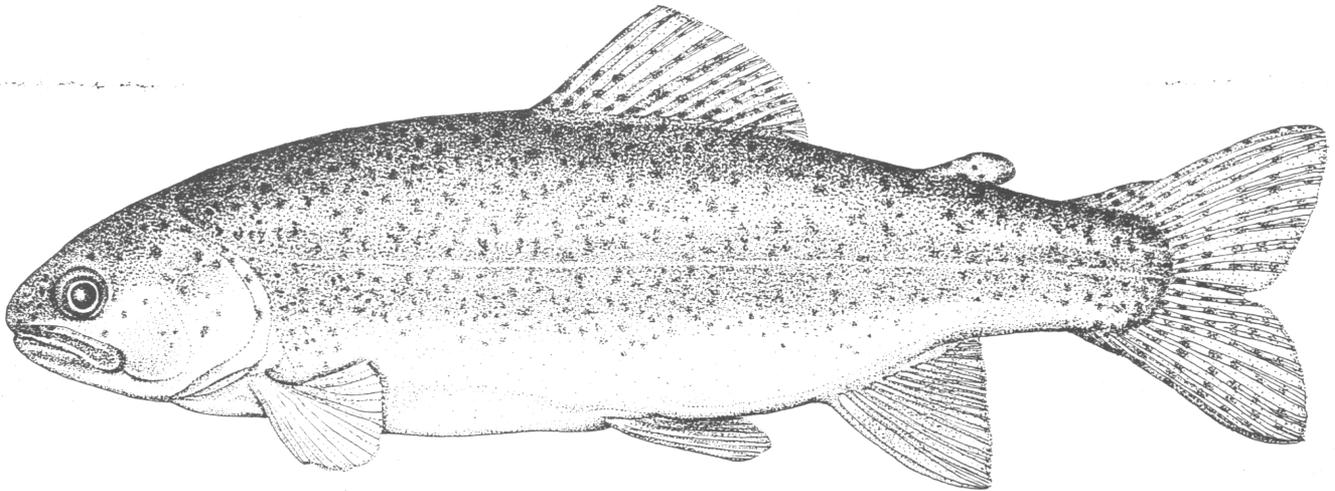


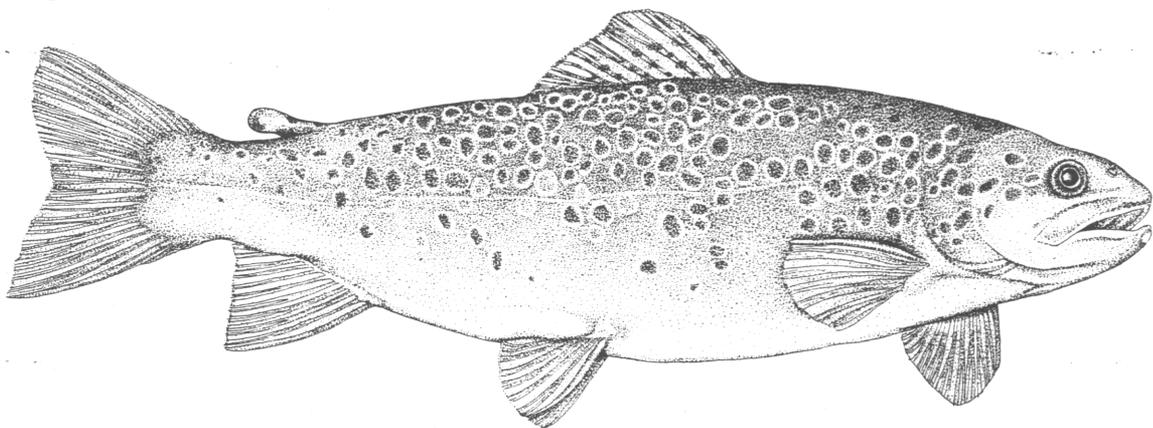
NON-NATIVE FISHES OF GRAND CANYON

a selection of nine exotic species



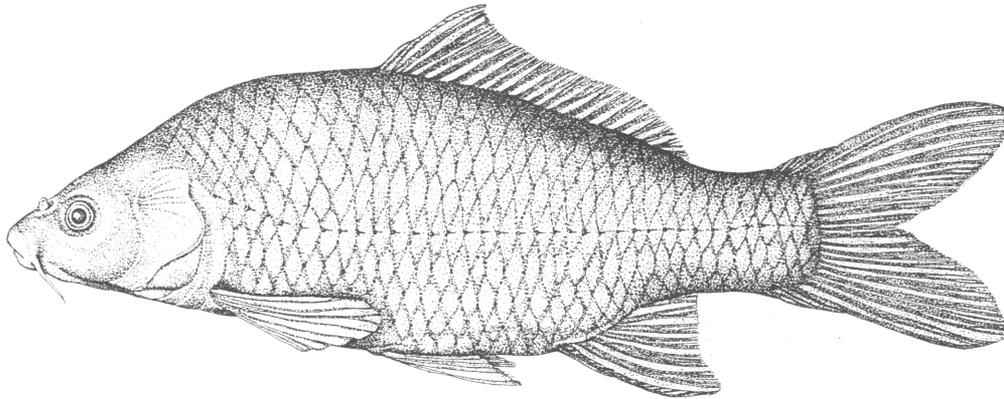
RAINBOW TROUT (*Oncorhynchus mykiss*)

Abundant in upper Grand Canyon. A silvery, soft-rayed trout with small, irregular black spots evenly distributed over the body, head, and fins, and a light orange-pink lateral band. Cutthroat trout, (*Oncorhynchus clarki*) are golden-bronze with regular round spots, greatest in number toward the tail, and a reddish-orange throat slash. Rainbow trout are managed as a blue ribbon tailrace fishery between Glen Canyon Dam and Lees Ferry, with hatchery fish released periodically to augment natural reproduction. Spawning in Grand Canyon occurs Octoberber to March, with large females depositing up to 3,000 eggs. Hatching occurs in 60 days at temperatures of 45°F. Maximum size is in excess of 10 pounds in Grand Canyon. Diet generally consists of insects and freshwater amphipod (*Gammarus lacustris*), although fish in Grand Canyon also absorb fats from millions of microscopic diatoms attached to green algae (*Cladophora glomerata*). Rainbow trout are found throughout Grand Canyon, but