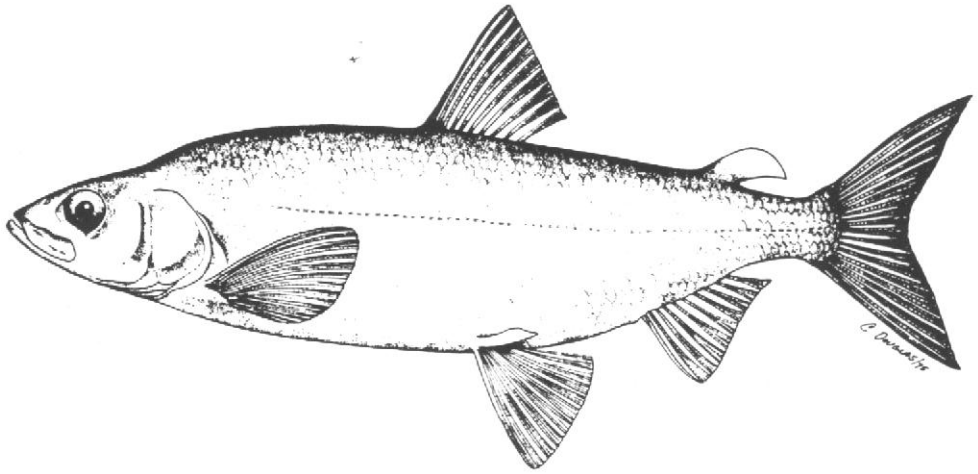
COSEWIC
Assessment and Update Status Report

on the

blackfin cisco
Coregonus nigripinnis

in Canada



DATA DEFICIENT
2007

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Blackfin cisco — Drawing by C.E. Douglas, courtesy D.E. McAllister, formerly National Museum of Natural Sciences.

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COSEWIC
Assessment Summary

Assessment Summary – April 2007

Common name
Blackfin cisco

Scientific name
Coregonus nigripinnis

Status
Data Deficient

Reason for designation
Uncertainty about whether or not we are dealing with ecomorphotypes of a common and widespread species (*C. artedii*) or distinct populations of blackfin cisco (*C. nigripinnis*) cannot be resolved with the information currently available. Given that uncertainty, COSEWIC cannot unambiguously define what unit it would be assessing. However, COSEWIC notes that whatever the systematic status, there are distinct coregonids in these lakes that warrant enhanced conservation and protection. The uncertainty of systematic status can probably only be resolved through a comprehensive taxonomic/systematic review of the sub-genus.

Occurrence
Ontario

Status history
Designated Threatened in April 1988. Species considered in April 2007 and placed in the Data Deficient category. Last assessment based on an update status report.

COSEWIC
Executive Summary

blackfin cisco
Coregonus nigripinnis

Species information

The blackfin cisco is a freshwater fish characterized by its darkly pigmented fins and deep body. It is one of the largest of the 10 cisco species found in Canada, averaging 330 mm in length and 0.7 kg in weight although, it may reach lengths of up to 510 mm and weigh up to 1 kg or more.

Distribution

Historically, the blackfin cisco was reported as an endemic species to each of the Great Lakes, except Lake Erie and Lake Nipigon. However, the occurrence of blackfin cisco in lakes Superior and Ontario was never confirmed. Recent sampling suggests that the stocks from the Great Lakes are extirpated. Historical records of blackfin cisco for inland lakes in Ontario, Manitoba, Saskatchewan and Alberta are now considered to be invalid due to taxonomic uncertainty.

Habitat

The blackfin cisco was considered to have inhabited the deeper waters of the Great Lakes, occurring at depths of 90-183 m in lakes Huron and Michigan. In Lake Nipigon, the blackfin cisco has been captured at depths to 104 m. However, the species has been found at shallower depths in riverine situations, perhaps related to spawning.

Biology

Little is known of the biology of the blackfin cisco. Age of maturity, breeding frequency, fecundity, early life history, age/sex ratio and population structure are all unknown or poorly defined and no information related to survival, growth rates or population structure is available for this species. Limited species-specific information has been reported for blackfin cisco regarding its movement/dispersal for the purposes of spawning or seasonal migration. Information on food preferences indicate that blackfin cisco feed almost exclusively on opossum shrimp (*Mysis relicta*). The blackfin cisco was a likely prey species of sea lamprey (*Petromyzon marinus*) and lake trout (Salvelinus namaycush) within the Great Lakes, and may still be an important prey item

for lake trout and other larger, predacious species within Lake Nipigon and other inland water locations.

Population sizes and trends

Little or no information exists on population size or trends for this species. Currently, the species is felt to be extirpated within the Great Lakes. In Lake Nipigon, the species is considered to be extant and is reported as an incidental species in the lake whitefish (*Coregonus clupeaformis*) fishery at a rate of approximately 4500 kg/year. Other existing populations of blackfin cisco are reported in the Little Jackfish River, a tributary of Lake Nipigon.

Limiting factors and threats

Factors suspected to have caused the decline of blackfin cisco in the Great Lakes are over-exploitation by commercial fisheries, sea lamprey predation and competition from other invasive fish species such as alewife (*Alosa pseudoharengus*) and rainbow smelt (*Osmerus mordax*). Continued capture of blackfin cisco as an incidental catch species in commercial fish nets on Lake Nipigon may have a detrimental effect on species populations in that lake; however, present information is insufficient to quantify this effect.

Special significance of the species

Within the Great Lakes, blackfin cisco would have formed a part of the deepwater community where it was known to occur. Blackfin cisco would also have served as a traditional forage fish for lake trout populations in the Great Lakes. Its continued presence as part of the deepwater community of Lake Nipigon is of continued value to the ecological integrity of the lake. Similarly, its occurrence in other inland waters enhances the biodiversity of those waterbodies where it is found.

Existing protection or other status

General protection is afforded to this species through the fish habitat sections of the federal *Fisheries Act*. Although listed under Schedule 2 of the federal Species at Risk Act as a species to be reassessed for consideration on Schedule 1, it receives no official protection as a species at risk.

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. Species designated at meetings of the full committee are added to the list. 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 for 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 entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* 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. Definition of the (DD) category revised in 2006.

