

DESCRIPTIONS OF THREE NEW SPECIES OF CISCO, OR
LAKE HERRING (*ARGYRO SOMUS*), FROM THE GREAT
LAKES OF AMERICA; WITH A NOTE ON THE SPECIES
OF WHITEFISH.

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In the investigations of the fisheries of the Great Lakes system by the International Fisheries Commission of Great Britain and the United States during the summer of 1908, three new species of the genus *Argyrosomus*, known as Cisco or Lake Herring, were obtained. These are described in the present paper.

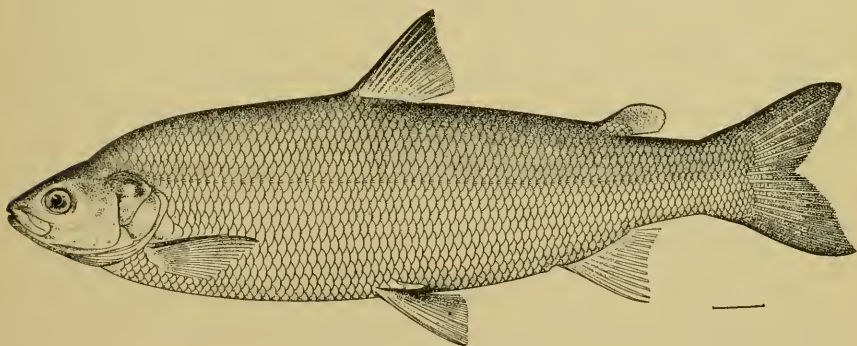


FIG. 1.—*ARGYRO SOMUS ERIENSIS*.

ARGYRO SOMUS ERIENSIS Jordan and Evermann, new species.

JUMBO HERRING OR ERIE CISCO.

Head $4\frac{2}{5}$ in the length, measured to base of caudal; depth $3\frac{2}{5}$; depth of caudal peduncle $2\frac{1}{5}$ in head; eye $5\frac{1}{5}$; snout $3\frac{3}{4}$; interorbital space $3\frac{1}{4}$; length of maxillary from tip of snout 3; D. 10; A. 12; scales in lateral line 71; between lateral line and origin of dorsal 8; between occiput and dorsal 32.

Body very deep, its width contained $1\frac{2}{3}$ times in head; dorsal outline curved abruptly upward behind occiput; dorsal contour of head straight; snout pointed, though rather blunt at tip; jaws about equal, the lower closing just beneath the upper at tip; maxillary extending to a point beneath anterior edge of pupil, the supplemental part about 3 times as long as wide. Gillrakers on first arch 16+29, very slender, the longest equal in length to diameter of orbit. Scales firmly attached.

Dorsal inserted about midway between tip of snout and base of caudal, the highest (first) ray contained $1\frac{1}{2}$ times in length of head; height of adipose dorsal equal to $1\frac{1}{2}$ times the length of its base; height of anal contained 2 times in length of head; outline of both dorsal and anal slightly concave; origin of ventral below anterior part of dorsal, length of fin contained $1\frac{1}{2}$ in head; pectoral $1\frac{2}{3}$ in head.

Color in spirits silvery, dusky on upper parts, but without blue shades in life; distal portion of dorsal, outer part of caudal, and edge and tip of pectoral dusky; other fins white.

Type.—Cat. No. 62515, U.S.N.M., is from Lake Erie at Port Stanley, Ontario, measuring $16\frac{1}{2}$ inches in length, and was collected by the writers. This represents the maximum of the size of the species as seen by us. Its weight when fresh was $2\frac{3}{4}$ pounds. A cotype, $14\frac{1}{2}$ inches long, No. 13083, Stanford University collection, obtained at the same time, is a little smaller and slightly darker in color, the anal having a terminal dusky cloud. It has 11 dorsal and 11 anal rays.

This species is very abundant along the northern shore of Lake Erie about the first of August. It is also occasionally taken in the southern part of Lake Huron, but it seems to be unknown in Lake Superior, and we did not hear of it in Lake Ontario. On the date of our visit to Port Stanley, July 29, 1908, about 1,500 pounds were taken in the gill-nets. The largest of these weighed $2\frac{3}{4}$ pounds, and were about 18 inches in length. The bulk of the catch was, however, about 14 inches in length. It is said of this species that there is a "great spurt" or large run in the spring and a short one in the autumn, before the spawning time in November.

