizostedion vitreum (Mitchill)



Courtesy of Natural History Survey of Illinois

Other Common Names: Wall-eyed Pike, Jack Salmon

Description.—Body color brassy, olive-buff, shading to olive-yellow. Two dorsal fins well separated. Front fin spiny with black margin exhibiting a dark blotch behind. Eyes milky or muddy colored. Shape of body roundish, mouth large, scales small. These two characters give it some resemblance to the pike. Iowa pike-perch are lighter colored than those of Minnesota. In contrast to this species, the sauger or sand-pike has several rows of dark spots on the spiny dorsal fin, and there is no black blotch at back of fin. There are also dark blotches at base of pectoral fins.

Range in Iowa.—Have been stocked in rivers and lakes of northern Iowa. They are abundant in the Mississippi River, Clear Lake, the Okobojis, and Spirit Lake. Call, in 1887, in his *Fishes of the Des Moines River Basin* says, "Jack-salmon" are abundant in the Raccoon River." Excessive pollution and silt-carrying waters have made this fish rare where it once was common.

Food Habits.—Like the pike, the pike-perch preys on other fish, beginning this habit when only a few days old. Insect larvae in large amounts have been found in stomachs examined in early May.

Reproduction.—Spawns about first of April on rocky and gravelly reefs covered with shallow water. The eggs are deposited in masses and hatch in 25 to 30 days. Two hatcheries are maintained in Iowa for pike-perch propagation—one at Orleans, the other at Clear Lake.

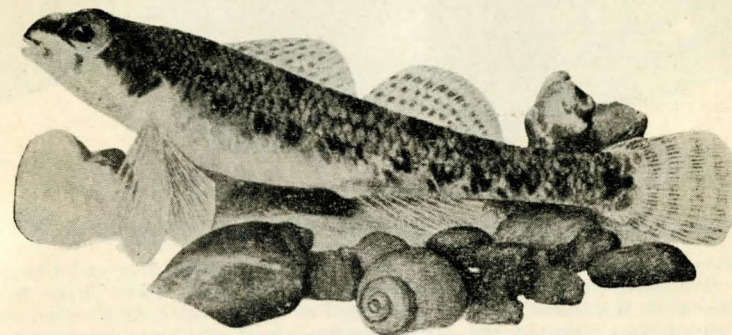
Economic Value and Management.—This is an excellent food fish eagerly sought by fishermen. The meat is white, solid, flaky, and free of small bones. Other states have widespread pike-perch activities, but in Iowa pike-perch cannot be sold for commercial purposes. All pike-perch legally sold in Iowa are shipped into the state from other waters.

The State collects pike-perch at spawning time by means of gill-nets. The spawn and milt are stripped from the fish without injuring them. After this operation they are returned to the lake. The fertilized spawn is taken to the hatcheries where it is kept in running water until the fry hatch. The fry are then returned to the lake or placed in rearing ponds to grow to fingerling sizes before being released. Sixty to ninety million young pike-perch are artificially produced each year in this manner.

Pike-perch are taken in May when the season opens by trolling a spinner and live minnow. Later in the year they are usually taken by plug casting.

Johnny Darter

Boleosoma nigrum (Rafinesque)



Courtesy of Natural History Survey of Illinois

Description.—Body slender. Color of back and sides a pale strawish olive, with brownish dots and splashes along the lateral line which approach W, X, and V-shaped markings. Dorsal and caudal fins barred. Head has blunt snout. Tail not forked.

Range in Iowa.—In northern and northeastern Iowa, on sandy and rocky-bottomed streams and lakes, and in some streams of muddier bottoms, and less swift water. Perhaps the most common darter in the state.

Food Habits.—The darters lurk behind rocks and other objects in the stream and dart, or make short dashes, after their food as it is carried along by the current. This food is chiefly small animal life.

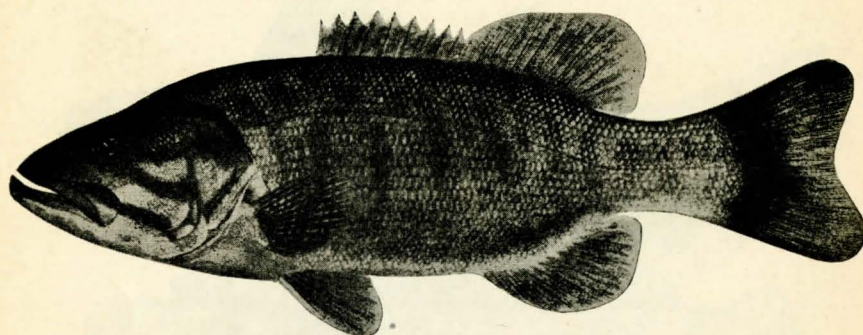
Reproduction.—They spawn in May on sandy bottoms or among weeds in shallow water. The eggs are more or less concealed in the bottom debris and sand particles.

Economic Value and Management.—The darters are the humming birds of the fish tribe. They are small, brilliantly colored, swiftly moving fishes commonly mistaken for minnows or young perch and pike-perch. More than 80 species are found in North America and perhaps 20 or more will be found in Iowa. The majority of them are less than 4 inches long. Because of their habits and small size they have no economic importance except as forage for game fish.

They do, however, present an interesting group for scientific study in relation to environmental pressures, and as a group for aesthetic consideration in general conservation.