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Canada

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

Update
COSEWIC Status Report

on the

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2007

TABLE OF CONTENTS

List of figures

List of appendices

SPECIES INFORMATION

Name and classification

Kingdom:	Animalia
Phylum:	Chordata
Class:	Actinopterygii
Order:	Salmoniformes
Family:	Salmonidae
Subfamily:	Coregoninae
Genus and Species:	*Coregonus nigripinnis* (Milner 1874)
Common Name	
English:	blackfin cisco (Nelson *et al.* 2004)
French:	*cisco à nageoires noires* (Scott and Crossman 1973)
Other:	blackfin, black-fin tulibee, black-back tullibee, black-fin, mooneye cisco and bluefin (Scott and Crossman 1973).

The blackfin cisco is one of 10 cisco species found in Canada (Scott and Crossman 1973), one of seven cisco species found in the Great Lakes (Cudmore-Vokey and Crossman 2000), and one of six cisco species identified as an incipient species flock endemic to the Great Lakes by Koelz (1929). These counts exclude the longjaw cisco (*C. alpenae*), described by Koelz (1929) and included in Scott and Crossman (1973), as it is considered a synonym of shortjaw cisco (*C. zenithicus*) by Todd *et al*. (1981).

The blackfin cisco (*Coregonus nigripinnis)* was originally named by Gill (in Hoy 1872). Hoy's 1872 paper did not describe the species but gave Gill as the authority for *C. nigripinnis*. Recent questions on the authority of this species have arisen. Eschmeyer (1998) noted that Hoy or Milner (1874, in Eschmeyer 1998) may be the authority, as Gill's manuscript was never published (Nelson *et al.* 2004). Based on additional information from Eschmeyer (1998), Milner's 1874 paper is presently considered by the AFS as the first valid description of the blackfin cisco (Nelson *et al.* 2004).

Taxonomy

In terms of its taxonomic nomenclature, especially as related to the Great Lakes basin and to inland waters, blackfin cisco has long been recognized as a problematic species. Koelz (1929) originally recognized four subspecies of *C. nigripinnis* within the Great Lakes, with each restricted to the following specific lakes: *C. n. nigripinnis* (lakes Michigan and Huron), *C. n. cyanopterus* (Lake Superior) and *C. n. prognathus* (Lake Ontario). However, Koelz (1929) noted difficulty in the ability to distinguish small *C. n. nigripinnis* and *C. n. cyanopterus* from *C. kiyi* (kiyi) in lakes Huron and Superior, respectively. More recently, *C. n. cyanopterus* in Lake Superior was synonymized with the shortjaw cisco (*C. zenithicus*) (Clarke and Todd 1980; Todd and Smith 1980; Becker 1983). The Lake Ontario type material of *C. n. prognathus* was examined by Todd (1981) and considered as a mixture of coregonine species with the holotype considered

a *nomen dubium*. As a result of these findings, no valid forms of blackfin cisco are considered to have occurred in lakes Superior and Ontario.

Outside of the Great Lakes, Koelz (1929) classified one subspecies from Lake Nipigon as *C. n. regalis* Clarke (1973) and Scott and Crossman (1973) have suggested that these fish were more probably *C. artedii*; while Nelson *et al*. (2004) considered the blackfin cisco to be extant in Lake Nipigon. According to recent observations, blackfin cisco are still found in Lake Nipigon (R. Salmon, Ontario Ministry of Natural Resources (OMNR), Nipigon District, Nipigon, ON, personal communication 2003; T. Todd, United States Geological Survey (USGS), Ann Arbour, MI, personal communications 2003, 2005).

The blackfin cisco has been recorded as present in inland lakes across central Canada (Nelson *et al.* 2004); however, the taxonomic identity of these fish is uncertain. Scott and Crossman (1973) suggested that, "*C. nigripinnis* is a problem species in inland waters and is most decidedly in need of critical systematic review", and that the species, "may well prove to be taxonomically inseparable from a broadly redefined *C. artedii*". To date, a comprehensive systematic and taxonomic review of the North American ciscoes has not been undertaken. Therefore, there is no formal taxonomic description or authority for the purported blackfin ciscoes reported present in the inland lakes of central Canada (*see also* **Distribution – Canadian Range**).

Research on the shortjaw cisco (*C. zenithicus*) revealed that Great Lakes and inland populations of this species were genetically indistinguishable from the cisco (*C. artedii*); however, the shortjaw cisco is still considered to be a valid species (Todd *et al*. 1981, Turgeon *et al*. 1999, Turgeon and Bernatchez 2003). This may be an indication that some, or all, of the endemic cisco species may actually be ecomorphotypes of the cisco (*C. artedii*), rather than valid species. If, in future, this was shown to be true for the blackfin cisco, it would still be considered an evolutionarily significant unit (ESU) or, at the very least, a unique morphotype.

Turgeon and Bernatchez (2003) suggested a possible resolution to the taxonomic confusion related to ciscoes, including the blackfin cisco. Based on their work on reticulate evolution and phenotypic diversity in North American ciscoes, Turgeon and Bernatchez (2003) suggested a single taxon, *C. artedii* (*sensu lato*), which includes blackfin cisco, be recognized as the sole legitimate taxon for North American ciscoes distributed in central Canada and the northern United States. This suggestion has not gained wide acceptance by others in the field and, at the time of preparing this update status report, the troubling taxonomy of this species remains unresolved and the taxonomy of Koelz (1929) is accepted by Nelson *et al.* (2004).

Description

The blackfin cisco was described by Koelz (1929) based on specimens collected in Lake Michigan (the type locality). However, within the Great Lakes, ciscoes as a group are noted to have changed considerably since Koelz's time, exhibiting morphological

variation within, and among, species that currently makes their classification difficult (Todd and Smith 1992). Parallel evolution, hybridization, local adaptation and phenotypic plasticity are believed to have interacted in varying degrees to produce a confounding array of forms and species in the Great Lakes and inland lakes that challenge traditional classification (Todd and Smith 1992; Steinhilber 2002).

As a result of the taxonomic uncertainty related to the blackfin cisco, the following description is based on Great Lakes specimens only (from Scott and Crossman 1973). The blackfin cisco is an elongate, lateral compressed fish whose greatest body depth is found anteriorly (Figure 1). The average adult length is approximately 330 mm and McAllister *et al.* (1985) reported a maximum length of 510 mm.

