

**Abundance and Population Structure of
Walleye in Fawcett and Moose Lakes,
Alberta, 2011**

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Abundance and Population Structure of Walleye in
Fawcett and Moose Lakes, Alberta, 2011

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EXECUTIVE SUMMARY

Walleye (*Sander vitreus*) populations throughout Alberta are faced with high angling pressure, late-maturity, and slow-growth rates, resulting in many populations being susceptible to over-exploitation. In 1995, Alberta Sustainable Resource Development (ASRD) implemented the Alberta Walleye Management and Recovery Plan (AWMRP) to facilitate the protection and recovery of exploited walleye fisheries. As part of the AWMRP, Alberta Conservation Association conducted gill net surveys in Fawcett and Moose lakes from 16 to 29 September 2011 to examine the population structure and growth characteristics of walleye.

Relative abundance of walleye in Fawcett Lake was 15.3 fish/100 m²/24 h (95%CI = 11.6-18.9, n = 11). Size of walleye ranged from 110 to 592 mm total length (TL), with the majority of the population in the 375 to 500 mm TL size ranges. Fish age ranged from zero (young-of-year (yoy)) to 22 y, with strong 7 and 8 y age-classes. Based on the AWMRP criteria, the walleye population in Fawcett Lake exhibits a wide (>8 age-classes) and very stable (mean age >9 y) age-class distribution. Overall, growth rates were slow (AWMRP standard size, 500 mm TL, in 14 y) and males grew slower than females with estimated average maximum sizes of 486 and 520 mm TL, respectively. Walleye in Fawcett Lake mature early, with both males and females reaching maturity at age 6.

Relative abundance of walleye in Moose Lake was 19.4 fish/100 m²/24 h (95%CI = 13.9-24.7, n = 14). Size of walleye ranged from 118 to 650 mm TL, with the majority of the population in the 450 to 550 mm TL size ranges. Fish age ranged from zero (yoy) to 21 y, with prominent zero (yoy), 4, and 14 y age-classes. Based on the AWMRP criteria, the walleye population in Moose Lake exhibits a wide (>8 age-classes) and stable (mean age 6-9 y) age-class distribution. Growth rates were moderate (AWMRP standard size, 500 mm TL, in 7 y), and males grew slower than females with estimated average maximum sizes of 538 mm and 631 mm TL, respectively. Walleye in Moose Lake mature early, with males reaching maturity by age 3 and females by age 5.

The information collected in these gill net surveys will provide current data to ASRD, assisting managers in making accurate management decisions regarding the sport fishery and the sustainability of walleye populations within Fawcett and Moose lakes.

Key words: Fawcett Lake, Moose Lake, walleye, Fall Walleye Index Netting, age, growth rate, maturity, length distribution.

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1.0 INTRODUCTION

Walleye (*Sander vitreus*) populations in Alberta are susceptible to high fishing pressure, resulting from the imbalance of a high angler population with limited fishing opportunities (Sullivan 2003). Historically high harvest rates, especially in the mid-1990s, have resulted in the over-harvest of many walleye populations (Sullivan 2003), and this trend is expected to continue, given the increasing popularity of recreational fishing among Alberta residents. Consequently, to facilitate the protection and recovery of walleye fisheries in the province, Alberta Sustainable Resource Development (ASRD) implemented the Alberta Walleye Management and Recovery Plan (AWMRP) in 1995 (Berry 1995). Under the AWMRP, lakes were classified into one of four management statuses (trophy, stable, vulnerable, and collapsed) based on the state of the walleye fishery (Berry 1995), and sport fishing regulations were developed accordingly.

In 1995, based on the AWMRP criteria, the Fawcett Lake walleye population was classified as stable, allowing anglers a catch limit of three walleye >430 mm total length (TL) from 1995 to 2000, and two walleye >430 mm TL from 2000 to 2008. Due to slow growth rates, in 2008 the minimum size limit was increased to 500 mm TL, with a catch limit of three walleye.

In 1995, the walleye population in Moose Lake was classified as vulnerable and was regulated with a catch limit of three walleye >500 mm TL. Walleye harvest has since been reduced to a catch limit of one walleye >500 mm TL (Ryder 2009).

As part of the AWMRP, we conducted gill net surveys on Fawcett and Moose lakes during the fall of 2011 to examine the abundance, population structure and growth rates of walleye in these lakes. The information collected in these surveys will help ASRD determine the status of these walleye populations and revise management plans accordingly.

2.0 STUDY AREA

2.1 Fawcett Lake

Fawcett Lake (UTM Easting 312733, Northing 6132141) is located in the Athabasca River drainage, approximately 100 km east of the town of Slave Lake (Figure 1), and has a surface area of 3,416 ha (Government of Alberta 2011). Fawcett Lake has two basins connected by a narrow channel; a smaller northern basin, and a larger, deeper southern basin. The inlet, Mink River, is located on the east side of the north basin and the outlet, Fawcett River, is at the north-west corner of the south basin (Fortier et al. 2004). There are two privately owned campgrounds with boat launches, one on the east side (Fawcett Lake Resort), and one on the west side (Anchor Inn Resort) of the lake. There is also a provincial recreation area, located on the northwest side of the lake, which is maintained by the Anchor Inn Resort.

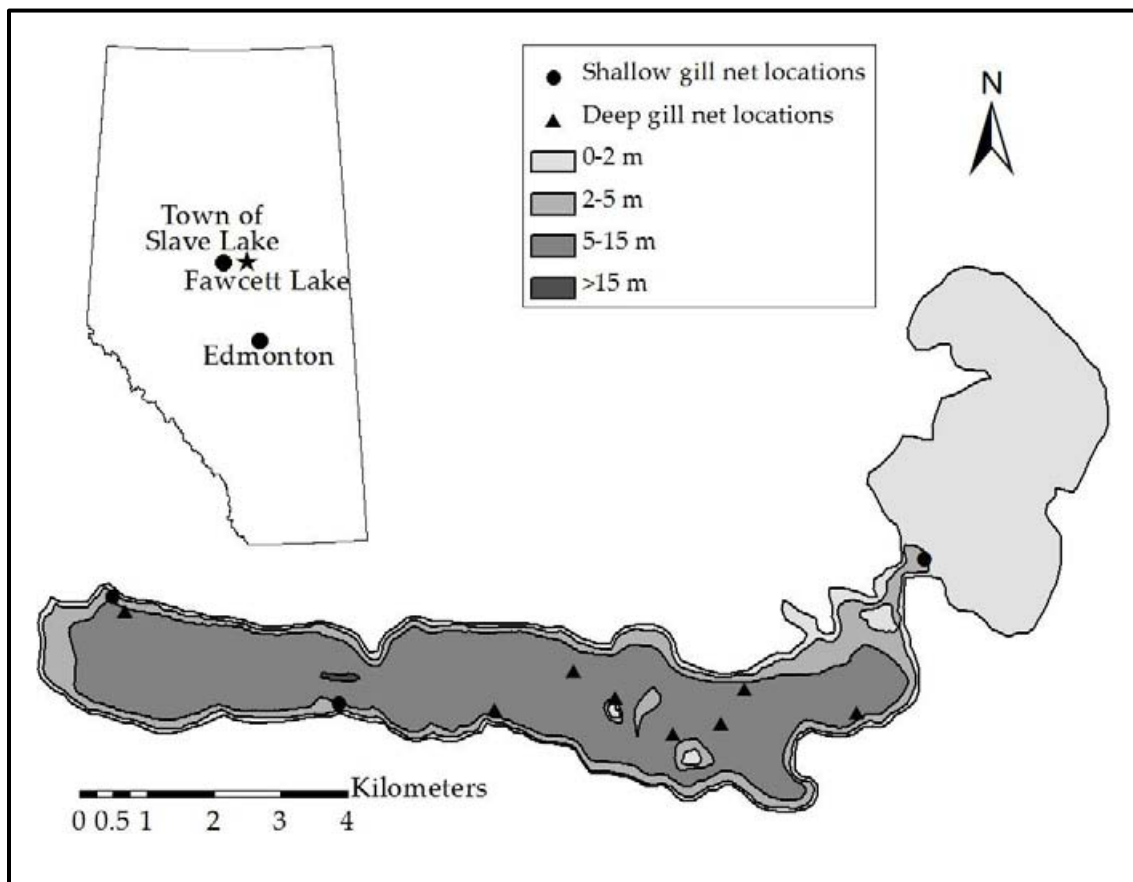


Figure 1. Bathymetric map of Fawcett Lake, Alberta showing gill net locations.

2.2 Moose Lake

Moose Lake (UTM Easting 504171, Northing 6010498) is located immediately west of Bonnyville (Figure 2), in the Churchill River drainage, and has a surface area of 4,080 ha (Government of Alberta 2011). Moose Lake has three basins and its inlet, Thinlake River is located on the west side of the lake, while its outlet, Mooselake River, is located on the north side of the most westerly basin (Ryder 2009). The shoreline is extensively developed with cottages and residential developments, including several public campgrounds and day-use areas. Moose Lake Provincial Park is located centrally, on the north side of the lake.

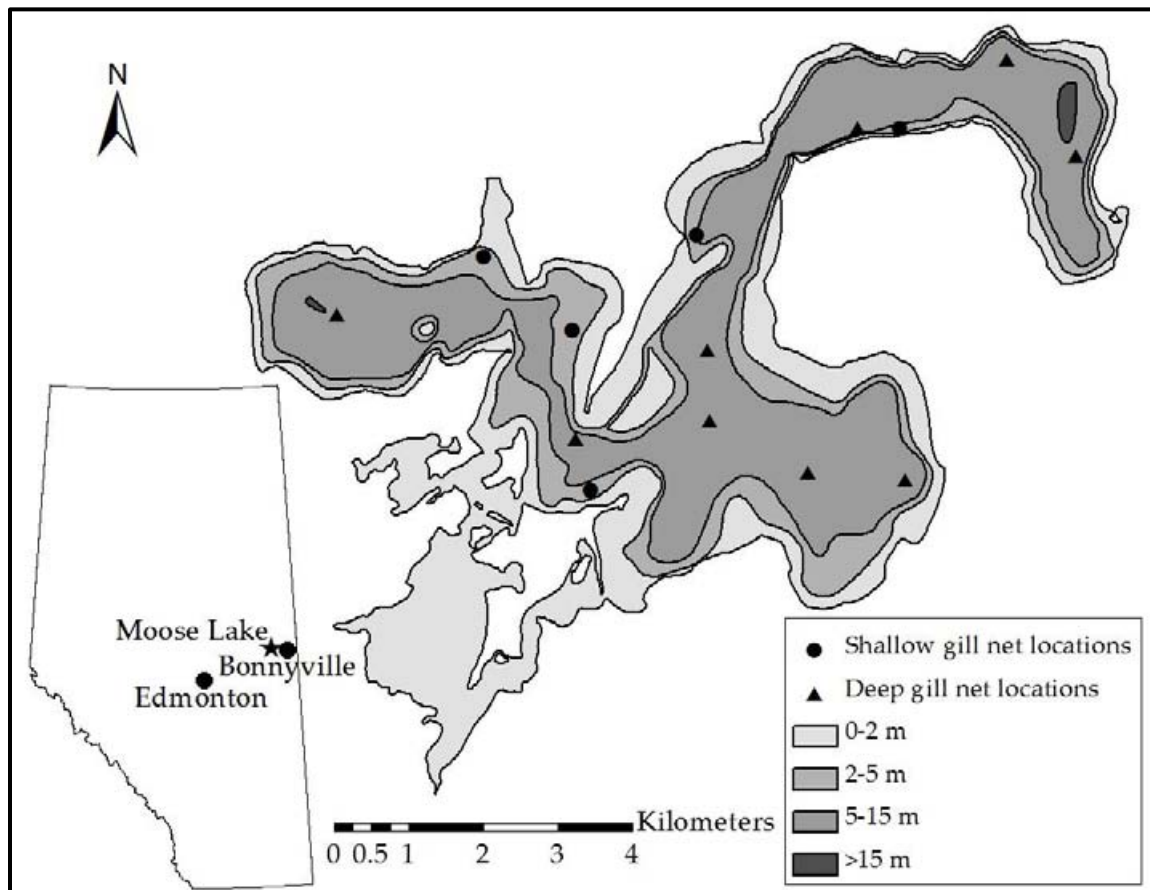


Figure 2. Bathymetric map of Moose Lake, Alberta showing gill net locations.

3.0 MATERIALS AND METHODS

We used gill net surveys to capture walleye in Fawcett and Moose lakes between 16 and 29 September 2011, following Fall Walleye Index Netting (FWIN) protocols (Morgan 2002). Surveys for both lakes were conducted over a short period (3-5 days) when lake surface temperatures ranged from 10-15°C. By ensuring that surveys are completed within a short time period, and under moderate water temperatures, the FWIN approach provides a snapshot of the population structure that minimizes the complications associated with long-term or seasonal variations in growth and age of fish (Morgan 2002).

We captured fish using 61 m x 1.8 m multi-panel monofilament FWIN gill nets that were set for approximately 24 h (range 22-25 h). Each net was composed of eight 7.6 m x 1.8 m panels of eight different mesh sizes (stretched mesh): 25, 38, 51, 64, 76, 102, 127 and 152 mm. Following Morgan (2002), we used a stratified-random sampling design based on surface area and depth zones (shallow: 2-5 m and deep: 5-15 m), to determine the number and location of sampling sites.

We used Hawth's Analysis Tools (version 3.27 in ArcGIS 9.2) to determine sample site locations using the 'generate random points' tool. Distance between random points was restricted to a minimum of 1 km. To reduce sampling bias due to variations in habitat, areas with steep gradients, drop-offs, or heavy vegetation were avoided. We used bathymetric data to calculate ratios of surface area and the two depth strata using ArcGIS (version 9.2). Sampling effort was allocated in proportion to the surface area within each depth zone. Following this procedure, we set 11 nets (3 shallow, 8 deep) at Fawcett Lake (Appendix 1) and 14 nets (5 shallow, 9 deep) at Moose Lake (Appendix 6).

For all sport fish captured, we recorded species, fork length (FL, mm), total length (TL, mm), weight (g), sex and state of maturity. Fish were considered sexually mature if they appeared able to spawn the following spring (Duffy et al. 2000). Otoliths and the first three rays of the left pelvic fin were collected from walleye for age determination, following Mackay et al. (1990). Ageing structures taken from other sport fish included: otoliths for lake whitefish (*Coregonus clupeaformis*) and burbot (*Lota lota*); cleithra and the first three pelvic fin rays for northern pike (*Esox lucius*); and opercula for yellow perch (*Perca flavescens*). For non-sport fish species such as spottail shiners (*Notropis hudsonius*),

cisco (*Coregonus artedii*), and white suckers (*Catostomus commersoni*), we measured FL and TL only.

