

Historical Notes on Lampreys in Wisconsin

Philip A. Cochran

Biology Department, Saint Mary's University, 700 Terrace Heights, Winona, MN 55987
pcochran@smumn.edu

The status, distribution, and ecology of Wisconsin's lampreys have been addressed in a number of recent publications (Lyons et al., 2000, and references therein). The purpose of this paper is to provide historical details about several species that for various reasons were not included in previous accounts or that have recently come to light. Voucher specimens referred to below were placed in the University of Wisconsin-Madison Zoology Museum (UWZM) or the James Ford Bell Museum of the University of Minnesota (JFBM).

Early Reports of Lampreys in the Fox River

I am currently involved in an effort to detail the original geographic range of the lake sturgeon (*Acipenser fulvescens*) in the Lake Michigan basin (Cochran and Elliott, 2003). Part of this effort involves searching microfilm of old newspapers in towns along tributary rivers for accounts of sturgeon caught by anglers and commercial fishers. In some cases, other fish species were mentioned in the early papers. The following accounts appeared in the *DePere News*, a weekly newspaper published in DePere, Brown County, Wisconsin. (For the sturgeon project, the *DePere News* was searched from 1871 to 1918.) The DePere dam is located on the Fox River approximately 12 km upstream from Green Bay. Ashwaubenon is a community situated on the west bank of the river between DePere and Green Bay.

The first mention of a lamprey appeared on 5 May 1883, under the heading "A Rare Fish":

A seine was taken in a few days ago, and George Marston, who happened to be near, found among the results of the haul a peculiar fish, which after considerable study he has

placed, finding it to be a black lamprey. The *Geology of Wisconsin*, Vol. I., in its list of fishes describes and shows it to be quite rare, and says it is found in the waters of the Mississippi and of the great Lakes, one having been found near Racine. So far as we can learn no one like this has ever before been taken from the Fox River. This specimen is preserved and can be seen upon application.

The second mention of lampreys appeared on 17 April 1885:

Lampreys are said to be caught in nets by fishermen along the Ashwaubenon. They are an eel-like fish and they secure their food by sucking it up. They are quite rare here, being found mostly along the Mississippi river. Geo. Marston has one of these specimens preserved in alcohol, and it is quite a curiosity.

This account is obviously derived from the first but suggests that more than one lamprey was captured and that captures occurred in more than one year. The perception that lampreys were rare may have been based at least in part on the difficulty of capturing lampreys in large mesh nets of the sort that would be used to harvest commercially marketable fish. Also, lampreys may have been present in the river only during or just prior to the spring spawning season.

It is likely that the lampreys mentioned in these accounts were silver lampreys (*Ichthyomyzon unicuspis*), which have been well documented in the lower Fox River in recent years (Cochran and Marks, 1995; Cochran and Lyons, 2004). Sea lampreys (*Petromyzon marinus*) had not yet invaded the upper Great Lakes at the time the newspaper accounts were written. The only common names similar to "black lamprey" listed by Becker (1983) for any of the lamprey species in Wisconsin are "small black lamprey" and "small black brook lamprey," both of which were applied to the American brook lamprey

(*Lampetra appendix*). American brook lampreys do tend to be darker in appearance than silver lampreys, and they were recently reported by Lyons et al. (2000) from the Lancaster Brook drainage, which is geographically proximal to the lower Fox River. However, American brook lampreys rarely occur in large riverine habitat and have not been reported from the Fox River. Moreover, they are smaller than silver lampreys and less likely to be caught in nets. The specimen from Racine referred to in the first account may have been that reported by Hoy (1883), which was identified as a silver lamprey by Hubbs and Trautman (1937) on the basis of location. The dates of the newspaper accounts fall within the seasonal range of occurrence of upstream migrant silver lampreys in the lower Fox River (Cochran and Marks, 1995; Cochran and Lyons, 2004).

1996: An Exceptional Year for Silver Lampreys in the Fox River

During the period 1979-1999, a sea lamprey assessment trap (Schuldt and Heinrich, 1982) was set below the east end of the DePere dam from the beginning of April to mid-June each year. Catches of upstream migrant silver lampreys in this trap were analyzed by Cochran and Marks (1995) and Cochran and Lyons (2004). Cochran and Marks (1995) inferred that most silver lampreys spent their parasitic phase in the waters of Green Bay proper. After completing the parasitic phase, they are known to ascend several Green Bay tributaries in the spring (on the basis of captures in sea lamprey assessment traps), but it is not known whether any tributaries contribute disproportionately to reproduction. I still have no evidence that silver lampreys reproduce successfully in the lower Fox River, but I did observe spawning silver lampreys in the Oconto River in 1996 after being alerted to their presence by an angler with a cell phone (Cochran and Lyons, 2004).

