

Study 2c3 - Trinity River Steelhead Creel Census

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ABSTRACT

This paper presents the results of a California Department of Fish and Game study, designed to estimate the Trinity River recreational angling use and salmonid catch from December 1 through March 31, 2000. During the period, I estimate that 3223 anglers fished 12,678 hours and caught 758 steelhead trout (*Oncorhynchus mykiss*), of which 39 were harvested. Of the three reaches censused, the upper reach (Lewiston) received by far the most angler pressure, with 69% of all anglers fishing this section. The lower section (Gorge) received the least angler pressure with only 5 % (169 fishermen) of river's total fishermen. Gear use also varied highly between reaches. 62% of all fishermen in the Lewiston reach were fly fishermen, while 78% of all fishermen in the gorge reach were bait fishermen. Overall catch per unit effort of steelhead for all three sections of the Trinity River was 0.0597 fish per hour. Catch rates were highest spatially in the Gorge section (0.0806 fish per hour) and temporally in late December and early January. Every harvested steelhead measured ranged between 60-70 cm. Adipose clipped fish composition varied by month, but averaged 44.8% unclipped steelhead for the season.

INTRODUCTION

The purpose of this paper is to present results of a creel census study 2c3 which estimates angler use and catch of steelhead and other salmonid species on the Trinity River in the winter fishery from December 1999 through March 2000. The Klamath River population of steelhead, including the Trinity River, is the State's most sought after steelhead resource for recreational fishing purposes (CDFG, 1998). Currently, limited information is available concerning the in-river sport harvest of steelhead in KMP rivers. The expansion of the Department's present creel to cover steelhead angling would highly complement already existing adult steelhead escapement estimates. The Department has operated several weirs in the system since 1977 to obtain steelhead run size, sport harvest, and spawning escapement estimates (McEwan and Jackson, 1996). Historically, the Department has conducted many creel censuses within the basin, but few have focused on steelhead. One exception is the South Fork Trinity River steelhead creel censuses from 1990-1995, which provided excellent baseline information on pressure and angler harvest rates. Previous to this season, no winter-run steelhead creel censuses have been conducted on the upper main-stem of the Trinity River.

This study was designed to estimate adult and sub-adult salmonid catch and harvest by species, week, and river reach. The Trinity River hatchery (TRH) is located below Lewiston Dam at the Trinity River's terminal end and is a mitigation facility funded by the Bureau of Reclamation. Yearlings are volitionally released into a impoundment below the hatchery in March. Since 1997, all hatchery steelhead have

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been marked with an adipose fin clips prior to release; this enables creel surveyors and anglers to discern 3 year old hatchery steelhead from wild steelhead. Before 1997, only a portion of hatchery steelhead were adipose clipped. Consequently, some 4+ year old hatchery steelhead may not be adipose fin clipped.

Species Status (Federal)

Chinook (or king) salmon within the Trinity River are considered part of the Southern Oregon/Northern California Coastal Evolutionarily Significant Unit (ESU), and Trinity River steelhead trout are within the Klamath Mountains Province ESU (NMFS 1999; NMFS 1998). The Southern Oregon/Northern California Coastal Chinook ESU was considered “not warranted” for Federal Endangered Species Act listing (NMFS 1999), and hence, angler catches were allowed. The Klamath Mountains Province Steelhead ESU was found to be a “candidate” for listing (NMFS 1998), and limited harvest of hatchery steelhead in the Trinity River was allowed. However, litigation is currently underway requesting that the KMP steelhead ESU be listed under the Endangered Species Act (pers comm. Heberer 2000). Coho salmon in the Trinity River belong to the Southern Oregon/Northern California Coasts ESU, are classified as “Threatened” (NMFS 1997), and subsequently, no harvest was allowed (CDFG Regulations).

Angling Restrictions

Specific angling restrictions limit seasonal time, areas fished, method of catch, and daily bag limits within the Trinity River Watershed. The Trinity River from Lewiston Dam to 250 feet downstream is closed to fishing year round. The Trinity River from 250 feet below Lewiston Dam to Old Lewiston bridge (fly-fishing only section) is open the least Saturday in April through September 15. The river from Old Lewiston bridge to the Highway 299 West bridge at Cedar Flat is open the fourth Saturday in May through March 31. The river from Cedar Flat downstream to the Hawkins Bar bridge is open the fourth Saturday in May through August 31 and November 16 through March 31.