We used a bootstrap technique to estimate the relative abundance of walleye, expressed as catch-per-unit-effort (CPUE, fish/100 m²/24 h), and associated 95% confidence intervals (95%CI), following procedures in Haddon (2001) and Sullivan (2004). Following the guidelines of the AWMRP, evaluation of demographic attributes (e.g., growth rate, age-at-maturity, age-class stability) was based on the standard size 500 mm TL fish. We used weight-length and length-age plots to identify and investigate outliers. Outliers were omitted if measurement or recording error was suspected. Age-at-maturity was described as the age at which ≥ 50% of the fish were mature (Berry 1995).

We described growth rate of fish using the von Bertalanffy (1938) growth model:

$$L_t = L_\infty (1 - e^{-K(t-t_0)})$$

where,

L_t = length at age t ,

L_∞ = maximum theoretical length that can be attained,

K = coefficient of growth,

t = age, in years (y), and

t_0 = theoretical time (y), when the fish was size zero

L_∞ , K , and t_0 were calculated using the Fishery Analysis Simulation Tools (version 3.0) (Slipke and Maceina 2006).

All data were entered into the ASRD Fish and Wildlife Management Information System.

4.0 RESULTS

4.1 Capture data

4.1.1 *Fawcett Lake*

We captured 180 walleye at Fawcett Lake with an estimated CPUE of 15.3 fish/100 m²/24 h (95%CI = 11.6-18.9, n = 11, Appendix 2). Other species captured included 81 northern pike, 87 yellow perch, 5 lake whitefish, 56 white suckers, 98 cisco, and 2 spottail shiners (Appendix 4). Estimated CPUE and biological data collected from these fish are provided in Appendices 3 and 5, respectively.

4.1.2 *Moose Lake*

We captured 283 walleye at Moose Lake with an estimated CPUE of 19.4 fish/100 m²/24 h (95%CI = 13.9-24.7, n = 14, Appendix 7). Other species captured included 111 northern pike, 280 yellow perch, 12 lake whitefish, 1 burbot, 192 cisco, 6 white suckers, and 3 spottail shiners (Appendix 9). Estimated CPUE and biological data collected from these fish are provided in Appendices 8 and 10, respectively.

4.2 Walleye population structure

4.2.1 *Fawcett Lake*

The size of walleye in Fawcett Lake ranged from 110 to 592 mm TL (Figure 3). The population was dominated primarily by fish 375 to 500 mm TL, which made up 81% (n = 146) of the total catch. Walleye >525 mm TL and <275 mm TL were poorly represented. Fish age ranged from zero (yoy) to 22 y, with a mean (\pm SE) age of 9.1 \pm 0.3 y (n = 180) (Figure 4). Strong age-classes were 7 and 8 y. Based on the AWMRP criteria, the walleye population in Fawcett Lake exhibits a wide (>8 age-classes) and very stable (mean age >9) age-class distribution.

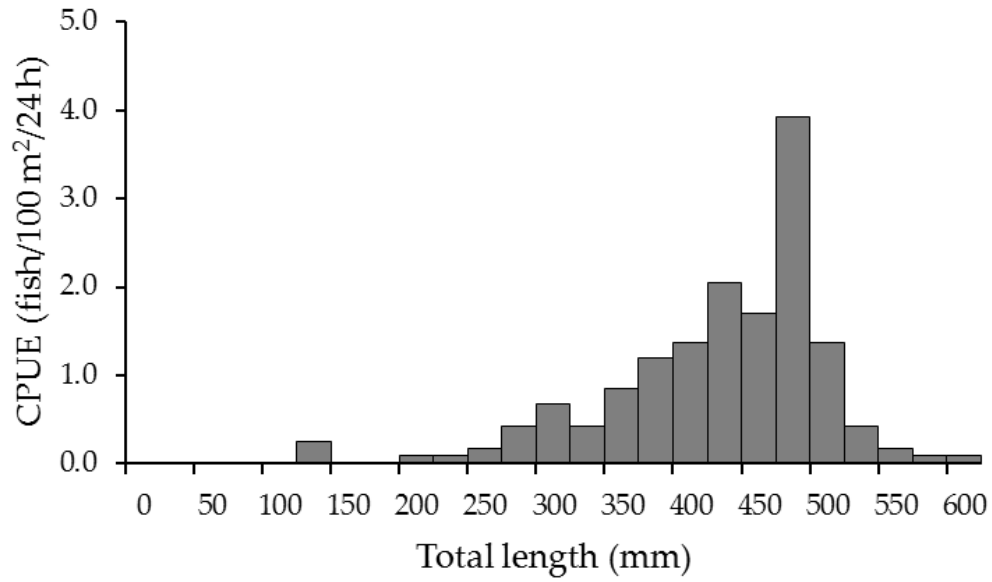


Figure 3. Length distribution of walleye captured from Fawcett Lake, Alberta, 2011. Mean (\pm SE) total length of walleye was 409 ± 6 mm ($n = 180$).

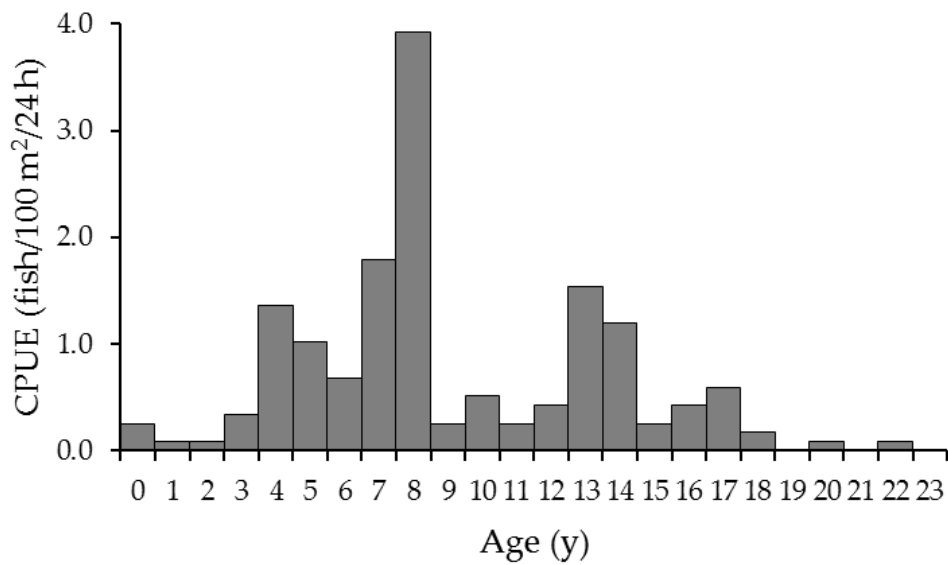


Figure 4. Age-class distribution of walleye captured from Fawcett Lake, Alberta, 2011. Mean (\pm SE) age of walleye was 9.1 ± 0.3 y ($n = 180$).

Overall growth rates were slow for walleye in Fawcett Lake and males grew at a slower rate than females (Figure 5). Estimated (von Bertalanffy growth model) average maximum size (L_{∞}) was 486 mm TL for males and 520 mm TL for females, with corresponding growth coefficients (K) of 0.17 and 0.24, respectively. Thus, based on the von Bertalanffy growth parameters, only female walleye in Fawcett Lake reach the 500 mm TL AWMRP standard size and do so at age 14.

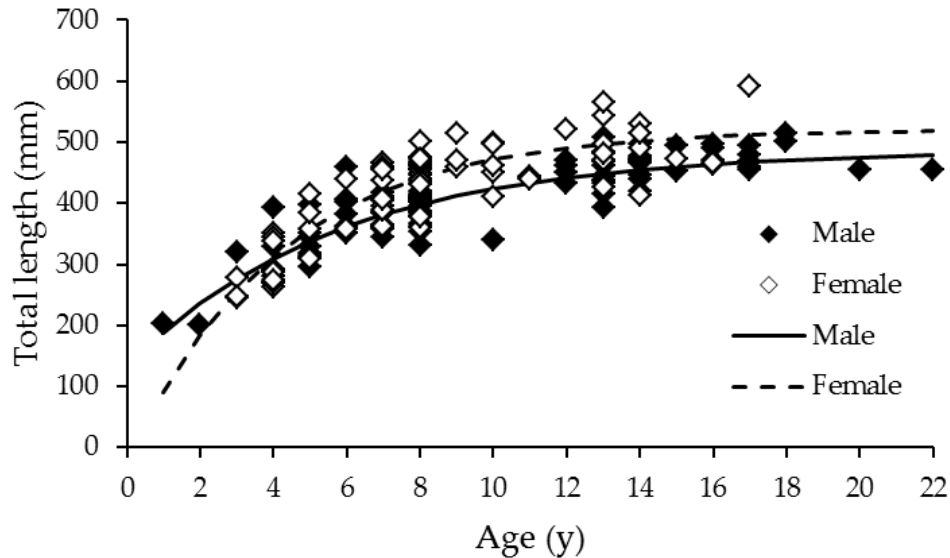


Figure 5. von Bertalanffy growth curves for male and female walleye captured from Fawcett Lake, Alberta, 2011. von Bertalanffy growth parameters; males: $L_{\infty} = 486$, $K = 0.17$, $t_0 = -1.83$, $n = 100$; females: $L_{\infty} = 520$, $K = 0.24$, $t_0 = 0.22$, $n = 77$.

Walleye from Fawcett Lake matured early, with both males and females reaching maturity by age 6 (Figures 6 and 7). Of the 180 walleye captured, 44% were mature males ($n = 80$) and 26% were mature females ($n = 46$).

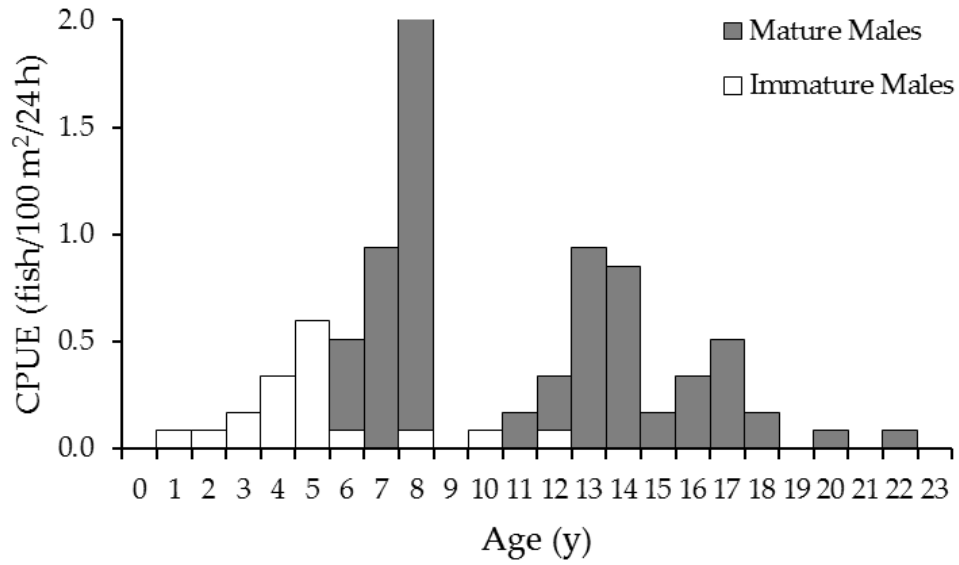


Figure 6. Age-at-maturity of male walleye from Fawcett Lake, Alberta, 2011 (n = 99).

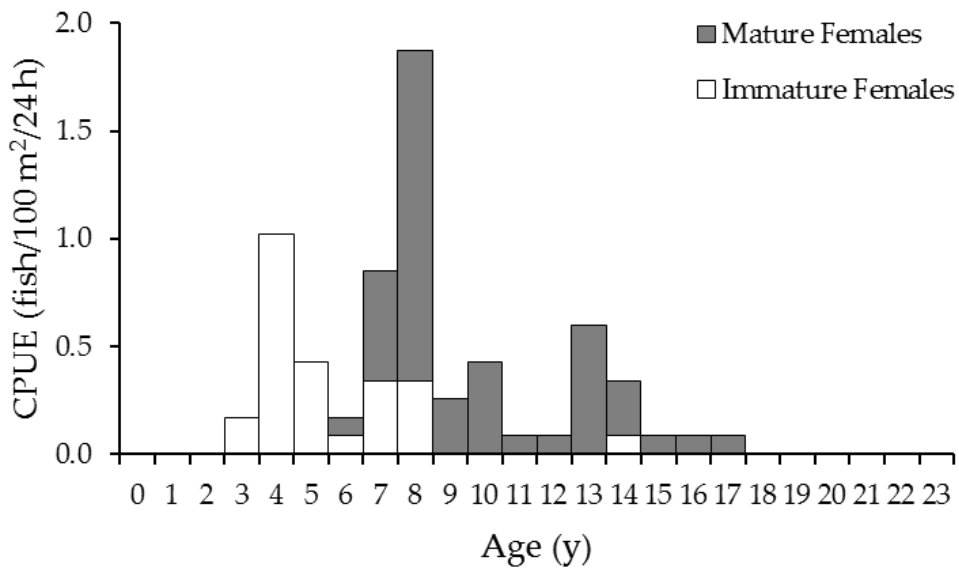


Figure 7. Age-at-maturity of female walleye from Fawcett Lake, Alberta, 2011 (n = 75).

4.2.2 Moose Lake

The size of walleye in Moose Lake ranged from 118 to 650 mm TL, with the majority of the population in the 450 to 550 size ranges (Figure 8); other strong peaks occurred at 125-150 and 250 mm TL. Fish age ranged from zero (yoy) to 21 y, with a mean (\pm SE) age of 6.8 ± 0.3 y ($n = 274$) (Figure 9). The majority of age-classes were well represented with ages zero, 4, and 14 being the most abundant. Based on the AWMRP criteria, the walleye population in Moose Lake exhibits a wide (>8 age-classes) and stable (mean age 6-9) age-class distribution.

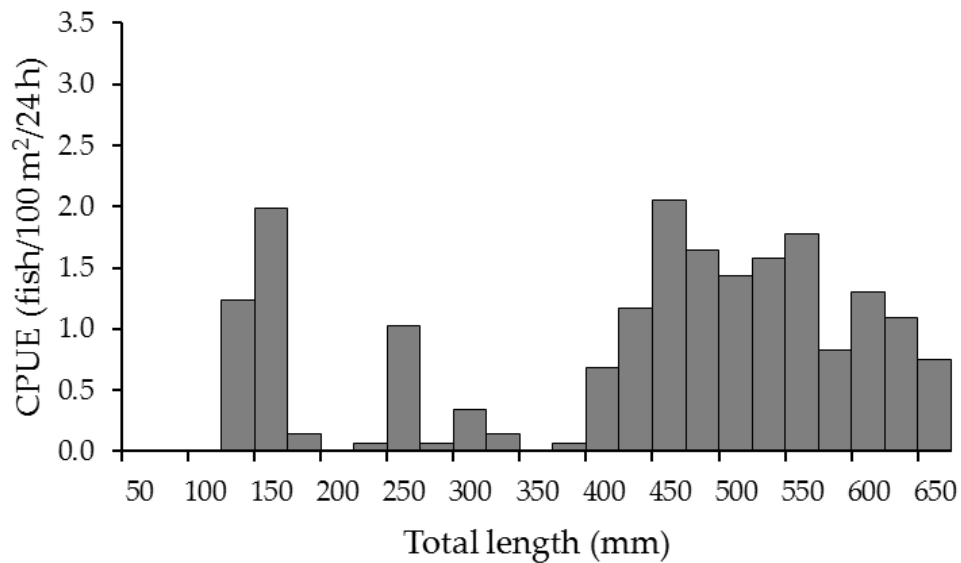


Figure 8. Length distribution of walleye captured from Moose Lake, Alberta, 2011. Mean (\pm SE) total length of walleye was 419 ± 10 mm ($n = 283$).