Small-mouthed Bass

Micropterus dolomieu Lacépède



Courtesy Ohio Department of Agriculture

Other Common Names: Tiger Bass, Small-mouth, Black Bass

Description.—Color of upper parts silvery to golden green. Cheeks have five olive-green bars radiating backward from eye. These bars are absent in the other species. The notch in caudal fin is more open and crescent-shaped than in the large-mouthed bass. Vertical line upward from mouth corner passes in front of eye. Dorsal spines are about of equal length which makes the spiny dorsal fin low and long compared to the higher, rounded, spiny dorsal fin of the large-mouthed bass.

Range in Iowa.—Although scattered throughout the state this species is more abundant in the clearer and colder streams. Small-mouth are being stocked more extensively than formerly and their abundance and popularity is increasing.

Food Habits.—The small-mouth feeds on other fish, insect larvae and crayfish.

Reproduction.—This species spawns on gravel beds in water about 18 inches deep. They have been observed on nests in water at 57 degrees Fahrenheit. Spawning begins when water becomes 5 or 6 degrees warmer. In propagation work, spawning beds of pea-sized gravel are used, although at times nests are made in mud by the side of the prepared spawning areas.

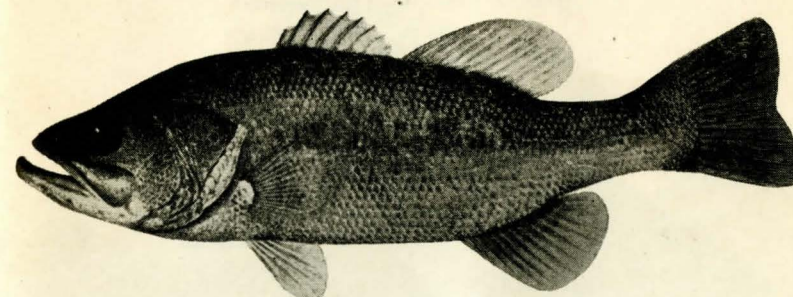
Economic Value and Management.—The flesh is firm and well flavored but the fish is not abundant enough over the state to be universally important. It is considered the gamiest of the basses and the acme of top lure fishing.

The management in pond culture can be similar to that of the large-mouth with good results and presents no greater difficulties. However, the small-mouth can be propagated with better success in colder water than can the large-mouth.

It is taken in those sections of Iowa rivers that are not heavily silted or polluted, where the stream bed is rocky, where vegetation is abundant, and water movement is fairly swift. They are taken in lakes that have both emergent and floating vegetation and water depths of 10 feet or more. Perhaps because they are gamier they are more sought after than the large-mouth by the more ardent angler. Their reputed better flavor is due to the type of water they more frequently inhabit.

Large-mouthed Bass

Aplites salmoides (Rafinesque)



Courtesy of Natural History Survey of Illinois

Other Common Names: Black Bass, Green Bass, Large-mouth

Description.—Color of back and sides dark green. Young specimens have a dark lateral band from end of snout to caudal fin. The mouth is large, lower jaw protruding. Vertical line from mouth upward passes behind eye. Dorsal spines are graduated and the spinous part of the dorsal fin is nearly separated from the soft part. Length from 10 to 25 inches.

Range in Iowa.—Found throughout Iowa in both lakes and streams. It is abundant in the upper Mississippi River. The artificial lakes and reservoirs of southern Iowa are stocked with this species.

Food Habits.—The large-mouthed bass is a well known carnivore and feeds largely on other fishes. Crayfish are freely eaten as well as insects, frogs, and other surface forms. The young bass feed on "water-bugs" when in the fry stage but shortly include other fish in their diet.

Reproduction.—This species spawns from about May 20th in the southern part of the state to early June farther north when the water temperature approaches 68 degrees Fahrenheit. The male fish builds the nest by fanning out a round depression 2 or 3 inches deep and from 12 to 16 inches across. The females are then herded over the nest where they deposit their spawn which is then fertilized by the male. One male secures the spawn of several females and guards the nest about a week until the young hatch. The fry stay schooled from 4 to 10 days and then scatter to fend for themselves.

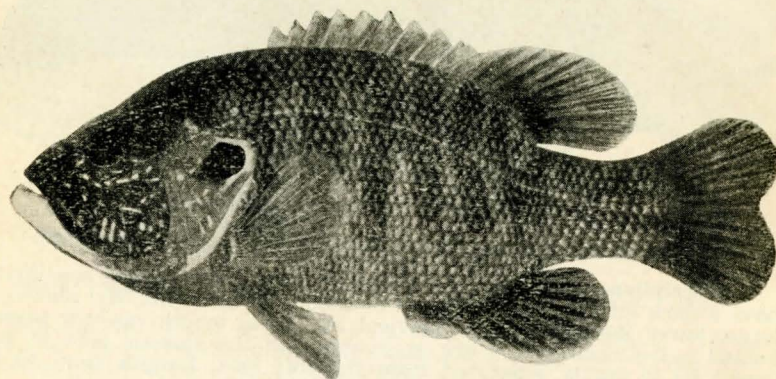
Economic Value and Management.—The large-mouthed bass is a favorite game fish of Iowa anglers. The meat is solid, flaky, and without fine bones—an acceptable table delicacy.

The pond culture of this fish is a major activity of the State Fisheries Division. The ease, with reasonable knowledge and care, that attends the propagation of this fish, coupled with its other qualities, places it in prime favor with those interested in fish or fishing.

