Gar Family—Lepisosteidae

Two species of gars occur in Wisconsin. Five species, all in the genus *Lepisosteus*, are known in the United States and Canada (Robins et al. 1980). This family is almost exclusively North American, ranging southward to Costa Rica, Cuba, and Central America. Fossils are known from the Middle Eocene of North America.

The gars are long, cylindrical fish with a characteristic long, slender snout and jaws well armed with needlelike teeth. The gar's body is completely covered with rhomboidal scales which join to one another and provide an armorlike protection. It has a double skull in which inner parts of cartilage are overlaid by dermal bone. Kidney tubules open directly into the coelomic cavity in adults, a condition persisting only in the adult of primitive species.

A unique characteristic of these primitive fishes is the ability to breathe atmospheric air. The swim bladder is connected to the esophagus and operates as a primitive lung. The inner lining of the swim bladder is cellular and somewhat roughened, providing for additional gas-absorption area. Even in well-oxygenated aquariums they will surface briefly every few minutes. This is the act of "breaking," so familiar to many fishermen.

In breaking, the gar turns partly over on one side, emits a bubble of air, swallows, and then sinks below the surface. Supposedly this habit is discontinued in cold weather, and from October to April gars do not come to the surface to breathe (Forbes and Richardson 1920).

Eddy and Underhill (1974:132) noted:

> Their ability to breathe air enables them to live in polluted water unfit for any other fishes except the bowfins. We have seen cases of total oxygen depletion

where all the other species were killed, but the gars and the bowfins still swam about unconcernedly. We have known gars to drown when entangled in a net and unable to reach the surface for fresh air. Their air-breathing ability may be one of the characteristics which enabled these primitive fishes to survive.

All gars serve as hosts to the parasitic young (glochidia) of the most valuable of all freshwater mussels. The yellow sandshell (*Lampsilis anodontoides*) yields a shell with form, texture, and luster that compares most nearly, of all freshwater shells, to the marine "mother-of-pearl" (Coker 1930). At one time it was used not only for the manufacture of buttons of superior grade but also for the preparation of pearl handles for knives and for other novelties. Only gars function as hosts for this clam, and no other fish will answer. Without gars the mussel would disappear unless it could be maintained by artificial means. The shortnose gar is a known host to the glochidia of *Amblema plicata* and *Lampsilis teres* (Hart and Fuller 1974).

Gar skins have been used to a small extent for covering picture frames, purses, and fancy boxes, the plates being very hard and taking a fine polish (Forbes and Richardson 1920).

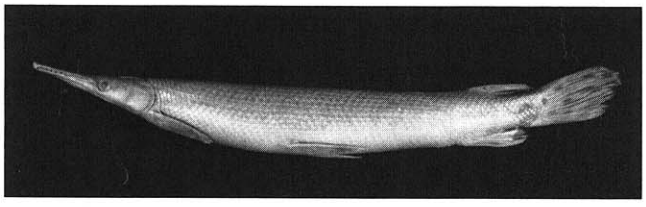
To anglers fishing with live bait, gars are sometimes a nuisance, since they steal the bait from hooks but are not themselves easily caught. They may, however, be taken by using a piano wire or copper wire snare on which a minnow is threaded; the snare is drawn tightly about the snout of the gar when it strikes the bait. Perhaps the most ingenious method for catching them is with a hookless lure which can be made at home. The only materials needed are a 75–100-mm (3–4-in) piece of nylon rope, 10 mm diam, and a short length of flexible wire. Stove pipe wire will do. The wire is attached to one end of the rope and fashioned into an eye to which a swivel leader can be attached. The other end of the rope is unraveled into its individual fibers until a fluffy "tail" results. The gar, which strikes a moving bait, will clamp down on the lure and its teeth will become snagged in the fibers (Sroka 1975).

Gars are of little commercial value. Some time ago, a crew operating in the Mississippi River near La Crosse made a haul of 1,134 kg (2,500 lb), which was sold to a rendering plant at $0.02 per kg (Wis. Conserv. *Bull.* 1948 13[2]:5). Both the longnose and the shortnose gar are taken from Wisconsin waters of the Mississippi River with setlines, gill nets, seines, buffalo nets, bait nets, and trammel nets. No distinction is made between the species in the commercial catch. For the 10-year-period 1956–1965, the average catch reported per year was 4,328 kg (9,542 lb); for the 1966–1975 period, 3,499 kg (7,713 lb). The record high for any year since 1953 was 13,218 kg (29,141 lb) in 1959, and the total value of the 1975 catch of 3,697 kg (8,151 lb) was $163.02 (Fernholz and Crawley 1976).

