COSEWIC
Assessment and Update Status Report

on the

Bigmouth Shiner
Notropis dorsalis

in Canada

NOT AT RISK
2003

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION DES
ESPÈCES EN PÉRIL
AU CANADA

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COSEWIC
Assessment Summary

Assessment Summary – November 2003

Common name
Bigmouth shiner

Scientific name
Notropis dorsalis

Status
Not at Risk

Reason for designation
There are no demonstrable or potential threats and the species is not particularly sensitive to habitat disturbances. It has been found in five new locations since 1985. It may also be present in unsurveyed areas of suitable habitat in western Manitoba and possibly eastern Saskatchewan.

Occurrence
Manitoba

Status history
Designated Special Concern in April 1985. Status re-examined and de-listed (Not at Risk) in November 2003. Last assessment based on an update status report.

COSEWIC
Executive Summary

Bigmouth Shiner
Notropis dorsalis

Species Information

The bigmouth shiner has a distinctive body form, being slender, relatively flat-bellied and more hump-backed than other *Notropis*. The eyes appear to focus upward in fish greater than 1.5 cm total length when viewed from above, due to the pupil being skewed dorsally. The body colour is olive-yellow on the back and silvery on the sides and belly. A mid-dorsal stripe that runs along the top of the body is continuous around the dorsal fin base. In Manitoba, the bigmouth shiner, sand shiner (*Notropis stramineus*), mimic shiner (*Notropis volucellus*), and river shiner (*Notropis blennius*) are similar to one another in appearance.

Distribution

The distribution of the bigmouth shiner includes the Hudson Bay (Red River), Great Lakes and Mississippi River basins from northern Michigan to southern Manitoba, and from eastern Illinois to the Platte River system, eastern Wyoming and northern Colorado. There are disjunct populations in western New York and Pennsylvania, western Michigan, northern Ohio, and northern West Virginia, and western Tennessee.

In Manitoba, the distribution of the bigmouth shiner includes the Cypress, Shell, Little Saskatchewan, and Assiniboine rivers, as well as Oak and Epinette Creeks, all of which are in the Assiniboine River drainage. The species also has been found in the lower Roseau River near its junction with the Red River (Red River Drainage) and the Woody and Roaring rivers (Lake Winnipegosis drainage).

Habitat

In Manitoba, the bigmouth shiner appears to favour small streams, up to 12 metres in width and one metre in depth, although presence in larger rivers such as the Assiniboine has been documented

Biology

The bigmouth shiner is fast-growing, exhibits a variable growth rate, and has a maximum life span of three years. Adult fish ranged between 50 and 75 mm. Nothing

is known about reproductive behaviour and spawning sites of the bigmouth shiner in Manitoba or elsewhere. Spawning occurs from late May to August depending on the location of the population

The bigmouth shiner is often associated with the sand shiner in Manitoba and the United States. In the smaller streams in Manitoba, they are collected with large numbers of common shiner (*Luxilus cornutus*) and creek chub (*Semotilus atromaculatus*). Both the longnose dace (*Rhinichthys cataractae*) and western blacknose dace (*Rhinichthys obtusus*) often also form part of this assemblage. No information is available regarding bigmouth shiner movements in Manitoba. However, appearance of the bigmouth shiner in repeated fall collections at sites on the Cypress and Assiniboine rivers throughout the 1980s and 1990s suggests that some movement occurs. Elsewhere, the bigmouth shiner has been observed to migrate upstream during fall and winter, and return downstream in summer. Diel movements can involve movement into shallow water at night, likely to either avoid terrestrial predators and to take advantage of emerging insect larvae.

Little is known of the diet of bigmouth shiner. Specimens collected from the Cypress River in the fall of 1995 were feeding exclusively on water boatmen (Family Corixidae). Benthic fauna, including aquatic nymphs, plant material, and bottom ooze are commonly found in stomachs. Taste is likely more important in foraging than is vision.

Population Size and Trends

Bigmouth shiner populations in the western part of its range are increasing, while those in the eastern part are decreasing. Increases in the west have been attributed to changes in habitat, specifically channelization of rivers. In Wisconsin, populations appear stable. Collections made in the Cypress River in Manitoba suggest that populations have been relatively stable.

Limiting Factors

Human disturbance, such as eutrophication from shoreline development, has resulted in decreases in bigmouth shiner populations. However, human disturbance to stream hydraulics through channelization has appeared to benefit the species. Reproduction might be affected by high water levels in spring, as preferred habitats, food sources, and spawning sites could be affected. In Ohio, decline in some bigmouth shiner populations has been attributed to competition with the invasive silverjaw minnow (*Notropis buccatus*). The recent invasion of the spotfin shiner (*Cyprinella spiloptera*) into the Hudson Bay watershed will not likely negatively affect the bigmouth shiner due to physical constraints on dispersal and differences in habitat preferences.

Two large-scale land uses that occur within the bigmouth shiner's present distribution in Manitoba are agriculture and forestry. The presence of livestock in watercourses can result in accelerated bank erosion and increased siltation, both of

which could be harmful to fish habitat. In forestry operations, several stream crossings can be installed every year depending on a company's annual operating plan. Poorly installed culverts can prevent fish passage and increase siltation into the watercourse either directly, or from sediment runoff from road infrastructure.

Special Significance

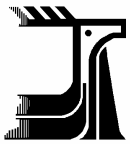
The bigmouth shiner is native to the United States and Canada. In Ohio, it is presently listed as "threatened." In Pennsylvania, the species has been recommended for "threatened" status." Its status in New York remains unknown. In Manitoba, the bigmouth shiner has no direct economic importance. However, it is used as bait fish in several states. The three subspecies of *Notropis dorsalis* may be of interest scientifically, as they represent geographically isolated populations.

Existing Protection and Other Status Designations

The bigmouth shiner is not protected in Canada, although the federal Fisheries Act prohibits destruction of fish habitat unless authorized by the Minister.