Its culture in ponds can be successful by either farmers or sportsmen's groups and does not require elaborate equipment. For best results the parent fish should not be left in the rearing ponds. The State uses brood ponds and transfers the fry to rearing ponds. Supplying enough food will keep all fish growing at an equal rate and hold cannibalism at a minimum.

Green Sunfish

Apomotis cyanellus (Rafinesque)



Courtesy of Natural History Survey of Illinois

Other Common Names: Blue-spotted Sunfish, Rubbertail

Description.—Dorsal outline curved, ventral outline much straighter. A slight notch at nape. Color, olive green above, coppery below. Each scale has a spot of emerald green. The sides are marked with seven or eight dusky vertical bars. A large black blotch shows at base of soft dorsal and anal fins. Mouth large, bass-like. Average length is from 4 to 7 inches. Too small to be important in game fish lists.

Range in Iowa.—Abundant throughout Iowa, found in ponds and small creeks, commonly mistaken for the bluegill sunfish.

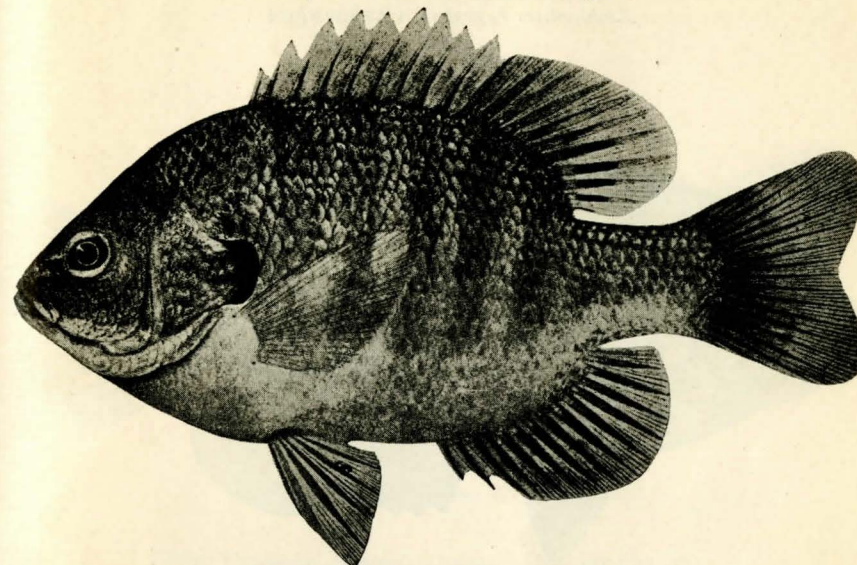
Food Habits.—Feeds on small fishes, insect larvae, crayfish, worms, and the like.

Reproduction.—Spawns through July; is not prolific. Seems to prefer a rather solitary existence in small streams, yet in many ponds of muddy bottoms this species becomes so abundant it literally crowds out other types.

Economic Value and Management.—Although small it is an excellent pan fish and young fishermen delight in taking this fish throughout the summer months from Iowa ponds and reservoirs. Because of its undesirable size care should be taken to avoid stocking this fish where bluegills are wanted. Where green sunfish have become so abundant as to be obnoxious, they should be thinned out by seining. After this is done, stock the area with large-mouthed black bass. The bass will have a tendency to keep the sunfish in check.

Bluegill

Helioperca macrochira (Rafinesque)



Courtesy Ohio Department of Agriculture

Other Common Names: Roach, Bream, Sunfish

Description.—Body outline to beginning of caudal peduncle squarish. Color light to dark olive with purplish luster. Six or more distinct dusky vertical bars on sides. These vertical bars identify the young bluegill from other sunfish. Fins dusky, dorsal fin with a blotch at base of last rays. Head short and small. Mouth very oblique, jaws equal in length. Flap of gill-cover black with no red spot and without light border. Length ranges from 5 to 12 inches. This is the largest of the Iowa sunfishes.

Range in Iowa.—Abundant in northern Iowa lakes and common throughout the state. This species is stocked in the artificial lakes and is the only sunfish distributed in inland waters by the State Fisheries Division.

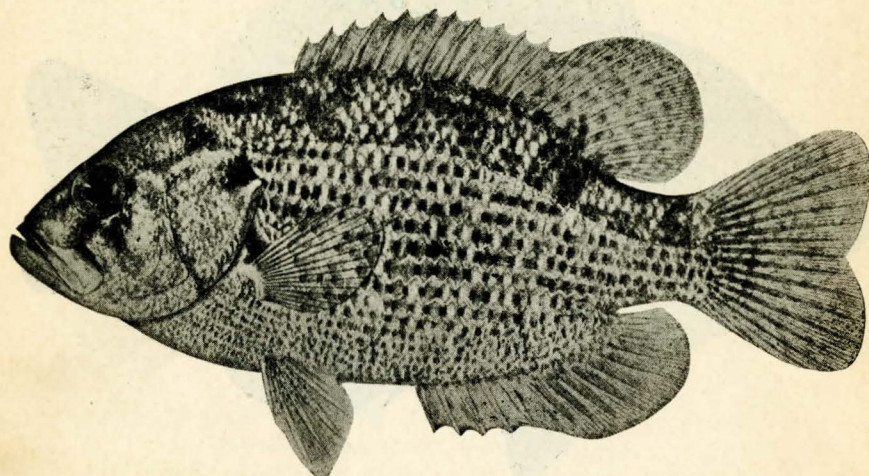
Food Habits.—The food consists of both animal and vegetable matter. Insect larvae, crustaceans, worms, small fishes and fragments of aquatic plants form the principal bill of fare.