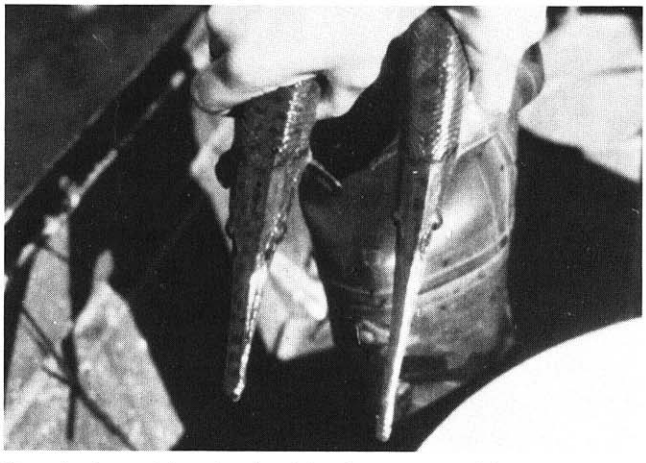
Shortnose Gar

Lepisosteus platostomus Rafinesque. *Lepisosteus*—scales of bone; *platostomus*—broad mouth.

Other common names: broadnosed gar, stubnose gar, shortbill gar, duckbill gar, billy gar.



Adult 535 mm, L. Winnebago (Fond du Lac Co.), 28 Aug. 1961



Dorsal view of heads of adult shortnose and longnose gars (photo by V. Hacker)

DESCRIPTION

Body long, cylindrical, depth into TL 10 (9–12). Adult length 460–480 mm. Head length into TL 4.1 (3.8–4.4). Snout length into head length 1.7 (1.6–1.8); snout length into TL 7.1 (6.0–7.9); least snout width into snout length 6.3 (5.2–9.3); snout width at level of nostrils into snout length 6.8 (5.3–10.5). Teeth numerous, villiform, sharp. Gill rakers rudimentary, irregularly arranged, 16–25. Scales ganoid (rhomboid); lateral line scales 61 (55–63). Tail abbreviate-heterocercal (vertebrae moving into dorsal portion of fin).

Adult brown, olive to slate dorsally; yellow or whitish below. Spots, when present, usually confined to the posterior third of the body. In fresh specimens from nonturbid water, large dark spots occasionally appear on bill and top of head; after death and with preservation, spots fade. Young less than 25 cm long similar to longnose gar of corresponding length (Trautman 1957).

DISTRIBUTION, STATUS, AND HABITAT

The shortnose gar occurs in the Mississippi River and its major tributaries (the St. Croix, Chippewa, Black and Wisconsin rivers) upstream generally to the first dam, and in the Rock River drainage (Greene 1935, Cahn 1927, McNaught 1963). I have not been able to verify Greene's report of this species from Pewaukee Lake (Waukesha County) in the Illinois-Fox drainage and have deleted it from the map.

The shortnose gar was recently reported for the first time in the Great Lakes drainage basin (Priegel 1963a, Becker 1964b); and it appears to be well established in the lower Wolf River, the lakes of the upper Fox River, the lower Fox River, and lower Green Bay. The presumed crossover point is the Fox-Wisconsin canal at Portage (Columbia County).

This species is uncommon to common in the lower Wisconsin and Mississippi rivers, the lower portions of their tributaries, in the lower Wolf River system, and in Green Bay. In some large rivers it may be more abundant than the longnose gar (Nord 1967). In the Rock River system it is rare, possibly extirpated. The shortnose gar prefers open, slow-moving, silty rivers. In large lakes it occurs over wave-washed shoals. Cross (1967) noted that it usually avoids the quiet backwaters, oxbows, and impoundments that often are inhabited by longnose gar.

BIOLOGY

The shortnose gar spawns in shallow, grassy sloughs from May to June. Spawning information was compiled by Carlander (1969). Shortnose gar spawned from May to June in 0.3–0.9 m (1–3 ft) of water in Illinois. In South Dakota during 1956, spawning occurred from 20 May to 15 June at water temperatures of 19–23.5°C (66–74°F); during 1957 and 1958 it occurred in late June and early July. The bright green eggs, about 2.5 mm diam, are deposited in small masses held together by a clear gelatinous substance and attached to grass, smartweed, etc. A 4.1-kg (9-lb) female produced 36,460 eggs (Potter 1926).