The bigmouth shiner was assessed by COSEWIC as a Species of Special Concern in Canada in 1985. In Manitoba, the Manitoba Conservation Data Centre (MBCDC) has ranked the bigmouth shiner as G5 (globally), and S3 (provincially). A global rank of G5 indicates that the species is "demonstrably widespread, abundant, and secure throughout its range" and "essentially irradicable under present conditions." A provincial rank of S3 indicates that it is uncommon in the province with 21-100 occurrences.

As with several fish species, the bigmouth shiner is sensitive to sedimentation caused by road and other linear crossings, bank erosion and intrusion of livestock into waterbodies. In most of its range in Manitoba, agriculture and forestry are major land use activities.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species and include the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal organizations (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership, chaired by the Canadian Museum of Nature), three nonjurisdictional members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The committee meets to consider status reports on candidate species.

DEFINITIONS
(After May 2003)

Species	Any indigenous species, subspecies, variety, or geographically or genetically distinct population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.

** Formerly described as “Not In Any Category”, or “No Designation Required.”

*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

Environment Canada	Environnement Canada
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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

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Bigmouth Shiner
Notropis dorsalis

in Canada

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2003

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SPECIES INFORMATION

Taxonomy

Class	Actinopterygii
Order	Cypriniformes
Family	Cyprinidae
Scientific name	*Notropis dorsalis* (Agassiz)
Common name	bigmouth shiner
Other names	Gilbert's minnow, central bigmouth shiner, big-mouthed shiner
French	Méné à grande bouche

Description

The bigmouth shiner (*Notropis dorsalis*) is a cyprinid of the plains that reaches a maximum size of 75 mm (Figure 1). The species is most commonly found in shallow waters in creeks and small rivers, but can occur rarely in larger rivers. They feed mainly on aquatic insects, but plant material, benthic ooze, and terrestrial insects can also form a portion of the diet. The bigmouth shiner has a distinctive body form, being slender, relatively flat-bellied, with a back that is more arched than other related *Notropis* species. The eyes appear to focus upward, when viewed from above, due to the pupil being skewed dorsally. The body colour is olive-yellow on the back and silvery on the sides and belly. A mid-dorsal stripe is continuous around the dorsal fin base.

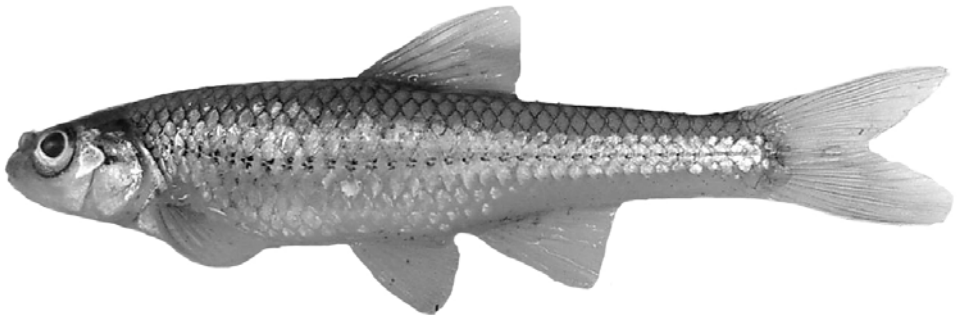

Figure 1. Fresh specimen of a Bigmouth Shiner (*Notropis dorsalis*). Photo courtesy of Ken Stewart.

In Manitoba, the bigmouth shiner, sand shiner, mimic shiner, and river shiner are similar to one another in appearance. K.W. Stewart, Department of Biology, University of Manitoba, Winnipeg, Manitoba (pers. comm., 2003) gives the following description for identification of the four species: Collectively, the four species differ from all other shiners in Manitoba in the combination of: (1) the lack of a lateral dark stripe that continues onto the head, (2) the lack of a black spot at the base of either the caudal or dorsal fin, (3) location of the base of the dorsal fin over the base of the pelvic fins and, (4) not having the scales on the sides more than twice as high as long. Superficially, the bigmouth shiner and sand shiner share the presence of dark markings ("mouse tracks") above and below each lateral line pore. "The bigmouth shiner differs from the sand and mimic shiners in having an arched back and flat ventral profile, having an inner row of pharyngeal teeth and the mid dorsal dark band is uniform in width anterior to the dorsal fin and continuous around the base of the dorsal fin. The bigmouth shiner differs from the river shiner in having only one inner row pharyngeal tooth on both sides instead of two on at least one side, usually seven anal fin rays instead of eight and in having the "mouse tracks" described above" (K.W. Stewart, pers. comm., 2003). Bigmouth shiners in Manitoba have scales covering the nape. In this respect, they conform to the subspecies *N. d. dorsalis* (K.W. Stewart, pers. comm., 2003).

DISTRIBUTION

In summary, the distribution of the bigmouth shiner includes the Hudson Bay (Red River), Great Lakes and Mississippi River basins from northern Michigan to southern Manitoba, and from eastern Illinois to the Platte River system, eastern Wyoming and northern Colorado. There are disjunct populations in western New York and Pennsylvania, western Michigan, northern Ohio, and northern West Virginia (Page and Burr 1991), and in western Tennessee (Etnier and Starnes 1993) (Figure 2). Three subspecies have been recognized. *Notropis d. piptolepis* is native to the Platte River system in Wyoming and Colorado; *N. d. keimi* is native to Lake Ontario and Allegheny River drainages in New York and Pennsylvania; and *N. d. dorsalis* is throughout the rest of the range (Page and Burr 1991).

In the original status report, Tompkins (1985) described the distribution of the bigmouth shiner in the United States in great detail. This will not be repeated for this update, as no recent updated information exists in the published literature.

At the time of the publication of the original status report, Tompkins (1985) identified the Canadian distribution of the bigmouth shiner as the Pembina River (Red River tributary) in southern Manitoba near the border with the United States, and the Woody and Roaring rivers, which flow into Swan Lake (Figure 2 in Tompkins 1987). Fedoruk (1970) first reported the bigmouth shiner in Canada from the Pembina River after collecting 84 specimens at five locations in 1968.