Reproduction.—Bluegills spawn during the last week of May and through the early part of June. They, like the crappie, build nests on sandy or silt bottoms. Like the crappies they are easily propagated in ponds. In lakes, bluegills seek the quiet water among the bullrushes for their crater-like nests.

Economic Value and Management.—This sunfish has firm, flaky meat and its large size classes it as a super-pan-fish. They are easily taken either by still fishing or fly casting, and have become the favorite of many fishermen. Their culture is almost identical with the crappie and they provide an excellent by-product of bass cultural work. Because they are more prolific than the bass and grow slower they provide forage for the young bass and still show a surplus for stocking purposes when ponds are drained in the fall.

Rock Bass

Ambloplites rupestris (Rafinesque)



Courtesy Ohio Department of Agriculture

Other Common Names: Redeye, Goggle Eye

Description.—Body robust. Dorsal profile and ventral profile in similar symmetry. Head large. No deep angle above eye. Eye large and reddish. Body color olive with black, squarish markings on scales of side. Scales on belly with spots on each scale. Dorsal fin long and low. Reaches length up to 12 inches. Averages much smaller.

Range in Iowa.—Found throughout Iowa, most abundant in north-east portion. Prefers clear water and seems to be chiefly a fish of the smaller streams.

Food Habits.—Feeds on small crustaceans, insect larvae, and some small fish. Rises to the fly.

Reproduction.—Spawns in June on gravel beds. The natural sites selected are in the current which keeps eggs aerated.

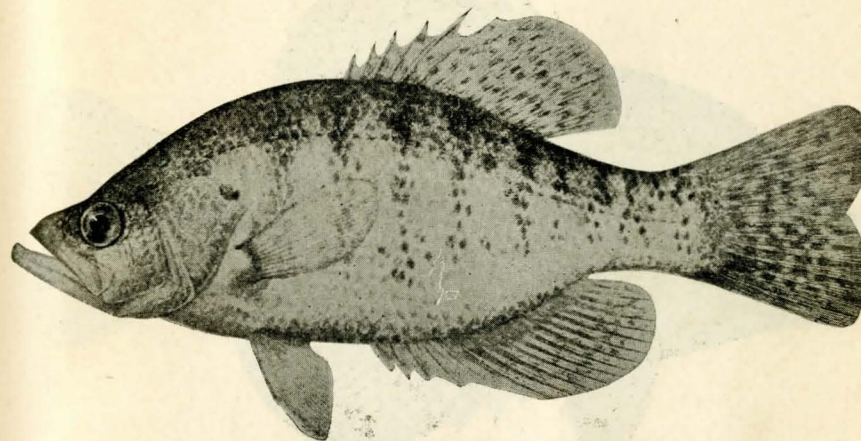
Economic Value and Management.—This fish is not abundant enough to be very important to anglers. However, fly fishermen delight in getting a rise from the "goggle-eye" when casting for small-mouth bass.

They can be used as a by-product of bluegill or crappie pond culture in northern Iowa where pond water stays fairly cool.

Even though rock bass could easily and successfully be propagated artificially, they can never reach a place of importance as a pan-fish in Iowa because of their uniformly small size, ordinary food quality, and lack of prolific tendencies.

White Crappie

Pomoxis annularis (Rafinesque)



Courtesy Ohio Department of Agriculture

Other Common Names: Crappie, Ringed Crappie, Tin-mouth, Speckled Perch

Description.—Body compressed, back elevated, its profile a long sweeping S-curve from tip of mouth to end of tail fin. Color silvery white, mottled with dark green, the markings arranged in narrow vertical bars. Spines in dorsal fin typically six. Head is small, mouth is large and oblique. Weight ranges up to 2 pounds.

Range in Iowa.—Common over Iowa in sluggish water, bayous, lakes and ponds; seems to prefer muddy bottoms.

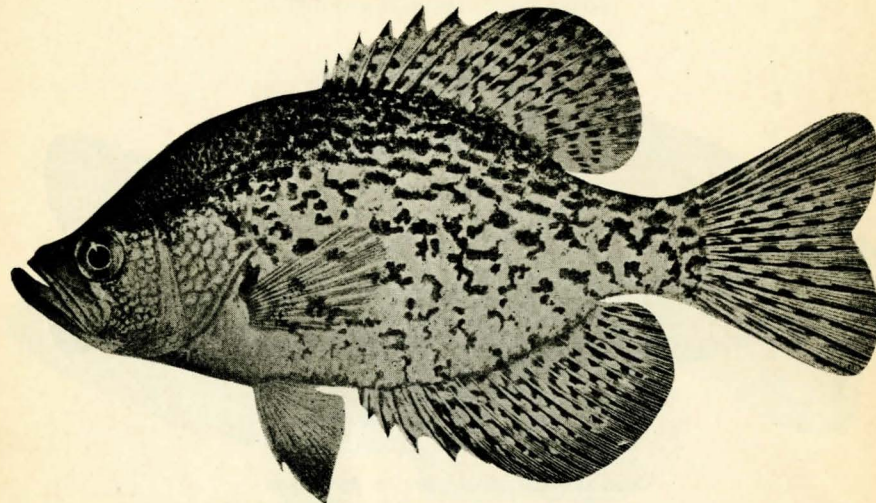
Food Habits.—Feeds on insect life, small fish and crustaceans.

