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Sturgeon Landings During The 1990 Zone 6 Set Net Net Fishery

Columbia River Laboratory Progress Report 91-16

Washington Department of Fisheries
Planning Research and Harvest Management Program
Columbia River Laboratory
16118 N.E. 219th St. P.O. Box 999
Battle Ground Washington 98604

Jim Grimes
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INTRODUCTION

The Columbia River Compact allowed 86 fishing days for the 1990 Zone 6 Treaty set net fishery. The fishery was divided into a 48 day winter season and a 38 day fall season. The winter season opened at noon, February 1 and closed at noon, March 21 with no mesh size restrictions. The fall season occurred during 8 fishing weeks between August 8 and September 29. The fall season began with a 3.5 day fishing week followed by two 5.5 day fishing weeks, a 4.5 day fishing week, a 2.5 day fishing week, and finished with three 5.5 day fishing weeks. All fishing weeks began on Mondays and opened at 6 a.m.. Fishing weeks closed at 6 p.m. Saturdays, except the first and fifth weeks. An 8 inch minimum mesh size was required during the first 4 fishing weeks and the sixth fishing week upstream of the Hood River bridge. A 4,100 sturgeon harvest guideline was in effect for the 1990 fishery. Sturgeon landed by hook and line during the fall season were included in the fall landing statistics and footnoted. A detailed season description is presented in the annual Columbia River Status Report (Oregon Department of Fish and Wildlife, *et. al.*, 1991).

METHODS

Landing Statistics. Landing statistics were defined as number of sturgeon pounds, deliveries, and fish landed, and number of pounds landed per delivery (CPUE). The number of pounds landed, deliveries made, and CPUE were determined by compiling Washington and Oregon fish tickets after the fishery closed. The number of fish landed was determined by applying a weekly average fish weight (determined by biological sampling) to the total sturgeon pounds landed each week. Landing statistics were summarized by pool and season during 1990. The values in this report are considered final.

Buyer Sampling. The sturgeon catch was sampled at Washington and Oregon fish buyers by Washington Department of Fisheries (WDF) and Oregon Department of Fish and Wildlife (ODFW) sampling crews. The catch data was recorded by season and pool. Catch data included; date and pool of landing, buyer, number of fish landed, and number of fish sampled. All sampled fish were mark sampled for tags and tag scars.

Biological sampled fish were measured for fork length (FL), weighed, sexed, and examined for gonad maturity. Pectoral fin rays were collected from all biological sampled fish and ovary samples were collected from all female fish.

Fork length was measured to the nearest centimeter (cm) and weight to the nearest 0.1 pound. Sex was determined by visual observation of gonads, and maturity was classified by gonad development (i.e., immature, maturing, mature, ripe, or spent). A fish was considered mature if gonads were mature or ripe.

Length frequencies were presented 2 ways. A total length (TL) size class distribution of the sturgeon catch by pool was estimated. Size classes were defined as;

less than 4 feet TL,
4 feet to 5 feet TL,
5 feet to 6 feet TL, and
greater than 6 feet TL.

The distribution was determined be converting in-sample FL measurements to TL and assigning each measurement to a size class. Size class proportions were extrapolated to the total sturgeon catch. Total length was determined using the formula; TL = 2.06 + (1.09 x FL) (Tracy, 1987).

A FL/sex frequency chart was generated using in-sample FL measurements and sex. Size classes were defined in multiples of 10 from 90 cm to 190 cm. A size class included fish between x - 4 cm and x + 5 cm, FL, where x = the size class. Fork lengths and associated sex were tallied by size class. Size class proportions were extrapolated to the total sturgeon catch and graphed.

RESULTS

Landing Statistics

Pounds. A total of 106,823 sturgeon pounds was landed during the 1990 set net fishery (Table 1). Pounds landed by week peaked during the third fishing week of the fall season. Pounds landed by pool ranged from 47,027 pounds for The Dalles pool to 15,497 pounds for John Day pool. Pounds landed from The Dalles pool and John Day pool accounted for 44 percent and 15 percent, respectively of the total sturgeon pounds landed.

Sturgeon pounds landed during the winter season, 45,151 pounds, accounted for 42 percent of the total sturgeon pounds landed. Pounds landed by week peaked during the second fishing week. Pounds landed by pool ranged from 26,469 pounds for Bonneville pool to 1,312 pounds for John Day pool. Pounds landed from Bonneville pool and John Day pool accounted for 59 percent and 3 percent, respectively of the winter season pounds landed.

Sturgeon pounds landed during the fall season, 61,672 pounds, comprised 58 percent of the total sturgeon pounds landed. Pounds landed by week peaked during the third fishing week. Pounds landed by pool ranged from 29,657 pounds for The Dalles pool to 14,185 pounds for John Day pool. Pounds landed from The Dalles pool and John Day pool accounted for 48 percent and 23 percent, respectively of the fall season pounds landed.

Deliveries. The 1990 set net sturgeon deliveries totaled 970 and peaked during the third fishing week of the fall season (Table 2). Deliveries by pool ranged from 431 for Bonneville pool to 165 for John Day pool. Bonneville pool and John Day pool deliveries accounted for 44 percent and 17 percent, respectively of the total sturgeon deliveries.

The winter season sturgeon deliveries, 258 fish tickets, accounted for 27 percent of the total sturgeon deliveries (Table 2). Sturgeon deliveries by week peaked during the second fishing week. Deliveries by pool ranged from 129 tickets for

Bonneville pool to 14 tickets for John Day pool. Bonneville pool and John Day pool deliveries accounted for 50 percent and 5 percent, respectively of the winter season deliveries.

The fall season deliveries, 712 fish tickets, comprised 73 percent of the total sturgeon deliveries (Table 2). Fall season deliveries peaked during the third fishing week. Deliveries by pool ranged from 302 tickets for Bonneville pool to 151 tickets for John Day pool. Deliveries from Bonneville pool and John Day pool accounted for 42 percent and 21 percent, respectively of the fall season deliveries.

Fish. A total of 3,191 white sturgeon were landed during the 1990 set net fishery (Table 3, Figure 1). Fish landed by week peaked during the third fishing week of the fall season. Fish landed by pool ranged from 1,625 fish for Bonneville pool to 399 fish for John Day pool. Fish landed from Bonneville pool and John Day pool comprised 51 percent and 13 percent, respectively of the total sturgeon landed.

