

COMMITTEE ON THE
STATUS OF ENDANGERED
WILDLIFE IN CANADA

OTTAWA, ONT. K1A 0H3
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COMITÉ SUR LE STATUT
DES ESPÈCES MENACÉES
DE DISPARITION AU
CANADA

OTTAWA (ONT.) K1A 0H3
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STATUS REPORT ON THE WARMOUTH
LEPOMIS GULOSUS

IN CANADA

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Vol. 10

BY

E.J. CROSSMAN
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AND

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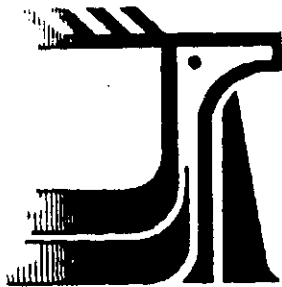
STATUS ASSIGNED IN 1994
VULNERABLE

REASON: AN UNUSUALLY RARE SPECIES WITH A VERY LIMITED
RANGE AND EXISTING IN SMALL NUMBERS.

OCCURRENCE: ONTARIO

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Canada.

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statut national aux espèces canadiennes en péril.



Committee
on the Status
of Endangered
Wildlife
in Canada

Comité sur le
statut des espèces
menacées
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au Canada

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3611014E

**STATUS REPORT ON THE WARMOUTH
*LEPOMIS GULOSUS***

IN CANADA

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**STATUS ASSIGNED IN 1994
VULNERABLE**

Status Of The Warmouth, *Lepomis gulosus*, In Canada

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Crossman, E.J., J. Houston, and R.R. Campbell. 1993. Status of the Warmouth, *Lepomis gulosus*, in Canada. Report to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Canadian Wildlife Service, Ottawa, Ontario.

The Warmouth, *Lepomis gulosus*, is a recent addition to the southern Ontario freshwater fauna where it has been known since only 1966. Little is known of this species in its limited Canadian range where it is undoubtedly a pioneering species which may have gone undetected for several years prior to 1966. A breeding population is present at Point Pelee.

Le crapet à bouche guerrière est une espèce neuve à la faune des eaux douces du sud de l'Ontario, où elle est une migrante récente. On la connaît ici depuis 1967, mais on connaît très peu de cette espèce au Canada. Sans doute, elle est une espèce colonizant, et elle probablement y existait quelques années avant de sa découverte en 1967. Une population reproductive est présent à la Pointe Pelee.

Key words: Centrarchidae, *Lepomis*, *Lepomis gulosus*, Warmouth, crapet à bouche guerrière, rare and endangered fishes

The Warmouth, *Lepomis gulosus* (Cuvier, 1829) [previously in genus *Chaenobryttus*] is a small centrarchid only recently reported from Canada (Crossman and Simpson 1984) where it is known from only two locations in southwestern Ontario. Although probably a recent natural migrant it might have been present and undetected for several years before the initial discovery in 1966. A successful breeding population is present at Point Pelee (Crossman and

Simpson 1984). As a relatively recent addition, with restricted range and abundance, in the Canadian freshwater fauna, the status of the species is of interest to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This report was prepared to summarize the information on the species in Canada as background for an assessment of the status of the species.

The Warmouth (Figure 1) is a small, robust centrarchid (sunfish), seldom exceeding 310mm in length or 234gm in weight. The species superficially resembles the Rock Bass, *Ambloplites rupestris* and could be mistaken for it and, to a lesser extent, the Green Sunfish *Lepomis cyanellus*, another small centrarchid which may be found in similar locations. The Warmouth has fewer anal spines than the Rock Bass (three versus six). The presence of many teeth on the tongue and the strong dark lines radiating out from the eye distinguish the Warmouth from the Green Sunfish.

In *Lepomis gulosus* there are no black spots at the bases of the dorsal rays. There are, however, pale spots near the base of most soft rays of the dorsal and anal fins. In contrast, adults of *Lepomis cyanellus* have one large black spot at the base of each of the posterior soft dorsal and anal rays, and the head is less densely pigmented. In the Warmouth the maxillary reaches to, or beyond the pupil so the mouth is larger than that in the Pumpkinseed and Bluegill.

