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Snorkel survey assessment of winter-run steelhead trout in Blue Creek, Klamath River, California, 1996-1998

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Abstract. Snorkel surveys assessed winter-run steelhead spawning in Blue Creek during the years 1996-98. Stream flows and water clarity conditions were sufficient to conduct four consecutive monthly dives between February- May 1997. Spawning run timing and duration of spawner presence were investigated. Blue Creek winter-run steelhead were actively spawning in February 1997 and continued constructing redds through the end of May 1997. Winter-run adults have been found in Blue Creek from September through the end of June. In future steelhead surveys, greater coverage of mainstem Blue Creek and major tributaries would provide spatial as well as temporal spawning data trends.

Introduction

Beginning in 1994, the Yurok Tribal Fisheries Program (YTFP) has conducted annual snorkel surveys to document late fall-run chinook salmon (*Oncorhynchus tshawytscha*) utilization of Blue Creek (Figure 1). The onset of heavy winter rains by early December, however, has typically curtailed dive surveys before the bulk of winter-run steelhead (*O. mykiss*) began their spawning migration.

Blue Creek, a fifth order perennially flowing stream, has a confluence with the Klamath River at river mile (rm) 16. Blue Creek is the largest, most pristine tributary entering the Klamath downstream of the Trinity River with a drainage size of approximately 128 square miles. Historically, Blue Creek has hosted an abundant run of winter steelhead, and was even labeled as "...the best steelhead producing creek in the entire Klamath drainage" by the California Department of Fish and Game (CDFG) (O'Brien 1973). A 20 Apr 1964 CDFG survey of approximately one mile on mainstem Blue Creek adjacent to the West Fork confluence counted 100 adult steelhead and fresh redds (Stone 1964).

In recent years, however, steelhead numbers along the California coast have declined precipitously. The National Marine Fisheries Service (NMFS) has conducted a status review and as a result, steelhead have been listed as threatened or endangered throughout their southern range in California with a similar status proposed for northern Californian populations.

Although Blue Creek steelhead are widely distributed throughout accessible habitats (Voight and Gale 1998), YTFP has sought to gain specific knowledge of winter-run steelhead with direct observation of spawning activity. Following the 1997 New Year's floods, infrequent rainfall during January and February allowed stream conditions to improve enough with regards to water visibility and diver safety for experimental steelhead surveys to be initiated. Stream flows, water clarity, and crew availability limited survey frequency during 1998, but several steelhead dives were conducted. June 1996 snorkel surveys that investigated relative densities of juvenile chinook in Blue Creek provide additional insight into the duration of winter-run steelhead presence in the system.

Methods

Downstream snorkel surveys were conducted on all four lower index reaches of Blue Creek during mid-June 1996 (Figure 1). During the months of February through May 1997 dive surveys took place on Blue Creek index reach #4. 1998 steelhead dives were conducted on index reaches #2 & 4 in March, and on reach #4 in June. Dive efforts were generally consistent with YTFP fall-run dive survey protocols: divers proceeded downstream in lanes, looking for fish and redds (Gale et al. 1998). High stream flows during Feb., March, and April surveys, however, necessitated the use of "boogie boards" and swim fins. In addition, high stream flows hindered data collection in steeper riffle and run habitat (high water velocities and associated bubble curtain cover), thus limiting fish observation to pool and low gradient run habitats.