Sturgeon landed during the winter season, 1,487 fish, accounted for 47 percent of the total fish landed (Table 3, Figure 2). Fish landed by week peaked during the second fishing week. Sturgeon landed by pool ranged from 1,050 fish for Bonneville pool to 30 fish for John Day pool. Sturgeon landed from Bonneville pool and John Day pool accounted 71 percent and 2 percent, respectively of the winter season catch.

Sturgeon landed during the fall season, 1,704 fish, accounted for 53 percent of the total sturgeon catch (Table 3, Figure 3). Fish landed by week peaked during the third fishing week. Sturgeon landed by pool ranged from 760 fish for The Dalles pool to 369 fish for John Day pool. Sturgeon landed from The Dalles pool and John Day pool comprised 45 percent and 22 percent, respectively of the fall season catch.

Pounds per Delivery/CPUE. The 1990 set net CPUE was 110 pounds per delivery and was greatest during the second fishing week of the winter season (Table 4). The CPUE by pool ranged from 126 pounds per delivery for The Dalles pool to 94 pounds per delivery for John Day pool.

The winter season CPUE was 175 pounds per delivery and peaked during the second fishing week (Table 4). The CPUE by pool ranged from 205 pounds per delivery for Bonneville pool to 94 pounds per delivery for John Day pool.

The fall season CPUE was 87 pounds per delivery and was greatest during the first fishing week (Table 4). The fall season CPUE by pool ranged from 114 pound per delivery for The Dalles pool to 59 pounds per delivery for Bonneville pool.

Catch by State. Washington State sturgeon landings from the 1990 set net fishery comprised 33 percent of the pounds, 39 percent of the deliveries, and 37 percent of the sturgeon landed (Table 5). Washington State sturgeon landings from the winter season accounted for 46 percent of the pounds, 45 percent of the deliveries, and 51 percent of the fish landed. Washington State sturgeon landings from the fall season accounted for 22 percent of the pounds, 37 percent of the deliveries, and 34 percent of the fish landed.

One Bonneville pool delivery of 10 sturgeon for 402 pounds was landed during a closed season.

Buyer Sampling

Mark Sampling. A total of 466 white sturgeon, or 15 percent of the total white sturgeon catch, was sampled for tags and tag scars (Tables 6 and 7). The mark sample included 202 fish from Bonneville pool, 232 fish from The Dalles pool, and 32 fish from John Day pool. Mark sample rates by pool ranged from 8 percent for John Day pool to 20 percent for The Dalles pool.

Four tagged fish and 2 scarred fish from The Dalles pool and 2 tagged fish from Bonneville pool were recorded during sampling (Table 6 and 7). Zone 6 tag and mark recovery rates were 1.3 percent and 1.7 percent, respectively. In-sample tag recovery rates for Bonneville pool, The Dalles pool, and John Day pool were 1.0 percent, 1.7 percent, and 0 percent, respectively. In-sample mark recovery rates for Bonneville pool, The Dalles pool, and John Day pool were 1.0 percent, 2.6 percent, and 0 percent, respectively.

The winter season mark sample totaled 148 fish, or 10 percent of the winter season catch (Table 6 and 7). The mark sample included 36 fish from Bonneville pool, 111 fish from The Dalles pool, and 1 fish from John Day pool. Mark sample rates by pool ranged from 3 percent for John Day pool to 27 percent for The Dalles pool.

One tagged fish and 2 tagged scarred fish from The Dalles pool were recorded during the winter season (Table 7 and 7). Winter season tag and mark recovery rates were 0.7 percent and 2.0 percent, respectively. In-sample tag rates for Bonneville pool, The Dalles pool, and John Day pool were 0 percent, 0.9 percent, and 0 percent, respectively. In-sample mark recovery rates for Bonneville pool, The Dalles pool, and John Day pool were 0 percent, 2.7 percent, and 0 percent, respectively.

The fall season mark sample totaled 318 fish, or 19 percent of the fall season catch. The mark sample included 166 fish from Bonneville pool, 121 fish from The Dalles pool, and 31 fish from John Day pool. Sample rates by pool ranged from 8 percent for John Day pool to 29 percent for Bonneville pool.

Two tagged fish from Bonneville pool and 3 tagged fish from The Dalles pool were recorded during the fall season. Season in-sample tag and recovery mark rates were both 1.6 percent. In-sample tag and mark recovery rates for Bonneville pool, The Dalles pool, and John Day pool were 1.2 percent, 2.5 percent , and 0 percent, respectively.

Biological sampling. Biological sampling was performed on 407 white sturgeon, or 13 percent of the total white sturgeon catch (Table 6 and 7). The biological sample included 132 fish from Bonneville pool, 232 fish from The Dalles pool, 32 fish from John Day pool, and 11 fish from an undetermined pool(s). Sample rates by pool ranged from 8 percent for Bonneville pool and John Day pool to 20 percent for The Dalles pool. All 11 fish from the unknown pool(s) were biological sampled. Biological statistics presented below include data from the 11 unknown pool fish.

The winter season biological sample totaled 159 fish, or 10 percent of the winter season catch (Table 6 and 7). The biological sample included 36 fish from Bonneville pool, 111 fish from The Dalles pool, 1 fish from John Day pool, and 11 fish from an undetermined pool(s). Sample rates by pool ranged from 3

percent for Bonneville and John Day pools to 27 percent for The Dalles pool. All 11 fish from the unknown pool(s) were sampled. The winter season average statistics were based on data from Bonneville pool, The Dalles pool, and the unknown pool samples.

The fall season biological sample totaled 318 fish, or 15 percent of the fall season catch. The biological sample included 166 fish from Bonneville pool, 121 fish from The Dalles pool, and 31 fish from John Day pool. Sample rates by pool ranged from 8 percent for John Day pool to 17 percent for Bonneville pool.

Average Weight. The average weight of white sturgeon landed during the 1990 set net fishery was 37.6 pounds (Table 6). The average weight by pool ranged from 29.7 pounds for Bonneville pool to 41.6 pounds for The Dalles pool. The average weight of male and female fish was 38.4 pounds and 36.5 pounds, respectively. The average male weight by pool ranged from 29.7 pounds for Bonneville pool to 42.2 pounds for The Dalles pool. The average female weight by pool ranged from 29.8 pounds for Bonneville pool to 40.8 pounds for The Dalles pool.

The winter season average weight was 39.4 pounds (Table 6). The average weight by pool ranged from 25.3 pounds for Bonneville pool to 56.0 pounds for John Day pool. The average weight of male and female sturgeon (female average based on Bonneville, The Dalles, and unknown pool data) was 40.7 and 37.1 pounds, respectively. The average male weight by pool ranged from 26.3 pounds for Bonneville pool to 56.0 pounds for John Day pool. The average female weight by pool ranged from 24.7 pounds for Bonneville pool to 41.9 pounds for The Dalles pool. No females from John Day pool were weighed.

