

NOTE ON THE GOLD-EYE, *AMPHIODON ALOSOIDES* RA-  
FINESQUE, OR *ELATTONISTIUS CHRYSOPSIS* (RICH-  
ARDSON).

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In the basin of Lake Winnipeg the fish known as the gold-eye has considerable value as an article of food. Smoked, it is fairly to be called delicious, and as a pan-fish, although beset by small bones, its flesh is excellent, scarcely inferior to that of the whitefish. It is flaky, rather firm, and of good quality. According to Richardson, the "flesh is white, resembling that of the perch in flavor, but excelling it in richness." The fish is bright silvery in life, the eyes being, as stated by Richardson, of a bright "honey yellow," suggesting the name of gold-eye, universally given to the species by the fishermen and fish dealers of Manitoba.

The species was found by the International Fisheries Commission to be abundant in Lake of the Woods, in the Red River of the North, and in Lake Winnipeg. It is also said to abound in the lower Saskatchewan and Assiniboine, as well as in Lake Manitoba and other lakes tributary to Lake Winnipeg. The moon-eye, *Hiodon tergisus*, which is nowhere valued as food, is not found in the Winnipeg basin.

Sir John Richardson gave the gold-eye the name of *Hiodon chrysopsis*,<sup>a</sup> his specimens being from Cumberland House on the lower Saskatchewan, near Lake Winnipeg.

Besides our specimens from the Winnipeg region, we have also examples from the White River at Gosport, Indiana, and from South Loup River, Nebraska. In all these, the eye is still yellow, although the specimens have been over twenty years in spirits.

The illustration (fig. 1) representing a female specimen from Red River of the North, at Winnipeg, is drawn by William S. Atkinson.

As to the proper specific name for the gold-eye, and the genus of which it is the type, we are still somewhat in doubt.

Rafinesque describes from the Falls of the Ohio a species he calls *Amphiodon alosoides* (misprinted *alricoides*), later called, by the same writer, *Hiodon amphiodon*. This fish has much in common with the gold-eye, and may be the same fish as supposed by Jordan and Ever-

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<sup>a</sup> Fauna Bor. Amer., 1836, p. 232.

mann. The gold-eye certainly occurs in the Ohio basin. It is, however, possible that the *Amphiodon alosoides*, with other nominal species of Rafinesque, is the common moon-eye, *Hiodon tergisus*.

The original account of Rafinesque (Journal de Physique, vol. 88, page 421, 1819, now almost inaccessible) is as follows, as transcribed for us by Mr. Henry W. Fowler:

Ce poisson se nomme Yellow Herring (Hareng jaune) dans l'Ohio. Cette rivière a en outre plusieurs nouvelles espèces de vraies Clupées à dents, ainsi que des *Glossodons* (ou *Hiodon* Les.) des *Thrisses sans dents*, ou *Clupanodons*, etc.

15. *Amphiodon*. (Abdominal) Différent du genre *Glossodon* (*Hiodon*, Lesueur) par mâchoires dentées, ainsi que la langue. Carène ventrale obtuse, peu visible, sans plaques. Nageoires dorsales au-dessus de l'anus. Ce genre a en outre les thoraciques appendiculées comme les Clupées et les Thrisses, mais a 7 rayons seulement au lieu de 9, comme les *Glossodons*.

*A. alveoloides*. Corps oblong argenté, tête dorée, mâchoire inférieure plus longue, ligne latérale à peine courbée en bas, queue fourchue. D. 10, A. 34, P. 16, C. 24. Grande espèce nommée vulgairement Shad (Alose) sur l'Ohio.

In the Ichthyologia Ohiensis, 1820, page 42, the subgenus *Amphiodon*, based on the *Hiodon alosoides*, which he now calls *Hiodon amphiodon*, is thus characterized: "Body lanceolate, lower jaw longer, dorsal beginning opposite base of the anal fin. The name means toothed all over."

This *Hiodon amphiodon* is said to have the diameter one-fourth the total length; jaws with large conical teeth, similar to those on the tongue; eyes round and black; iris silvery gilt; dorsal rays 10; anal 34.