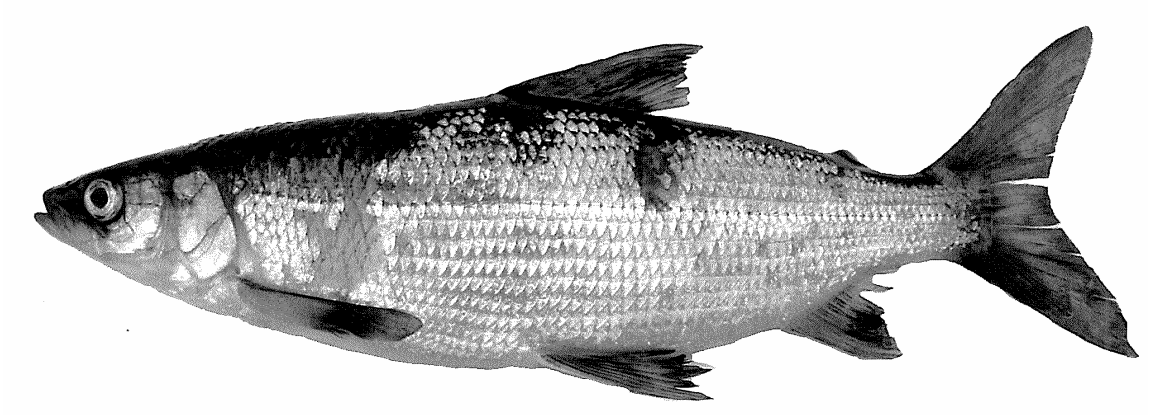

Figure 1. Fresh specimen of a blackfin cisco (*Coregonus nigripinnis*) caught in the Little Jackfish River in 2004. Photograph courtesy of David Stanley.

The head is broadly triangular with a blunt snout and terminal mouth that has the lower jaw usually projecting beyond, or sometimes equal to, the upper jaw. The eyes are large, with a diameter equivalent to about 25% of the head length. The gill rakers are long; the longest gill raker is greater in length than the longest gill filaments. The number of gill rakers ranges from 36-54, depending on geographic location.

A small adipose fin is present, and all other fins are relatively long. The dorsal fin has 9-11 rays. The caudal fin is widely spread and deeply forked. The anal fin has 10-13 rays, the pelvic fins have 11-12 rays, and the pectoral fins have 15-18 rays. Scales are cycloid and large; the scale count along the lateral line ranges from 74-89 (Scott and Crossman 1973).

The overall colouration of blackfin cisco is dark silvery, with pink or purple iridescence on the sides. The back is dark green to black and silvery below. The upper and lower jaws are whitish but darkly pigmented. All fins are typically heavily pigmented black, particularly on the outer half. Breeding males and some females are described as developing nuptial tubercles or pearl organs during spawning periods.

Designatable units

All Great Lakes and Lake Nipigon populations described by Koelz (1929) are found within the Great Lakes-Upper St. Lawrence ecozone of the freshwater ecozone classification adopted by COSEWIC. Based on morphological data, Koelz (1929) considered the lakes Huron and Michigan population(s) to be one subspecies (*C. n. nigripinnis*), and the Lake Nipigon population to consist of a second subspecies (*C. n. regalis*). Koelz (1929) also described subspecies from Lake Ontario (*C. n. prognathus*) and Lake Superior (*C. n. cyanopterus*); however, these forms have been since synonymized with the shortjaw cisco (Clarke and Todd 1980) and deemed invalid (Todd 1981), respectively.

In Ontario, the blackfin cisco has been reported in several lakes, outside of the Great Lakes and Lake Nipigon, in the Great Lakes-Upper St. Lawrence ecozone. However, the taxonomy of the fish in these lakes has not been resolved.

Due to the taxonomic uncertainties described above it is not possible at this time to determine if we are dealing with ecomorphotypes of a common and widespread species (*Coregonus artedi*), or distinct populations of blackfin cisco (*C. nigripinnis*). The uncertainty of systematic status can probably only be resolved through a comprehensive taxonomic/systematic review of the sub-genus, and therefore we will consider a single designation for the species.

DISTRIBUTION

Global range

The blackfin cisco is part of the subfamily Coregoninae which have a global distribution within North America, Europe and Asia. As a species, blackfin cisco is only known to occur, or have occurred, within the Laurentian Great Lakes and Lake Nipigon. It has also been reported in several lakes in central Canada, but the taxonomy of the fish in these lakes has not been resolved.

Canadian range

Historically, the blackfin cisco was reported by Koelz (1929) as an endemic species to each of the Great Lakes bordering Ontario, except Lake Erie; and also Lake Nipigon. More recently, the Lake Superior form was synonymized with the shortjaw cisco (Clarke and Todd 1980) and the Lake Ontario form was deemed invalid (Todd 1981).

Blackfin cisco have been reported within the Little Jackfish River watershed adjacent to Lake Nipigon in 1986 and 2004, and Ombabika Bay, the outlet of the Little Jackfish River in Lake Nipigon (UMA 1987). The identification of the specimens from these locations was confirmed (T. Todd, USGS, pers. comm. 2005). It is plausible that

fish from these locations are related to, or originated from, the Lake Nipigon population. However, it seems unusual for a species with a deepwater affinity to have a riverine occurrence, and these may be accidentals that have migrated into the river and are not resident there.

The blackfin cisco has also been reported in lakes throughout central Canada (Figure 2, Appendix 1). In Ontario, it has been reported from lakes in northwestern and central Ontario. Deepwater cisco have also been reported in the Ogoki River, which was originally part of the Albany River drainage, but has been diverted south to flow into the Great Lakes drainage. These have also been confirmed as blackfin cisco by Todd, but their affinity is unknown. Ryder *et al*. (1964) tentatively reported blackfin cisco from several lakes in northwestern Ontario; however, they cautioned that, "Until a comprehensive taxonomic study on the coregonids of the northern inland lakes has been completed, the identifications of *C. nigripinnis* and *C. zenithicus* are tentative. It is possible that *C. nigripinnis* is merely a deep-water form of *C. artedii*". Such a taxonomic study has not taken place on specimens from these lakes, nor from any other inland lake in Ontario; therefore, the taxonomic identify of these specimens is unresolved.