In Illinois the eggs hatched in 8 or 9 days (Richardson 1913). According to Echelle and Riggs (1972), spawning and hatching occur earlier in this species than in the longnose gar. The total length at hatching is 8 mm and in aquariums the average growth rate per day is 1.7 mm. The yolk-sac is absorbed 7 days after hatching (Richardson 1913). Young gar start feeding on entomostracans and mosquito larvae at 16 days after hatching. They are solitary in habit, floating near the surface, sometimes with their backs out of the water (Carlander 1969). Carlander has compiled the following growth data for young-of-year: 15–

Range of the shortnose gar
- ● Specimens examined
- ▲ Wisconsin Fish Distribution Study (1974–75)
- ○ Literature and reports
- ○ Greene (1935)

64 mm (0.6–2.5 in) in May (Illinois), 44 mm (1.7 in) in June (Illinois), 69 mm (2.7 in) in July (South Dakota), 64–127 mm (2.5–5 in) in August (Iowa), 102–152 mm (4–6 in) in October (Iowa), 178–254 mm (7–10 in) in October (Ohio).

In Lake Okoboji, Iowa, shortnose gar 483–584 mm (19–23 in) long fed mostly in the morning on crayfish, perch (165 mm), sunfish (114 mm), and bluegills (127 mm) (Potter 1923). On clear, warm days they lined up along the shore in 100–250 mm (4–10 in) of water, with their tails toward shore, waiting until prey were in easy reach. In Illinois (Richardson 1913) adult gars were observed coming to the surface to seize emerging gnats and mayflies. In South Dakota, Shields (1957) noted that shortnose gar fed heavily on carp until the latter were over 125 mm (5 in) long.

Growth of the shortnose gar is rapid. In South Dakota's Lewis and Clark Lake (Walburg 1964) mean total length at age I was 417 mm (16.4 in); II, 486 mm (19.1 in); III, 536 mm (21.1 in); IV, 587 mm (23.1 in); V, 605 mm (23.8 in); VI, 671 mm (26.4 in); VII, 734 mm (28.9 in). A few males matured at 457 mm (18 in) and females at 483 mm (19 in) (Carlander 1969). The largest shortnose gar reported by Carlander was 826 mm (32.5 in) TL and weighed 1.5 kg (3.4 lb). Trautman (1957) stated that adults are usually 406–762 mm (16–30 in) long and weigh 0.5–2.3 kg (1–5 lb). Potter (1926) reported a female from Iowa weighing 4.1 kg (9 lb). The shortnose gar is heavier for its length than the longnose gar but it attains far less length and weight and has a shorter life span.

Adult shortnose gars move in large schools both before and after the spawning season (Coker 1930). On 28 August I encountered a school of these gars alongside a concrete pier jutting into Lake Winnebago (Fond du Lac County) in open water devoid of aquatic vegetation. Five adults were quickly caught in a 6-m (20-ft) seine.

This species lies on the surface of the water in full sun, a habit which brings it into contact with water temperatures approximating high summer air temperatures. In Indiana, Gammon (1973) determined

optimum temperatures for gars at 33–35°C (86–95°F), although Proffitt and Benda (1971) have taken them in the White River and Ilpaco Discharge Canal at 36.1°C (97°F). Adult shortnose gar are more abundant in shallow waters at night than during the daylight hours (Echelle and Riggs 1972).

IMPORTANCE AND MANAGEMENT

The eggs of this species are dangerous to vertebrate animals. Of two mice force-fed 0.2 ml of homogenized eggs, one died in less than 18 hr; the other became very sick but eventually recovered (Netsch and Witt 1962).

The shortnose gar is an excellent food fish when baked or smoked.

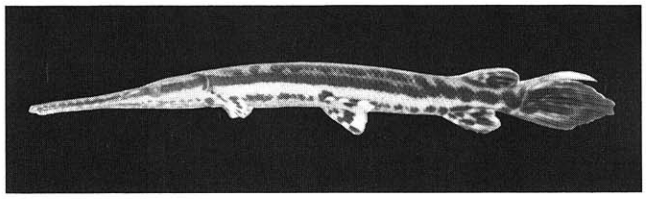
Durham (1955b) introduced the shortnose gar into small experimental ponds to test its effect on the populations of green sunfish, bluegill, largemouth bass, and black crappie. The results were inconclusive, but the shortnose gar tended to cause a reduction in the number of green sunfish and an increase in the number of bluegills. The maximum sizes of all the species of centrarchids increased.

The role of this species in maintaining a balanced fish population in some waters may be significant and warrants further study.

