FISHERY RESEARCH

KOOTENAI RIVER WHITE STURGEON SPAWNING AND RECRUITMENT EVALUATION

ANNUAL PROGRESS REPORT
May 1, 2008 — April 30, 2009

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IDFG Report Number 09-12
October 2009

Kootenai River White Sturgeon Spawning and Recruitment Evaluation

Project Progress Report

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By

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Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, OR 97283-3621

Project Number 1988-065-00
Contract Number 00000148-00001

IDFG Report Number 09-12
October 2009

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ABSTRACT

The objective of this research was to determine the environmental requirements for successful spawning and recruitment of the Kootenai River white sturgeon *Acipenser transmontanus* population. Annual tasks include monitoring and evaluating the response of various life stages of Kootenai River white sturgeon to mitigation flows supplied by the U S Army Corps of Engineers (Corps). On May 21, 2008, discharge from Libby Dam peaked June 10 at 745 m^3/s, was reduced to 481 m^3/s during the remainder of the spawning season, and then decreased slightly from 368 m^3/s through July to 255 m^3/s through August. One hundred forty-one adult white sturgeon were captured with 5,423 hours of angling and set-lining effort from March-November. Twelve adult white sturgeon were tagged in spring, and 26 of the current or previously tagged adult sturgeon exhibited a spawning migration as far upstream as rkm 235.2. Twenty-three (88%, 13 females) of the migrating adults were recorded at rkm 240 just below Deep Creek, and 18 (69%, nine females) of the migrating adults went upstream as far as rkm 244.5 (Ambush Rock), 13 (50%, six females) of the tagged migrating adults went above the Hwy. 95 Bridge in Bonners Ferry into the braided reach. One female white sturgeon went upstream to rkm 268.5, the furthest upstream migration any tagged white sturgeon has been recorded since IDFG began telemetry studies in 1991. We deployed substrates mats to evaluate the temporal and spatial extent of spawning events sampling four different geographic sections (rkm 230.0–245.7) for 1,884 mat days between May 5 and July 14 and collected 218 eggs. The first eggs were collected on May 29, and the last eggs were collected on July 3. The highest catch came from the Shortys Island reach. Based on the stages of the 202 eggs collected, 93 percent of the eggs may have been viable, and we estimated white sturgeon spawned during at least eight days. To address incubation and larval rearing habitat, we released over 780,000 free embryos at five cobble and gravel sites in Idaho and Montana. The first embryos were released on June 14 and the last on July 2, and surface water temperatures during the releases ranged from 10 to 14°C. We sampled for white sturgeon embryos and larvae between June 20 and August 7 and spent a total of 926 h sampling at four general areas between rkm 230.5 and 270.7. One larval sturgeon was collected on July 14 at the Caboose Creek side channel (rkm 270.3) in a bottom set D-ring net. This larva was likely part of an earlier free embryo release at the upstream end of this site 13 days prior. Most of the catch was larval *Catostomidae*. We sampled for juvenile white sturgeon with gillnets between July and September at 14 sites in Idaho and captured 567 hatchery reared juvenile white sturgeon with 430 h of effort. Rock Creek (rkm 215.0) had the highest catch with 13 percent of the individuals but the highest catch rates of 2.6 fish per net h came from Ambush Rock (rkm 244.5). Twelve wild juvenile white sturgeon were collected in Idaho and Canadian sections of the Kootenai River in 2008.

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INTRODUCTION

The Kootenai River white sturgeon *Acipenser transmontanus* population is comprised mainly of old-aged adults, and significant recruitment has not occurred since the 1970s. Although the specific causes of recruitment failure remain unclear, years of study suggest that mortality occurs between embryo and larval stages. Over a decade of artificial substrate mat sampling has indicated that from nine to 20 spawning events occur annually, and many viable embryos are produced (Paragamian and Wakkinen 2002). Most of the post-Libby Dam spawning events have been documented in areas where substrate conditions appear to be unsuitable for egg incubation and larval rearing (Paragamian et al. 2001), and only one larvae and very few wild juveniles have been collected despite years of intensive sampling. However, recent bathymetry, sediment transport, shear stress, and velocity studies suggest Libby Dam era flows are unable to scour pockets of existing cobbles and gravels where white sturgeon presently spawn (McDonald et al. 2006; Paragamian et al. 2009). Research to date suggests that egg and/or larval suffocation, predation, and/or other mortality factors associated with these early life stages contribute to persistent recruitment failure (Kock et al. 2006). Hatchery-reared juveniles (as young as 9 months of age at release) have average annual growth rates of 6.4 cm per year, and second year survival rates exceed 90% (Ireland et al. 2002). Since 1991, Libby Dam has released spring flows intended to benefit Kootenai River white sturgeon (hereafter white sturgeon) spawning by increasing discharge above 630 m^3/s for 42 d.

GOAL

1. The goal of the Kootenai River white sturgeon investigations is to recover the population to a self-sustained fishable level.

OBJECTIVE

1. To have suitable spawning, rearing, and incubation habitat for white sturgeon for successful wild recruitment. The main task of this program is to monitor the response of all life stages of white sturgeon to mitigative flows from Libby Dam provided by the United States Army Corps of Engineers (Corps).

STUDY SITE

The Kootenai River originates in Kootenay National Park, British Columbia (BC), Canada. The river flows south into Montana and turns northwest at Jennings, near the site of Libby Dam, at river kilometer (rkm) 352.4 (Figure 1). Kootenai Falls, 42 rkm downstream of Libby Dam, may be an impassable barrier to white sturgeon. As the river flows through the northeast corner of Idaho, there is a gradient transition at Bonners Ferry. Upstream from Bonners Ferry, the channel has an average gradient of 0.6 m/km, and the velocities are often higher than 0.8 m/s. Downstream from Bonners Ferry, the river slows to velocities typically less than 0.4 m/s, the average gradient is 0.02 m/km, and the channel deepens as the river meanders north through the Kootenai River Valley. The river returns to BC at rkm 170.0 and enters the South Arm of Kootenay Lake at rkm 120.0. The river leaves the lake through the West Arm of Kootenay Lake and flows to its confluence with the Columbia River at Castlegar, BC. A natural barrier at Bonnington Falls (now a series of four dams) has isolated the Kootenai River white sturgeon from other populations in the Columbia River basin for approximately

10,000 years (Northcote 1973). The basin drains an area of 49,987 km^2 (Bonde and Bush 1975). Regulation of the Kootenai River following the construction of Libby Dam in 1974 changed the natural hydrograph and temperatures of the river (Partridge 1983). Spring flows were reduced to about a third, and flows during winter are now three to four times higher (Figure 2). Post Dam temperatures are now cooler in summer and warmer in winter.

METHODS

Water Levels, Discharge, and River Temperature

We obtained Kootenai River stage, discharge, and water temperature data at Bonners Ferry from the US Army Corps of Engineers (Corps) (Figure 3). In 2008, United States Fish and Wildlife Service (USFWS) in cooperation with members of the Kootenai River White Sturgeon Recovery Team (KRWSRT) proposed to the Corps a System Operational Request (SOR) FWS #1 while operating under strict variable flow (VARQ) flood control guidelines. Under VARQ, higher, more stable summer discharges are provided to the extent possible with the available water to meet white sturgeon and bull trout ESA responsibilities (USFWS 2006) in an attempt to mimic a more natural river hydrograph. The intent was to provide spawning and incubation flows to meet attributes for depth, velocity, and temperature in the Kootenai River as defined in the 2006 Biological Opinion RPA for Kootenai River white sturgeon (USFWS 2006). Discharges during white sturgeon spawning in 2008 were expected to be near normal because snowpack in the basin was slightly above 100% of normal (see http://www.mt.nrcs.usda.gov/news/releases/aprilsnow08.html).

Adult White Sturgeon Sampling

Adult white sturgeon were collected by angling or setlines from February through November 2008 following the methods of Paragamian et al. (1996). From February through April, most of the sampling occurred in the staging areas at rkm 205 and 215. These areas are backwater habitats and have depths in excess of 20 m and low current velocities (<0.05 m/s). Later in the spring, areas further upstream closer to the spawning locations were sampled more frequently (near rkm 229). Fall 2008 sampling occurred in the spring staging areas and near the Kootenai River delta at rkm 120. We biopsied adult sturgeon to determine sex and level of maturity (Conte et al. 1988; Van Eenennaam and Doroshov 1988). Male and female white sturgeon expected to spawn in 2008 or later were tagged with Vemco model V16 sonic transmitters and released (see telemetry section). Some adult female white sturgeon expected to spawn in 2008 were transported to the Kootenai Tribe of Idaho (KTOI) Hatchery for hatchery production. Gametes from ripe male white sturgeon were collected in the field by extraction through the urogenital opening with a syringe. Gametes were placed in a Ziploc® bag, transported to the KTOI Hatchery, and stored in a refrigerator. White sturgeon sperm is viable for only 48 hours after extraction, so we did not collect male gametes until a female was initially induced to ovulate.

Adult White Sturgeon Telemetry

Monitoring daily and seasonal movements of white sturgeon throughout the Kootenai River/Lake system continues to be a high priority of this investigation. From 2003-2008 we deployed an array of passive Vemco model VR2 sonic receivers located from rkm 18.0, near the mouth of the Lardeau River in Kootenay Lake, BC, upstream to rkm 275.5, just below the Montana/Idaho border (Figure 4). We deployed receivers in areas where fish pass through but do not usually hold for long periods to avoid redundant data collection. Most sites were below

river bends or along straight reaches that allow for good signal reception but are reasonably free of drifting debris and out of potential vandalism. Each receiver was tethered to a float to keep the hydrophone off the substrate, anchored to a cement block, and chained to the riverbank. Receivers were downloaded in late winter, during the spawning season, and in the fall by connecting proprietary hardware (VR2PC) through a computer serial port to an external port on the receiver. Data were transferred through the serial port to proprietary software for analysis. This array allows continuous monitoring of sturgeon movements within the Kootenai river system and into Kootenay Lake.

Artificial Substrate Mat Sampling

Artificial substrate mats were used to document white sturgeon spawning in the Kootenai River (McCabe and Beckman 1990). The main purpose of this monitoring is to evaluate temporal and spatial distribution of spawning events in the Kootenai River. Mats were deployed in four general areas and were checked two or three times per week. All eggs were removed from mats each day and when eggs were found, a new mat was deployed in the same location to remove any doubts if eggs captured the next day were new or missed from the previous day. Eggs were stored in formalin and brought back to the laboratory at the field station for analysis. All eggs were staged by viewing at 120X magnification under a dissecting microscope to estimate spawn date by the methods described by Beer (1981).

Free Embryo Releases and Larval sampling

Proper incubation and larval rearing habitat is critical for successful recruitment and this habitat is limited in the Post-Libby Dam spawning reach (Paragamian et al. 2002). To address these recruitment issues, in 2008 we released one- to four-day-old embryos (free embryos) at five sites to determine drift rates and short-term survival. All five of these sites contain substrate and flow conditions that are similar to those of successfully reproducing and recruiting white sturgeon populations in the basin (Parsley et al. 1993, USFWS 2006). Sampling for drifting free embryos and larvae was performed using 600 *um* plankton nets. Longer-term survival will be monitored and evaluated using gill nets, as potential recruits become vulnerable to this gear type in three years.

Larval white sturgeon sampling was conducted using ½ m and D-ring plankton nets fished on the surface, in the water column, and on the bottom of the Kootenai River. Sampling began June 20 and continued until July 30. Nets were fished passively in the river current with a boat anchored in the thalweg. Lead weights ranging from 2.7 to 9.1 kg were attached to mid-water column and bottom nets in order to reach desired depths. A diver's depth watch was attached to the mid-column nets to record specific depth within the water column. A General Oceanics model 2030R flow meter was attached to the mouth of each net to record rotor revolutions, which was used along with net diameter and sampling time to give the total volume of water sampled. In addition to the standard boat sampling, later in the season after river discharge and floating debris decreased, ½ m nets and D-ring nets were anchored with 100 kg cement blocks in shallow water and fished overnight and checked the following morning. Larval sampling took place at various times of day between rkms 230.5 and 270.7.

Juvenile White Sturgeon Sampling

We used weighted multifilament gill nets with 1.3, 1.9, 2.5, 3.8, 5.1, 6.4, and 7.6 cm stretch mesh to sample juvenile and young-of-the-year (YOY) sturgeon. The purpose of this sampling is to evaluate natural recruitment, growth and mortality rates of marked hatchery

juveniles, and distribution and densities of both hatchery and wild juveniles. Sampling was conducted from July through September 2008 and followed the methodology of Paragamian et al. (1996). We sampled 14 different sites between rkm 174.0 and 244.5. Gill nets were set during the daytime and checked every hour to reduce mortality and all fish were released alive. From 1992 to 2004, prior to release, each fish received a passive integrated transponder (PIT) tag and a pattern of scutes was removed at the KTOI Hatchery, which provided a unique mark for each brood year. In 2005 and 2006, most (92%) of the released juvenile white sturgeon were not PIT tagged, although scutes were removed from each fish released. All hatchery reared juvenile sturgeon released in the Kootenai River after 2007 were PIT tagged and had scutes removed in a pattern unique to the brood year and rearing facility. We recorded fork (FL) and total length (TL), weight, PIT tag numbers, fish condition, and scute removal patterns (to determine release date and location of hatchery fish) for each sampled fish. Pectoral fin ray sections were removed from all wild juvenile white sturgeon for age determination.

RESULTS

Water Levels, Discharge, and River Temperature

On May 21, 2008, Lake Koocanusa inflows peaked at 1,841 m^3/s (65,000 ft^3/s) and the reservoir filled to elevation 745 m (2,445 feet) by July 11. Full reservoir elevation is 750 m (2459 ft). Libby Dam outflow discharge peaked June 10 at 745 m^3/s (26,300 ft^3/s), was reduced to 481 m^3/s (17,000 ft^3/s) during the remainder of the spawning season, and then decreased slightly from 368 m^3/s (13,000 ft^3/s) through July to 255 m^3/s (9,000 ft^3/s) through August. By September, flows were reduced to 227 m^3/s (8,000 ft^3/s) and declined steadily throughout the fall (Figure 3).

Water temperatures measured at Bonners Ferry began increasing slowly in mid-March from 4 to 5°C and stayed cool (below 7°) through mid-May. Temperatures increased rapidly in late May and continued increasing through the spawning season (Figure 3). Temperatures were over 8°C and oscillated slightly during the spawning season. By late July, water temperatures reached their maximum of 16.5°C.

Adult White Sturgeon Sampling

Between March 5 and November 12, 2008, we expended a total of 5,423 h to capture nine adult white sturgeon by angling and 132 adult white sturgeon with setlines (Table 1). Additionally, four adult sturgeon were collected in gillnets while sampling for juvenile sturgeon. The adult sturgeon catch per unit effort (CPUE) was 0.042 fish per rod h for angling and 0.025 fish per setline h for setlines (Table 1). Ninety-seven (67%) of the 145 adult white sturgeon collected were recaptures from previous years (Table 1). Thirty-six adult white sturgeon were biopsied by IDFG during adult sampling: 21 were females, 10 were males, and sex could not be determined from five individuals. Eighteen of the 21 females biopsied were stage F4 (mature eggs) and specific stage could not be determined from the remaining three females. Seven of the biopsied males were stage M8 (mature testes), and specific stage could not be determined from three males. KTOI Hatchery personnel also captured and biopsied adult white sturgeon for their propagation operations; Lewandowski (2008) provides adult capture information.

Adult White Sturgeon Telemetry

Adult white sturgeon movements were analyzed after downloading location data from 61 stationary Vemco VR2 sonic receivers (Figure 4). Twelve adult white sturgeon were tagged with Vemco sonic transmitters in spring 2008, two were tagged in fall 2007 that were expected to spawn in 2008, and 71 adult white sturgeon had active Vemco sonic transmitters from previous years or were not expected to spawn in spring 2008 (Table 2).