Reproduction.—They are found preparing nests when water is less than 70 degrees Fahrenheit, spawning in late May and early June. They build nests on sandy or muddy bottoms. The fry grow fast for a few weeks but, on the average, scarcely exceed 2½ inches in length by the end of the first summer. In pond propagation they can be grown to 3½ to 4½ inches in 90 days.

Economic Value and Management.—These fish are easily taken by still fishing and, because of their excellent flavor, white, flaky meat and freedom from fine bones, are much sought for food. They are easily propagated in ponds. From 2 to 15 pairs in an acre pond will produce from 8 to 15 thousand fingerling for fall stocking. Young minnows and a fertilizer culture will supply natural food. They can be stocked with large-mouth bass in ponds and serve as a by-product in bass culture for a surplus of young crappies will survive the bass feeding. Brush shelters have been installed in the artificial lakes of Iowa to improve crappie environment. Plans have been formed to install similar devices in natural lakes suited for crappie propagation. This is, no doubt, one of our finest pan-fish.

Black Crappie

Pomoxis sparoides Lacépède



Courtesy Ohio Department of Agriculture

Other Common Names: Calico Bass, Strawberry Bass, Giant Crappie

Description.—Body is less elongate than the preceding species and not as compressed, neither is head as small. It is proportionately deeper and the notch above the eye is not as prominent. The dark markings on the sides are scattered and not arranged to form vertical bands as in the white crappie. The dorsal spines are typically seven.

Range in Iowa.—Common over Iowa. When available this species is used for stocking the artificial lakes because it seems to prefer deeper and clearer waters than the white crappie and does not display tendency toward "dwarfiness". The black crappie is the common species of Clear Lake, as well as other northern lakes.

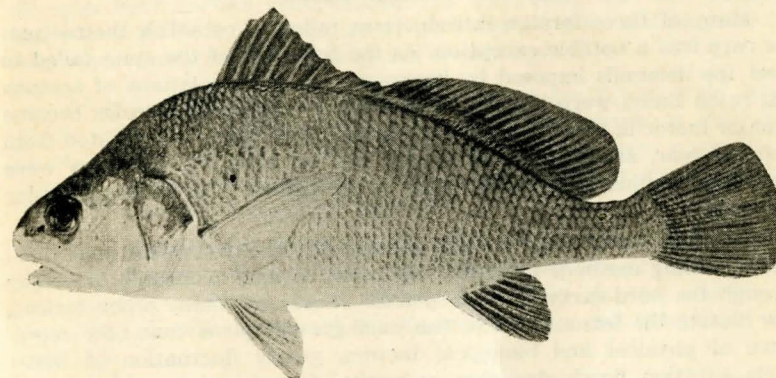
Food Habits.—About identical with that of the white crappie.

Reproduction.—Spawns about first of June to middle of the month, although they start forming nests early in May when water is 66 degrees Fahrenheit.

Economic Value and Management.—There is no finer pan-fish. They are easily taken and furnish unlimited sport to all fishermen. Like the white species, they are easily propagated in ponds and require about the same type of care and food. Private individuals and sportsmen can raise numbers of these fish yearly for local stocking. Ponds from $\frac{1}{4}$ to 1 or 2 acres in area are about ideal. Have water in ponds by April 15. Arrange, in two or three piles, about 1,000 pounds of manure per pond-acre every 2 weeks. This, with a stocking of 1,000 brood fathead minnows per pond-acre by May 1, will provide necessary food for young crappies. The water level of the pond should not be allowed to fluctuate more than 6 inches. The pond depth should range from 12 inches to 5 feet and two-thirds of the area should be covered with water 3 $\frac{1}{2}$ feet deep or less.

Sheepshead

Aplodinotus grunniens Rafinesque



Courtesy of Natural History Survey of Illinois

Other Common Names: Fresh-water Drum, Drum, Silver Perch, River Perch, Croaker, Grunter, Gaspergou

Description.—Profile angled above eye, humped in front of dorsal fin. Color silvery gray on sides, belly white. Many fine black dots scattered over body. Dorsal fins continuous. Tail fin not notched, somewhat obtuse. Lower jaw shorter than upper. Head small, nose blunt. Reaches a weight of from $\frac{1}{2}$ to 25 pounds or more.

It is thought the grunting noise is produced by vibrations of the swim bladder. There are two round, button-like bones in the head connected with the ear mechanism that are extracted and carried by the youthful angler as lucky stones.

Range in Iowa.—Abundant in Des Moines River basin, also common in Okoboji region and Storm Lake.

Food Habits.—The young feed on insect larvae, yet mollusks are the principal diet of the sheepshead. The hard shells of the snails and clams are cracked and broken by the grinding pharyngeal molars. The soft parts of the clams are used and the bits of shells are expelled back through the mouth.

Economic Value and Management.—It has best food value when about a pound in weight. In large specimens the flesh has a strong flavor. Taken by commercial fishermen and sold as river perch, the sheepshead finds a fair market.

In Storm Lake the sheepshead has become so abundant that its food supply fails to meet the demand, resulting in a lake full of starved molluscan feeders. The decrease in numbers of meat-eating fish, such as bass and pike, is proportional to the tremendous increase of sheepshead. For this reason heavy stocking of basses and other carnivorous fish will tend to restore a population balance in the lake.

FISH MANAGEMENT

The early management of fish in Iowa consisted of introducing fish not native to the state in the hope perhaps that Iowa might gain a fishing reputation comparable to other states.