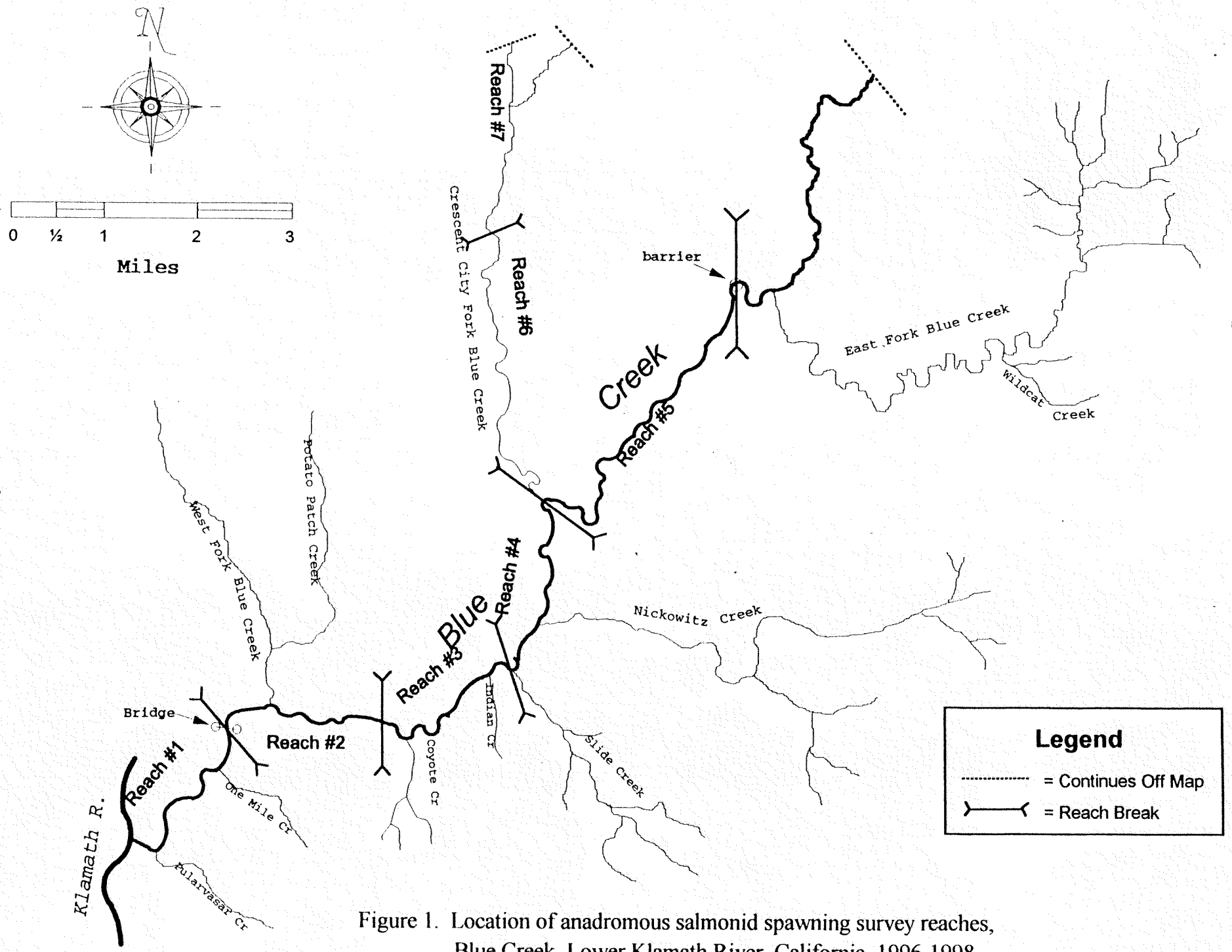


Figure 1. Location of anadromous salmonid spawning survey reaches, Blue Creek, Lower Klamath River, California, 1996-1998.

Results/Discussion

1996-98 steelhead observations provide a "rough" description of run timing and duration of winter-run steelhead spawner presence in Blue Creek. The best snorkeling conditions existed during late spring dives each year because of reduced stream discharge and excellent water clarity. Underwater visibility was poorest (< 8ft.) during March surveys each year.

Blue Creek "Winter" Steelhead Run Timing

We documented spawning activity from February through late May in Blue Creek during 1997. Spawning probably commenced much earlier than our first dive on 23 Feb, and likely continued into June since steelhead were observed constructing redds on 23 May. In fact, divers surveying the same index reach (#4) on 30 Jun 98 observed many "recently" constructed redds. California steelhead reportedly spawn earlier than fish in Oregon and Washington, with spawning usually beginning in December and lasting through May (Busby et al. 1996).

Peak spawning in Blue Creek probably occurred between February and March 1997 (Table 2). Busby et al. (1996) describe March as the peak spawning time for Klamath River winter-run steelhead. The peak steelhead count occurred 23 February with 30 fish observed in conditions of reduced visibility (12-15 ft.). Although numbers of observed

Table 1. Summaries of Blue Creek "winter-run" steelhead dives spring 1996- spring 1998.

