



**Trapping Activities and Population Estimates of  
Adult Sea Lamprey in Tributaries of  
Lake Superior  
During 1999 and 2000**

by  
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## ABSTRACT

The Great Lakes Section of the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) has conducted a cooperative sea lamprey (*Petromyzon marinus*) trapping project with the U.S. Fish and Wildlife Service Sea Lamprey Control Station (USFWS-SLC) since 1986. The purpose of the project is to gather information on adult spawning-phase sea lamprey ascending various tributaries to Lake Superior. Results of the 1999 and 2000 trapping seasons are reported.

The seven rivers sampled in both 1999 and 2000 were the Amnicon, Middle, and Bad rivers in Wisconsin, and the Silver, Firesteel, Misery, and Ontonagon rivers in Michigan. In 1999 and 2000, 4,807 and 10,908 lamprey, respectively were captured. These catches were well above the eleven year average of 1,470 from 1988 to 1998. Schaefer estimates of adult spawner abundance were calculated for 6 of the 7 tributaries in 1999 and 2000. In 1999, spawner abundance estimates ranged from 84 in the Firesteel river to 13,515 in the Middle river and in 2000 they ranged from 937 in the Silver to 6,900 in the Middle river.

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## INTRODUCTION

The Great Lakes Section of the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) has conducted a cooperative sea lamprey (*Petromyzon marinus*) trapping project with the U.S. Fish and Wildlife Service Sea Lamprey Control Station (USFWS-SLC) in Marquette, Michigan since 1986. The purpose of the project is to gather information on and estimate the population size of adult spawning-phase sea lamprey ascending various tributary streams of Lake Superior during their May-June spawning run. Objectives of the project are as follows: (1) to monitor the upstream spawning movements of sea lamprey, (2) to collect data on the biological characteristics of spawning sea lamprey, (3) to estimate the number of lamprey spawning in each tributary, and (4) to reduce the spawning potential of sea lamprey by removing a portion of the run.

Information collected by GLIFWC supplements that collected by USFWS-SLC and other agencies, and is included in a lake wide management plan to control and reduce the lamprey population. Results of the mark-recapture study are used in a Discharge Regression model developed by USFWS-SLC to estimate total number of spawning-phase lamprey in United States waters of Lake Superior, and to evaluate the effectiveness of regional lamprey control efforts. This report presents results of the 1999 and 2000 trapping seasons.

Tributaries selected for trapping by GLIFWC were known to contain spawning runs of adult sea lamprey and represent a range of stream sizes based on in-stream flows. Several of these tributaries contained natural or man-made barriers. The number of tributaries trapped by GLIFWC has varied from 5 rivers in 1986 and 1987 to 13 rivers in 1990 and 1991 (Ebener 1987, 1988, 1989, 1990, Shively 1994, Mattes 1995, Mattes 1997, Mattes 1998, Mattes 1999). Due to sampling difficulties and low catch in several streams, the number of rivers trapped was reduced to eight in 1992. These eight rivers were among those sampled annually between 1988 and 1996. In 1997, the Traverse river was dropped from the sampling schedule due to low catch rates since 1993. The Falls river was added in 1997 because of its comparability to the Traverse river in mean annual discharge and to determine if lamprey catches would be sufficient to calculate a mark-recapture population estimate. In 1998, the Falls and Huron rivers were dropped from the sampling schedule while the West Branch of the Ontonagon was added. These changes were made in response to a report by an independent review panel released in August 1997 which recommended sampling fewer small streams and more large streams.

In 1999 and 2000, seven streams were trapped; the Amnicon, Middle, and Bad rivers in Wisconsin and the Firesteel, Misery, Silver, and Ontonagon rivers in Michigan. The trapping method and location on the Ontonagon river was changed from two steel trap on the West Branch of the Ontonagon in 1998 to two fyke-nets on the main-stem of the Ontonagon in 1999 and 2000.

## METHODS

### Rivers and Trapping Sites

Three tributaries in Wisconsin and four tributaries in the Upper Peninsula of Michigan were trapped from late April through early July (Figure 1). The Middle and Misery rivers possessed man-made barriers that were specially built to prevent the upward movement of sea lamprey. The Amnicon and Silver rivers possess natural barriers which prevent sea lamprey from moving through the entire system. The Ontonagon river has a hydroelectric dam on the West Branch but nowhere else, whereas the Bad and Firesteel rivers possess no impassable barriers. Traps were placed below barriers where they occurred and in the lower portion of rivers in which no barriers existed.

Location and type of traps used within tributaries depended on the suitability of the site for trapping (Table 1). The man-made barriers on the Middle and Misery rivers allowed portable steel cage traps to be abutted against the barriers. On the Bad river portable steel cage traps were placed directly below and against a natural rock shelf which transects the rivers. The other four rivers were trapped using fyke nets.

### Data Collection

Traps or fyke nets were emptied at least three times per week (i.e., Monday, Wednesday, and Friday). Live lamprey were transported downstream (Table 1), marked by clipping one or both dorsal fins, then released back into the river. The fins were clipped with a v-notch tool and a different combination of clips was used to identify week of capture and release within the year (Table 2). In the Misery and Middle rivers only the first 50 lamprey and all female lamprey thereafter were marked and used to obtain a population estimate. The remaining male lamprey were placed in holding cages in the rivers and later transported for use in the sterile male release program. Water and air temperature were recorded each time the traps or nets were emptied (Table 3).