Many of these foreign introductions failed to establish themselves; the carp was a notable exception. As the fish yield of the state failed to meet the demands imposed by increased fishing, regulations of seasons and catch limits were imposed. The enforcement of these rules became a major factor in fish management and as fishing history fluctuated from year to year, stocking, creel limits, and enforcement measures were accordingly adjusted in an attempt to compensate for these particular variations.

The passage of time brought changes in the stream and lake characters, fishing methods improved, all areas became accessible to fishing through the hard-surfaced road system. These, and many other factors, now dictate the formulation of fish management plans that take cognizance of physical and biological factors, yearly fluctuation of water levels, siltation, floods, droughts, extremes of temperature, and all other factors that complicate fish life.

The solution of a statewide problem of fish culture involves propagation by hatcheries and ponds to augment natural reproduction, collection of game fish from land-locked pools in the Mississippi River flood plain, rescue of fish from flooded areas and their return to mother waters, stocking specific species from rescue areas and propagation sources to suitable waters, control of obnoxious fish by seining and netting, aeration of lakes through the winter months, regulation of seasons, tackle and take, survey of physical and biological factors, improvement of state waters by natural and artificial means. In a sentence, the solution to fish management is the evaluation of these phases and their fusion into a single working plan to place fish and their management on an equal basis with crops, cattle, coal mining or any other of the industries natural to the state.

A knowledge of fish, their habits, anatomy, and ecology are necessary in prescribing remedial measures. Attention is directed to the feeding habits of fish. Fish fall in three classes as feeders—meat-eating, plant-eating, and those that eat what is at hand. There are fish that eat meat when young and plants when adult, and there are fish which have the reverse habit.

There are fish that feed on bottom forms of plant and animal life, and there are fish that live strictly on top life forms. There are also fish that feed in both regions and fish that feed in open water. Not only do fish have wide ranges in food habits but they have wide differences in spawning habits as well.

Some fish build nests, guard the eggs, and tend the young until they are large enough to fend for themselves. Other fish scatter their

eggs at random and leave the hatching wholly to chance, and the young must battle for existence without parental care. Nesting places may be sandy bottoms, muddy bars, rocky reefs, or holes in clay banks. Some spawning areas require vegetation on which eggs may be fastened and some spawning areas selected are barren shallows. Not only do eggs have certain requirements for incubation but the young fish must emerge from the eggs in an environment that affords both food and cover protection while they are fingerlings.

After the fingerling stage is passed living conditions must remain stable until the fish reach reproductive age and propagate their kind. In short, fish must be able to secure proper food, they must have a suitable spawning area in order to reproduce and they must be able to adapt themselves to their environment.

The environment is the aggregate of all conditions that influence the life of each individual fish. Such factors are temperature, gaseous and mineral content of the water, winds and storms, floods and droughts, all other forms of life in water, birds and animals of prey, and man.

The grouping of the general environmental factors that affect fish life in Iowa creates a trout stream section in northeast Iowa, small-mouthed black bass streams in central and eastern Iowa, pike-perch lakes, bass, crappie, bluegill and bullhead lakes—all areas with different problems, all sections requiring individual treatment.

The food and spawning habits of fish and their rate of growth, coupled with their abundance in their particular locality dictate the rules for the fish crop take. As an illustration, the legal length established by the Conservation Commission as a minimum for fish to be taken is about the length fish reach in their third year giving an opportunity for natural productivity. This length is also about the minimum desirable for table use.

When some fish reach a large size their fecundity becomes lessened. For this reason large fish are removed from some areas to assist in keeping a balance between numbers of fish and amount of available food.

The seasons for taking fish are designated at dates that will permit fish to spawn before being taken. The daily limit is based on the population of fish and the number necessary for a reasonable creel. The method for taking fish considers the type of injury to fish that escape after being hooked, and tackle necessary for taking particular fish. The places where fish may be taken are designated so that fish will not be taken from spawning areas or at places of low fish population.

Although regulations are a necessary part of fish management it is obvious that regulations will not in themselves manage fish, since many other factors play an important role in fish management.