The blackfin cisco has also been reported in Manitoba, Saskatchewan and Alberta (Figure 2; Appendix 1). Hinks (1957, *in* Stewart *et al*. 2004) reported the species from Lake Winnipeg. However, Clarke (1973, *in* Stewart *et al*. 2004) did not consider the Lake Winnipeg and Lake Manitoba specimens to be different from *C. artedii*. As a result, there are presently no confirmed records of blackfin cisco reported in Manitoba (M. Erickson, Manitoba Water Stewardship, Fisheries Branch, Winnipeg, MB, personal communication 2005; K. Stewart, Professor (retired) Department of Zoology, University of Manitoba, Winnipeg, MB, personal communication 2005).

In Saskatchewan, Dymond (1943, *in* Scott and Crossman 1973) considered the species to occur in Waskesiu, Little Trout, Burntwood and Heart lakes. Additional occurrences have been reported for Clearwater, Kingsmere and Reindeer lakes. However, these records are no longer considered as valid as specimens collected from these lakes are now considered to be forms of *C. artedii* and not *C. nigripinnis* (J. Pepper, Saskatchewan Conservation Data Centre, Fish and Wildlife Branch, Saskatchewan Environment, personal communication 2005).

Dymond (1943) reported the species from Lake Athabaska; however, this occurrence is now considered invalid (Kooyman 1970, *in* Scott and Crossman, 1973; J. Nelson, Professor Emeritus, Department of Biological Sciences, University of Alberta, Edmonton, AB, personal communication 2005).

Therefore, the Canadian range of the blackfin cisco is Lakes Huron, Lake Nipigon and its tributaries, and possibly some of the inland lakes in northwestern and central Ontario.

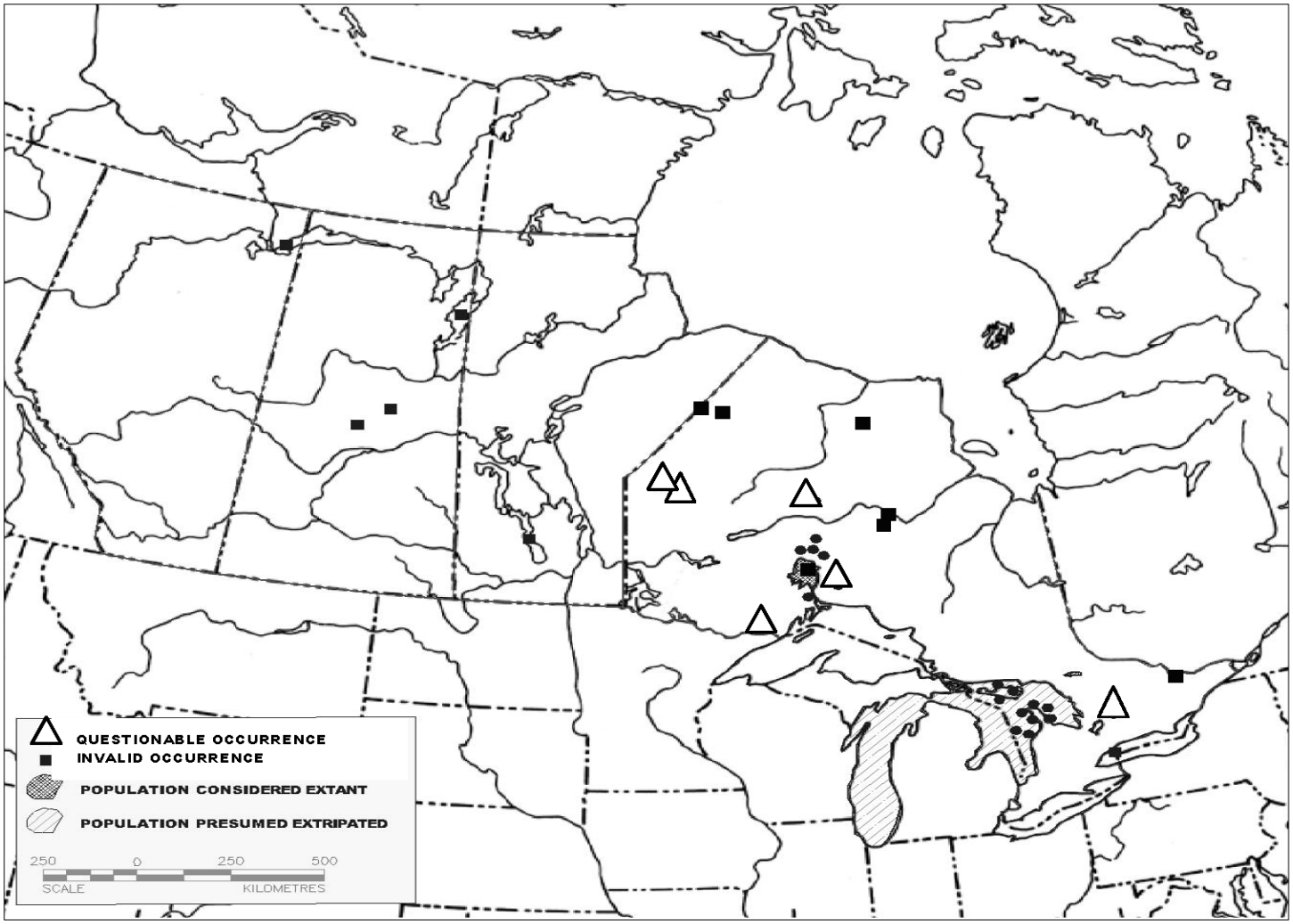

Figure 2. Reported distribution of blackfin cisco in Canada. Data compiled from museum collection data and reports from literature. Historical records of blackfin cisco for inland lakes in Ontario, Manitoba, Saskatchewan and Alberta are now considered to be invalid due to taxonomic uncertainty.