The number of live and dead marked and unmarked lamprey captured each sampling day was counted, along with the number of other fish species in the traps or nets. Lamprey or a subsample of lamprey were measured to the nearest millimeter, weighed to the nearest gram, and sex determined each day in all rivers except the Middle and Misery. The fin clip combination on recaptured lamprey was also recorded.

### Population Estimates

Mark-recapture population estimates were attempted based on the tagging procedure described above. When sample size was sufficient population estimates were calculated using the modified Schaefer method (Ricker 1975, 3.18). When the number of recaptures was deemed too low, no such estimate was calculated. Population estimates of adult spawning lamprey in these and other streams are made and combined to estimate the population in U.S. waters of Lake Superior for determining the effectiveness of efforts to control lamprey and extractions of lean lake trout.

## RESULTS AND DISCUSSION

### Trap Catches

In 1999 and 2000, 4,807 and 10,908 lamprey were captured, respectively. These catches were well above the eleven year average of 1,470 lamprey from 1988 to 1998 (Table 4). The majority of lamprey captured came from the Middle and Misery rivers. In 1999, 2,235 and 1,753 lamprey were captured in the Middle and Misery rivers, respectively and in 2000, 8,841 and 1,238 were captured.

Trap catch in the Middle river increased dramatically after 1997 (Table 4). Prior to 1998 the twelve year average annual catch was 65 lamprey. In 1998, lamprey catch increased to 408, then to 2,235 in 1999, and to 8,481 in 2000. In 2000, four traps were set in the Middle river in an increased effort to capture male lamprey for the sterile male release technique program (SMRT). This increase in effort may in-part explain the increased catch.

Other than sea lamprey, 32 taxa of fish and other animals were captured during 1999 with 39 taxa collected during 2000 (Tables 5 and 6). White sucker (*Catostomus commersoni*) was the species captured most often (572 in 1999 and 1,126 in 2000). Other taxa commonly captured in the traps or nets were creek chub (*Semotilus atromaculatus*; 230 in 1999 and 376 in 2000) and crayfish (*Procambarus spp.*; 220 in 1999 and 689 in 2000).

### Biological Characteristics

Male lamprey (256 in 1999 and 76 in 2000) comprised 49% and 44% of the total lamprey sexed in 1999 (524) and 2000 (174), respectively (Table 7, Figure 2). These percentages were within the range for the thirteen year period 1986-1998 (range: 18% to 53%). In 1999 and 2000 the overall female to male sex ratio was 1.0 and 1.3, respectively.

The mean lengths of male lamprey were 459 mm and 441 mm in 1999 and 2000, respectively, while the mean lengths of female lamprey were 440 mm and 444 mm, during these respective years (Table 7). These lengths were within the range of lengths observed during the previous thirteen years (Figure 3), except that for average length, males in 1999 (459 mm) were the largest recorded.

The mean weights for male lamprey were 234 g and 226 g in 1999 and 2000, respectively, while female lamprey were 219 g and 213 g, respectively (Table 7). Mean weight of male and female lamprey has been similar within years but has varied considerably between years (Figure 4).

### Population Estimates

In 1999 and 2000, Schaefer method mark-recapture estimates were calculated for six of the seven tributaries (Table 8). The highest estimates were for lamprey in the Middle river (1999, N=13,515 and 2000, N=6,900), followed by the Bad river (1999, N=12,552 and 2000, N=2,767). In 1999 for the Bad and Middle rivers and in 2000 for the Amnicon and Firesteel rivers, population estimates were the highest recorded (Table 9). Also, the population estimates for the Silver river in 1999 and 2000 were the highest during the time series.