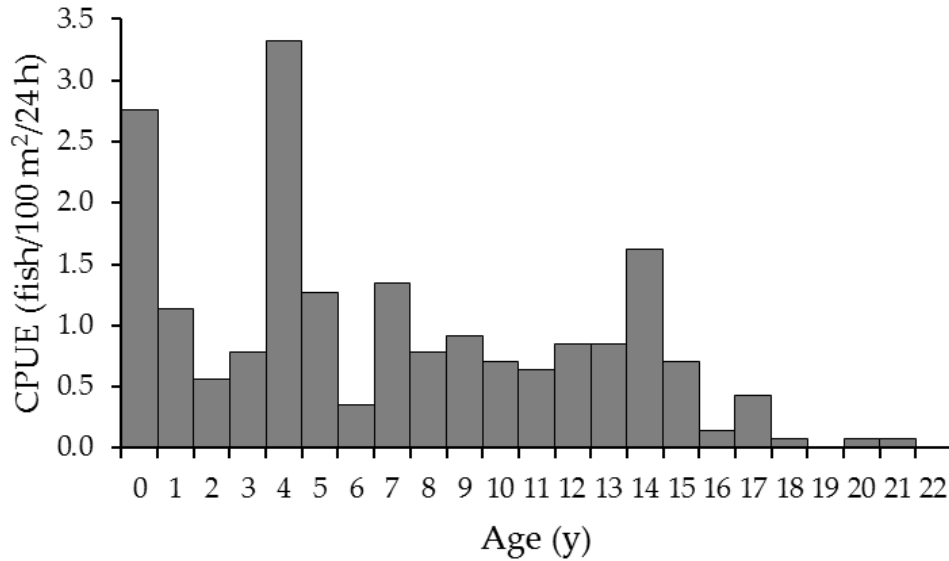


Figure 9. Age-class distribution of walleye captured from Moose Lake, Alberta, 2011. Mean (\pm SE) age of walleye was 6.8 ± 0.3 y ($n = 274$).

The walleye population in Moose Lake exhibited moderate growth rates, with males growing at a slower rate than females (Figure 10). Estimated (von Bertalanffy growth model) average maximum size (L_{∞}) was 538 mm TL for males and 631 mm TL for females, with corresponding growth coefficients (K) of 0.3 and 0.21, respectively. Thus, based on these growth parameters, the average walleye in Moose Lake will attain the 500 mm TL AWMRP standard size by age 7.

Walleye from Moose Lake mature early, with males reaching maturity by age 3 and females by age 5 (Figures 11 and 12). Of the 283 walleye captured, 39% were mature males ($n = 111$) and 23% were mature females ($n = 66$).

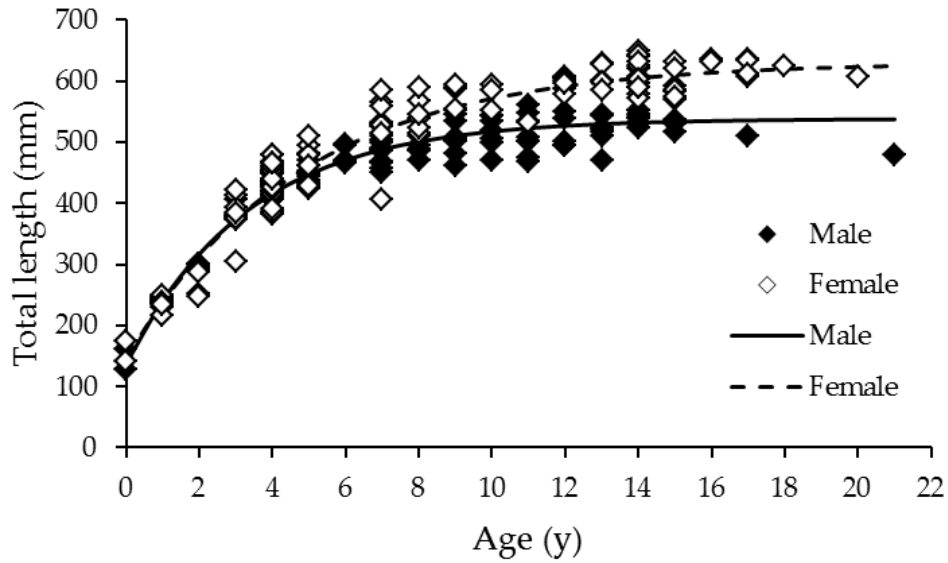


Figure 10. von Bertalanffy growth curves for male and female walleye captured from Moose Lake, Alberta, 2011. von Bertalanffy growth parameters; males: $L_{\infty} = 538$, $K = 0.3$, $t_0 = -0.99$, $n = 129$; females: $L_{\infty} = 631$, $K = 0.21$, $t_0 = -1.26$, $n = 108$.

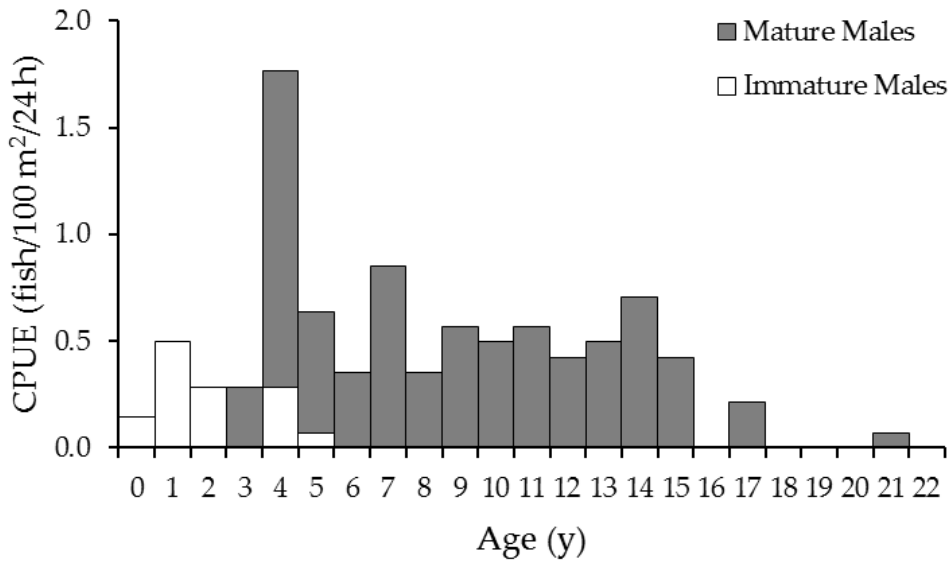


Figure 11. Age-at-maturity of male walleye from Moose Lake, Alberta, 2011 ($n = 129$).

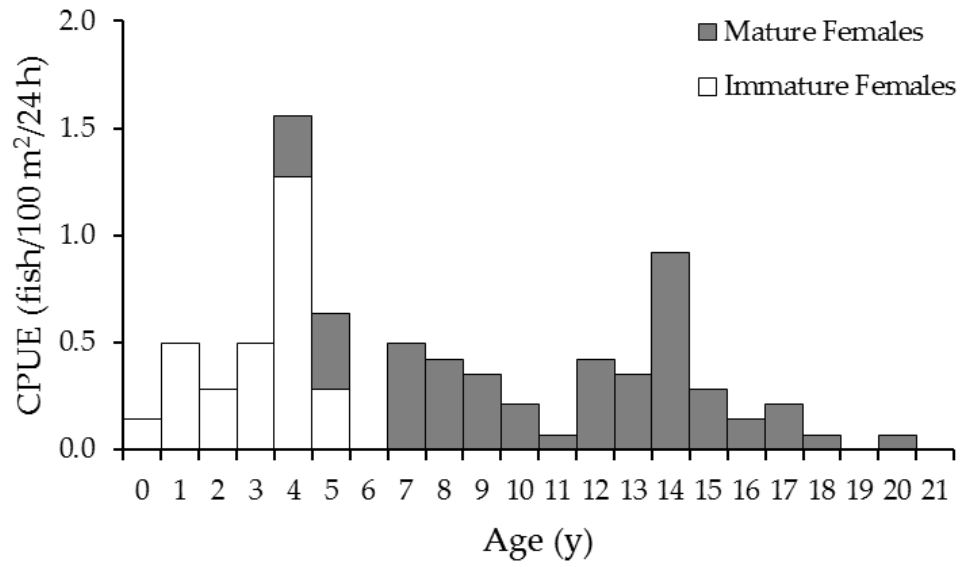


Figure 12. Age-at-maturity of female walleye from Moose Lake, Alberta, 2011 (n = 108).

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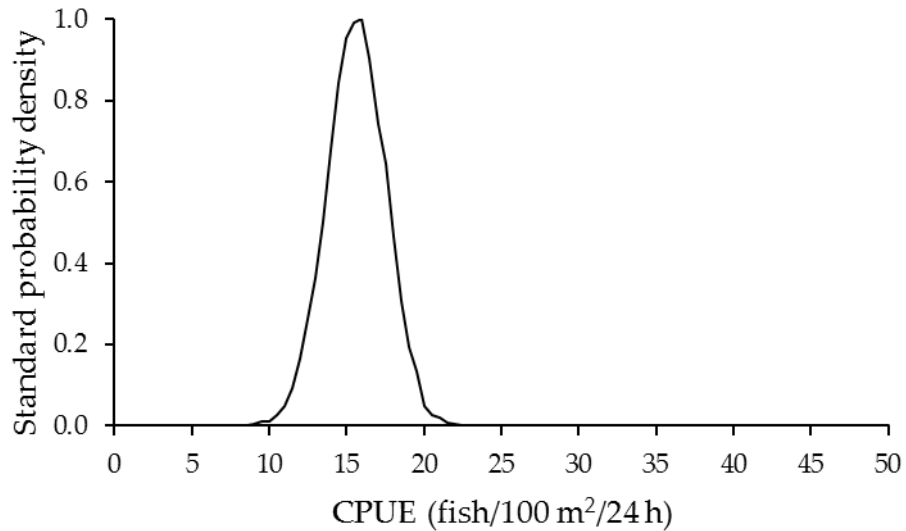
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6.0 APPENDICES

Appendix 1. Summary of gill net locations and set dates for the 2011 Fall Walleye Index Netting survey at Fawcett Lake, Alberta.

Set number	Depth strata	UTM Easting	UTM Northing	Net set date	Net pull date	Net soak time (h)
S9	Shallow	687600	6134280	26-Sep-11	27-Sep-11	22.00
D5	Deep	687877	6133976	26-Sep-11	27-Sep-11	22.00
S10	Shallow	310051	6132602	26-Sep-11	27-Sep-11	21.75
D2	Deep	312541	6132330	27-Sep-11	28-Sep-11	22.67
D8	Deep	314390	6132364	27-Sep-11	28-Sep-11	22.32
S11	Shallow	318687	6133990	27-Sep-11	28-Sep-11	23.42
D3	Deep	317928	6131923	27-Sep-11	28-Sep-11	23.45
D1	Deep	316290	6132217	27-Sep-11	28-Sep-11	24.90
D10	Deep	315238	6131725	28-Sep-11	29-Sep-11	24.27
D4	Deep	313780	6132841	28-Sep-11	29-Sep-11	24.17
D13	Deep	315899	6131859	28-Sep-11	29-Sep-11	24.20

Appendix 2. Standardized probability density function of walleye catch-per-unit-effort (CPUE) from Fawcett Lake, Alberta, 2011. CPUE was 15.3 fish/100 m²/24 h (95%CI = 11.6-18.9, n = 11).



Appendix 3. Catch-per-unit-effort (CPUE) shown as fish/100 m²/24 h with associated 95% confidence intervals (CI) for all fish species captured during the Fall Walleye Index Netting survey at Fawcett Lake, Alberta, 2011.

Species	CPUE	95%CI
Cisco	8.3	5.3 – 11.3
Lake whitefish	0.4	0.0 – 0.9
Northern pike	6.9	4.3 – 10.8
Spottail shiner	0.2	0.0 – 0.5
Walleye	15.3	11.6 – 18.9
White sucker	4.9	3.4 – 6.4
Yellow perch	7.4	4.4 – 10.7

Appendix 4. Catch summary from the 2011 Fall Walleye Index Netting survey at Fawcett Lake, Alberta.

