

Committee  
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of Endangered  
Wildlife  
in Canada

Comité sur le  
statut des espèces  
menacées  
de disparition  
au Canada

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STATUS REPORT ON THE GHOST SHINER  
NOTROPIS BUCHANANI  
IN CANADA

BY

E. HOLM

AND

J. HOUSTON

STATUS ASSIGNED IN 1993  
REPORT ACCEPTED, NO STATUS DESIGNATION REQUIRED

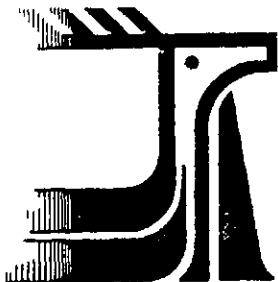
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<sup>1</sup>Ichthyology and Herpetology, Royal Ontario Museum, Toronto,  
Ontario, M5S 2C6

<sup>2</sup>374 Fireside Drive, R.R. No. 1, Woodlawn, Ontario,  
K0A 3M0

## Status of the Ghost Shiner, *Notropis buchanani*, in Canada

E. HOLM<sup>1</sup> AND J. HOUSTON<sup>2</sup>

<sup>1</sup> Department of Ichthyology and Herpetology, Royal Ontario Museum, Toronto, Ontario M5S 2C6

<sup>2</sup> 374 Fireside Drive, R.R. #1 Woodlawn, Ontario KOA 3M0

Holm, E., and J. Houston. 1991. Status of the Ghost Shiner, *Notropis buchanani*, in Canada. Report to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Canadian Wildlife Service, Ottawa, Ontario K1A 0H3.

The Ghost Shiner, *Notropis buchanani*, is a small minnow only recently discovered in Canada. Little is known of this fish which is restricted to southwestern Ontario where it is apparently common in quiet areas of large turbid rivers. Canadian populations of the Ghost Shiner are considerably isolated; they are the only known populations from the Laurentian Great Lakes watershed. The species should be considered rare, but not at risk in Canada.

Le Méné fantôme, *Notropis buchanani*, est un petit méné qui n'a été découvert que récemment au Canada. On connaît peu de chose de cette espèce qui est limitée à la partie sud-ouest de l'Ontario; elle est apparemment commune dans les tronçons calmes des grands cours d'eau trouble. Les populations canadiennes de cette espèce sont isolées à un très haut point : les seules populations connues vivent dans le bassin hydrographique des Grands Lacs Laurentides. Il faudrait considérer que cette espèce est rare, mais qu'elle n'est pas menacée au Canada.

**Key Words:** Cyprinidae, *Notropis buchanani*, Ghost shiner, méné fantôme, southwestern Ontario

The Ghost Shiner, *Notropis buchanani* Meek 1896, is a small minnow which is closely related to, and resembles, the Mimic Shiner, *Notropis volucellus*. Adults (Figure 1) are usually 33 to 58 mm total length (TL) in Ontario, but are known to reach 64 mm TL in Ohio (Trautman 1981). This little known fish has only recently been recorded from Canada (Holm and Coker 1981) where the extent of the known range is confined to southwestern Ontario.

It is not known whether *Notropis buchanani* is native to Ontario or has been introduced sometime prior to 1972, the earliest record of capture. The Ghost Shiner displays a disjunct North American distribution (see inset, Figure 2); nearest populations in the United States occur only in the Mississippi and other Gulf of Mexico drainages.

Given the limited distribution of the species in Canada and its apparent rarity, *Notropis buchanani* was considered to be of interest to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This presentation serves to document the extent of available information on the species and provides the basis for a report on the status of the Ghost Shiner in Canada.

### Description

*Notropis buchanani* (Figure 1) has a compressed body with very little pigment, this pallid colouration accounting for the vernacular name. Unlike *Notropis volucellus*, it lacks infraorbital canals and has only two or three small infraorbital bones (Reno 1966). It has a relatively deep body (depth into standard length 3.7-5.5), highly elevated anterior lateral line scales (exposed scale width into exposed scale height 2.8-4.5), and a long caudal peduncle (its length 3.7-4.5 in SL).