Twenty-six tagged adult white sturgeon (13 females) were in spawning condition and exhibited a spawning migration. A spawning migration was defined by fish observed in spawning condition in 2008 or expected to be in spawning condition based on previous biopsies, which moved upstream to at least the lower end of the spawning reach (rkm 228.0). All 26 of these tagged adults moved upstream as far as rkm 235.2. Twenty-three (88%, 13 females) of the migrating adults were recorded at rkm 240 just below Deep Creek, and 18 (69%, nine females) of the migrating adults went upstream as far as rkm 244.5 (Ambush Rock). Additionally, 13 (50%, six females) of the tagged migrating adults went above the Hwy. 95 Bridge in Bonners Ferry into the braided reach. One female white sturgeon went upstream to rkm 268.5, the furthest upstream migration any tagged white sturgeon has been recorded since IDFG began telemetry studies in 1991.

Appendix 1 shows movement extent of six female white sturgeon that went above Bonners Ferry into the braided reach in 2008. Some of these individuals were tagged in previous years.

Artificial Substrate Mat Sampling

We deployed substrates mats in 2008 to evaluate the temporal and spatial extent of spawning events of white sturgeon. We sampled four different geographic river sections (Table 3) within the traditional post-Libby Dam spawning reach (rkm 230.0–245.7) for 1,884 mat days between May 5 and July 14 and collected 218 eggs (Table 3). The highest catch came from the Shortys Island reach (rkm 230.0, Table 3). The first eggs were collected on May 29, and the last eggs were collected on July 3. Most of the eggs were stage 12, but the stages ranged from 12 to 21 (Beer 1981). Sixteen eggs were either dead, broken, or otherwise could not be staged (Table 4). Based on the stages of the 202 eggs collected, 93 percent of the eggs may have been viable, and based on the stages of the viable eggs, we estimate that white sturgeon spawned during at least eight days in 2008 (Table 4).

Free Embryo Releases and Larval Sampling

Over 780,000 free embryos were released at five sites in Idaho and Montana in 2008 (Appendix 2). The first embryos were released on June 14 and the last on July 2, and surface water temperatures during the releases ranged from 10 to 14°C.

In 2008, we sampled for white sturgeon embryos and larvae between June 20 and August 7 (Table 5). We spent a total of 926 h sampling at four general areas between rkm 230.5 and 270.7 (Table 5). Effort was distributed evenly among the four general areas and 982 fish larvae were collected. One larval sturgeon was collected on July 14 in a bottom set D-ring net at the Caboose Creek side channel (rkm 270.3). This net was placed in the middle of the side channel and water depth was 0.8 m. Total length was 1.2 cm and the barbels were clearly visible. This larva was likely part on an earlier free embryo release at the upstream end of this site 13 days prior.

Most of the sampling effort was with the D-ring nets fished on the bottom, and the highest catch came from these nets. Even though larvae were collected at all depths, effort was not uniform among the gear types (Table 5). Additionally, most of the larval fish were collected in late June, but at least some larvae were collected throughout the sampling period. Most of the catch was larval *Catostomidae*.

Juvenile White Sturgeon Sampling

Beginning in 1990 and continuing to the present, the KTOI hatchery has released over 150,000 juvenile white sturgeon (Appendices 3 and 4). We sampled for juvenile white sturgeon with gillnets between July and September 2008 in Idaho and Canadian sections of the Kootenai River. In Idaho, we sampled 14 sites and captured 567 juvenile white sturgeon with 430 h of effort (Table 6). The Ferry Island area (rkm 205.0) had the highest catch with 13 percent of the individuals, but the highest catch rates of 2.6 fish per net h came from the Ambush Rock area (rkm 244.0) (Table 6). The catch was well distributed among the 14 sites, and juvenile white sturgeon were collected throughout the river. One hundred fifty-six of the individuals were collected in the 2.5 cm gillnets, but the highest catch rates were in the 0.75 cm nets (Table 7). The average fork and total length of the hatchery reared juvenile white sturgeon was 46.0 cm FL and 53.6 cm TL (n = 487), and weight of juvenile sturgeon averaged 0.75 kg (n = 487) (Table 8). Appendix 3 lists the details on sizes and numbers and recapture rates of tagged and/or measured hatchery juvenile white sturgeon released in the Kootenai River since 1990. Appendix 4 provides the numbers of untagged and/or not measured juvenile hatchery releases through fall 2008. Appendix 5 provides the specific growth parameters of hatchery-released juveniles captured in 2008.

Twelve wild juvenile white sturgeon were captured while gill netting in Canada and Idaho in 2008 (Table 9). The TL of these twelve individuals ranged from 39.6 to 73.1 cm, and weights ranged from 0.24 to 1.55 kg (Table 9.) Four different year classes were represented with one individual assigned to the 1998 year class, five to the 2000 year class, four to the 2002 year class, and one individual to the 2004 year class (Table 9). We were not able to assign an age to one fish because its fin ray was not ageable (Table 9). Appendix 6 shows the year class assignments from a sample of the wild juvenile white sturgeon collected between 1977 and 2008 that could be aged. Appendix 7 shows the number of wild juvenile white sturgeon collected annually from 1977 to 2008.

DISCUSSION

In 2008, 50% of our tagged sample of migrating adult white sturgeon went above Bonners Ferry into the braided reach. Temperature and discharge are two variables we can control and both play a role in determining sturgeon spawning extent, duration, and timing (Paragamian et al. 2001). Libby Dam discharge increased rapidly beginning in early May and continued increasing into late May when discharge peaked (Figure 3). Temperature began increasing in March and increased steadily throughout the spawning season. In 2008, water temperatures remained relatively stable, with only slight decreases resulting from Libby Dam operations (Figure 3). Rapid decreases in water temperature, which historically resulted when discharge volume from Libby Dam rapidly increased, can cause sturgeon to cease spawning or move downstream out of the spawning reach (Paragamian et al. 2002). In 2006 and continuing to 2008, biologists at Libby Dam (Greg Hoffman, USACE, personal communication) conformed selective withdrawal gates in the Libby Dam forebay so the warmest water available could be

released during the white sturgeon spawning season. Ways to judge the effectiveness of this include monitoring the upstream extent of the spawning migrations, evaluating the number of spawning sturgeon, or evaluating behavior of spawning female sturgeon. If our ultimate objective of sturgeon flows (SORs) and temperature management is to attract migrating sturgeon to the braided reach or beyond, then we should attempt to duplicate dam operations in the future. If our tagged sample legitimately actually represents the population of spawning sturgeon, then several hundred spawning sturgeon may have migrated into the braided reach in 2008. Unfortunately because the water velocities are higher and boat anchors do not hold well in the shifting gravel we have not been able to sample for eggs adequately. Developing an egg sampling strategy for this reach should be a priority in 2009.

Finding successful spawning habitats and understanding early life history requirements are still unidentified in our understanding of Kootenai River white sturgeon. The embryo releases in 2005 and 2006 (Rust and Wakkinen 2007, Rust et al. 2007) were an important first step in selecting sites, determining logistics, and developing sampling techniques, and this began focusing our recovery efforts on early life history studies. However, with spawning stock limitations and hatchery production still having priority, other early life history studies may be a better use of a limited resource. Beginning in 2007 and continuing in 2008, we conducted a project to release one- to four-day-old embryos (free embryos) at sites that appear suitable for early life stage survival and rearing. These embryos are hatched in the KTOI facility and released at one to four days post-hatch over sites comprised of gravel and cobble with water velocities that exceed 1 m/s. On July 14, one larval white sturgeon was collected in a D-ring net 14 days after any free embryos were released at or near this site. It is likely that this larva came from a free embryo release; however, genetic validation techniques to match larvae with parents are not available for Kootenai River white sturgeon at this time. While collecting one 14-day-old larva from a release of several thousand free embryos does not suggest a major production contribution to this brood year, it does provide some information as to what flow and substrate conditions are suitable for 14-day survival of recently hatched embryos. This study may yield important information on distribution, drift, growth, survival, and may further test the suitable substrate hypothesis and possibly guide the future direction of our recovery efforts. Since this study does not jeopardize hatchery production, it should be continued until monitoring techniques can successfully judge its effectiveness.

RECOMMENDATIONS

1. As soon as water temperature reaches 7°C after April 1, provide flows of 425 m^3/s at Bonners Ferry with stable or increasing temperature using the selective withdrawal gate system at Libby Dam to initiate and maintain spawning migration of Kootenai River white sturgeon.

2. Provide minimum flows of 630 m^3/s for 42 d (as prescribed for spawning and rearing in the Kootenai River White Sturgeon Recovery Plan, USFWS 1999) at Bonners Ferry once water temperatures of 8-10°C are reached to stimulate spawning and optimize egg/larval survival of Kootenai River white sturgeon.

3. Release one- to four-day-old free embryos at several sites in the canyon or braided reaches to evaluate drift, distribution, and survival over gravel and cobble substrates.

4. Develop a technique for sampling sturgeon eggs in the braided and canyon reaches above Bonners Ferry.

ACKNOWLEDGMENTS

We would like to thank Seth Richards and Wes Ewing of IDFG for their assistance with data collection during the 2008 field season. We also thank Chris Lewandowski, Jack Siple, and Sue Ireland of the KTOI and Matt Neufeld and Don Miller of the BC Ministry of Environment. Special thanks to Nick Wahl, Rob Ryan, and Vaughn L. Paragamian of IDFG for reviewing this document. The Bonneville Power Administration provided funding for this work.

Table 1. Sampling effort and number of adult and juvenile white sturgeon caught by the Idaho Department of Fish and Game alone or with Kootenai Tribe of Idaho or British Columbia Ministry of the Environment personnel, in the Kootenai River, Idaho March 5, 2008 to November 12, 2008.

	Hours of effort	Number of juvenile sturgeon caught (No. of recaptures)	Number of adult sturgeon caught (No. of recaptures)	Juvenile CPUE (fish/h)	Adult CPUE (fish/h)
Gillnet[a]	672.2	961(528)	4(3)	1.4296	0.0059
Angling[b]	213.8	0	9(5)	—	0.0421
Setline[c]	5,208.6	3(2)	132(89)	0.0006	0.0253
Total	6,094.6	964(530)	145(97)		

[a] Includes 242.0 hours sampling by BCE for IDFG from July 11 – August 22, 2008. There were 394 juveniles (221 recaptures) and two adults (one recapture) caught during this period and included in the totals above.

[b] There were an additional 60 adult captures (45 recaptures) by KTOI during spring broodstock angling efforts from March 5 – June 20, 2008. There were also five adults (all recaptures) caught by IDFG and six adults (four recaptures) caught by BCE during spring and fall sampling for which no effort was recorded.

[c] Based on 24-hour sets. Includes 98.5 setline hours by BCE staff for IDFG and five adult captures (two recaptures). There was an additional one adult (recapture) by KTOI setline efforts, for which no effort was recorded.

Table 2. Vital statistics from Kootenai River adult white sturgeon marked with Vemco sonic tags as part of a telemetry study, Kootenai River, Idaho, 2003-2008.

Fish #	Tag year	Sex/Development Stage	Release Date	Release RKM	Fork Length (cm)	Total Length (cm)	Weight (kg)	Vemco Code
2117	2003	F-2	8/26/03	119.0	173.0	195.5	37.8	52
1471	2003	na	9/8/03	19.0	181.0	205.0	45.0	51
22212	2004	F-3[a]	9/7/04	121.0	204.0	229.0	78.8	259
22214	2004	M-8	9/7/04	121.0	179.5	203.0	48.6	261
1791	2004	M	9/7/04	121.0	141.0	163.0	22.5	264
1792	2004	na	9/7/04	121.0	138.0	164.0	26.0	265
22211	2004	F-3	9/8/04	121.0	186.0	213.0	56.3	260
22210	2004	M-8	9/8/04	121.0	169.0	191.0	38.3	262
22222	2004	M-8	9/8/04	121.0	182.0	204.0	45.9	263
690	2004	M-8	9/8/04	121.0	168.5	190.0	38.3	266
22213	2004	M-8	10/4/04	119.0	195.5	220.0	54.9	257
53853	2005	F-4	3/10/05	204.0	170.0	197.0	41.0	275
53855	2005	F-2	3/16/05	215.0	215.0	241.0	[i]	277
53872	2005	F-4	3/29/05	215.0	165.0	191.0	48.0	274
53871	2005	F-3	3/29/05	215.0	182.0	209.0	47.0	276
53863	2005	F-3	4/12/05	215.0	182.0	200.0	59.0	273
947	2005	F-4	4/26/05	215.0	142.0	162.0	26.0	272
958	2005	F-4[b]	4/28/05	226.5	189.0	220.0	58.0	280
348	2005	F-1	5/18/05	230.7	161.0	184.0	[i]	278[c]
906	2005	M-8	6/08/05	229.0	166.0	191.0	35.0	281
330	2005	M-8	6/08/05	229.0	179.0	206.0	43.0	279
53894	2005	M-8	6/08/05	229.0	189.0	217.0	70.0	271
2117	2005	F-4[d]	6/28/05	243.0	170.0	196.0	40.0	52
406	2005	M-7	9/26/05	215.0	168.0	192.0	43.0	50
345	2005	F-4[b]	9/26/05	215.0	164.0	189.0	52.0	269
535	2005	F-4[b]	9/26/05	215.0	177.0	204.0	57.0	270
1578	2005	F-4	9/27/05	215.0	178.0	200.0	40.0	267
804	2005	U[e]	9/27/05	215.0	105.0	132.0	14.0	87
1795	2005	F-4	9/27/05	215.0	185.0	208.0	54.0	268
1794	2005	M-7	9/27/05	215.0	197.0	224.0	63.0	258
1824	2006	F-4	3/23/06	207.0	166.0	189.0	36.9	9dt[f]
202	2006	F-1	3/28/06	190.0	185.0	212.0	48.6	292
939	2006	M	3/28/06	185.0	147.0	171.0	21.2	294
65	2006	M	3/28/06	185.0	167.0	193.0	27.9	290
1305	2006	F-4[b]	3/30/06	215.0	158.0	182.0	36.9	3dt
22218	2006	F-4[b]	4/4/06	205.0	169.0	195.0	37.2	10dt
86	2006	M-8	4/4/06	187.5	161.0	195.0	33.3	7dt
139	2006	M-8	4/6/06	215.0	175.0	202.0	43.5	1dt
1828	2006	F-4[b]	4/10/06	205.0	185.0	215.0	56.0	6dt
1833	2006	F-4[b]	4/13/06	215.0	196.0	228.0	65.0	8dt
1837	2006	F-4[b]	4/19/06	215.0	194.0	223.0	65.9	4dt
1840	2006	F-4[b]	4/25/06	215.0	186.0	217.0	53.3	288
987	2006	M-8	4/26/06	204.0	151.0	174.0	25.5	291
2230	2006	M-8	5/4/06	229.0	214.0	243.0	54.2	2dt
1842	2006	M-8	5/4/06	229.0	155.0	179.0	30.5	295
22212	2006	F-4[a]	5/4/06	229.0	208.0	236.0	[i]	293
2227	2006	F-4	5/9/06	229.0	170.0	190.0	37.2	287
679	2006	M-8	6/1/06	235.5	155.0	177.0	27.3	5dt
1847	2006	M-9	6/6/06	229.0	167.0	187.0	40.3	286

Table 2. Continued.