HABITAT

Habitat requirements

As reported in the 1988 status report (Parker 1988), information on the habitat of blackfin cisco is limited. The blackfin cisco was considered to inhabit deeper waters than most other cisco species in the Great Lakes (Scott and Crossman 1973), and had been taken at depths of 183 m in Lake Huron (Koelz 1929). Clarke and Todd (1980) reported that blackfin cisco occurred at depths of 90-160 m in lakes Huron and Michigan. In Lake Nipigon, Dymond (1926) reported that blackfin cisco were captured at depths to 104 m, but were common at shallower depths (37 m) in the summer. They have also been captured in Lake Nipigon at depths of between 10-50 m (R. Salmon, OMNR, pers. comm. 2003). Data collected on the Little Jackfish River, a tributary to Lake Nipigon, suggest that some fish are found at shallower depths than in lakes (UMA 1987). Fish taken in the summer and fall from the Ogoki River, a tributary to the Albany River, were caught at depths of 1-13 m over a mixture of bedrock/silt, gravel/silt or pure silt substrate (D. Stanley, pers. comm. 2005).

Trends

Little is known about trends in the deepwater habitats of the Great Lakes and Lake Nipigon; however, the preferred deepwater habitat of blackfin cisco has likely changed little over time (Berst and Spangler 1973).

Protection/ownership

The Great Lakes and Lake Nipigon are publicly owned, and all fish habitat within Lake Nipigon, and the Canadian portion of Lake Huron, is protected by the federal *Fisheries Act*.

BIOLOGY

General

There is limited information on the biology of the blackfin cisco in Canadian waters. Standard lengths for adults reported from the Great Lakes have ranged from 230-370 mm (Clarke and Todd 1980). McAllister *et al*. (1985) reported a maximum length of 510 mm. Dymond (1926) gave a length of 388 mm for a specimen taken from Lake Nipigon. A small sample of blackfin cisco (n=4) taken from the Ogoki River in October 2004 had standard lengths of 431 and 465 mm for two males, and 485 and 499 mm for two females. Weights of these specimens were 660 and 1090 g for the males, and 1060 and 1110 g for the females (D. Stanley, pers. comm. 2005).

Reproduction

Little is known of the reproductive habits of blackfin cisco. Age of maturity, breeding frequency, fecundity, early life history, age/sex ratio and population structure are all unknown or poorly defined. Information originally reported by Koelz (1929) for the Great Lakes suggests that blackfin cisco spawned from October to January. Scott and Crossman (1973) suggest that spawning took place between November and January within the Great Lakes, possibly over a clay bottom.

Blackfin cisco in northwestern Ontario have been reported as co-occurring with *C. artedi* during a fall spawning run on the Little Jackfish River and on Crescent Lake (UMA 1987). The apparent similarity of spawning location and timing, at these locations, suggests a probable reason for encountering many intergrades between the two species.

Survival

No information related to survival, growth rates or population structure is available for this species. The growth potential of any remnant Great Lakes population (if existing), the Lake Nipigon population, and any other inland lake or river populations is unknown.

Scott and Crossman (1973) indicate that data on age of maturity, etc., for *C. artedi* could be used to give some idea of age of maturity, etc. for *C. nigripinnis*. This would suggest that males reach sexual maturity at age 4 or 5 and females at age 5, with a maximum age of 11 years. On this basis the generation time for the species would be 7.5 years.

Physiology

No information on the specific physiology of blackfin cisco was found during the preparation of this update status report.

Movements/dispersal

Limited species-specific information has been reported for blackfin cisco regarding its movement/dispersal for the purposes of spawning or due to seasonal migration. Spawning areas have not been documented in the literature; however, ripe specimens collected from the lower Little Jackfish River in October (UMA 1987) suggest there may be movement of blackfin cisco from Lake Nipigon into this river to spawn.

Dymond (1926) suggested that the difference in depth distribution of blackfin cisco in Lake Nipigon may be the result of seasonal movement from deep to shallower waters during the summer months. No information is available regarding breeding or wintering ranges.

Nutrition and Interspecific Interactions

Koelz (1929) reported that blackfin cisco fed almost exclusively on opossum shrimp (*Mysis relicta*). Food in the stomachs of a limited number of individuals caught off the Michigan shore of Lake Huron and in Georgian Bay (1917 and 1919, respectively) contained primarily opossum shrimp with small amounts of plant fragments, insect remains and fish scales. All fish sampled were captured at depths of more than 110 m. Beyond this observation, little is known of the feeding habits of this species.

As a prey species, blackfin cisco, along with other cisco species, were believed to form the basic food of lake trout (*Salvelinus namaycush*) within the Great Lakes and Lake Nipigon until at least the 1950s (Scott and Crossman 1973). The blackfin cisco in the Great Lakes was also reported to have been preyed on by sea lamprey (*Petromyzon marinus)* (Moffett 1957).

Behaviour/Adaptability

No specific information was found during the preparation of this update status report regarding the behaviour of blackfin cisco, particularly as related to the ability of the species to cope with human disturbance. Such information is difficult to assess because human interference, where documented, has been of a dramatic nature. The intense exploitation of deepwater ciscoes, including blackfin cisco, by the commercial fisheries from the early 1900s to the 1950s contributed to the dramatic decline of populations in the Great Lakes (Smith 1964; Berst and Spangler 1972; Christie 1972; Lawrie and Rahrer 1972).

Similarly, information on the ability of blackfin cisco to adapt to environmental change or degradation (e.g., water temperature changes, water level fluctuation, and industrial discharges to water) is lacking.

POPULATION SIZES AND TRENDS

Although the deepwater cisco fishery (commonly known as the “chub fishery”) was very important in the Great Lakes, the catches were rarely identified to species (Lawrie and Rahrer 1972). Too few collections of blackfin cisco (recorded to species) have been documented over time in a standardized manner to evaluate population sizes and trends.

The blackfin cisco was formerly abundant in Lake Michigan (Koelz 1929). Smith (1964) reported that commercial fishery exploitation during the late 1800s to early 1900s, combined with sea lamprey predation, resulted in a drastic reduction in abundance by the 1930s. Blackfin cisco constituted less than 1% of the 1930-31 catch of deepwater ciscoes taken during experimental fishing in Lake Michigan (Smith 1964). The blackfin cisco was absent from areas of former abundance in experimental index

surveys made during 1954-55 and 1960-61 (Smith 1964). Moffett (1957) reported the species was near extinction by 1956. The last record from Lake Michigan was in 1969 (Clarke and Todd 1980). Index fishing and sampling of the commercial catch from Lake Michigan in Illinois, Indiana, Wisconsin and Michigan conducted in the mid-1980s have not produced any further specimens (Parker 1988).