The species was also seen at Port Burwell, where large numbers of them are smoked, having an excellent flavor as thus prepared. Many others from Point Rondeau, Ontario, were seen in the Detroit market.

The species may be called the "Erie Cisco," as it is characteristic of that lake, although other species, *Argyrosomus artedi*, the common Lake Herring, and *Argyrosomus huronius*, are found in the same lake. Fishermen claim that it is found in middle water, not at the surface nor at the bottom. As a food fish it is far superior to any other lake herring, being as delicate and rich in flavor as

the best Whitefish, *Coregonus albus* and *Coregonus clupeiformis*. It is therefore a species worthy of careful attention from the propagators of fish. It is claimed that it is rapidly increasing in abundance and that it was virtually unknown until within the past ten years. Most of the fishermen claim never to have seen examples of 2 to 3 pounds until within four or five years. It is locally known as the "Jumbo Herring," as it reaches a larger size than any other "Lake Herring" except the Tullibee of the northwestern lakes (*Argyrosomus tullibee*).

It is believed by many fishermen that the Jumbo Herring is the product of a cross between the Erie Whitefish (*Coregonus albus*) and the Lake Herring (*Argyrosomus artedi*). This belief is without foundation. It rests on the fact that at the Put-in-Bay Hatchery attempts have been made to fertilize Whitefish eggs with the milt of the Lake Herring, in default of the milt of its own species. To test this matter, Mr. Frank N. Clark, of the hatchery at Northville, Michigan, undertook the same experiment under carefully prepared conditions. In no case was the egg of a Whitefish fertilized by the milt of the Lake Herring, and the hybridization of the two species is quite improbable.

The following are our field notes on this species:

Jumbo Herring, Port Stanley, July 29, 1908. Head $4\frac{2}{3}$; depth $3\frac{1}{3}$; length $16\frac{1}{2}$; scales 7-9-80. D. 2, 9; A. 12. Head much deeper and less pointed than in the Lake Huron herring; lower jaw less projecting, almost even. Maxillary 3 in head. Supplemental maxillary a little narrower than in the other, not twice as long as broad, reaching front of pupil. Eye $3\frac{2}{5}$ in head. Suborbital to mucous channel, about $\frac{1}{2}$ as broad as pupil below eye, the whole width of bone not much greater than pupil. Gillrakers about 30 below arch. Color, olive above, sides silvery, a little less bluish than in the other, the stripes on scales much less distinct. Dorsal, pectoral, and caudal edged with black. Ventral without black tips. Caudal peduncle $1\frac{2}{3}$ in length from adipose. Greatest depth of tail equal to its length. Cooked, the Jumbo Herring is a fine, rich, well-flavored fish, as good as Whitefish. The Lake Huron herring is rather poor and tasteless, though as good as ordinary *artedi*.

ARGYROSOMUS HURONIUS Jordan and Evermann, new species.

LAKE HURON CISCO.

Head $4\frac{2}{3}$ in length to base of caudal; depth $4\frac{1}{4}$; depth of caudal peduncle $2\frac{9}{10}$ in head; eye 5; snout $3\frac{2}{3}$; interorbital space $3\frac{1}{3}$; length of maxillary from tip of snout 3; D. 9; A. 11; scales in lateral line 80; between lateral line and origin of dorsal 8; between occiput and dorsal 36.

Body notably elongate, elliptical, with slender, pointed head and slender tail, less compressed than in the other species of the genus; head small, the snout long and pointed; lower jaw not closing within the upper, but extending slightly beyond it; maxillary reaching a point below center of pupil, its width contained 3 times in the

length. Gillrakers on first arch, $10 + 32$; very slender, those near angle equal in length to diameter of eye.

Lateral line almost straight. Scales large and rather loosely attached.

Dorsal inserted midway between anterior border of eye and base of caudal; height of first ray contained about $1\frac{2}{3}$ times in length of head; length of base of adipose dorsal about equal to its height; origin of ventrals below middle of dorsal, the rays slightly shorter than those of dorsal; length of first anal ray, $2\frac{1}{2}$ in head; caudal deeply forked; pectoral short, about $1\frac{1}{2}$ in head.