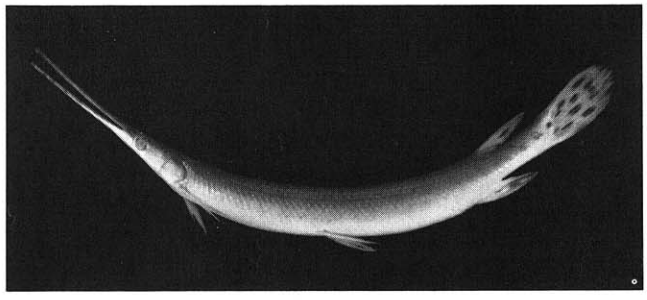
Longnose Gar

Lepisosteus osseus (Linnaeus). *Lepisosteus*—scales of bone; *osseus*—bony.

Other common names: northern longnose gar, gar, garpike, common garpike, billfish, billy gar, northern mailed fish.



Immature 290 mm, Swan L. (Columbia Co.), 27 Sept. 1969



Adult 748 mm, Mississippi R., Pool 5a (Buffalo Co.), 28 July 1977. (See also photograph of heads of gars, p. 45)

DESCRIPTION

Body long, cylindrical, depth into TL 15 (12–18). Adult length 500 mm. Head length into TL 3.3 (3.0–3.6). Snout length into head length 1.5 (1.4–1.6); snout length into TL 4.7 (4.3–5.4); least snout width into snout length 16.1 (15.2–16.1), in young-of-year this measurement 11.6 (9.3–14.4); snout width at level of nostrils into snout length 15.6 (13.4–16.5), in young-of-year this measurement 10.6 (6.4–13.9). Teeth numerous, villiform, sharp. Gill rakers rudimentary, irregularly arranged 24–28. Scales ganoid (rhomboid); lateral line scales 62 (60–66). Tail abbreviate-heterocercal (vertebrae moving into dorsal portion of fin).

Adult olive to dark green above; whitish below with large round spots on dorsal, anal, and caudal fins. Young distinctly marked with a broad brown or blackish midlateral stripe from snout to base of caudal fin, with a striking white stripe immediately below, and a chocolate brown stripe on each side of belly. Fish (1932:305) noted: "The young are easily recognized by the greatly prolonged toothed jaws and elongate body, brilliant in seal, reddish brown, and bronze. . . . The most remarkable feature of this small and brilliant gar was the prolongation of the notochord into a fleshy filament, apart from the caudal fin, which kept up a rapid vibratory motion."

DISTRIBUTION, STATUS, AND HABITAT

The longnose gar occurs in the Mississippi, Lake Michigan, and Lake Superior drainage basins. The reports from Hacker (1975) do not designate the species of gar, but most reports undoubtedly pertain to the longnose gar, although occurrence of the shortnose gar is possible where the species are sympatric.

The longnose gar is common in the Mississippi and lower Wisconsin rivers. In the Lake Michigan drainage it is common in the Wolf and Fox rivers and their connecting systems. The 89-cm (35-in) gar reported in 1942 from Lake Michigan off Port Washington by commercial fishermen (*Milwaukee Journal* 27 September 1942) has not been verified as to species, but it was probably a longnose gar.

In northwestern Wisconsin the longnose gar is common in Big Sissabagama, Lac Court Oreilles, Grindstone, and Big Sand lakes (Sawyer County). It is common in the St. Croix River below St. Croix Falls Dam and abundant in the Island Lake Chain (Rusk County) and the Long Lake Chain (Chippewa County). This species is uncommon in northeastern Wisconsin.