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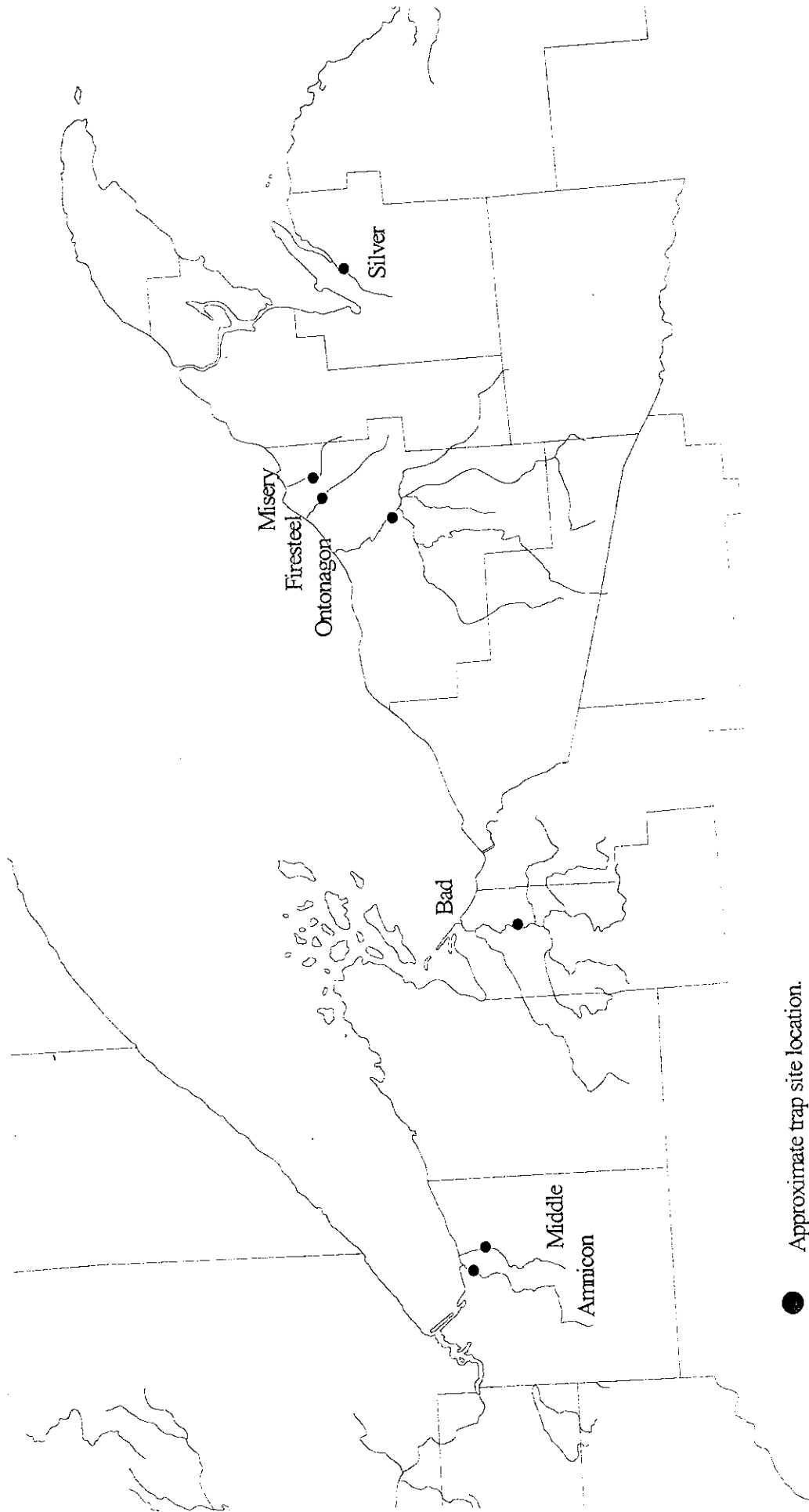


Figure 1. Location of tributaries in which spawning-phase lamprey were trapped in 1999 and 2000.