In the second subgenus, *Glossodon*, based on "*Hiodon vernalis*" (= *Hiodon tergisus*), the following characters are given: "Body lanceolate; jaws equal, with small teeth, dorsal fin opposite the vent, nearly medial, beginning behind the abdominal fins. The name means toothed tongue."

In this species, the dorsal rays are 13, the anal 28; the falcation of the fin indicates the male.

In the third subgenus, *Clodulus* (*Hiodon clodulus*), we have the "body oblong, irregular or somewhat rhomboidal. Jaws nearly equal, the lower one somewhat longer and with small teeth. Dorsal fin beginning before the base of the anal fin." In *H. clodulus* (= *Hiodon tergisus* LeSueur) the dorsal rays are 15, the anal 30.

In support of the theory that the *Amphiodon alosoides* was the moon-eye and not the gold-eye, we have these phrases: "Carène ventrale obtuse, peu visible." "Nageoires dorsales au-dessus de l'anus."

On the other hand, in favor of the identity of *Amphiodon alosoides* with the gold-eye, we have the backward position of the dorsal (although it is still farther back in the gold-eye), the presence of ventral carina, however little visible in comparison with the river herring, and especially the numbers of fin rays, D. 10, A. 34, indicating a very long anal and a short dorsal, both characteristics of the gold-eye. On the whole we have little doubt that Rafinesque had the

gold-eye in mind, as *Amphiodon alosoides*, and also in his *Hiodon heterurus*. If this view be not accepted, these two nominal species will be placed in the synonymy of the moon-eye, *Hiodon tergisus*. The name *chrysopsis* must then stand for the gold-eye and the species will be *Elattonistius chrysopsis*.

We regard the gold-eye as certainly generically distinct from the moon-eye, adopting for the former Rafinesque's name *Amphiodon*.<sup>a</sup> Gill and Jordan have defined *Elattonistius* as a subgenus by the *carination* of the entire abdomen and by the shortness of the dorsal fin. Equally important is the distinction perhaps indicated by Rafinesque of the backward insertion of the dorsal, which in the gold-eye is considerably behind the front of the long anal, about over the ninth ray. In the moon-eye the anal is shorter and the dorsal is inserted in front of it, its middle directly over the vent.

*Description of the gold-eye.*—Two specimens from the Red River of the North at Winnipeg, Manitoba, 235 and 265 mm. in length:

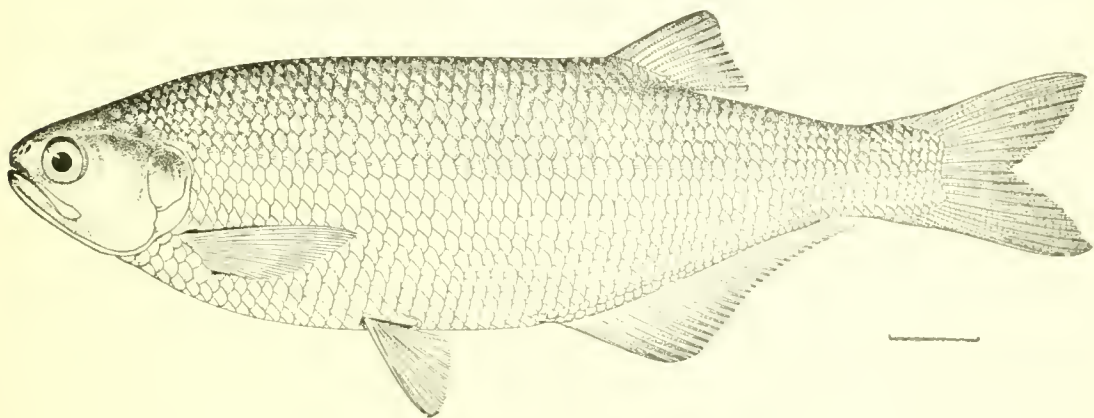


FIG. 1.—AMPHIODON ALOSOIDES.

one from Warroad, Lake of the Woods, 310 mm.; one from Gosport, Indiana, 172 mm., and two from South Loup River, Nebraska, 97 and 126 mm. long.