numbers are greatly reduced below turbid inflows such as the Paria River and Little Colorado River. They spawn in tributaries throughout the canyon in winter, such as Bright Angel, Shinumo, Deer Creek, Tapeats, and Nankoweap, where they provide an important food source for bald eagles. Rainbow trout probably prey on young native fishes, and compete for the same food, but the degree of competition is unknown.



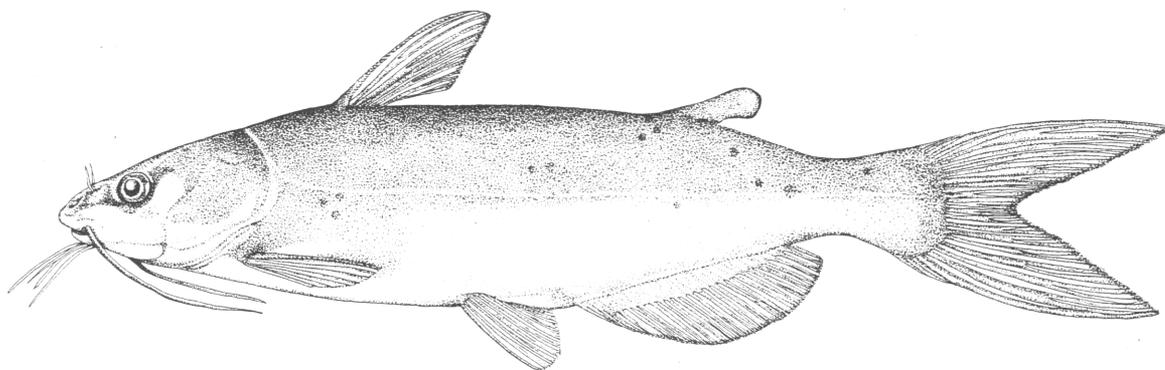
BROWN TROUT (*Salmo trutta*)

Locally common in middle Grand Canyon. A silver to greenish-brown soft-rayed trout with a yellowish belly, and small red spots surrounded by bluish halos. Most common in and near Bright Angel Creek, where the species spawns from October through March. Large females deposit 3,000 to 6,000 eggs, that incubate in 50 days at 50°F. Maximum size in excess of 15 pounds in Grand Canyon; world record 50 pounds. More tolerant to warm water and turbidity than rainbow trout. Also, tend to be more predaceous at a smaller size. Diet consists of insects, freshwater amphipods, and small fish. Uncommon in tailrace between Glen Canyon Dam and Lees Ferry. Brown trout prey on small and young native fish, but the degree of predation is unknown.