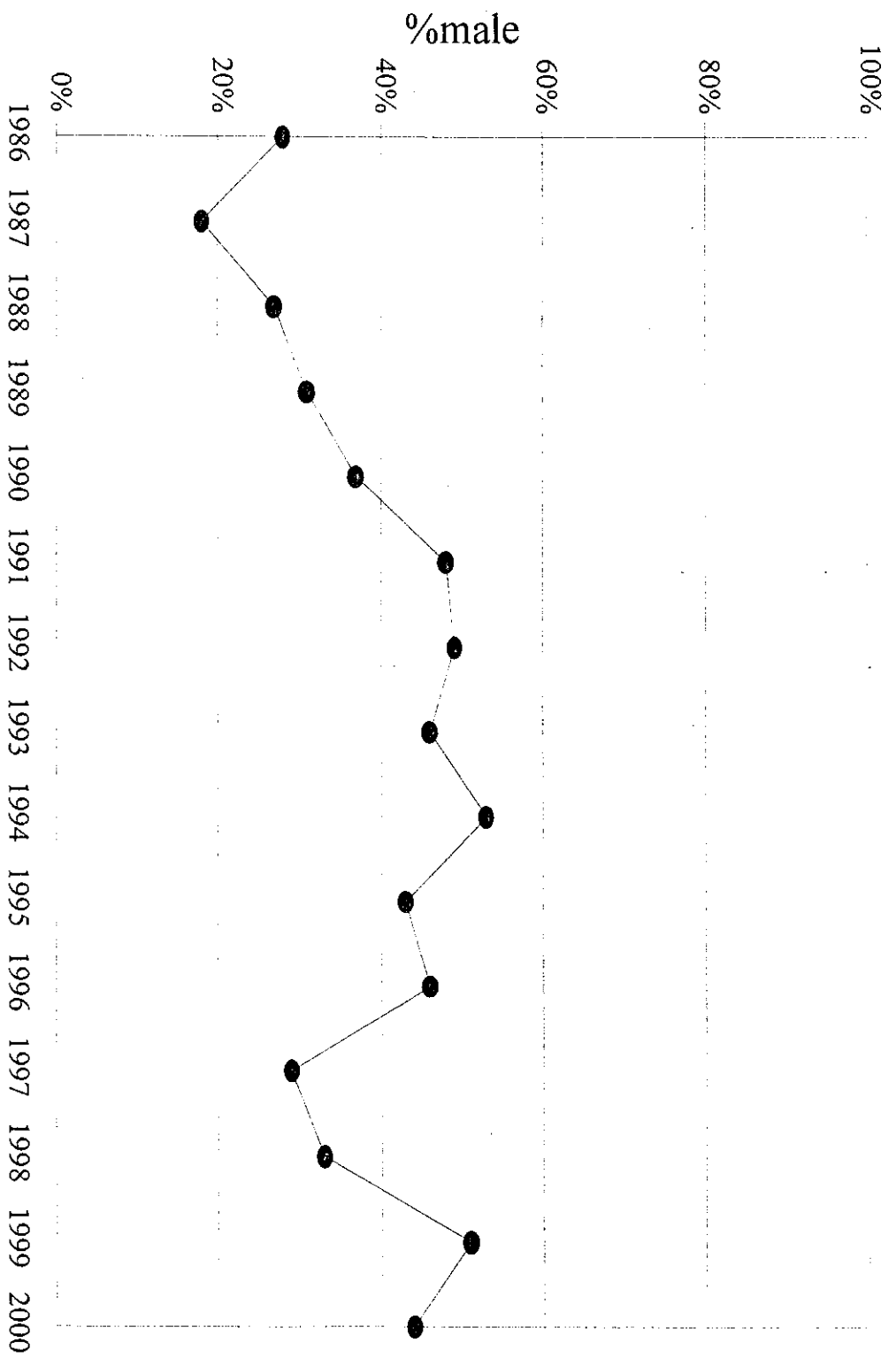


Figure 2. Percent male lamprey from rivers trapped during 1986-2000, excluding the Misery and Middle rivers in 2000.

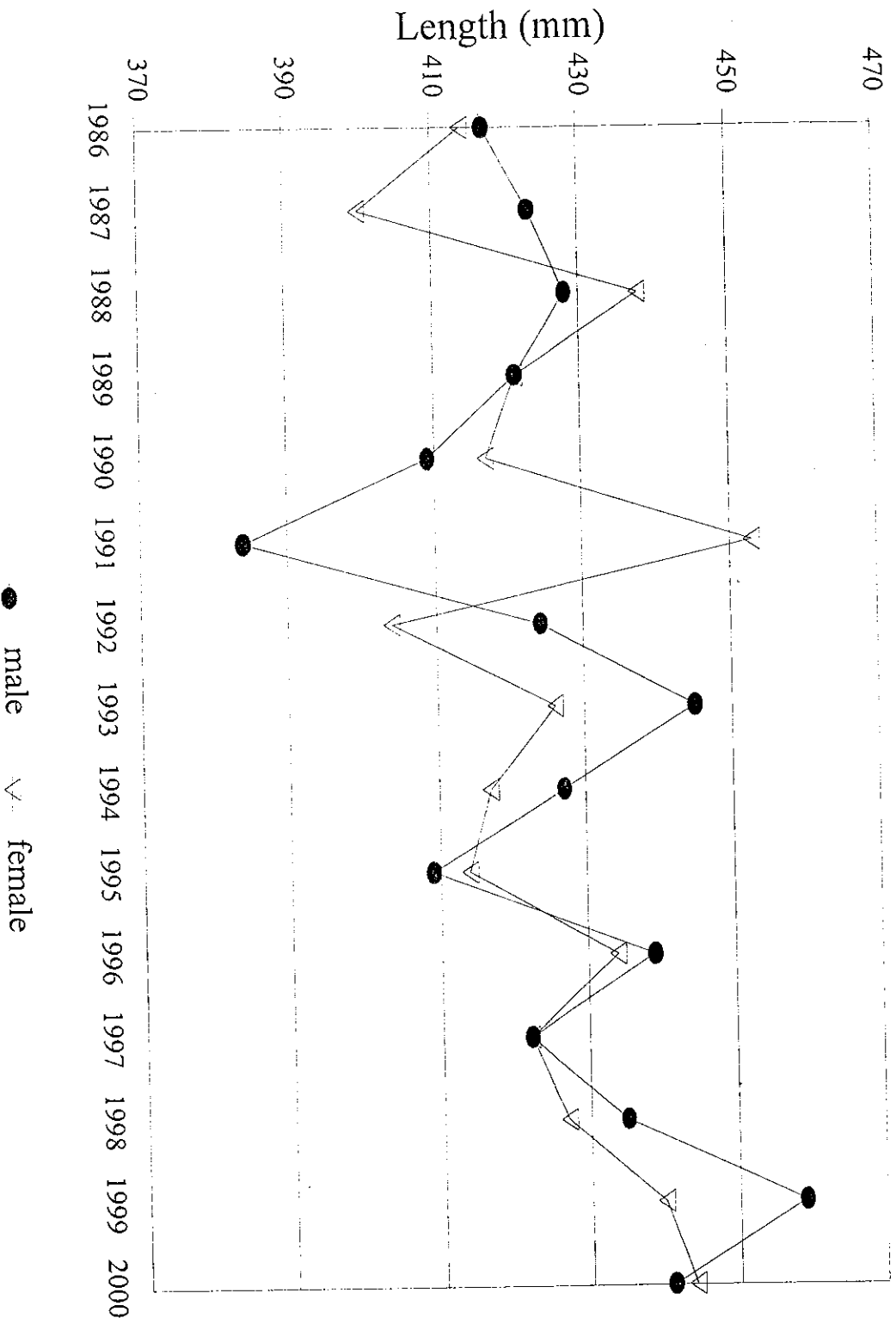


Figure 3. Mean length (mm) for male and female lamprey from rivers trapped during 1986-2000.

