# NOTROPIS VOLUCELLUS WICKLIFFI, A NEW SUBSPECIES OF CYPRINID FISH FROM THE OHIO AND UPPER MISSISSIPPI RIVERS.

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A study of the material now preserved in the Museum of Zoology, University of Michigan, and the Ohio State Museum, makes it apparent that several more or less well defined subspecies of the shiner *Notropis volucellus* (Cope) occur in various parts of its range.

In the present paper three northern forms of this species are differentiated and their ranges and habits discussed and defined. It is hoped that the southern forms will be dealt with later. This paper is an extension of the contributions to the status of *Notropis volucellus* and its subspecies which have been made by Hubbs and Green (1928: 375–379) and Hubbs and Ortenburger (1929: 67–70).

The range, variation and habitat of the three forms are as follows:

1. *Notropis volucellus volucellus* (Cope) ranges throughout the Great Lakes drainage, from Lake Champlain to Minnesota, northward to Lake Nipigon in Ontario, and southward to a distance as yet undefined. Specimens apparently referable to *volucellus* proper come from as far south as various parts of the Cumberland and Tennessee rivers systems. Farther south it appears to be represented in the upland streams by at least two different subspecies. The most extreme of these forms, from northeastern Mexico, is being described by Hubbs and Gordon. The southwestern upland form of the United States has been regarded as referable to *N. v. volucellus*, but new material indicates that one or more subspecies may in the future be recognized in this territory.

The typical subspecies is quite consistent in its characters and range, and forms a well defined unit. This is especially true in the northern part of its range beyond the influence of other subspecies. Occasionally, one of the features of this form may fall at one locality, but the ensemble of characters remain. Whenever it comes in close proximity with another subspecies to the south or west, however, this consistency of

characters is lost, and all forms of intergradations between it and the other subspecies can then be noted.

*Volucellus* proper is very numerous and at times a dominant fish throughout most of its range. It is especially common in the glacial lakes in moderately weedy situations having a silty or mud bottom. As a rule it occurs but seldom in the more strictly terrigenous and exposed portions of these lakes, where its near relative, *Notropis deliciosus stramineus* (Cope), abounds. This condition holds for the Great Lakes themselves where both these species can be found in abundance, especially in the shallower portions.

It is also a common inhabitant within the above-named area in the streams and creeks, living in the quieter pools having a soft bottom of silt or muck, and is not adverse to a moderate amount of submerged aquatic vegetation. Here again it leaves the terrigenous areas with their usually swifter current to *N. d. stramineus*. Towards the southern part of its range *volucellus* proper becomes uncommon or entirely absent in the larger streams and rivers.

2. *Notropis volucellus buchanani* Meek ranges from extreme southwestern Pennsylvania westward to Iowa, south to the Rio Grande and Tennessee. More material farther south from northern Mississippi, Louisiana and Texas will probably show this form to be not uncommon there in the larger streams.

*Buchanani* does not appear in typical form anywhere in the Great Lakes drainage. But along the Maumee river, and northwestward across Lake Erie to Big Creek, Elgin County, Ontario (Hubbs and Green, 1928: 378), *buchanani* influence is noted, cropping out in isolated places in a most interesting manner. This apparently is a relic from the time when the connection between the Wabash and Maumee rivers still existed.

Since typical examples of *buchanani* throughout the known range show but little variation, this subspecies forms a well defined unit. As pointed out by Hubbs and Green (1928: 378), it is a smaller and much daintier fish than *volucellus* proper; is sharply compressed; has greatly elevated lateral line scales; very large and delicate fins and but few melanophores on the body. The two characters last named suggested the vernacular name "ghost shiner," which has been used by recent authors.

In the northern part of its range, at least, *buchanani* is confined to the lower portions of streams flowing through

lowlands, where they have a southern fauna. Here it is to be found living over a silty bottom in a very sluggish to moderate current, and penetrating freely into weed beds when these are present.

3. A third form, confined to the Ohio and upper Mississippi rivers and the lower courses of their larger tributaries, is now described:

**Notropis volucellus wickliffi,** new subspecies.

*Diagnosis.*—This form of *Notropis volucellus* differs from *N. v. buchanani* in growing to a much larger size (reaching the total length of 56 mm. from tip of snout to base of caudal); in having a larger eye; longer and heavier head; much deeper caudal peduncle; larger mouth; lower and more rounded fins with less feeble rays; and in the less elevated and less imbricated scales. In these respects it approaches or agrees with the typical subspecies. From *N. v. volucellus* the new form differs in having slightly larger fins, and in the more anterior insertion of the dorsal. It is differentiated from both *volucellus* proper and *buchanani* in having a relatively larger mouth; deeper caudal peduncle; a heavier head; a more turgid body; less elevated lateral line scales, and a more solidly and evenly stippled dark lateral band on the tail region of the body.

*Range.*—This form is apparently confined to the larger and deeper waters of the Ohio and upper Mississippi rivers and the lower courses of their larger tributaries. It is represented in the Museum of Zoology by specimens from Ohio, West Virginia, Kentucky, Indiana, Missouri (St. Louis) and Wisconsin.