The body of the Warmouth is ovoid, compressed and somewhat broader than most sunfishes. The mouth is large and oblique with a projecting lower jaw. The pectoral fin is rounded and the caudal slightly forked. The colour of these fish varies from olive-yellow to brassy or muddy brown dorsally, shading to yellow or white below, a small red or orange spot may appear at the base of the vermiculated soft dorsal in breeding males. There are numerous darker markings on the sides which may be suggestive of vertical bands. The five or so dark lines radiating from the snout and eye across the cheeks and opercle help to distinguish this species (Clay 1962; Smith 1979).

Young Warmouth have heavy stippling on the head, and six or seven dark bands that extend from the mid-dorsal line to the ventral surface (Smith 1979, Crossman and Simpson 1984). The young of many other centrarchids have dark vertical bands on the sides so the separation of young Warmouth requires very careful examination.

Distribution

The species is widely distributed in ponds, lakes and, occasionally, streams throughout the eastern United States (Cooper 1983). The northern limit appears to be along a line from southeastern Minnesota, central Wisconsin to Maryland (Lee 1980), including western Pennsylvania only. The range extends south to Florida and the Gulf coast to Texas and the Rio Grande and west to New Mexico and Kansas. Successful transplants have been made west of the Rockies and in locations on the Atlantic slope (Lee 1980). It has been introduced elsewhere in the U.S. (see McMahon et al. 1984). The closest populations had been one in the upper Huron River in Michigan, and several in the mid and lower reaches of Lake Erie tributaries in eastern Ohio from the Grand River to the Cuyahoga River

and possibly one in a tributary (Toussaint River?) east of Toledo (Trautman 1981).

In Canada, the species has been recorded only from southwestern Ontario (Figure 2) where its presence was first discovered in 1966 (Crossman and Simpson 1984). *Lepomis gulosus* has been taken from Lake Erie near Rondeau Provincial Park, about 35km southeast of Chatham, Ontario (Table 1) and in two ponds at Point Pelee National Park 60km further west of Rondeau.

Protection

The species is widespread and common in the U.S. and is not listed as of any concern in any part of its range there (Williams et al. 1989).

Although given no specific protection in Canada, general protection is available, if required, through laws which protect the habitat of the species which include: the Ontario Lakes and Streams Improvement Act which prohibits the impoundment or diversion of watercourses which leads to siltation; the voluntary Land Stewardship II program of the Ontario Ministry of Agriculture and Food which is designed to reduce the erosion of agricultural lands and thus reduce siltation of habitat. The Point Pelee collection sites (see Table 1) are protected within the confines of the Point Pelee National Park. Similarly, one of the two Rondeau sites is within Rondeau Provincial Park.

This is a naturalized species in Canada [according to the recent definition of the American Fisheries Society (Kohler and Courtenay (1986))]. As a result of the growing concern for the potential negative impact of introduced species on

native species, and on biodiversity (see Billington and Hebert 1991), some would argue that this species warrants no protection in Canada.

Habitat

Extensive information on various habitat requirements for this species was provided by McMahon et al. (1984). The recorded captures of the Warmouth in Ontario have been from ecological conditions similar to those for other sunfishes (see Scott and Crossman 1973). Other warm water species such as Yellow Perch, *Perca flavescens*; Bowfin, *Amia calva*, and Brown Bullhead, *Ameiurus nebulosus*, were taken at the same sites (Crossman and Simpson 1984). Similar assemblages have been noted in the United States (Lewis and English 1949; Larimore 1957; Germann et al. 1974; Guillory 1979).

Typically, the Warmouth occurs in the deeper, open water of swamps, sluggish (low gradient) streams, ponds, or lakes with mud, silt or organic detritus substrates (Guillory 1979; Smith 1979; Cooper 1983). In Ohio, this species was said to occur (Trautman 1981) in silt-free water with an abundance of vegetation and a mucky bottom. In Kentucky they are usually found in clear areas with rooted aquatic vegetation (Clay 1962), and in Illinois streams, are associated with pool areas with beds of vegetation or roots and deadheads (Smith 1979). In Missouri, Pflieger (1971) indicates that the species may occasionally be found in turbid waters, but prefers clearer waters. Cooper (1983) suggests they may tolerate brackish water to some degree. Trautman (1981) indicated that (in Ohio) the Warmouth preferred lakes, ponds, marshes and streams of low gradient with an abundance of aquatic vegetation and a mucky bottom covered with organic debris.