Although reported to have a narrower caudal peduncle than *Notropis volucellus* (Trautman 1981, Page and Burr 1991) a sample of specimens of *Notropis buchanani* from Ontario, Ohio and Iowa had significantly deeper caudal peduncles than a sample of *Notropis volucellus*. The ratio of caudal peduncle into standard length was compared between a sample of 26 *Notropis buchanani*, distinguished primarily by absence of infraorbital canal, and a sample of 26 *Notropis*

*volucellus*, identified by presence of infraorbital canal. Caudal peduncle depth over standard length ranged from 0.09 - 0.10 (mean = 0.95, standard deviation = 0.0038) in *Notropis volucellus* and 0.09 - 0.13 (mean = 0.107, standard deviation = 0.0078) in *Notropis buchanani*. Although there is a considerable overlap in the ratios between species, the average caudal peduncle depth of the Ghost Shiner is significantly greater ( $p < 0.0001$ ). No significant difference was found in caudal peduncle depth between the sexes of either *Notropis volucellus* ( $t = 0.73$ ,  $p < 0.47$ ) or *Notropis buchanani* ( $t = 0.36$ ,  $p < 0.72$ ). Six of the 26 specimens from each species were from the United States; the Ghost Shiner had a significantly deeper caudal peduncle than the Mimic Shiner in these specimens as well.

In life, the Ghost Shiner is silvery or translucent with very little pigment. In preserved adult specimens, the scales on the entire length of the back are outlined with melanophores. On several anterior lateral line scales, there is often a large melanophore on each side of the lateral line and, posteriorly, a line of melanophores along the midlateral surface extending to the caudal base. Ventrally, melanophores occur along each side of the anal base and a row of melanophores is present on the lower surface of the caudal peduncle. At the base of the caudal fin, there is often a lightly pigmented bar. The first two outer rays of both the upper and lower caudal lobe are clear but the rest of the caudal is usually speckled with numerous melanophores. Breeding males become densely tuberculate on the top of the head, nape, and snout. The tubercles may also be evident on rays two to seven of the pectoral fins. Its tubercles are larger and greater in number on the top of the head than in *Notropis volucellus* but, unlike that species, it lacks tubercles below the eyes and on the underside of the head (Cross 1967).

#### **Taxonomic Considerations**

The taxonomy of *Notropis buchanani* Meek and related species has been very confused. Originally described in 1896, it was later regarded as a synonym of *Notropis blennioides* (Girard) and then of *Notropis deliciosus* (Girard) [= *Notropis*

*stramineus* (Cope)]. Hubbs and Greene (1928) reduced *buchanani* to subspecific level, representing southern populations of *Notropis volucellus* (Cope) which is currently considered by some to be a complex of more than one species (Smith 1979; Trautman 1981). Taylor (in Bailey 1951) noted that *Notropis buchanani* lacked an infraorbital canal and it was subsequently returned to full species status.

### Distribution

The Ghost Shiner occurs in the Mississippi River drainage and Gulf of Mexico drainages west of the Mississippi (Figure 2, inset). It occurs in Gulf of Mexico drainages as far south as the lower Rio Grande in Mexico and Texas and, in the Mississippi drainage, from central Louisiana and Mississippi north to Minnesota and Wisconsin in the upper Mississippi and east to Pennsylvania in the Ohio River drainage (Gilbert 1980; Cooper 1985). There is a conspicuous absence in the Ozark Mountains in upper Arkansas and lower Missouri and in the Ouachita Mountains in southwest Arkansas. It appears more closely restricted to large rivers in northern and eastern parts of its range where its occurrence is often sporadic and localized, but it is common in most suitable habitat of the western Mississippi system, (Gilbert 1980).