Set number	Walleye	Northern pike	Yellow perch	Lake whitefish	Non-sport fish
D10	18	4	21	0	10
S10	15	6	1	2	14
D13	17	5	15	0	15
D1	20	6	7	0	24
D2	16	2	7	0	13
D3	30	8	7	0	17
D4	23	6	0	0	3
D5	15	3	12	0	10
D8	16	6	6	0	20
S9	7	9	3	2	11
S11	3	26	8	1	19

Appendix 5. Biological data collected from fish captured during the 2011 Fall Walleye Index Netting survey at Fawcett Lake, Alberta. Codes: M = male, F = female, U = unknown, WALL = Walleye, NRPK = Northern pike, YLPR = Yellow perch, LKWH = Lake whitefish, CISC = Cisco, SPSH = Spottail shiner, WHSC = White sucker.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	10	272	292	195	M	Immature	4
WALL	11	255	274	160	F	Immature	4
WALL	12	285	308	250	F	Immature	5
WALL	17	441	466	955	F	Mature	8
WALL	18	396	420	680	M	Mature	8
WALL	19	370	392	490	M	Immature	4
WALL	20	378	401	590	M	Mature	8
WALL	23	324	345	360	M	Immature	5
WALL	24	105	110	11	U	Immature	0
WALL	38	387	410	603	M	Mature	7
WALL	39	350	366	419	M	Mature	8
WALL	40	387	411	604	M	Mature	8
WALL	41	302	320	273	M	Immature	3
WALL	42	396	417	671	M	Mature	7
WALL	43	309	329	288	M	Immature	5
WALL	45	416	439	782	F	Mature	6
WALL	46	344	360	400	F	Immature	8
WALL	47	396	420	649	M	Mature	14
WALL	48	405	431	716	F	Mature	8
WALL	49	485	514	1241	M	Mature	18
WALL	50	361	384	528	M	Mature	7
WALL	51	471	500	1216	F	Mature	8
WALL	53	456	482	992	F	Mature	13
WALL	54	427	462	907	M	Mature	12
WALL	55	436	466	790	F	Mature	16
WALL	56	460	497	1145	M	Mature	14
WALL	58	185	200	53	M	Immature	2
WALL	59	273	292	192	F	Immature	4
WALL	60	434	460	735	M	Mature	6
WALL	61	250	269	154	F	Immature	4

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	62	268	289	193	F	Immature	4
WALL	63	248	269	152	F	Immature	4
WALL	64	333	360	387	M	Mature	7
WALL	68	266	286	197	F	Immature	4
WALL	69	332	357	376	F	Immature	5
WALL	70	410	436	772	F	Mature	7
WALL	71	383	413	610	M	Mature	8
WALL	72	402	432	716	M	Mature	8
WALL	73	326	350	372	F	Immature	4
WALL	77	438	455	878	F	Mature	8
WALL	78	423	455	839	F	Mature	8
WALL	81	435	462	950	F	Mature	8
WALL	82	408	437	805	F	Mature	8
WALL	83	348	362	490	F	Immature	8
WALL	84	450	483	1085	F	Mature	13
WALL	85	386	410	650	F	Mature	10
WALL	86	342	364	420	M	Mature	7
WALL	90	403	432	795	M	Immature	12
WALL	91	407	439	785	F	Mature	11
WALL	92	308	332	300	M	Immature	8
WALL	93	318	340	285	M	Immature	10
WALL	95	363	388	535	F	Immature	7
WALL	96	373	402	590	M	Mature	8
WALL	97	328	357	393	M	Mature	7
WALL	98	259	278	160	F	Immature	3
WALL	99	310	344	299	F	Immature	4
WALL	100	338	362	422	M	Mature	6
WALL	106	353	378	490	F	Immature	8
WALL	108	422	454	795	M	Mature	22
WALL	109	382	408	655	M	Mature	8

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	110	355	379	505	M	Mature	8
WALL	113	409	438	775	M	Mature	13
WALL	114	437	464	975	F	Mature	8
WALL	115	469	495	1115	M	Mature	17
WALL	116	380	407	615	M	Mature	8
WALL	117	290	313	247	F	Immature	5
WALL	118	325	398	350	M	Immature	5
WALL	122	323	350	362	M	Immature	5
WALL	124	440	469	995	M	Mature	13
WALL	133	375	403	625	M	Mature	7
WALL	140	439	468	1010	F	Mature	8
WALL	141	452	472	975	F	Mature	8
WALL	168	435	467	845	M	Mature	17
WALL	169	500	530	1170	F	Mature	14
WALL	170	451	473	1185	F	Mature	15
WALL	171	443	474	950	F	Mature	8
WALL	172	453	471	1085	F	Mature	9
WALL	173	441	465	1015	F	Mature	7
WALL	174	418	445	795	M	Mature	8
WALL	175	438	465	1020	F	Mature	7
WALL	176	445	472	945	M	Mature	14
WALL	182	445	459	855	F	Mature	7
WALL	183	382	408	630	M	Mature	8
WALL	184	489	520	1135	F	Mature	12
WALL	185	392	415	690	M	Mature	8
WALL	188	450	476	915	M	Mature	14
WALL	189	463	500	1130	M	Mature	18
WALL	190	420	443	820	M	Mature	11
WALL	191	438	457	850	F	Mature	7
WALL	192	394	426	780	F	Mature	13

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	193	412	437	720	M	Mature	13
WALL	194	372	394	540	M	Mature	8
WALL	195	450	480	1035	M	Mature	17
WALL	196	431	454	820	F	Mature	7
WALL	197	300	329	295	M	Immature	4
WALL	198	305	337	295	F	Immature	4
WALL	199	250	268	162	F	Immature	4
WALL	200	230	246	127	F	Immature	3
WALL	203	266	287	192	F	Immature	4
WALL	204	190	202	70	M	Immature	1
WALL	209	112	120	13	U	Immature	0
WALL	210	114	121	14	U	Immature	0
WALL	213	378	402	560	M	Mature	8
WALL	221	559	592	1780	F	Mature	17
WALL	222	417	443	820	M	Mature	13
WALL	224	432	459	930	F	Mature	9
WALL	226	425	450	875	F	Mature	10
WALL	228	465	497	1010	F	Mature	10
WALL	229	426	452	915	M	Mature	15
WALL	230	421	449	810	F	Mature	8
WALL	231	430	456	910	F	Mature	8
WALL	232	329	351	380	M	Immature	6
WALL	233	440	470	975	M	Mature	14
WALL	235	425	455	875	F	Mature	8
WALL	236	416	442	820	M	Mature	11
WALL	237	386	408	645	M	Mature	8
WALL	238	380	407	595	M	Mature	8
WALL	239	466	496	1060	M	Mature	16
WALL	240	457	483	1080	M	Mature	13
WALL	241	324	344	390	M	Mature	7

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	242	412	439	840	M	Mature	14
WALL	243	438	462	945	F	Mature	8
WALL	246	459	494	1120	M	Mature	15
WALL	247	460	490	970	M	Mature	16
WALL	248	418	445	835	M	Mature	14
WALL	249	484	514	1240	F	Mature	9
WALL	250	401	433	725	M	Mature	13
WALL	251	436	466	985	M	Mature	14
WALL	252	510	542	1520	F	Mature	13
WALL	253	367	395	555	F	Immature	7
WALL	254	423	451	845	M	Mature	12
WALL	255	442	475	950	F	Mature	8
WALL	257	413	440	770	F	Immature	8
WALL	258	437	468	895	M	Mature	17
WALL	259	352	384	525	M	Mature	7
WALL	260	528	566	1765	F	Mature	13
WALL	261	357	386	535	M	Mature	8
WALL	262	356	384	460	M	Mature	8
WALL	268	348	365	470	M	Mature	7
WALL	288	365	393	505	M	Mature	13
WALL	295	264	281	185	M	Immature	4
WALL	296	291	312	240	M	Immature	5
WALL	297	380	405	565	F	Immature	7
WALL	298	228	244	105	M	Immature	3
WALL	301	446	475	955	F	Mature	8
WALL	302	425	455	790	M	Mature	20
WALL	303	295	318	260	M	Immature	5
WALL	304	423	454	860	M	Mature	17
WALL	307	386	414	680	M	Mature	13
WALL	308	370	401	530	M	Mature	8

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	309	330	362	415	M	Mature	7
WALL	310	440	471	1000	M	Mature	12
WALL	311	458	489	1015	F	Mature	14
WALL	312	444	471	845	M	Mature	16
WALL	313	332	352	355	M	Mature	8
WALL	314	381	407	640	M	Mature	6
WALL	315	430	461	840	F	Mature	10
WALL	316	353	378	535	M	Mature	8
WALL	318	465	497	1160	F	Mature	13
WALL	319	485	515	1315	F	Mature	14
WALL	320	438	467	905	M	Mature	14
WALL	321	441	471	930	M	Mature	13
WALL	322	433	458	880	M	Mature	17
WALL	324	472	499	1100	F	Mature	10
WALL	325	445	475	995	F	Mature	8
WALL	326	434	463	845	M	Mature	16
WALL	327	441	470	950	F	Mature	13
WALL	328	429	461	940	M	Mature	13
WALL	329	488	508	1305	M	Mature	13
WALL	330	441	472	900	M	Mature	14
WALL	331	392	415	640	F	Immature	5
WALL	332	355	386	495	M	Mature	8
WALL	333	360	385	445	F	Immature	5
WALL	337	357	382	545	M	Mature	6
WALL	338	331	357	315	F	Immature	6
WALL	339	336	362	425	F	Immature	7
WALL	342	387	413	625	F	Immature	14
WALL	343	275	296	225	M	Immature	5
WALL	344	242	262	125	F	Immature	4
WALL	357	375	402	620	M	Mature	6

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
NRPK	1	449	478	565	M	Mature	3
NRPK	4	420	449	520	M	Mature	3
NRPK	5	533	556	1035	F	Mature	6
NRPK	7	490	524	810	M	Mature	4
NRPK	8	447	478	555	M	Mature	3
NRPK	9	644	680	1615	F	Mature	8
NRPK	14	488	521	675	F	Mature	3
NRPK	15	565	600	1095	F	Mature	6
NRPK	16	583	624	1385	F	Mature	7
NRPK	22	519	551	925	F	Mature	5
NRPK	37	452	479	564	M	Mature	3
NRPK	44	558	595	999	F	Mature	5
NRPK	52	500	533	571	M	Mature	4
NRPK	65	539	573	1049	F	Mature	5
NRPK	66	554	590	1006	F	Mature	6
NRPK	67	492	524	739	M	Mature	4
NRPK	74	531	564	926	F	Mature	5
NRPK	75	583	622	1140	F	Mature	6
NRPK	76	589	612	1488	F	Mature	5
NRPK	87	494	525	720	F	Mature	4
NRPK	88	521	551	960	F	Mature	5
NRPK	107	590	624	1345	F	Mature	7
NRPK	111	509	545	790	F	Mature	5
NRPK	112	495	526	785	M	Mature	4
NRPK	119	470	502	650	M	Mature	3
NRPK	121	470	511	815	M	Mature	4
NRPK	129	445	471	595	F	Mature	3
NRPK	130	919	962	8260	F	Mature	8
NRPK	132	935	979	6825	F	Mature	9
NRPK	134	498	532	740	F	Immature	4

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
NRPK	135	521	557	970	F	Mature	5
NRPK	136	495	527	850	M	Mature	4
NRPK	137	481	515	765	M	Mature	4
NRPK	138	567	607	1180	F	Mature	6
NRPK	139	474	509	775	M	Mature	3
NRPK	142	450	483	640	F	Mature	3
NRPK	143	539	571	1035	F	Mature	5
NRPK	144	643	683	1575	F	Mature	5
NRPK	145	486	516	830	M	Mature	4
NRPK	146	453	482	585	M	Mature	3
NRPK	147	448	480	635	F	Immature	3
NRPK	148	527	559	950	F	Mature	5
NRPK	149	462	492	690	M	Mature	3
NRPK	150	635	676	1525	F	Mature	7
NRPK	151	510	544	965	F	Mature	4
NRPK	152	583	622	1325	F	Mature	6
NRPK	153	500	534	805	F	Mature	4
NRPK	154	385	415	405	M	Immature	2
NRPK	155	610	651	1320	F	Mature	7
NRPK	156	546	585	1065	F	Mature	5
NRPK	157	543	574	960	F	Mature	5
NRPK	158	503	538	850	M	Mature	4
NRPK	177	435	570	975	F	Mature	5
NRPK	178	500	528	815	M	Mature	4
NRPK	179	469	513	680	M	Mature	4
NRPK	180	615	640	1555	M	Mature	7
NRPK	181	480	509	720	M	Mature	3
NRPK	186	591	628	1190	M	Mature	6
NRPK	187	785	827	3355	F	Mature	11
NRPK	202	441	467	570	F	Mature	3

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
NRPK	223	569	605	1130	F	Mature	6
NRPK	225	535	566	1090	F	Mature	5
NRPK	227	526	559	870	F	Mature	4
NRPK	234	614	651	960	F	Mature	5
NRPK	244	505	539	725	M	Mature	4
NRPK	245	893	940	5605	F	Mature	10
NRPK	256	440	470	555	M	Mature	3
NRPK	265	497	534	720	F	Mature	3
NRPK	266	448	480	566	F	Mature	3
NRPK	267	686	726	2365	F	Mature	8
NRPK	294	482	514	725	M	Mature	3
NRPK	299	455	486	620	M	Mature	3
NRPK	300	553	593	1035	F	Mature	5
NRPK	305	480	509	680	M	Mature	3
NRPK	306	471	504	650	M	Mature	3
NRPK	317	470	504	710	M	Mature	3
NRPK	334	507	539	830	M	Mature	4
NRPK	335	483	514	755	M	Mature	3
NRPK	340	414	443	445	M	Mature	2
NRPK	341	463	491	650	M	Mature	3
NRPK	349	464	495	605	M	Mature	3
CISC	363	298	330	370	U	Undetermined	
CISC	364	105	115	14	U	Undetermined	
CISC	365	110	117	12	U	Undetermined	
CISC	366	203	231	114	U	Undetermined	
CISC	367	264	300	256	U	Undetermined	
CISC	368	267	295	244	U	Undetermined	
CISC	369	289	213	50	U	Undetermined	
CISC	370	258	292	249	U	Undetermined	
CISC	371	338	383	609	U	Undetermined	

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	372	384	434	725	U	Undetermined	
CISC	373	351	401	554	U	Undetermined	
CISC	374	330	358	541	U	Undetermined	
CISC	375	353	395	670	U	Undetermined	
CISC	376	353	399	631	U	Undetermined	
CISC	377	385	430	765	U	Undetermined	
CISC	378	265	301	276	U	Undetermined	
CISC	379	251	285	220	U	Undetermined	
CISC	380	105	119	13	U	Undetermined	
CISC	381	107	122	14	U	Undetermined	
CISC	382	355	409	630	U	Undetermined	
CISC	383	332	374	575	U	Undetermined	
CISC	384	375	420	660	U	Undetermined	
CISC	385	255	286	227	U	Undetermined	
CISC	386	346	392	670	U	Undetermined	
CISC	387	214	241	123	U	Undetermined	
CISC	388	206	234	121	U	Undetermined	
CISC	389	205	234	118	U	Undetermined	
CISC	390	200	237	109	U	Undetermined	
CISC	391	200	230	121	U	Undetermined	
CISC	392	200	228	118	U	Undetermined	
CISC	393	196	224	91	U	Undetermined	
CISC	411	420	468	710	U	Undetermined	
CISC	412	371	419	700	U	Undetermined	
CISC	413	400	444	710	U	Undetermined	
CISC	414	346	389	595	U	Undetermined	
CISC	415	483	426	660	U	Undetermined	
CISC	416	429	489	670	U	Undetermined	
CISC	417	270	308	280	U	Undetermined	
CISC	418	245	278	210	U	Undetermined	

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	419	260	294	240	U	Undetermined	
CISC	420	345	390	615	U	Undetermined	
CISC	421	275	320	270	U	Undetermined	
CISC	422	211	236	127	U	Undetermined	
CISC	423	170	205	81	U	Undetermined	
CISC	424	113	129	17	U	Undetermined	
CISC	425	280	318	306	U	Undetermined	
CISC	426	253	287	216	U	Undetermined	
CISC	427	193	213	88	U	Undetermined	
CISC	428	213	241	136	U	Undetermined	
CISC	429	205	232	119	U	Undetermined	
CISC	430	271	307	297	U	Undetermined	
CISC	431	262	290	237	U	Undetermined	
CISC	432	264	295	270	U	Undetermined	
CISC	433	345	382	650	U	Undetermined	
CISC	434	375	422	650	U	Undetermined	
CISC	435	346	395	590	U	Undetermined	
CISC	436	360	400	650	U	Undetermined	
CISC	437	338	380	590	U	Undetermined	
CISC	438	267	310	285	U	Undetermined	
CISC	439	263	298	250	U	Undetermined	
CISC	440	340	380	575	U	Undetermined	
CISC	441	374	424	725	U	Undetermined	
CISC	442	358	414	630	U	Undetermined	
CISC	443	331	379	530	U	Undetermined	
CISC	444	358	406	545	U	Undetermined	
CISC	445	257	294	234	U	Undetermined	
CISC	446	120	135	18	U	Undetermined	
CISC	447	368	417	690	U	Undetermined	
CISC	448	350	396	705	U	Undetermined	