Color in life, clear metallic blue above, silvery below; in spirits, silvery; dusky above, light below; a very indistinct, narrow, dusky stripe along each row of scales on upper half of body; dorsal with a broad dusky margin; caudal largely dusky; a mere trace of dark color on paired fins and the anal.

Type.—Cat. No. 62516, U.S.N.M., measures $14\frac{3}{4}$ inches in length and was taken at Port Stanley, Ontario, by the writers, on July

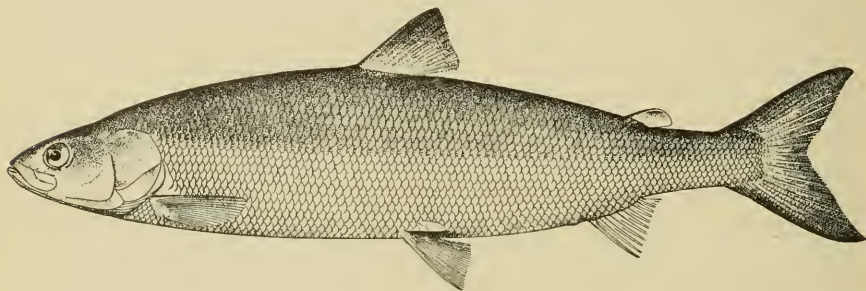


FIG. 2.—*ARGGYROSOMUS HURONIUS*.

29, 1908. A cotype, No. 13082, Stanford University collection, measuring 17 inches long, has ten rays in the dorsal and a slightly longer pectoral.

The species is known locally at Port Stanley as Lake Huron Herring, or Blueback. About a dozen were found mixed with about a thousand of *Arggyrosomus eriensis*.

The flesh of this species is rather dry and flavorless, something like that of the Menominee Whitefish, *Coregonus quadrilateralis*, and it is not to be compared as a food fish with the Erie Cisco.

The species seems to be quite as common in Lake Huron as is the usual lake herring, *Arggyrosomus artedi*. It has not been noted from Lake Superior or Lake Ontario, in both of which lakes *Arggyrosomus artedi* is abundant. A number of specimens were obtained from off Mackinac, but none of these was preserved. In our field notes is the following account of one of these:

Arggyrosomus huronius, a lake herring called Blueback, taken off Mackinac Island, by Leggett, a fisherman at Mackinac, August 3, 1908.

Length $13\frac{2}{3}$ inches; head $4\frac{1}{4}$; depth $4\frac{2}{3}$; eye $4\frac{1}{2}$ in head; maxillary to end of snout $3\frac{1}{2}$; maxillary proper $3\frac{1}{4}$; supplemental maxillary with broad hook, and more than twice as long as broad; maxillary barely reaching front of pupil; snout $3\frac{2}{3}$; jaws equal at tip; chin projecting; scales, 8-78-8; gillrakers, 14+29. Pectoral $1\frac{1}{2}$ in head; dorsal $1\frac{1}{4}$; dorsal rays 10; anal 10.

Color dark olive with bluish luster above and sparse dark points on scales; tip of jaws dark; dark spot on preopercle as in the other species; edge of all fins dusky; maxillary rather dark; caudal slender, least depth less than half, its greatest depth a little more than half length.

This seems to be the same as the Lake Huron herring we got at Port Stanley. Maxillary barely to front of pupil.

The following field notes were taken in Lake Erie:

Lake Huron Herring, Port Stanley. Specimen 18 inches long. Head $5\frac{1}{4}$; depth 5; scales 8-10-83. Dorsal 10; anal 10. Body elongate, lanceolate, not much compressed. Head pointed, lower jaw distinctly projecting. Maxillary $3\frac{1}{2}$ inches head, reaching front of pupil. Eye $4\frac{1}{3}$ in head. Snout $3\frac{1}{4}$. Maxillary on level of pupil. Supplemental maxillary half longer than broad, with a posterior hook. Depth of head under middle of eye $\frac{1}{2}$ length of head. Sub-orbital to mucous channel nearly as broad as pupil. The bone $\frac{2}{3}$ of breadth of eye. Pectoral $1\frac{2}{3}$ in head; ventral $1\frac{1}{4}$; dorsal $1\frac{1}{3}$.