Specific information regarding population size and trends of blackfin cisco in Lake Huron is limited. Berst and Spangler (1972) stated that the larger species of the deepwater cisco complex (which could include blackfin cisco) were selectively removed from Lake Huron by the 1940s as a result of commercial harvesting and sea lamprey predation. Records from the Canadian Museum of Nature indicate that the most recent record for blackfin cisco from Lake Huron is for two specimens collected in the Canadian waters off Southampton, Ontario in 1960 (S. Laframboise, Assistant Collection Manager, Fish Collection, Canadian Museum of Nature, Ottawa, ON, personal communication 2003). An examination of 1943 ciscoes, collected at 46 deepwater locations in Lake Huron in 2002 and 2003, failed to find any blackfin cisco (N.E. Mandrak, unpubl. data).

The results of a fish community index netting program conducted by the OMNR in Lake Nipigon since 1998-99 indicates that blackfin cisco are seen with relative frequency, representing 2-6% of the index catch each year. Catch rates (CUE values) of blackfin cisco have been relatively consistent over the 1998-2006 sampling period, although many of the other cisco species (particularly *C. artedi*) are declining (R. Salmon, OMNR, pers. comm. 2007). Blackfin cisco is reported as an incidental species (along with other ciscoes) caught by the lake whitefish (*Coregonus clupeaformis*) fishery in Lake Nipigon at a rate of 1 blackfin cisco to 57 lake whitefish in commercial nets, which would represent an incidental harvest of < 1000 kg from lake Nipigon in 2006 (R. Salmon, OMNR, pers. comm. 2007).

LIMITING FACTORS AND THREATS

Factors known to have caused the decline of blackfin cisco in the Great Lakes are over-exploitation by the commercial fisheries and sea lamprey predation (Smith 1964; Berst and Spangler 1972; Lawrie and Rahrer 1972; Christie 1972). Smith (1964) also suggested that, in Lake Michigan, the extirpation of blackfin cisco may have been through introgressive hybridization with *C. artedi*. Continued capture of blackfin cisco as an incidental catch species in lake whitefish nets on Lake Nipigon may have a detrimental effect on species populations in this lake over time; however, present information is insufficient to quantify this effect.

Introduced species, such as alewife (*Alosa pseudoharengus*) and rainbow smelt (*Osmerus mordax*), may have competed for food with deepwater cisco populations in Lake Huron (Berst and Spangler 1972; Christie 1972). This threat, along with potential sea lamprey predation, may, in part, be suppressing a recovery of remnant deepwater cisco populations, populations that may once have included blackfin cisco, within the

Great Lakes. Rainbow smelt may also be impacting blackfin cisco populations in Lake Nipigon.

SPECIAL SIGNIFICANCE OF THE SPECIES

Of the six cisco species identified as endemic to the Laurentian Great Lakes and Lake Nipigon by Koelz (1929), the blackfin cisco is one of only three species (other species are *C. hoyi* and *C. zenithicus*) known to be extant in Lake Nipigon. The ciscoes are the most notable of the few species endemic to the relatively young waterbodies of northern North America, and are believed to be one of few examples of the incipient species flock concept in North America (Smith and Todd 1984). As endemic species, these ciscoes represent unique evolutionary and ecological processes. The Laurentian Great Lakes and Lake Nipigon are no more than 18,000 years old (Dyke and Prest 1987); therefore, the endemic ciscoes have likely evolved in the Great Lakes and Lake Nipigon within the last 18,000 years (Smith and Todd 1984). Changes in gill raker morphology (e.g. number, length) over time, have minimized competition between the endemic ciscoes (Smith and Todd 1984). In addition to these unique processes shared by the endemic ciscoes, the blackfin cisco exhibits unique adaptations to its deepwater habitat.

The deepwater ciscoes were once a commercially important species in the Great Lakes and several species, including blackfin cisco, are still harvested in Lake Nipigon.

EXISTING PROTECTION OR OTHER STATUS

No specific legal protection exists for this species in Canada, although general protection is afforded through the fish habitat sections of the federal *Fisheries Act.* Although listed on Schedule 2 of the federal *Species at Risk Act* as a species to be reassessed for consideration on Schedule 1, it receives no official protection as a species at risk.

As with the taxonomic designation, the current conservation status of blackfin cisco is confusing. Globally, the species is presumed extinct (GXQ) by NatureServe, with the taxonomic distinctiveness of *C. nigripinnis* at the current level of understanding questionable (NatureServe 2004).

At the national level, the International Union for the Conservation of Nature (IUCN) considers blackfin cisco to be extinct (E) within Canada and the United States (Gimenez 1996), while NatureServe has assessed the species as extirpated (NX) (NatureServe 2004).

At the provincial level, blackfin cisco has been given the status of presumed extirpated (SX) from the Great Lakes of Ontario, but is still considered extant in Lake Nipigon (NatureServe 2004). Similarly, the Ontario Natural Heritage Information Centre

(NHIC) also ranks the species as extirpated from the Great Lakes, but considers it extant in Lake Nipigon (NHIC 2004). However, the NHIC status for Ontario also includes an extinct designation based on a determination of status by the OMNR (NHIC 2004).

Within the United States, Illinois, Indiana and Michigan rank the species as presumed extirpated (SX) from lakes Michigan and Huron (NatureServe 2004).

In terms of the species' commercial value, no specific harvest quotas are currently known to exist for blackfin cisco reported from Lake Nipigon. Commercial fishing quotas for all deepwater cisco species in Lake Nipigon are regulated through the *Ontario Fisheries Regulations* and enforced by OMNR. General restrictions or closures on the commercial harvest of ciscoes as a group have historically been in effect for Great Lakes waters in both Canada and the United States (Parker 1988).