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	449	352	391	555	U	Undetermined	
CISC	450	272	303	255	U	Undetermined	
CISC	451	354	405	515	U	Undetermined	
CISC	452	269	305	270	U	Undetermined	
CISC	453	327	371	565	U	Undetermined	
CISC	454	299	337	365	U	Undetermined	
CISC	455	280	308	295	U	Undetermined	
CISC	456	345	393	595	U	Undetermined	
CISC	457	203	234	130	U	Undetermined	
CISC	458	196	225	110	U	Undetermined	
CISC	459	185	214	90	U	Undetermined	
CISC	460	194	222	100	U	Undetermined	
CISC	520	371	419	705	U	Undetermined	
CISC	521	365	410	695	U	Undetermined	
CISC	522	337	384	585	U	Undetermined	
CISC	523	368	417	705	U	Undetermined	
CISC	524	350	396	550	U	Undetermined	
CISC	525	326	375	540	U	Undetermined	
CISC	526	351	401	630	U	Undetermined	
CISC	527	354	396	650	U	Undetermined	
CISC	528	308	354	640	U	Undetermined	
CISC	529	345	377	570	U	Undetermined	
CISC	530	378	426	690	U	Undetermined	
CISC	531	374	424	725	U	Undetermined	
CISC	532	348	386	545	U	Undetermined	
CISC	533	255	296	265	U	Undetermined	
CISC	534	380	428	855	U	Undetermined	
CISC	535	306	345	435	U	Undetermined	
CISC	536	270	305	286	U	Undetermined	
LKWH	13	474	519	1450	F	Mature	

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
LKWH	21	486	532	1450	M	Mature	
LKWH	79	468	515	1532	F	Mature	
LKWH	80	492	546	1848	M	Mature	
LKWH	131	500	550	1905	F	Mature	
SPSH	361	96	106	10	U	Undetermined	
SPSH	362	97	106	11	U	Undetermined	
WHSC	461	427	457	1120	U	Undetermined	
WHSC	462	445	472	1365	U	Undetermined	
WHSC	463	441	473	1220	U	Undetermined	
WHSC	464	432	467	1220	U	Undetermined	
WHSC	465	420	449	1975	U	Undetermined	
WHSC	466	440	464	1265	U	Undetermined	
WHSC	467	430	456	1315	U	Undetermined	
WHSC	468	498	529	1825	U	Undetermined	
WHSC	469	460	496	1520	U	Undetermined	
WHSC	470	433	464	1148	U	Undetermined	
WHSC	471	489	524	1589	U	Undetermined	
WHSC	472	432	467	1077	U	Undetermined	
WHSC	473	460	490	1319	U	Undetermined	
WHSC	474	470	502	1483	U	Undetermined	
WHSC	475	441	472	1267	U	Undetermined	
WHSC	476	448	478	1377	U	Undetermined	
WHSC	477	495	541	1884	U	Undetermined	
WHSC	478	519	549	1844	U	Undetermined	
WHSC	479	483	517	1667	U	Undetermined	
WHSC	480	463	497	1555	U	Undetermined	
WHSC	481	398	427	1065	U	Undetermined	
WHSC	482	450	485	1445	U	Undetermined	
WHSC	483	439	467	1290	U	Undetermined	
WHSC	484	477	508	1555	U	Undetermined	

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WHSC	485	433	464	1230	U	Undetermined	
WHSC	486	459	491	1525	U	Undetermined	
WHSC	487	455	480	1315	U	Undetermined	
WHSC	488	495	530	1720	U	Undetermined	
WHSC	489	477	513	1690	U	Undetermined	
WHSC	490	459	502	1720	U	Undetermined	
WHSC	491	402	432	1020	U	Undetermined	
WHSC	492	442	461	1300	U	Undetermined	
WHSC	493	462	500	1550	U	Undetermined	
WHSC	494	415	448	1000	U	Undetermined	
WHSC	495	469	505	1440	U	Undetermined	
WHSC	498	424	457	1155	U	Undetermined	
WHSC	499	480	520	1770	U	Undetermined	
WHSC	500	473	504	1675	U	Undetermined	
WHSC	501	430	451	1175	U	Undetermined	
WHSC	502	428	452	1150	U	Undetermined	
WHSC	503	428	447	1220	U	Undetermined	
WHSC	504	455	486	1475	U	Undetermined	
WHSC	505	390	415	890	U	Undetermined	
WHSC	506	413	445	1095	U	Undetermined	
WHSC	507	438	470	1200	U	Undetermined	
WHSC	508	452	491	1620	U	Undetermined	
WHSC	509	455	486	1455	U	Undetermined	
WHSC	510	448	482	1385	U	Undetermined	
WHSC	511	429	464	1180	U	Undetermined	
WHSC	512	367	394	750	U	Undetermined	
WHSC	513	440	471	1360	U	Undetermined	
WHSC	514	505	537	1885	U	Undetermined	
WHSC	515	539	578	2110	U	Undetermined	
WHSC	516	430	454	1180	U	Undetermined	

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WHSC	517	495	534	1790	U	Undetermined	
WHSC	518	455	482	1335	U	Undetermined	
YLPR	2	101	109	12	F	Immature	1
YLPR	3	144	151	33	F	Immature	2
YLPR	6	185	194	80	F	Immature	4
YLPR	25	88	94	9	U	Undetermined	1
YLPR	26	100	105	12	U	Undetermined	1
YLPR	27	100	104	13	U	Undetermined	2
YLPR	28	93	98	10	U	Undetermined	1
YLPR	29	95	99	11	U	Undetermined	2
YLPR	30	90	96	9	U	Undetermined	1
YLPR	31	181	190	78	F	Immature	3
YLPR	32	140	145	33	F	Immature	3
YLPR	33	143	149	39	F	Immature	3
YLPR	34	138	142	32	F	Immature	3
YLPR	35	190	196	88	F	Immature	3
YLPR	36	191	183	87	F	Immature	3
YLPR	57	95	101	9	M	Mature	1
YLPR	89	187	198	81	M	Mature	3
YLPR	94	98	103	11	F	Immature	1
YLPR	101	137	146	32	M	Mature	2
YLPR	102	112	118	15	F	Immature	1
YLPR	103	96	101	11	M	Mature	1
YLPR	104	96	103	11	F	Immature	1
YLPR	105	98	104	10	M	Mature	1
YLPR	120	185	190	83	F	Mature	3
YLPR	123	130	136	31	F	Mature	2
YLPR	125	94	96	11	M	Mature	1
YLPR	126	90	95	9	M	Mature	1
YLPR	127	91	96	9	M	Immature	1

Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	128	98	101	12	M	Mature	1
YLPR	159	136	142	36	M	Mature	3
YLPR	160	95	102	13	M	Mature	2
YLPR	161	111	116	16	M	Mature	1
YLPR	162	106	112	15	F	Immature	2
YLPR	163	97	103	12	F	Immature	1
YLPR	164	91	95	8	F	Immature	1
YLPR	165	92	96	9	M	Mature	1
YLPR	201	220	230	147	F	Immature	6
YLPR	205	143	150	38	M	Mature	4
YLPR	206	138	145	31	F	Immature	3
YLPR	207	146	152	38	F	Immature	4
YLPR	208	142	145	35	M	Mature	2
YLPR	211	100	105	12	M	Mature	1
YLPR	212	95	100	9	F	Immature	1
YLPR	214	102	110	14	M	Mature	1
YLPR	215	150	154	53	F	Mature	2
YLPR	216	139	147	33	M	Mature	2
YLPR	217	165	173	57	F	Immature	2
YLPR	218	131	140	28	M	Mature	3
YLPR	219	94	98	9	F	Immature	1
YLPR	220	193	203	100	F	Mature	3
YLPR	263	221	231	150	F	Mature	3
YLPR	264	275	282	305	F	Mature	6
YLPR	269	190	200	84	F	Mature	4
YLPR	270	188	196	82	F	Immature	3
YLPR	271	179	187	80	F	Immature	3
YLPR	272	184	194	80	M	Mature	4
YLPR	273	189	197	82	F	Immature	3
YLPR	274	195	204	102	F	Mature	3

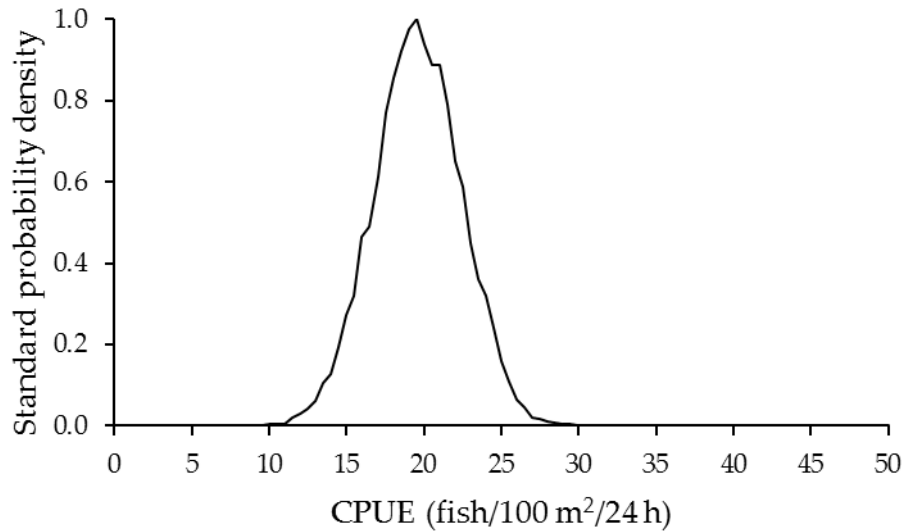
Appendix 5. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	275	229	240	176	F	Mature	5
YLPR	276	142	150	37	F	Immature	3
YLPR	277	142	148	37	M	Mature	3
YLPR	278	140	149	34	M	Mature	3
YLPR	279	149	156	42	M	Mature	3
YLPR	280	148	156	41	M	Mature	3
YLPR	281	175	184	67	F	Immature	4
YLPR	282	191	200	88	F	Immature	4
YLPR	283	100	104	11	M	Mature	2
YLPR	284	94	99	9	F	Immature	1
YLPR	285	95	100	10	U	Immature	2
YLPR	286	98	104	11	M	Mature	1
YLPR	287	98	104	10	M	Mature	1
YLPR	336	275	287	280	F	Mature	7
YLPR	345	217	228	100	F	Mature	5
YLPR	346	202	209	105	F	Mature	3
YLPR	347	191	200	90	F	Immature	3
YLPR	348	170	179	120	F	Immature	4
YLPR	350	134	140	35	M	Mature	3
YLPR	351	140	147	35	F	Immature	3
YLPR	352	150	156	40	F	Immature	3
YLPR	353	133	140	30	M	Mature	3
YLPR	354	133	140	30	F	Immature	2
YLPR	355	139	150	40	M	Immature	3
YLPR	356	137	145	35	F	Immature	2
YLPR	358	148	155	80	F	Immature	3
YLPR	359	93	100	10	M	Mature	2
YLPR	360	104	109	15	M	Mature	1

Appendix 6. Summary of gill net locations and set dates for the 2011 Fall Walleye Index Netting survey at Moose Lake, Alberta.

Set number	Depth strata	UTM Easting	UTM Northing	Net set date	Net pull date	Net soak time (h)
D2	Deep	510062	6015135	16-Sep-11	17-Sep-11	20.75
S4	Shallow	504150	6009793	16-Sep-11	17-Sep-11	21.08
D9	Deep	508398	6009564	17-Sep-11	18-Sep-11	21.48
D3	Deep	503972	6010363	17-Sep-11	18-Sep-11	24.63
D7	Deep	505815	6011455	17-Sep-11	18-Sep-11	24.47
D8	Deep	510911	6013760	18-Sep-11	19-Sep-11	22.08
D16	Deep	506920	6009565	18-Sep-11	19-Sep-11	22.83
S1	Shallow	502906	6012864	17-Sep-11	18-Sep-11	24.18
D5	Deep	500907	6012222	17-Sep-11	18-Sep-11	23.67
S7	Shallow	505830	6013115	17-Sep-11	18-Sep-11	23.35
S9	Shallow	508677	6014235	18-Sep-11	19-Sep-11	22.50
D15	Deep	505814	6010510	18-Sep-11	19-Sep-11	22.02
S6	Shallow	504052	6011834	18-Sep-11	19-Sep-11	23.68
D4	Deep	507988	6014303	18-Sep-11	19-Sep-11	22.72

Appendix 7. Standardized probability density function of walleye catch-per-unit-effort (CPUE) from Moose Lake, Alberta, 2011. CPUE was 19.4 fish/100 m²/24 h (95%CI = 13.9-24.7, n = 14).



Appendix 8. Catch-per-unit-effort (CPUE) shown as fish/100 m²/24 h with associated 95% confidence intervals (CI) for all fish species captured during the Fall Walleye Index Netting survey at Moose Lake, Alberta, 2011.

Species	CPUE	95%CI
Cisco	13.1	8.0 – 18.5
Lake whitefish	0.8	0.2 – 1.6
Northern pike	7.5	4.6 – 10.6
Spottail shiner	0.2	0.0 – 0.4
Walleye	19.4	13.9 – 24.7
White sucker	0.4	0.1 – 0.7
Yellow perch	18.8	11.1 – 26.8

Appendix 9. Catch summary from the 2011 Fall Walleye Index Netting survey at Moose Lake, Alberta.