As noted by Cochran and Lyons (2004), the silver lamprey catch in the Fox River sea lamprey assessment trap in 1996 exceeded the combined total catch for the 15 years analyzed in Cochran and Mark's (1995) initial report (Fig. 1). The exceptional catch in 1996, when the trap contained more lampreys on a single day (78 on 5 May) than the total seasonal catches in 18 of 21 years, presumably reflected a high abundance of parasitic-phase silver lampreys in the lower Green Bay system during the previous year. It may be no coincidence that additional unusual observations occurred during the same period:

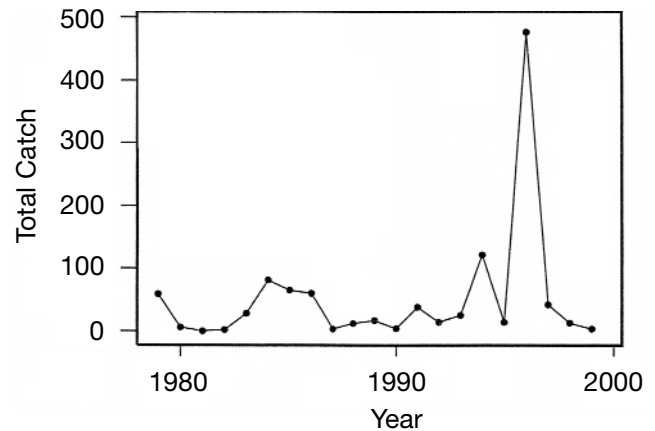


Fig. 1.

Yearly total catch of upstream migrant silver lampreys in the Fox River below the DePere dam. Data for 1979-1993 are from Cochran and Marks (1995). Data for 1994-1999 are from Cochran and Lyons (2004).

- (1) Two female silver lampreys collected in the sea lamprey assessment trap (400 mm on 19 April and 415 mm on 24 April) were even longer than the record 392-mm specimen reported by Cochran and Marks (1995). Silver lampreys that enter the Fox River from Green Bay tend to be relatively large (Cochran and Marks, 1995). The chance of finding extremely large individuals should be greater when the total sample size is large, as it was in 1996.
- (2) A silver lamprey (UWZM 10731) collected on 6 May 1996 in Duck Creek, a tributary that enters Green Bay between the mouths of the Fox and Oconto rivers, represents the first known record from that stream (Becker, 1983; Fago, 1992). In years of greater lamprey abundance, it may be more likely to observe strays in systems where they don't normally occur.
- (3) A silver lamprey collected on a carp (*Cyprinus carpio*) in the Fox River in September 1995 (Table 1) is the only silver lamprey I have observed attached to a host in that river, and the only specimen I have ever collected upstream from the DePere dam. It was captured during a shoreline fish survey with a boat-mounted electrofisher, one of 12 such collections I made on dates in September during the period 1992-1998. Each survey covered both sides of the river within a reach extending approximately 200 meters upstream from the dam, and actual shocking time on each date was 3-6 hours. The lamprey was caught approximately 100 m upstream from the lock channel that allows boats to bypass the dam, and it was on the same side of the river, in an area where other fish more typical of the lower river are sometimes collected.

Table 1. Some records of silver lampreys on hosts other than sturgeon or paddlefish. All lengths are total lengths.

DATE	LOCALITY	LAMPREY SIZE	HOST	LOCATION ON HOST
13 September 1974	Mississippi River, MN	200 mm (preserved)	<i>Cyprinus carpio</i> "large"	Dorsal fin
15 September 1995	Fox River above DePere dam, Brown Co., WI	256 mm 31.8 g	<i>Cyprinus carpio</i> 644 mm	Dorsolateral, posterior to upper opercular cleft; site bloody with wound slanting between adjacent scales
20 June 1997	Cassville Slough off Mississippi River, Grant Co., WI	121 mm	<i>Lepisosteus osseus</i> 840 mm	Ventral, just posterior to vent; small mark with blood present at juncture of four scales
15 July 1997	St. Croix River, Marine on St. Croix, St. Croix Co., WI	121 mm 3.33 g	<i>Cyprinus carpio</i> 483 mm	On side of dorsal fin; wound evident
31 May 2000	Wolf River, Shawano Co., WI	160 mm 9 g	<i>Cyprinus carpio</i> 574 mm, 2.5 kg	Dorsal midline behind head; wound bloody with slight central puncture
25 July 2002 (JFBM 41038)	Grassy Bay of Lake Namakan, St. Louis Co., MN	146 mm	<i>Esox lucius</i> approximately 1 kg	Lateral; no mark noticed

