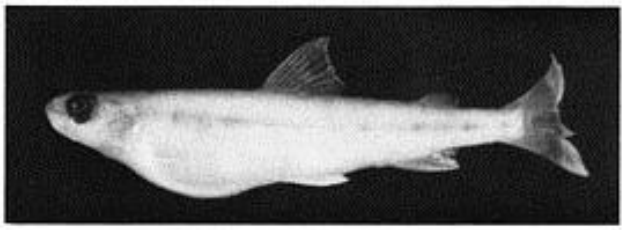
Pygmy Whitefish

Prosopium coulteri (Eigenmann and Eigenmann). *Prosopium*—a mask, from the large bones in front of the eyes; *coulteri*—of Coulter, after Dr. J. M. Coulter, a distinguished botanist.

Other common names: Coulter's whitefish, brownback whitefish, pygmy.



100 mm, L. Superior, Cat Island (Ashland Co.), 7 Nov. 1979 (specimen donated by U.S. Fish and Wildlife Service, Ashland)

DESCRIPTION

Body elongate, rounded. Length 30–153 mm. Depth less than twice its width. Depth into TL 5.6–6.4. Head length into TL 4.9–5.5. Snout bluntly rounded and overhanging the ventral mouth. A single skin flap between the nostrils. Maxillary extends to anterior edge of eye or as far as center of eye; upper jaw length into head length 3.1–3.4. Lower jaw length into head length 2.3–2.6. Teeth absent except on tongue. Eye large, its diam greater than snout length. Gill rakers 16–20; raker length into head length 11–15. Scales in lateral line 56–66 (55–70); scales around body anterior to dorsal and pelvic fins 33–37 (31–40); scales around caudal peduncle 18–20 (16). Dorsal fin rays 11–13 (10–14); anal fin rays 13 (12–14); pelvic fin rays 9–10 (11). Pelvic fin length into distance from pelvic origin to anal origin 1.3–1.7. Pyloric caeca 15–23. Chromosomes 2n = 82 (Booke 1968).

Pale tan to brownish on back grading to whitish below. Along lateral line, 8–11 almost circular parr marks, becoming indistinct in large adults. Back with 12–14 dark spots.

Sexual dimorphism: Female deeper and broader; male with longer rayed fins. Breeding tubercles on top of head, on scales of back and sides, and on paired fins in both sexes, but more conspicuous in males.

Hybrid: Pygmy whitefish × round whitefish (Eschmeyer and Bailey 1955).

SYSTEMATIC NOTES

The pygmy whitefish is regarded as an early offshoot from the ancestral *Prosopium*, and has evolved characteristics represented by a reduction in the numbers of gill rakers, pyloric caeca, and lateral line scales (Norden 1970). It is the smallest species in the genus, and the one with the most disjunct distributional pattern.

McCart (1970) discussed the existence of sibling species of pygmy whitefish, suggesting that the Lake Superior population is sufficiently divergent from western populations to have had a Mississippi glacial refugium, while western populations may have redispersed from a Yukon-Bering Sea refugium (high gill raker form), or from a western refugium south of the ice sheet (low gill raker form).

DISTRIBUTION, STATUS, AND HABITAT

Bottom trawling by the United States Fish and Wildlife Service motor vessel *Cisco* in Lake Superior in 1952–1953 revealed a peculiarly isolated population of pygmy whitefish, which had previously been reported only from the Pacific drainage of northwestern North America. This disjunct Lake Superior population is over 1600 km (1000 mi) removed from its normal range (Eschmeyer and Bailey 1955).

The pygmy whitefish is widely distributed in Lake Superior, at least from the Apostle Islands east to Whitefish Bay (about 470 km) and north to Isle Royale. In the Great Lakes basin the pygmy whitefish is known only from Lake Superior, where it is rare (Todd 1978).

It seeks out the coldest of waters. In Lake Superior no seasonal changes appear in depth distribution (Dryer 1966). The all-season bathymetric range in southern Keweenaw Bay extends from 18 to 90 m, but the pygmy whitefish is most abundant at the 46–71 m interval.

BIOLOGY

Spawning in Lake Superior occurs during November or December. In the Apostle Islands from 17–20 November 1961, spawning and spent pygmy whitefish were trawled at depths of 31–46 m (M. Bailey, pers. comm.). Eschmeyer and Bailey (1955) captured young fish in the relatively shallow water (24–33 m) of Keweenaw Bay, Michigan.

All male pygmy whitefish of age-group II or older in collections from Keweenaw Bay and Siskiwit Bay (Isle Royale) were sexually mature. A few age-I males (7%) from Keweenaw Bay also were mature. The age at which 50% or more of the females were mature was 3 years (Eschmeyer and Bailey 1955).

Maturing eggs were counted in the ovaries of 63 pygmy whitefish collected in Lake Superior in 1953. Egg production averaged 362 (93–597) (Eschmeyer

Range of the pygmy whitefish
● Specimens examined
○ Literature and reports

and Bailey 1955). The eggs are orange in color, 2.57 ± 0.03 mm diam (Booke 1970).