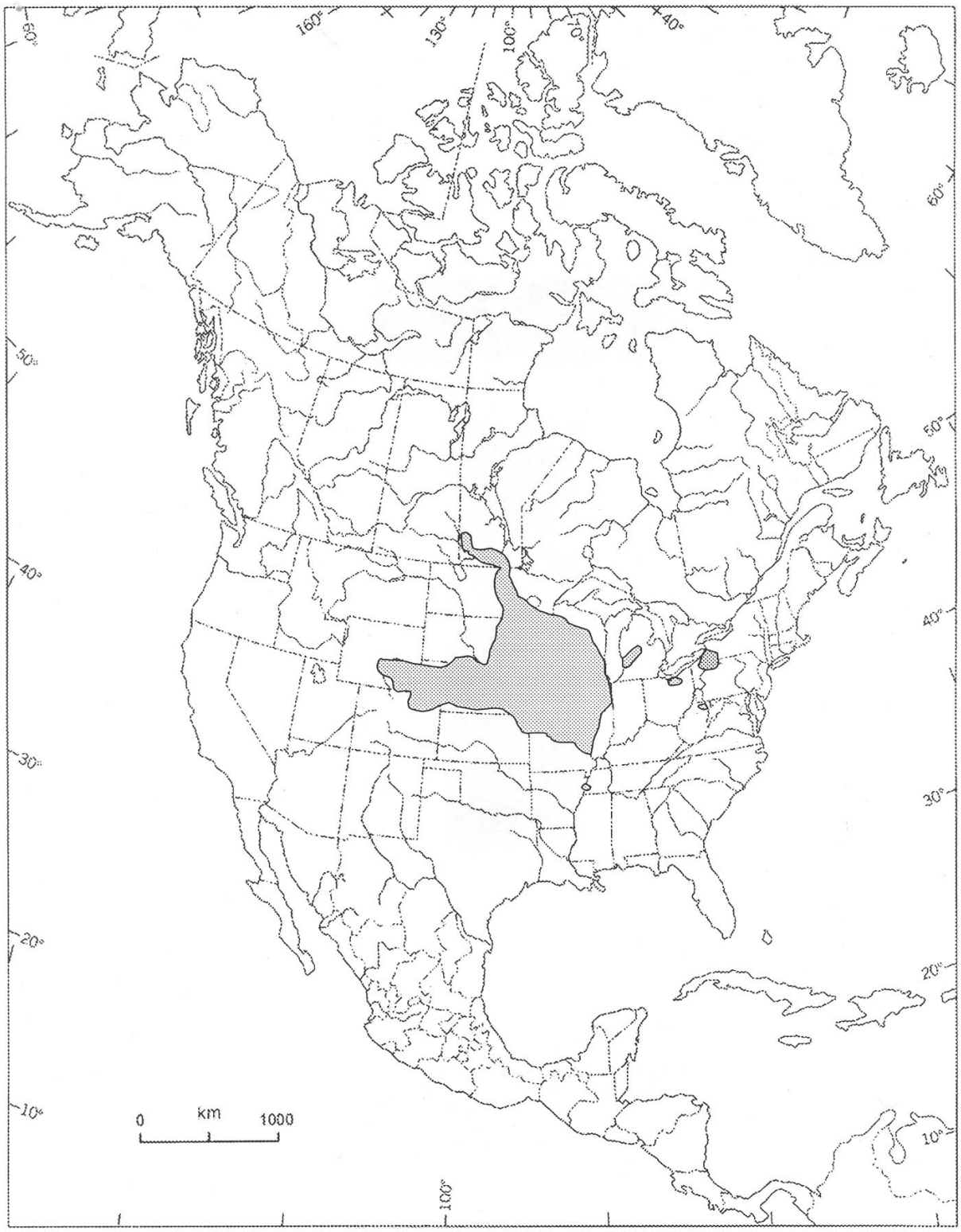

Figure 2. North American distribution of the Bigmouth Shiner, *Notropis dorsalis,* (from Page and Burr (1991) and Etnier and Starnes (1993)).

The Pembina River location records from Fedoruk (1970) and Copes and Tubb (1966) are illustrated in Figure 3 in Tompkins (1987). The collections made by Copes and Tubb (1966) were from the United States portion of the Pembina River watershed. The Woody and Roaring River specimens in the collections of the Royal Ontario Museum were originally identified as mimic shiners (*Notropis volucellus*) and erroneously illustrated in the distribution maps for that species in Scott and Crossman (1979) (K.W. Stewart, pers. comm. 2003). The mimic shiner is restricted to tributaries east of the Red River in southeastern Manitoba (K.W. Stewart pers. comm. 2003).