		Adult Fish Observed		Carcasses Observed		Estimated Visibility	
Date	Blue Creek Reach	Species*	# Fish	Species	# Fish	(ft.)	Comments
11 Jun 96	#1	Stlhd	1	-	-	>20	summer stlhd?
12 Jun 96	#2	Stlhd	7	-	-	>20	2 "very large, dark fish"
13 Jun 96	#3	Stlhd	3	-	-	>20	summer stlhd?
14 Jun 96	#4	Stlhd	1	-	-	>20	summer stlhd?
23 Feb 97	# 4 (pools only)	Stlhd	30	-	-	12-15	stlhd redds
18 Mar 97	# 4 (pools only)	Stlhd	16	-	-	8-10	stlhd redds
18 Mar 97	# 4 (pools only)	Cutt	1	-	-	8-10	14-16"
19 Apr 97	# 4 (pools only)	Stlhd	10	-	-	10	stlhd redds
19 Apr 97	# 4 (pools only)	Cutt	1	-	-	10	18-20"
23 May 97	#4	Stlhd	11	Stlhd	1	>20	stlhd redds
23 May 97	#4	Cutt	1	-	-	>20	14-16"
20 Mar 98	#4 (pools only)	Stlhd	7	-	-	6-8	stlhd redds
20 Mar 98	#2	Stlhd	24	-	-	6-8	stlhd redds
20 Mar 98	#2	Cutt	1	-	-	6-8	16-17"
30 Jun 98	#4	Stlhd	2	-	-	>20	stlhd redds
30 Jun 98	#4	Cutt	1	-	-	>20	13"

* "Stlhd"=steelhead trout; "Cutt"= coastal cutthroat trout

fish decreased during the next dive 20 March 1997 (16 fish), visibility was much worse-only about 8 ft.

Using peak dive counts of steelhead as indicators of peak spawning may be misleading for another reason in addition to fluctuating water clarity (visibility). Other Blue Creek salmonids such as late fall-run chinook salmon have a distinct migratory/spawning window that occurs over a relatively brief period of time (Gale et al. 1998). Winter-run steelhead, however, typically migrate to freshwater and spawn over an extended period of time, with fresh fish entering the system throughout winter months. Thus, peak spawning period for a given run of steelhead may actually be a series of spawning pulses.

Duration of Blue Creek Winter Run Steelhead Presence

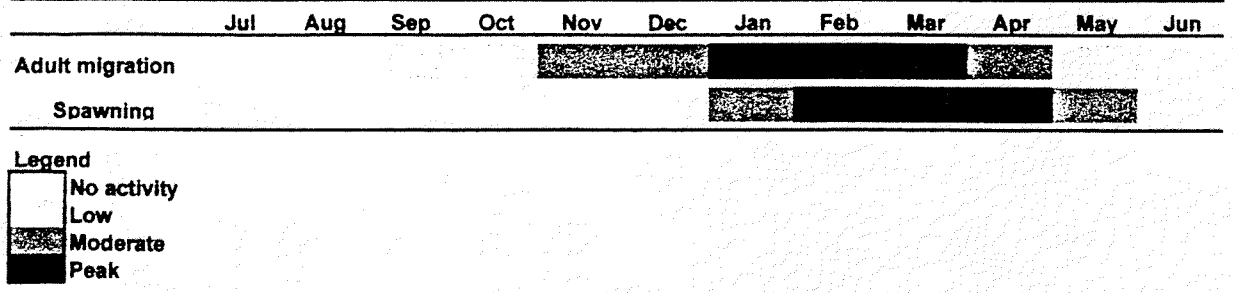
Busby et al. (1996) describe winter-run steelhead as being present in the Klamath River system from September through the end of May, and Blue Creek fish appear to have similar run characteristics. Small numbers of adult steelhead were seen in Blue Creek as early as September during 1994-1997 snorkel surveys (Gale et al. 1998). During 1997, steelhead spawners were present in reach #4 at least through the end of May. 1996 and 1998 surveys observed small numbers of "large, dark, stream-colored" steelhead still present as late as 30 Jun (Table 2).

Smaller, silvery adult steelhead were also observed during the June dives. These were not likely winter-run fish based on their coloration and condition. YTFP has conducted annual "summer steelhead surveys" in 7 index reaches of mainstem Blue Creek during July and August 1996- 1998 (including the Crescent City Fork)(Gale, 1996, 1997, 1998). Low observed abundance of adult form "summer steelhead" each year, and past data are evidence to suggest a recent lack of a reproductively viable Blue Creek population. A 1982 USFS summer steelhead survey conducted in the vicinity of YTFP reaches #4, 5, & 6 found zero steelhead (Figure 1) (Smith 1983).