Female pygmy whitefish spawn in consecutive years. Mature ripe eggs are present in the abdominal cavity while smaller eggs, 1 mm diam, are developing in the ovaries (Weisel et al. 1973).

In the Northwest this lacustrine species moves from deep water to the mouths of inlet rivers, where spawning occurs. Spawning takes place generally in November and December, although Kendall (1921) found this species in a spawning run in Alaska in August. A late spawning was reported during the 26 December to 12 January period in Ross Creek, Montana (Weisel and Dillon 1954).

In Flathead Lake, Montana, pygmy whitefish males predominated during the early part of the spawning period at a ratio of 6.7:1. Of the age-I males, 74.5% were sexually mature and all males age II or older were mature. The percentage of maturity of the females was 27.8 at age I, 90.2 at age II, and 100 for older fish (Weisel et al. 1973). Four large spawners from Bull Lake had from 1,027 to 1,136 eggs.

Booke (1970) noted that large-egg coregonines spawn earlier than those with small eggs. From the information available, it appears that in Montana the large-egg mountain whitefish spawns about a month earlier than the small-egg pygmy whitefish (Weisel et al. 1973). Applying this to Wisconsin, we would anticipate that the spawning period for the round whitefish should occur before the known spawning period (November to December) of the pygmy whitefish.

Growth of young-of-year pygmy whitefish in Lake Superior is rapid. By 5 September average length is 31 mm; 30 September, 35–49 mm; 21 October, 47–51 mm (Eschmeyer and Bailey 1955). After this period, growth rates are slow: the two oldest fish from Keweenaw Bay, both nearing the end of their eighth growing season, were only 137 mm (5.4 in) long at the time of collection. Also, the average length of fish increased progressively with water depth, chiefly because the number of yearlings decreased from 100% at 18–26 m to none at 82–90 m.

According to Eschmeyer and Bailey, the average

calculated TL mm for females (males in parentheses) at the end of each year of life is: 1—46 (49); 2—69 (71); 3—88 (87); 4—107 (98); 5–117 (106); 6—123; 7—130. Females generally average longer and heavier at capture than do males of the same age. The percentage of males in the population decreases with age. In the populations studied males made up 51% of the fish in age groups I and II, 45% of those in age groups III and IV, and only 31% of those in age groups V-VII. Only females appear in age groups VI and VII. This trend is reflected in the average ages of the sexes: 2.4 years for males, and 2.9 years for females.

Pygmy whitefish from the Apostle Islands grow more rapidly than the Siskiwit or Keweenaw Bay populations. Calculated lengths (mm) of a gill net collection of females from the Apostle Islands at the end of each year of life were: 1—44; 2—68; 3—98; 4—117; 5—129; 6—139; 7—144. A large female 153 mm TL (UWSP 2718) was taken in the vicinity of Stockton Island (Ashland County) at 62 m on 29 May 1962. Scott and Crossman (1973) noted that in Maclure Lake, British Columbia, females of this species lived longer than in other waters; attaining an age of 9 years and a fork length of 271 mm (10.7 in), whereas males reached 6 years of age and a fork length of 225 mm (8.8 in).

In Lake Superior pygmy whitefish, crustacea occurred in 95% of the stomachs and composed 77% of the food volume (Eschmeyer and Bailey 1955); ostracods and amphipods (principally or entirely *Pontoporeia*) were the chief components. Copepods were in 26% of the stomachs, but were usually incidental in the diet of fish more than 89 mm (3.5 in) long. Cladocera (presumably *Daphnia*) and *Mysis* were unimportant items. Insects (principally larval and pupal chironomids) appeared in 62% of the stomachs and made up 9% of the food; adult insects were present in 20% of the stomachs, but represented only 1% of the volume. Larval clams (Sphaeriidae) occurred in 20% of the stomachs, making up 3% of volume. Fish eggs, presumably coregonine, were taken from May and January collections; when available, they may be important in the diet of this species. Small quantities of organic detritus and sand grains were present in a few of the fish examined.

A December collection of spawning pygmy whitefish from Ross Creek (Montana) demonstrated that these fish feed actively during their spawning period (Weisel et al. 1973). Fish eggs, laid by fellow spawners, were the most frequently ingested food and made up by far the greatest volume. Chironomids, however, were still taken in numbers, along with a few other insects.

In Lake Superior the most common associates of the pygmy whitefish are the cottid species, *Cottus cognatus* and *Myoxocephalus thompsoni*. The ninespine stickleback is next in importance, followed by the smelt, lake herring, deepwater ciscoes, lake trout, and trout-perch (Eschmeyer and Bailey 1955). M. Bailey (pers. comm.) also lists the spoonhead sculpin as a common associate of the pygmy whitefish.

IMPORTANCE AND MANAGEMENT

Wherever the pygmy whitefish comes to the surface during the spawning period it is vulnerable to predators. It has been caught by kingfishers in Washington and by terns in Alaska (Scott and Crossman 1973). Because of its small size and deepwater habitat in Lake Superior, it is most likely utilized by the lake trout, which were present in 57% of the hauls that took pygmy whitefish, and by burbot (18% of the hauls) (Eschmeyer and Bailey 1955).