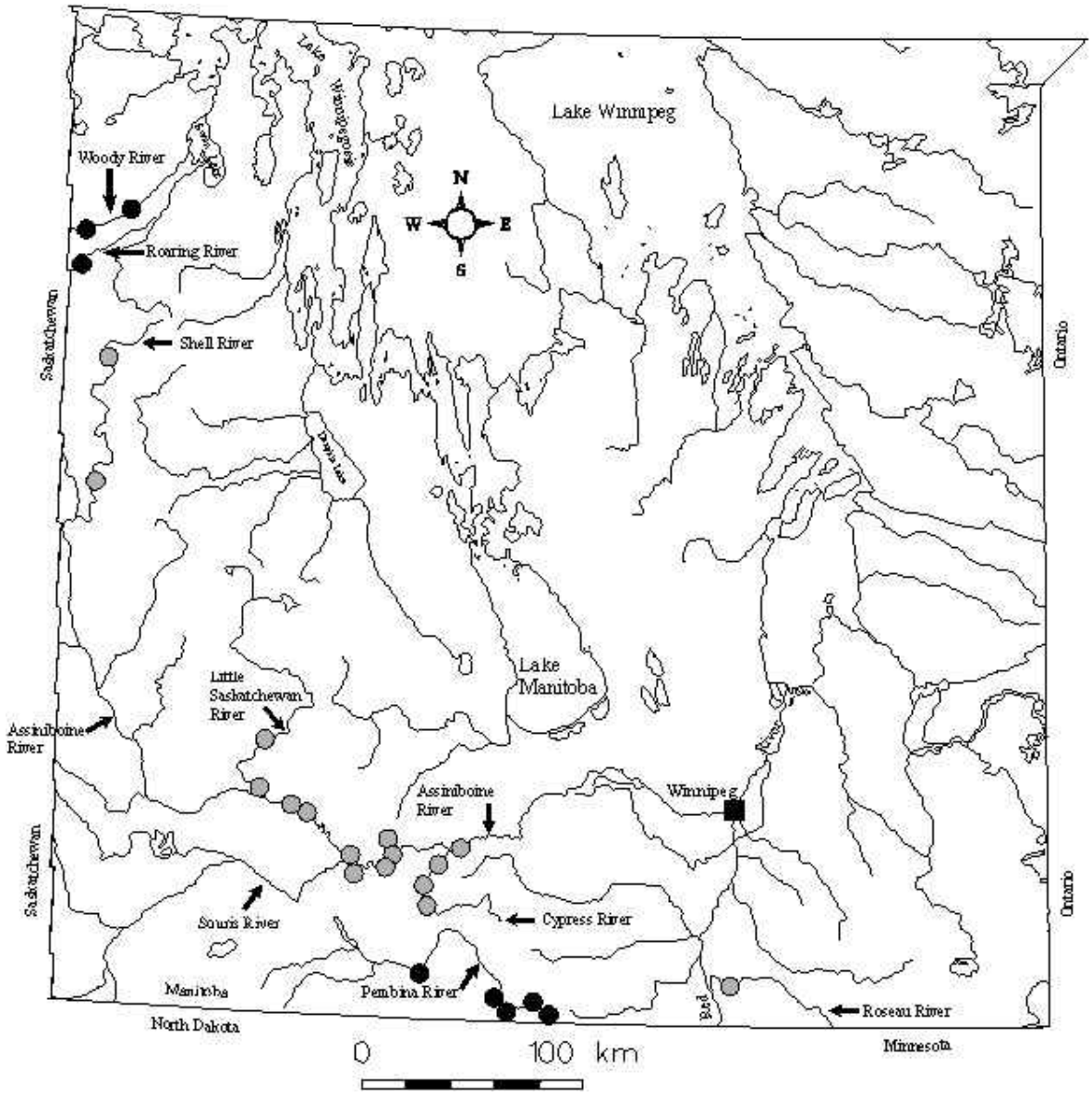

Figure 3. Canadian distribution of the Bigmouth Shiner, *Notropis dorsalis*. Black circles indicate localities from original status report (Tompkins 1985). Gray circles indicate new locality records.

Since the original status report was published, the distribution of the bigmouth shiner has not been expanded latitudinally, but is more extensive, as the species has been collected from the Cypress, Shell, Little Saskatchewan, and Assiniboine rivers, as well as Oak and Epinette Creeks. The species also has been found in the lower Roseau River near its junction with the Red River (Figure 3). Twenty-seven individuals were collected there by the author, Dave Tyson, and Gavin Hanke in May 1991. The bigmouth shiner was first recorded in the Assiniboine River in 1979 at the Provincial Highway 34 crossing (Stewart et al. 1985); in the Little Saskatchewan River near its junction with the Assiniboine River in 1954; in the Cypress River at the Provincial Highway 2 crossing in 1985; and from the Shell River in 1953 (Appendices 1, 3-5 in McCulloch and Franzin 1996). The bigmouth shiner was first recorded from Oak Creek in 1973 and from Epinette Creek in 1989 (Appendix 7 in McCulloch and Franzin 1996). While range extensions of species such as the stonecat (*Noturus flavus*) (McCulloch and Stewart 1998) and rainbow smelt (Wain 1993) in Manitoba reflect recently invading species (the stonecat naturally via high meltwater conditions between headwaters of Red River and upper Mississippi drainages; and the rainbow smelt (*Osmerus mordax*) through bait bucket transfers), the bigmouth shiner appears to have dispersed into Manitoba with the retreat of the Wisconsinon glaciation.

The presence of the bigmouth shiner in the Shell and Little Saskatchewan rivers upstream of the Shellmouth and Rivers dams respectively, both of which have halted the stonecat's dispersal in these rivers (McCulloch and Stewart 1998), supports the bigmouth shiner's lengthy presence in Manitoba. Absence of the species in the Souris River, despite extensive collections made by Hallum's group from the Manitoba Museum of Man and Nature in 1974, and by a research group led Dr. Bill Franzin of the Department of Fisheries and Oceans in 1995, may be explained by the lack of suitable habitat due to alterations to stream flow and discharge in the form of check dams throughout much of the river's length. Possibly, this has eliminated any long stretches of relatively shallow, monotypic habitat preferred by the species.

The bigmouth shiner is most likely present in other streams in western Manitoba. Its present distribution in Manitoba is reflected by the relative lack of collection effort in this region of Manitoba. While yearly September collections throughout the 1980s and most of the 1990s by Dr. Ken Stewart and the Biology of Fishes Class at the University of Manitoba have contributed greatly (almost single-handedly) to the determination of fish distribution in southern Manitoba, time constraints on the weekend field trips usually restricted collection efforts within the Assiniboine River watershed from the city of Winnipeg west to near the city of Brandon and north to the Little Saskatchewan River.