Several gear restrictions exist on the Trinity River. Only barbless hooks may be used. Bait may be used only with single hooks having a gap between the point and shank between $\frac{1}{2}$ and 1 inch, or with multiple hooks having a gap between the point and shank between $\frac{1}{4}$ and $\frac{1}{2}$ inch. In areas closed to the take of adult salmon, anglers shall not remove any adult king salmon from the water by any means.

Daily bag limits included one hatchery steelhead or one hatchery trout, two chinook (king) salmon, no more than one over 22 inches total length. For chinook salmon, a size restriction will be imposed on the Trinity River when the Department has determined that 16.5 % of the allowable sport-fishery harvest for the Klamath River basin has been exceeded. Steelhead anglers were required to fill out steelhead report cards on a daily basis. The California Department of Fish and Game’s Sport Fishing Regulations handbook for 2000 and corresponding supplements, have complete descriptions of angling restrictions.

DESCRIPTION OF STUDY AREA

The Trinity River is the largest tributary in the Klamath River system and drains into the Klamath River near the town of Weitchep, California. The watershed is a mountainous, semi-wilderness region of approximately 2,900 square miles, which lies almost entirely within Humboldt and Trinity counties. The creel census will cover the entire main-stem river accessible to steelhead above Hawkins Bar, California, where the majority of winter steelhead angling occurs.

For the purposes of this study, the Trinity River was divided into three reaches and covered most water open to fishing by the public. Some areas of the river are only accessible by private property or boat and are subsequently excluded from surveys.

Reach 1: Gorge Hawkins Bar bridge to Cedar Flat

Reach 2: Middle Cedar Flat to Evans Bar

Reach 3: Lewiston Steiner Flat Rd. to Lewiston Dam

METHODS

The Trinity River Creel Census for steelhead is a roving interview style creel census, where all anglers encountered are interviewed. Anglers not able to be interviewed are enumerated for effort calculations. This sampling protocol will be similar to those used by SRAMP personnel on the Mad and Smith Rivers.

To ensure as complete of coverage as possible, the river will be divided into three sections, to which each is assigned a creel clerk (scientific or seasonal aide). Sections were selected based on mileage to be covered and estimated angling pressure. Sampling days will be randomly selected and be stratified by weekday and weekend. Approximately 50% of weekdays and 67% of weekends will be sampled. Two passes will be made of each section each day. Each day is stratified into morning and evening shifts. More passes are made of each section as time allows. Each pass constitutes approximately five hours of censusing effort.

Catch expansions are made weekly for each julian week using the following formula:

$$\text{Weekly catch} = \sum (T_d/I_d) * \sum (H_d) * (5/d) * (C_d) + \sum (T_w/I_w) * \sum (H_w) * (2/w) * (C_w)$$

T_d = total anglers - weekdays

I_d = interviewed anglers - weekdays

T_w = total anglers - weekends

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I_w = interviewed anglers - weekends
 H_d = hours fished on weekdays sampled
 H_w = hours fished on weekends sampled
 d = number of weekdays sampled
 w = number of weekend days sampled
 C_d = catch per hour- weekdays
 C_w = catch per hour - weekends

RESULTS

Table 1. Expanded Angler Effort and Steelhead Catch for entire Upper Trinity River (Hawkins Bar to Lewiston)

Week ending	Anglers	Hours	CPUE Steelhead	Steelhead Released	Steelhead Harvest
2-Dec	10	14	0.428571	6	0
9-Dec	252	998.5	0.060090	60	0
16-Dec	215	739.5	0.056795	36	6
23-Dec	254	1023.5	0.030288	27	4
31-Dec	390	1247	0.052927	66	0
7-Jan	171	595.5	0.045340	18	9
14-Jan	217	877	0.101482	89	0
21-Jan	233	877.5	0.124217	109	0
28-Jan	286	1212	0.019802	21	3
4-Feb	377	1472.5	0.059083	70	17
11-Feb	268	1323	0.089191	118	0
18-Feb	203	850.5	0.028218	24	0
25-Feb	153	894.5	0.0681945	61	0
3-Mar	5	8	0	0	0
10-Mar	13	14	0	0	0
17-Mar	14	11.5	0	0	0
24-Mar	45	106.5	0.0281690	3	0
31-Mar	117	413	0.0266343	11	0
Totals	3223	12678	0.059789	719	39

Table 2. Expanded Angler Effort and Steelhead Catch for Lewiston Section (Steiner Flat Rd. to Lewiston)

Week ending	Anglers	Hours	CPUE Steelhead	Steelhead Released	Steelhead Harvest
2-Dec	6	8	0.5	4	0