Fish #	Tag year	Sex/Development Stage	Release Date	Release RKM	Fork Length (cm)	Total Length (cm)	Weight (kg)	Vemco Code
7917	2006	M-9	6/7/06	229.0	145.0	165.0	23.3	289
57859	2006	F-3	9/28/06	121.0	118.0	121.6	57.0	299
57035	2006	F-3	10/5/06	215.0	172.0	194.0	42.8	296
57033	2006	F-3	10/5/06	215.0	179.0	210.0	48.2	298
57034	2006	F-3	10/8/06	215.0	182.0	205.0	54.0	301
1854	2006	F-4	10/24/06	215.0	185.0	213.0	60.0	297
57869	2007	F-4[g]	3/12/07	120.0	207.0	235.0	82	17dt
850	2007	F-4[g]	3/13/07	120.0	207.0	230.0	95	13dt
2216	2007	F-4[g]	3/14/07	123.0	194.0	220.0	67	303
152	2007	F-4[g]	3/14/07	120.0	178.0	197.0	65	305
2198	2007	F-4[g]	3/14/07	137.0	170.0	192.0	51.3	20[h]dt
891	2007	F-4[b]	3/28/07	215.0	193.0	221.0	61.8	16dt
252	2007	M-8	3/28/07	205.0	172.0	208.0	49.7	15dt
57880	2007	F-4[b]	3/29/07	215.0	185.0	214.0	65.9	14dt
57881	2007	F-4[b]	3/29/07	215.0	162.0	186.0	47.0	18dt
57882	2007	F-4[b]	3/29/07	215.0	172.0	193.0	44.8	12dt
57883	2007	M-8	3/29/07	215.0	167.0	191.0	44.8	11dt
2268	2007	M-8	4/3/07	215.0	167.0	190.0	33.2	19dt
162	2007	M-8	4/10/07	215.0	188.0	218.0	58.2	302
1141	2007	M-8	5/23/07	232.0	154.0	178.0	[i]	300
57891	2007	F-4	[k]	[k]	186.0	211.0	57.0	304[j]
22232	2007	F-4[b]	9/25/07	121.0	144.0	169.0	30.9	306
136	2007	F-4/F-3[b]	10/17/07	215.0	152.0	172.0	41.7	313
22401	2007	F-4/F-3[b]	10/17/07	215.0	177.0	200.0	67.2	314
605	2008	F-4[b]	3/12/08	215.0	209.0	241.0	[l]	307
62259	2008	F-4[b]	3/25/08	215.0	186.0	200.0	71.7	311
62260	2008	F-4[b]	3/25/08	205.0	182.0	206.0	49.7	309
1605	2008	F-4[b]	4/1/08	215.0	180.0	211.0	56.9	319
62261	2008	F-4[b]	4/3/08	205.0	193.0	221.0	[i]	317
337	2008	M-8	4/10/08	205.0	204.0	235.0	[l]	321
524	2008	F-4[b]	4/9/08	205.0	189.0	216.0	[l]	323
62262	2008	M-8	4/21/08	205.0	169.0	198.0	40.3	320
364	2008	M-8	4/21/08	205.0	170.0	196.0	41.7	316
62263	2008	M-8	4/22/08	205.0	177.0	202.0	[l]	325
62264	2008	M-8	4/23/08	205.0	156.0	178.0	31.4	318
62265	2008	F-4[b]	4/22/08	205.0	181.0	206.0	[i]	315
8	2008	F-3	9/24/08	117.0	186.0	210.0	[l]	310
970	2008	M	11/4/08	205.0	149.0	168.0	54.0	312
67849	2008	U	11/12/08	205.0	279.0	308.0	[l]	420
19	2008	F-2	11/12/08	190.0	167.0	189.0	85.0	422

[a] This fish was first tagged with Vemco 259, then 293 in May 2006.
[b] F-1 eggs present.
[c] Fish recaptured twice in 2007, Vemco scar looked good.
[d] Fish recaptured; no mention of sonic tag.
[e] Unknown sex/ development; 3-year tag.
[f] dt = depth sensitive tag.
[g] F-4 eggs present.
[h] This is the second deployment of this tag code (was on juvenile 21890 previously).
[i] No weight taken.
[j] Fish taken to hatchery and tagged. Originally captured by Montana in May 1976.
[k] Release date and location unknown (probably Kootenai Tribal Hatchery, 241.0).

Table 3. Location (river kilometer), depth (m), white sturgeon egg catch and catch per unit effort (CPUE) by standard artificial substrate mats, Kootenai River, Idaho, 2008.

River location (rkm)	Depth range (m)	Total mat hours	Number white sturgeon eggs	CPUE
230.0	1.5-12.2	14,688.5	179	0.0125
235.0	4.3-15.3	7,858.5	13	0.0017
237.5	3.1	7,447.5	20	0.0027
245.7	1.2-9.8	15,236.8	6	0.0004
All	1.2-21.4	45,231.2	218	0.0049

Table 4. Stages of white sturgeon eggs captured by artificial substrate mats, Kootenai River, Idaho, 2008.

Sample No.	Temp °C	Date Pull	End Time	Total Eggs	Egg stage													Notes	Hours from fertilization (Spawn Date)
					12	13	14	15	16	17	18	19	20	21	22	23	Other		
1	6	5/29	9:24	3	3														
2	6	5/29	10:06	1	1														
3	8	6/2	8:33	4					3+								1	broken	
4	8.5	6/2	8:46	1	1													dead?	
5	8.5	6/9	11:27	2	2													1 dead?	
6	8.5	6/9	12:35	1													1	dead	
7	8	6/10	9:54	1													1	dead	
8	10	6/16	14:38	2	2														0(6/16)
9	10.5	6/17	8:10	2	1			1											0(6/17), 8(6/16)
10	10.5	6/17	8:21	8	8														0(6/17)
11	10	6/18	9:19	2			2+												5(6/18)
12	10	6/18	9:41	11						6+	3+						2	broken	22,25,28, 31 (6/17)
13	10	6/18	9:58	1							1+								28(6/17)
14	10	6/18	10:23	14				12+	1								1	broken	8(6/18),11,15 (6/17)
15	10	6/18	10:37	1	1														0(6/18)
16	10.5	6/19	11:51	134		7	15+	43+	63+		1						5	broken	
17	10.5	6/19	13:33	7	1	2	4												0,3,4,5 (6/19)
18	10.5	6/19	13:58	2								2							35(6/18)
19	12	6/25	9:46	2										1			1	broken	48(6/23)
20	12	6/25	9:44	2										2					48(6/23)
21	13	6/25	10:55	1													1	dead	
21(2)	12	6/25	10:55	3									3						35(6/23)
22	13	7/1	12:12	1												1			64(6/28)
22(2)	13	7/1	12:12	1													1	dead	
23	13	7/1	12:17	1													1	broken / dead	
24	13	7/1	12:30	1													1	fungus	
25	13	7/1	13:31	2	2														0(7/1)
26	13	7/2	10:28	1												1-			59(6/29)
27	14	7/2	11:28	3				3											7(7/2)
28	14	7/2	11:31	1				1											7(7/2)
29	14	7/2	11:42	1				1											7(7/2)
30	14.5	7/3	9:07	1									1						30(7/2)
Total collected				218	22	9	21	61	67	6	5	2	4	3	0	2	16		
Total staged				202	22	9	21	61	67	6	5	2	4	3	0	2			
Total not staged				16													16		

[a] Indicates whether egg(s) are early (-) or late (+) in particular developmental stage.

Table 5. Summary of 2008 white sturgeon larval sampling effort and volume sampled by gear type and location, Kootenai River, Idaho.

	Location (river kilometer)	Sampling Dates	Catch[a]	No. Sites	Effort (hours)		Volume (m^3) sampled	
					Mean (SD)	Total	Mean (SD)	Total
D-ring, Benthic	230.5	7/17-8/7	48	11	8.8(5.5)	97.0	4,568.2(3,933.3)	50,249.7
	231.5	6/20	157	12	3.5(0.6)	42.4	1,239.6(207.2)	12,396.2
	245.6	7/28-7/30	0	3	5.2(0.6)	15.6	111.0(188.4)	332.9
	246.6	7/30	0	1	4.5	4.5	265.4	265.4
	258.5	7/21-7/24	0	6	4.2(0.5)	25.1	787.0(1,117.3)	4,722.1
	270.3	6/26-7/16	280	42	8.0(7.0)	335.3	3,320.0(1,655.6)	132,800.3
D-ring, Mid-column	230.5	7/17-8/7	41	12	9.5(5.9)	114.1	2,767.9(1,284.7)	33,214.5
	231.5	7/9	51	12	3.1(1.5)	37.7	1,527.0(1,171.4)	18,324.4
	244.6	7/30	2	2	4.3(0)	8.6	770.4(10.2)	1,540.9
	245.7	7/28	8	2	5.6(0)	11.1	178.5(59.4)	357.0
	258.5	7/24	0	2	3.6(0)	7.3	2,188.9(410.9)	4,377.8
D-ring, Surface	230.5	7/17-8/7	23	12	9.5(5.7)	114.4	2,745.2(1,262.9)	32,942.7
	231.5	7/9	3	6	3.3(1.6)	19.8	2,419.7(1,165.5)	14,518.4
	244.4	7/30	3	3	2.8(1.3)	8.5	1,618.4(1,054.1)	4,855.1
	245.7	7/28	3	2	5.6(0)	11.2	946.7(1,294.4)	1,893.3
	258.5	7/21-7/24	0	6	4.1(0.4)	24.5	2,533.9(394.8)	7,601.7
1/2 Meter, Benthic	231.6	6/20	63	2	3.2(1.5)	6.4	448.3(535.5)	896.5
	231.7	6/20	79	2	3.3(1.6)	6.6	761.3	761.3
	231.8	6/20	111	2	3.3(1.4)	6.5	--[b]	0
	231.9	6/20	34	2	3.0(1.6)	6.0	427.7	427.7
	270.4	6/26	18	2	2.9(0.4)	5.7	1,511.0(129.8)	3,022.0
	270.5	6/26	13	2	2.9(0.3)	5.7	--[b]	0
	270.6	6/26	17	2	3.0(0.4)	5.9	--[b]	0
	270.7	6/26	28	2	3.0(0.4)	6.0	2,053.6(418.9)	4,107.2
Combined	All	6/20-8/7	982	150	6.2(5.2)	925.9	2,441.5(1,960.5)	329,607.1

[a] Catch was entirely species other than white sturgeon with the exception of one larval sturgeon captured at rkm 270.3 7/14/08 during benthic d-ring net fishing. This may have been part of a release 13 days prior.

[b] Meter readings were unattainable at some sampling locations.

Table 6. Idaho Department of Fish and Game juvenile white sturgeon gill net sampling effort by sampling location for July through September 2008.

River Kilometer	Number of Sets	Hours of Effort	Number of adults captured	Number of juveniles captured	Sturgeon catch per unit of effort
174.0	23	26.18	0	16	0.611
176.5	12	14.12	0	1	0.071
177.5	16	17.45	0	5	0.287
185.0	40	47.53	0	63	1.325
190.5	24	25.80	0	35	1.357
193.0	39	45.20	0	54	1.195
205.0	42	47.77	0	110	2.303
207.0	32	36.72	1	94	2.587
215.0	45	50.93	1	72	1.433
225.0	32	39.37	0	30	0.762
235.0	16	18.38	0	1	0.054
236.0	8	10.07	0	0	—
244.0	20	21.63	0	57	2.635
244.5	27	29.07	0	29	0.998
Total	376	430.22	2	567	1.323

Table 7. Idaho Department of Fish and Game juvenile white sturgeon gill net sampling effort by mesh size for July through September 2008.

Gill net mesh size (cm)	Number of sets	Hours of effort	Number of adults captured	Number of juveniles captured	Sturgeon catch per unit effort
1.3	44	50.93	0	69	1.355
1.9	15	16.32	0	27	1.655
2.5	91	102.92	0	156	1.516
3.8	51	59.32	0	84	1.416
5.1	69	78.08	0	119	1.524
6.4	82	95.05	2	109	1.168
7.6	12	13.48	0	2	0.148
Unknown	13	14.12	0	1	0.071

Table 8. Summary statistics of recaptured juvenile hatchery white sturgeon from 2008 gill net sampling, Kootenai River, Idaho.

Statistic	Fork length (cm) n=487	Total length (cm) n=487	Mean weight (kg) n=485
Average	46.0	53.6	0.75
Standard deviation	12.1	13.9	0.64
Minimum	20.8	25.3	0.05
Maximum	85.1	99.7	4.60

Table 9. Wild juvenile white sturgeon captured in gillnets in 2008, Kootenai River, Idaho.

Date	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)	Mesh size (cm)	Year class
8/13	207.0	41.0	47.3	0.54	1.5	2002
8/13	207.0	48.5	57.0	0.72	1.5	2000
8/18	121.0	56.5	64.8	1.15	2.0	2000
8/18	121.0	37.0	43.0	0.30	4.0	2002
8/18	121.0	48.0	55.0	0.70	4.0	2000
8/18	121.0	54.5	63.5	1.05	2.0	1998
8/18	121.0	53.5	61.5	1.00	2.0	[a]
8/18	121.0	44.2	51.6	0.45	2.0	2002
8/21	123.0	62.5	73.1	1.55	4.0	2000
8/27	207.0	37.4	43.2	0.32	1.0	2000
9/8	185.0	34.0	39.6	0.24	1.0	2004
9/16	215.0	38.1	44.1	0.31	1.0	2002

[a] Fin ray not readable.

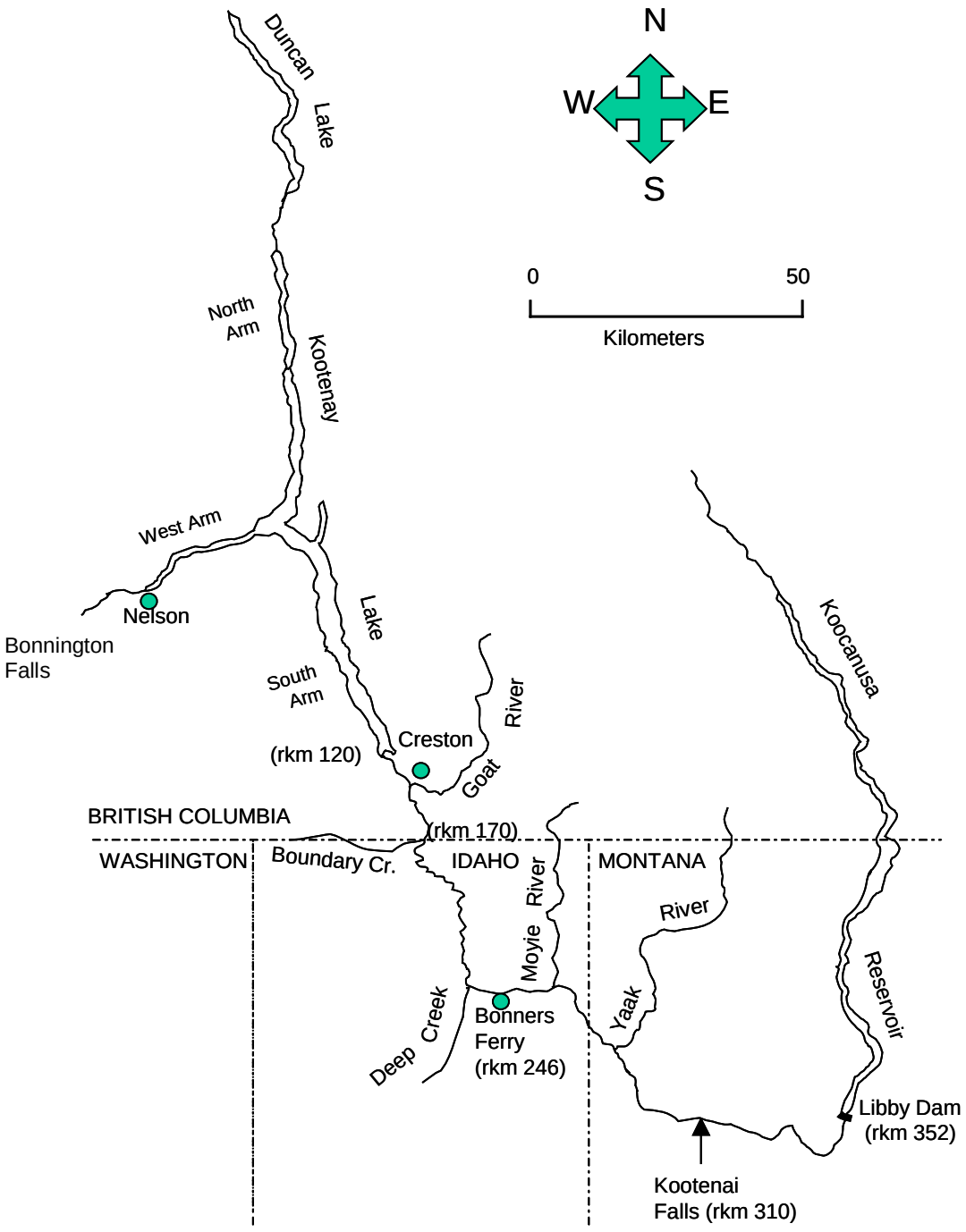

Figure 1. Location of the Kootenai River, Kootenay Lake, Lake Koocanusa, and major tributaries. The river distances from the northernmost reach of Kootenay Lake are in river kilometers (rkm) and are indicated at important access points.