HABITAT

In Manitoba, the bigmouth shiner appears to favour small streams, up to 12 metres in width and one metre in depth, although presence in larger rivers such as the Assiniboine has been documented. Stewart pers.comm., state that the bigmouth shiner commonly inhabits riffles and runs at moderately fast velocities, preferring faster water

than the sand shiner. The bigmouth shiner is also found closer to upstream ends of riffles and runs than is the sand shiner (K.W. Stewart pers. comm. 2003). The bigmouth shiner seems to be most common in the Pembina and Cypress rivers. The Cypress River is a small stream (up to 12 metres in width) with a medium gradient and substrate characterized by shale outcrops. In one of the few detailed habitat sampling efforts conducted in the Cypress River, the bigmouth shiner was found in locations with channel widths between 2 and 12 metres (average 5.5 m), water depths between 0.11 and 1.0 metres (average 0.41 m) and velocities between 0.10 and 0.62 m/sec (average 0.39 m/sec). Substrates were composed of the following combinations: gravel/shale; cobble/boulder; shale/silt; cobble/shale; and sand/shale. The bigmouth shiner was the most abundant species (over 20% of the total catch) where wetted widths were between 3 and 4 metres, depths were between 0.28 and 0.5 metres, velocities were between 0.39 and 0.62 m/sec, and substrate was gravel and shale (B. Franzin, 1995 unpublished data).

In the Little Saskatchewan River, a single bigmouth shiner was collected over sand and gravel in 0.69 metres of water (Appendix 3 in McCulloch and Franzin 1996). The bigmouth shiner has been collected in similar habitat in Oak and Epinette creeks. In the Assiniboine River, the bigmouth shiner has always been collected in low numbers (<10 individuals) were they occur over gravel, sand and shale outcrops in water up to one metre in depth (Appendix 1 in McCulloch and Franzin 1996).

Elsewhere, the bigmouth shiner occurs mainly in small permanent prairie streams with unstable sandy bottoms (Mendelson 1975, Pflieger 1997). Becker (1983) and Mendelson (1975) found that the species was absent or rare from larger streams. In smaller streams, abundance decreased as stream width exceeded 3 metres. This tendency to favour smaller streams is not exclusive throughout its range, however, as Johnson and Becker (1970) reported it common in medium-sized sandy streams in the Mississippi drainage, while Starrett (1950) found it to be abundant in the Des Moines River. In tributaries of the Red River in North Dakota, Copes and Tubb (1966) found the bigmouth shiner to be most abundant in slightly turbid water over sand substrate. Other habitats occupied have included small streams with silt substrates (Eddy and Underhill 1974) and sand substrate overlain with silt (Gilbert 1980). Mendelson (1975) found that the bigmouth shiner exhibits a pronounced preference for shallow water upstream from pools. O'Shea et al. (1990) found bigmouth and sand shiners in wide river channels with abundant sandbars and low amounts of river-edge habitat in the Platte River in Nebraska.

While it is hard to determine rates of habitat change, Tompkins (1987) indicated that population trends in the United States have suggested that suitable habitat has expanded in the central plains, but has declined in the eastern part of the range. Pflieger (1971) suggested that channelization of prairie streams in the early part of the twentieth century created habitat conditions that were favourable for the bigmouth shiner. In fact, Scarnecchia (1988) found that bigmouth shiner populations were significantly higher in channelized sections than in unchannelized sections of Pillsbury Creek, Iowa. Percentage of total catch increased from 1-4% in unchannelized sections to 22-54% in channelized sections (Scarnechhia 1988). Typically, channelization of

waterbodies occurs either to protect infrastructure and other properties from natural erosive features of active steam channels, or when a waterbody is crossed and a culvert is used to convey water under the roadway. Realignment of a portion of the stream channel usually involves minor channelization to accommodate flow through the culvert. In this way, flow becomes uniform, with little or no variation.

GENERAL BIOLOGY

Information on the biology and life history of the bigmouth shiner is limited. Keeton (1963 in Tompkins 1987) suggests that the species is fast-growing and has a maximum life span of three years. In Ohio, Trautman (1981) found considerable variation in the size of young-of-the-year fish (28 and 50 mm), and 1+ age fish (33 and 63 mm). Adult fish ranged between 50 and 75 mm. A sample of bigmouth shiners from the Pembina River ranged in size from 65-74 mm total length (K.W. Stewart pers. comm. 2003). From a collection of 129 bigmouth shiners taken from the Cypress River in the fall of 1995, specimens ranged from 28-75 mm. No specimens could be sexed that were less than 47 mm total length, suggesting that maturation is achieved above this length. For those fish where sex could be determined, 70% were female and 30% were male (McCulloch, unpublished data). Figure 4 summarizes length-frequency distribution of the bigmouth shiners collected in the Cypress River in 1995. While most of the specimens in the collection were mature, some recruitment in the population was evident.

Nothing is known about reproductive behaviour and spawning sites of the bigmouth shiner in Manitoba (K.W. Stewart pers. comm. 2003) or elsewhere (Tompkins 1987). Becker (1983) indicates that spawning can occur between late May and early August in Wisconsin, and Starrett (1951) found that spawning occurs in late July and August in Iowa. In Illinois, Gilbert (1980) spawning occurs from May to June, while in Missouri spawning takes place in June and July (Pfleiger 1997).

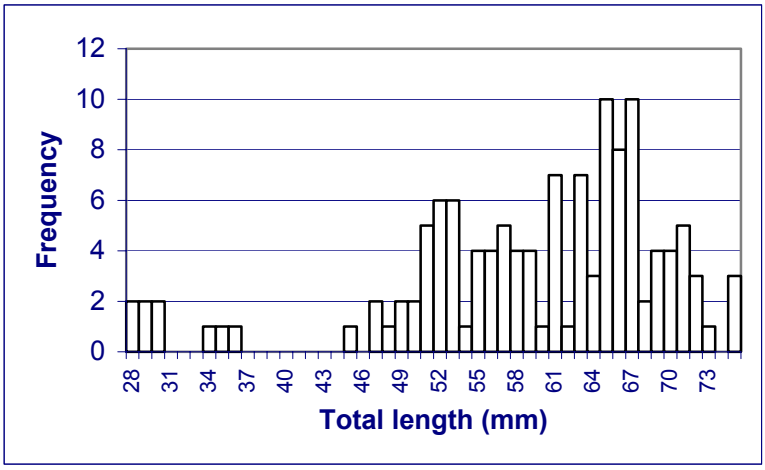

Figure 4. Length-frequency distribution of 129 bigmouth shiners captured in the fall of 1995.