COMMON CARP (*Cyprinus carpio*)

Common in Grand Canyon and abundant in upper Lake Mead. A robust fish with large scales, dark golden body, more than 12 dorsal rays, toothless jaws, and a barbel at each corner of the upper jaw. The first ray of the dorsal and anal fins is spinous and strongly serrated. May attain a weight of 80 pounds. "Mirror carp" and "Jerusalem carp" have few very large scales. Spawning occurs in small aggregations with females releasing thousands of eggs, and young hatching in 4 to 6 days at 60°F. Carp feed on the bottom, vacuuming insects, algae, and organic matter. Carp are the most widespread and abundant non-native fish in North America, first introduced in 1872, from Germany. Carp were imported into the U.S. by the U.S. Fish Commission under President Ulysses S. Grant, as a valued food fish, and quickly raised and distributed to many states from 1879 to 1896. This wide distribution enabled the species to take hold in most drainages of North America, where it is commercially harvested in some regions, but considered a pest in most parts of the country. Carp are locally abundant in sheltered habitats of the Colorado River Basin, particularly in off-river impoundments, backwaters, and sand-silt tamarisk-lined banks that now dominate the Colorado and Green rivers. In Grand Canyon, carp probably constitute the greatest biomass of any species. Another large Asian cyprinid, the grass carp or white amur (*Ctenopharyngodon idella*) attains 100 pounds in weight, and is reported from the lower basin.



CHANNEL CATFISH (*Ictalurus punctatus*)

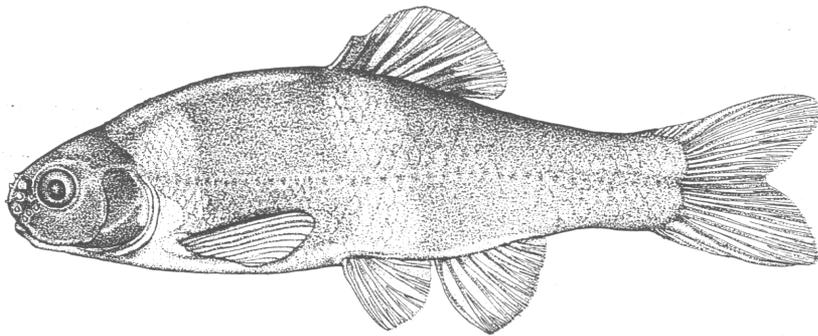
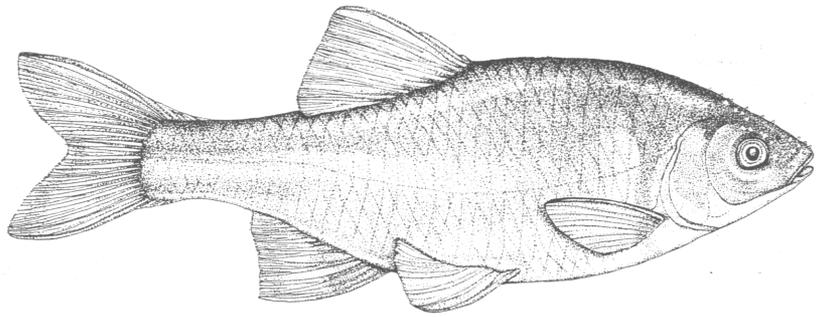
Locally common in Grand Canyon. Channel catfish were first introduced into the Colorado River near Moab, Utah in 1919 by active sportsman and public figure, Horace Stone Rutledge. The fingerlings were received from a hatchery in Kansas, with approval from the Bureau of Fisheries in Washington, D.C. They are common in some tributaries and tributary inflows of Grand Canyon, such as the Little Colorado River. Channel catfish are abundant in the middle reaches of the upper basin, particularly in canyons such as Desolation Canyon on the Green River and Ruby Canyon on the Colorado River. Their abundance declines progressively downstream to the confluence of these two rivers, but increases significantly in Cataract Canyon, indicating an association with rock substrate and swift canyon areas. The young are very numerous along shallow shorelines and backwaters, while juveniles and adults are abundant in eddies, often in sympatry with chubs. Their impact on the native fishes is unknown, but their abundance and omnivorous diet suggests competition and possibly predation. Although channel catfish are reported to reach nearly 50 pounds in weight, the largest specimens from the Colorado River are less than 10 pounds, although individuals of up to 20 pounds are reported from Lake Powell and Lake Mead. A close relative of the channel catfish-blue catfish (*Ictalurus furcatus*)-are reported, but unconfirmed, from the Colorado River basin. Blue catfish lack the dark spots of the channel catfish, and have 30-35 anal fin rays, compared to 24 to 29 rays in (*Pylodictus olivaris*), and are common below Lake Mead.