*LIST OF NATIVE FISHES KNOWN FROM IOWA

COMMON NAME	SCIENTIFIC NAME
1. Western Silver Lamprey	<i>Ichthyomyzon castaneus</i> Girard
2. American Brook Lamprey	<i>Entosphenus appendix</i> (DeKay)
3. Paddlefish	<i>Polyodon spathula</i> (Walbaum)
4. Rock Sturgeon	<i>Acipenser fulvescens</i> Rafinesque
5. Shovel-nosed Sturgeon	<i>Scaphirhynchus platyrhynchus</i> (Rafinesque)
6. White Sturgeon	<i>Parasphirhynchus albus</i> Forbes and Richardson
7. Short-nosed Gar	<i>Lepisosteus platostomus</i> Rafinesque
8. Long-nosed Gar	<i>Lepisosteus osseus</i> (Linnaeus)
9. Dogfish	<i>Amia calva</i> Linnaeus
10. Mooneye	<i>Hiodon tergisus</i> Le Sueur
11. Goldeye	<i>Amphiodon alosoides</i> Rafinesque
12. Skipjack	<i>Pomolobus chrysochloris</i> Rafinesque
13. Ohio Shad	<i>Alosa ohioensis</i> Evermann
14. Gizzard Shad	<i>Dorosoma cepedianum</i> (Le Sueur)
15. Brook Trout	<i>Salvelinus fontinalis</i> (Mitchill)
16. Big-mouthed Buffalo	<i>Megastomatobius cyprinella</i> (Cuvier and Valenciennes)
17. Black Buffalo	<i>Ictiobus niger</i> (Rafinesque)
18. Small-mouthed Buffalo	<i>Ictiobus bubalus</i> (Rafinesque)
19. Quillback	<i>Carpiodes cyprinus</i> (Le Sueur)
20. River Carpsucker	<i>Carpiodes carpio</i> (Rafinesque)
21. Blunt-nosed Carpsucker	<i>Carpiodes velifer</i> (Rafinesque)
22. Blue Sucker	<i>Cyprinus elongatus</i> (Le Sueur)
23. Common Sucker	<i>Catostomus commersonnii commersonnii</i> Lacépède
24. Hog Molly	<i>Hypentelium nigricans</i> (Le Sueur)
25. Chub Sucker	<i>Erimyzon</i> sp.
26. Spotted Sucker	<i>Minytremma melanops</i> (Rafinesque)
27. Black Mullet	<i>Moxostoma duquesnii</i> (Le Sueur)
28. Golden Mullet	<i>Moxostoma erythrurum</i> Rafinesque
29. Silver Mullet	<i>Moxostoma anisurum</i> Rafinesque
30. Northern Redhorse	<i>Moxostoma aureolum</i> (Le Sueur)
31. River Redhorse	<i>Placopharynx carinatus</i> Cope
32. Lake Chub	<i>Conestus plumbeus</i> (Agassiz)
33. Horny-headed Chub	<i>Nocomis biguttatus</i> (Kirtland)
34. Plains Flat-headed Chub	<i>Platypharodon gracilis communis</i> (Girard)
35. Spotted Chub	<i>Erimystax dissimilis</i> (Kirtland)
36. Silver Chub	<i>Hybopsis storerianus</i> (Kirtland)
37. Northern Longnose Chub	<i>Extrarius aestivus hyostomus</i> (Gilbert)
38. Sickle-finned Chub	<i>Macrhybopsis meeki</i> (Jordan and Evermann)
39. Black-nosed Dace	<i>Rhinichthys atronatus meleagris</i> Agassiz
40. Long-nosed Dace	<i>Rhinichthys cataractae</i> (Cuvier and Valenciennes)
41. Northern Creek Chub	<i>Semotilus atromaculatus atromaculatus</i> (Mitchill)
42. Southern Red-bellied Dace	<i>Chrosomus erythrogaster</i> Rafinesque
43. Northern Common Shiner	<i>Notropis cornutus frontalis</i> (Agassiz)
44. Northern Red-finned Shiner	<i>Notropis umbratilis cyanocephalus</i> (Copeland)
45. Emerald Shiner	<i>Notropis atherinoides</i> Rafinesque
46. Rosy Shiner	<i>Notropis rubellus</i> (Agassiz)
47. River Shiner	<i>Notropis blennioides</i> (Girard)
48. Northern Spot-tailed Shiner	<i>Notropis hudsonius hudsonius</i> (Clinton)
49. Northern Weed Shiner	<i>Notropis nux richardsoni</i> Hubbs and Greene
50. Big-eyed Shiner	<i>Notropis boops</i> Gilbert
51. Black-chinner Shiner	<i>Notropis heterodon</i> (Cope)
52. Northern Steel-colored Shiner	<i>Notropis whiplii spilopterus</i> (Cope)
53. Plains Red Shiner	<i>Notropis lutrensis lutrensis</i> (Baird and Girard)
54. Central Big-mouthed Shiner	<i>Notropis dorsalis dorsalis</i> (Agassiz)
55. Central Sand Shiner	<i>Notropis deliciosus deliciosus</i> (Cope)
56. Plains Sand Shiner	<i>Notropis deliciosus missouriensis</i> (Cope)
57. Northern Sand Shiner	<i>Notropis deliciosus stramineus</i> (Cope)
58. Mimic Shiner	<i>Notropis volucellus volucellus</i> (Cope)
59. Channel Shiner	<i>Notropis volucellus wickliffi</i> Trautman
60. Ghost Shiner	<i>Notropis volucellus bucanani</i> Meek
61. Topeka Shiner	<i>Notropis topeka</i> Gilbert
62. Black-nosed Shiner	<i>Notropis heterolepis heterolepis</i> Eigenmann and Eigenmann
63. Pug-nosed Shiner	<i>Notropis anogenus</i> Forbes
64. Sucker-mouthed Minnow	<i>Phenocobius mirabilis</i> (Girard)
65. Western Golden Shiner	<i>Notemigonus crysoleucas auratus</i> (Rafinesque)
66. Ozark Minnow	<i>Dionda nubila</i> (Forbes)

*Dr. Carl L. Hubbs has modernized the sequence of species, corrected the Potter and Jones list, and made a number of additions from his own original work. The author found *Notropis umbratilis cyanocephalus* in Franklin County in 1935. Formerly on the hypothetical list for Iowa.