Fedoruk (1970) found that the bigmouth shiner in the Pembina River was often associated with the sand shiner. This association was also observed in Kansas (Cross 1967), Iowa (Harlan and Speaker 1957), Minnesota (Eddy and Underhill 1974), Pennsylvania (Cooper 1983) and Missouri (Hanson and Campbell 1963). While performing habitat studies in the Platte River in Nebraska, O'Shea et al. (1990) lumped the two species into a sand shiner-bigmouth shiner assemblage due to similarities in food and habitat preferences, and in the difficulty identifying specimens less than 25 mm.

Elsewhere in Manitoba, the bigmouth shiner is collected with the sand shiner in the Assiniboine River, but the latter can often outnumber the former by ratios of several hundred to one (Appendix 1 in McCulloch and Franzin 1996). In the Cypress River, where bigmouth shiner populations can attain some of their largest sizes, the species is frequently collected with large numbers of common shiner and creek chub. Both the longnose and western blacknose dace often also form part of this assemblage, but are represented in lower numbers (Appendix 4 in McCulloch and Franzin 1996). It should be noted that collection techniques (i.e., seine hauls) in the Cypress River often encompass several habitat types, including pools and runs. As both common shiner and creek chub tend to favour rocky or sandy pools (Page and Burr 1991), the representation of these two species in seine collections was likely achieved during that portion of the haul through pool habitat, while bigmouth shiner, longnose dace and western blacknose dace were collected while the seine was being hauled through run and riffle habitats. Stewart pers. comm., also note that western blacknose dace is commonly associated with the bigmouth shiner, as they share very similar microhabitats. Longnose dace-bigmouth shiner co-occurrences are less common, as longnose dace prefer even faster water (K.W. Stewart pers. comm. 2003). Interestingly, the sand shiner is often collected with the common shiner, creek chub, western blacknose dace, and longnose dace in the absence of the bigmouth shiner in the Souris River (Appendix 2 in McCulloch and Franzin 1996).

No information is available regarding bigmouth shiner movements in Manitoba. However, appearance of the bigmouth shiner in repeated fall collections at sites on the Cypress and Assiniboine rivers throughout the 1980s and 1990s suggests that some movement occurs, in that recolonization takes place after individuals are removed from the population after a collection event. Elsewhere, Mendelson (1975) found that the bigmouth shiner migrates upstream during fall and winter, and returns downstream in summer. Diel movements involve movement into shallow water at night, likely either to avoid terrestrial predators or to take advantage of emerging insect larvae (Mendelson 1975).

Little is known of the diet of bigmouth shiner in Manitoba. Specimens collected from the Cypress River in the fall of 1995 were feeding exclusively on water boatmen (Family Corixidae) (McCulloch, unpublished data). In Iowa, Starrett (1950) found that the bigmouth shiner increased consumption of terrestrial insects in fall in response to reductions in Ephemeroptera (mayfly) and Trichoptera (caddisfly) larvae. Starrett (1950) found that aquatic nymphs, larvae and Diptera formed a large part of the diet the remainder of the year. Elsewhere, Gilbert (1980) reported that the bigmouth shiner

consumes mainly insects, but that plant material and bottom ooze was also present in the stomach. Mendelson (1975) found that benthic fauna was more prevalent in the diet than drift fauna throughout all sampling periods. The presence of caddisfly larvae (*Hydropsyche* spp.), along with *Dicranota* spp., and mite (*Libertia* spp.) in bigmouth shiner stomachs supports the preferred microhabitat of shallow water areas upstream from pools that Mendelson (1975) observed in Wisconsin.

Tompkins (1987) stated that taste is more important in foraging than sight. In aquaria, foraging occurred near or on the bottom, with fish swimming quickly over the substrate, inhaling sand and sorting out food through ejection out the mouth or gill opening (Pflieger 1997). The inferior and horizontal mouth is deemed consistent with bottom feeding (Hubbs 1941).

POPULATION SIZES AND TRENDS

In the original status report on the bigmouth shiner, Tompkins (1985) extensively covered population size and trends in the United States' portion of its range, and that information will not be repeated in this document. In summary, Gilbert (1980) suggests that bigmouth shiner populations in the western part of its range are increasing, while those in the eastern part are decreasing. Increases in the west have been attributed to changes in habitat, specifically channelization of rivers, which will be addressed in more detail in the habitat section of this report. In Wisconsin, Lyons (1996) found that the percent occurrence of the bigmouth shiner in collections from the 1970s (23%) was slightly higher than in the 1990s (21%). When first reported in Tennessee in 1990, the bigmouth shiner was the most abundant species in Bear Creek. In three previous collections of Bear Creek between 1967 and 1986 the bigmouth shiner was absent (Etnier and Starnes 1993). Pflieger (1997) also reports that bigmouth shiner distribution and abundance in Missouri have both increased in the last 50 years.

Since the original status report, our knowledge of the distribution of the bigmouth shiner in Manitoba has been expanded greatly to include the Assiniboine River and several of its tributaries as well as the Roseau River. It is difficult to assess population size and trends in the absence of repeatable and quantifiable data. The low numbers of the bigmouth shiner that typically characterize collections in the Assiniboine and Shell rivers makes any analysis difficult. Other streams such as Oak Creek and Epinette Creek have been sampled too few times to determine population size and trends. In the Cypress River, repeated sampling in September using seines at the Highway 2 crossing produced 130 fish in 1986, 58 fish in 1987, 52 fish in 1991, 58 fish in 1992, and 60 fish in both 1993 and 1994 (Appendix 4 in McCulloch and Franzin 1996).