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9-Dec	142	573	0.061082	35	0
16-Dec	109	491	0.06721	30	3
23-Dec	181	753	0.010624	8	0
31-Dec	215	736.5	0.059742	44	0
7-Jan	91	344	0.026163	9	0
14-Jan	144	670	0.102985	69	0
21-Jan	212	852.5	0.127859	109	0
28-Jan	210	986.5	0.018246	18	0
4-Feb	268	1160.5	0.068936	63	17
11-Feb	209	1128.5	0.090385	102	0
18-Feb	182	802	0.029925	24	0
25-Feb	109	807.5	0.065635	53	0
3-Mar	5	8	0	0	0
10-Mar	11	10	0	0	0
17-Mar	10	10.5	0	0	0
24-Mar	39	90.5	0.033149	3	0
31-Mar	99	378	0.02381	9	0
Totals	2242	9810	0.061162	580	20

Table 3. Expanded Angler Effort and Steelhead Catch for Middle Section (Cedar Flat to Dutch Creek)

Week ending	Anglers	Hours	CPUE Steelhead	Steelhead Released	Steelhead Harvest
2-Dec	4	6	0.333333	2	0
9-Dec	99	377.5	0.055629	21	0
16-Dec	91	218.5	0.018307	4	0
23-Dec	55	223.5	0.089485	19	1
31-Dec	166	499.5	0.044044	22	0
7-Jan	67	212.5	0.065882	9	5
14-Jan	62	185.5	0.107817	20	0
21-Jan	12	13	0	0	0
28-Jan	54	167.5	0	0	0
4-Feb	84	270.5	0.018484	5	0
11-Feb	44	177.5	0.090141	16	0
18-Feb	19	47.5	0	0	0
25-Feb	32	66	0.075758	5	0
3-Mar	0	0	0	0	0
10-Mar	0	0	0	0	0
17-Mar	4	1	0	0	0
24-Mar	6	16	0	0	0

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31-Mar	13	26.5	0.083333	0	0
Totals	812	2508.5	0.051425	123	6

Table 4. Expanded Angler Effort and Steelhead Catch for Gorge Section (Hawkins Bar to Cedar Flat)

Week ending	Anglers	Hours	CPUE Steelhead	Steelhead Released	Steelhead Harvest
2-Dec	0	0	0	0	0
9-Dec	11	48	0.083333	4	0
16-Dec	15	30	0.166667	2	3
23-Dec	18	47	0.06383	0	3
31-Dec	9	11	0	0	0
7-Jan	13	39	0.102564	0	4
14-Jan	11	21.5	0	0	0
21-Jan	9	12	0	0	0
28-Jan	22	58	0.103448	3	3
4-Feb	25	41.5	0.048193	2	0
11-Feb	15	17	0	0	0
18-Feb	2	1	0	0	0
25-Feb	12	21	0.142857	3	0
3-Mar	0	0	0	0	0
10-Mar	2	4	0	0	0
17-Mar	0	0	0	0	0
24-Mar	0	0	0	0	0
31-Mar	5	8.5	0.235294	2	0
Totals	169	359.5	0.080668	16	13

Table 5. Catch of Incidental Species (i.e. Chinook salmon, brown trout, juvenile steelhead) stratified by section and month from Real Angler Data. (un-expanded)

Gorge	Chinook Released	Brown Trout Released	Juvenile Steelhead Released
December	5	0	4
January	0	0	2
February	0	0	6
March	0	0	0

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Total	5	0	12
Middle			
December	0	1	24
January	1	1	7
February	0	2	0
March	0	0	14
Total	1	4	45
Lewiston			
December	1	4	29
January	0	7	8
February	0	6	3
March	0	1	228
Total	1	18	268
Overall	7	22	325

Table 6. Gear Use of Steelhead Anglers on the Upper Trinity River by Section, stratified by month
(Percent using gear that day)

Gorge	Fly	Lure	Bait
December	15.79%	7.89%	76.32%
January	10.26%	12.82%	76.92%
February	6.67%	13.33%	80.00%

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March	25.00%	0.00%	75.00%
Total	11.71%	10.81%	77.48%
Middle			
December	27.78%	25.00%	47.22%
January	18.60%	29.07%	52.33%
February	15.00%	11.25%	73.75%
March	0.00%	73.33%	26.67%
Total	22.34%	25.59%	52.07%
Lewiston			
December	59.71%	17.14%	23.14%
January	60.51%	11.65%	27.85%
February	66.58%	11.58%	21.84%
March	58.33%	18.75%	22.92%
Total	62.00%	13.76%	24.24%
Overall	47.37%	17.12%	35.51%

Table 7. Shore vs. Boat Angler Comparison of Steelhead Anglers on the Upper Trinity River by Section, stratified by month.