RED SHINER

(*Cyprinella lutrensis*)

Rare in upper Grand Canyon, common below Separation Canyon. Adult red shiners are usually deep bodied and laterally compressed, steel blue above and silvery below with orange fins. Breeding males are metallic blue with bright red fins and tubercles on the head and body.

Spawning may occur twice in one year as water temperatures approach 65°F. Maximum size about 4 inches. Red shiners typically have eight or nine anal rays, whereas sand shiners typically have only seven. Red shiners were probably introduced into the Colorado River in the early 1900's incidental with bass and sunfish from the Illinois River bottoms, or in bait buckets. Red shiners are the most common fish species in the upper basin, found primarily in backwaters and shallow sheltered habitats. They are tolerant of high turbidity and siltation, and avoid waters that are continuously clear or cool. The species is implicated in predation and competition with the native fishes because of its great abundance in the Colorado River Basin.



FATHEAD MINNOW

(*Pimephales promelas*)

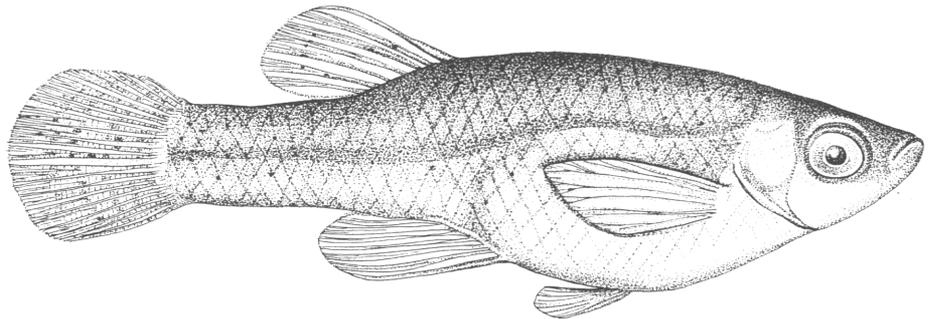
Locally common in Grand Canyon. A small robust minnow with a maximum size of about 4 inches, and characterized by brassy color. Males are robust with a black band around the body, and prominent pimple-like "tubercles" on a large head. Females are

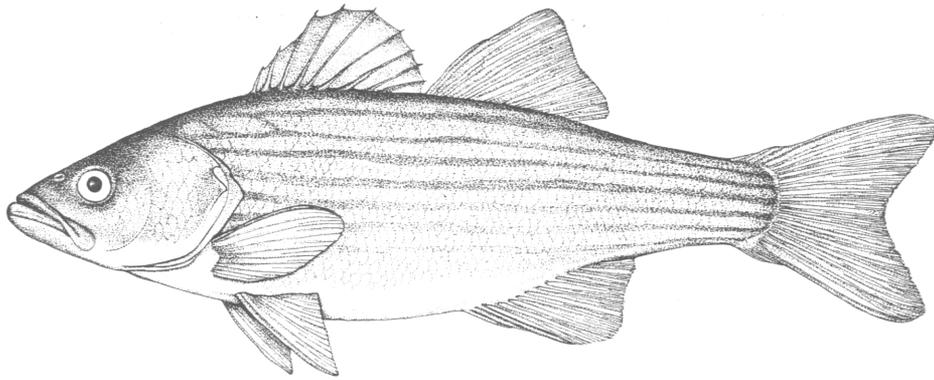
smaller and less robust. Fathead minnows are widely distributed in the warmer middle and lower regions of the Colorado River Basin. Their mode of access was probably via bait buckets, since the species is so popular as a bait fish for crappie and large-mouth bass. The species may have gained access into the drainage as early as the late 1800's incidental in seine hauls of bass and sunfish brought to the west from midwestern drainages. Fathead minnows can be very abundant locally in small pools and quiet areas. They thrive in warm, turbid waters, and can survive high temperatures and low oxygen levels better than any other species in the Colorado River, except perhaps black bullheads. The impact of the fathead minnow on native species is unknown, but like the other small cyprinids, it is implicated as a potential competitor and predator.