The fall season average weight was 36.5 pounds (Table 6). The average weight by pool ranged from 31.4 pounds for Bonneville pool to 40.0 pounds for John Day pool. The average weight of male and female sturgeon was 39.4 pounds and 36.2 pounds, respectively. The average male weight by pool ranged from 30.7 pounds for Bonneville pool to 40.6 pounds for The Dalles pool. The average female weight by pool ranged from 32.1 pounds for Bonneville pool to 39.5 pounds for The Dalles pool.

Average Length. The average FL of white sturgeon landed during the 1990 set net fishery was 125 cm (Table 6, Figure 1). Average estimated TL was 138 cm. Average FL by pool ranged from 117 cm for Bonneville pool to 128 cm for The Dalles and John Day pools. Eleven fish measured from unknown pool(s) averaged 131 cm. Average FL for male and female sturgeon was 125 cm and 124 cm, respectively. Average male FL by pool ranged from 117 cm for Bonneville pool to 128 cm for The Dalles pool. Average female FL by pool ranged from 118 cm for Bonneville pool to 129 cm for The Dalles pool.

The winter season average FL of white sturgeon was 126 cm (Table 6, Figure 2). Average estimated TL was 139 cm. Average FL by pool ranged from 113 cm for Bonneville pool to 146 cm for John Day pool. Average fork length of male and female (female length based on Bonneville pool, The Dalles pool, and unknown pool(s) data) was 126 cm and 124 cm, respectively. Average male FL by pool ranged from 114 cm for Bonneville pool to 146 cm for John Day pool. Average female FL by pool ranged from 113 cm for Bonneville pool to 129 cm for The Dalles pool. No females from John Day pool were measured.

The fall season average FL was 123 cm (Table 6, Figure 3). Average estimated TL was 136 cm. Average FL by pool ranged from 119 cm for Bonneville pool to 127 cm for The Dalles pool. Average FL of male and female fish was 123 cm and 124 cm, respectively. Average male FL by pool ranged from 118 cm for Bonneville pool to 127 cm for The Dalles pool. Average female FL by pool ranged from 120 cm for Bonneville pool to 127 cm for The Dalles pool.

Length Frequency Distributions. A size class distribution was not determined for the winter sturgeon catch from John Day pool due to small sample size. The TL size class distribution was based on winter season landings from Bonneville pool and The Dalles pool and fall season landings from all 3 pools (Table 8). This report assumes zero illegal size fish were landed from John Day pool during the winter season.

The TL frequency distribution for the 1990 set net fishery estimated that 570 fish were less than 4 feet TL or greater than 6 feet TL, 2,054 fish were between 4 feet and 5 feet TL, and 537 fish were between 5 feet and 6 feet TL (Table 8). Size class proportions by pool were similar to proportions documented for the whole fishery. The sturgeon catch from all 3 pools were dominated by fish less than 5 feet TL and illegal size fish accounted for 10 percent to 25 percent of the catch. Bonneville pool had the largest proportion of fish less than 5 feet TL and of illegal size fish landed.

The TL frequency distributions for the winter and fall seasons were dominated by fish less than 5 feet TL and illegal sized fish comprised at least 15 percent of the season catch. The distribution for the winter catch estimated that 314 fish were less than 4 feet TL or greater than 6 feet TL, 998 fish were between 4 feet and 5 feet Tl, and 155 fish were between 5 feet and 6 feet TL. The distribution of the fall catch estimated that 256 fish were less than 4 feet TL, 1,066 fish were between 4 feet and 5 feet TL, and 382 fish between 5 feet and 6 feet TL.

Illegal size sturgeon, 570 fish, accounted for 18 percent of the total sturgeon catch. Illegal size fish landed during the winter season comprised 55 percent of the illegal size fish landed. Illegal size fish landed by pool ranged from 9 percent for John Day pool to 68 percent for Bonneville pool.

Undersize fish comprised 99 percent of the illegal size fish landed. An estimated total of 227 undersize fish were between 0 inches and 1 inch too short, 277 of the undersize fish were between 1 inch and 2 inches short, 9 undersize fish were between 2 inches and 3 inches too short, and 49 undersize fish were less than 45 inches TL.

Sex and Maturation. The male to female ratio of the 1990 set net fishery was 53:47 (Table 6). Male to female ratio by pool ranged from 49:51 for Bonneville pool to 71:29 for John Day pool. Five mature females from The Dalles pool and 2 mature females from Bonneville pool were recorded during sampling.

The winter season male to female ratio was 56:44 (Table 6). Male to female ratio by pool ranged from 58:42 for Bonneville pool to 100:00 ratio for John Day pool. Five mature females from The Dalles pool were recorded during sampling.

The fall season male to female ratio was 52:48 (Table 6). Male to female ratio by pool ranged from 49:51 for Bonneville pool

to 71:29 ratio for John Day pool. Two mature females from Bonneville pool were recorded during sampling.

DISCUSSION

The 1990 Zone 6 set net fishery was managed with a sturgeon harvest guideline for the second consecutive year. The harvest guideline was implemented by Columbia River fish managers to reduce commercial exploitation on depressed Zone 6 sturgeon stocks (Oregon Department of Fish and Wildlife, 1991). Rieman and Beamesderfer (1990) suggest that Zone 6 sturgeon stocks were overexploited during the 1980's and current commercial harvest rates may be too high. The 1990 set net fishery was not impacted by the harvest guideline.

Landing Statistics.

The 1990 Zone 6 set net sturgeon landing statistics were similar to 1989 and 1988 statistics. The 1990 landing statistics were generally on the lower end of a range of set net landing statistics recorded between 1985 and 1989. The 1990 statistics represented less than 50 percent of the recent, 1987 record year.

Landings by season were quite different in 1990 relative to 1989. Sturgeon sales were allowed during both in 1990, but only during the 1989 winter season (Grimes, 1991a). Landings by pool were more equally distributed in 1990 than 1989.

Pounds. Sturgeon pounds landed during the 1990 set net fishery decreased 2 percent from 1989 (Table 9). Pounds landed in 1990 ranked on the low end of a range of set net sturgeon pounds landed between 1985 - 1989. The 1990 pounds landed was 40 percent of the 1987 record high.

The 1990 winter season pounds landed declined 58 percent relative to the 1989 winter season. Reduced landings from the 1990 winter season were attributed to the unusually high catch rate during the 1989 winter season (Grimes, 1991a).