67. Brassy Minnow	<i>Hybognathus hankinsoni</i> Hubbs
68. Mississippi Silver Minnow	<i>Hybognathus nuchalis</i> Agassiz
69. Bullhead Minnow	<i>Hybargyrus velox</i> (Girard)
70. Blunt-nosed Minnow	<i>Hyborhynchus notatus</i> (Rafinesque)
71. Northern Fathead Minnow	<i>Pimephales promelas promelas</i> Rafinesque
72. Mississippi Stoneroller Minnow	<i>Campostoma anomalum pullum</i> Agassiz
73. Channel Catfish	<i>Ictalurus punctatus</i> (Rafinesque)
74. Blue Catfish	<i>Ictalurus furcatus</i> (Cuvier and Valenciennes)
75. Northern Black Bullhead	<i>Ameiurus melas melas</i> (Rafinesque)
76. Northern Brown Bullhead	<i>Ameiurus nebulosus nebulosus</i> (Le Sueur)
77. Northern Yellow Bullhead	<i>Ameiurus natalis natalis</i> (Le Sueur)
78. Shovel-headed Catfish	<i>Pilodictis olivaris</i> (Rafinesque)
79. Stone Cat	<i>Noturus flavus</i> Rafinesque
80. Tadpole Madtom	<i>Schilbeodes gyrynus</i> (Mitchill)
81. Blender Madtom	<i>Schilbeodes exilis</i> (Nelson)
82. Brindled Madtom	<i>Schilbeodes miurus</i> (Jordan) (Doubtful)
83. Western Mud Minnow	<i>Umbra limi</i> (Kirtland)
84. Western Mud Pickerel	<i>Esox vermiculatus</i> Le Sueur
85. Northern Pike	<i>Esox lucius</i> Linnaeus
86. Tiger Muscalonge	<i>Esox masquinomyg immaculatus</i> Garrard
87. American Eel	<i>Anguilla bostoniensis</i> (Le Sueur)
88. Menona Banded Killifish	<i>Fundulus diaphanus menona</i> Jordan and Copeland
89. Plains Topminnow	<i>Fundulus sciadicus</i> Cope
90. Black-striped Topminnow	<i>Fundulus notatus</i> (Rafinesque)
91. Starheaded Topminnow	<i>Fundulus dispar</i> (Agassiz)
92. Brook Silverside	<i>Labidesthes sicculus</i> (Cope)
93. Trout-perch	<i>Percopsis omiscomaycus</i> (Walbaum)
94. White Bass	<i>Lepibema chrysops</i> (Rafinesque)
95. Yellow Bass	<i>Morone interrupta</i> Gill
96. Yellow Perch	<i>Perca flavescens</i> (Mitchill)
97. Sauger	<i>Stizostedion canadense canadense</i> (Smith)
98. Yellow Pike-perch	<i>Stizostedion vitreum</i> (Mitchill)
99. Gilt Darter	<i>Hadropterus evis</i> (Jordan and Copeland)
100. Black-sided Darter	<i>Hadropterus maculatus</i> (Girard)
101. Longheaded Darter	<i>Hadropterus phoxocephalus</i> (Nelson)
102. Northern Log Perch	<i>Percina caprodes semifasciata</i> (DeKay)
103. Channel Darter	<i>Imostoma shumardi</i> (Girard)
104. Sand Darter	<i>Ammocrypta pellucida</i> (Baird)
105. Crystal Darter	<i>Crystallaria asprella</i> (Jordan)
106. Western Johnny Darter	<i>Boleosoma nigrum nigrum</i> (Rafinesque)
107. Northern Banded Darter	<i>Poecilichthys zonalis zonalis</i> Cope
108. Rainbow Darter	<i>Poecilichthys coeruleus</i> Storer
109. Orange-throated Darter	<i>Poecilichthys spectabilis spectabilis</i> Agassiz
110. Mud Darter	<i>Poecilichthys jessiae</i> (Jordan and Brayton)
111. Iowa Darter	<i>Poecilichthys exilis</i> (Girard)
112. Striped Fan-tailed Darter	<i>Catnotus fiabellaris lineolatus</i> Agassiz
113. Least Darter	<i>Microperca punctulata</i> Putnam
114. Northern Green-sided Darter	<i>Etheostoma blennioides blennioides</i> Rafinesque
115. Small-mouthed Bass	<i>Micropterus dolomieu</i> Lacépède
116. Large-mouthed Bass	<i>Aplites salmoides</i> (Rafinesque)
117. Warmouth Bass	<i>Chaenobryttus gulosus</i> (Cuvier and Valenciennes)
118. Green Sunfish	<i>Apomotis cyanellus</i> (Rafinesque)
119. Orange-spotted Sunfish	<i>Allotis humilis</i> (Girard)
120. Bluegill	<i>Helioperca macrochira</i> (Rafinesque)
121. Northern Long-eared Sunfish	<i>Xenotis megalotis peltastes</i> (Cope)
122. Southern Sunfish	<i>Eupomotis microlophus</i> (Günther)
123. Pumpkinseed	<i>Eupomotis gibbosus</i> (Linnaeus)
124. Rock Bass	<i>Ambloplites rupestris</i> (Rafinesque)
125. Black Crappie	<i>Pomoxis sparoides</i> (Lacépède)
126. White Crappie	<i>Pomoxis annularis</i> (Rafinesque)
127. Brook Stickleback	<i>Eucalia inconstans</i> (Agassiz)
128. Sheepshead	<i>Aplodinotus grunniens</i> Rafinesque
129. Northern Muddler	<i>Cottus bairdii bairdii</i> Girard
130. Slimy Muddler	<i>Cottus cognatus</i> Richardson
131. American Burbot	<i>Lota maculosa</i> (Le Sueur)

In addition to this number of fish, there are 31 other species that may be found in Iowa.

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