MOSQUITOFISH

(*Gambusia affinis*)

Locally common in tributaries of the lower Colorado River in Grand Canyon. A small, delicate greenish fish with a robust belly, upward mouth, and square tail. Maximum size about 2 inches. Mosquitofish belong to the family of livebearers or viviparous fish. The males are distinguished by an elongated anal fin which is a highly-specialized rod-like organ, or gonopodium, used to internally fertilize the female. Up to 300 embryos develop internally within the female and the young are born live. All other species of fish in Grand Canyon are oviparous-producing eggs that are fertilized after leaving the body of the female. Mosquitofish were first introduced into the Colorado River in the 1930's. It is native to the central United States from southern Illinois and Indiana to Alabama, and the lower Rio Grande in Texas. It has been distributed extensively since the 1950's by mosquito abatement districts to control mosquitoes, and has received world-wide attention in helping to combat the malaria-carrying forms. It does not tolerate prolonged cold conditions (<40°F) and does not occur extensively in northern regions, although it is tolerant to warm temperatures and low oxygen conditions. The low numbers and insectivorous diet of this species probably do not pose a major threat to native fishes.



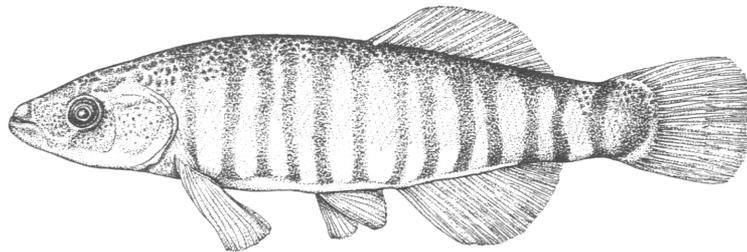


STRIPED BASS (*Morone saxatilis*)

Occur in June, July, and August in small numbers in Grand Canyon, during spawning migrations from Lake Mead. Have been caught as far upstream as the Little Colorado River. A spiny-rayed fish with green back, white belly, silvery sides, and 6 to 8 black, lateral, horizontal stripes. Maximum size about 50 pounds in reservoirs, 100 pounds as sea-run form. Females generally ascend turbid rivers to spawn in spring, depositing thousands of tiny eggs that incubate and hatch as they drift back to the lake. Striped bass were first introduced into Lake Mead in the early 1970's and into Lake Powell in 1974 to alleviate a decline in spawning and nursery habitat of largemouth bass and black crappie. Threadfin shad, a consistent and dependent forage for stripers, were also introduced. Striped bass have been a very successful sport fish, and are highly sought by trophy fishermen. A decline in threadfin shad sometimes sends striped bass populations into decline in numbers and condition of individuals, as seen in Lake Powell in 1982-83 and 1985-88. Rainbow smelt (*Osmerus mordax*) have been proposed as an alternate forage for stripers in Lake Powell. The impact of striped bass on the native fishes of the Colorado River has not been determined. Predation of native fish could be occurring during spawning ascents, or when native fishes enter the lake inflows inhabited by the species.

PLAINS KILLIFISH (*Fundulus zebrinus*)

Found primarily in tributaries of the Colorado River in Grand Canyon. A small cylindrical, minnow-like fish with black vertical bars. Maximum size about 5 inches. Killifish are known as "topminnows" because of their habit of skimming along just beneath the surface of the water feeding on insects and other small invertebrates. The top of the head and forward



part of the back are broad and flat and the mouth is tilted upward so that it opens at the upper surface of the head to facilitate surface feeding. The species is easily distinguished by the presence of a seemingly massive protruding lower jaw with many teeth, thus the name "cyprinodont" which means "toothed carp". Plains killifish, (*Fundulus zebrinus*) and plains topminnow (*Fundulus sciadicus*) are reported as incidental in the Colorado, Green, and White Rivers of the upper basin, and rare in the San Juan River. The plains killifish has a dorsal fin base situated above or forward of the anal fin base; usually 13 to 16 dorsal fin rays; 40 or more lateral line scales; and 12 to 13 dark vertical bars on the sides of the body. The plains topminnow has a dorsal fin base situated above the anal fin base; usually 6 to 11 dorsal fin rays; 38 or fewer lateral line scales; and without vertical bars or horizontal streaks. Plains killifish may compete with small native fishes for food.

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