

TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE

WYOMING

SOIL CONSERVATION SERVICE

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Subject: CHANNEL CATFISH*

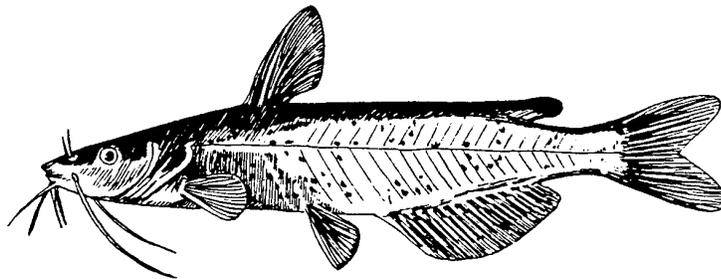
General

The native range of channel catfish (Ictalurus punctatus) extends from the southern portions of the Canadian prairie provinces south to the Gulf states, west to the Rocky Mountains, and east to the Appalachian Mountains. They have been widely introduced outside this range and occur in essentially all of the Pacific and Atlantic drainages in the 48 contiguous states.

Age, Growth, and Food

Age at maturity in channel catfish is variable. Catfish from southern areas with longer growing seasons mature earlier and at smaller sizes than those from northern areas. Southern catfish mature at age V or less while northern catfish mature at age VI or greater for males and at age VIII or greater for females.

Young-of-the-year (age 0) catfish feed predominantly on plankton and aquatic insects. Adults are opportunistic feeders with an extremely varied diet, including terrestrial and aquatic insects, detrital and plant material, crayfish, and mollusks. Fish may form a major part of the diet of catfish >50 cm in length. Channel catfish diets in rivers and reservoirs do not appear to be significantly different. Feeding is done by both vision and chemosenses and occurs primarily at night. Bottom feeding is more characteristic, but food is also taken throughout the water column.



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*Information taken from Ecoregion M3113 Handbook and Habitat Suitability Index Models, Wildlife Species Narratives (literature searches), U.S. Fish and Wildlife Service, various dates between 1978-1984.

Reproduction

Channel catfish spawn in late spring and early summer (generally late May through mid-July) when temperatures reach about 21°C. Spawning requirements appear to be a major factor in determining habitat suitability for channel catfish. Spawning is greatly inhibited if suitable nesting cover is unavailable.

Special Habitat Requirements

Channel catfish populations occur over a broad range of environmental conditions. Optimum riverine habitat is characterized by warm temperatures and a diversity of velocities, depths, and structural features that provide cover and food. Optimum lacustrine habitat is characterized by large surface area, warm temperatures, high productivity, low to moderate turbidity, and abundant cover.

Fry, juvenile, and adult channel catfish concentrate in the warmest sections of rivers and reservoirs. They strongly seek cover, but quantitative data on cover requirements of channel catfish in river's and reservoirs are not available. Debris, logs, cavities, boulders, and cutbanks in lakes and in low velocity (<15 cm/sec) areas of deep pools and backwaters of rivers will provide cover for channel catfish. Cover consisting of boulders and debris in deep water is important overwintering habitat. Deep pools and littoral areas (≤5 m deep) with ≥40 percent suitable cover are assumed to be optimum. Turbidities: >25 ppm but <100 ppm may somewhat moderate the need for fixed cover.

Riffle and run areas with rubble substrate and pools (<15 cm/sec) and areas with debris and aquatic vegetation are conditions associated with high production of aquatic insects consumed by channel catfish in rivers. Channel catfish are most abundant in river sections with a diversity of velocities and structural features. Therefore, it is assumed that a riverine habitat with 40 to 60 percent pools would be optimum, for providing riffle habitat for food production and feeding and pool habitat for spawning and resting cover. It also is assumed that at least 20 percent of lake or reservoir surface area should consist of littoral areas (≤5 m deep) to provide adequate area for spawning, fry and juvenile rearing, and feeding habitat for channel catfish.

High standing crops of warmwater fishes are associated with total dissolved solids (TDS) levels of 100 to 350 ppm for reservoirs in which the concentrations of carbonate-bicarbonate exceed those of sulfate-chloride. It is assumed that high-standing crops of channel catfish in lakes or reservoirs will, on the average, correspond to this TDS level.