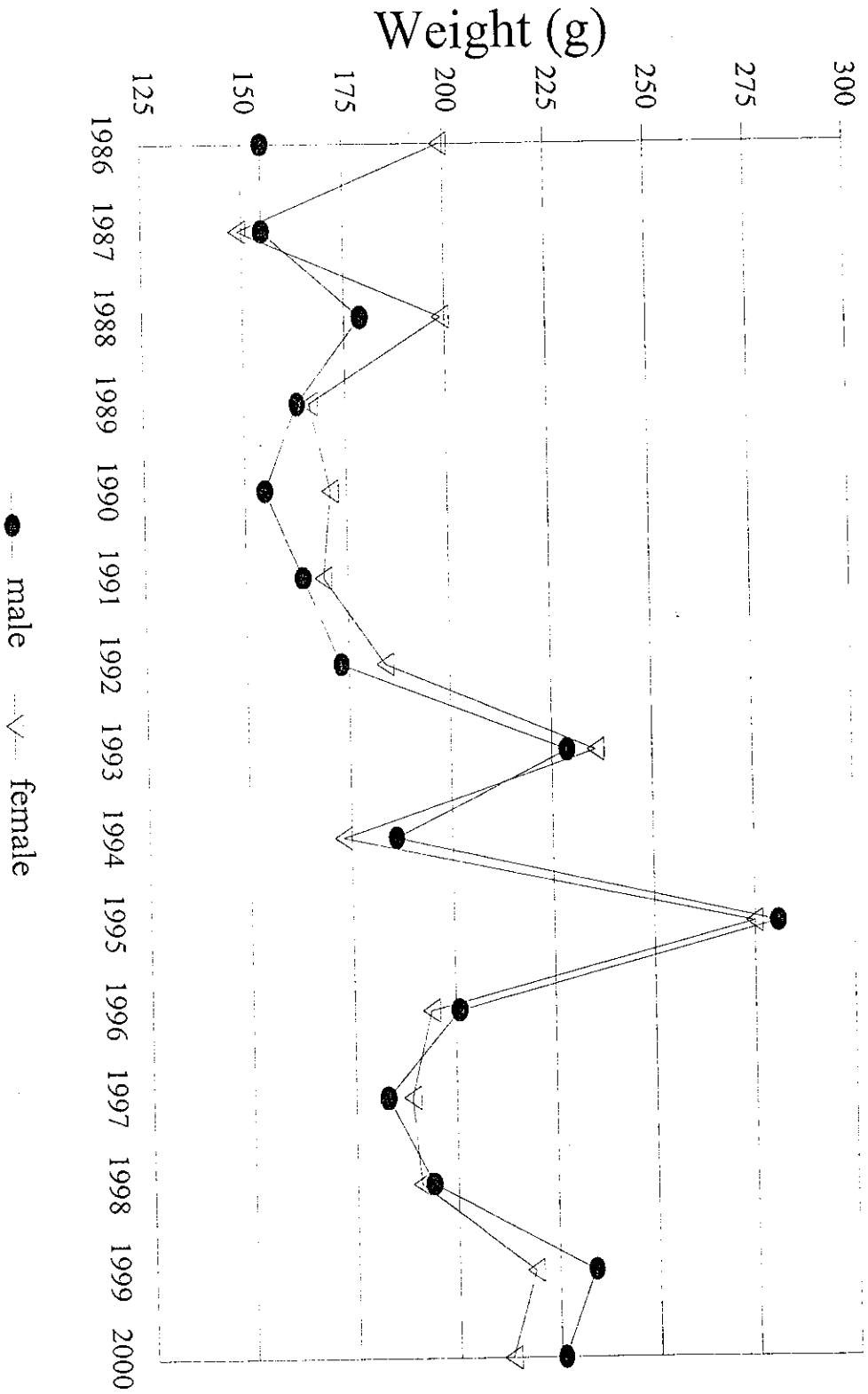


Figure 4. Mean weight (grams) for male and female lamprey from rivers trapped during 1986-2000.

Table 1. Information on location of lamprey trapping conducted on Lake Superior tributaries during 1999 and 2000.

Tributary	State/County	Location trapped	Gear	Trap site distance		Barrier distance		Release site
				from mouth		from mouth		
Amnicon	WI/Douglas	T48N, R12W, Sec 8, SE 1/4	1-fyke net	5 km (3 miles)		11 km (7 miles)		0.1 km downstream from net
Middle	WI/Douglas	T48N, R12W, Sec 13, NE 1/4	2-4 traps	5 km (3 miles)		5 km (3 miles)		HWY 13 bridge
Bad	WI/Ashland	T47N, R3W, Sec 36, NE 1/4	3-traps	30 km (19 miles)		no barrier		0.8 km downstream from trap
Firesteel	MI/Ontonagon	T51N, R38W, Sec 27, SE 1/4	1-fyke net	11.2 km (7 miles)		no barrier		bridge 0.4 km below trap
Misery	MI/Ontonagon	T52N, R37W, Sec 15, NE 1/4	2-traps	1.6 km (1 mile)		1.6 km (1 mile)		0.4 km below trap
Silver	MI/Baraga	T51N, R31W, Sec 13, SE 1/4	1-fyke net	1.6 km (1 mile)		5 km (3 miles)		0.4 km below trap
Ontonagon	MI/Ontonagon	T50N, R39W, Sec 20, NW 1/4	2-fyke nets	22 km (14 miles)		no barrier		0.4 km below trap

Table 2.A Type and combination of marks used on adult lamprey by week for Wisconsin rivers trapped during 1999.

