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Coho Salmon Spawning Assessment in Tustumena Lake Tributaries, 2006

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Douglas E. Palmer and Kenneth S. Gates

Abstract

Aerial and ground surveys were conducted to determine the distribution and relative abundance of coho salmon in twelve Tustumena Lake tributaries during 2006. Aerial surveys included a fixed-wing survey on 5 October and a helicopter survey on 27 October. Three ground surveys were conducted between 17 October and 9 November. Adult coho salmon were observed in only three of the twelve streams surveyed: Glacier, Indian, and Shantatalik creeks. Peak counts observed between 17 and 30 October were 195, 126, and 44 coho salmon in each of these streams, respectively. Several factors influenced our ability to observe coho salmon during the surveys including glacial turbidity, turbulent water, thick and overhanging vegetation, concentrations of large woody debris, undercut banks, and tannin-stained water. Freezing temperatures in late October and early November caused ice to form on most streams prohibiting any surveys beyond 9 November.

Introduction

The Kasilof River watershed provides spawning and rearing habitat for four species of Pacific salmon including Chinook *Onchorhynchus tshawytscha*, coho *O. kisutch*, sockeye *O. nerka*, and pink salmon *O. gorbuscha*. Sockeye salmon are targeted primarily by commercial fisheries in Cook Inlet and have been the focus of numerous research, enhancement, and assessment projects within the Kasilof River watershed for nearly 30 years (Kyle 1992; Burger et al. 1995, 1997; Finn et al. 1997; Woody et al. 2000; Shields 2006). Conversely, little research and monitoring effort has been directed toward understanding coho salmon within the watershed. Monitoring for coho salmon has been limited to three years (2004-2006) of adult counts through a video weir on Crooked Creek, a lower Kasilof River tributary, and ground counts of coho salmon in Tustumena Lake tributaries during 1987. Estimates of annual escapement through the Crooked Creek video weir have ranged from 2,756 to 5,703 coho salmon since 2004 (U.S. Fish and Wildlife Service and Alaska Department of Fish and Game, unpublished data). Faurot and Jones (1990) found coho salmon in only four (Pipe, Indian, Glacier, and Seepage creeks) of the eleven Tustumena Lake tributaries that were surveyed during 1987. Index counts for all streams were less than 50 fish, except for Indian Creek which had a peak count of 931 coho salmon on 9 November. Coho salmon are also known to occur in Fox and Nikolai creeks (Johnson and Weiss 2006), but none were observed during ground surveys conducted in 1987. Sport anglers encountered on Nikolai Creek during the 1987 survey did report catching two coho salmon on 20 August and one on 2 September (Faurot and Jones 1990). Traditional knowledge of the area does indicate that the run-timing for coho salmon returning to Nikolai Creek may be earlier than other Tustumena Lake tributaries (Mike Sipes, personal communication). Coho salmon may also spawn in the mainstem Kasilof River, but this has never been documented.

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Coho salmon returning to the Kasilof River watershed are harvested primarily in sport and personal use fisheries. Annual sport harvest in the Kasilof River has averaged 3,185 coho salmon between 1996 and 2003 (Howe et al. 2001a-d; Jennings et al. 2004, 2006a, 2006b; Walker et al. 2003). During the same period, estimated harvest of coho salmon in the personal use dip net fishery has averaged 625 fish annually (Reimer and Sigurdsson 2004). Harvest of coho salmon in federal subsistence fisheries has been minimal to date, but will likely increase in the near future because Ninilchik residents were granted customary and traditional use for salmon, trout, Dolly Varden and other char on federal waters within the Kasilof River watershed by the Federal Subsistence Board in January 2006. New regulations will be implemented during 2007 that will liberalize methods and means, seasons, and harvest limits for coho salmon and other species in federal subsistence fisheries.

The development of new federal subsistence fisheries in the Kasilof River watershed and the potential for increased harvest has triggered a need for more detailed information on the abundance, run-timing, and distribution of coho salmon. Preliminary work to begin addressing this need was conducted during 2006 and included aerial and ground surveys to determine the distribution and relative abundance of coho salmon spawning in Tustumena Lake tributaries. This report summarizes the findings from these surveys.

Study Area

Most of the Kasilof River watershed (Figure 1) is located within the Kenai National Wildlife Refuge on the Kenai Peninsula approximately 130 km southwest of Anchorage. The headwaters are covered by Tustumena Glacier, an extension of the Harding Ice Field, which directly influences the water level and turbidity of Tustumena Lake and the Kasilof River. Tustumena Lake, with a surface area of 29,450 hectares, a length of 40 km, a width of 8 km, and a maximum depth of 290 m, is one of the largest and deepest glacial lakes in Alaska.

Tustumena Lake has twelve perennial tributaries and is drained by the Kasilof River which flows approximately 31 km northwest into Cook Inlet (Figure 1). The characteristics of perennial streams flowing into Tustumena Lake vary considerably. Shantatalik, Pipe, Fox, Nikolai, and West are tannin-stained creeks that drain lowland habitats. Glacier and Seepage creeks also drain lowland habitats on the east end of Tustumena Lake, but water clarity is typically very good. Most other tributaries have higher gradients, especially in headwater reaches that originate in alpine habitats. Indian Creek is the only perennial stream that is seasonally influenced by glacial turbidity.