Finally, it should be noted that the Oconto River was treated with lampricide during September 1997 to eliminate sea lampreys. This treatment may have contributed to the reduced catch of silver lampreys in the Fox River during subsequent years (Fig. 1), and it may have helped to obscure the "quasi-cyclical" pattern in annual catch that was described by Cochran and Marks (1995) but that was no longer evident by 1999 (Cochran and Lyons, 2004).

Some Records of Silver Lampreys on Hosts Other than Sturgeon and Paddlefish

Silver lampreys have been strongly associated with large host species, such as lake sturgeon, paddlefish (*Polyodon spathula*), catfish, and esocids, that have naked skin or small scales (Cochran and Lyons, 2004, and references therein). Cochran and Lyons (2004) pointed out, however, that fish assemblages in many systems have come to be dominated at the larger end of the size spectrum by common carp, which have formidable scales. Additional exotic carp species are expanding their ranges up the Mississippi River drainage in a direction that will bring them into greater overlap with silver lampreys. Information on hosts used by silver lampreys in habitats where sturgeon and paddlefish are not common is of interest, as is information on the success of silver lampreys that attach to carp. Cochran and Lyons (2004) provided some relevant field data, but they did not provide details of individual attachments (Table 1). Although small captive silver lampreys in their study did not form obvious puncture wounds on carp and did not grow well, silver lampreys found on carp in the field had at least sometimes formed enough of a wound that blood was evident.

I was recently provided with information about parasitic-phase lampreys in the Mississippi River by Chad Richtman, a graduate student at Saint Mary's University. Chad spends considerable time assisting his father in his commercial fishing operation, which is headquartered in Trempealeau, Wisconsin, but which takes them upstream as far as Lake Pepin. Chad associates parasitic lampreys most strongly with carp and paddlefish, but sees more lampreys on the former simply because they catch carp more frequently and in much greater numbers. He has also provided additional confirmation to recent reports that parasitic-phase *Ichthyomyzon* may attach to hosts during the winter (Cochran et al., 2003).

Sea Lampreys in the Lower Fox River

The sea lamprey was first reported from the Fox River by Cochran (1994) on the basis of a specimen collected in 1991. Lyons et al. (2000) reported that a total of six specimens had been taken as of 1999. Details about those collected in the sea lamprey assessment trap are provided in Table 2 (other specimens were collected by the Wisconsin Department of Natural Resources). As noted by Cochran (1994), the relatively large size of sea lampreys taken in the Fox River is typical for lampreys collected in Green Bay tributaries (Johnson, 1982). The lampreys trapped by Cochran (1994) were collected unusually early in the spring; the more recent collections (Table 2) occurred on dates more typical for northeastern Wisconsin.

It should be noted that 1999 was the last year that the sea lamprey assessment trap was operated in the Fox River during the spring spawning season. A number of years previously, the U.S. Fish and Wildlife Service had dropped the Fox River from the set of tributaries to be officially monitored as

Table 2. Records of sea lampreys collected in an assessment trap in the lower Fox River below the DePere dam, Brown Co., Wisconsin. The first two specimens were reported by Cochran (1994).

DATE	WATER TEMPERATURE	LENGTH	WET MASS	SEX	COMMENTS
5 April 1991	5°C (41°F)	587 mm	365 g	male	UWZM 9975
6 April 1992	5°C (41°F)	600 mm	505 g	female	-
22 April 1998	13°C (55.4°F)	580 mm	357 g	female	a silver lamprey also present
16 May 1999	17.5°C (63.5°F)	not recorded	not recorded	not recorded	-
Mean: 20 April	10.1°C (50.18°F)	556 mm	409 g		

part of their assessment program. I continued trapping according to the same protocol while I was affiliated with Saint Norbert College (directly across the river from the trapping site), but I could no longer do so when I moved to my current position in Minnesota.