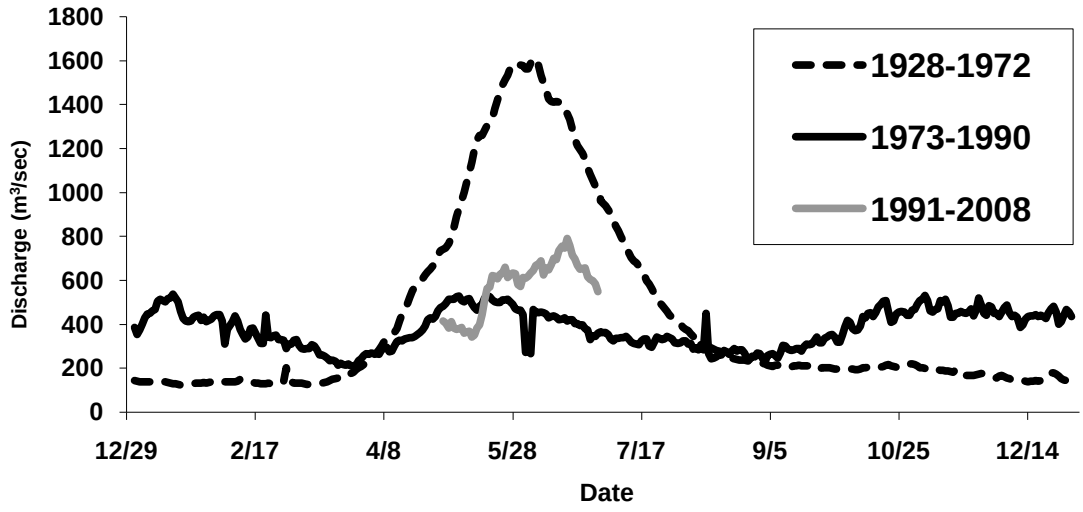

Figure 2. Mean daily flow patterns in the Kootenai River at Bonners Ferry, Idaho from 1928-1972 (pre-Libby Dam), 1973-1990 (post-Libby Dam) and 1991-2008 (post-Libby Dam with augmented flows, May 1 through June 30).

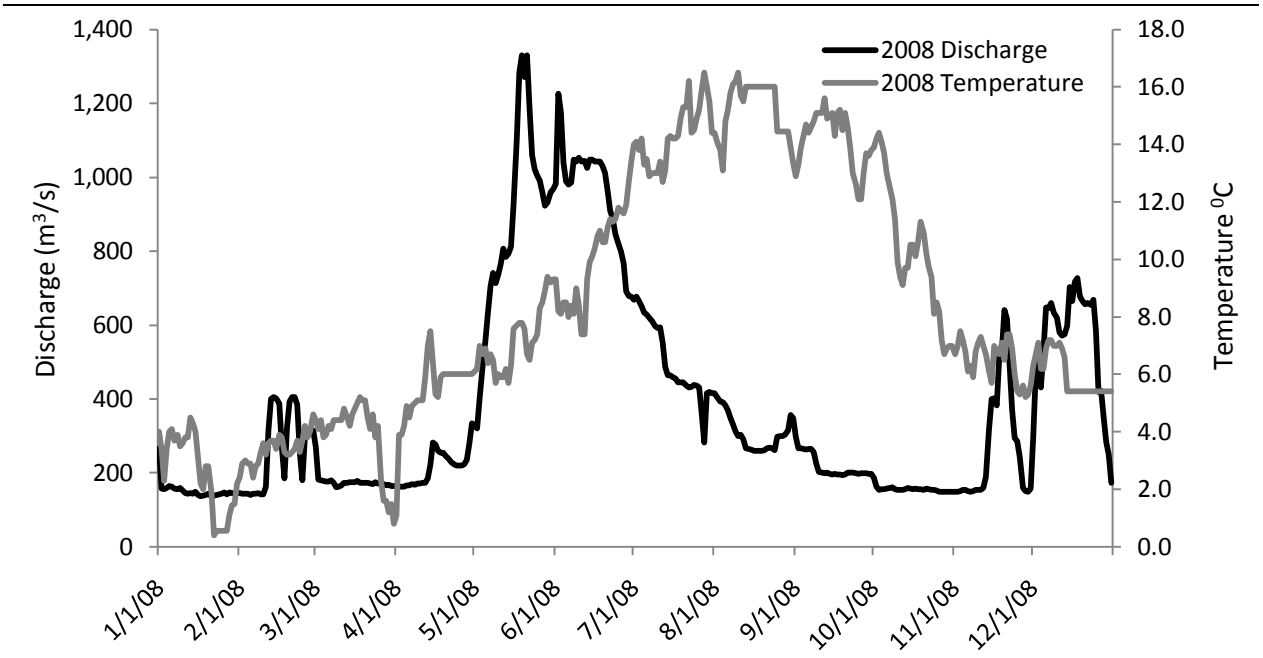

Figure 3. Mean daily discharge (m^3/sec) and temperature (°C) for Kootenai River at Bonners Ferry, Idaho 2008.

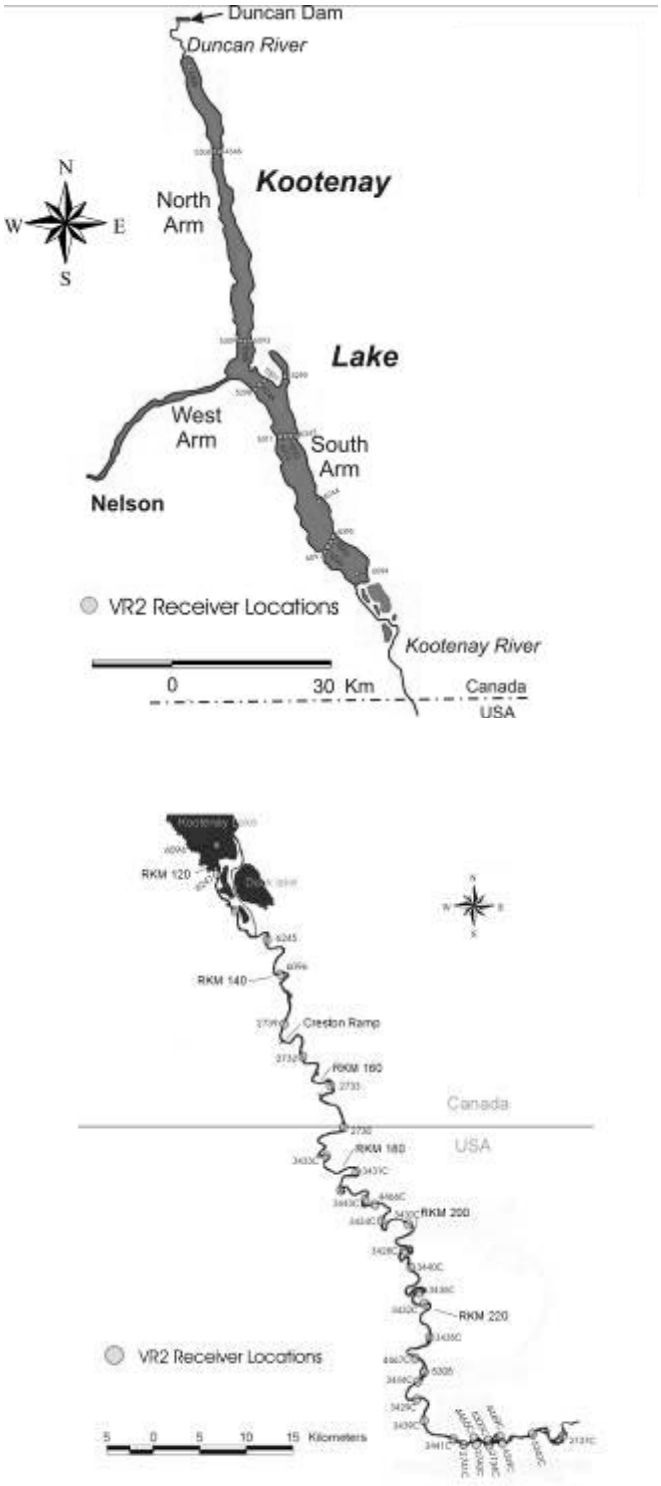

Figure 4. Location of Vemco VR2 receivers in Kootenai River/Lake system, Idaho and British Columbia, Canada, 2008.

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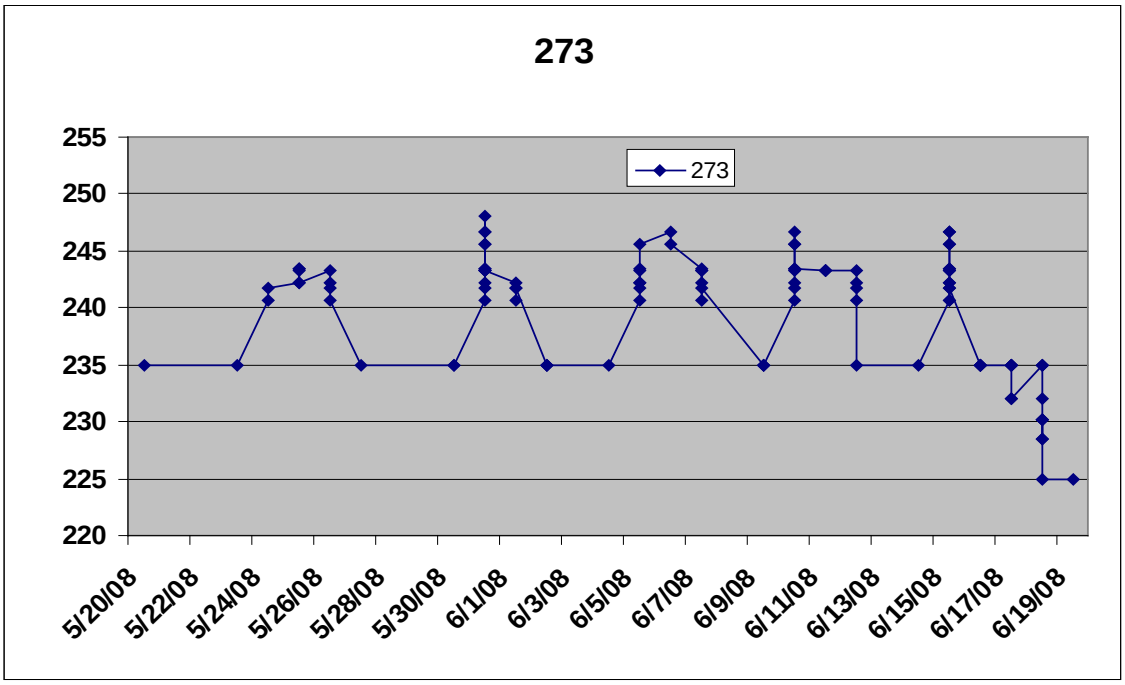
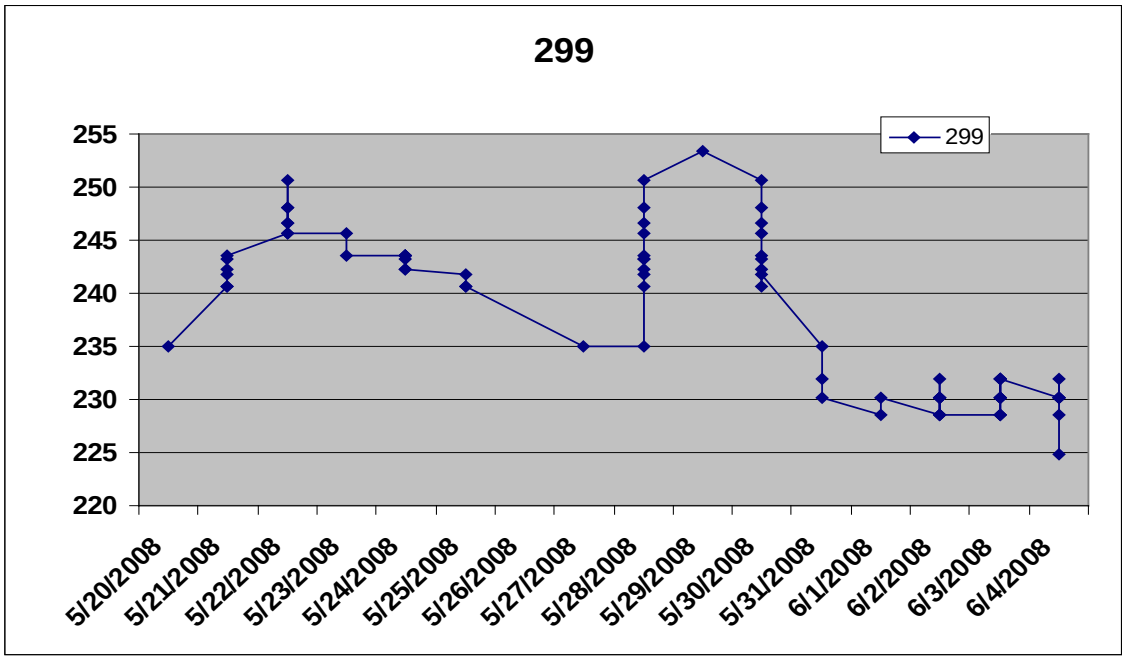
APPENDICES

Appendix 1. Movement above Bonners Ferry, Idaho for six adult female white sturgeon believed to have spawned in 2008. X-axis denotes date; Y-axis denotes river kilometer.