In Canada, *Notropis buchanani* is known primarily from clay plains of southwestern Ontario in streams tributary to lakes Huron and St. Clair (Figure 2, ROM). Holm and Coker (1981) first documented its occurrence from 1979 and 1980 collections in the lower Thames River. Additional field work in southwestern Ontario by the Royal Ontario Museum (ROM), the Canadian Museum of Nature [formerly National Museum of Natural Science (CMN)] and the Ontario Ministry of Natural Resources (OMNR) uncovered many additional records from sites in the Lake St. Clair and Lake Huron drainages. An additional five records from the Sydenham River drainage including a 1972 record from Mollys Creek were discovered at the Canadian Museum of Nature in 1990 during an examination of collections identified as *Notropis volucellus*. Field work in the Thames and Sydenham rivers in 1991 continued to increase the known range of the Ghost Shiner

farther up the Thames and Sydenham rivers. *Notropis buchanani* has been collected from the Lake Huron drainage from the mouth of the Bayfield River and in the lower Ausable River. It has been captured in two tributaries to the St. Clair River, Clay and Bowens Creeks near their mouths. It is found in the Lake St. Clair drainage from the drainages of the Sydenham River, Little Bear Creek, Maxwell Creek, and Thames River. The western-most record is from a site at the mouth of Duck Creek, a creek draining into the southwest end of Lake St. Clair.

All distribution records obtained from ROM (ROM 1990), the OMNR Fish Species Distribution Data System (OMNR 1990), and CMN (CMN 1990) were checked; only valid records were plotted and listed in ROM. All specimens have been identified by E. Holm, G. Coker, or R.M. Bailey.

Van Meter and Trautman (1970) listed *Notropis buchanani* from Talbot Creek, a tributary of Lake Erie in Ontario and stated it may occur in other tributaries of Ontario. However, they based their record on Hubbs and Lagler (1964) who considered the Talbot Creek specimens "an aberrant form, wrongly called *Notropis volucellus buchanani* Meek". Hubbs and Brown (1929) indicated that these specimens were too large for typical *buchanani* and approached the colour pattern of typical *volucellus*. The specimens (25-61 mm TL) from Talbot Creek (UMMZ 60495, UMMZ 56798) were examined. An obvious infraorbital canal is present and these are, therefore, not *Notropis buchanani*. Despite intensive sampling at many suitable habitats in the drainage by OMNR, ROM, and NMC, there are no valid records from the Lake Erie drainage.

Canadian populations of the Ghost Shiner are 240 km north of the nearest record in the Ohio River drainage, a distribution gap which is greater than all other species native to Ontario. This gap and the species' late discovery may suggest that Ontario populations arose from one or more recent introductions. It is unlikely that the small delicate Ghost Shiner was imported intentionally from the United States for bait, but it is possible that specimens may have been included in bait buckets inadvertently and subsequently released.

It is also possible that *Notropis buchanani* is native having dispersed into Ontario thousands of years ago. Underhill (1986) suggested that *Notropis*



*buchanani* could have either utilized the eastern connectives from the Wabash River to reach the lakes and streams of the Erie basin 10 000 to 12 000 years ago, or simply moved through minor passageways from preglacial rivers and streams tributary to the Ohio River. Its distribution is similar to other species such as the Gravel Chub, *Erimystax x-punctata* (now considered extirpated in Canada), and the Silver Chub, *Macrhybopsis storeriana* both of which are considered native to Ontario and had (have) disjunct northern distributions with absences in adjacent Great Lakes drainages.

Early collectors failed to note the species in many parts of the U.S. range, perhaps due to its small size (Cross 1967), its subspecific status (Trautman 1981), and lack of intensive sampling in its prime habitat (Cooper 1985). Inability to differentiate the species from the Mimic Shiner may also have been a factor. Based on University of Michigan Museum of Zoology (UMMZ) and ROM records, only six sites have been sampled in Ontario within the present range of *Notropis buchanani* prior to 1972. These collections, including a collection of 110 *Notropis volucellus* captured in the Thames River "at Muncey" in 1223 (UMMZ 60438), were re-examined for possible misidentifications. *Notropis buchanani* was not found. A total of 35 Ghost Shiners were captured at four sites near the Muncey Indian Reserve in 1991. Available evidence, therefore, indicates that it has only recently become established at least in the Thames River at the Muncey Indian Reserve.