LIMITING FACTORS

Tompkins (1987) concluded that the bigmouth shiner can tolerate little human disturbance. Eutrophication from shoreline development in Oneida Lake, New York was

the likely cause of decreased shiner populations (Clady 1976). However, it appears that the bigmouth shiner has actually benefited from human disturbance to stream hydraulics throughout settlement of North America. As mentioned previously, Pfleiger (1971) suggested that channelization of prairie streams has created habitat conditions in Kansas that have become favourable for the bigmouth shiner, and Scarnecchia (1988) found that bigmouth shiner populations were significantly higher in channelized sections than in unchannelized sections. Additionally, besides being the most widely distributed and abundant minnow in Iowa, it has been suggested that the bigmouth shiner is becoming more widely distributed as habitats are changed into shallow streams with homogeneous width, depth and current. The bigmouth shiner is one of a few species found over the seemingly sterile sand flats that are common in medium and smaller Iowa streams (Iowa Department of Natural Resources Web Site 2003).

Starrett (1951) also found that the bigmouth shiner was less susceptible to periods of flooding than were co-existing species, as it moved from small streams into the Des Moines River, Iowa to avoid becoming isolated in backwaters. No changes in abundance were observed. Reproduction might be affected by high water levels in spring, as preferred habitats, food sources, and spawning sites could be affected. Fedoruk (1970) suggested that the high turbidity levels in the Red River had likely prevented further dispersal in Manitoba. Since the original status report, the bigmouth shiner has been found in many areas within the Assiniboine River watershed. Depending on the timing of the dispersal into these areas, the bigmouth shiner might have had to use the Red River as a dispersal route to enter the Assiniboine River system. Thus, unless the turbidity levels in the Red River were lower during the period of dispersal than they are at present, the bigmouth shiner might be more tolerant of turbid water than previously observed, at least for dispersal purposes. Stewart pers. comm., state that the bigmouth shiner in Manitoba can be found in moderately turbid to turbid water.

In Ohio, decline in some bigmouth shiner populations has been attributed to competition with the invasive silverjaw minnow (*Notropis buccatus*) (Trautman 1981). No such recent invading cyprinids into the Hudson Bay watershed share habitat as closely with the bigmouth shiner as does the silverjaw minnow. The spotfin shiner (*Cyprinella spiloptera*), with which the bigmouth shiner forms an assemblage along with the sand shiner and emerald shiner (*Notropis atherinoides*) in Wisconsin (Mendelson 1975), was first collected from the Roseau River in 1988, and had dispersed to the tailrace of the Portage Spillway on the Assiniboine River at the town of Portage la Prairie by July 1990 (Appendix 1 in McCulloch and Franzin 1996). The Portage Spillway, which will most likely be a barrier to spotfin shiner dispersal upstream in the Assiniboine River, is downstream of all of the reported bigmouth shiner collection locations on the Assiniboine River, and downstream of the mouth of the Cypress River. The spotfin shiner prefers moderate to large rivers of moderate to high turbidity, where it is found over sand, gravel or rubble substrates (Gilbert and Burgess 1980). Where the two species co-occur with sand and emerald shiners in Wisconsin, Mendelson (1975) found that the bigmouth shiner was the most responsive to both con- and heterospecifics. Each species appeared to coexist by utilizing different morphological adaptations.

Two large-scale land uses that occur within the bigmouth shiner's present distribution in Manitoba are agriculture and forestry. The presence of livestock in watercourses can result in accelerated bank erosion and increased siltation, both of which could be harmful to fish habitat. In forestry operations, several stream crossings can be installed every year depending on a company's annual operating plan. Poorly installed culverts can prevent fish passage and increase siltation into the watercourse either directly, or from sediment runoff from road infrastructure.

SPECIAL SIGNIFCANCE OF THE SPECIES

Stewart pers. comm., state that the bigmouth shiner has no direct economic importance outside of its ecological role in stream habitats. It is, however, used as bait fish in several states including Colorado (Beckman 1953) and Iowa (Iowa Department of Natural Resources web site).

Tompkins (1987) suggested that the three subspecies of *Notropis dorsalis* are of interest scientifically, as they represent geographically isolated populations.

As with several cyprinids and other non-game fish species, very little information is known about basic life history parameters and biological requirements of the bigmouth shiner. In the 2002-2003 fiscal year, the bigmouth shiner has been targeted for study under the Habitat Stewardship Program (Environment Canada 2003). The species will be studied in the following projects: Sturgeon Creek; Integrated Conservation Agreements; and the Riding Mountain Biosphere Project and Manitoba Tall Grass Prairie Preserve.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

The bigmouth shiner is native to the United States and Canada. In Ohio, Trautman (1981) considered the species to be almost extirpated. It is presently listed as "threatened" in Ohio, as its distribution is restricted to two small watersheds that flow north into Lake Erie (Appendix F in Anonymous 1997). In 1998, the bigmouth shiner was unlisted in Pennsylvania, but had been recommended for "threatened" status, as the species occurs only the northwestern part of the state. Clady (1976) considered the species to be threatened in New York. However, the bigmouth shiner is presently not listed as extinct, extirpated, endangered, threatened, or of special concern in New York. Thus, its status in this state remains unknown.

In April 1985, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) approved and assigned rare status to the bigmouth shiner in Canada. After categorical changes were made within COSEWIC, the species was re-designated as vulnerable. After another categorical re-alignment, the bigmouth shiner was assessed as a Species of Special Concern in Canada "because of characteristics that make it particularly sensitive to human activities or natural events" (COSEWIC 2002).

There is no protection specific to the bigmouth shiner in Canada. The federal Fisheries Act prohibits the harmful alteration, disruption and destruction (HADD) of fish habitat.

The Manitoba Conservation Data Centre (MBCDC) has established ranks of Species of Conservation Concern. The ranks are divided into a global rank (G) and a provincial rank (S). The bigmouth shiner has been ranked as G5, S3. A global rank of G5 indicates that the species is "demonstrably widespread, abundant, and secure throughout its range" and "essentially irradicable under present conditions" (MBCDC web site 2003). A provincial rank of S3 indicates that it is uncommon in the province with 21-100 occurrences.