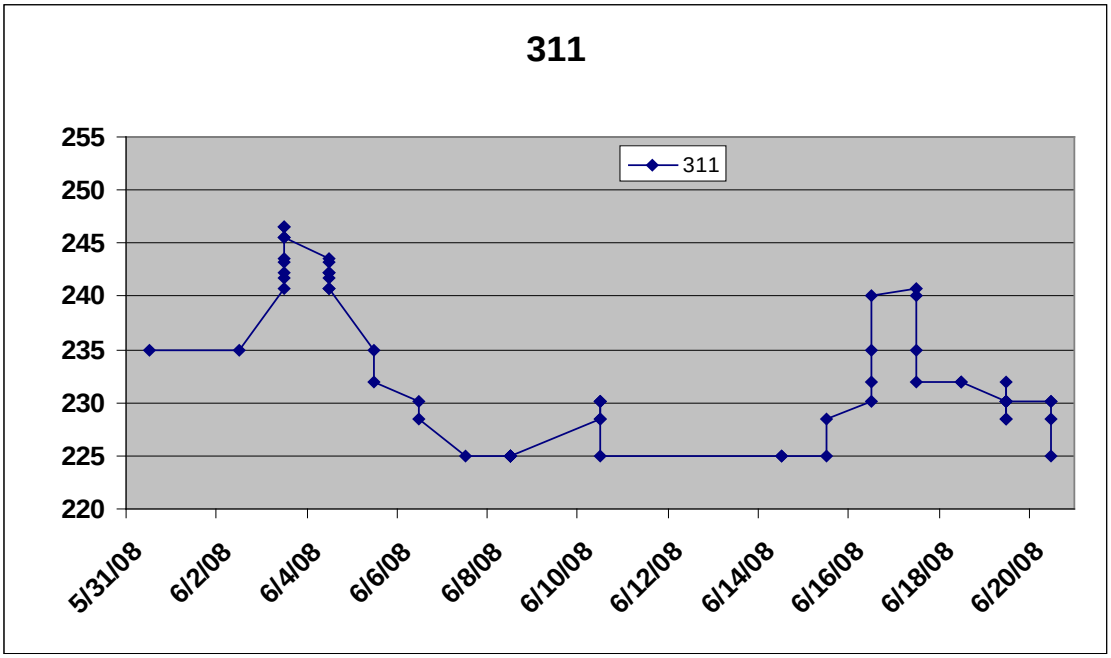
Transmitter 273, stage F-4 on April 12, 2005



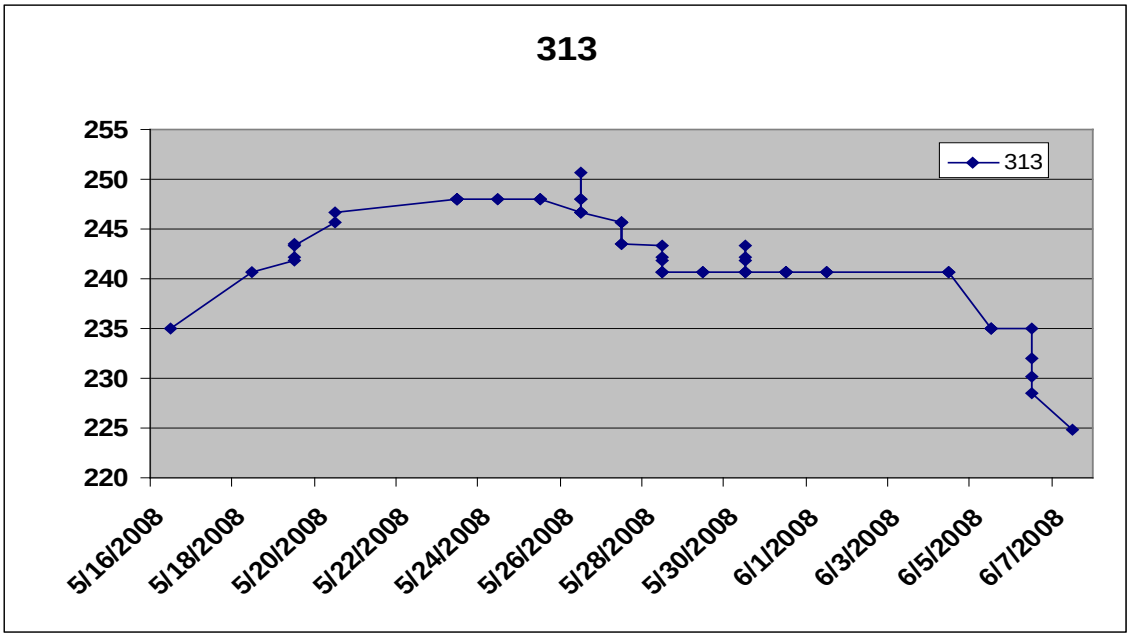
Transmitter 299, stage F-3 on September 28, 2005



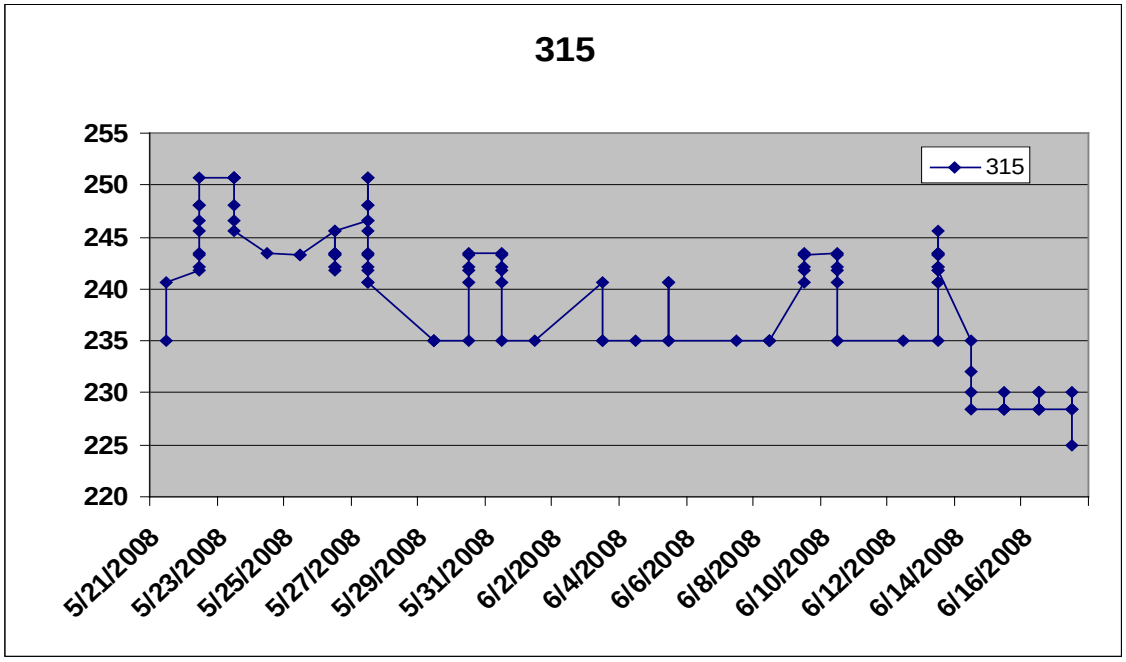
Transmitter 311, stage F-4 on March 25, 2008



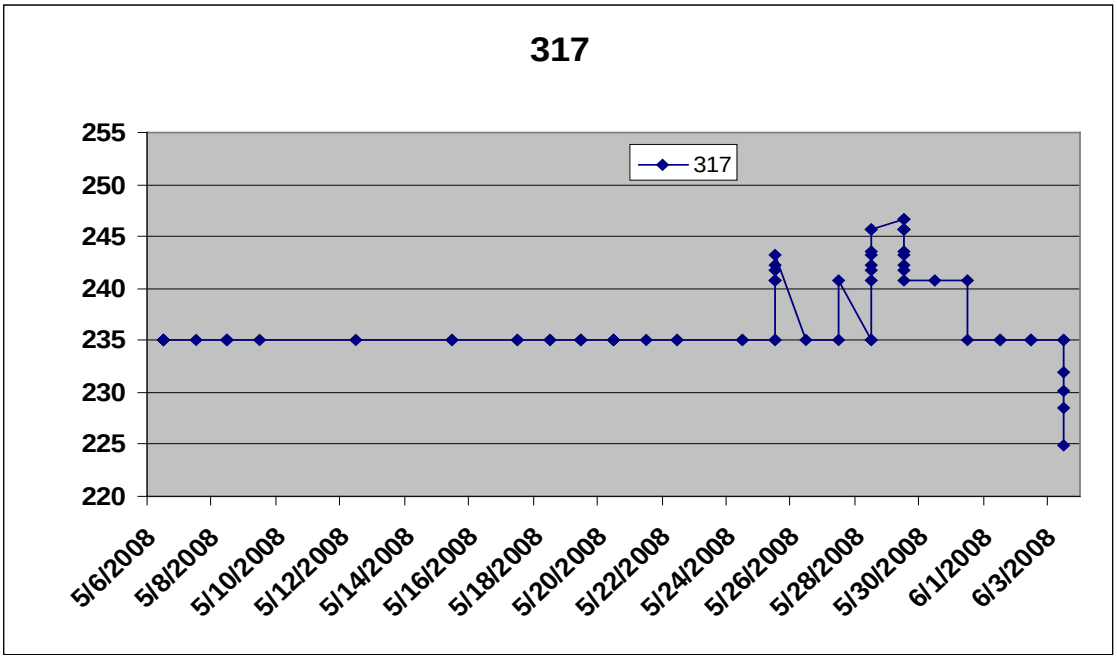
Transmitter 313, stage F-4 on October 17, 2007



Transmitter 315, stage F-4 on April 22, 2008



Transmitter 317, stage F-4 on April 3, 2008



Appendix 2. Chronology of white sturgeon free embryo releases in 2008, Kootenai River.

1st Hatch Date	Last Hatch Date	Family #	Parents		# Eggs	% Neura-lation	Release Date/ Time	Rkm/ Site	Release Coords.		# Larvae	Water Temp. C	Leonia Flow (cfs)	Stage (ft.)	Secchi (m)	Velocity (f/s)		
			Female	Male					Lat.	Long						Surf	.2	.8
6/14	6/16	RRC 3414	1BF2784E06	1BF2783414	83292	83	6/16/ 10:00-10:05/ 11 bags	255.9/ Site 5	48.42'12.6	116.12' 29.9	69132	10	32600	20.3	1.1	8.05	7.73	6.22
							6/16/ 12:27-12:31/ 8 bags											
6/18	6/20	RR 1BA4	1BF2776E93	1BF2781BA4	28824	80	6/20/ 9:34	231.0/ Shortys Side Channel	48.45' 54.4	116.23' 38.2	23059	10	31700	20.1	1.5	1.91	1.85	1.05
6/22	6/24	04B0	1BF278586A	1BF27804B0	93000	97	6/24/ 10:33-10:40	257.4/ Site 3	48.42' 15.1	116.11' 9.6	90210	11			1.6	6.14	6.42	4.12
6/22	6/24	1BD5	1BF278586A	1BF2781BD5	25000	91	6/24/ 12:27-12:30	262.5/ Site 4 Hem-lock	48.42' 45.0	116.08' 30.8	22750	11.5			1.3	6.74	6.56	5.52
6/24	6/26	RR FF3B	1BF2780FDA	1BF277FF3B	102000	95	6/26/ 8:30/ Rel 1	255.9/ Site 5	48.39' 39.8	116.05' 14.6	76900	10	24450	18.0	1.8	4.73/5.83/ 4.31	5.88/ 3.62	3.53/ 5.17/ 3.47
							6/26/ 10:03/ Rel 2	270.3/ Site 2			20000							
6/26	6/28	RR 3665	1BF2784EF2	1BF2783665	135000	99	6/28/ 10:53-10:59	257.4/ Site 3			131650[a]	12	21950	17.1	2.0	6.27	5.85	2.83
6/28	6/30	3D03	1BF2780193	1BF2783D03	76000	99	6/30/ 10:20-10:26/ Rel. 1	306.5/ Site 1	48.26' 50.6	115.48' 4.4	73240[a]	12.5	21900	17.0	2.0	0.3	0.34	0.25
		4BF0	1BF2785E47	1BF2784BF0	28316	99	/30/ 10:20-10:26/ Rel. 2				26033[a]							
		5A76	1BF2785E47	1BF2785A76	20000	96	6/30/ 10:20-10:26/ Rel. 3				17200[a]							

Appendix 2. Continued.																		
1st Hatch Date	Last Hatch Date	Family #	Parents		# Eggs	% Neura-lation	Release Date/ Time	Rkm/ Site	Release Coords.		# Larvae	Water Temp. C	Leonia Flow (cfs)	Stage (ft.)	Secchi (m)	Velocity (f/s)		
			Female	Male					Lat.	Long						Surf	.2	.8
6/29	7/1	1899	1BF27849B1	1BF2781899	68250	99	7/1/ 10:15-10:23/ Rel. 1	270.3/ Site 2	48.39' 39.9	116.05' 14.5	65568[a]	13	21300	17.0	1.7	5.63	5.5	3.87
		80E-	1BF27849B1	1BF2780E47	79800	98	7/1/ 10:15-10:23/ Rel. 2				76204[a]							
6/30	7/2	4BF0	1BF2785E47	1BF2784BF0	100000	99	7/1/ 9:33-9:39/ Rel 1	262.5/ Site 4	48.42' 40.7	116.08' 30.8	99000	14	21400	16.97	1.5	7.02	7.29	5.09
		5A76	1BF2785E47	1BF2785A76	13300	96	7/1/ 9:33-9:39/ Rel 2				12768							
Total					852782						803714							

[a] 2,000 larval fish held over at Kootenai Tribal Hatchery.

Appendix 3. Numbers and recapture rates of hatchery produced white sturgeon juveniles (progeny of wild brood stock) released into the Kootenai River and Kootenay Lake in Idaho, Montana, and British Columbia between 1990 and December 2008 (from Kootenai Tribe of Idaho and Idaho Department of Fish and Game Annual Reports 1990-2008). This table includes tagged and/or measured fish only.

Year class	Hatchery facility[a]	Release number	Mean total length (mm) at release (S.D.)	Mean weight (g) at release (S.D.)	Release season & year	Number re-captures	Percent of all re-captures
1990	KTOI	14	456.9 (53.0)	320.8 (112.3)	Summer 1992	10	0.20%
1991	KTOI	104	254.7 (17.3)	66.1 (13.1)	Summer 1992	116	2.36%
1992	KTOI	123	482.6 (113.0)	549.3 (482.9)	Fall 1994	114	2.32%
1995	KTOI[b]	0	--	--	?	42	0.85%
1995	KTOI	1,075	228.5 (27.0)	47.3 (16.6)	Spring 1997	487	9.90%
1995	KTOI	884	343.6 (43.7)	148.0 (64.0)	Fall 1997	452	9.19%
1995	KTOI	97	410.7 (68.2)	288.5 (137.8)	Summer 1998	65	1.32%
1995	KTOI	25	581.5 (40.5)	863.3 (197.9)	Summer 1999	14	0.28%
1998	KTOI	309	260.1 (41.9)	79.0 (44.4)	Fall 1999	58	1.18%
1999	KTOI	828	256.1 (22.2)	70.6 (18.2)	Fall 2000	159	3.23%
1999	KH	1,358	248.1 (32.9)	67.2 (27.6)		391	7.95%
1999	KTOI	491	284.3 (54.4)	107.6 (60.1)	Spring 2001	41	0.83%
1999	KH	1,583	306.5 (40.4)	55.9 (39.5)		579	11.77%
1999	KT[b]	0	--	--	?	3	0.06%
1999	?[b]	0	--	--	?	44	0.89%
2000	KTOI	2,286	244.0 (38.9)	64.2 (31.0)	Fall 2001	109	2.21%
2000	KH	1,654	240.0 (23.2)	57.7 (16.4)		172	3.50%
2000	KH	2,209	283.1 (28.7)	99.3 (30.2)	Spring 2002	12	0.24%
2000	KH	30	365.4 (14.0)	195.3 (19.9)	Summer 2002	0	0.00%
2000	KTOI	214	409.4 (53.5)	294.1 (109.8)	Fall 2002	29	0.59%
2000	KTOI[c]	907	333.1 (36.0)	190.8 (60.0)	Jan. 2003	118	2.40%
2000	KTOI[d]	10	557.7 (28.4)	87.6 (18.4)	Feb. 2004	0	0.00%
2000	KTOI[l]	3	662 (6.01)	425 (66.1)	Summer 2006	0	0.00%
2000	?[b]	0	--	--	?	25	0.51%
2001	KTOI	2,672	200.1 (37.9)	33.0 (15.6)	Fall 2002	93	1.89%
2001	KH	4,469	227.4 (24.2)	51.6 (16.6)		9	0.18%
2001	KH	1,715	257.1 (26.4)	71.8 (24.2)	April 2003	7	0.14%
2001	KTOI[l]	1	570.0	750.0	Summer 2006	0	0.00%
2001	KH	0	--	--	?	1	0.02%
2001	?[b]	0	--	--	?	2	0.04%
2002	KH	5,864	217.3 (25.2)	41.3 (14.2)	May 2003	25	0.51%
2002	KTOI	856	214.0 (43.8)	41.9 (22.6)	Oct. 2003	0	0.00%
2002	KTOI[e]	550			Nov. 2003	NRND	0.00%
2002	KTOI	3,852	215.4 (37.3)	43.4 (20.0)	Late wtr. 2003	5	0.10%
2002	KTOI	3,663	214.2 (54.8)	43.1 (27.2)	Late wtr.'03-Early wtr. '04	8	0.16%
2002	KTOI[l]	1	55.0	740.0	Summer 2006	0	0.00%
2002	?[b]	0	--	--	?	14	0.28%
2003	KH	9,020	222.8 (25.7)	48.9 (24.4)	Spring 2004	549	11.16%
2003	KH[f]	19	229.5 (26.7)	51.9 (18.5)	Sept. 2004	0	0.00%
2003	KTOI	3,519	226.9(46.3)	55.4(31.6)	Late wtr. 2004	2	0.04%
2003	KTOI[l]	3	43.7 (2.8)	346.7 (49.3)	Summer 2006	0	0.00%
2003	?[b]	0	--	--	?	12	0.24%

Appendix 3. Continued.