### Protection

There are no specific protection measures in place for the species in Canada. The habitat sections of the Fisheries Act afford general habitat protection.

In the United States, *Notropis buchanani* is considered to have declined in Ohio to the extent that it is given Protected status there (Johnson 1987). Recently discovered in Pennsylvania, the Ghost Shiner has been classified as endangered pending more intensive sampling in that state (Cooper 1985).

### Population Sizes and Trends

In the United States, there is some suggestion of decline in the populations in the upper Mississippi drainage. Smith (1979) indicated that *Notropis buchanani* was once more widespread in the upper Mississippi, although could not account for its decline in the northeast. Once known from many sites in the upper Mississippi River in Wisconsin, the Ghost Shiner is now regarded as extirpated in that state (Becker 1983). Recent records are known from the upper Ohio River in Ohio. Trautman (1981) documented a 1966 record of *Notropis buchanani* from the Muskingum River and four records in the Ohio River taken between the years 1968 and 1970. These records confirmed its continued presence in the Muskingum River in 1966 and extended its range farther upstream in the Ohio River.

In Ontario, the Ghost Shiner has been collected from 49 sites between 1972 to 1991 from several river systems. It was frequently caught in substantial numbers and comprised a significant proportion of the catch except in the Bayfield River, In Duck Creek, and at the sites farthest upstream in the Sydenham and Thames rivers. At nine sites it was the most abundant species in the seine hauls. Individuals of *Notropis buchanani* average 12 percent of the total catch in 42 collections for which complete species data is available. This high relative abundance may, however, reflect bias in the sampling technique. Small mid-water schooling species such as the Ghost Shiner are probably more susceptible to a seine than species which are larger and faster or more secretive.

The Ghost Shiner has been collected from four sites in the North Sydenham drainage from Wallaceburg upstream for a distance of 23 km to Bear Creek above Wilkesport, and from ten sites in the Sydenham drainage from Wallaceburg upstream for a distance of 95 km to Melwood Conservation Area, 11 km southwest of Strathroy. It has been collected from Chenail Ecarté, a channel draining into the northeast end of Lake St. Clair; two tributaries of Chenail Ecarté, Little Bear Creek where it was collected from four sites, and Maxwell Creek where it has been collected from three sites. It has been collected from 19 sites in the

Thames River and its tributaries from the mouth of the Thames upstream for a distance of 106 km to the Muncey Indian Reserve, about 30 km southwest of London. Distribution records indicate that the Ghost Shiner is undergoing a range expansion.

#### Habitat

In the United States, *Notropis buchanani* has been recorded from large rivers or creeks usually near their confluence with a large river where they are found in quiet pools, eddies or backwaters away from current. In Kansas, it has been found in the main channel during periods of drought when the flow was slight (Cross 1967). In Arkansas, it can be common in reservoirs as well as in large warm sluggish streams or rivers (Robison and Buchanan 1988). Bottoms frequently consist of silt, clay, sand, and detritus (Smith 1979; Burr and Warren 1986; Becker 1983) or of clean sand, and gravel (Trautman 1981; Cooper 1983). The Ghost Shiner is found in moderately clear water in Missouri, Ohio, and Pennsylvania (Pflieger 1975; Trautman 1981; Cooper 1985) but in moderate to high turbidities in Kentucky, Arkansas, Illinois and Kansas (Burr and Warren 1986; Retzer et al. 1983; Robison and Buchanan 1988; Smith 1979; and Cross 1967). Retzer et al. (1983) recorded no submerged aquatic vegetation whereas Trautman (1981) noted some submerged aquatics such as pondweed.