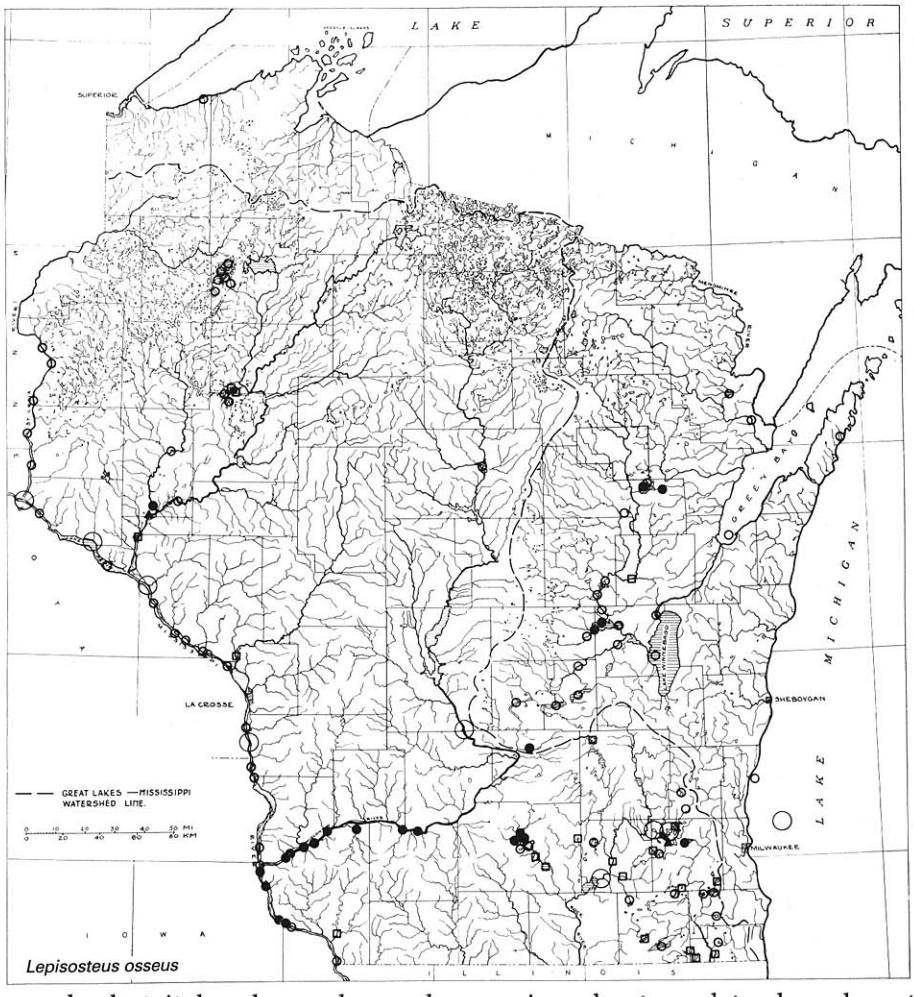
I have seen a single report from the Lake Superior drainage: a 676-cm (26.6-in) male taken by a sport fisherman below the electric barrier on the Brule River (Douglas County) (Moore and Braem 1965).

The longnose gar is endangered (possibly extirpated) in Delaware and rare in South Dakota (Miller 1972). It appears secure in Wisconsin.

The longnose gar inhabits large, weedy lakes and reservoirs. In rivers (generally over 12 m wide) it occurs most frequently in backwaters or in quiet currents. In the lower Wisconsin River it was found in small numbers in the drop-offs between sand riffles and the shallow pools below. The frequencies of substrates associated with this species were gravel 29%, sand 25%, mud 17%, clay 13%, silt 8%, rubble 4%, and boulders 4%. It is an open-water fish, spending much time in the topmost stratum of a pelagic environment.

BIOLOGY

In Wisconsin spawning occurs from May to late June, and possibly early July. In southern Wisconsin the fish often ascend rivers to spawn over the weed beds of shallower waters (Cahn 1927). In lakes the longnose gar spawns in shoal water, usually in grass and



Range of the longnose gar
- ● Specimens examined
- ▲ Wisconsin Fish Distribution Study (1974–75)
- ○ Literature and reports
- ○ Greene (1935)
- □ *Lepisosteus* spp. (Hacker 1975)

weeds, but it has been observed spawning about stone piles of railroad bridges (Forbes and Richardson 1920).

In Lake Mendota one spawning area was on a shallow gravel bar where the water was 0.3–0.9 m (1–3 ft) deep and bulrushes were present; the other was in 2 m (7 ft) of water over a substrate of boulders (Haase 1969). Spawning was associated with two ranges of temperature peaking at 19.5°C (67.1°F) and 21°C (69.8°F), and data suggest that spawning occurs with rising temperatures of the water—the immediate stimulus for the formation of the spawning groups. During each year there is usually more than one 3-day period of spawning, and these periods are concentrated within two ranges of temperature.

Detailed spawning behavior was reported by Haase (1969). As many as 15 males approach a female. If she is ready to spawn, she leads them in an elliptical path (apparently related to the shape of the spawning ground) for up to 15 minutes before spawning occurs. Over the spawning bed the males nudge the female with the ends of their snouts in the pectoral, lateral, and ventro-lateral areas. Frequent surfacing and gulping takes place during this phase. Then the spawning group positions itself at one place with heads down and snouts very close to or touching the bottom, and males continue to nudge the female. A rapid, violent quivering of the spawners follows as eggs and sperm are released. The quivering moves the spawning group forward and away from the spawning area. The eggs are green; those collected from Lake Mendota gars were 2.6–3.6 mm diam (Haase 1969).

H. Neuenschwander (pers. comm.) observed spawning at Picnic Point on Lake Mendota on 3 June 1948. Twenty-three gars swam an elliptical course about 3 × 8 m (10 × 26 ft) in 1–1.5 m (3–5 ft) of water over algal-covered boulders. Two to six males attended one female. The water temperature was 23.3°C (74°F).