Year class	Hatchery facility[a]	Release number	Mean total length (mm) at release (S.D.)	Mean weight (g) at release (S.D.)	Release season & year	Number re-captures	Percent of all re-captures
2004	KH[g]	2,038	196.2(27.7)[h]	57.4(33.0)	Spring 2005	30	0.61%
2004	KT	1	510	490	Wtr 2007	0	0.00%
2004	?[b]	0			?	52	1.06%
2005	KH[i]	14	298.6(14.1)[h]	174.2(27.8)	Spring 2006	0	0.00%
2005	KH[g]	1,765	197.8(24.5)[h]	54.2(22.4)		35	0.71%
2005	KTOI[j]	510	171.0(47.0)	26.8(19.9)	Fall 2006	4	0.08%
2005	KH[b]	0			?	4	0.08%
2005	?[b]	0			?	81	1.65%
2006	KH[g,k]	600	148.8(10.8)[h]	22.9(5.4)	Fall 2006	NRND	0.00%
2006	KH[g]	1,877	182.2(15.0)[h]	43.8(11.7)	Spring 2007	22	0.45%
2006	KH[g,k]	1,000	184.4(15.9)[h]	45.6(11.5)			
2006	KT[g]	4,922	170.8(30.2)	21.8(10.8)	Wtr 2007	0	0.00%
2006	KH[b]	0	--	--	?	1	0.02%
2006	?[b]	0	--	--	?	6	0.12%
2007	KH	2,167	241.3(23.8)[h]	91.6(26.8)	Spring 2008	39	0.79%
2007	KT[g]	884	163.1(28.2)	21.5(9.8)	Fall 2008	0	0.00%
2007	KT[k]	203	99.4(13.7)	6.4(5.3)		0	0.00%
?	KH[l]	0	--	--	?	2	0.04%
?	KT[l]	0	--	--	?	1	0.02%
?	?[l]	0	--	--	?	877	17.82%
Total marked		**66,389**	--	--	--	**4,921**	**7.41%**

[a] Hatchery facility refers to the rearing hatchery: Kootenai Tribal Hatchery in Idaho (KTOI) or Kootenay Hatchery in British Columbia (KH).

[b] Year class determined by scute removal; fish had shed PIT or PIT was not matched in database.

[c] Eleven fish held over for later upriver release with transmitters (only 10 released with transmitters).

[d] These fish were released upriver (rkm 306.5) with sonic and radio tags.

[e] No measurements available; exact number not known, approximate is 550; NRND (number recaptured cannot be determined).

[f] These fish were first taken to Kokanee Creek Provincial Park, then released in September 2004.

[g] Additional fish were released with no measurements taken or PITs added (see Appendix 3).

[h] Value given is mean fork length (mm).

[i] These fish were released upriver (299.0 and 258.7), six of them with Vemco sonic tags.

[j] There were 200 additional fish held over at KTOI hatchery for Biopar study.

[k] These fish did not have a PIT tag added and were all given fish # 999.

[l] These fish were untraceable as to brood year, rearing facility, release date, and/or family.

Appendix 4. Juvenile hatchery releases with no tag added or measurements taken through fall 2008: combined hatcheries.

Year class	Hatchery facility[a]	Release number	Release season and year
2004	KTOI	3,000	Fall 2004
2004	KTOI	1,275	Late wtr. '04-early wtr. '05
2004	KTOI	17,723	Spring 2005
2004	KH	3,440	Spring 2005
2004	KTOI	8,637	Summer 2005
2005	KTOI	6,200	Fall 2005
2005	KTOI	3,947	Spring 2006
2005	KH	13,665	Spring 2006
2006	KH	6,900	Fall 2006
2006	KTOI	6,175	Fall 2006
2006	KH	5,800	Spring 2007
2006	KTOI	12,973	Spring 2007
2007	KT	203	Fall 2008
Total		89,938	

[a] Hatchery facility refers to the rearing hatchery: Kootenai Tribal Hatchery in Idaho (KTOI) or Kootenay Hatchery in British Columbia (KH).

Appendix 5. Year class, number captured, capture locations, fork length (cm), total length (cm), and weight (kg) of hatchery released juvenile sturgeon captured with gill net from Kootenai River, Idaho, through 2008.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
1990	1	120.0	76.5	88.0	3.00
	3	205.0	61.0-81.4	74.0-95.0	1.75-2.70
	2	215.4	55.4-66.2	66.2-78.1	1.86
	1	215.6	65.2	76.0	2.00
	1	215.7	69.0	82.0	2.25
	1	225.1	65.8	77.0	1.95
	1	Unknown	66.5	76.1	1.95
1991	1	118.0	95.0	110.5	5.65
	3	119.0	73.0-85.0	85.5-98.0	1.10-4.50
	1	119.5	75.0	88.5	--
	4	120.0	63.0-102.5	73.5-118.5	1.60-6.65
	4	121.0	67.0-95.0	77.2-92.0	2.10-4.65
	1	134.0	82.0	94.5	4.1
	1	140.0	70.4	83.2	--
	1	190.0	70.0	83.0	2.20
	1	192.0	35.1	40.8	0.16
	1	203.4	56.0	64.0	1.05
	4	203.5	52.0-72.0	61.0-83.0	0.95-2.70
	1	204.5	64.0	76.0	--
	1	204.7	60.0	68.8	1.36
	23	205.0	26.5-84.0	30.5-100.0	0.11-3.60
	1	205.4	51.0	60.0	1.10
	4	205.5	47.0-76.0	56.0-89.1	0.69-3.10
	5	215.0	40.0-53.0	47.0-62.0	0.14-0.70
	1	215.3	47.0	56.0	0.70
	1	215.4	64.2	75.4	2.15
	18	215.5	46.0-74.0	54.0-85.1	0.21-2.85
	8	215.6	41.0-57.0	48.0-66.2	0.43-1.80
	4	215.7	39.0-61.0	46.0-72.0	1.05-1.60
	3	216.0	44.0-53.0	51.0-61.0	0.50-0.88
	1	217.1	33.0	42.0	0.49
	1	224.6	48.0	58.0	0.65
	1	224.7	46.0	55.0	0.70
	2	224.9	42.0-73.5	50.0-84.8	0.45-2.80
	10	225.0	38.0-60.5	45.0-70.0	0.40-1.65
	3	225.1	39.0-49.6	46.0-58.0	0.40-0.78
	2	225.5	50.0-52.0	55.0-61.0	1.90-1.95
	1	227.0	36.0	43.0	0.52
	2	227.5	63.0-73.0	74.0-88.0	2.0-3.0
	1	244.5	--	35.0	0.07
1992	3	118.0	80.0-97.5	95.0-110.0	3.4-5.95
	4	119.0	61.0-102.0	69.0-118.0	1.20-5.50
	2	120.0	45.0-70.5	52.0-80.5	2.20
	3	121.0	77.0	92.0	3.19
	1	123.0	78.0	90.5	3.3
	1	134.0	77.1	90.5	2.95
	1	161.0	67.3	77.5	2.10
	1	174.3	56.0	62.0	1.06
	1	182.5	51.5	59.0	0.78
	1	190.3	61.2	71.0	1.53
	1	190.4	73.0	86.0	4.25
	1	203.4	74.0	85.0	5.20
	4	203.5	52.0-66.0	62.0-75.0	1.55-1.90
	1	204.0	59.0	69.5	1.50

Appendix 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
1992, continued.	1	204.3	64.5	75.0	1.77
	1	204.7	65.8	75.6	1.60
	17	205.0	49.0-68.6	58.0-79.2	2.00
	1	205.3	50.0	90.0	1.80
	2	205.4	62.0-65.3	75.0-75.2	1.83
	6	205.5	49.0-69.0	57.0-79.1	0.20-3.50
	1	205.6	54.0	64.0	--
	1	208.0	70.4	79.4	1.90
	1	210.5	66.3	75.6	1.80
	1	215.0	50.0	59.0	0.70
	2	215.1	59.0-67.90	67.5-81.0	1.11-2.10
	1	215.3	58.0	66.5	1.20
	12	215.5	50.2-72.5	57.9-83.5	0.11-2.13
	8	215.6	45.0-62.0	52.0-75.0	0.48-2.40
	6	215.7	42.0-66.0	49.0-77.0	1.05-2.30
	1	215.8	57.0	65.0	1.08
	1	215.9	63.0	75.0	1.35
	2	216.0	49.0-67.5	56.0-78.6	0.70-1.78
	1	216.9	64.0	75.0	2.3
	2	217.1	30.0-36.0	35.0-44.0	0.35-0.51
	1	224.5	56.5	66.5	1.16
	2	224.9	50.0-69.5	61.0-80.5	1.30-1.68
	6	225.0	31.0-55.0	37.0-65.0	0.35-1.10
	5	225.1	47.0-62.0	56.0-73.0	0.60-1.30
	1	227.0	66.0	80.0	1.70
	1	227.4	59.1	62.0	1.00
	1	227.8	42.0	49.0	0.90
	2	229.0	46.0	55.0	0.55
	1	231.0	66.0	77.0	2.0
	1	231.1	71.0	85.0	2.3
1995	5	118.0	63.1-74.0	72.6-84.6	1.8-3.05
	3	119.0	49.0-58.0	56.5-67.1	0.70-1.27
	12	120.0	56.5-86.9	65.5-99.0	0.83-3.90
	29	121.0	43.9-83.3	50.0-97.5	0.53-4.5
	7	123.0	65.2-88.5	70.1-100.2	1.30-5.35
	5	130.0	38.0-78.0	43.9-90.0	0.46-3.25
	3	134.0	49.0-70.5	57.0-81.3	0.73-2.4
	1	137.0	50.9	59.2	0.76
	1	141.0	53.8	60.4	0.83
	1	144.3	39.8	45.3	0.38
	2	144.5	29.0-45.5	33.5-52.0	0.14-0.56
	5	145.0	42.5-85.1	50.0-99.7	0.50-4.6
	1	157.0	54.1	62.6	0.99
	1	157.5	33.2	37.3	0.18
	2	161.0	45.6	51.8	0.44
	2	163.0	35.2-49.1	41.7-56.9	0.24-0.73
	1	174.5	52.4	60.7	0.77
	1	176.0	33.9	40.0	0.20
	4	176.3	24.7-49.3	40.0-58.1	0.15-0.68
	4	176.4	42.5-51.0	50.0-59.0	0.42-0.71
	2	176.5	39.3-44.1	46.2-53.0	0.33-0.48
	2	177.3	37.9-45.0	43.7-52.0	0.28-0.49
	1	184.9	44.2	51.0	0.31
	2	185.0	39.1-58.3	43.3-68.5	0.33-1.25
	1	189.9	51.5	59.5	0.74
	18	190.0	31.0-62.0	36.0-72.3	0.15-1.41
	4	190.1	36.8-54.0	43.9-63.5	0.28-0.87
	2	190.3	27.2-48.5	31.7-56.0	0.15-0.63
	1	190.4	43.0	50.5	0.47

Table 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
1995, continued.	2	190.5	53.3-62.4	62.4-73.1	0.90-1.53
	1	191.9	35.7	41.3	0.20
	2	192.0	34.7-61.4	38.2-71.8	0.18-1.49
	1	192.1	36.1	42.0	0.25
	1	193.0	65.0	75.5	1.61
	3	195.7	35.5-50.0	42.0-57.0	0.24-0.65
	2	195.8	47.5-49.0	55.5-57.0	0.64-1.34
	1	195.9	43.0	50.5	0.42
	1	203.3	39.3	45.5	0.34
	2	203.4	33.2-37.0	38.5-42.9	0.25-0.36
	7	203.5	36.5-49.8	42.5-57.5	0.28-0.60
	6	204.0	37.9-61.0	43.5-70.0	0.27-1.39
	1	204.1	39.0	45.0	0.35
	1	204.3	44.0	51.0	0.35
	3	204.7	43.0-54.3	49.8-63.6	0.43-1.00
	5	204.8	35.4-50.3	41.2-58.4	0.26-0.67
	7	204.9	35.2-48.0	41.2-55.2	0.20-0.62
	165	205.0	30.8-70.2	35.0-82.5	0.13-2.30
	3	205.3	38.0-50.0	44.0-51.0	0.30-0.76
	10	205.4	36.0-50.5	42.2-58.5	0.28-0.78
	33	205.5	26.0-62.1	31.0-71.8	0.08-1.50
	11	207.0	45.8-71.1	52.5-83.9	0.54-2.14
	3	207.5	44.6-59.7	51.3-68.7	0.47-1.18
	2	207.8	28.4-39.5	33.0-45.9	0.15-0.3
	3	213.2	37.0-58.1	43.0-67.0	0.30-1.17
	1	213.5	58.6	67.6	1.13
	50	215.0	33.1-70.0	37.8-81.1	0.10-3.0
	9	215.1	36.1-49.5	41.1-58.2	0.25-0.69
	6	215.2	25.0-47.0	30.0-55.5	0.05-0.55
	23	215.4	31.2-49.0	36.5-56.4	0.20-0.75
	149	215.5	25.5-64.8	29.1-74.0	0.06-1.32
	41	215.6	30.0-48.9	34.2-56.8	0.13-0.60
	61	215.7	25.0-54.8	29.0-63.8	0.05-0.93
	9	215.8	25.0-50.2	30.0-58.4	0.08-0.68
	2	216.0	40.5-45.6	47.3-52.5	0.39-0.53
	4	219.0	22.0-58.4	25.3-67.4	0.10-1.18
	2	219.8	28.7-33.5	33.5-39.0	0.13-0.25
	1	220.0	32.5	38.0	0.24
	4	222.0	25.9-30.5	30.0-35.0	0.20-0.30
	1	222.7	33.0	38.2	0.20
	1	224.0	61.2	70.9	1.32
	1	224.5	39.0	45.4	0.34
	4	224.6	29.4-37.4	33.0-42.0	0.15-0.35
	13	224.7	29.8-50.9	34.4-58.7	0.16-0.95
	16	224.8	31.9-50.1	36.2-59.3	0.18-0.76
	24	224.9	30.4-64.0	34.2-74.0	0.15-1.70
	108	225.0	21.0-66.6	24.0-78.0	0.05-4.0
	34	225.1	28.0-55.4	32.0-64.2	0.09-1.20
	2	225.2	24.0-27.0	28.0-32.0	0.05
	1	225.4	37.1	43.0	0.20
	1	226.1	45.3	52.3	0.53
	5	227.0	29.5-51.0	33.5-61.0	0.10-1.00
	3	227.2	33.0-35.0	38.0-40.5	0.20
	6	227.3	30.0-34.5	34.5-39.0	0.10-0.20
	11	227.4	22.7-41.4	33.0-48.6	0.10-0.45
	2	227.8	48.3-51.5	54.8-60.2	0.65-0.78
	1	229.0	59.0	69.0	5.0
	1	229.7	46.3	53.5	0.55
	2	229.8	39.9-42.3	46.6-50.1	0.35-0.38