Week of trapping	Dates in 1999	Mark (anterior, posterior)	Week of trapping	Dates in 1999	Mark (anterior, posterior)
1	4/18-4/24	(3,3)	5	5/16-5/22	(2,0)
2	4/25-5/1	(1,3)	6	5/23-5/29	(1,2)
3	5/2-5/8	(1,1)	7	5/30-6/5	(2,2)
4	5/9-5/15	(0,2)	8	6/6-6/12	(2,3)

Table 2.B Type and combination of marks used on adult lamprey by week for Michigan rivers trapped during 1999.

Week of trapping	Dates in 1999	Mark (anterior, posterior)	Week of trapping	Dates in 1999	Mark (anterior, posterior)
1	5/2-5/8	(3,1)	6	6/6-6/12	(1,1)
2	5/9-5/15	(3,0)	7	6/13-6/19	(0,2)
3	5/16-5/22	(2,2)	8	6/20-6/26	(1,2)
4	5/23-5/29	(2,1)	9	6/27-7/3	(0,3)
5	5/30-6/5	(2,0)			

Table 2.C Type and combination of marks used on adult lamprey by week for Wisconsin rivers trapped during 2000.

Week of trapping	Dates in 2000	Mark (anterior, posterior)	Week of trapping	Dates in 2000	Mark (anterior, posterior)
1	4/23-4/29	(1,0)	5	5/21-5/27	(1,1)
2	4/30-5/6	(0,2)	6	5/28-6/3	(2,1)
3	5/7-5/13	(0,1)	7	6/4-6/10	(2,2)
4	5/14-5/20	(1,2)			

Table 2.D Type and combination of marks used on adult lamprey by week for Michigan rivers trapped during 2000.

Week of trapping	Dates in 2000	Mark (anterior, posterior)	Week of trapping	Dates in 2000	Mark (anterior, posterior)
1	5/7-5/13	(2,2)	6	6/11-6/17	(1,2)
2	5/14-5/20	(2,1)	7	6/18-6/24	(0,3)
3	5/21-5/27	(2,0)	8	6/25-7/01	(3,2)
4	5/28-6/3	(1,1)	9	7/2-7/08	(3,3)
5	6/4-6/10	(0,2)			

Table 3. Water and air temperature (degrees Centigrade) on seven tributaries to Lake Superior in 1999 and 2000.

Tributary	Code	Water Temperature					Water Temperature				
		N*	1999				N*	2000			
			average	S.D.	min	max		average	S.D.	min	max
Michigan Tributaries											
Firesteel	289	12	13.9	1.9	11	18	35	16.4	3.2	11	20
Misery	284	30	14.1	2.8	8	20	40	14.5	2.8	10	19
Silver	190	13	13.4	2.1	11	19	27	14.6	2.6	9	18
Ontonagon	295	19	11.5	2.9	6	14	34	18.0	2.5	12	23
Wisconsin Tributaries											
Amnicon	705	22	12.0	3.5	4	19	38	13.6	2.2	9	18
Bad	611	21	12.6	3.0	7	18	27	11.1	5.6	3	19
Middle	703	22	11.4	3.8	7	17	43	12.8	2.8	8	22
Air Temperature											
1999											
		N*	average	S.D.	min	max	N*	average	S.D.	min	max
Michigan Tributaries											
Firesteel	289	6	18.3	4.8	13	26	35	16.2	4.1	6	22
Misery	284	18	17.3	5.9	7	26	40	16.4	3.8	7	22
Silver	190	7	16.3	3.5	12	23	27	15.6	3.9	9	22
Ontonagon	295	10	18.2	6.3	10	25	34	18.0	4.0	8	28
Wisconsin Tributaries											
Amnicon	705	22	16.9	7.6	4	30	35	13.4	4.4	6	21
Bad	611	21	13.1	5.8	2	24	27	10.7	6.2	1	21
Middle	703	23	15.8	6.6	4	27	40	13.2	4.9	7	31

\*N= number of days where measurement was recorded.



Table 4. Annual catches of unmarked adult sea lamprey in spring spawning assessment traps and nets, in tributaries to Lake Superior monitored by GLIFWC from 1986-2000.