More pounds were landed from Bonneville and John Day pools and less from The Dalles pool in 1990 relative to 1989. No single pool accounted for a majority of the 1990 set net pounds landed. Pounds landed from John Day pool contributed the smallest proportion of the total sturgeon pounds for the second straight year.

Deliveries. Sturgeon deliveries recorded during the 1990 set net fishery more than doubled the deliveries made during the 1989 fishery (Table 9). The increased deliveries were attributed to the allowance of sturgeon sales during the 1990 fall season. The 1990 deliveries were on the high end of a range of set net sturgeon deliveries recorded between 1985 - 1989. The 1990 deliveries represented 77 percent of the 1987 record year.

Winter season sturgeon deliveries decreased 28 percent from the 1989 winter season. Reduced deliveries during 1990 winter season were attributed to an unusually high catch rate during the 1989 winter season.

Sturgeon deliveries by pool increased for all 3 pools in 1990 relative to 1989. Increased 1990 deliveries were attributed to

allowance of sturgeon sales during both 1990 seasons. No single pool accounted for a majority of the 1990 deliveries.

Fish. Sturgeon landed during the 1990 set net fishery increased 4 percent from 1989 (Table 9). The 1990 fish landings were on the low end of a range of set net sturgeon landed between 1985 - 1989. Sturgeon landed during 1990 represented 40 percent of the 1987 record year.

Sturgeon landed during the 1990 winter season decreased 51 percent relative to 1989. Lower winter season fish landings in 1990 were attributed to the unusually high catch rate of the 1989.

Fish landed by pool increased for Bonneville pool and John Day pool and decreased for The Dalles pool in 1990 relative to 1989. The 1990 Bonneville pool sturgeon catch accounted for a majority of the 1990 set net sturgeon landed. The dominance of Bonneville pool fish in the 1990 catch was reflected by lower average pounds per fish landed compared to 1989 (Table 9). Fish landed from John Day pool contributed the smallest proportion of the total catch for the second straight year.

Fishing Days. Sturgeon fishing days allowed during the 1990 fishery was nearly double the allotment of the 1989 fishery (Grimes, 1991b). Sturgeon fishing days allowed in 1990 was slightly longer than the 3 year and 5 year average set net sturgeon fishing days (Table 9). The sturgeon season allowed in 1990 was in the upper end of a range of season lengths recorded between 1985 - 1989. The 1990 fishing days was 78 percent of the record, long 1987 set net season.

Buyer Sampling

Mark Sample. The 1990 Zone 6, set net mark sample rate was below the preferred 20 percent rate for the sixth consecutive year. The 1990 rate was similar to mark sample rates achieved since 1987. The low sample rate was attributed to the low proportion of sturgeon sampled during the winter season. Achieving the minimum sample rate for the fishery would require increased sampling effort during the winter season.

The 1989 and 1990 winter season sturgeon catch contributed 47 percent and 100 percent, respectively of the total 1989 and 1990 set net sturgeon catch. Between 1982 - 1988, the winter season sturgeon catch generally contributed less than 40 percent of the Zone 6 set net sturgeon harvest (Grimes, 1991b). If the winter season sturgeon catch continues to increase, winter season sampling must be increased to assure an adequete Zone 6 sturgeon sample and to achieve the minimum sample rate.

The percent of in-sample, marked fish recovered during the 1990 set net fishery declined 30 percent relative to 1989 (Grimes, 1991a). The decreased 1990 mark rate was attributed to a lower sturgeon catch from The Dalles pool (the pool with the largest population of tagged fish) and higher catch from Bonneville pool and John Day pool. The Dalles pool had the highest mark rate of all 3 pools in 1990. In-sample, marked sturgeon were recorded from Bonneville pool for the first time during the 1990 fishery.

Biological Sampling. The Zone 6 biological sample rate was below the preferred rate for the sixth consecutive year. Both the winter and fall season sample rates were below 20 percent. Achieving the minimum biological sample would require a strategy

allowance of sturgeon sales during both 1990 seasons. No single pool accounted for a majority of the 1990 deliveries.

Fish. Sturgeon landed during the 1990 set net fishery increased 4 percent from 1989 (Table 9). The 1990 fish landings were on the low end of a range of set net sturgeon landed between 1985 - 1989. Sturgeon landed during 1990 represented 40 percent of the 1987 record year.

Sturgeon landed during the 1990 winter season decreased 51 percent relative to 1989. Lower winter season fish landings in 1990 were attributed to the unusually high catch rate of the 1989.

Fish landed by pool increased for Bonneville pool and John Day pool and decreased for The Dalles pool in 1990 relative to 1989. The 1990 Bonneville pool sturgeon catch accounted for a majority of the 1990 set net sturgeon landed. The dominance of Bonneville pool fish in the 1990 catch was reflected by lower average pounds per fish landed compared to 1989 (Table 9). Fish landed from John Day pool contributed the smallest proportion of the total catch for the second straight year.

Fishing Days. Sturgeon fishing days allowed during the 1990 fishery was nearly double the allotment of the 1989 fishery (Grimes, 1991b). Sturgeon fishing days allowed in 1990 was slightly longer than the 3 year and 5 year average set net sturgeon fishing days (Table 9). The sturgeon season allowed in 1990 was in the upper end of a range of season lengths recorded between 1985 - 1989. The 1990 fishing days was 78 percent of the record, long 1987 set net season.

Buyer Sampling

Mark Sample. The 1990 Zone 6, set net mark sample rate was below the preferred 20 percent rate for the sixth consecutive year. The 1990 rate was similar to mark sample rates achieved since 1987. The low sample rate was attributed to the low proportion of sturgeon sampled during the winter season. Achieving the minimum sample rate for the fishery would require increased sampling effort during the winter season.

The 1989 and 1990 winter season sturgeon catch contributed 47 percent and 100 percent, respectively of the total 1989 and 1990 set net sturgeon catch. Between 1982 - 1988, the winter season sturgeon catch generally contributed less than 40 percent of the Zone 6 set net sturgeon harvest (Grimes, 1991b). If the winter season sturgeon catch continues to increase, winter season sampling must be increased to assure an adequete Zone 6 sturgeon sample and to achieve the minimum sample rate.

The percent of in-sample, marked fish recovered during the 1990 set net fishery declined 30 percent relative to 1989 (Grimes, 1991a). The decreased 1990 mark rate was attributed to a lower sturgeon catch from The Dalles pool (the pool with the largest population of tagged fish) and higher catch from Bonneville pool and John Day pool. The Dalles pool had the highest mark rate of all 3 pools in 1990. In-sample, marked sturgeon were recorded from Bonneville pool for the first time during the 1990 fishery.