Table 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
1995, continued.	1	230.0	64.0	75.0	--
	1	230.5	51.5	60.3	0.75
	2	230.8	29.0-36.3	35.0-41.3	0.13-0.25
	3	230.9	27.9-47.5	32.3-55.0	0.13-0.68
	1	234.1	38.0	44.4	0.30
	3	234.3	33.2-35.0	37.0-39.0	0.16-0.19
	2	234.4	25.0-37.0	29.0-42.0	0.09-0.20
	5	234.5	224.0-52.0	27.0-60.2	0.06-0.83
	1	235.5	34.2	39.0	0.21
	1	236.0	33.2	38.8	0.20
	1	237.0	48.9	55.7	0.60
	1	241.5	31.0	36.0	0.14
	3	244.0	56.8-66.0	66.2-76.3	0.98-1.67
	10	244.4	24.9-44.0	28.8-50.5	0.06-0.55
	12	244.5	24.8-48.2	33.3-56.6	0.10-0.65
	2	244.6	31.5-33.0	36.6-38.8	0.13-0.20
	1	244.7	—	61.4	0.85
	1	244.8	45.1	52.6	0.60
	3	245.0	46.4-63.7	67.0-73.6	1.02-1.08
	8	Unknown	21.5-55.5	25.5-65.3	0.06-1.13
1998	1	145.0	28.5	31.1	0.13
	2	150.0	32.0-56.6	40.5-66.5	0.23-1.10
	1	193.5	50.0	57.6	0.71
	1	204.0	38.4	44.4	0.28
	10	205.0	30.0-52.5	35.0-60.5	0.13-0.86
	2	207.0	45.2-58.4	53.1-69.1	0.53-1.34
	1	213.2	35.5	41.5	0.24
	1	213.5	37.7	43.2	0.28
	7	215.0	36.1-61.1	52.0-71.5	0.51-1.51
	6	215.5	22.6-46.6	26.7-52.5	0.08-0.34
	1	215.7	33.2	38.7	0.20
	1	224.0	32.5	38.7	0.20
	1	224.8	36.0	41.7	0.30
	6	224.9	30.0-51.0	35.1-60.2	0.12-0.83
	6	225.0	27.0-38.5	31.6-44.6	0.06-0.36
	2	225.1	27.7-27.8	32.0-32.4	0.10-0.14
	1	226.1	36.1	41.8	0.28
	1	227.4	25.7	30.5	0.07
	1	227.8	28.4	33.1	0.13
	2	229.8	22.5-25.6	26.4-30.2	0.06-0.10
	1	230.0	54.0	63.7	1.1
	2	230.9	23.5-25.0	28.0-29.5	0.07-0.08
	1	244.5	40.7	47.4	0.35
1999	55	118.0	42.3-74.0	49.5-86.6	0.47-3.25
	2	119.0	—	39.0-45.2	0.24-0.38
	54	120.0	29.1-70.4	33.9-83.0	0.16-2.50
	95	121.0	29.5-81.0	34.0-75.5	0.17-3.75
	17	123.0	32.1-70.2	37.5-81.0	0.19-2.4
	17	130.0	27.6-53.0	31.8-61.8	0.12-0.90
	9	134.0	31.3-40.5	36.5-47.0	0.17-0.38
	4	137.0	28.3-45.0	33.4-57.0	0.14-.70
	2	141.0	48.8-56.0	57.1-65.2	0.60-1.0
	1	144.1	—	37.0	0.20
	10	145.0	26.5-56.0	31.1-65.6	0.11-1.20
	1	147.0	22.4	25.9	0.10
	4	150.0	37.5-41.5	43.6-48.2	0.35-0.45
	4	152.7	37.8	39.5	0.24
	1	154.3	22.2	26.7	0.10
	2	154.5	26.4	31.2	0.10-0.12

Table 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
1999, continued.	6	157.0	31.2-50.0	36.9-58.7	0.19-0.80
	15	161.0	27.4-47.0	31.9-55.2	0.13-0.72
	2	163.0	29.0	33.7	0.15
	7	165.0	27.2-36.5	31.0-42.8	0.14-0.27
	2	167.0	32.1-32.7	37.1-38.1	0.16-0.20
	1	169.0	26.0	30.2	0.15
	4	169.6	20.8-22.7	24.5-26.5	0.05-0.10
	1	170.2	37.2	44.4	0.20
	1	173.2	—	41.5	0.30
	1	174.0	46.0	53.7	0.55
	31	174.5	24.1-33.4	28.3-38.9	0.04-0.20
	1	175.2	—	31.0	0.13
	1	176.1	35.7	42.4	0.25
	1	176.4	26.5	30.5	0.10
	3	176.5	24.5-51.1	28.5-59.8	0.07-0.75
	1	176.9	31.3	36.3	0.17
	5	182.0	30.1-38.5	35.6-44.5	0.15-0.29
	5	185.0	44.1-53.9	50.7-62.9	0.5-0.95
	1	189.9	29.0	34.0	0.13
	40	190.0	23.0-47.3	26.5-55.0	0.06-0.63
	2	190.1	27.0-29.0	31.0-33.0	0.10-0.14
	2	190.2	23.5-31.0	28.0-36.0	0.07-0.15
	8	190.3	27.0-41.5	31.1-49.1	0.10-0.36
	5	190.4	27.0-36.0	31.0-41.5	0.10-0.20
	3	190.5	47.1-49.5	54.6-57.4	0.57-0.69
	5	192.0	28.5-43.0	33.0-49.9	0.15-0.35
	3	193.0	46.5-49.2	54.3-57.3	0.61-0.76
	2	193.5	48.3-48.7	55.4-56.5	0.48-0.62
	4	195.7	22.3-32.0	25.9-37.0	0.08-0.20
	12	195.8	24.5-36.0	28.6-42.0	0.07-0.31
	14	195.9	22.5-33.5	26.5-39.2	0.04-0.68
	6	196.0	25.5-33.5	30.0-38.5	0.05-0.23
	8	203.5	27.5-52.5	32.1-60.7	0.12-0.73
	11	204.0	30.5-51.5	35.6-59.7	0.15-86
	3	204.7	26.3-31.7	29.8-38.0	0.11-0.21
	1	204.8	29.0	34.0	0.12
	4	204.9	27.6-32.4	32.0-37.9	0.11-0.19
	247	205.0	19.5-58.5	28.5-68.5	0.05-1.25
	1	205.3	28.0	32.0	0.10
	1	205.4	24.0	29.3	0.05
	49	205.5	25.6-51.5	29.1-60.0	0.11-0.88
	31	207.0	34.4-52.4	40.1-61.5	0.45-0.81
	1	207.5	48.2	55.1	0.74
	7	208.0	27.1-35.1	31.4-41.5	0.12-0.23
	4	213.2	29.6-40.6	33.6-47.3	0.15-0.35
	1	213.5	31.0	36.1	0.18
	105	215.0	34.5-55.0	39.6-64.5	0.23-0.95
	1	215.4	—	35.5	0.10
	83	215.5	20.9-44.5	31.5-52.6	0.14-0.50
	1	216.0	28.9	33.6	0.11
	1	219.0	51.4	59.0	0.70
	1	219.5	36.0	41.2	0.30
	6	224.7	22.6-30.0	24.9-34.9	0.05-0.15
	8	224.8	25.0-27.4	28.5-32.2	0.08-0.12
	14	224.9	26.9-43.5	30.9-50.7	0.10-0.67
	39	225.0	23.2-51.9	26.1-60.4	0.07-0.82
	1	225.1	26.5	30.7	0.12
	4	230.0	27.0-44.0	26.6-51.2	0.08-0.47
	4	230.9	25.0-27.5	29.0-32.0	0.10-0.14

Table 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
1999, continued.	2	231.0	25.5-285	30.0-33.5	0.10-0.14
	4	244.0	42.3-55.1	49.3-63.6	0.47-1.20
	9	244.5	27.5-53.9	27.3-62.0	0.10-0.96
	1	244.6	—	44.0	0.28
	1	245.0	47.1	54.0	0.58
	91	Unknown	19.0-39.0	22.0-44.2	0.05-0.90
2000	1	76.0	25.6	31.0	0.11
	19	118.0	36.9-67.0	42.1-77.7	0.29-1.65
	23	120.0	26.3-74.2	30.9-87.5	0.12-2.95
	50	121.0	26.4-71.1	30.4-82.5	0.12-2.45
	10	123.0	29.5-58.5	34.3-68.5	0.14-1.50
	13	130.0	25.1-42.4	29.3-49.3	0.09-0.39
	2	134.0	36.5-42.5	42.5-49.2	0.25-0.48
	2	137.0	28.2-42.0	32.6-48.3	0.11-0.51
	3	141.0	30.8-39.0	34.8-46.0	0.14-0.31
	4	145.0	31.1-33.0	33.2-38.3	0.15-0.24
	3	150.0	29.3-33.5	34.0-44.3	0.19-0.26
	4	157.0	23.5-27.8	27.0-31.9	0.09-0.11
	9	161.0	21.8-33.4	24.5-39.0	0.07-0.24
	3	163.0	25.5-29.0	29.6-33.5	0.13-0.14
	9	165.0	26.0-31.0	29.7-35.6	0.09-0.17
	4	167.0	27.2-35.5	31.4-41.5	0.10-0.26
	1	170.2	27.9	32.2	0.50
	4	174.0	38.9-53.0	44.8-61.0	0.34-0.86
	2	182.0	29.2-29.4	33.5-34.7	0.13-0.15
	2	185.0	40.0-41.9	46.3-48.8	0.36-0.38
	5	190.0	26.1-44.5	30.6-51.7	0.09-0.57
	2	190.3	25.5-29.0	30.9-33.6	0.09-0.14
	2	190.5	39.5-40.9	45.6-47.9	0.43-0.45
	2	192.0	30.0	35.0	0.14-0.16
	4	193.0	38.6-70.5	44.4-80.5	0.32-2.08
	6	193.5	37.4-45.8	42.2-52.6	0.14-0.51
	5	195.8	26.5-34.2	32.3-40.2	0.11-0.27
	2	204.0	37.0-46.1	43.1-53.3	0.03-0.43
	98	205.0	21.0-51.0	26.2-60.4	0.05-0.77
	26	205.5	24.1-42.7	28.0-49.2	0.08-0.42
	13	207.0	33.6-48.9	38.5-57.6	0.30-0.66
	2	208.0	25.6-32.0	30.0-37.5	0.10-0.19
	1	210.0	34.2	40.4	0.25
	10	213.2	26.0-35.3	30.2-41.1	0.10-0.29
	4	213.5	28.0-32.5	32.0-38.6	0.12-0.19
	33	215.0	30.2-49.0	33.8-57.1	0.14-0.78
	1	215.2	—	33.0	0.10
	25	215.5	25.1-37.7	27.3-44.0	0.09-0.30
	1	219.0	38.7	45.4	0.37
	6	224.0	29.6-38.0	34.3-44.0	0.15-0.31
	9	224.9	32.2-39.0	37.7-45.5	0.23-0.44
	29	225.0	26.1-49.5	30.5-56.5	0.09-0.97
	1	227.8	24.3	27.8	0.09
	1	230.5	32.9	37.5	0.21
	3	244.0	38.7-47.9	45.6-55.8	0.38-0.69
	2	244.5	33.6-50.2	49.5-58.7	0.590.67
	1	245.0	45.3	52.3	0.56
	3	Unknown	28.0-32.2	32.4-38.0	0.12-0.18
2001	4	118.0	36.6-64.1	43.0-73.4	0.27-1.95
	6	120.0	42.8-54.3	49.6-63.4	0.51-1.00
	13	121.0	41.5-68.5	48.6-80.0	0.40-2.10
	3	123.0	26.2-55.0	31.3-64.0	0.09-1.10
	1	145.0	70.0	81.0	2.20

Table 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
2001, continued.	1	161.0	18.9	21.9	0.04
	1	185.0	39.5	46.1	0.46
	2	190.0	31.5-40.8	36.6-47.9	0.19-0.36
	1	192.0	34.9	39.4	0.22
	2	195.8	21.9	25.2	0.06
	2	203.5	40.9-42.0	47.6-49.1	0.18-0.34
	3	204.0	35.5-38.0	41.8-44.2	0.25-0.30
	17	205.0	25.0-46.6	28.2-54.2	0.08-0.64
	3	205.5	23.6-29.1	27.2-33.7	0.08-0.13
	3	207.0	35.3-47.4	41.3-54.5	0.41-0.57
	1	207.5	—	25.6	0.05
	1	213.2	23.0	26.5	0.07
	1	213.5	24.5	28.9	0.09
	22	215.0	28.9-45.9	30.9-53.6	0.14-0.54
	7	215.5	21.2-29.3	24.4-33.8	0.05-0.15
	2	224.0	22.9-26.1	26.6-30.4	0.07-0.09
	3	224.9	22.3-29.0	25.8-33.2	0.06-0.20
	9	225.0	18.2-36.0	20.6-42.5	0.04-0.27
	1	228.5	22.7	26.6	0.06
	2	244.0	44.1-44.9	51.6	0.52
	1	244.5	40.0	47.1	0.34
2002	2	118.0	51.5-53.0	61.0-62.8	0.89-1.10
	2	120.0	26.0-35.5	30.1-40.9	0.10-0.26
	17	121.0	24.5-60.3	27.5-69.7	0.09-1.45
	4	123.0	26.0-53.5	30.1-62.8	0.08-0.88
	3	130.0	22.0-38.0	25.7-44.3	0.07-0.30
	1	134.0	24.0	27.9	0.09
	1	137.0	26.4	30.6	0.10
	4	145.0	20.8-23.4	24.1-27.1	0.05-0.08
	4	161.0	24.1-57.2	27.8-67.0	0.07-1.14
	2	163.0	19.0-21.9	22.2-25.2	0.030.06
	3	165.0	22.2-23.6	26.1-27.3	0.05-0.07
	2	167.0	15.0-21.0	17.6-24.0	0.03-0.05
	1	190.0	29.3	33.5	0.14
	1	177.5	36.6	41.9	0.31
	1	185.0	42.7	50.1	0.47
	1	205.0	27.5	31.6	0.11
	2	205.5	27.7	31.4	0.10-0.13
	1	207.0	35.0	40.2	0.24
2003	4	118.0	33.8-36.0	39.0-42.0	0.21-0.27
	12	120.0	30.0-53.0	35.0-60.0	0.13-0.94
	62	121.0	21.0-61.5	24.8-71.8	0.08-1.52
	7	123.0	22.5-58.0	26.1-67.2	0.06-1.20
	37	130.0	20.2-41.0	23.4-47.7	0.04-0.37
	26	134.0	19.5-41.5	23.0-48.3	0.05-0.38
	14	137.0	21.3-36.9	24.6-44.0	0.04-0.31
	18	141.0	18.0-38.0	21.5-44.0	0.03-0.32
	1	144.5	—	43.1	0.26
	59	145.0	19.0-38.0	22.1-44.0	0.04-0.35
	37	150.0	17.8-41.5	20.8-48.2	0.03-0.47
	5	157.0	20.6-34.0	24.1-39.4	0.07-0.25
	52	161.0	19.5-33.5	22.8-39.5	0.04-0.23
	14	163.0	20.9-36.6	23.8-42.5	0.04-0.33
	21	165.0	20.7-42.5	24.0-49.3	0.05-0.46
	8	167.0	14.9-35.5	17.1-41.6	0.02-0.29
	2	170.0	35.4-36.9	40.7-43.4	0.15-0.19
	4	174.0	37.1-41.1	43.5-48.2	0.31-0.41
	14	185.0	23.9-41.8	29.649.1	0.13-0.43