Tributary	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Wisconsin Tributaries															
<i>Primary</i>															
Amnicon	61	14	3	118	67	101	7	39	24	40	83	83	79	278	
Bad	184	439	972	684	465	121	236	84	114	280	316	272	471	646	293
Middle	315	16	11	249	1	4	12	46	11	24	42	47	408	2,235	8,481
<i>Secondary</i>															
Arrowhead	1														
Black					3	8									
Nemadji					0	1									
Poplar	0														
Raspberry										0					
Red Cliff Cr.					14	15									
Subtotal-3 primary	499	516	997	936	584	192	349	137	164	328	398	402	962	2,960	9,052
Total-WI	500	516	997	936	601	216	349	137	164	328	398	402	962	2,960	9,052
Michigan Tributaries															
<i>Primary</i>															
Firesteel		17	40	44	86	43	74	24	21	0	37	79	35	375	
Huron		1	51	6	9	14	41	54	2	35	2	18			
Misery		261	265	164	336	907	4,871	455	197	672	1,131	406	1,753	1,238	
Silver	0	4	0	6	26	29	36	0	6	20	6	42	42	59	243
<i>Secondary</i>															
Traverse		10	10	31	33	11	4	0	0	1					
Falls												3			
Ontonagon				56	18								0	9	13
Other			0	0											
Subtotal-4 primary	0	5	329	317	243	465	1,027	4,999	487	273	680	1,228	527	1,847	1,856
Total-MI	0	5	339	327	274	498	1,038	5,003	487	273	681	1,228	527	1,847	1,856
<i>Primary total</i>															
		1,326	1,253	827	657	1,376	5,136	651	601	1,078	1,630	1,489	4,807	10,908	
Grand total	500	521	1,336	1,263	875	714	1,387	5,140	651	601	1,079	1,630	1,489	4,807	10,908
<i>Average catch after 1988:</i>															
		1,300	1,158		1,115	1,786	1,624	1,496	1,450	1,468	1,470	1,748	2,452		

Table 5. Number of fish and other taxa captured during trapping on seven Lake Superior tributaries in 1999.

<i>Fish Species</i>	Wisconsin Tributaries				Michigan Tributaries				Grand Total	
	Bad	Amnicon	Middle	Total-WI	Firesteel	Misery	Silver	Ontonagon		Total-MI
Sea lamprey	646	79	2,235	2,960	35	1,753	59	9	1,856	4,816
Silver lamprey			2	2		1			1	3
Chesnut lamprey				0					0	0
Bluegill		1		1					0	1
Brook trout			1	1	1	1			2	3
Brown trout				0	6				6	6
Bullhead spp.		23	17	40	7			8	15	55
Burbot				0		6		5	11	11
Chub sp. (Cyprinidae)		1	103	104	4	1			5	109
Coho Salmon				0		4			4	4
Creek chub	3	2	26	31	26	163	11		200	231
Lake chub		6		6					0	6
Lake sturgeon				0				2	2	2
Log perch		3		3					0	3
Longnose dace				0		9			9	9
Longnose sucker				0		22			22	22
Northern pike	1			1				4	4	5
Crayfish	4	12	52	68		1	4	139	144	212
Smelt				0		1		15	16	16
Rainbow trout	1		5	6	3	150			153	159
Redhorse sucker				0				1	1	1
Ruffe		13		13					0	13
Rock bass	4	7		11				43	43	54
Sculpin spp.			2	2					0	2
Shiner	2			2					0	2
Smallmouth bass	1			1				1	1	2
Sucker spp.	2		200	202	3	23		10	36	238
Trout perch	1	5		6	1			17	18	24
Walleye				0	1			3	4	4
White sucker	17	5	157	179	24	334	3	44	405	584
Yellow perch				0				9	9	9
<i>Other taxa</i>				0					0	0
Snake				0			1		1	1
Water beetle	2			2					0	2

Table 6. Number of fish and other taxa captured during trapping on seven Lake Superior tributaries in 2000.

<i>Fish Species</i>	Wisconsin Tributaries				Michigan Tributaries					Grand Total
	Bad	Amnicon	Middle	Total-WI	Firesteel	Misery	Silver	Ontonagon	Total-MI	
Sea lamprey	293	278	7,910	8,481	375	1,238	243	13	1,869	10,350
Silver lamprey		1	7	8		1	1		2	10
Chesnut lamprey				0					0	0
Brook trout				0		2	16		18	18
Brown trout				0	8			2	10	10
Bullhead spp.	5	5	8	18		2		1	3	21
Burbot			39	39	1	10		2	13	52
Central mudminnow				0		30			30	30
Chinook Salmon				0		2			2	2
Chub sp. (Cyprinidae)		44	67	111					0	111
Coho Salmon				0		5			5	5
Common shiner				0	201	1		9	211	211
Creek chub	1	36	226	263	74	23	3	13	113	376
Dace	1		3	4					0	4
Crayfish		23	314	337	16	10	66	260	352	689
Log perch				0			1		1	1
Longnose dace	9		19	28	3	46			49	77
Longnose sucker	8			8					0	8
Minnow family		17	49	66	14			15	29	95
Mottled Sculpin				0	1	1	1		3	3
Northern pike		1		1				1	1	2
Pike family				0		1			1	1
Pumpkinseed		1		1	1		1	1	3	4
Smelt				0		7			7	7
Rainbow trout	1		1	2	16	197	3		216	218
Redhorse sucker				0				39	39	39
River Chub				0	11	4			15	15
Ruffe		7	2	9					0	9
Rock bass	9	9	1	19	16	2	35	97	150	169
Sculpin spp.			3	3		1			1	4
Shiner sp.	5	82	237	324	12			15	27	351
Smallmouth bass	4			4			1	6	7	11
Sunfish family		1	2	3					0	3
Trout spp.				0	4				4	4
Trout perch		9		9	6		13		19	28
White sucker	68	11	585	664	289	81	91	1	462	1,126
<i>Other taxa</i>				0					0	0
Bull frog				0		1			1	1
Giant Water Beetle				0	1				1	1
Toad/Frog sp.	1		8	9					0	9
Turtle				0				3	3	3

Table 7. Calculated percent, female:male sex ratio, average length (mm), weight (grams), and standard deviation (S.D.) for male and female lamprey during 1999 (a) and 2000 (b).

a.