Biological Sampling. The Zone 6 biological sample rate was below the preferred rate for the sixth consecutive year. Both the winter and fall season sample rates were below 20 percent. Achieving the minimum biological sample would require a strategy

similar to achieving the minimum mark sample rate. Biological sample rates for commercial sampling have historically equaled or been slightly less than the mark sample rate.

Biological averages recorded during the 1990 set net fishery were similar to values recorded during the 1989 fishery and within the range of values observed between 1985 - 1989. The 1990 winter season biological averages were similar to 1989 winter season (Grimes, 1991b). The 1990 fall season biological averages could not be compared to 1989 as sturgeon sales were disallowed during the 1989 fall season. Biological averages for Bonneville pool showed the greatest difference relative to 1989. Biological statistics for The Dalles pool were similar to 1989. Comparisons could not be made for John Day pool due to lack of 1989 samples.

Average weight. The average weight of white sturgeon landed during the 1990 fishery was similar to 1989 average (Table 9). The 1990 average was near the mid point of average weights recorded between 1985 - 1989. The 1990 winter season average weight was nearly identical to 1989 winter season. Increased average weight of the 1990 Bonneville pool catch was attributed to landing heavier sturgeon during the fall season.

Average length. The average FL of white sturgeon landed during the 1990 fishery was nearly identical to 1989 average (Table 9). The 1990 average FL was longest recorded since 1982, and greater than the range of average FL recorded between 1985 - 1989. The 1990 winter season average FL was similar to the 1989 winter average FL. The increased average FL of the 1990 Bonneville pool catch was attributed to catching longer sturgeon during the fall season.

Landing of illegal size sturgeon continued to be a problem in the 1990 set net fishery (Table 9). The percent of illegal size fish landed in 1990 was similar to the percent recorded for the 1989 fishery (Grimes, 1991a). The 1990 illegal landing rate was near the mid point of a range of illegal landing rates documented between 1985 - 1989.

A total of 99 percent of the illegal size sturgeon measured was less than the minimum legal size. A total of 90 percent of the undersize fish were between 0 inches and 2 inches too short. Measuring sturgeon for TL can vary with the 'natural flop' of the tail. Sturgeon TL measurements can be increased or decreased by altering the 'natural flop' of the tail. Adopting a FL standard measurement for commercial sturgeon sales would reduce landings of illegal size fish by disallowing the variable and alterable TL measurement. A FL standard would ease enforcement of size regulations. A scientifically derived conversion from TL to FL was developed by Tracy (1987). WDF and ODFW sampling crews generally only measure FL when sampling sturgeon. The Columbia River white sturgeon database generally relies on FL measurements. Fork legnths measurements are used for all sturgeon landing progress reports and for sturgeon fishery modeling secenarios.

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Table 1. Combined Oregon and Washington sturgeon pounds landed by season, pool, and week for the 1990 Zone 6 set net fisheries.

Landing Dates	Pool			Total
	Bonneville	The Dalles	John Day	
Winter Season				
Feb 1 - 4	1,822	1,326	0	3,148
5 - 11	6,209	7,145	0	13,354
12 - 18	1,845	2,188	400	4,433
19 - 25	670	1,049	191	1,910
26 - Mar 4	1,546	2,191	31	3,768
5 - 11	4,824	1,127	74	6,025
12 - 18	5,118	780	206	6,104
19 - 21	4,435	1,564	410	6,409
Total	26,469 1/	17,370	1,312	45,151
Fall Season				
Aug 8 - 11	3,520	3,148	5,367	12,035
13 - 18	2,352	7,690	2,434	12,476
20 - 25	2,878	10,772	1,452	15,102
27 - 31	2,699	2,699	624	6,022
Sep 3 - 5	1,565	1,328	572	3,465
10 - 15	1,335	1,675	1,624	4,634
17 - 22	1,805	1,486	1,280	4,571
24 - 29	1,676	859	832	3,367
Total	17,830 2/	29,657	14,185	61,672
Zone 6 Total	44,299	47,027	15,497	106,823

1/ Does not include 402 pounds landed duning a closed season.
2/ Includes 94 pounds landed by hook and line.

Table 2. Combined Oregon and Washington sturgeon deliveries by season, pool, and week during the 1990 Zone 6 set net fisheries.

Landing Dates	Pool			
	Bonneville	The Dalles	John Day	Total
Winter Season				
Feb 1 - 4	3	12	0	15
5 - 11	19	31	0	50
12 - 18	11	14	1	26
19 - 25	7	13	4	24
26 - Mar 4	11	13	1	25
5 - 11	24	8	2	34
12 - 18	28	16	2	46
19 - 21	26	8	4	38
Total	129 1/	115	14	258
Fall Season				
Aug 8 - 11	42	29	22	93
13 - 18	45	46	25	116
20 - 25	49	74	19	142
27 - 31	37	32	14	83
Sep 3 - 5	23	14	9	46
10 - 15	29	24	29	82
17 - 22	47	26	22	95
24 - 29	30	14	11	55
Total	302 2/	259	151	712
Zone 6 Total	431	374	165	970

1/ Does not include 1 delivery during a closed season.
2/ Includes 3 deliveries by hook and line gear.

Table 3. Combined Oregon and Washington sturgeon landed by season, pool, and week for the 1990 Zone 6 set net fisheries.

Landing Dates	Pool			
	Bonneville	The Dalles	John Day	Total
Winter Season				
Feb 1 - 4	72	31	0	103
5 - 11	246	166	0	412
12 - 18	73	51	9	133
19 - 25	28	25	4	57
26 - Mar 4	62	52	1	115
5 - 11	192	27	2	221
12 - 18	202	18	5	225
19 - 21	175	37	9	221
Total	1,050 1/	407	30	1,487
Fall Season				
Aug 8 - 11	115	81	140	336
13 - 18	78	198	63	339
20 - 25	95	287	38	420
27 - 31	85	72	17	174
Sep 3 - 5	49	30	14	93
10 - 15	42	39	43	124
17 - 22	58	34	33	125
24 - 29	53	19	21	93
Total	575 2/	760	369	1,704
Zone 6 Total	1,625	1,167	399	3,191

1/ Does not include 10 fish landed during a closed season.
2/ Includes 3 fish landed by hook and line gear.

Table 4. Combined Oregon and Washington sturgeon pounds per delivery by season, pool, and week for the 1990 Zone 6 set net fisheries.