Comments on the Southern Brook Lamprey

On 25 May 1982, I first collected lampreys in the Namekagon River in Sawyer County that I subsequently identified as southern brook lampreys (*Ichthyomyzon gagei*), well outside the known range of the species at that time (Cochran, 1987). Southern brook lampreys eventually were found to be even more broadly distributed in Wisconsin and Minnesota than I originally expected, with populations scattered in the upper reaches of the St. Croix, Wisconsin, and Black River drainages (Lyons et al., 1997, 2000). When I am asked how this species could have been missed by the many previous surveys of fishes in these areas, I often give the pat answer that people tend to see what they expect to see. For example, fisheries workers are often much more aware of parasitic lampreys than they are of nonparasitic brook lampreys (especially if they have sat through lectures on the history of sea lampreys in the Great Lakes). When they encounter small lampreys in the field, they sometimes assume they are ammocoetes or recently transformed adults of parasitic species. Those who have collected southern brook lampreys in Wisconsin have often identified them as chestnut lampreys (*I. castaneus*), perhaps sometimes on the basis of locality and perhaps sometimes because they have looked closely enough at the specimens to see their bicuspid circumoral teeth. Specimens from the upper Black River drainage have been misidentified as chestnut lampreys, which do occur farther down in the drainage (Lyons et al., 1997, 2000). On the other hand, workers who were aware of the existence of nonparasitic brook lampreys have sometimes collected southern brook lampreys, and, perhaps on the basis of their single, incom-

pletely divided dorsal fin, have assumed they were northern brook lampreys (*I. fossor*), the only brook lamprey of the genus *Ichthyomyzon* known at the time to occur in the upper Midwest. Under the assumption that only one nonparasitic *Ichthyomyzon* species occurred in the area, there would have been no need to look more closely at the circumoral teeth, an examination that would require a microscope. Thus, in February 1989, I was provided by George Seeburger of the University of Wisconsin-Whitewater with a southern brook lamprey originally collected on 3 June 1980 from the Namekagon River about five miles south of Cable; the specimen was originally identified as *I. fossor*. Similarly, when I taught ichthyology at the Pigeon Lake Field Station near Drummond in 1997, I found in the teaching collection there preserved specimens of southern brook lamprey that had been collected in the Namekagon River and labeled *I. fossor*.

I was recently provided evidence, however, that at least some previous workers recognized that a southern brook lamprey collected in Wisconsin was something out of the ordinary. My colleague John Lyons, a researcher with the Wisconsin Department of Natural Resources (DNR), found the following memo (reproduced verbatim) while he was cleaning out some files:

Ichthyomyzon castaneus

Namekagon R. T41N R13W Sec 27 NW1/4 (Washburn Co.) V:4:1976
Wis. Fish Distrib. Studies – Don Fago contributor.

The adult male lamprey is definitely *I. castaneus*. It has 53 trunk myomeres, pigmented sensory pores, and the following dental formula in the buccal funnel: circumoral bicuspid teeth 4-4; 7 teeth in lateral row; 4 teeth in anterior row. All teeth are well formed but without the sharpened cusps typical of the parasitic adult.

The lamprey is atypical in that the length of the buccal funnel is only 6.5 mm, the same as the diameter of the branchial area. It is a mature male with well-developed testis and genital papilla.

My analysis is that this individual passed through its adult phase without the parasitic stage typical of its peers. It probably metamorphosed the preceding winter and matured the following spring, the sort of thing we expect from *I. fossor* and *L. lamottei*. The total length was 125 mm which is somewhat less than the total length of an *I. castaneus* ammocete at the time of metamorphosis, and, which may be expected, in that the non-parasitic lamprey adults are somewhat less than the ammocete lengths. I have no idea how common this phenomenon is, nor am I aware of it having been covered in the literature. Perhaps you have something unique here.

G. Becker
UWSP-Museum
21 March 1977

It appears that someone in Don Fago's DNR fish survey crew collected a southern brook lamprey in 1976, and George Becker of the University of Wisconsin-Stevens Point, the most noted ichthyologist in the state, was called upon to make sense of it. I don't fault George for his identification of the specimen as an unusual chestnut lamprey. After all, when all six southern brook lampreys I collected in 1982 proved to be males, I found myself wondering if they represented an alternative life history for male chestnut lampreys, something comparable to jack salmon perhaps.

I only wish to add that when I was wrestling with the realization that a previously unreported species of lamprey occurred in Wisconsin and Minnesota, I received nothing but encouragement from George Becker, as I did from Jim Underhill (University of Minnesota) and Reeve Bailey (University of Michigan). George regretted that his *Fishes of Wisconsin* was already in press and could not be altered to include the new find. For some reason, he never mentioned to me the southern brook lamprey from the Namekagon River. Readers interested in a biography of George Becker can refer to Ness (2003).

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