Methods

A combination of aerial and ground surveys were conducted to determine the distribution and relative abundance of coho salmon spawning in twelve Tustumena Lake tributaries. Ground surveys were conducted on 17 October, 30 October, and 9 November. During ground surveys, two observers equipped with Polaroid sunglasses would hike up to 2 km along the lower reach of each stream and count the number of coho salmon observed. All twelve streams were surveyed during 17 October; however, only Glacier, Indian and Shantatalik creeks were included in later ground surveys.

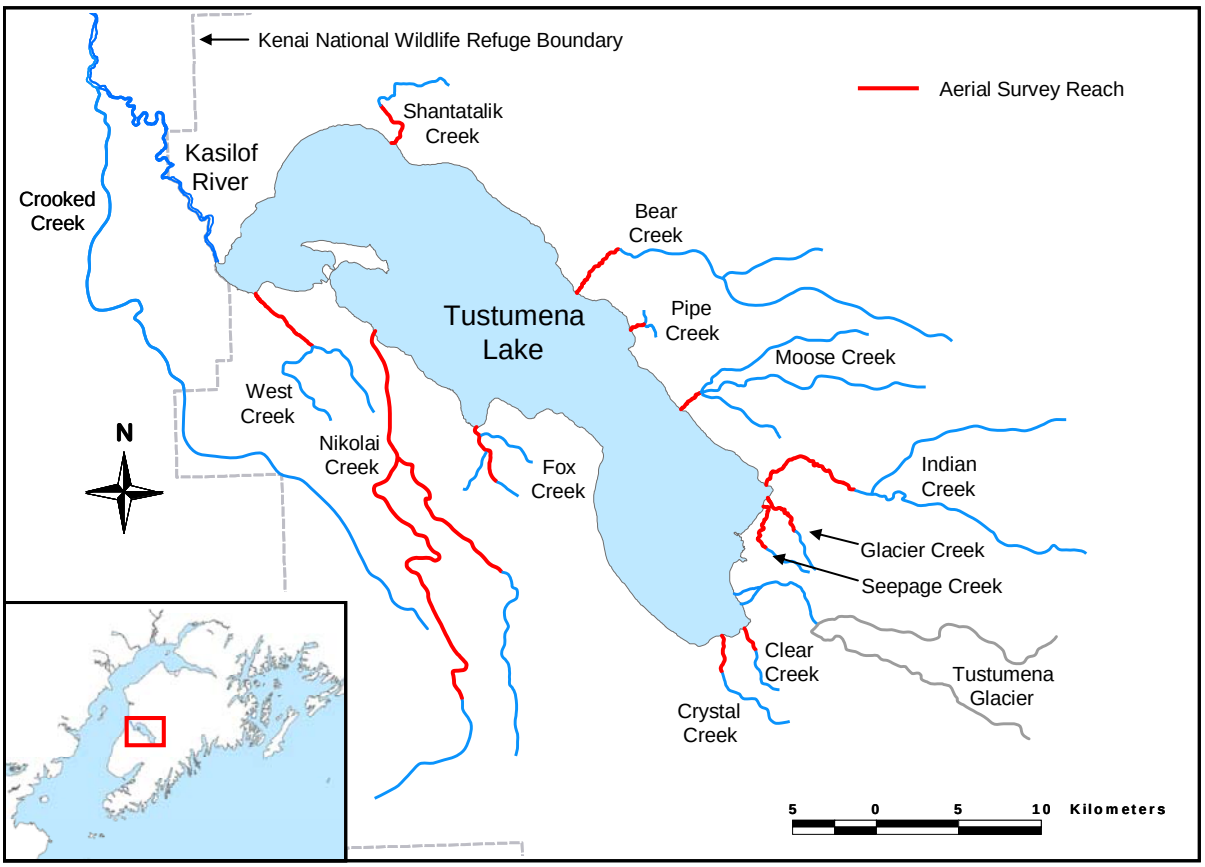

FIGURE 1. —Map of the Kasilof River watershed showing Tustumena Lake tributaries surveyed during 2006.

Aerial surveys were conducted using low-level fixed wing and helicopter flights. The first aerial survey was conducted on 5 October using a PA-18 fixed-wing aircraft (Super Cub). The focus of this flight was to count coho salmon and also identify stream sections that would be surveyed using the helicopter. The helicopter aerial survey was conducted on 27 October. During the helicopter survey, the pilot maintained the slowest airspeed possible at an altitude ranging from 20 to 50 m above the streambed, depending on the terrain and vegetation. When necessary, the aircraft hovered over schools of fish to assist with counting. Each stream was surveyed by either moving upstream from the mouth or moving downstream from the headwaters. The direction of travel on each stream (upstream or downstream) was dictated by local wind and visibility conditions. Generally, each mainstem tributary stream was surveyed until it began branching into numerous small tributaries, or until other conditions were encountered that limited the ability of observers to count fish. A portable global positioning system (GPS) was used to record stream reaches surveyed during the helicopter flight (Figure 1).