Head 4 to  $3\frac{5}{7}$  in body length to base of caudal, smallest in adults; depth  $3\frac{1}{4}$  to  $3\frac{1}{3}$  in body length; eye  $3\frac{1}{8}$  to  $3\frac{1}{2}$  in head, larger in young; snout 5; interorbital space equal to eye diameter; maxillary measured from tip of snout, two in head; D. 9 or 10 (fully developed rays); A. 29 to 35; scales 6–58 to 60–12 (18 in transverse series from insertion of dorsal to insertion of anal); 8 between ventrals and lateral line; B. 9.

Body greatly compressed, its width  $3\frac{1}{2}$  in depth, greatest width above lateral line, thinning to ventral outline, which is strongly carinated from isthmus to anal fin; depth intermediate between that of *Hiodon tergisus* and *H. sclenops*; ventral and dorsal outlines parallel and straight in center of body for nearly half length; axis of body between snout and caudal peduncle high, leaving three-fifths of depth below; dorsal outline hence tapering less to head and tail than ven-

<sup>a</sup> Journal de Physique, 1819, p. 421=*Elattonistius*, Gill and Jordan, Bull. 10, U. S. Nat. Mus., 1877, p. 68.

tral, especially posteriorly; caudal peduncle moderately broad, strongly compressed, and rather short, barely tapering, if at all, viewed laterally; head rather short, especially from snout to occiput, compressed, conical, varying in concavity of dorsal outline in sex, and straight from corner of mouth to below pectorals; its longitudinal axis tilted decidedly upward to about 30 degrees from body axis, owing to low position of opercular plates; snout strongly gibbous from above nostrils to tip, mouth oblique; lower jaw equal to upper, included laterally; maxillary extending to below a point midway between pupil and posterior margin of eye; eye large, very close to angle of mouth, the suborbital bones very narrow.

Dentition very complete; vomer toothless, small; parasphenoids extending far forward, with strong canines, a large series on each side, one or two smaller series between, usually two posteriorly, these strongest in the male; palatines with one large series each of canines; ecto- and entopterygoids with bands of villiform teeth;

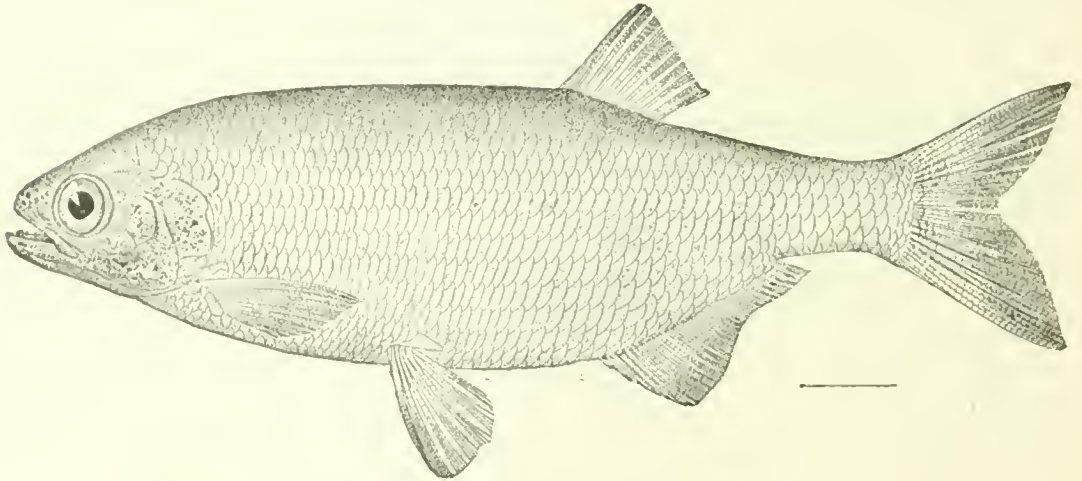


FIG. 2.—*Hiodon tergisus*.

glossohyal toothed similarly to parasphenoid, but with a central band of villiform teeth, the area broader; premaxillaries with a single series of small teeth, set widely, visible when jaws are closed; maxillaries with a minute series larger anteriorly; dentaries with inner and outer small series, and between a band of minute teeth. Teeth of dentaries closing against those of palatines.