Set number	Walleye	Northern pike	Yellow perch	Lake whitefish	Non-sport fish
D15	35	3	9	4	2
F16	23	5	39	0	23
S1	13	18	15	0	4
D2	7	0	0	0	12
D3	18	14	49	1	40
D4	31	2	42	0	26
S4	6	17	21	0	6
D5	7	2	0	0	26
S6	5	16	24	1	7
D7	37	6	41	2	4
S7	23	13	1	0	3
D8	19	2	2	0	21

Appendix 10. Biological data collected from fish captured during the 2011 Fall Walleye Index Netting survey at Moose Lake, Alberta. Codes: M = male, F = female, U = unknown, WALL = Walleye, NRPK = Northern pike, CISC = Cisco, YLPR = Yellow perch, LKWH = Lake whitefish, BURB = Burbot, SPSH = Spottail shiner, WHSC = White sucker.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	33	562	593	1935	F	Mature	10
WALL	34	559	586	1910	F	Mature	10
WALL	35	521	552	1630	F	Mature	10
WALL	37	119	127	15	U	Immature	1
WALL	38	122	131	16	U	Immature	
WALL	39	121	129	16	U	Immature	
WALL	46	522	551	1530	F	Mature	9
WALL	70	574	604	1985	F	Mature	12
WALL	109	522	550	1455	M	Mature	12
WALL	110	476	507	1260	M	Mature	11
WALL	111	459	485	1240	M	Mature	8
WALL	112	570	601	1910	F	Mature	13
WALL	113	490	526	1475	M	Mature	7
WALL	129	113	123	12	U	Immature	0
WALL	130	125	130	16	U	Immature	0
WALL	131	114	123	13	U	Immature	0
WALL	132	116	125	15	U	Immature	0
WALL	138	152	161	31	M	Immature	0
WALL	139	229	246	133	F	Immature	2
WALL	140	282	301	219	M	Immature	2
WALL	141	220	235	114	M	Immature	1
WALL	142	235	251	132	M	Immature	2
WALL	143	281	300	225	M	Immature	2
WALL	144	537	568	1635	F	Mature	8
WALL	150	399	420	670	M	Mature	4
WALL	151	275	295	207	F	Immature	2
WALL	152	505	538	1470	F	Mature	8
WALL	153	597	630	2010	F	Mature	13
WALL	154	533	511	1430	M	Mature	17
WALL	155	402	426	730	F	Immature	5

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	156	443	470	920	M	Mature	6
WALL	157	401	426	735	M	Mature	4
WALL	158	396	420	675	F	Immature	4
WALL	159	123	132	19	U	Immature	0
WALL	162	595	625	2010	F	Mature	18
WALL	163	555	587	1735	F	Mature	9
WALL	164	464	487	1025	M	Mature	7
WALL	165	465	495	1135	M	Mature	12
WALL	166	411	437	765	M	Mature	5
WALL	167	432	461	1035	M	Mature	9
WALL	169	591	624	2050	F	Mature	14
WALL	186	602	640	2199	F	Mature	14
WALL	191	488	516	1289	M	Mature	15
WALL	192	451	480	1011	M	Mature	5
WALL	193	417	443	784	M	Mature	5
WALL	194	358	380	469	M	Mature	3
WALL	197	503	530	1491	M	Mature	15
WALL	198	443	470	1031	M	Mature	8
WALL	199	420	495	1225	F	Mature	5
WALL	200	463	470	1171	M	Mature	10
WALL	201	434	459	912	F	Mature	4
WALL	202	455	487	1074	M	Mature	8
WALL	203	622	650	2891	F	Mature	14
WALL	204	601	634	2209	F	Mature	17
WALL	206	467	475	1214	M	Mature	11
WALL	231	416	431	731	F	Immature	5
WALL	232	505	535	1377	M	Mature	9
WALL	246	132	142	22	F	Immature	0
WALL	247	120	128	17	M	Immature	0
WALL	259	445	468	890	M	Immature	4

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	260	410	434	770	M	Mature	4
WALL	262	580	611	2180	M	Mature	17
WALL	263	527	560	1670	M	Mature	11
WALL	264	592	621	2090	M	Mature	14
WALL	266	607	636	2110	M	Mature	17
WALL	267	413	438	865	M	Immature	4
WALL	268	412	439	800	F	Immature	4
WALL	269	428	454	870	F	Immature	4
WALL	270	359	380	525	F	Immature	3
WALL	279	110	120	12	U	Immature	0
WALL	280	109	119	12	U	Immature	0
WALL	281	121	135	18	U	Immature	0
WALL	282	123	132	15	U	Immature	0
WALL	283	125	134	13	U	Immature	
WALL	284	115	124	15	U	Immature	
WALL	285	110	119	14	U	Immature	
WALL	286	117	123	14	U	Immature	0
WALL	287	121	129	16	U	Immature	0
WALL	288	119	127	15	U	Immature	
WALL	289	125	134	15	U	Immature	0
WALL	290	118	127	15	U	Immature	0
WALL	291	219	237	103	F	Immature	1
WALL	301	424	453	925	M	Mature	5
WALL	302	443	468	1020	M	Mature	11
WALL	303	557	578	1890	F	Mature	14
WALL	304	471	501	1130	M	Mature	12
WALL	305	470	500	1095	M	Mature	11
WALL	317	485	514	1335	F	Mature	8
WALL	318	420	447	790	F	Immature	4
WALL	319	433	461	920	M	Mature	4

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	323	120	128	15	U	Immature	0
WALL	324	118	125	17	U	Immature	0
WALL	325	219	233	107	U	Immature	1
WALL	335	224	238	118	F	Immature	1
WALL	337	222	237	124	M	Immature	1
WALL	338	389	413	640	M	Immature	4
WALL	342	415	479	780	M	Mature	4
WALL	343	228	242	126	F	Immature	1
WALL	344	562	590	1926	F	Mature	8
WALL	345	385	407	604	M	Mature	3
WALL	346	463	490	1031	M	Mature	7
WALL	347	405	428	744	F	Immature	4
WALL	348	468	405	1173	F	Mature	7
WALL	349	355	376	415	F	Immature	3
WALL	350	276	292	214	F	Immature	2
WALL	353	555	586	1971	F	Mature	15
WALL	354	564	596	1925	F	Mature	14
WALL	355	424	450	855	F	Immature	4
WALL	356	550	574	1711	F	Mature	15
WALL	357	576	607	1852	F	Mature	17
WALL	358	580	612	1910	F	Mature	17
WALL	360	575	607	1910	F	Mature	20
WALL	362	108	118	17	U	Undetermined	0
WALL	363	118	127	15	U	Undetermined	
WALL	364	113	122	16	U	Undetermined	0
WALL	374	490	524	1455	F	Mature	8
WALL	391	119	129	15	U	Undetermined	0
WALL	392	114	123	13	U	Undetermined	0
WALL	393	117	126	14	U	Undetermined	0
WALL	394	405	424	725	M	Mature	5

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	395	425	450	862	M	Mature	4
WALL	396	426	454	820	M	Mature	4
WALL	397	403	431	786	M	Mature	4
WALL	398	282	300	239	M	Immature	2
WALL	399	212	217	102	F	Immature	1
WALL	408	539	566	1868	F	Mature	7
WALL	409	508	533	1444	F	Mature	7
WALL	410	453	481	1062	M	Mature	9
WALL	411	595	628	2317	F	Mature	13
WALL	412	554	588	1635	M	Mature	12
WALL	414	494	523	1221	M	Mature	14
WALL	415	360	385	522	F	Immature	4
WALL	416	408	432	735	M	Mature	4
WALL	417	417	439	800	F	Mature	4
WALL	418	403	425	756	M	Mature	4
WALL	421	433	467	962	M	Mature	6
WALL	422	517	545	1448	F	Mature	8
WALL	423	410	436	775	F	Immature	4
WALL	514	508	539	1422	M	Mature	12
WALL	515	561	578	1841	F	Mature	12
WALL	524	116	124	15	U	Immature	
WALL	547	438	462	1010	F	Mature	5
WALL	558	498	527	1405	F	Mature	7
WALL	559	489	530	1325	M	Mature	14
WALL	560	422	448	795	M	Mature	4
WALL	561	380	407	635	M	Mature	4
WALL	562	389	410	605	M	Mature	4
WALL	563	553	582	1835	M	Mature	15
WALL	564	480	505	1280	M	Mature	10
WALL	565	570	604	2105	F	Mature	14

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	566	531	555	1655	F	Mature	9
WALL	567	500	529	1410	M	Mature	7
WALL	568	451	479	1125	F	Mature	5
WALL	572	540	570	1731	M	Mature	15
WALL	573	395	435	688	M	Mature	4
WALL	574	540	571	1635	F	Mature	14
WALL	575	555	589	1991	F	Mature	9
WALL	576	485	514	1188	F	Mature	7
WALL	577	517	547	1456	M	Mature	11
WALL	578	510	540	1428	M	Mature	14
WALL	579	505	531	1406	M	Mature	14
WALL	580	467	495	1211	M	Mature	12
WALL	581	491	523	1395	M	Mature	13
WALL	584	508	542	1333	M	Mature	10
WALL	585	527	558	1604	F	Mature	7
WALL	586	560	591	1844	M	Mature	15
WALL	587	517	545	1473	M	Mature	13
WALL	591	485	510	1330	M	Mature	7
WALL	592	475	501	1211	M	Mature	11
WALL	593	430	456	913	M	Mature	7
WALL	594	489	520	1411	M	Mature	13
WALL	595	482	501	1238	M	Mature	9
WALL	596	475	503	1206	M	Mature	9
WALL	606	605	642	2370	F	Mature	14
WALL	607	555	585	1775	F	Mature	7
WALL	608	513	544	1338	M	Mature	10
WALL	609	522	551	1653	M	Mature	14
WALL	610	507	535	1482	M	Mature	11
WALL	611	610	635	2323	F	Mature	16
WALL	612	525	607	2097	F	Mature	12

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	613	467	471	1154	M	Mature	13
WALL	633	101	121	15	U	Immature	0
WALL	634	121	129	15	U	Immature	0
WALL	635	121	131	16	U	Immature	0
WALL	636	117	126	15	U	Immature	0
WALL	637	114	122	13	U	Immature	0
WALL	638	116	121	13	U	Immature	
WALL	639	114	123	13	U	Immature	0
WALL	641	164	175	42	F	Immature	0
WALL	649	232	249	128	F	Immature	1
WALL	650	223	240	111	M	Immature	1
WALL	651	504	530	1390	M	Mature	14
WALL	652	476	507	1129	M	Mature	9
WALL	655	455	486	970	M	Mature	7
WALL	656	442	466	855	F	Mature	4
WALL	657	392	412	635	F	Immature	3
WALL	658	471	499	1115	M	Mature	10
WALL	663	412	436	680	F	Immature	4
WALL	664	442	465	900	F	Mature	4
WALL	665	572	604	2075	F	Mature	12
WALL	666	473	504	1375	M	Mature	9
WALL	667	566	598	1975	F	Mature	13
WALL	668	426	450	810	M	Mature	4
WALL	669	454	481	1075	M	Mature	5
WALL	670	486	504	1165	M	Mature	7
WALL	671	456	480	995	F	Immature	4
WALL	672	506	535	1380	M	Mature	10
WALL	673	579	608	2075	F	Mature	14
WALL	674	509	544	1655	M	Mature	13
WALL	675	559	589	1810	F	Mature	14

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	676	598	631	1900	F	Mature	14
WALL	677	604	632	2265	F	Mature	16
WALL	756	392	416	675	F	Immature	4
WALL	759	353	377	478	M	Mature	3
WALL	760	448	478	1082	M	Mature	21
WALL	761	508	531	1291	F	Mature	11
WALL	762	364	387	530	M	Mature	4
WALL	763	506	537	1483	M	Mature	15
WALL	764	569	602	2365	F	Mature	14
WALL	765	426	453	836	F	Immature	4
WALL	766	384	405	559	M	Mature	4
WALL	768	227	241	121	M	Immature	1
WALL	769	443	465	1026	M	Mature	6
WALL	770	571	601	1804	F	Mature	12
WALL	772	355	374	498	M	Mature	3
WALL	773	420	430	740	F	Immature	4
WALL	774	356	381	517	M	Mature	4
WALL	775	402	422	707	F	Immature	4
WALL	776	439	467	889	M	Mature	7
WALL	777	395	419	684	M	Mature	4
WALL	778	422	447	827	M	Immature	5
WALL	779	470	498	1089	M	Mature	7
WALL	780	490	519	1566	M	Mature	10
WALL	781	513	545	1536	M	Mature	14
WALL	782	560	589	1939	F	Mature	14
WALL	783	556	594	1854	F	Mature	9
WALL	784	516	545	1518	M	Mature	9
WALL	785	485	511	1307	M	Mature	13
WALL	786	599	632	2008	F	Mature	15
WALL	787	386	415	670	M	Mature	4

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	788	566	595	1996	F	Mature	12
WALL	791	597	620	2194	F	Mature	15
WALL	801	122	131	15	U	Immature	0
WALL	802	122	130	16	U	Immature	0
WALL	803	138	145	22	U	Immature	0
WALL	804	119	130	18	U	Immature	0
WALL	805	125	135	18	U	Immature	0
WALL	807	445	470	950	M	Mature	5
WALL	808	401	426	707	F	Immature	5
WALL	818	400	426	781	F	Immature	4
WALL	821	234	246	132	M	Immature	1
WALL	822	214	229	122	M	Immature	1
WALL	845	425	450	865	M	Mature	7
WALL	846	124	133	17	U	Immature	0
WALL	847	109	118	13	U	Immature	0
WALL	848	125	135	17	U	Immature	0
WALL	849	121	130	14	U	Immature	0
WALL	880	224	239	113	F	Immature	1
WALL	881	220	234	104	F	Immature	1
WALL	882	405	432	710	M	Mature	5
WALL	883	408	429	755	F	Immature	5
WALL	884	288	304	236	F	Immature	3
WALL	885	382	405	620	M	Mature	4
WALL	886	408	434	755	F	Immature	4
WALL	905	239	245	126	M	Immature	1
WALL	906	268	287	185	F	Immature	2
WALL	907	366	392	485	F	Immature	3
WALL	908	482	510	1185	F	Mature	5
WALL	912	363	383	540	F	Immature	3
WALL	913	390	422	715	F	Immature	3

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
WALL	914	468	497	1155	M	Mature	6
WALL	915	469	494	1075	M	Mature	6
WALL	916	434	461	1125	F	Mature	5
WALL	917	483	511	1245	M	Mature	8
WALL	918	486	517	1230	M	Mature	13
WALL	920	401	427	660	F	Immature	4
WALL	921	365	390	515	F	Immature	4
WALL	922	414	439	480	M	Immature	4
WALL	923	525	553	1535	M	Mature	14
WALL	924	467	495	1260	M	Mature	8
WALL	925	439	466	975	M	Mature	7
WALL	926	556	586	2035	F	Mature	13
WALL	927	511	539	1485	M	Mature	14
NRPK	75	592	632	1130	F	Mature	8
NRPK	76	610	648	1375	F	Mature	9
NRPK	82	500	525	1095	M	Mature	4
NRPK	83	555	591	1175	M	Mature	8
NRPK	84	442	473	660	M	Mature	3
NRPK	85	542	580	1100	M	Mature	7
NRPK	96	217	231	82	F	Immature	1
NRPK	97	528	559	1125	M	Mature	7
NRPK	98	610	641	1235	F	Mature	9
NRPK	99	523	555	1085	M	Mature	6
NRPK	102	540	574	1160	M	Mature	7
NRPK	103	525	560	1105	M	Mature	6
NRPK	104	570	608	1265	F	Mature	8
NRPK	105	624	661	1700	F	Mature	11
NRPK	106	531	564	1185	F	Mature	6
NRPK	107	507	540	850	F	Mature	4
NRPK	108	573	611	1335	M	Mature	9