Landing Dates	Pool			Total
	Bonneville	The Dalles	John Day	
Winter Season				
Feb 1 - 4	607	111	0	210
5 - 11	327	230	0	267
12 - 18	168	156	400	171
19 - 25	96	81	48	80
26 - Mar 4	141	169	31	151
5 - 11	201	141	37	177
12 - 18	183	49	103	133
19 - 21	171	196	103	169
Total	205 1/	151	94	175
Fall Season				
Aug 8 - 11	78	109	244	128
13 - 18	53	167	97	109
20 - 25	60	145	76	107
27 - 31	73	84	45	73
Sep 3 - 5	72	95	64	77
10 - 15	46	70	56	57
17 - 22	38	57	58	48
24 - 29	56	61	76	61
Total	59 2/	114	94	87
Zone 6 Total	104	126	94	110

1/ Does not include 1 delivery for 402 pounds during a closed season.
2/ Includes 3 deliveries for 94 pounds landed by hook and line.

Table 5. Oregon and Washington white sturgeon landings (pounds, deliveries, and fish) by state, pool and season for 1990 Zone 6 set net fisheries.

	Pool			
	Bonneville 1/	The Dalles	John Day	Total
Winter Season				
Oregon				
Pounds	9,826	13,497	846	24,169
Deliveries	55	76	10	141
Fish	391	317	19	727
Washington				
Pounds	16,643	3,873	466	20,982
Deliveries	74	39	4	117
Fish	659	90	11	760
Fall Season				
Oregon				
Pounds	8,762	28,115	11,027	47,904
Deliveries	104	232	116	452
Fish	284	720	285	1,289
Washington 2/				
Pounds	9,068	1,542	3,158	13,768
Deliveries	198	27	35	260
Fish	291	40	84	415
Zone 6				
Oregon				
Pounds	18,588	41,612	11,873	72,073
Deliveries	159	308	126	593
Fish	675	1,037	304	2,016
Washington 2/				
Pounds	25,711	5,415	3,624	34,750
Deliveries	272	66	39	377
Fish	950	130	95	1,175

1/ Does not include 1 delivery of 10 fish for 402 pounds landed from Bonneville pool during a closed season.
2/ Includes 3 deliveries of 3 fish for 94 pounds landed by hook and line.

Table 6. Summary of 1990 white sturgeon biological sampling by pool and season for white sturgeon landed during Zone 6 Treaty set net fisheries.

Pool	No. Sampled Mark.	No. Sampled Bio.	Sex Ratio M:F 1/	Avg. Wt. (lbs.)	Avg. Length Fork (cm)	No. Mature	Tag Recoveries	No. Tag Scars
Winter Season								
Bonneville Pool	36	36	58:42 (36)	25.3	113	0	0	0
The Dalles Pool	111	111	62:38 (111)	43.3	129	5	1	2
John Day pool	1	1	100:00 (1)	56.0	146	0	0	0
Unknown pool	0	11	73:27 (11)	45.3	131	0	0	0
Total	148	159	56:44 (159)	39.4	126	5	1	2
Fall Season								
Bonneville pool	166	96	49:51 (96)	31.4	119	2	2	0
The Dalles pool 1/	121	121	50:50 (121)	40.0	127	0	3	0
John Day pool	31	31	71:29 (31)	38.5	127	0	0	0
Total	318	248	52:48 (249)	36.3	123	2	5	0
Zone 6								
Bonneville Pool	202	132	51:49 (132)	29.7	117	2	2	0
The Dalles Pool	232	232	55:45 (232)	41.6	128	5	4	2
John Day pool	32	32	78:22 (32)	39.0	128	0	0	0
Unknown pool	0	11	73:27 (11)	45.3	131	0	0	0
Total	466	407	53:47 (407)	37.6	125	7	6	2

Table 7. Summary of 1990 white sturgeon mark sample data by season and pool for Zone 6 Treaty set net fisheries.

Pool	Number				Percent Tagged	Percent Marked 1/	Sampling Rate	
	Total Catch	Mark Sampled	Tagged	Tag Scars			Percent Mark	Percent Bio
Winter Season 2/								
Bonneville	1,050 3/	36	0	0	0.0	0.0	3	3
The Dalles	407	111	1	2	0.9	2.7	27	27
John Day	30	1	0	0	0.0	0.0	3	3
Total	1,487 3/	148	1	2	0.7	2.0	10	10
Fall Season								
Bonneville	575 4/	166	2	0	1.2	1.2	29	17
The Dalles	760	121 5/	3	0	2.5	2.5	16	16
John Day	369	31	0	0	0.0	0.0	8	8
Total	1,704 4/	318 5/	5	0	1.6	1.6	19	15
Zone 6								
Bonneville	1,625	202	2	0	1.0	1.0	12	8
The Dalles	1,167	232	4	2	1.7	2.6	20	20
John Day	399	32	0	0	0.0	0.0	8	8
Total	3,191	466	6	2	1.3	1.7	15	12

1/ Sum of tagged and tag scarred fish.
2/ Does not include 11 fish sampled from an unknown pool.
3/ Does not include 10 fish landed during a closed season.
4/ Includes 3 fish landed by hook and line.
5/ Includes 3 fish from John Day pool.

Table 8. Extrapolated size class distribution by season and pool for white sturgeon landed during the 1990 Zone 6 Treaty set net fisheries. Number of fish measured in in parenthesis. - indicates insufficient sample size to complete extrapolation.

Pool	Size class (Total Length) < 4 feet	4 - 5 feet	5 - 6 feet	> 6 feet	Totals
Winter Season					
Bonneville 1/	263 (9)	758 (26)	29 (1)	0	1,050 (36)
The Dalles	44 (12)	230 (62)	126 (34)	7 (2)	407 (110)
John Day	-	-	-	-	30 (1)
Total 2/	307 (21)	988 (88)	155 (35)	7 (2)	1,487 (147)
Fall Season					
Bonneville	127 (21)	375 (62)	73 (12)	0	575 (95)
The Dalles	80 (11)	470 (65)	210 (29)	0	760 (105)
John Day	49 (4)	221 (18)	99 (8)	0	369 (30)
Total	256 (36)	1,066 (145)	382 (49)	0	1,704 (230)
Zone 6					
Bonneville	390 (28)	1,133 (91)	102 (13)	0	1,625 (131)
The Dalles	124 (24)	700 (142)	336 (63)	7 (3)	1,167 (215)
John Day 3/	49 (5)	221 (18)	99 (8)	0	399 (31)
Total	563 (57)	2,054 (251)	537 (84)	7 (3)	3,191 (377)

1/ Does not include 10 fish landed during a closed season.
2/ Does not include fish sampled from an undetermined pool. Assumes zero illegal size fish landed from John Day pool.
3/ Size class distribution based on fall season results. Total catch includes winter and fall season totals.