Results

Aerial and ground counts of coho salmon were conducted on twelve Tustumena Lake tributaries from 5 October through 9 November (Table 1). No coho salmon were observed in any stream during the initial Super Cub aerial survey conducted on 5 October. Subsequent surveys included a helicopter survey on 27 October and three ground surveys. Adult coho salmon were observed in only three of the twelve streams surveyed: Glacier, Indian, and Shantatalik creeks. Peak counts observed between 17 and 30 October were 195, 126, and 44 coho salmon in each of these streams, respectively (Table 1). In addition to fish counted during stream surveys, we also

observed an estimated 200 to 300 coho salmon milling in Tustumena Lake near the mouth of Glacier Creek on 17 October.

Several factors influenced our ability to observe coho salmon during the surveys. Glacial turbidity prohibited counts in Indian Creek until 27 October. High gradient areas, especially in the upper reaches of Indian Creek, created turbulent water conditions which impaired our ability to observe fish. Aerial and ground counts were also hampered at times by thick and overhanging riparian vegetation, concentrations of large woody debris, and undercut banks. Tannin-stained waters in Shantatalik, Pipe, Fox, Nikolai, and West creeks also influenced our ability to observe fish. Freezing temperatures in late October and early November caused ice to form on most streams prohibiting any surveys beyond 9 November.

TABLE 1. —Aerial and ground counts of coho salmon in Tustumena Lake tributaries during 2006. Ground surveys on October 30 and November 9 were only conducted on Glacier, Indian, and Shantatalik creeks.

	Date				
Stream	October 5 (Super Cub)	October 17 (Ground)	October 27 (Helicopter)	October 30 (Ground)	November 9 (Ground)
West	0	0	0		
Nikolai	0	0	0		
Fox	0	0	0		
Crystal	[a]	0	0		
Clear	[a]	0	0		
Seepage	0	0	0		
Glacier	0	195[c]	88	147	95
Indian	[b]	[bd]	91	126	[e]
Moose	0	0	0		
Pipe	0	0	0		
Bear	0	0	0		
Shantatalik	0	6	40	44	[e]

[a] No aerial survey conducted because of low clouds.

[b] Unable to count due to glacial turbidity.

[c] Approximately 200-300 additional coho salmon were observed milling at the mouth.

[d] Three coho salmon were captured by drifting a gill at the mouth.

[e] Unable to count because stream was covered with ice.

Discussion

Adult coho salmon were observed in only three of the twelve streams surveyed during 2006. Peak counts ranging from 44 to 195 coho salmon were observed in Glacier, Indian, and Shantatalik creeks during late October. Counts of coho salmon were highest in Glacier and Indian creeks; an observation that was also made by Faurot and Jones (1990) during 1987 (Table 2). During the 1987 surveys, coho salmon were observed in only four (Pipe, Indian, Glacier, and Seepage creeks) of the eleven streams surveyed. Index counts for all streams during 1987 were all less than 50 fish, except for Indian Creek which had a peak count of 931 coho salmon on 9 November (Table 2). Coho salmon are also know to occur in Nikolai and Fox creeks (Johnson and Weiss 2006), but were not observed in surveys conducted during 1987 or 2006. Traditional knowledge of the area does indicate that coho salmon return to Nikolai Creek earlier than other Tustumena Lake tributaries; therefore, our surveys may have been conducted too late to document coho salmon returning to this stream.

TABLE 2. —Peak counts of coho salmon observed in Tustumena Lake tributaries during 1987 and 2006.

	Stream				
Year	Glacier	Indian	Shantatalik	Seepage	Pipe
1987	46	931	0	15	2
2006	195	126	44	0	0

Index counts of coho salmon from these surveys have provided some insight regarding the distribution and relative abundance of coho salmon in Tustumena Lake tributaries; however, meaningful comparisons among tributaries and years may be difficult because of challenging survey conditions that were encountered. Glacial turbidity, turbulent water, thick and overhanging vegetation, concentrations of large woody debris, undercut banks, and tannin-stained water impaired our ability to observe coho salmon on several streams. All of the streams surveyed presented one or more of these challenges except for Glacier Creek.

The development of new federal subsistence fisheries in the Kasilof River watershed has triggered the need for a more comprehensive approach to assess the abundance, run-timing, and distribution of coho salmon. To address this need, the Kenai Fish and Wildlife Field Office has developed two projects (FIS 07-507 and FIS 08-502) using fish weirs, underwater video, and radio-telemetry to identify spawning areas and determine the abundance and run-timing of adult coho salmon in four tributaries of Tustumena Lake: Glacier, Indian, Nikolai, and Shantatalik creeks. These four streams appear to support the majority of coho salmon spawning in Tustumena Lake tributaries based on findings from this study and conversations with area residents. The telemetry component of the planned studies will validate this assumption and also provide some indication on the level of spawning activity which may occur in the upper Kasilof River.

Acknowledgements

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