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
NRPK	133	510	543	1010	M	Mature	7
NRPK	148	538	572	1115	M	Mature	6
NRPK	149	540	583	1170	F	Mature	7
NRPK	160	525	561	950	F	Mature	5
NRPK	161	555	596	1230	M	Mature	8
NRPK	168	651	682	1485	F	Mature	10
NRPK	182	935	991	6560	F	Mature	14
NRPK	183	580	623	1375	F	Mature	9
NRPK	184	500	540	955	M	Mature	4
NRPK	185	555	599	1423	M	Mature	7
NRPK	188	575	615	1325	M	Mature	9
NRPK	189	495	526	942	F	Mature	5
NRPK	190	479	514	808	F	Mature	4
NRPK	196	575	616	1123	F	Mature	7
NRPK	205	450	481	731	F	Mature	3
NRPK	229	578	615	1409	F	Mature	9
NRPK	230	505	541	949	M	Mature	6
NRPK	243	635	669	1712	F	Mature	11
NRPK	244	611	645	1423	F	Mature	10
NRPK	245	850	893	4560	F	Mature	15
NRPK	271	567	605	1290	F	Mature	8
NRPK	272	566	603	1235	F	Mature	6
NRPK	320	556	594	1285	M	Mature	8
NRPK	321	554	582	1170	M	Mature	7
NRPK	322	617	656	1480	M	Mature	10
NRPK	336	600	638	1400	F	Mature	8
NRPK	351	528	562	1093	M	Mature	6
NRPK	361	763	806	2789	F	Mature	13
NRPK	375	600	642	1298	F	Mature	9
NRPK	400	628	666	1984	F	Mature	12

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
NRPK	401	626	666	1265	F	Mature	8
NRPK	413	497	530	868	F	Mature	ns
NRPK	424	533	569	1012	M	Mature	6
NRPK	426	590	631	1301	F	Mature	9
NRPK	527	536	569	985	F	Mature	5
NRPK	528	553	592	1270	F	Mature	5
NRPK	529	547	574	1330	M	Mature	8
NRPK	530	333	358	250	F	Immature	2
NRPK	531	246	265	105	M	Immature	1
NRPK	532	249	271	110	M	Mature	1
NRPK	542	561	602	1420	F	Mature	5
NRPK	543	572	605	1370	F	Mature	6
NRPK	544	550	585	1280	F	Mature	6
NRPK	545	587	624	1460	M	Mature	6
NRPK	546	506	541	905	M	Mature	4
NRPK	552	628	672	1875	F	Mature	7
NRPK	553	600	632	1590	F	Mature	9
NRPK	554	634	675	1750	F	Mature	8
NRPK	555	514	550	975	M	Mature	4
NRPK	556	505	541	960	M	Mature	4
NRPK	557	491	520	850	M	Mature	4
NRPK	569	593	636	1480	F	Mature	8
NRPK	570	519	555	942	F	Mature	4
NRPK	571	510	545	925	M	Mature	4
NRPK	582	590	630	1481	F	Mature	8
NRPK	588	490	523	858	M	Mature	4
NRPK	589	645	687	1278	F	Mature	8
NRPK	590	494	529	813	M	Mature	4
NRPK	597	545	580	1162	M	Mature	6
NRPK	598	490	525	916	F	Mature	4

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
NRPK	599	545	588	1184	F	Mature	6
NRPK	600	554	590	1180	M	Mature	6
NRPK	601		648	1288	F	Mature	8
NRPK	602	555	599	1226	F	Mature	6
NRPK	603	460	493	700	M	Mature	3
NRPK	604	547	585	1090	F	Mature	5
NRPK	605	857	902	5925	F	Mature	14
NRPK	640	632	674	1740	F	Immature	8
NRPK	653	529	561	1055	M	Mature	6
NRPK	654	560	600	1190	M	Mature	6
NRPK	659	531	566	1070	M	Mature	4
NRPK	660	472	505	800	M	Mature	4
NRPK	661	572	619	1280	F	Mature	5
NRPK	662	554	588	1240	F	Mature	5
NRPK	755	644	683	1777	F	Mature	9
NRPK	757	616	657	1525	F	Mature	9
NRPK	771	574	609	1231	F	Mature	7
NRPK	809	510	543	953	M	Mature	4
NRPK	810	504	544	961	M	Mature	4
NRPK	811	552	590	1158	F	Mature	5
NRPK	812	537	569	1095	M	Mature	4
NRPK	813	572	607	1279	F	Mature	6
NRPK	814	577	612	1375	F	Mature	7
NRPK	815	560	584	1325	F	Mature	7
NRPK	816	497	532	889	F	Mature	4
NRPK	817	564	600	1310	M	Mature	7
NRPK	819	561	597	1034	F	Mature	5
NRPK	820	467	497	800	M	Mature	4
NRPK	840	314	337	205	M	Mature	2
NRPK	841	558	590	1109	F	Mature	6