Undoubtedly, this is a warm water species, but there is no information on temperature tolerances. This could be a factor in limiting distribution even though habitat otherwise suitable should be abundant throughout much of southern Ontario. In Ontario, the species was captured at depths of 20 to 95cm (ROM collection records), similar to those reported in the U.S. (Guillory 1979).

Population Sizes and Trends

Eight specimens were taken from Rondeau Park sites (Table 1) between 1966 and 1968. Although no further specimens have been collected at Rondeau, 53 specimens have been taken (all but nine were released alive) at Point Pelee

(Table 1) between 1983 and 1989 (Crossman and Simpson 1984). Of these, 28 were adults and 18 young-of-the-year (Crossman and Simpson 1984) indicating a breeding population.

Fisheries agencies along the Ontario side of Lakes Erie, St. Clair, and the Detroit and St. Clair rivers have been advised to be on the lookout for the species but, to date, no additional specimens have been noted. This is not surprising since no directed surveys for the species have been undertaken and it can be a difficult species to sample. Contact with personnel at Rondeau and Point Pelee parks in 1992 indicated that no recent records for the species had been noted. However, no assessment work that might have indicated presence or absence was carried out in 1991.

The two individual populations of *Lepomis gulosus* in Ontario would appear to comprise one or more pioneering colonies resulting from recent natural dispersion, probably moving along the shore from Ohio to Lakes Erie and St. Clair rather than across the lake from Ohio (Crossman and Simpson 1984). Although first recorded in Canada in 1966 they probably arrived several years prior to that date. Pioneer populations often go undetected for some time prior to documentation (Crossman and Simpson 1984). In this case, they are a difficult species to sample and can be confused with the Rock Bass and Green Sunfish which are also known from the area.

If we consider native species as those which arrived here between the time aquatic habitats became available with the gradual "retreat", or fluctuations of the Wisconsin ice, and the arrival of European settlers, this is not a native (indigenous) species. If the established population in Point Pelee National Park survives, the Warmouth would have to be considered a naturalized species in Ontario. The range may still be expanding (Mandrak 1989) where conditions are suitable and one should expect to find this species at other sites along the shores of Lakes Erie and St. Clair, as suggested by Crossman and Simpson (1984).

Biology

Nothing is known of the biology of the Warmouth in Canada but, in general, its life history might be similar to that of the Green Sunfish (Smith 1979) and the Rock Bass (see Scott and Crossman 1973 for details). Information on age, growth and food for U.S. populations were provided by McMahon et al. (1984). Detailed life histories on the Warmouth have been reported from studies in Iowa

(Lewis and English 1949), Illinois (Larimore 1957) and Georgia (Germann et al. 1974). Other studies related to growth, length-weight relationships and population structure have been summarized by Carlander (1977), Panek and Cofield (1978), and (Guillory 1980) among others.

Spawning occurs in spring and early summer over rubble or loose vegetation or debris. Spawning behaviour is that typical of sunfishes (Cooper 1983). The spawning season in Florida is protracted, and females spawn several times in one season (Guillory 1980). In Ontario the length of season may limit this. Fecundity estimates range from 800 to 34 000 eggs per female, larger females producing more eggs. Maturity seems to be related more to size than age; depending on growth rate, Warmouth may spawn at age I or II. Size at maturity varies with latitude and food availability, ranging from 51mm in Illinois to 102mm in Georgia (Larimore 1957; Germann et al. 1974; Guillory 1980). As a result, one would expect individuals in Ontario to mature at lengths of 50mm or less.

The species has hybridized successfully elsewhere with many other sunfishes, including Rock Bass (Schwartz 1972, 1981; Smith 1979; Parker et al. 1985). Growth depends on habitat conditions (Panek and Cofield 1978; Guillory 1980). Individuals in some populations have been noted to grow to 152mm in 13 months and others only to 137mm in six years (Cooper 1983). Several authors (e.g. Panek and Cofield 1978; Guillory 1980) have developed length-weight relationships and condition factors for the species.