Color.—Olive sides, very silvery, with lighter streaks along rows of scales. Dorsal, anal, pectoral, caudal, and ventral edged with blackish (smaller fish with the ventrals white). Depth of caudal peduncle at base of fin 2 in length from adipose fin. Gillrakers about 35 below angle. Greatest depth of tail $1\frac{2}{3}$ in its length.

This differs from the Jumbo Herring in being more slender, less compressed, with slimmer, more pointed head, narrower and much more projecting lower jaw, and much slimmer and rounder caudal peduncle.

ARGYROSOMUS ZENITHICUS Jordan and Evermann, new species.

LONGJAW OF LAKE SUPERIOR.

Head $3\frac{2}{3}$ in length to base of caudal; depth $4\frac{2}{3}$; depth of caudal peduncle $3\frac{1}{4}$ in head; eye $5\frac{1}{3}$; snout $3\frac{2}{5}$; mouth larger than in related species, almost as large as in *Argyrosomus hoyi*; maxillary to tip of upper jaw $2\frac{2}{3}$ in head; scales in lateral line 72; between lateral line and base of dorsal 8; between occiput and origin of dorsal 30; D. 10; A. 12.

Form of body elongate, compressed, the width contained about $2\frac{2}{5}$ times in the length of head; snout pointed; jaws equal in length, the lower usually closing with the upper lip, as in *A. hoyi*. Maxillary extending to a point below center of pupil, the supplemental part wider than that below it. Gillrakers on first arch 17+25; very slender; the longest contained 6 times in the length of head.

Origin of dorsal midway between tip of snout and base of caudal, its height contained $1\frac{2}{3}$ times in length of head; base of adipose dorsal less in length than height, the height about equal to diameter

of orbit; caudal deeply forked, the lobes equal; length of fin about an eye's diameter less than length of head; height of anal contained $2\frac{1}{2}$ times in length of head; ventrals inserted below middle of base of dorsal; length $1\frac{3}{8}$ in head; pectorals unusually long, $1\frac{1}{2}$ in head, reaching considerably more than half way to anal.

Color silvery; dusky above; dorsal, caudal, pectorals, and anal more or less suffused with black toward the borders, the anal much lighter than the others. Ventrals immaculate; none of the fins wholly black, as in *Argyrosomus nigripinnis*. Scales loose, falling readily.

Type.—This description is taken from the type, Cat. No. 62577, U.S.N.M., a specimen 330 mm. long. It was obtained in Duluth, Minnesota, by Mr. John Coventry, of Booth and Company, in September, 1908, it having been taken in deep water off Isle Royale. A cotype, No. 13084, Stanford University, of the same size, and taken at the same time and place, is apparently like the type, in all essential

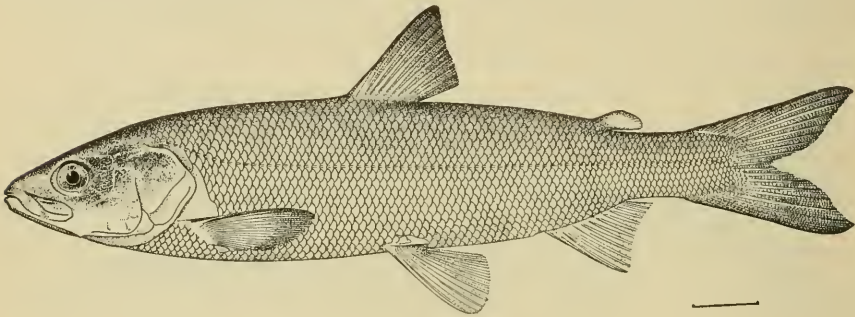


FIG. 3.—ARGYROSOMUS ZENITHICUS.

details. Hundreds of specimens of this species were seen in the cold-storage plant of Booth and Company, at Duluth, "the Zenith City."