(Percent using boat or shore fishing that day)

Gorge	Shore	Boat*
December	100.00%	0.00%
January	100.00%	0.00%
February	100.00%	0.00%

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March	100.00%	0.00%
Total	100.00%	0.00%
Middle		
December	76.19%	23.81%
January	76.82%	23.18%
February	79.45%	20.55%
March	84.62%	15.38%
Total	77.10%	22.90%
Lewiston		
December	76.70%	23.30%
January	70.07%	29.93%
February	65.87%	34.13%
March	72.45%	27.55%
Total	70.83%	29.17%
Overall	73.84%	26.16%

* Anglers fishing from shore in use of a boat are counted as boat anglers.

Table 8 .Marked vs. Un-marked Composition from Real Angler Data (un-expanded)

Month	Released Un-marked	Marked	Unknown		Harvest Un-marked*	Marked	% Un-marked
Dec	35	21	22		3	2	62.30 %
Jan	28	57	17		1	10	30.21 %

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Feb	30	29	17		0	1	50.00 %
Mar	2	2	0		0	0	50.00 %
Total	95	109	56		4	13	44.80 %

* The harvest of wild steelhead is illegal on the Trinity River. Four un-marked fish were observed harvested during this creel census. These are not positively known to be wild steelhead, since 4+ year old fish have the possibility of being unmarked. All offending anglers were informed of the illegality of keeping non-hatchery trout. Two anglers were identified by creel clerks as possible poachers and the warden was notified. The other two offending anglers were an uninformed senior citizen and a seven year old boy.

DISCUSSION

This year's creel census was highly successful in accomplishing the goals set forth in its proposal. We now have baseline data documenting fishing pressure, catch rate and harvest of Trinity River steelhead. When interpreting results of this creel census, it is important to realize several shortcomings of the study design. By identifying these problems, I hope to further understand the dynamics of Trinity River steelhead sport-fishery as well as improve future year's creel census design.

The greatest problem in conducting a creel census is estimating effort. All effort counts are negatively biased, as a creel clerk can only be at one place at any one time. In a perfect world, a instantaneous count would be possible, i.e. minute to minute satellite photos of fishermen. But lacking a omnipotent perspective, a creel clerk must try his/her best to cover their section of the river in the most complete fashion as possible. There is a long list of problems which could cause severe underestimation of effort.

Due to the nature of a roving/interview creel census, one creel clerk must interview and enumerate anglers. Time is lost enumerating remaining anglers every time the creel clerk takes time to conduct an interview. Other activities that take away from time enumerating anglers include excessive time locating elusive anglers after a vehicle has been found in a probable fishing access point, unfamiliarity of new creel clerks on the river, drive time between popular fishing spots, and walking to check certain spots on the river when a four-wheel drive vehicle was unavailable.

Several problems specific to the Trinity creel also impeded the estimation of effort. Effort was uneven in the three sections of the upper river. During most of the year, there was double to triple the effort in the Lewiston section when compared to the middle section. This leads to the Lewiston creel clerk being over-worked and further biases the effort counts negatively, as the Lewiston clerk has less time to enumerate anglers.

Some areas of the river are difficult to access or view anglers, creating another area that could possibly

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negatively bias effort estimates. In the Burnt Ranch gorge and Grays Falls areas, there are multiple trails, which make anglers easy to miss on hikes in and out. There are also areas of private property that are impossible to view or access. Some of these areas include private campgrounds at Del Loma and Big Bar, and the section of river between the end of Steiner Flat Rd. and Evans Bar. This section is heavily drifted and only accessible at the put-in and take-out points.

Boating anglers create another problem in estimating effort. Boat anglers move around more than shore anglers, and are harder to creel from the shore. All boat trailers are counted at all take-out points and then added in when in addition to all boats seen on the river that day.

Poachers also create problems in assessing effort. Most poaching on the Trinity River is conducted in inaccessible areas or at night. Poachers are elusive and rarely agree to be interviewed by creel clerks. Two areas of higher than average poaching are around Junction City and in the Burnt Ranch gorge. During the survey, only two poachers were identified harvesting wild steelhead, both in the Burnt Ranch gorge. Lt. Bob Taylor, the local warden, was notified the next day.