Existing Status

Nature Conservancy Ranks (Naturserve 2004)

Global – GX
National
US – NX
Canada NX
Regional
US - IL SX, IN – SX, MI -SX
Canada - ON – SX.
Other
IUCN - EX

Wild Species 2005 (Canadian Endangered Species Council 2006)
Canada – 5
Ontario – 5, SK - 5

COSEWIC
Threatened (1988)
Data Deficient (2007)

TECHNICAL SUMMARY

Coregonus nigripinnis
Blackfin cisco — Cisco à nageoires noires
Range of Occurrence in Canada: Ontario

Extent and Area information	
• *extent of occurrence (EO)* (Polygon using Figure 2) *Measured as total area of Lake Nipigon*	< 740,000 km^2
• *specify trend (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in EO (> 1 order of magnitude)?*	Unknown
• *area of occupancy (AO)* (The AO is restricted to the deeper waters of the lake, and thus would only be a fraction of the EO)	Unknown
• *specify trend (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in AO (> 1 order magnitude)?*	No
• *number of extant locations (*Includes the Little Jackfish River – fish found there are probably migrants from Lake Nipigon)	Unknown
• *specify trend in # locations (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in # locations (>1 order of magnitude)?*	No
• *habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat*	Unknown
Population information	
• *generation time (average age of parents in the population) (indicate years, months, days, etc.)*	7.5 yr
• *number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values)*	Unknown
• *total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals*	Unknown
• *if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)*	Unknown
• *are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?*	Unknown
• *is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., ≤ 1 successful migrant / year)?*	No
• *list each population and the number of mature individuals in each*	Unknown
• *specify trend in number of populations (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in number of populations (>1 order of magnitude)?*	No
Threats (actual or imminent threats to populations or habitats)	
Exploitation – continued presence as incidental catch in Lake Nipigon commercial fishery; – historically – overfishing in lake Huron Competition with introduced exotics such as rainbow smelt, and spiny water flea Possible Introgressive Hybridization	
Rescue Effect (immigration from an outside source)	None
• *does species exist elsewhere (in Canada or outside)?*	No
• *status of the outside population(s)?*	N/A
• *is immigration known or possible?*	No
• *would immigrants be adapted to survive here?*	N/A
• *is there sufficient habitat for immigrants here?*	N/A
Quantitative Analysis	N/A

Status and Reasons for Designation

Status: Data Deficient	**Alpha-numeric code**: Not Applicable
Reasons for Designation: Uncertainty about whether or not we are dealing with ecomorphotypes of a common and widespread species *(C. artedii*), or distinct populations of blackfin cisco (*C. nigripinnis*), cannot be resolved with the information presently available. Given this uncertainty, COSEWIC cannot unambiguously define which units it would be assessing. However, COSEWIC notes that whatever the systematic status, there are distinct coregonids in these lakes that warrant enhanced conservation and protection. The uncertainty of systematic status can probably only be resolved through a comprehensive taxonomic/systematic review of the sub-genus.	
Applicability of Criteria **Criterion A**: (Declining Total Population): Not Applicable – taxonomy uncertain. **Criterion B**: (Small Distribution, and Decline or Fluctuation): Not Applicable – taxonomy uncertain. **Criterion C**: (Small Total Population Size and Decline): Not Applicable – taxonomy uncertain. **Criterion D**: (Very Small Population or Restricted Distribution): Not Applicable – taxonomy uncertain. **Criterion E**: (Quantitative Analysis): Not Applicable – No data.	

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Rob Mellow, completed his undergraduate degree in Biology from Wilfrid Laurier University in 1989. Mr. Mellow has over ten years experience in areas of environmental science related to aquatic biology, mine reclamation and industrial site assessment and remediation. This experience has been gained through work with the Ontario Ministries of Environment and Northern Development and Mines, and through work in private consulting. His biological skills have focused on performing various biological field studies related to the characterization of water, sediment, fish and aquatic invertebrates at numerous sites throughout Northern Ontario, with a specific focus on the mining and pulp and paper resource industries. Mr. Mellow currently works for Golder Associates Ltd. in Sudbury, Ontario as an Environmental Biologist/Project Manager.

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COLLECTIONS EXAMINED

No collections were examined in the preparation of this update status report.

Appendix 1. Blackfin cisco occurrence records in Canada. Note that only records from Lake Huron and Lake Nipigon and its tributaries are considered taxonomically valid in this report.

Specimens in Museum Collections

SITE	PROVINCE	LAT./LONG.	DATE	INSTITUTION[1]
Georgian Bay[2]	Ontario	49°34' N 88°50' W	1922-08-11	UMMZ
Gore Bay	Ontario	45°56' N 82°28' W	-	ROM
Lake Huron	Ontario	44°30' N 82°15' W	-	ROM
Lake Huron	Ontario	45°39' N 82°39' W	1941-00-00	ROM
Georgian Bay	Ontario	45°15' N 81°40' W	1931-09-01	UMMZ
Georgian Bay	Ontario	44°53' N 80°47' W	1917-11-06	UMMZ
Georgian Bay	Ontario	44°56' N 81°01' W	1919-07-28	UMMZ
Georgian Bay	Ontario	45°03' N 81°34' W	1919-07-30	UMMZ
Georgian Bay	Ontario	45°02' N 81°16' W	1919-10-06	UMMZ
Georgian Bay	Ontario	44°10' N 81°06' W	1919-11-29	UMMZ
Georgian Bay	Ontario	44°56' N 81°01' W	1923-06-26	UMMZ
Georgian Bay	Ontario	44°56' N 81°01' W	1923-06-10	UMMZ
Lake Huron	Ontario	44°29' N 81°53' W	1960-08-01	NMNS
Lake Ontario	Ontario	43°33' N 79°35' W	1927-06-29	ROM
Lake Nipigon	Ontario	Unknown	1923-08-28	ROM
Crescent Lake	Ontario	50°28' N 88°20' W	1986-10-21	ROM
Lake Nipigon	Ontario	49°50' N 88°30' W	1922-08-11	UMMZ
Lake Nipigon	Ontario	49°50' N 88°30' W	1921-00-00	ROM
Lake Nipigon	Ontario	49°50' N 88°30' W	1921-08-16	ROM
Lake Nipigon	Ontario	49°50' N 88°30' W	1922-08-15	ROM
Lake Nipigon	Ontario	49°50' N 88°30' W	1924-06-00	ROM
Lake Nipigon	Ontario	49°50' N 88°30' W	1993-06-00	MW
Lake Nipigon	Ontario	49°50' N 88°30' W	1994-07-00	MW
Lake Nipigon	Ontario	49°50' N 88°30' W	1974-10-18	UMMZ
Lake Nipigon	Ontario	49°50' N 88°30' W	1994-07-24	MW
Lake Nipigon	Ontario	49°50' N 88°30' W	1922-07-25	UMMZ
Lake Nipigon	Ontario	49°50' N 88°30' W	1922-07-26	UMMZ
Lake Nipigon	Ontario	49°50' N 88°30' W	1994-07-26	MW
Lake Nipigon	Ontario	49°50' N 88°30' W	1994-07-27	MW
Lake Nipigon	Ontario	49°50' N 88°30' W	-	ROM
Lake Nipigon	Ontario	49°40' N 88°51' W	1924-06-21	ROM
Lake Nipigon	Ontario	50°12' N 88°15' W	1923-08-21	ROM
Lake Nipigon	Ontario	50°12' N 88°15' W	1923-08-23	ROM
Lake Nipigon	Ontario	50°13' N 88°18' W	1924-06-19	ROM
Lake Nipigon	Ontario	49°26' N 88°08' W	1923-09-10	ROM
Lake Nipigon	Ontario	49°26' N 88°08' W	1925-09-14	ROM
Lake Nipigon	Ontario	49°25' N 88°08' W	1923-09-07	ROM
Lake Nipigon	Ontario	49°26' N 88°08' W	1921-07-26	ROM
Lake Nipigon	Ontario	49°26' N 88°08' W	1922-07-26	ROM
Lake Nipigon	Ontario	49°26' N 88°08' W	1922-08-03	ROM
Lake Nipigon	Ontario	49°39' N 88°06' W	1924-07-23	ROM
Lake Nipigon	Ontario	49°39' N 88°06' W	1923-09-06	ROM
Lake Nipigon	Ontario	50°12' N 88°15' W	1974-10-18	UMMZ
Lake Nipigon	Ontario	49°50' N 89°00' W	1922-10-26	UMMZ