Breder and Rosen (1966) reported that eggs may number more than 36,000 in a female of 101.6 cm (40 in) SL. Embryological development based largely on materials from Lac La Belle (Waukesha County) is de-

scribed and depicted by Eycleshimer (1903). Hatching takes 3–9 days, depending on the temperature: 6 days at 20°C (68°F).

The emerging sac-fry, 9–10 mm long, while capable of swimming, are relatively inactive and, using an adhesive structure, hang vertically for long periods attached by their snouts to submerged objects such as vegetation and debris (Echelle and Riggs 1972). In aquariums they may attach to the surface film of the water. Shortly after absorption of the yolk-sac (about 9 days after hatching) and now 18–20 mm in length, the fry cease to hang vertically and are capable of resting motionless in a horizontal position at any depth in the water. At about this stage the gar takes its first aerial breath, becomes more active, and begins to feed. After absorption of the yolk-sac, the fry disperse. They do not exhibit a pronounced tendency to school.

Growth rate of the longnose gar during its first year of life is rapid. In aquariums Echelle and Riggs (1972) noted an average growth of 3.2 mm per day. In Portage Lake, Michigan, the estimated growth was 2.33 mm per day (Hubbs 1921); in Lake Mendota, Wisconsin, 1.5 mm per day (Haase 1969).

In Missouri 20 young-of-year raised experimentally for 52 days grew at the rate of 2.95 mm and 0.72 g per day (Netsch and Witt 1962). Their gross metabolic efficiency during this time was 43.1% and their food conversion factor was 2.34. Young-of-year longnose gars ate an average of 9.1% of their body weight per day, and digestion was completed at the end of 24 hours. Gar activity, or more appropriately inactivity, is probably the major factor contributing to the low food conversion factor. Throughout the experiments the gars were extremely inactive and made few unnecessary movements; even their method of feeding was one of apparent leisure. These factors contribute to their rapid growth, up to 6 times faster than that of other common large freshwater fishes.

Niemuth et al. (1959b) reported young-of-year 248–353 mm (9.8–13.9 in) long in early September in several Wisconsin lakes. Haase (1969) noted that young-of-year reach a maximum TL of 460 mm (18.1 in).

Age and growth of the longnose gar in central Missouri were determined from branchiostegal rays (Netsch and Witt 1962). Age-I males were 49.5 cm (19.5 in) long; females, 55.9 cm (22 in) long. Females continue to grow approximately 25 mm (1 in) a year for 13 or 14 years and outlive the males. Males mature between 3 and 4 years of age and females at about 6 years of age. At the end of the first year of life the females average 64 mm (2.5 in) longer than the males; this disparity in size increases with age to a point where the females are 178 mm (7 in) longer than the males at the end of the 11th year of life.

Compared to Missouri longnose gar, Wisconsin males (Lake Mendota) are 60–90 mm (2.4–3.5 in) smaller and females are 95–150 mm (3.7–5.9 in) smaller, with the maximum differences occurring at age I (Haase 1969). Lake Poygan males (age XVII) and females (age XVIII) are 309 and 380 mm (12.2 and 15 in) smaller than Missouri gars.

Haase (1969) noted that one-half of the maximum growth in length was attained during the first 2 or 3 years of life. The sexes are very similar in size at first,

Growth of the Longnose Gar in Wisconsin During First Year of Life (Preserved Museum Specimens)