In Ontario, *Notropis buchanani* is found principally in the main channels of large rivers or in creeks near their confluence with large rivers having bottoms of silt and clay, frequently with sand, and occasionally with gravel or detritus. Stream width recorded for 13 sites was 13 to 45 m. Of 33 sites 91% had a component of silt, 73% of clay, 48% of sand, and 39% of gravel and 15% of detritus. Aquatic vegetation was present at 55% of 31 sites. Of those sites that had vegetation, 67% had submerged, 33% emergent, and 17% floating aquatic vegetation. Current varied from none to moderate but was most frequently none to slow (45% of 29 sites-none; 33% none to slow; and 22% moderate). Water clarity was estimated at 18 sites and ranged from 0.2 to 0.5 m with an average of 0.3 m. At other sites the water was described most frequently as muddy or

turbid and at some sites as cloudy. In Ontario, the water where the Ghost Shiner occurs has never been described as clear.

### Biology

Very little is known concerning the biology or ecology of the species. Spawning is reported to be from May to August in Kansas (Cross 1967), from June to August in Wisconsin (Becker 1983), and from late April to early July in Missouri. It takes place over sluggish riffles composed of sand and gravel (Pflieger 1975). In Ontario, collections indicate that *Notropis buchanani* spawns in the latter half of June. Females were found full of mature eggs and males were tuberculate on 12 June 1980 in the Thames River at a water temperature of 19°C. Pflieger (1975) noted that most spawning adults are in their second summer and individuals are not believed to live past their third summer of life.

Young of the year from Ohio were reported to be 20 to 38 mm TL by October and 28 to 58 mm TL by around 1 year. Adults are reported to average 33 to 64 mm (Trautman 1981). In Ontario, mature males reach a maximum of at least 43 mm TL, and mature females up to 58 mm TL have been found.

Diet has not been investigated, but in the Neosho River in Kansas, the Ghost Shiner has been observed to dart out from large stones for bits of food borne downstream by the current (Cross 1967).

### Limiting Factors

*Notropis buchanani* appears to be limited to large sluggish rivers or large creeks near their confluence with a large river. Turbidity or siltation does not limit the distribution of the Ghost Shiner as it apparently thrives in areas of high turbidity and silty bottoms. Requirements for successful spawning, temperature tolerances, and effects of predators or competitors are unknown.

### Special Significance of the Species

The value of the fish as a bait or forage species is unknown, but its localized abundance in certain sections of some streams could indicate an

importance as a prey species. *Notropis buchanani* has been used in histological and osteological studies of development of the infraorbital canal and infraorbital ossicle (Reno 1966).

#### Evaluation

The Ghost Shiner has a limited range in southwestern Ontario where it is on the fringe of its northeastern distribution. There is no evidence to indicate that *Notropis buchanani* is indigenous to the fauna of Ontario. It may have been introduced but lack of early sampling in its current range makes it difficult to make a positive conclusion. Its range may be expanding and it should be looked for in suitable habitats where it has not yet been found. Viable populations exist in several river systems flowing into lakes Huron and St. Clair. At present Ontario populations of *Notropis buchanani* do not appear to be threatened, but the steadily increasing bait fish harvest in southwestern Ontario could have serious effects on the limited number of Ontario populations if they were allowed to be over harvested.

#### Acknowledgements

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### List of Figures

Figure 1. Ghost Shiner, *Notropis buchanani*, from Thames River (ROM 36439), 45 mm TL. Drawn by Anker Odum.

Figure 2. Distribution of the Ghost Shiner, *Notropis buchanani* in Canada.

Inset: North American distribution of the Ghost Shiner, based on a range map provided by C.R. Gilbert (personal communication).

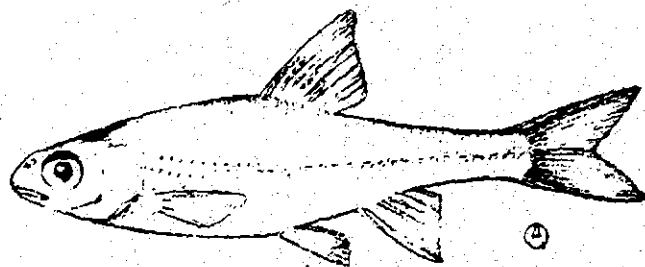


Fig. 1 (Draft Drawing)