Argyrosomus zenithicus lives in much deeper water than the ordinary lake herring, and makes a part of the autumn catch in deep water. A large part of this catch, however, is of another species, apparently undescribed, called the Bluefin. The present species is locally known as Longjaw, and is more or less confounded by the fishermen with the true Bluefin, which seems to be an ally of *Argyrosomus prognathus*, and with the Mooneye Cisco, Chub, Longjaw, or Kieye (*Argyrosomus hoyi*), which occurs in Lake Michigan and Lake Huron, but which we did not see in Lake Superior.

From the Mooneye Cisco, *Argyrosomus hoyi*, as seen in Lake Michigan, the Lake Superior Longjaw differs in being less silvery in color, with the scales thinner, looser, and more dotted with black; in having a much longer pectoral, in the longer head, longer jaws, and larger adipose fin. The Blackfin Cisco, of Lake Michigan, *Argyrosomus nigripinnis*, has the fins all black, the head shorter, the jaws shorter, and the snout shorter. The pectoral is long in both species.

The Bluefin above mentioned is also a deep water Cisco, with the body robust and the scales firm; head $4\frac{1}{2}$ in length; depth $3\frac{3}{4}$; maxillary reaching front of eye, $2\frac{3}{4}$ in head; fins, pale; the dorsal and caudal with the upper edge of pectoral dusky. The species reaches a larger size than the common herring, the specimen above noted, but not preserved, being $13\frac{1}{4}$ inches in length. Having no specimens at hand, we refrain from naming this species. The Bluefin is not a good food-fish, being rather poor and dry, the flesh rather soft.

The Longjaw, described as *Argyrosomus zenithicus*, is a good fish for smoking. The flesh is soft, but it has a delicate flavor when fresh, though poor and bony after freezing.

NOTE ON THE SPECIES OF WHITEFISH.

In this connection it may be noted that the common Whitefish of Lake Superior is the species called Labrador Whitefish, *Coregonus labradoricus* Richardson, characteristic of the Lake of the Woods and of the Canadian lakes generally, and that it is apparently distinct from the Whitefish of Lake Erie and Lake Ontario.

The Lake Superior Whitefish was first named *Salmo clupeiformis* by Mitchill, whose specimens came from the Sault Sainte Marie. Only the Labrador Whitefish is found at Sault Sainte Marie, where it was formerly netted or speared in large numbers by the Indians and where it still readily takes the hook. Large numbers are hooked every day, in the locks of the ship canal, by local anglers. The Erie Whitefish does not take the hook. The technical differences separating the two species are slight, but apparently constant.

Mr. Harry Marcks, director of the fish hatchery at Sault Sainte Marie, tells us that the eggs of the Superior Whitefish are different from those of the Lake Erie Whitefish, being larger and darker in color. The fry are also distinguishable, those of the Superior Whitefish being much livelier and having two dark lines along each side.

The Lake Superior Whitefish must therefore stand as *Coregonus clupeiformis* (Mitchill), or *clupeiformis*, if we demand correct spelling. The Whitefish of Lake Erie is *Coregonus albus* Le Sueur. The Whitefish seen by us in Georgian Bay and a series received from Cheboygan in Lake Michigan belong to *Coregonus clupeiformis*. The same species is found in Rainy Lake, Lake of the Woods, and Lake Winnipeg.

The synonymy of the two species should stand as follows:

COREGONUS CLUPEIFORMIS (Mitchill).

Salmo clupeiformis MITCHELL, Amer. Monthly Mag., II, 1818, p. 321; Sault Sainte Marie.

Coregonus labradoricus RICHARDSON, Fauna Bor.-Amer., III, 1836, p. 206; Musquaw River, Labrador.

Coregonus sapidissimus AGASSIZ, Lake Superior, 1850, p. 344; Lake Champlain "type," after Thompson; and Lake Superior.

- Coregonus latior* AGASSIZ, Lake Superior, 1850, p. 348; The Pic, Lake Superior.
Coregonus neohantoniensis PRESCOTT, Amer. Journ. Sci. Arts, XI, 1851, p. 342;
Lake Winnipiseogee, New Hampshire.

COREGONUS ALBUS (Le Sueur).

- Coregonus albus* LE SUEUR, Journ. Acad. Nat. Sci. Phila., I, 1818, p. 231; Lake Erie.
Coregonus otsego CLINTON, Med. and Phil. Register, III, about 1824, p. 188;
Otsego Lake, New York.