Lateral line straight, nearer dorsum; scales fairly large, larger than subopercle, thin, with transparent, flexible margin, two series inclosing the base of anal fin. Adipose formation over preorbitals and from dorsal edge of eye to upper attachment of opercle; ventral scale present, half of ventral length.

Dorsal fin inserted somewhat behind insertion of anal, about over the ninth ray, contrasting with that of *Hiodon tergisus* and *H. schenops*, in which the insertion is well in advance of the vent; the fin low, its height  $1\frac{5}{8}$  in head, its base short, two-thirds its height, slightly concave; caudal deeply forked, its lower lobe longer; pectorals long, reaching six-sevenths of distance to ventrals; latter

small, equal to dorsal height; anal longer than in allied species, its base nearly equal to body depth; falciform, its border notched (in males) or concave, rays anteriorly greatly heightened, in males especially, to about two-thirds head; posterior rays very short in both sexes; base of anal greatly compressed and slightly concave in outline.

Color, in spirits, lustrous silvery, bluish above, colorless below, fins with dark margins, save for ventrals, which are clear.

Iris bright golden yellow; sides of head with golden luster.

The sexual differences are somewhat marked, and some differences are observable in dentition. These may be due to age. The specimens from Winnipeg, Red River of the North, are of moderate size, 235 and 265 mm. in length, to the base of the caudal, one female, the other male. The parasphenoids in both have a single median series of strong canines similar to the lateral series anteriorly, doubling posteriorly; the teeth on the palatines are large and strong; the concavity of the dorsal outline of the head is not very marked in either, and the snout is rounded. The anal fin is strongly notched in the male, but not in the female. In the specimen from Warroad, Lake of the Woods, an adult male of large size, 310 mm. in length to the base of the caudal, the space between the nostrils and occiput is strongly convex, the head appearing to be much more strongly turned upward, and the snout is almost, if not quite, truncate. The teeth on the parasphenoids are less strongly developed than in either male or female from Winnipeg, two rows of small teeth being present anteriorly between the lateral rows, and the palatine teeth are not as strong. The anal fin is strongly notched.

The remainder of the specimens from White River, Indiana, and South Loup River, Nebraska, are of smaller size and immature, but, in so far as can be seen, resemble the Winnipeg specimens. The differences of the Warroad specimen may be due to sex and age.

*Measurements of Amphiodon alosoides.*

Locality.	War. road, Lake of Woods.	Winnipeg, Red River.	Winnipeg, Red River.	South Loup River, Nebraska.	South Loup River, Nebraska.	Gosport, Indiana.
Specimen number . . . . .	13108	13086	13087	861	859	1238
Length without caudal (mm.) . . . . .	310	265	235	126	97	172
Head . . . . .	.225	.21	.23	.24	.23	.215
Depth . . . . .	.30	.30	.31	.28	.28	.30
Caudal peduncle:						
Length . . . . .	.105	.10	.095	.10	.09	.095
Depth . . . . .	.095	.10	.10	.10	.105	.11
Eye . . . . .	.06	.06	.065	.075	.075	.06
Snout . . . . .	.04	.04	.047	.05	.045	.045
Interorbital space . . . . .	.065	.06	.065	.065	.065	.06
Maxillary, from tip of mouth . . . . .	.11	.11	.11	.125	.12	.11
Dorsal rays (fully developed) . . . . .	9	10	9	10	10	10
Anal rays . . . . .	31	32	32	29	32	31
Scales . . . . .	6-61-12	6-60-12	6-58-12	6-58-11	6-60-11	6-60-12
Scales, occiput to dorsal . . . . .	42	40	39	40	40	41
Snout to anus . . . . .	.66	.64	.61	.65	.65	.63
Pectoral length . . . . .	.20	.20	.22	.225	.22	.20
Ventral, length longest ray . . . . .	.13	.13	.13	.13	.12	.125
Dorsal, length longest ray . . . . .	.11	.11	.13	.135	.12	.125
Anal, length longest ray . . . . .	.14	.135	.14	.13	.15	.12
Sex . . . . .	Male.	Female.	Male.	Immature.	Immature.	Immature.