Conclusion

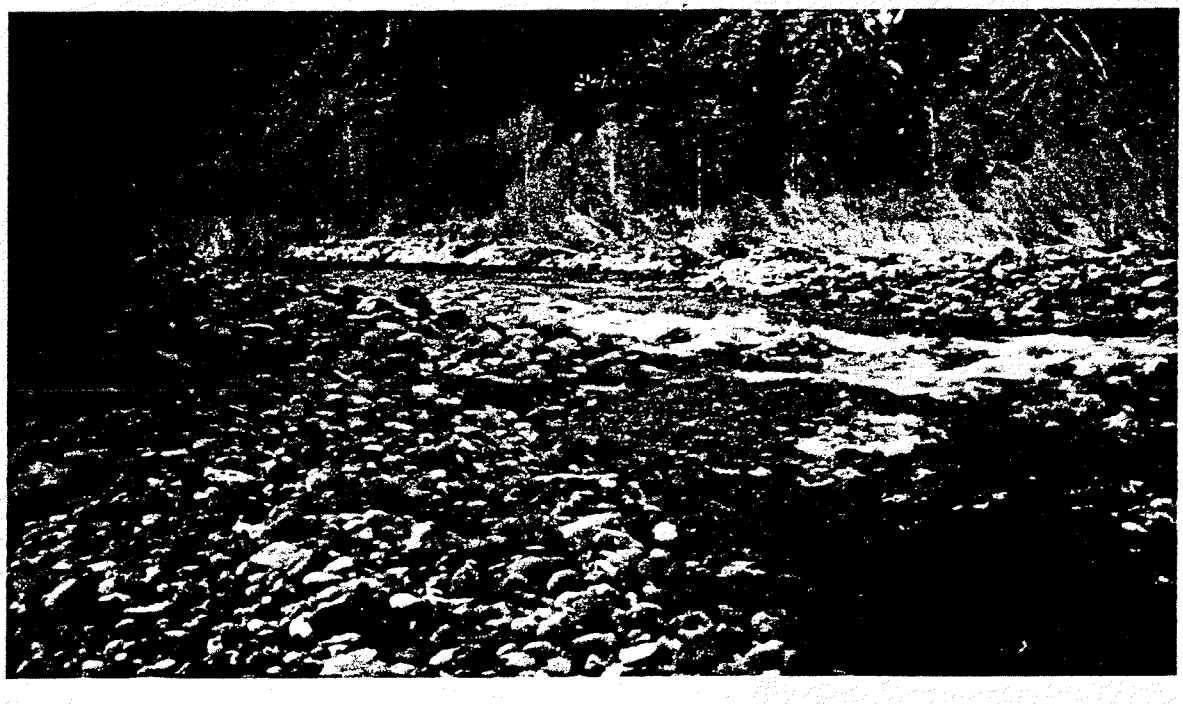
YTFP observations correlate well with previous reports of steelhead spawner presence in the basin. Spawner or "runback" steelhead presence in June, however, is later in the year than previously documented. YTFP data indicates that at least small numbers of

Table 2. Migration and spawn timing for Blue Creek winter-run steelhead.



steelhead can be found in Blue Creek year-round, perhaps indicative of the extreme variation possible in steelhead life history forms. For example, Rogue River summer steelhead populations possess 15 identified life history patterns (Busby et al. 1994).

While wholly dependent on weather and streamflows, future winter steelhead surveys could be expanded to include greater and more consistent coverage of mainstem Blue Creek and Crescent City Fork Blue Creek. 1997 marked the most consistent effort to date but these surveys all took place on one 2.5-mile reach. An effort where the lower 10.3 miles are surveyed in one day (similar to current YTFP fall-run chinook surveys) would discern spatial spawning trends as well as temporal trends. The Crescent City Fork has abundant winter steelhead habitat yet survey data is currently lacking. Since steelhead have yet to be documented in anadromous-accessible tributaries, YTFP should also conduct yearly spawning checks in the West Fork Blue Creek, Slide Creek, and Nickowitz Creek. Although abundant juvenile steelhead/rainbow trout have been found in all major tributaries, questions exist concerning the extent of anadromous utilization (Voight and Gale 1998). Direct observation of steelhead spawners in these streams would enhance current knowledge of salmonid habitat utilization in the Blue Creek basin.



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