In the spring vast numbers of this form migrate from the Ohio river up the larger tributaries to spawn, retreating later to the main stream. There is no indication of its occurrence anywhere in small streams or lakes. But very few of the record stations are more than fifty miles away from either the Ohio or Mississippi rivers. The significance of this statement is enhanced when it is considered that all of the hundreds of collections made in the course of the Ohio and Wisconsin fish surveys, containing thousands of specimens of *N. volucellus* from all sections and types of habitats in these two states, have been studied in the preparation of this paper.

*Holotype.*—A breeding male 48 mm. in length from the tip of the snout to base of caudal, collected by M. B. Trautman and R. B. Foster at the mouth of the Miami river at its confluence with the Ohio river in extreme southwestern Miami Township, Hamilton County, Ohio, on May 25, 1931; Cat. No. 92411,

Division of Fishes of the Museum of Zoology, University of Michigan.

The body is decidedly terete, more so than in *volucellus* proper and much more than in *buchanani*. The width is contained 1.5 times in the greatest depth (taken just before the dorsal). The depth enters 4 times into the standard length of the body; the head 4 times. The orbit, contained 3 times in the length of the head, is quite conspicuous and bulging. Upper jaw 3.5 in length of head.

The caudal peduncle enters 2.25 times in the length of the head. As in other forms of this species, the dorsal fin has 8 rays; the anal 8 rays; and the pelvics 8 rays each. The height of the depressed dorsal fin is contained 2.25 times in the distance from the origin of that fin to tip of the snout. The origin of this fin is equidistant between the tip of the snout and the base of the caudal. The pelvics do not reach to the origin of the anal fin.

Scales 5½–35–4; 3½ to pelvic; 15 before the dorsal. The highest lateral line scales on the exposed fields are only about 2.5 times as high as long.

The general color is silvery. The dusky lateral streak is well developed and is thickly and uniformly stippled, especially posteriorly. Two small black dots mark each scale in the lateral line, one above the pore and the other below, these becoming quite indistinct towards the tail when they merge into the lateral band. The dark margins of the dorsal scale pockets are more diffuse than in typical *volucellus*.

Pharyngeal teeth 4–4 (many paratypes examined), strongly hooked, and with the grinding surfaces but slightly developed or absent.

The nuptial tubercles correspond well with the description given by Hubbs and Ortenburger (1929: 68) for southern forms of the other two subspecies. They cover the head, and are but weakly enlarged between the eyes. They become obsolescent toward the dorsal fin and are generally absent on the sides of the body, except on the lateral line scales. Here they form a vertical row near the base of each exposed field, and another incipient row near the margin. On the pectoral rays they are in one row basally, and in two, rarely three or four, distally.

Numerous paratypes from Ohio and Wisconsin are deposited in the Museum of Zoology of the University of Michigan and in the Ohio State Museum.

*Variations and Comparisons.*—This subspecies shows a moderate amount of variation, as is to be expected of any form within such a plastic species. Due to this variability, no single character can be found that is everywhere constant. For the certain identification of material of any subspecies of *volucellus*, it is necessary to study several characters, preferably in several specimens.

The shape of the body averages more terete and is more turgid than in *volucellus* proper, and much more so than in

*buchanani.* This effect is heightened by the heavy caudal peduncle and heavy, rather squarish head.

The width is contained in the depth from 1.50 to 1.75* in the present form; 1.65 to 1.95 in *volucellus* proper; and 1.95 to 2.15 in *buchanani.*