SITE	PROVINCE	LAT./LONG.	DATE	INSTITUTION[1]
Lake Nipigon	Ontario	48°57' N 88°14' W	1922-07-25	UMMZ
Lake Nipigon	Ontario	49°26' N 88°08' W	1922-07-26	UMMZ
Lake Nipigon	Ontario	49°34' N 88°50' W	1922-08-11	UMMZ
Lake Nipigon	Ontario	49°40' N 88°51' W	-	ROM
Lake Nipigon	Ontario	49°39' N 88°38' W	1921-00-00	ROM
Lake Nipigon	Ontario	50°00' N 88°21' W	1921-08-10	ROM
Lake Nipigon	Ontario	49°55' N 88°20' W	1923-09-05	ROM
Lake Nipigon	Ontario	49°31' N 88°09' W	1921-08-21	ROM
Lake Nipigon	Ontario	50°00' N 88°21' W	1922-08-15	ROM
Lake Nipigon	Ontario	50°10' N 88°49' W	1922-08-17	ROM
Lake Nipigon	Ontario	49°53' N 88°11' W	1922-07-28	ROM
Lake Nipigon	Ontario	49°40' N 88°38' W	1923-09-03	ROM
Lake Nipigon	Ontario	49°58' N 88°06' W	1923-09-03	ROM
Little Jackfish River	Ontario	50°19' N 88°21' W	1986-10-27	ROM
Little Jackfish River	Ontario	50°19' N 88°21' W	1986-10-27	ROM
Little Jackfish River	Ontario	50°18' N 88°22' W	1986-10-27	ROM
Little Jackfish River	Ontario	50°19' N 88°21' W	1986-10-28	ROM
Little Jackfish River	Ontario	50°25' N 88°19' W	1986-07-18	ROM
Little Jackfish River	Ontario	50°19' N 88°21' W	1986-05-07	ROM
Little Jackfish River	Ontario	50°19' N 88°21' W	1986-04-28	ROM
Zigzag Lake	Ontario	50°29' N 88°50' W	1986-10-20	ROM
Ogoki River	Ontario	50°46' N 88°00' W	1986-10-19	ROM
Ogoki River	Ontario	50°46' N 88°00' W	1986-10-19	ROM
Long Lake	Ontario	49°30' N 86°50' W	1924-08-24	ROM
Long Lake	Ontario	49°30' N 86°50' W	1926-08-11	ROM
Long Lake	Ontario	49°30' N 86°50' W	1926-08-14	ROM
Long Lake	Ontario	49°22' N 87°00' W	1925-09-19	ROM
Long Lake	Ontario	49°22' N 87°00' W	1925-09-24	ROM
Shebandowan L.	Ontario	48°40' N 90°19' W	1958-08-28	ROM
Lake Manitou	Ontario	45°47' N 82°00' W	1931-07-15	ROM
Twelve Mile Lake	Ontario	45°02' N 78°42' W	1924-09-13	ROM
Deer Lake	Ontario	52°36' N 94°02' W	1960-08-26	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-06-07	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-06-11	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-06-22	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-06-27	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-07-09	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-07-12	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-07-19	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-07-20	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-08-03	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-08-08	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-08-11	ROM
Attawapiskat Lake	Ontario	52°18' N 87°54' W	1939-08-16	ROM
Crescent Lake	Ontario	50°28' N 88°20' W	1986	OFDDS
Culverson Lake	Ontario	52°20' N 93°38' W	1977	OFDDS
Lake Manitoba	Manitoba	51°02' N 98°46' W	1926-02-16	ROM
Clearwater Lake	Saskatchewan	-	-	ROM
Kingsmere Lake	Saskatchewan	-	1929-07-18	ROM
Kingsmere Lake	Saskatchewan	-	1923-08-28	ROM

Reports from the literature

SITE	PROVINCE	LAT./LONG.	DATE	REFERENCE
Lake Athabaska	Alberta	58°52’ N 110°28’ W	-	Dymond, 1943
Lake Waskesiu	Saskatchewan	53°55’ N 106°05’ W	1929-07-04	Dymond, 1943
Little Trout Lake	Saskatchewan	-	1928-08-29	Dymond, 1943
Burntwood L.	Saskatchewan	-	1929-08-02	Dymond, 1943
Heart Lake	Saskatchewan	54°23’ N 105°00’ W	1929-08-26	Dymond, 1943
Reindeer Lake	Saskatchewan	57°15’ N 102°15’ W	1955-00-00	Atton and Merkowsky, 1983

Notes: (1) UMMZ = University of Michigan Museum of Zoology; ROM = Royal Ontario Museum; NMNS = National Museum of Natural Science; MW = unknown source; OFDDS = Ontario Fish Data Distribution System.
(2) Occurrence Site or Lat./Long. incorrect.