Table 9. Number of sturgeon, pounds, CPUE, average weight and fork legnth, fishing days, and illegal fish landed by year from the Zone 6 Treaty set net fisheries, 1982 - 1990.

Year	Nos.	Lbs.	Pounds/ Delivery	Fishing Days	Average 2/ Weight	Average 2/ Fork Length	% Illegal Fish Landed
1990 1/	3,201	107,225	111	86	33.5	125	18.0 3/
1989	3,067	109,836	306	48	35.8	124	19.0 3/
1988	3,758	121,605	136	81	32.4	119	30.0 4/
1987	7,904	269,889	215	107.8	34.1	121	22.0 4/
1986	6,136	198,156	218	88	32.3	120	10.0 4/
1985	3,015	100,859	139	95	33.5	123	10.0 4/
1984	1,096	34,879	99	87	31.8	120	11.0 4/
1983	270	9,536	62	68.8	35.3	123	18.0 4/
1982	185	6,310	64	62	34.1	121	26.0 4/
Period averages							
87-89	4,910	167,110	200	79	34.0	121	23.4
85-89	4,776	160,069	193	84	33.5	121	18.3
82-89	3,179	106,384	179	80	33.5	121	18.0

1/ Includes 10 fish for 402 pounds landed during a closed season.
2/ Average weight determined as; pounds / number of fish. Fork legnths determined from biological sampling.
3/ Includes landings of undersize fish and fish landed during a closed season.
4/ Includes landings of illegal size fish only.

Table 10. Comparison of sturgeon pounds, deliveries, fish, average weight and length by season, pool, and year for the 1990 Zone 6 Treaty set net fishery, 1989 - 1990. Number in parenthesis represents pe percent of annual catch by pool.

Pool/Year	Pounds	Deliveries	Fish	Average Weight 2/	Average Length 2/
Winter Season 1/					
Bonneville/90	26,469 (59)	129 (50)	1,050 (71)	25.3	113
/89	31,807 (29)	131 (37)	1,182 (39)	25.9	112
The Dalles/90	17,370 (38)	115 (44)	407 (27)	43.3	129
/89	73,666 (67)	206 (57)	1,773 (58)	42.4	126
John Day/90	1,312 (3)	14 (6)	30 (2)	56.0	146
/89	4,278 (4)	22 (6)	108 (4)	-	-
Fall Season 1/ 3/					
Bonneville/90	17,830 (29)	302 (42)	575 (34)	31.4	119
/89	-	-	-	-	-
The Dalles/90	29,657 (48)	259 (36)	760 (45)	40.0	127
/89	-	-	-	-	-
John Day/90	14,185 (23)	151 (21)	369 (21)	38.5	127
/89	-	-	-	-	-
Zone 6 Total					
Bonneville/90	44,299 (42)	431 (44)	1,625 (51)	29.7	117
/89	31,807 (29)	131 (37)	1,182 (39)	25.9	112
The Dalles/90	47,027 (44)	374 (39)	1,167 (36)	41.6	128
/89	73,666 (67)	206 (57)	1,773 (58)	42.4	126
John Day/90	15,497 (14)	165 (17)	399 (13)	39.0	128
/89	4,278 (4)	22 (6)	108 (4)	-	-

1/ Includes pounds, deliveries, and fish landed during closed seasons.
2/ Average weight and length determined from biological sampling.
3/ Sturgeon sales were disallowed for the 1989 fall season.