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
NRPK	842	574	611	1399	F	Mature	4
NRPK	843	574	612	1621	F	Mature	6
NRPK	887	565	596	1125	M	Mature	6
NRPK	919	482	519	840	M	Mature	4
BURB	195	0	551	1385	M	Mature	
CISC	1007	97	107	0	U	Undetermined	
CISC	1008	104	115	11	U	Undetermined	
CISC	1009	99	109	10	U	Undetermined	
CISC	1010	94	107	11	U	Undetermined	
CISC	1011	103	114	12	U	Undetermined	
CISC	1012	106	119	13	U	Undetermined	
CISC	1013	101	112	11	U	Undetermined	
CISC	1014	103	115	12	U	Undetermined	
CISC	1015	92	103	9	U	Undetermined	
CISC	1016	105	119	14	U	Undetermined	
CISC	1017	99	109	11	U	Undetermined	
CISC	1018	0	0	8	U	Undetermined	
CISC	1019	0	0	12	U	Undetermined	
CISC	1020	97	109	12	U	Undetermined	
CISC	1021	108	121	15	U	Undetermined	
CISC	1022	96	107	10	U	Undetermined	
CISC	1023	99	112	11	U	Undetermined	
CISC	1024	96	109	11	U	Undetermined	
CISC	1025	101	112	11	U	Undetermined	
CISC	1026	108	120	16	U	Undetermined	
CISC	1027	105	118	14	U	Undetermined	
CISC	1028	105	117	13	U	Undetermined	
CISC	1029	105	118	12	U	Undetermined	
CISC	1030	112	126	17	U	Undetermined	
CISC	1031	105	117	13	U	Undetermined	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	1032	105	117	12	U	Undetermined	
CISC	1033	112	125	14	U	Undetermined	
CISC	1034	103	114	12	U	Undetermined	
CISC	1035	95	106	11	U	Undetermined	
CISC	1036	106	119	12	U	Undetermined	
CISC	1037	111	123	15	U	Undetermined	
CISC	1038	111	123	16	U	Undetermined	
CISC	1039	112	125	16	U	Undetermined	
CISC	1040	105	120	15	U	Undetermined	
CISC	1041	110	124	15	U	Undetermined	
CISC	1042	112	125	15	U	Undetermined	
CISC	1043	102	114	13	U	Undetermined	
CISC	1044	110	125	15	U	Undetermined	
CISC	1045	106	120	14	U	Undetermined	
CISC	1046	105	117	14	U	Undetermined	
CISC	1047	108	120	15	U	Undetermined	
CISC	1048	105	118	14	U	Undetermined	
CISC	1049	107	120	14	U	Undetermined	
CISC	1050	107	120	14	U	Undetermined	
CISC	1051	105	116	13	U	Undetermined	
CISC	1052	112	123	18	U	Undetermined	
CISC	1053	104	115	13	U	Undetermined	
CISC	1054	103	113	13	U	Undetermined	
CISC	1055	105	116	12	U	Undetermined	
CISC	1056	95	104	11	U	Undetermined	
CISC	1057	100	111	14	U	Undetermined	
CISC	1058	105	114	12	U	Undetermined	
CISC	1059	95	106	14	U	Undetermined	
CISC	1060	105	117	15	U	Undetermined	
CISC	1061	103	113	9	U	Undetermined	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	1062	110	111	10	U	Undetermined	
CISC	1063	94	105	10	U	Undetermined	
CISC	1064	100	110	10	U	Undetermined	
CISC	1065	100	111	7	U	Undetermined	
CISC	1066	100	112	10	U	Undetermined	
CISC	1067	100	111	10	U	Undetermined	
CISC	1068	102	115	12	U	Undetermined	
CISC	1069	107	120	11	U	Undetermined	
CISC	1070	103	116	9	U	Undetermined	
CISC	1071	99	113	12	U	Undetermined	
CISC	1072	100	108	9	U	Undetermined	
CISC	1073	97	110	12	U	Undetermined	
CISC	1074	112	124	18	U	Undetermined	
CISC	1075	105	119	15	U	Undetermined	
CISC	1076	105	119	16	U	Undetermined	
CISC	1077	106	120	14	U	Undetermined	
CISC	1078	109	121	15	U	Undetermined	
CISC	1079	98	111	10	U	Undetermined	
CISC	1080	111	125	17	U	Undetermined	
CISC	1081	107	119	13	U	Undetermined	
CISC	1082	100	110	12	U	Undetermined	
CISC	1083	103	116	14	U	Undetermined	
CISC	1084	103	115	12	U	Undetermined	
CISC	1085	102	115	13	U	Undetermined	
CISC	1086	102	113	13	U	Undetermined	
CISC	1087	100	113	12	U	Undetermined	
CISC	1088	98	109	11	U	Undetermined	
CISC	1089	108	121	14	U	Undetermined	
CISC	1090	102	115	12	U	Undetermined	
CISC	1091	103	114	12	U	Undetermined	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	1092	106	119	12	U	Undetermined	
CISC	1093	97	111	12	U	Undetermined	
CISC	1094	100	112	12	U	Undetermined	
CISC	1095	102	114	13	U	Undetermined	
CISC	1096	104	113	12	U	Undetermined	
CISC	1097	97	106	11	U	Undetermined	
CISC	1098	96	108	11	U	Undetermined	
CISC	1099	104	116	11	U	Undetermined	
CISC	1100	106	119	14	U	Undetermined	
CISC	1101	105	117	13	U	Undetermined	
CISC	1102	104	116	13	U	Undetermined	
CISC	1103	98	110	10	U	Undetermined	
CISC	1104	100	112	12	U	Undetermined	
CISC	1105	108	121	15	U	Undetermined	
CISC	1106	102	110	11	U	Undetermined	
CISC	1107	97	109	10	U	Undetermined	
CISC	1108	96	109	11	U	Undetermined	
CISC	1109	102	113	11	U	Undetermined	
CISC	1110	100	112	11	U	Undetermined	
CISC	1111	98	109	11	U	Undetermined	
CISC	1112	101	114	12	U	Undetermined	
CISC	1113	103	116	11	U	Undetermined	
CISC	1114	104	116	13	U	Undetermined	
CISC	1115	99	110	11	U	Undetermined	
CISC	1116	100	112	11	U	Undetermined	
CISC	1117	97	111	11	U	Undetermined	
CISC	1118	101	114	10	U	Undetermined	
CISC	1139	195	214	84	U	Undetermined	
CISC	1140	255	287	240	U	Undetermined	
CISC	1141	405	455	1193	U	Undetermined	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	1142	445	492	1456	U	Undetermined	
CISC	1143	407	455	1162	U	Undetermined	
CISC	1144	91	188	211	U	Undetermined	
CISC	1145	239	269	205	U	Undetermined	
CISC	1146	270	304	294	U	Undetermined	
CISC	1147	428	474	1415	U	Undetermined	
CISC	1148	198	234	100	U	Undetermined	
CISC	1149	324	363	601	U	Undetermined	
CISC	1150	195	220	96	U	Undetermined	
CISC	1151	396	443	1074	U	Undetermined	
CISC	1152	407	464	1307	U	Undetermined	
CISC	1153	407	459	1324	U	Undetermined	
CISC	1154		198	222	U	Undetermined	
CISC	1155	358	400	785	U	Undetermined	
CISC	1156	255	286	247	U	Undetermined	
CISC	1157	236	278	185	U	Undetermined	
CISC	1158	311	354	539	F	Mature	
CISC	1159	268	302	296	F	Immature	
CISC	1160	296	331	465	M	Mature	
CISC	1161	302	375	420	U	Undetermined	
CISC	1162	355	392	833	U	Undetermined	
CISC	1163	300	339	446	U	Undetermined	
CISC	1164	334	379	658	U	Undetermined	
CISC	1165	391	449	1032	U	Undetermined	
CISC	1166	291	331	400	U	Undetermined	
CISC	1167	309	346	500	U	Undetermined	
CISC	1168	368	410	893	U	Undetermined	
CISC	1169	358	402	823	U	Undetermined	
CISC	1170	354	394	875	U	Undetermined	
CISC	1171	403	452	849	U	Undetermined	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	1172	315	356	540	U	Undetermined	
CISC	1173	297	337	395	U	Undetermined	
CISC	1174	261	298	274	U	Undetermined	
CISC	1175	195	220	109	U	Undetermined	
CISC	1176	256	288	240	U	Undetermined	
CISC	1177	373	427	900	U	Undetermined	
CISC	1178	325	370	577	F	Mature	
CISC	1179	386	435	950	M	Mature	
CISC	1180	370	415	720	M	Mature	
CISC	1181	400	460	1078	U	Undetermined	
CISC	1182	304	347	447	U	Undetermined	
CISC	1183	308	345	514	U	Undetermined	
CISC	1184	325	355	564	U	Undetermined	
CISC	1185	290	331	387	U	Undetermined	
CISC	1186	300	339	427	U	Undetermined	
CISC	1187	385	435	888	U	Undetermined	
CISC	1188	397	443	1183	U	Undetermined	
CISC	1189	402	447	915	U	Undetermined	
CISC	1190	527	368	540	U	Undetermined	
CISC	1191	365	411	730	U	Undetermined	
CISC	1192	404	454	1155	U	Undetermined	
CISC	1193	389	440	1040	U	Undetermined	
CISC	1194	418	472	1060	U	Undetermined	
CISC	1196	390	440	1047	F	Mature	
CISC	1197	340	386	724	U	Undetermined	
CISC	1198	319	359	585	U	Undetermined	
CISC	1199	402	463	1248	U	Undetermined	
CISC	1200	385	437	984	U	Undetermined	
CISC	1201	378	416	915	U	Undetermined	
CISC	1202	395	464	1122	U	Undetermined	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
CISC	1203	397	450	1072	U	Undetermined	
CISC	1204	415	464	1092	U	Undetermined	
CISC	1205	416	469	1209	F	Mature	
CISC	1206	367	415	813	M	Mature	
CISC	1207	390	448	885	U	Undetermined	
CISC	1208	438	497	1460	U	Undetermined	
CISC	1209	405	461	1130	U	Undetermined	
CISC	1210	685	432	875	U	Undetermined	
CISC	1211	387	435	980	U	Undetermined	
CISC	1212	409	465	1075	U	Undetermined	
CISC	1216	419	472	1290	M	Mature	
CISC	1217	405	454	1280	U	Undetermined	
CISC	1218	410	455	1240	U	Undetermined	
CISC	1219	400	447	1052	U	Undetermined	
CISC	1220	428	485	1372	U	Undetermined	
CISC	1221	372	421	955	U	Undetermined	
CISC	1225	434	487	1555	F	Mature	
LKWH	261	540	599	2515	F	Mature	
LKWH	265	547	611	2895	F	Mature	
LKWH	789	508	565	2071	M	Mature	
LKWH	790	489	544	1642	M	Mature	
LKWH	792	504	545	2041	M	Mature	
LKWH	793	490	545	1919	F	Mature	
LKWH	806	537	593	2164	M	Mature	
LKWH	1000	116	130	16	U	Undetermined	
LKWH	1001	105	122	13	U	Undetermined	
LKWH	1002	106	117	13	U	Undetermined	
LKWH	1003	86	97	8	U	Undetermined	
LKWH	1195	410	438	1122	U	Undetermined	
SPSH	1004		90	8	U	Undetermined	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
SPSH	1005	98	101	10	U	Undetermined	
SPSH	1006	95	106	10	U	Undetermined	
WHSC	1213	458	488	1450	M	Mature	
WHSC	1214	433	463	1030	U	Undetermined	
WHSC	1215	443	475	1411	U	Undetermined	
WHSC	1222	492	535	1900	U	Undetermined	
WHSC	1223	429	452	1007	U	Undetermined	
WHSC	1224	456	534	1993	U	Undetermined	
YLPR	71	141	148	41	F	Immature	
YLPR	72	104	110	14	F	Immature	
YLPR	73	95	101	11	F	Immature	
YLPR	74	91	96	10	F	Immature	
YLPR	77	196	205	113	F	Mature	
YLPR	78	176	185	85	U	Undetermined	
YLPR	79	166	174	70	M	Mature	
YLPR	80	180	190	89	M	Mature	
YLPR	81	172	180	80	M	Mature	
YLPR	86	135	142	37	M	Immature	
YLPR	87	150	155	48	F	Immature	
YLPR	88	147	153	46	M	Mature	
YLPR	89	140	147	42	M	Mature	
YLPR	90	137	143	36	F	Immature	
YLPR	91	135	142	35	M	Mature	
YLPR	92	154	161	60	M	Mature	
YLPR	93	144	152	45	M	Mature	
YLPR	94	133	141	33	F	Immature	
YLPR	95	140	147	34	F	Immature	
YLPR	100	223	232	180	M	Mature	
YLPR	101	215	226	155	F	Mature	
YLPR	126	102	108	15	F	Immature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	127	110	117	17	F	Immature	
YLPR	128	100	107	15	F	Immature	
YLPR	134	198	158	51	M	Mature	
YLPR	135	144	153	42	F	Immature	
YLPR	136	138	145	37	M	Mature	
YLPR	137	144	150	39	F	Immature	
YLPR	145	155	164	61	M	Mature	
YLPR	146	167	175	71	F	Immature	
YLPR	147	206	217	145	F	Mature	
YLPR	170	100	105	11	F	Immature	
YLPR	171	105	111	15	F	Immature	
YLPR	172	91	100	11	F	Immature	
YLPR	177	137	143	35	F	Immature	
YLPR	178	181	190	90	F	Mature	
YLPR	187	216	227	158	F	Mature	
YLPR	207	175	183	77	F	Mature	
YLPR	208	146	155	44	M	Mature	
YLPR	209	140	147	37	F	Immature	
YLPR	210	140	153	44	F	Immature	
YLPR	211	135	143	35	F	Immature	
YLPR	212	159	167	47	F	Immature	
YLPR	213	132	138	34	M	Immature	
YLPR	214	154	162	54	M	Mature	
YLPR	215	127	133	27	M	Mature	
YLPR	216	135	148	36	M	Mature	
YLPR	217	133	149	32	F	Immature	
YLPR	218	164	172	47	M	Mature	
YLPR	219	137	142	37	M	Immature	
YLPR	220	140	147	39	M	Mature	
YLPR	221	159	163	53	M	Mature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	222	133	140	34	F	Immature	
YLPR	223	136	143	37	M	Immature	
YLPR	224	142	149	42	F	Immature	
YLPR	225	138	145	38	M	Mature	
YLPR	226	130	137	32	M	Immature	
YLPR	227	143	149	44	F	Immature	
YLPR	228	133	140	32	M	Mature	
YLPR	233	199	208	115	F	Mature	
YLPR	234	195	201	103	F	Mature	
YLPR	235	190	196	101	M	Mature	
YLPR	236	221	234	156	M	Mature	
YLPR	237	205	213	121	F	Mature	
YLPR	238	199	208	114	M	Mature	
YLPR	239	192	200	107	M	Mature	
YLPR	240	198	205	123	F	Mature	
YLPR	241	210	219	143	M	Mature	
YLPR	242	205	214	133	M	Mature	
YLPR	248	113	118	20	M	Immature	
YLPR	249	107	111	14	M	Immature	
YLPR	250	111	116	18	F	Immature	
YLPR	251	105	111	15	M	Immature	
YLPR	252	100	105	14	M	Immature	
YLPR	253	104	110	16	F	Immature	
YLPR	254	107	113	17	M	Immature	
YLPR	255	105	111	16	M	Immature	
YLPR	256	101	105	14	M	Mature	
YLPR	257	98	104	12	M	Immature	
YLPR	258	100	104	12	M	Immature	
YLPR	273	226	237	165	F	Mature	
YLPR	274	222	231	160	M	Mature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	275	211	222	135	M	Mature	
YLPR	276	211	219	135	M	Mature	
YLPR	277	224	233	170	F	Mature	
YLPR	278	227	236	175	F	Mature	
YLPR	292	104	109	15	F	Immature	
YLPR	293	99	105	13	U	Immature	
YLPR	294	100	107	13	U	Immature	
YLPR	295	104	109	13	U	Immature	
YLPR	296	107	114	15	U	Immature	
YLPR	297	107	113	16	U	Immature	
YLPR	298	102	109	15	U	Immature	
YLPR	299	94	102	12	U	Immature	
YLPR	300	178	187	78	M	Immature	
YLPR	326	148	156	54	U	Immature	
YLPR	327	135	142	34	U	Immature	
YLPR	328	135	142	35	M	Mature	
YLPR	329	209	215	132	U	Undetermined	
YLPR	330	97	102	12	U	Immature	
YLPR	331	179	187	77	M	Mature	
YLPR	332	182	186	81	F	Mature	
YLPR	333	143	151	48	M	Mature	
YLPR	334	130	137	31	M	Mature	
YLPR	339	234	245	426	M	Mature	
YLPR	340	215	228	332	F	Mature	
YLPR	341	206	217	314	M	Mature	
YLPR	376	175	184	76	F	Mature	
YLPR	377	138	146	41	M	Mature	
YLPR	378	191	198		F	Immature	
YLPR	379	165	172	63	M	Mature	
YLPR	380	188	191	98	F	Mature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	381	150	157	44	M	Immature	
YLPR	382	132	139	31	F	Immature	
YLPR	383	134	145	37	F	Immature	
YLPR	384	155	163	49	M	Mature	
YLPR	385	152	160	51	M	Mature	
YLPR	386	140	145	40	M	Mature	
YLPR	387	141	147	38	F	Immature	
YLPR	388	136	143	32	M	Immature	
YLPR	389	135	142	34	F	Immature	
YLPR	390	137	145	36	F	Immature	
YLPR	402	198	209	113	M	Mature	
YLPR	403	237	247	207	F	Mature	
YLPR	404	216	225	150	F	Mature	
YLPR	405	200	206	118	F	Mature	
YLPR	406	193	202	111	F	Mature	
YLPR	407	172	177	68	M	Mature	
YLPR	419	223	235	174	F	Mature	
YLPR	420	228	238	187	M	Mature	
YLPR	425	142	149	38	M	Mature	
YLPR	427	141	148	42	F	Immature	
YLPR	428	101	106	13	F	Immature	
YLPR	429	108	114	16	F	Immature	
YLPR	435	168	176	70	F	Immature	
YLPR	500	224	238	360	M	Mature	
YLPR	501	210	222	294	F	Mature	
YLPR	502	229	240	442	F	Mature	
YLPR	503	232	241	382	F	Mature	
YLPR	504	195	205	94	F	Mature	
YLPR	505	202	211	124	F	Mature	
YLPR	506	118	207	113	F	Mature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	507	206	215	137	F	Mature	
YLPR	508	183	191	89	F	Mature	
YLPR	509	185	196	83	M	Mature	
YLPR	510	196	205	105	M	Mature	
YLPR	511	206	215	130	F	Mature	
YLPR	512	186	193	97	M	Mature	
YLPR	513	189	198	96	F	Mature	
YLPR	525	104	110	16	M	Immature	
YLPR	526	97	101	11	F	Immature	
YLPR	533	232	242	176	F	Mature	
YLPR	534	208	219	168	F	Mature	
YLPR	535	198	209	120	F	Mature	
YLPR	536	197	204	119	F	Mature	
YLPR	537	180	187	90	M	Mature	
YLPR	538	168	176	73	F	Immature	
YLPR	539	128	134	31	M	Mature	
YLPR	540	135	142	34	F	Immature	
YLPR	541	126	132	29	M	Mature	
YLPR	548	276	287	350	F	Mature	
YLPR	549	222	232	162	F	Mature	
YLPR	550	254	263	238	F	Mature	
YLPR	551	243	252	190	F	Mature	
YLPR	583	100	107	12	M	Mature	
YLPR	614	80	85	7	U	Immature	
YLPR	615	90	98	11	F	Immature	
YLPR	616	99	105	13	M	Mature	
YLPR	617	101	107	14	M	Mature	
YLPR	618	109	115	16	F	Immature	
YLPR	619	99	103	12	F	Immature	
YLPR	620	110	116	16	M	Mature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	621	93	98	12	M	Immature	
YLPR	622	101	116	14	M	Immature	
YLPR	623	102	118	14	F	Immature	
YLPR	624	109	115	17	M	Immature	
YLPR	625	106	112	16	M	Immature	
YLPR	626	98	104	12	U	Immature	
YLPR	627		104	12	M	Immature	
YLPR	628	99	104	11	M	Immature	
YLPR	629	109	114	16	F	Immature	
YLPR	630	99	115	12	F	Immature	
YLPR	631	85	90	8	M	Mature	
YLPR	632	106	111	16	M	Immature	
YLPR	642	131	137	33	F	Immature	
YLPR	643	143	150	45	F	Immature	
YLPR	644	129	136	31	F	Immature	
YLPR	645	138	146	34	F	Immature	
YLPR	646	154	162	54	M	Mature	
YLPR	647	139	147	36	F	Mature	
YLPR	648	185	194	92	M	Mature	
YLPR	750	146	153	48	M	Mature	
YLPR	751	145	148	41	M	Mature	
YLPR	752	152	159	52	M	Mature	
YLPR	753	141	148	42	F	Immature	
YLPR	754	143	148	42	M	Mature	
YLPR	758	218	227	151	M	Mature	
YLPR	767	190	197	100	M	Mature	
YLPR	799	100	103	12	M	Mature	
YLPR	800	105	110	15	F	Immature	
YLPR	823	185	195	106	M	Mature	
YLPR	824	180	188	101	F	Immature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	825	203	214	136	F	Mature	
YLPR	826	207	217	134	F	Mature	
YLPR	827	214	225	164	M	Mature	
YLPR	828	200	209	109	F	Mature	
YLPR	829	188	197	103	F	Mature	
YLPR	830	185	195	93	M	Mature	
YLPR	831	223	233	186	M	Mature	
YLPR	832	241	252	205	F	Mature	
YLPR	833	124	13	30	M	Mature	
YLPR	834	137	144	36	F	Immature	
YLPR	835	135	143	39	M	Mature	
YLPR	836	154	163	54	F	Immature	
YLPR	837	152	161	49	F	Immature	
YLPR	838	144	151	42	F	Immature	
YLPR	839	188	196	99	F	Mature	
YLPR	844	144	151	45	F	Mature	
YLPR	850	100	150	13	U	Immature	
YLPR	851	108	114	17	M	Immature	
YLPR	852	98	105	13	F	Immature	
YLPR	853	97	106	13	M	Mature	
YLPR	854	118	123	20	F	Immature	
YLPR	855	104	111	15	F	Immature	
YLPR	856	100	106	13	M	Immature	
YLPR	857	103	110	16	M	Immature	
YLPR	858	105	111	15	M	Mature	
YLPR	859	93	99	10	M	Immature	
YLPR	860	117	124	21	F	Immature	
YLPR	861	97	102	11	M	Immature	
YLPR	862	108	112	17	F	Immature	
YLPR	863	106	111	15	F	Immature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	864	103	109	15	F	Immature	
YLPR	865	101	107	15	F	Immature	
YLPR	866	107	114	17	F	Immature	
YLPR	867	104	110	14	U	Immature	
YLPR	868	104	108	13	F	Immature	
YLPR	869	117	124	22	M	Mature	
YLPR	877	219	239	158	F	Mature	
YLPR	878	177	188	81	F	Mature	
YLPR	879	195	206	105	F	Mature	
YLPR	888	132	140	33	M	Mature	
YLPR	889	132	139	32	M	Mature	
YLPR	890	140	148	39	M	Mature	
YLPR	891	135	142	34	F	Immature	
YLPR	892	152	162	52	M	Mature	
YLPR	893	152	159	46	F	Immature	
YLPR	894	136	143	36	M	Mature	
YLPR	895	123	130	25	M	Mature	
YLPR	896	141	150	38	M	Mature	
YLPR	897	150	158	52	M	Mature	
YLPR	898	135	142	38	M	Mature	
YLPR	899	141	148	38	M	Mature	
YLPR	900	146	153	45	F	Immature	
YLPR	901	137	144	38	M	Mature	
YLPR	902	144	151	43	M	Mature	
YLPR	903	139	144	36	F	Immature	
YLPR	904	138	166	58	M	Mature	
YLPR	910	148	156	42	F	Immature	
YLPR	911	223	234	178	M	Mature	
YLPR	1119	97	104	90	U	Undetermined	
YLPR	1120	98	105	12	M	Mature	

Appendix 10. Continued.

Species	Sample number	Fork length (mm)	Total length (mm)	Weight (g)	Sex	Maturity	Age (y)
YLPR	1121	90	95	12	M	Immature	
YLPR	1122	98	107	13	M	Immature	
YLPR	1123	97	104	12	M	Immature	
YLPR	1124	111	117	17	M	Immature	
YLPR	1125	106	113	17	M	Immature	
YLPR	1126	102	107	13	M	Immature	
YLPR	1127	103	108	13	F	Immature	
YLPR	1128	97	105	13	F	Immature	
YLPR	1129	103	110	14	F	Immature	
YLPR	1130	104	111	14	F	Immature	
YLPR	1131	105	113	16	F	Immature	
YLPR	1132	99	103	15	F	Immature	
YLPR	1133	101	105	12	M	Immature	
YLPR	1134	116	122	20	M	Mature	
YLPR	1135	94	98	11	M	Immature	
YLPR	1136	93	98	10	M	Immature	
YLPR	1137	93	98	10	F	Immature	
YLPR	1138	103	111	13	U	Undetermined	

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