Table 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
2003, continued.	1	188.0	32.5	37.7	0.21
	17	190.0	28.0-41.4	32.7-49.0	0.13-0.45
	5	190.5	33.5-42.8	39.2-50.2	0.23-0.46
	3	192.0	25.8-27.2	29.6-31.7	0.09-0.11
	5	193.0	27.4-42.9	38.1-50.0	0.20-0.52
	3	193.5	31.9-37.1	37.4-42.5	0.12-0.19
	3	203.5	33.5-44.1	39.3-50.9	0.24-0.43
	4	204.0	31.0-35.7	36.1-41.5	0.02-0.22
	41	205.0	23.5-43.5	27.2-51.2	0.08-0.57
	18	207.0	32.1-41.5	38.0-48.9	0.22-0.47
	4	207.5	33.2-45.1	39.0-52.9	0.22-0.49
	50	215.0	22.5-47.9	26.5-55.7	0.07-0.59
	8	225.0	25.8-42.9	29.7-48.6	0.11-0.50
	1	230.0	31.2	36.8	0.18
	2	244.0	38.0-40.1	43.4-46.8	0.31-0.40
	1	245.0	32.4	37.9	0.17
2004	1	118.0	27.9	32.1	0.11
	1	121.0	42.0	47.9	0.55
	1	123.0	28.0	32.1	0.12
	7	130.0	23.6-36.0	27.5-42.7	0.08-0.26
	1	134.0	23.8	28.4	0.07
	5	141.0	20.5-21.5	23.1-25.3	0.04-0.06
	11	145.0	19.0-29.1	22.0-34.1	0.02-0.14
	4	150.0	17.8-31.0	21.0-35.1	0.04-0.15
	2	157.0	25.5-28.0	29.6-30.5	0.08-0.12
	5	161.0	24.0-29.2	27.9-34.2	0.07-0.14
	2	165.0	28.0-30.0	32.6-35.2	0.11-0.15
	1	167.0	29.0	33.4	0.12
	1	185.0	36.2	42.0	0.30
	1	190.0	32.1	37.3	0.13
	3	193.0	31.2-33.6	35.5-39.3	0.18-0.23
	2	204.0	25.9-30.0	30.0-33.5	0.09-0.12
	6	205.0	23.0-32.5	25.0-39.8	0.07-0.18
	2	207.0	28.0-32.9	32.7-38.5	0.13-0.20
	1	215.0	32.9	37.9	0.22
	1	215.5	35.5	41.9	0.25
	6	225.0	25.6-33.0	26.0-39.6	0.06-0.23
	9	244.0	21.5-47.2	25.3-54.9	0.06-0.50
	4	244.5	25.4-40.1	29.9-47.2	0.09-0.43
	5	245.0	34.2-38.6	40.3-44.9	0.21-0.29
2005	2	120.0	23.1-25.4	27.3-29.5	0.06-0.08
	2	121.0	40.5-40.7	47.0-48.2	0.37-0.55
	4	130.0	23.3-24.8	26.8-29.6	0.06-0.17
	1	134.0	22.6	26.5	0.06
	4	137.0	25.9-28.0	30.0-33.2	0.07-0.12
	10	141.0	20.5-26.5	24.0-30.9	0.04-0.10
	17	145.0	19.5-29.5	23.2-34.0	0.04-0.11
	1	150.0	27.7	32.7	0.12
	1	157.0	25.5	30.7	0.09
	9	161.0	21.3-31.0	22.9-36.1	0.05-0.18
	2	163.0	20.9-24.1	24.5-28.8	0.04-0.09
	6	165.0	23.0-31.3	27.0-36.3	0.06-0.17
	1	167.0	31.0	36.0	0.16
	1	177.5	31.4	37.1	0.17
	3	190.0	20.8-27.8	23.2-32.1	0.05-0.09
	1	190.5	30.6	36.1	0.16
	3	192.0	22.6-24.3	26.9-27.6	0.06-0.08
	3	193.0	30.4-32.7	35.8-38.3	0.15-0.19
	1	193.5	26.2	29.5	0.08

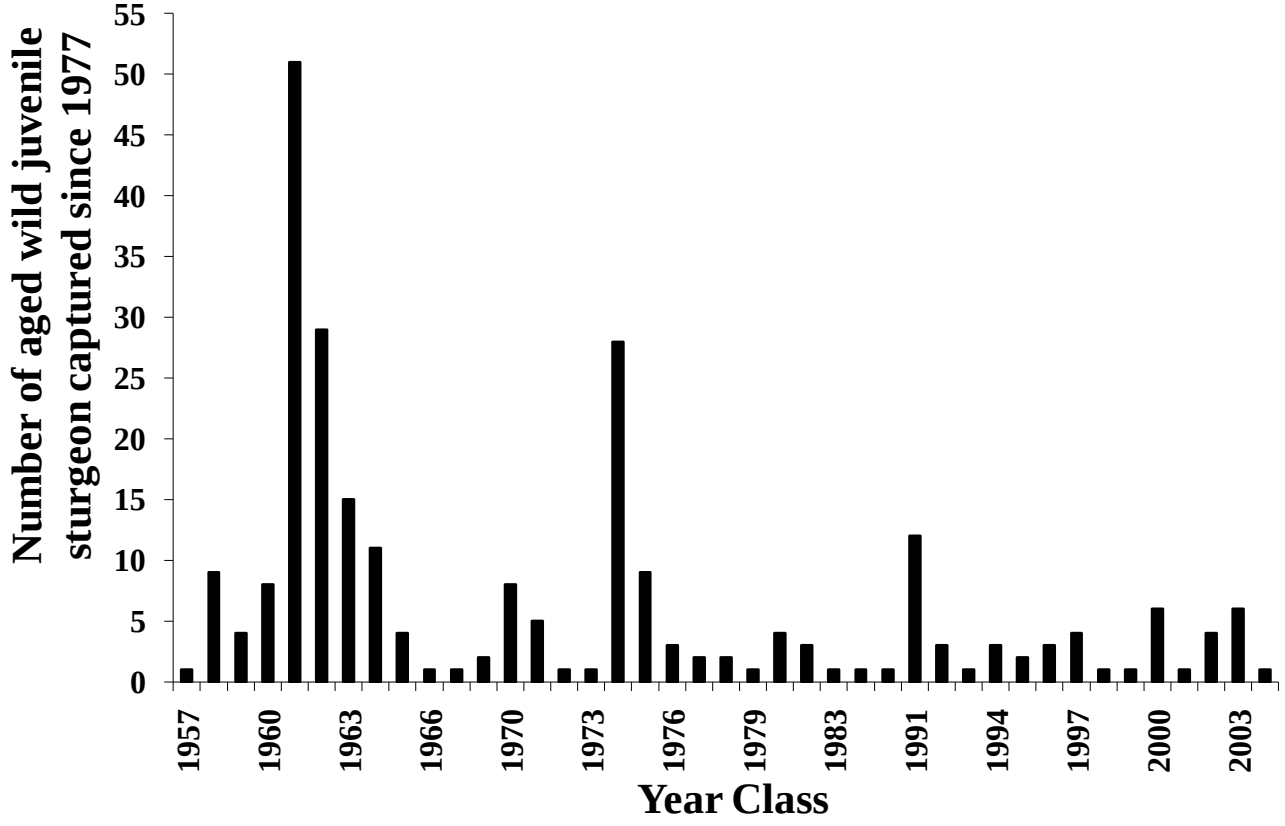
Table 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
2005, continued.	9	204.0	19.5-25.5	22.6-29.2	0.03-0.08
	2	205.0	20.5-29.3	23.7-34.0	0.050.14
	1	207.0	25.0	28.9	0.06
	2	215.0	28.6-31.2	33.2-36.6	0.12-0.19
	3	225.0	20.0-22.7	24.3-26.0	0.06-0.07
	3	229.0	25.1-28.6	29.5-33.0	0.08-0.13
	1	235.0	29.9	35.0	0.13
	3	244.0	32.6-39.4	39.5-46.5	0.21-0.39
	24	244.5	18.5-32.3	21.1-40.9	0.03-0.23
	4	245.0	21.6-33.5	25.2-39.3	0.06-0.18
2006	1	123	24.5	28.5	0.09
	2	141.0	22.5-24.0	26.0-28.2	0.07-0.08
	1	145.0	26.9	31.1	0.10
	2	150.0	22.4-23.0	26.4-26.6	0.07-0.08
	1	165.0	27.5	32.2	0.10
	7	193.5	14.9-30.3	17.4-35.1	0.01-0.10
	1	240.5	24.0	27.0	0.08
	4	244.0	29.1-30.2	33.1-35.1	0.14-0.17
	3	244.5	19.6-27.4	23.6-32.3	0.05-0.12
	7	245.0	23.8-27.6	27.9-39.6	0.04-0.11
2007	1	121.0	--	--	--
	1	130.0	30.0	35.6	0.16
	3	145.0	26.0-27.1	30.5-31.2	0.07-0.09
	1	163.0	28.0	32.8	0.12
	1	174.0	30.1	34.69	0.14
	1	185.0	29.4	34.3	0.13
	2	193.0	27.4-31.7	31.9-36.9	0.12-0.16
	2	205.0	29.4-30.1	34.1-35.4	0.14-0.15
	1	207.0	29.8	35.1	0.12
	1	225.0	29.0	34.2	0.12
	16	244.0	23.9-31.5	28.3-36.3	0.08-0.16
	9	244.5	20.8-33.9	25.3-39.5	0.05-0.11
Unknown year class	4	118.0	44.5-60.0	51.5-69.2	0.52-1.80
	11	120.0	34.5-51.2	40.4-59.6	0.23-0.85
	85	121.0	24.5-77.0	28.5-91.0	0.08-3.25
	8	123.0	28.0-39.2	33.0-46.0	0.14-5.33
	29	130.0	18.0-40.0	21.8-46.1	0.03-0.35
	8	134.0	21.4-99.0	25.1-111.0	0.05-4.25
	13	137.0	22.5-94.2	26.0-114.5	0.07-0.6.9
	29	141.0	19.5-32.8	23.0-37.0	0.04-0.22
	30	145.0	19.5-38.3	22.8-44.7	0.04-0.30
	21	150.0	20.3-30.1	23.4-34.9	0.05-0.19
	9	157.0	21.6-29.0	24.1-34.8	0.06-0.13
	17	161.0	22.1-36.1	25.9-43.0	0.07-0.25
	7	163.0	18.5-34.7	21.0-40.7	0.03-0.22
	29	165.0	16.8-49.5	19.0-57.1	0.03-0.76
	8	167.0	15.4-40.0	17.8-46.0	0.02-0.35
	4	170.0	24.8-32.0	29.2-37.7	0.05-0.11
	6	174.0	27.0-35.4	31.4-41.4	0.12-0.26
	3	177.5	31.2-36.8	35.8-43.4	0.16-0.28
	5	182.0	26.2-33.5	30.5-38.8	0.10-0.21
	41	185.0	25.9-53.5	30.1-59.6	0.04-1.05
	4	188.0	26.3-34.0	30.2-39.3	0.06-0.19
	8	190.0	20.5-48.5	24.7-56.2	0.06-0.59
	22	190.5	26.9-38.9	31.5-44.0	0.10-0.41
	11	192.0	21.4-33.0	24.6-38.8	0.03-0.20
	57	193.0	20.3-46.5	26.2-53.7	0.07-0.57
	30	193.5	13.6-45.7	16.0-52.9	0.01-0.42

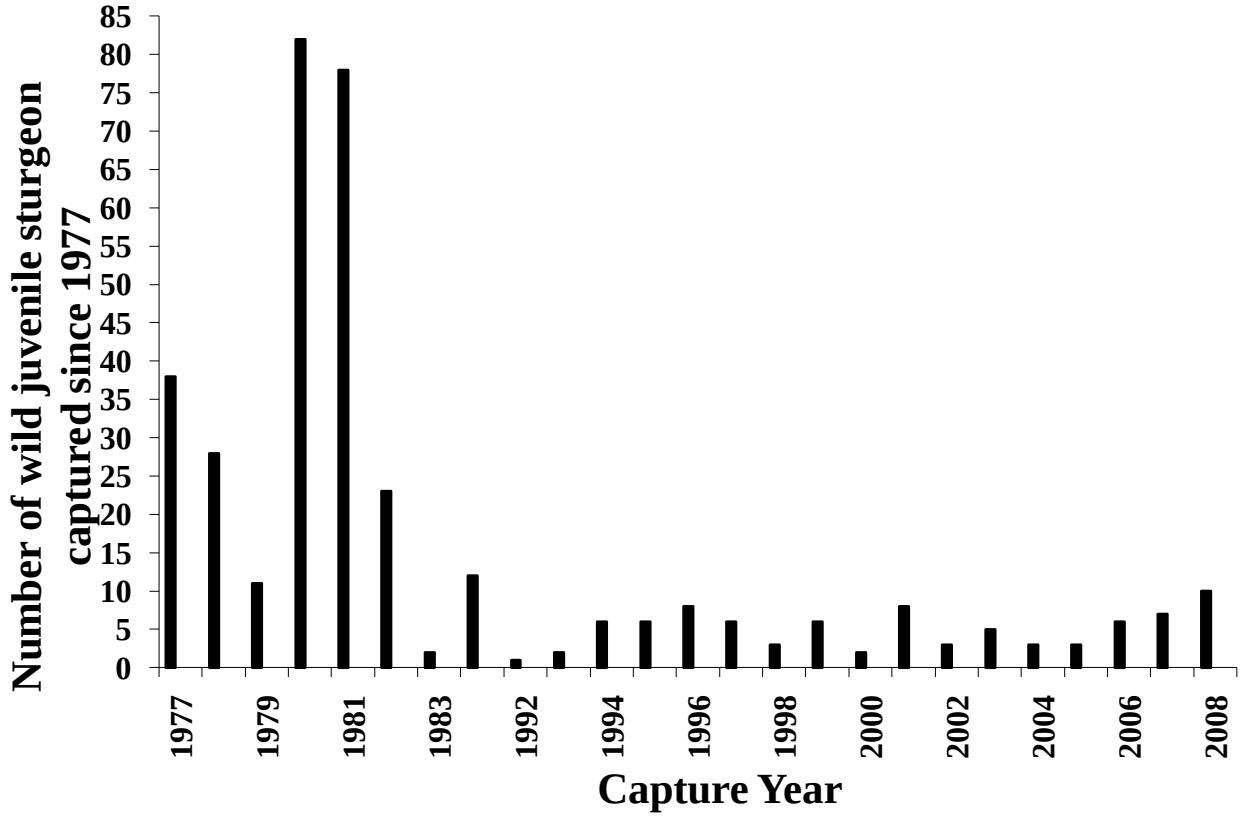
Appendix 5. Continued.

Year class	Number captured	Capture rkm	Fork length (cm)	Total length (cm)	Weight (kg)
Unknown year class, continued.	1	195.8	34.2	38.0	0.20
	7	203.5	25.0-65.9	30.0-75.7	0.07-1.42
	4	204.0	21.2-72.5	25.0-84.8	0.05-0.56
	89	205.0	15.4-85.5	17.2-99.0	0.01-4.48
	6	205.5	33.4-35.0	38.1-40.7	0.16-0.33
	63	207.0	22.9-60.4	26.2-69.9	0.05-1.26
	10	207.5	25.6-43.0	30.0-49.5	0.05-0.47
	69	215.0	24.0-61.9	28.5-71.1	0.06-1.22
	1	215.4	61.0	72.0	1.10
	9	215.5	21.8-51.0	24.7-58.3	0.07-0.90
	2	219.5	30.9-33.0	35.5-36.7	0.20-0.23
	3	224.9	30.0-36.1	34.6-40.7	0.13-0.26
	26	225.0	23.1-39.0	26.7-45.5	0.07-0.50
	1	227.0	106.0	126.0	--
	1	230.0	30.0	35.0	0.13
	1	235.0	27.5	33.1	0.12
	1	241.0	24.7	29.0	0.05
	18	244.0	22.4-63.7	25.4-73.9	0.06-1.44
	27	244.5	19.1-43.1	22.0-50.4	0.04-0.52
	40	245.0	20.8-62.4	22.3-72.5	0.03-1.40
	1	Unknown	24.0	27.2	0.08
Total	4921				

Appendix 6. Number by age class of wild juvenile white sturgeon captured in the Kootenai River, Idaho since 1977.



Appendix 7. Number of wild juvenile white sturgeon captured annually in the Kootenai River, Idaho, since 1977 (no sampling occurred between 1981 and 1988).



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