River	River Code	Sex	Count	Percent	F:M Ratio	Length			Weight		
						Number	Average	S.D.	Number	Average	S.D.
Silver	190	Female	37	66%	1.9:1	37	428	58	32	219	70
		Male	19	34%		19	447	52	16	234	65
		All	56			56	435	57	48	224	68
Misery	284	Female	60	44%	0.8:1	60	469	40	60	222	53
		Male	76	56%		76	477	41	76	239	52
		All	136			136	473	41	136	231	53
Firesteel	289	Female	13	39%	0.7:1	13	448	43	13	196	59
		Male	20	61%		20	464	52	20	237	74
		All	33			33	458	49	33	221	70
Ontonagon	295	Female									
		Male									
		All									
Bad	611	Female	36	78%	3.6:1	36	435	66	14	221	122
		Male	10	22%		10	434	70	4	217	82
		All	46			46	435	66	18	220	112
Middle	703	Female	108	44%	0.8:1	108	437	74	42	221	44
		Male	136	56%		136	458	50	64	230	47
		All	244			244	449	62	106	226	46
Amnicon	705	Female	4	44%	0.8:1	4	197	177	1	233	-
		Male	5	56%		5	265	135	1	243	-
		All	9			9	235	149	2	238	7
All Rivers		Female	258	49%	1.0:1	258	440	73	162	219	63
		Male	266	51%		266	459	58	181	234	54
		All	524			524	449	67	343	227	59

b.

River	River Code	Sex	Count	Percent	F:M Ratio	Length			Weight		
						Number	Average	S.D.	Number	Average	S.D.
Silver	190	Female	32	60%	1.5:1	32	421	32	32	207	49
		Male	21	40%		21	434	44	21	204	61
		All	53			53	426	37	53	206	53
Misery^	284	Female	251	98%		251	429	38	251	200	44
		Male	4	2%		4	433	16	4	207	27
		All	255			255	429	38	255	200	44
Firesteel	289	Female	36	46%	0.8:1	36	437	43	33	221	50
		Male	43	54%		43	457	53	40	234	64
		All	79			79	448	50	73	228	58
Ontonagon	295	Female	1			1	402	-	1	165	-
		Male	1			1	375	-	1	151	-
		All	2			2	389	19	2	158	10
Bad	611	Female	17	74%	2.8:1	17	354	114	14	173	57
		Male	6	26%		6	360	128	6	280	127
		All	23			23	356	115	20	205	95
Middle^	703	Female	259	100%		259	467	39	259	228	51
		Male	0	0%		0	-	-	-	-	-
		All	259			259	467	39	259	228	51
Amnicon	705	Female	12	71%	2.4:1	12	449	44	12	205	56
		Male	5	29%		5	452	38	5	229	30
		All	17			17	450	41	17	212	50
5 Rivers*		Female	98	56%	1.3:1	608	444	48	602	213	50
		Male	76	44%		80	441	62	77	226	69
		All	174			688	443	50	679	214	53

\*Does not include the Misery and Middle rivers because most males were contributed to the sterile male release technique (SMRT) program.

^Numbers do not include males collected for the sterile male program, therefore sex ratio not calculated.

Table 8. Population estimates for spawning phase sea lamprey in GLIFWC monitored streams tributary to Lake Superior during 1999 and 2000.

Tributary	1999 Population Estimates	2000 Population Estimates
	Schaefer Method Mark/Recapture	Schaefer Method Mark/Recapture
Wisconsin Tributaries		
Bad	12,552	2,767
Middle	13,515	6,900
Amnicon	600	3,380
Michigan Tributaries		
Firesteel	84	1,036
Misery	2,339	1,764
Silver	651	937
Ontonagon	N/A	N/A

Estimates provided by the USFWS- Sea Lamprey Control Program in Marquette, Michigan.  
 N/A=Not available, population estimate could not be calculated due to low sample size.

Table 9. Population estimates for spawning lamprey from six GLIFWC monitored tributaries to Lake Superior from 1986-2000.

River	Year														
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Armenicon	647 S				1,368 S	413 SM	1,394 SM	1,216 SM			58 SM	673 SM	605 SM	600 SM	3,380 SM
Bad	6,026 S	4,654 S	7,762 S	9,818 S	3,138 S	3,806 SM	2,651 SM	2,428 SM	2,135 SM	2,048 SM	8,513 SM	4,700 SM	4,064 SM	12,552 SM	2,767 SM
Middle	1,080 S	20 S	21 S	1,328 S			172 SM	184 SM		82 SM	31 SM	186 SM	1,081 SM	13,515 SM	6,900 SM
Misery			610 S	1,124 S	800 S	737 SM	1,771 SM	8,859 SM	748 TE	413 TE	951 TE	2,881 TE	1,073 TE	2,339 SM	1,764 SM
Firesteel				220 P	462 S	265 SM	113 SM	256 SM				76 SM	274 SM	84 SM	1,036 SM
Silver					56 S	61 SM	110 SM					170 SM	157 SM	651 SM	937 SM

Method of estimation: Schaefer=S  
 Schaefer, Modified=SM  
 Peterson, adjusted=P  
 Trap Efficiency=TE