Individuals live at least eight or nine years and seldom exceed 310mm in length or 340gm in weight, although a 0.9kg individual was reported by the U.S. Fish and Wildlife Service (Don E. McAllister, Canadian Museum of Nature, Ottawa, Ontario; personal communication).

The Warmouth is probably more piscivorous than other sunfishes; small fishes, crayfish and aquatic insects comprise the bulk of their diet (Smith 1979; Cooper 1983). Smaller individuals feed on zooplankton, midges and caddisfly larvae with a shift to fish and crayfish as the fish become larger (Guillory 1980; Cooper 1983).

Little is known of parasites and diseases. Benz and Pohley (1980) have recorded the presence of the nematode *Philometra* sp. from the oculo-orbit of centrarchids from Georgia, including *Lepomis gulosus*.

Limiting Factors

Basically a warm-water species, further range extensions may be limited by seasonal water temperature. Further study is required, but under present conditions, the species probably would not be found much further north in Canada than at the present latitude (see Mandrak 1989 for potential range expansion under climate warming).

Except when spawning, the Warmouth is solitary, not forming schools (Cross 1967), and does not dominate or eradicate other populations of syntopic centrarchids such as the Green Sunfish or Bluegill, *Lepomis macrochirus* (Smith 1979). Guillory (1980) found it was usually one of the least abundant of the centrarchids. Availability of suitable forage species and predation by larger fishes such as the Largemouth Bass, *Micropterus salmoides*, occupying the same habitat would limit populations.

Smith (1979) indicated that siltation, drainage of natural marshes and lakes, and other disruptions leading to destruction of aquatic vegetation has led to a decline of the species in Illinois. The nematode *Philometra* sp., if present in Canada would not be limiting.

Special Significance of the Species

The species is too rare in Canada to be of importance either economically or as a forage species. However, its presence here is of zoogeographic interest as it presents another example of the recent northward dispersal of freshwater fishes.

Although small and solitary in nature, in the United States the warmouth is common throughout most of its range and is popular in some areas as a sport fish (Clay 1962), but less so than the Bluegill or crappies. It is a naturalized species with the potential of adversely impacting native species and biodiversity.

Evaluation

The Warmouth has recently extended its range to southwestern Ontario where it is known from two locations. If the populations in Ontario survive, the species would have to be considered a naturalized part of the aquatic fauna of Ontario. Although the population in Point Pelee National Park is probably secure, the species should be considered rare in Canada where it is at the

northeastern fringe of its range. Populations in Ohio are close to those of Point Pelee and the general distribution in that State have remained relatively unchanged in the latter half of this century, but the species is uncommon where found (Trautman 1981).

Until the nature of the impact of this species is determined, these populations enjoy the protection of being within Federal or Provincial Parks, are subject to few threats and are vulnerable only to natural factors.

Acknowledgments

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Literature Cited

- Billington, N., and P.D.N. Hebert (*Editors*). 1991. International Symposium on "The ecological and genetic implications of fish introductions (FIN)." Canadian Journal of Fisheries and Aquatic Sciences 48 (Supplement 1): 181.
- Benz, G.W., and W.J. Pohley. 1980. A conspicuous *Philometra* sp. (Nematoda: Philometridae) from the oculo-orbits of centrarchid fishes. Proceedings of The Helminthological Society of Washington 47(2): 264-265.
- Carlander, K. 1977. Handbook of freshwater fishery biology. Volume II. Iowa State University Press, Ames, Iowa.
- Clay, W.M. 1962. A field manual of Kentucky fishes. Kentucky Department of Fish and Wildlife Resources, Frankfurt, Kentucky.
- Cooper, E.L. 1983. Fishes of Pennsylvania and the northeastern United States. Pennsylvania State University Press, University Park, Pennsylvania.
- Cross, F.B. 1967. Handbook of fishes of Kansas. University of Kansas Museum of Natural History Publications 45: 256-257.
- Crossman, E.J., and Robert C. Simpson. 1984. Warmouth, *Lepomis gulosus*, a freshwater fish new to Canada. Canadian Field-Naturalist 98(4): 496-498.
- Germann, J., L. McSwain, D. Holder, and C. Swanson. 1974. Life history of the