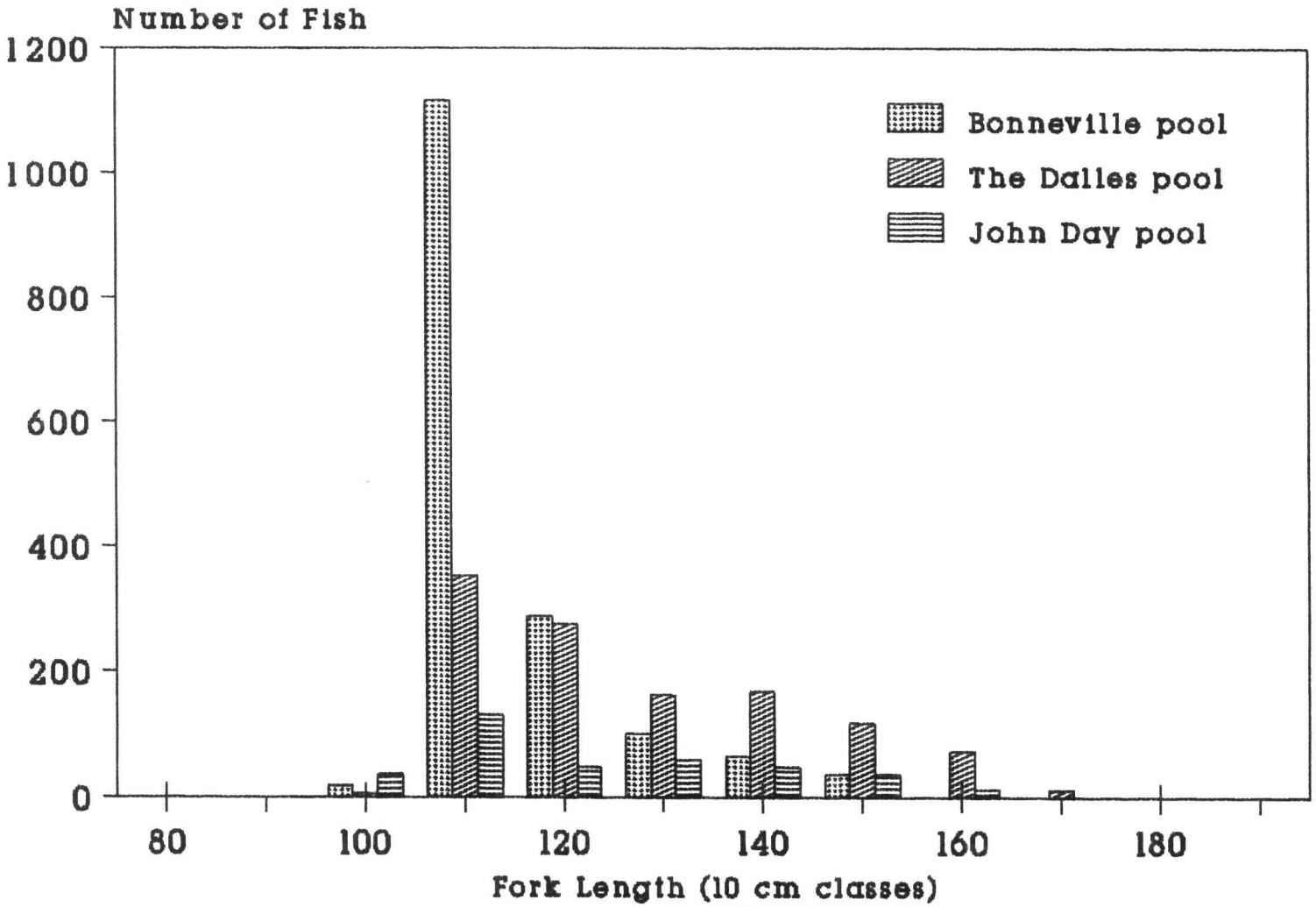

Figure 1. Fork length frequency of extrapolated white sturgeon catch from the 1990 Zone 6 winter and fall set net fisheries. (John Day catch from fall fishery only.)

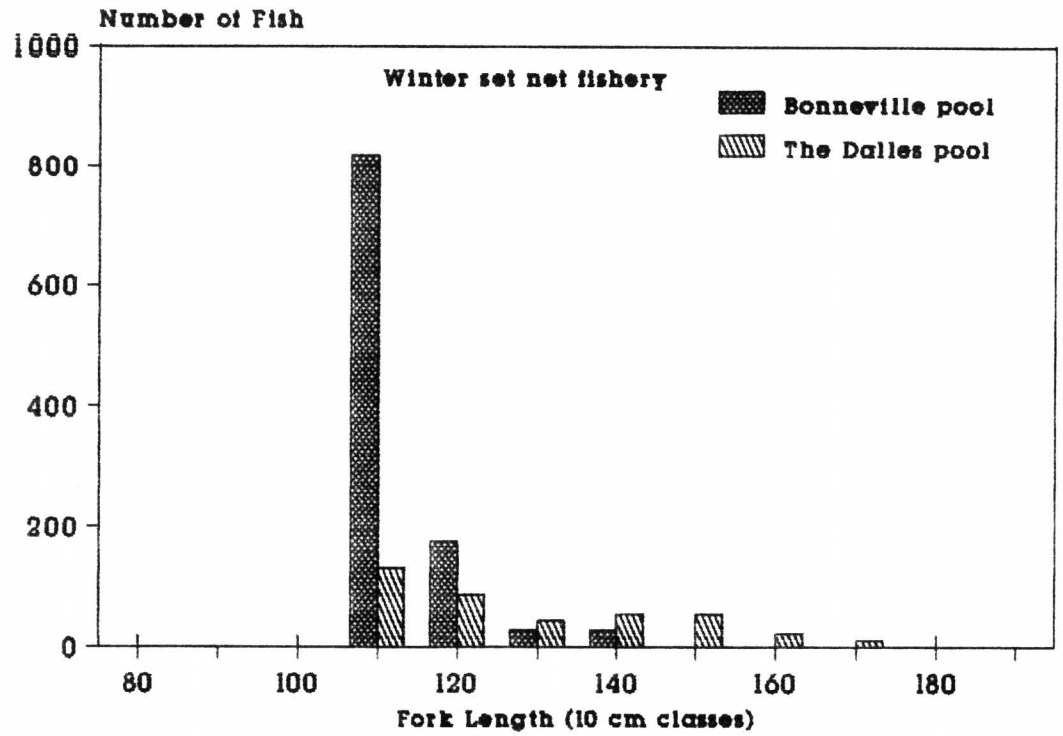

Figure 2. Fork length frequency of extrapolated white sturgeon catch from Bonneville and The Dalles pools during the 1990 Zone 6 winter set net fishery.

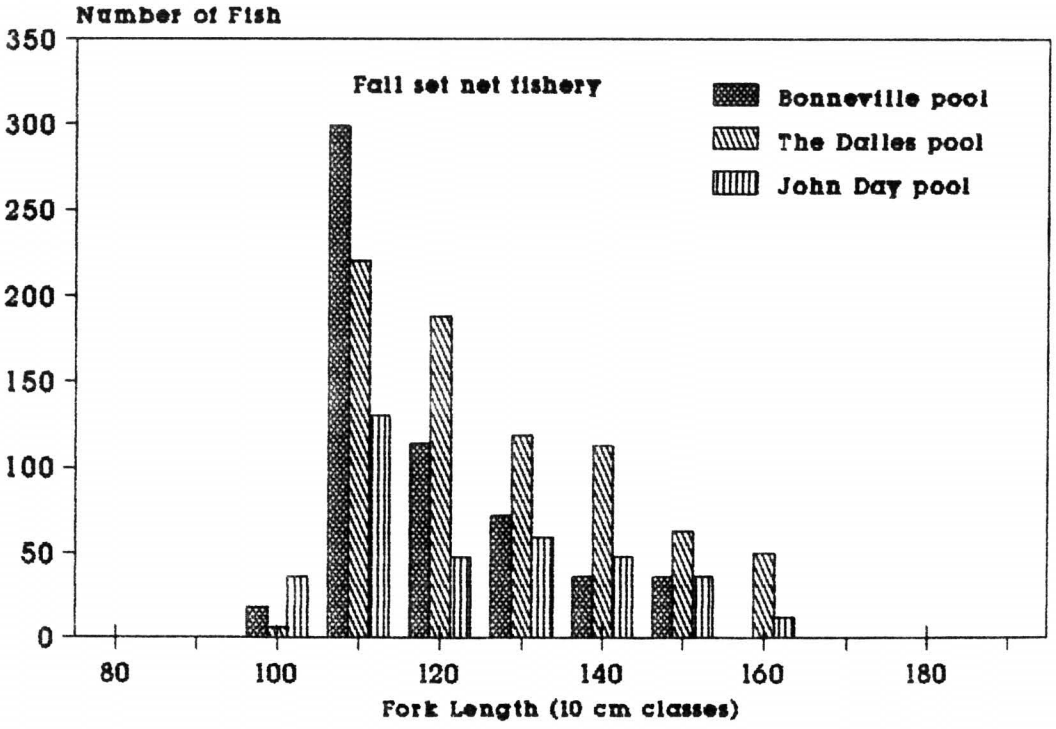

Figure 3. Fork length frequency of extrapolated white sturgeon catch from the 1990 Zone 6 fall set net fishery.