Turbidity in rivers and reservoirs and reservoir size are other factors that may influence habitat suitability for channel catfish populations. Channel catfish are abundant in rivers and reservoirs with varying levels of turbidity and siltation. However, low to moderate turbidities (<100 ppm) are probably optimal for both survival and growth. Larger reservoirs (>200 ha) are probably more suitable reservoir habitat for channel catfish populations because survival and growth are better than in smaller reservoirs. Other factors that may affect reservoir habitat suitability for channel catfish are mean depth, storage ratio (SR), and length of agricultural growing season. One study found that high mean

depths were negatively correlated with standing crop of channel catfish. Mean depths are an inverse correlate of shoreline development, thus higher mean depths may mean less littoral area would be available. Another study also reported that standing crops of catfishes (Ictaluridae) peaked at an SR of 0.75. Standing crops of channel catfish were positively correlated to growing season length. However, harvest of channel catfish reported in reservoirs was not correlated with growing season length.

Dissolved oxygen (DO) levels of 5 mg/l are adequate for growth and survival of channel catfish, but DO levels of ≥ 7 mg/l are optimum. Dissolved oxygen levels < 3 mg/l retard growth and feeding is reduced at DO levels < 5 mg/l.

Adult. Adults in rivers are found in large, deep pools with cover. They move to riffles and runs at night to feed. Adults in reservoirs and lakes favor reefs and deep, protected areas with rocky substrates or other cover. They often move to the shoreline or tributaries at night to feed.

The optimal temperature range for growth of adult channel catfish is 26° - 29° C. Growth is poor at temperatures $< 21^{\circ}$ C and ceases at $< 18^{\circ}$ C. An upper lethal temperature of 33.5° C has been reported for catfish acclimated at 25° C.

Embryo. Dark and secluded areas are required for nesting. Males build and guard nests in cavities, burrows, under rocks, and in other protected sites. Nests in large impoundments generally occur among rubble and boulders along protected shorelines at depths of about 2-4 m. Catfish in large rivers are likely to move into shallow, flooded areas to spawn. One study reported that spawning in Utah Lake, Utah, was concentrated in sections of the lake with abundant spawning sites of rocky outcrops, trees, and crevices. The male catfish fans embryos for water exchange and guards the nest from predators. Embryos can develop in the temperature range of 15.5 to 29.5° C, with the optimum about 27° C. They do not develop at temperatures $< 15.5^{\circ}$ C. Embryos hatch in 6-7 days at 27° C.

Laboratory studies indicate that embryos three days old and older can tolerate salinities up to 16 ppt until hatching, when tolerance drops to 8 ppt. However, 2 ppt salinity is the highest level in which successful spawning in ponds has been observed. Embryo survival and production in reservoirs will probably be high in areas that are not subject to disturbance by heavy wave action or rapid water drawdown.

Fry. The optimal temperature range for growth of channel catfish fry is 29° - 30° C. Some growth does occur down to temperatures of 18° C, but growth generally is poor in cool waters with average summer temperatures $< 21^{\circ}$ C and in areas with short agricultural growing seasons. Upper incipient lethal levels for fry are about 35° - 38° C, depending on acclimation temperature. Optimum salinities for fry range from 0-5 ppt; salinities ≥ 10 ppt are marginal as growth is greatly reduced.

Channel catfish fry have strong shelter-seeking tendencies, and cover availability will be important in determining habitat suitability. Newly hatched fry remain in the nest for 7-8 days and then disperse to shallow water areas with cover. Fry are commonly found aggregated near cover in protected, slow-flowing (velocity <15 cm/sec) areas of rocky riffles, debris-covered gravel, or sand bars in clear streams, and in very shallow (<0.5 m) mud or sand substrate edges of flowing channels along turbid rivers and bayous. Dense aquatic vegetation generally does not provide optimum cover because predation on fry by centrarchids is high under these conditions, especially in clear water. Fry overwinter under boulders in riffles or move to cover in deeper water.