- Warmouth in the Swannee River and Okefenokee Swamp, Georgia. Proceedings of the Annual Conference of the Southeast Association of Game and Fish Commissioners 28: 259-278.
- Guillory, V. 1979. Species assemblages of fish in Lake Conway, Florida. Science 42: 158-162.
- Guillory, V. 1980. Life history of warmouth in Lake Conway, Florida. Proceedings of the Annual Conference of the South East Association of Fish and Wildlife Agencies 32: 490-501.
- Kohler, C.C., and W.R. Courtenay, Jr. 1986. American Fisheries Society position on introduced aquatic species: a review of past initiatives. Fisheries 11(2): 34-38.
- Larimore, R. 1957. Ecological life history of the warmouth (Centrarchidae). Bulletin of the Illinois Natural History Survey 27: 1-83.
- Lee, D.S. 1980. Atlas of North American freshwater fishes. Edited by D.S. Lee, C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer Jr. North Carolina Biological Survey Publication Number 1980-12.
- Lewis, W., and T. English. 1949. The warmouth, *Chaenobryttus coronarius* (Bartram), in Red Haw Hill Reservoir, Iowa. Iowa State College Journal of Science 23: 317-322.
- Mandrak, N.E. 1989. Potential invasion of the Great Lakes by fish species associated with climatic warming. Journal of Great Lakes Research 15: 306-316.
- McMahon, T.E., G. Gebhart, O.E. Maughan, and P.C. Nelson. 1984. Habitat suitability index models and instream flow suitability curves: warmouth. U.S. Fish and Wildlife Service, Fort Collins, Colorado. FWS/OBS-82/10.67. 21 p.
- Panek, F.M., and C.R. Cofield. 1978. Fecundity of bluegill and warmouth from a South Carolina blackwater lake. The Progressive Fish-Culturist 40(2): 67-68.
- Parker, H.R., D.P. Philipp, and G.S. Whitt. 1985. Relative developmental success of interspecific *Lepomis* hybrids as an estimate of gene regulatory divergence between species. Journal of Experimental Zoology 233: 451-466.
- Pflieger, W.L. 1971. A distributional study of Missouri fishes. University of Kansas Museum of Natural History Publications 20(3): 412.
- Scott, W.B., and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries

- Research Board of Canada Bulletin 183. [Third Printing 1979]
- Schwartz, F.J. 1972. World literature to fish hybrids with an analysis by family, species, and hybrid. Publications of the Gulf coast Research laboratory Museum. Number 3.
- Schwartz, F.J. 1981. World literature to fish hybrids with an analysis by family, species, and hybrid. Supplement 1. National Ocean and Atmospheric Administration Technical Report NMFS SSRF-750.
- Smith, P.W. 1979. The fishes of Illinois. University of Illinois Press, Urbana, Illinois.
- Trautman, M.B. 1981. The fishes of Ohio. Ohio State University Press, Columbus, Ohio. Revised Edition.
- Williams, J.E., J.E. Johnson, D.A. Hendrickson, S. Contreras-Balderas, J.D. Williams, M. Novarro-Mendoza, D.E. McAllister, and J.E. Deacon. 1989. Fishes of North America, endangered, threatened, or of special concern. 1989. Fisheries 14(6): 2-21.

Table 1: Collection Records of *Lepomis gulosus* in Canada.

Location	Date	Number of Specimens	Source
Lake Erie, Essex Co. Rondeau Provincial Park 42°17'N, 81°51'W	5 June 1966	1	RPM ^a F103-66
Lake Erie, Essex Co. Rondeau Provincial Park 42°17'N, 81°51'W	1967	2	Crossman and Simpson (1984)
Lake Erie, Essex Co. Rondeau Provincial Park 42°17'N, 81°51'W	1968	3	Crossman and Simpson (1984)
Lake Erie, Essex Co. Rondeau Provincial Park 42°17'N, 81°51'W	June 1968	1	NMC ^b 88-0030 Possibly one of the above specimens
Lake Erie, Kent Co., McLean Farm, outside Rondeau Provincial Park 41°19'N, 81°51'W	8 Aug 1968	1	ROM ^c 34267 Possibly one of the above specimens
Essex Co., Point Pelee National Park, Lake Pond 41°57'44"N, 82°30'21"W	31 March 1983	1	ROM 42752
Essex Co., Point Pelee National Park, Redhead Pond 41°57'N, 82°30'W	3 June - 18 Oct 1983	46	Crossman and Simpson (1984)
Essex Co., Point Pelee National Park, Redhead Pond 41°57'N, 82°30'W	3 June 1983		Rom 43022 Possibly part of the above specimens
Essex Co., Point Pelee National Park, Lake Pond 41°58'00"N, 82°30'20"W	11 Aug 1989	1	ROM 56953