Date	TL (mm)	WT (g)	Scalation	Location
19 June 1962	49	0.2	No scales	Wisconsin R. (Richland Co.)
7 July 1962	114	1.8	Side of caudal peduncle scaled	Blue R. (Grant Co.)
10 July 1962	140+	4.6	Lateral line, caudal peduncle, and sides posterior to pelvic fins scaled	Glass L., Mississippi R. (Grant Co.)
13 July 1962	62	0.4	No scales	Wisconsin R. (Grant Co.)
13 July 1962	71	0.5	No scales	Wisconsin R. (Grant Co.)
13 July 1962	133	3.6	Caudal peduncle & posterior half of lateral line scaled	Wisconsin R. (Grant Co.)
17 July 1962	119	2.5	Caudal peduncle & posterior half of lateral line scaled	Wisconsin R., Boscobel (Grant Co.)
3–5 Aug. 1960	74	1.0	No scales	Pewaukee L. (Waukesha Co.)
3–5 Aug. 1960	161	5.9	Lateral line scales complete	Pewaukee L. (Waukesha Co.)
3–5 Aug. 1960	168	7.8	Lateral line scales complete	Pewaukee L. (Waukesha Co.)
3–5 Aug. 1960	170	7.0	Lateral line scales complete	Pewaukee L. (Waukesha Co.)
8 Aug. 1962	141	4.7	Caudal peduncle and lateral lines scaled	Wisconsin R. (Iowa Co.)
10 Aug. 1974	138	4.8	Entirely scaled except ventrally from anus to isthmus	L. Mendota (Dane Co.)
10 Aug. 1974	147	5.3	Entirely scaled except ventrally from anus to isthmus	L. Mendota (Dane Co.)
10 Aug. 1974	167	9.2	Entirely scaled except ventrally from anus to isthmus	L. Mendota (Dane Co.)
10 Aug. 1974	204	16.1	Entirely scaled except ventrally from anus to isthmus	L. Mendota (Dane Co.)
19 Sept. 1971	366	72.9	Fully scaled	White Clay L. (Shawano Co.)
27 Sept. 1969	291	48.3	Fully scaled	Swan L. (Columbia Co.)
3 Dec. 1973	382	119.0	Fully scaled	Shawano L. (Shawano Co.)

but in Lake Mendota the females surpass the males at age III and in other lakes somewhat later. The oldest fish Haase recorded was a 32-year-old female from Lake Mendota, 123 cm (48.3 in) long. Males were up to 27 years old and under 99 cm (39 in) TL.

By age III all males more than 50 cm (19.7 in) long had sperm present (Haase 1969). The first maturity of females was noted at age IV, and most females had eggs in some stage of development by age IX.

A 142-cm (56-in) longnose gar was seined from Pewaukee Lake (Waukesha County) (Wis. Conserv. *Bull.* 1937 2[11]:39). In 1949 a 122-cm, 5-kg (48-in, 11-lb) gar was seined from Lake Wingra (Dane County) (Noland 1951). A 135-cm, 11.8-kg (53-in, 26-lb) fish was reported from Lake Beulah (Walworth County) in 1956 (H. Neuenschwander, pers. comm.). A female from the Oklawaha River, Florida, 142 cm and 14.5 kg (56 in and 32 lb), had an egg count of 77,156. The angler record is a 183-cm, 22.7-kg (6-ft ¼-in, 50-lb) fish from the Trinity River, Texas, 30 July 1954 (Walden 1964).

Fishes constitute the greatest bulk of stomach contents in all size-groups of longnose gars except those in the initial feeding stages (17–21 mm long) (Echelle and Riggs 1972), which select minute crustaceans, such as cladocerans and copepods. Very small fish appear early in the diet of the gar, however.

Haase (1969) noted a high percentage of fish in the diets of Wisconsin longnose gars reaching the swimming stage. Next to the fry of fishes, *Scapholeberis mucronata* (Cladocera) is the most important food item, but its importance diminishes rapidly as more fish is eaten. The fish portion of the diet of the young-of-year gar is mainly carp. The noncarp group includes silverside, bluegill, gar, largemouth bass, darters, spottail shiner, killifish, black crappie, and others. Gars 21–96 mm long are able to take prey up to one-third of their own length. Forbes and Richardson (1920) reported 16 larval minnows taken from the stomach of a 51-mm gar.

Adult longnose gars in southern Wisconsin are reported to have eaten brook silverside, blackstripe topminnow, sand shiner, largemouth and smallmouth bass, cisco, and white bass (Cahn 1927). Availability may be a major factor affecting the kinds of foods gars eat. Haase (1969) noted, however, that fishes important for sport fishing, like the largemouth bass, the yellow bass, the northern pike, and the walleye, were found infrequently in the stomachs of adult gars. Even though young-of-year largemouth bass were plentiful in Lake Mendota during 1967, gars fed on them sparingly.

A longnose gar feeds more actively at night than during daylight and much of the feeding is surface-oriented. It is adept at stalking a fish victim by swimming, not toward it, but off to one side, moving along in the water like a stick drifting with the surface current. Suddenly it flips its long beak to the side and catches its prey across the body in its jaws. The action is similar to the strike of a rattlesnake, occurring so quickly that the eye is unable to follow. Then, by a series of thrusts, the victim is turned so that it can be swallowed head first.

In the lower Wisconsin River a large longnose gar struck a seine so hard that it almost jerked the sticks out of the operators' hands, and it left behind in the torn mesh most of its upper jaw, which had broken off with the violence of its charge. Had it struck one of the seiners instead of the net, its pointed snout could easily have penetrated into the flesh several centimeters.