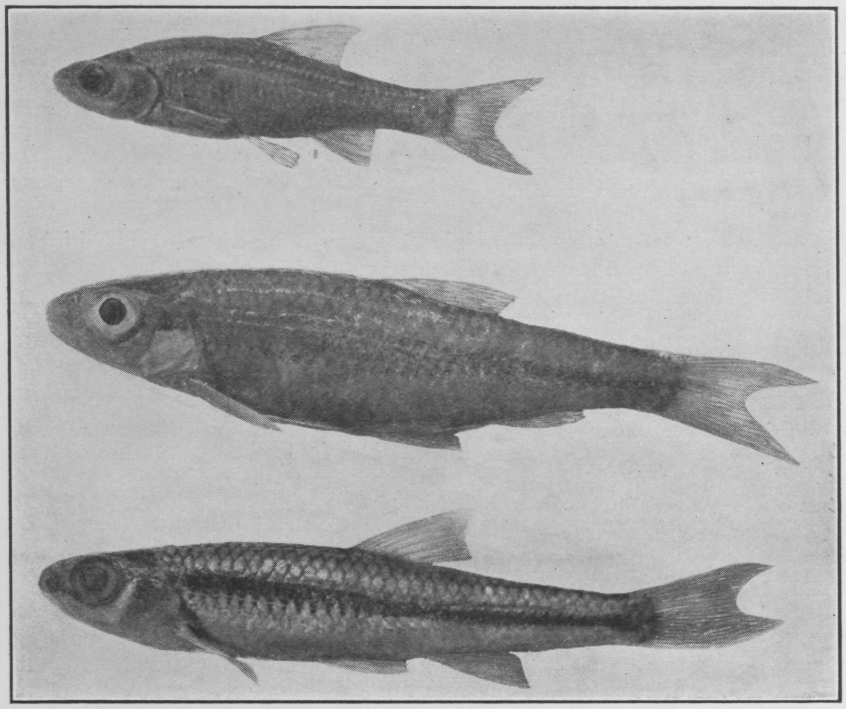

FIG. 1. The three subspecies of *Notropis volucellus.* Upper figure, *N. v. buchanani;* middle figure, *N. v. wickliffi;* lower figure, *N. v. volucellus.*

The depth varies from 3.90 to 4.35 in the standard length in *wickliffi;* 4.6 to 5.0 in typical *volucellus;* and 3.6 to 3.9 in *buchanani.*

The head is contained from 3.9 to 4.1 times in the standard length in the present form, agreeing in this respect with typical *volucellus;* but not with *buchanani,* in which form the head is contained from 3.6 to 3.9 times in the standard length. The whole head is thicker and more heavily built in *wickliffi* than in the other two.

*The usual and not the extreme variations are indicated.

The orbit of the present form is contained 2.9 to 3.3 times in the head; in *volucellus* proper 2.9 to 4.0 times (averaging 3.0 in some northern lakes and 4.0 in others); and in *buchanani* 3.5 to 4.0 times.

The mouth averages larger than in the other two subspecies. The upper jaw is usually contained from 3.4 to 3.6 times in the length of the head; in *volucellus* this measurement ranges from 3.5 to 4.0; and in *buchanani* from 3.9 to 4.1.

In the present subspecies the depth of the caudal peduncle is contained from 2.2 to 2.4 times in the length of the head; 2.6 to 2.8 in typical *volucellus;* and 2.8 to 3.05 in *buchanani.*

The height of the depressed dorsal is contained slightly more than 2.0 times on the average in the distance from the origin of the dorsal to the tip of the snout; in typical *volucellus* this fin is slightly shorter, usually contained 2.3 to 2.6 times in the predorsal length, while in *buchanani* it is longer, being contained 1.6 to 2.1 times in the same interval. The origin of this fin is directly above or but slightly in front of the insertion of the ventral fins; in *volucellus* proper it is inserted a trifle behind the vertical; from the origin of the ventral; and in *buchanani* this fin is decidedly behind the vertical from the origin of the ventrals.

The rows of scales in the lateral line usually number 34 or 35; in *volucellus* proper there are usually one or two more; in *buchanani* one or two fewer.

The scales along the lateral line are less elevated than usual in the species, as the width of the exposed portion averages only 2.5 times in the height of the most elevated scales; in *volucellus* proper this value is about 3.0; and in *buchanani* about 4.0.

The general coloration is not so intense as in typical *volucellus* except along the posterior portion of the lateral band. It is very much more heavily pigmented than in *buchanani.*

Intergrades between *wickliffi* and *volucellus* proper have been found in collections from Ohio and northern Wisconsin; and intergrades between it and *buchanani* from Ohio. Intergrades between *volucellus* and *buchanani* have also been examined.

The occurrence of these intergrades and the high degree of overlapping in all the varying characters in all the forms, calls for treating them as subspecies rather than as species, as one would certainly treat them if only typical examples of each

were at hand. The contrast between extreme examples of these three subspecies is most striking. (See figures).

In as much as *wickliffi* occupies a territory more or less between the centers of the ranges of *volucellus* (subspecies) and *buchanani*, one might be inclined to interpret it as representing intergrades between the two. It does have in fact some intermediate characters such as general paleness, size of the fins and obliquity and terminal position of the mouth. But as evidence of the subspecific distinctness and integrity of the form, it may be pointed out that in other characters it is not intermediate; that in some respects it shows extreme characters (see diagnosis); and that it occupies in abundance and virtually exclusively a very distinct habitat along hundreds of miles of main river course.

*Habitat.—N. v. wickliffi* has been noted in wholly typical form only in the largest rivers (within the range given above), where these have a silty bottom and practically no submerged vegetation. It is not adverse to turbid conditions or a good current. In the Ohio river and the lower courses of its tributaries, in Ohio at least, this form greatly predominates. It is a deep water shiner, straggling in but few numbers into the shallower portions during the day, especially if the water is clear. Toward evening during the summer months *wickliffi*, together with its close associates, *Hybopsis storerianus* (Kirtland), *Notropis blennius* (Girard) and *Notropis atherinoides* Rafinesque, can be seen coming to the surface in great numbers to feed, or jumping from the water when chased or startled. They appear in large schools in the shallower water at night. Due to its abundance it is undoubtedly of economic importance as a forage fish.

It gives me great pleasure to dedicate this form to my loyal friend, Edward L. Wickliff, who has done much in carrying on and furthering ichthyological research in Ohio.

## LITERATURE CITED.

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