SUMMARY OF STATUS REPORT

As with several species sensitive to sedimentation caused by bank erosion and intrusion of livestock into waterbodies, it appears that bigmouth shiner populations have benefited where streambank fencing has been implemented. In Eagle Creek, Buffalo County, Wisconsin, researchers observed a doubling in the total fish population. This included the presence of fish typically found in good trout streams. The total increase in fish numbers was largely reflected by an increase in the bigmouth shiner population (U.S. EPA 1993). Numerous co-operative initiatives (e.g., Cows and Fish, Environmental Farm Plans) throughout the Canadian Prairies have been undertaken in an effort to protect riparian areas while benefiting livestock production. Much of the protection of riparian areas involves livestock exclusion through fence installation. Continued efforts to protect riparian areas should benefit bigmouth shiner populations throughout much of their range in Manitoba.

Adequate information regarding critical habitat requirements, population size, structure and stability, and distribution are lacking. However, the species has been found at five new locations since 1985 and may be present in other unsurveyed areas in western Manitoba and possibly eastern Saskatchewan, although the species is at the northern extent of its worldwide distribution in Canada, and Manitoba is, at present, the only province in which it occurs.

TECHNICAL SUMMARY

Notropis dorsalis
Bigmouth shiner Méné à grande bouche
Range of Occurrence in Canada: MB

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* [calculated from Figure 2]	< 10,000 km²
• *Specify trend in EO*	Unknown
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²)* [calculated from Figure 3]	<500 km²
• *Specify trend in AO*	Unknown
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	8 (24 sites)
• *Specify trend in #*	Probably no losses; 5 new sites since 1985
• *Are there extreme fluctuations in number of locations?*	No
• *Specify trend in area, extent or quality of habitat*	Unknown
Population Information	
• *Generation time (average age of parents in the population)*	Unknown, but likely 1 year as in other shiners
• *Number of mature individuals*	Unknown
• *Total population trend:*	Unknown
• *% decline over the last/next 10 years or 3 generations.*	Unknown
• *Are there extreme fluctuations in number of mature individuals?*	Unknown
Is the total population severely fragmented?	Yes. Populations are fragmented to the degree that they are found in separate watersheds.
• *Specify trend in number of populations*	Unknown
• *Are there extreme fluctuations in number of populations?*	No
• *List populations with number of mature individuals in each:*	Unknown
Threats (actual or imminent threats to populations or habitats)	
There are no apparent or immediate threats identified in the Canadian population.	
Rescue Effect (immigration from an outside source)	
• *Status of outside population(s)?*	Not at Risk (see below)
• *Is immigration known or possible?*	Yes
• *Would immigrants be adapted to survive in Canada?*	Possibly
• *Is there sufficient habitat for immigrants in Canada?*	Yes
• *Is rescue from outside populations likely?*	Negligible
Quantitative Analysis	N/A

Current Status

COSEWIC: Rare (=Vulnerable, = Special Concern) 1985
Nature Conservancy Ranks
Global: G5

Canada **National:** N3
Regional: MB – S3

U.S. **National:** N5
Regional: CO – S4, IL – S5, IA – S5, KS – S2, MI – S?, MN – S?, MO – S?, NE – S4, NY – S3, ND – S?, OH – S2, PA – S2, SD – S5, TN – S1, WI – S4, WV – SX, WY – S5

Status and Reasons for Designation

Status: Not at Risk	**Alpha-numeric code: N/A**.

Reasons for Designation:

There are no demonstrable or potential threats and the species is not particularly sensitive to habitat disturbances. It has been found in five new locations since 1985. It may also be present in unsurveyed areas of suitable habitat in western Manitoba and possibly eastern Saskatchewan.

Applicability of Criteria

Criterion A (Declining Total Population): N/A: Total population not in decline.

Criterion B (Small Distribution, and Decline or Fluctuation): N/A: The EO is < 20,000 km^2, and the AO <500 km^2, but there is no evidence of decline or fluctuation.

Criterion C (Small Total Population Size and Decline): N/A: Population numbers unknown, but new sites have been discovered since last assessment and no evidence of decline.

Criterion D (Very Small Population or Restricted Distribution): N/A: The number of mature individuals would be > 1,000 and the AO is also > 20 km^2, and the species occurs at more than 5 locations.

Criterion E (Quantitative Analysis): N/A: No data available for a quantitative analysis.

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Bruce McCulloch is an Impact Assessment Biologist with Fisheries & Oceans Canada (DFO), Edmonton District Office, where his duties include project review, staff supervision, and participation in several federal-provincial working groups. Bruce is a graduate of the University of Manitoba, where he conducted a Master’s thesis on the distribution of the stonecat (*Noturus flavus*) in Manitoba and its interactions with native fish species. Prior to joining DFO in 2001, he was employed by Westworth Associates Environmental Ltd., where he was involved in a number of major fisheries studies including reconnaissance-level fish and fish habitat inventories in British Columbia, and the establishment of an aquatic ecosystem monitoring program in the vicinity of a hazardous waste landfill in west-central Alberta. Mr. McCulloch has undertaken several fish and fish habitat assessments throughout Alberta for culvert and bridge replacements, and pipeline crossings. Bruce also conducted the fisheries component of a number of functional planning studies related to stream crossings in central Alberta, baseline inventories of aquatic ecosystems and the collection of fish tissues for chemical analysis. As a contractor, he worked with the Department of Fisheries and Oceans where he was involved in population studies of lake trout, lake whitefish, northern pike and white sucker in the Experimental Lakes Area of Ontario. As a private consultant, Bruce conducted a survey of non-game fish species in the upper Missouri River watershed in southwestern Saskatchewan; undertook research on the effects of thermal effluents from a Manitoba Hydro thermal generating station on the fish communities in the Assiniboine River; studied the effects of road crossings on fish populations in eastern Manitoba; participated in data collection to assess effects of forest harvesting and fire on fish populations in the Fort McMurray area of northern Alberta; and conducted research on prey selection by juvenile walleye in Manitoba. He is a member of the American Fisheries Society, is a certified PADI open water diver, and a Certified Electrofishing Crew Leader in Alberta. Bruce is an avid angler and birder, who enjoys playing guitar and bass in his spare time.

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COLLECTIONS EXAMINED

N.A.