Table 1: Cont'd.

Location	Date	Number of Specimens	Source
Essex Co., Point Pelee National Park, near SE corner of Redhead Pond 41°57'06"N, 82 30'20"W	11 Aug 1989	4	ROM 57157
Essex Co., Point Pelee National Park, NE corner of Redhead Pond 41°57'24"N, 82 30'20"W	11 Aug 1989	1	ROM 57164

^a Rondeau Park Museum

^b National Museums of Canada - Canada Museum of Nature

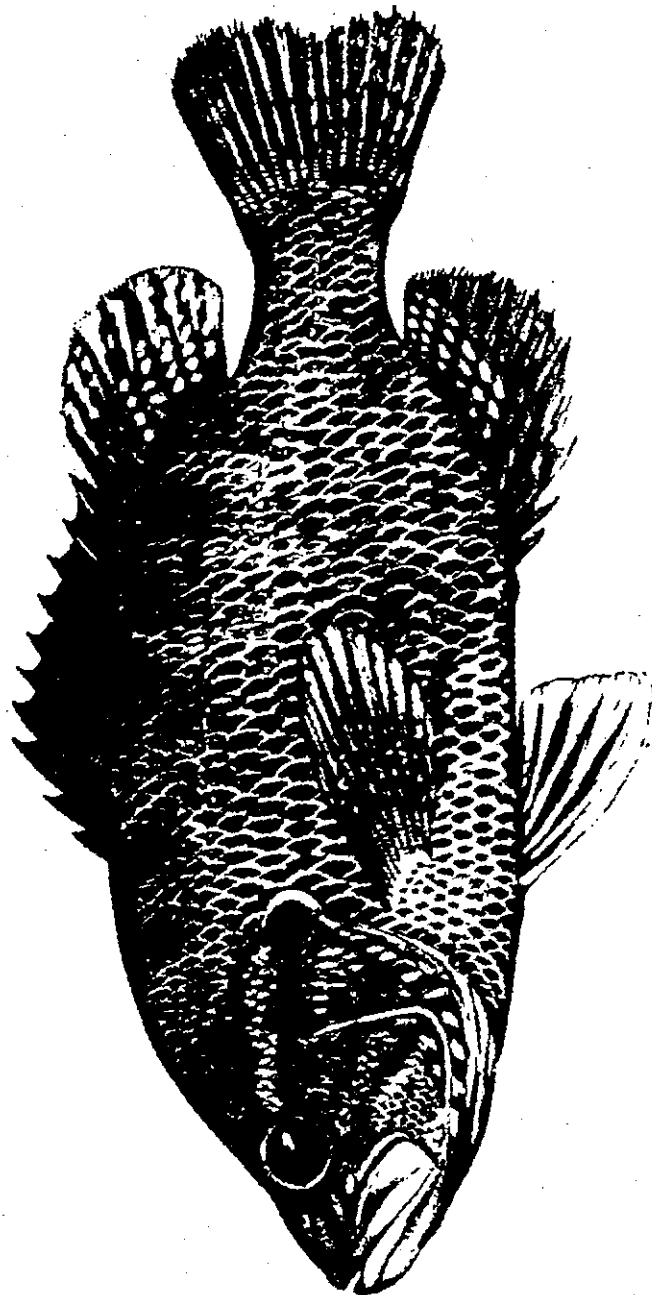
^c Royal Ontario Museum

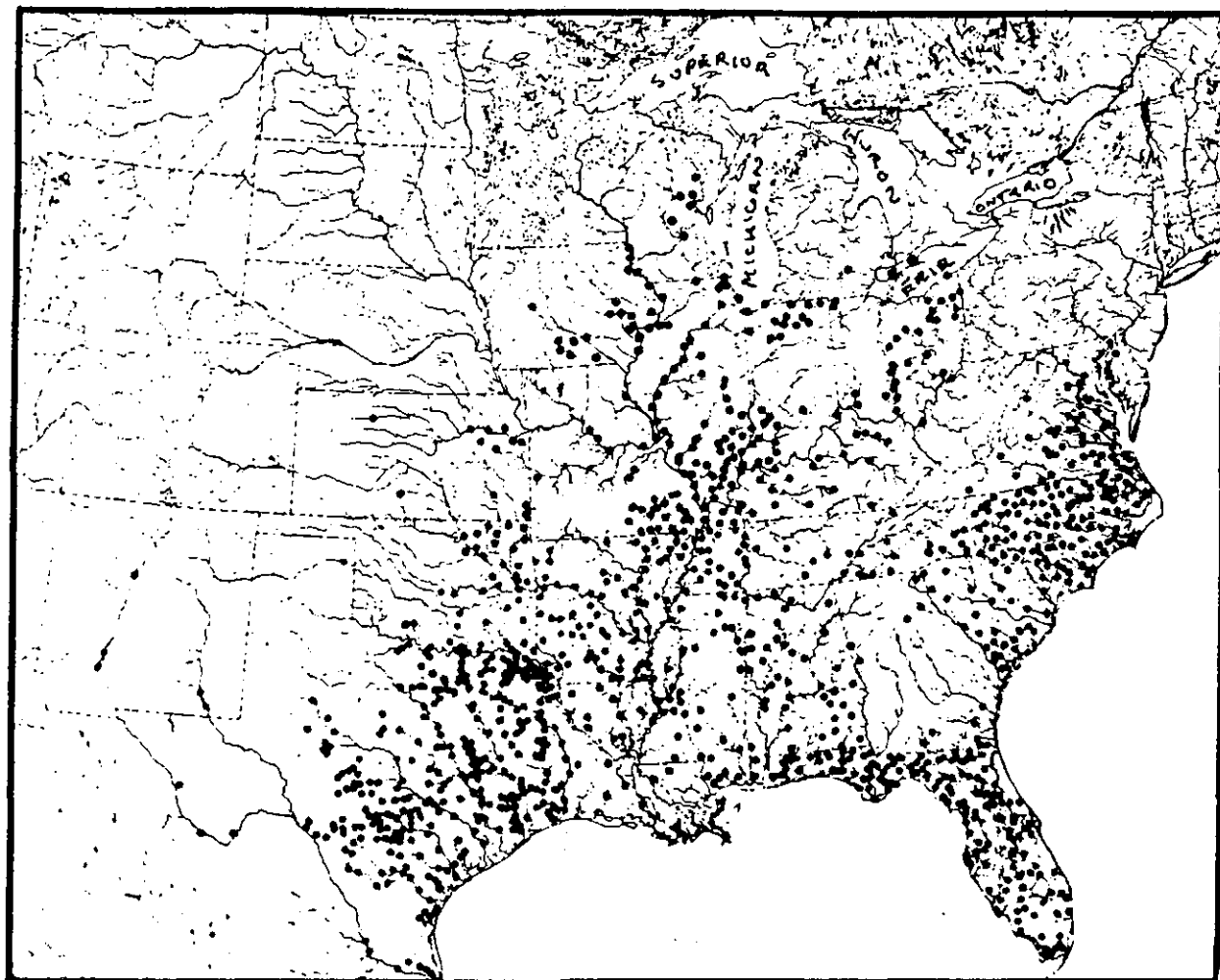
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Figure 1: Warmouth, *Lepomis gulosus*. (Illustration by Duane Raver, U.S. Fish and Wildlife Service, courtesy Don E. McAllister, Canadian Museum of Nature, Ottawa, Ontario)

Figure 2: North American distribution of the Warmouth, *Lepomis gulosus* [redrawn from Lee (1980)].

Figure 3: Canadian (southern Ontario) distribution of the Warmouth, *Lepomis gulosus*.





GREAT LAKES BASIN