Another possibility for bias in the estimation of effort is variation between creel clerks. Five creel clerks work three sections of river, so the same person does not work the same section every day. Different creel clerks have differing levels of knowledge of local fishing spots. All clerks were trained on all sections, but some clerks have additional knowledge of the river and do a better than average job of coverage. Also, different creel clerks drive at different speeds, and spend varying amounts of time trying to locate individual fishermen.

The second greatest source of error in conducting a creel census is estimating catch rate. The Trinity River has additional problems not encountered on most rivers because of the limited amount of harvest. Therefore, most catch rate numbers are dependent upon an angler's memory, knowledge, and honesty, because the majority of fish caught are subsequently released and never examined by creel clerks. There are many potential sources of error in estimating the catch rate of steelhead.

Species identification by anglers is the greatest problem in estimating catch rate. Many anglers cannot differentiate between steelhead and salmon. This is further complicated by the presence of two anadromous salmon species: chinook and coho. Coho are often confused for steelhead and vice versa. Even more anglers cannot differentiate a wild from a hatchery fish. All creel clerks are instructed to educate anglers as to the characteristics which identify a wild fish. Wild steelhead are identified by a missing adipose fin or by dorsal fin erosion. All steelhead from the Trinity River hatchery are 100% adipose fin clipped as of brood year 97 (Wade Sinnen, personal communication, 2000). This means that only four year old and older fish could possibly not be adipose clipped. Angler's confusion is further propagated by adipose clips on chinook salmon. The adipose clip of chinook salmon is used to show presence of a coded-wire tag in the snout. Many anglers are confused and believe adipose fin clipped steelhead have a coded-wire tag or that adipose clipped salmon are wild. Proper angler identification of un-marked fish as potentially wild has dramatically improved each month of the survey and can be

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attributed to increased angler education.

Catch rate estimates are also biased by under-sampling boat anglers. Boat anglers are harder to interview due to lack of access point and their position in the river. Due to the lack of interviews with boat anglers in comparison to shore anglers, I was unable to stratify the catch estimate by boat or shore angler. Boat anglers inherently have a higher catch rate for steelhead, due to more and better access to steelhead fishing areas and often the assistance of a licensed fishing guide. Furthermore, boat anglers can cover much more water in far less time than your average shore angler.

Recommendations

I recommend and will implement the following changes to the 2000/2001 Trinity River steelhead creel census.

River sections need to be adjusted to create more even coverage between creel clerks. There is far too much pressure in the Lewiston section to be handled by a single clerk. The lower most area of the upper section, Steiner Flat Rd., has 12% of all angling effort on the upper river. I suggest shifting that area over to the middle section. Also, the gorge section has too little effort to constitute a entire section. I suggest moving the upper boundary of the gorge section to North Fork of the Trinity at Helena. Changes in creel sections will cause problems in comparing to the first year, but I believe will ultimately lead to improved coverage of the river. Next year's creel sections will be: Gorge (Hawkins Bar to Helena), Middle (Helena to Indian Creek), Lewiston (Indian Creek to Dam).

Data sheets should be modified for better facilitation of data entry and creel interviews. The data sheet will be changed to landscape view in order to include more information on each angler entry. A column will be added for wild or hatchery for each steelhead and codes will be changed to alleviate confusion between species.

Data entry should be conducted on a daily basis by the creel clerk who recorded it. This will alleviate handwriting confusion and omission mistakes. Data is harder to proof and correct when it is entered by different people, weeks or months after it was actually recorded. With daily entry of data, quality control of data should be much quicker and a completed product would be available much sooner.

Four-wheel drive vehicles need to be acquired in order to properly cover creel routes. Many areas fished by steelhead anglers require off-road travel which is further complicated by mud and snow, a frequent condition of winter weather. To date, all sedans have been returned to Fleet Services and replaced with four-wheel drive trucks.

Finally, I recommend the development of a methodology to estimate a probability coefficient for angler contacts in the effort estimate. By developing a coefficient which estimates the probability of coming in

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contact with anglers, the effort calculation would become more accurate and less negatively biased. This could be done quite simply by taking the average completed trip length and dividing it by the length of time taken to complete one rover pass of the section. Problems could arise when no or not enough completed trips are interviewed to estimate an average trip length. Another problem is that length of daily rover passes differ depending on number and length of interviews and time taken to track down anglers. Other possible ways of developing the coefficient include introducing known fishermen into creel design, follow-up mail surveys, frequent floats of the river, or possibly radio-tagging fishermen.

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