Young gars are commonly taken in the shallows, but as they grow larger they tend to go to deeper water and perhaps become more nocturnal (Haase 1969). During daylight they spend much time resting motionlessly close to submerged or overhanging objects near shore (Echelle and Riggs 1972). At night they are commonly found swimming actively in shallow, open waters. Certain individuals were found in identical spots day after day—one frequented the space beneath the same overhanging limb from mid-July until September. Saksena (1963) found that increased activity increased the rate of air-breathing.

Haase (1969) captured a number of longnose gars over spawning beds and transported them to the opposite side of Lake Mendota. A short time later 70% of them were recaptured spawning again in the same places.

The longnose gar prefers high water temperatures. In the Wabash River, Indiana, the longnose gar was attracted to the warmest zone available (Gammon 1973), and in the White River and Ipalco Discharge Canal the maximum temperature at which it was captured was 33.9°C (93°F) (Proffitt and Benda 1971).

Adult gars have the habit of basking near the surface on warm days or nights, and they may be seen floating like sticks of varying sizes. In Florida Holloway (1954) noted that gars are gregarious enough so that they are usually found in groups of two to five. I have seen such loose aggregations a number of times on the lower Wisconsin River, and Haase (1969) observed them on Lake Mendota.

IMPORTANCE AND MANAGEMENT

Haase (1969) showed that the main prey of the adult longnose gars were yellow perch, carp, bluegills, and

pumpkinseeds. In addition, young-of-year gars fed heavily on young-of-year carp. He concluded that the gar probably doesn't harm fishing for sport fish and may in fact improve it.

Consideration has been given to gars as a possible aid in controlling overpopulation of sunfish and yellow perch. Niemuth et al. (1959b) noted that gars would be less vulnerable to overfishing than the sport fishes and suggested introducing gars into lakes with stunted populations of panfishes.

The longnose gar is classified as a nongame fish. Although it is seldom taken on hook and line, in recent years it has had its devotees among fishermen. Devices for catching gars have been discussed earlier. The meat is described as white, boneless, well-flavored, and wholesome. It is delicious baked on the "half shell" (Sroka 1975). It has been compared to roast pig and may be smoked with excellent success. When fried, it reportedly tastes like a combination of fish and pork chops. In Arkansas, gar meat recently sold on the market at $3.80 per kilo, and the demand was greater than the supply (V. Hacker, pers. comm.).

Although the flesh may be usable, gar eggs are highly poisonous to man as well as to chickens, cats, dogs, and mice. Vertebrate animals will normally avoid eating them. When 0.2 ml of egg homogenate from the longnose gar was force-fed to two mice they became quite sick, although both recovered within 2 days (Netsch and Witt 1962). On the other hand, gar eggs have been found in the stomach of a bluegill and in the intestine of a river carpsucker, and neither appeared to have suffered ill effects.

Because of its appearance and its known fish-eating habits, man has destroyed gars wherever possible. In 1900, the first fish contract granted by the state was one given to residents of Eau Claire and Chippewa Falls to remove "gar fish and other deleterious fish . . . " (V. Hacker, pers. comm.). A state rough-fish removal crew operating on Pewaukee Lake (Waukesha County) took 4,500 kg (10,000 lb) of gars in a single haul (Wis. Conserv. *Bull.* 1937 2[11]:39). The catch was converted into fertilizer.

Nowhere has the case against the longnose gar been stated more eloquently than by Forbes and Richardson (1920:32):

> This voracious, active and well-protected fish is a notable winner in the long struggle for existence which its species has maintained, but it is a wholly worthless and destructive nuisance in its relations to mankind. It is the enemy of practically all the other fishes in our waters, and so far as it eats anything but fishes, it subtracts from the food supply of the more valuable kinds. It has, in fact, all the vices and none of the virtues of a predaceous fish. On the other hand, it is preyed upon by nothing that swims, and is so well adapted to the varied features and vicissitudes of its habitat that it is proof against any but the most extraordinary occurrences.

Other fishery biologists are not sure that this species has earned such condemnation. Holloway (1954), while dealing with the management of gars, stated that it remains to be seen whether the reduction of gars will result in an increase or a decrease in the harvest of desirable species. Lagler et al. (1942) noted that gar populations are greatest (and perhaps most useful) where the largest populations of buffer, forage, and nonsport predators occur. Similarly Branson (1966:19) argued:

> . . . gars are especially important in waters where man's activities have upset the balance of nature in favor of the so-called "rough" fishes, i.e., carp, buffalofishes, and the like. It is here that gar populations often reach their greatest numbers and importance. In all of these environments, the gar exerts a profound controlling influence on the tendency of both rough and game species to overpopulate.