Juvenile Salmonid Use of Tidal Creek and Independent Marsh Environments in North Hood Canal: Summary of First Year Findings

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Summary – Working under contract with the Port Gamble S'Klallam Tribe, Ron Hirschi and Thomas Doty conducted monthly and twice monthly hand-seine sampling of small, independent marshes and tidal creek environments in North Hood Canal during 2002. The goal of this work was to characterize species use and relative abundance at 12 representative small estuary sites across the year to better understand the significance of these environments to fish. This report documents first year findings; a second year of sampling is now being implemented and the study area has been expanded to all of Hood Canal, working in cooperation with the Skokomish Tribe.

Introduction and Background – Though the importance of large-river estuaries to migrating juvenile salmon has long been known, biologists have only recently come to appreciate the significance of the estuarine-nearshore environment to migrating salmon – that is, the more extensive shallow, tidal areas fringing Puget Sound and Hood Canal (Simenstad et al. 1985, Simenstad 2000).

The numerous independent marshes and tidal portions of small creeks that drain to Puget Sound are also integral components of this "estuarine landscape". Though small and often ignored, these tidal creek and independent marsh environments harbor productive juvenile salmon habitats. Very limited past biological sampling in these environments limits our understanding of their significance to regional at-risk salmonid populations.

A popular Washington Department of Fish and Wildlife fishery management practice in Hood Canal identifies watersheds as "chinook", "summer chum", or "just coho/fall chum" streams, based on present-day spawning population distributions. In response to recent Endangered Species Act (ESA) listings, local counties have largely adopted this approach – excluding certain areas from additional habitat protection measures based on the presumed absence of threatened stocks. In shaping their land use polices, the counties have emphasized expanded resource protection measures in the "ESA watersheds" that harbor present-day spawning populations of threatened chinook and summer chum salmon, with lesser protection outside these areas.

At first sight, this might appear to be a reasonable conservation approach. However, very limited juvenile salmon sampling has ever been conducted in these various estuarine environments. Since we know little about how early life stages are using these habitats we have little information with which to determine the validity of the WDFW/county management approach. We sampled independent marshes and tidal creek environments to evaluate species presence/absence and relative abundance across the year. Sites were randomly selected from a larger pool of similar potential sites, as a means of generalizing results to other areas. Here we define "independent marsh" as those saltmarsh environments fringing the main body of Hood Canal, often with a well-developed tidal

channel network and enclosing sand spit but little/no freshwater inputs. "Tidal creeks" encompass the lowermost reaches of small streams draining directly to Hood Canal that are under tidal influence, and which include some saltmarsh and tidal channel networks but where there is strong freshwater mixing.

Survey Methods and Timing – Based on pilot work conducted during July-October 2001, potential sites were identified and stratified by type (independent marsh/tidal creek) and location (Northeast, West Central, East Central, and Northwest Hood Canal – see Map 1). We randomly selected sites from this list, working to ensure an even distribution of sites in space and by type (Table 1 and Figure 1).

Sites were sampled once monthly December 2001-January 2002 and twice monthly from February-October 2002. At each site visit, water temperature, time, weather conditions, and relative tidal stage were recorded as well as species and abundance of fish captured in multiple, replicate seine hauls. Since all sites offered their own sampling challenges, a seining routine was established that was best suited to each location and in subsequent visits this routine was repeated. The number and length of tows, sampling time, and other effort measures were also recorded for each site visit. At most sites, a minimum of four tows was generally suitable.

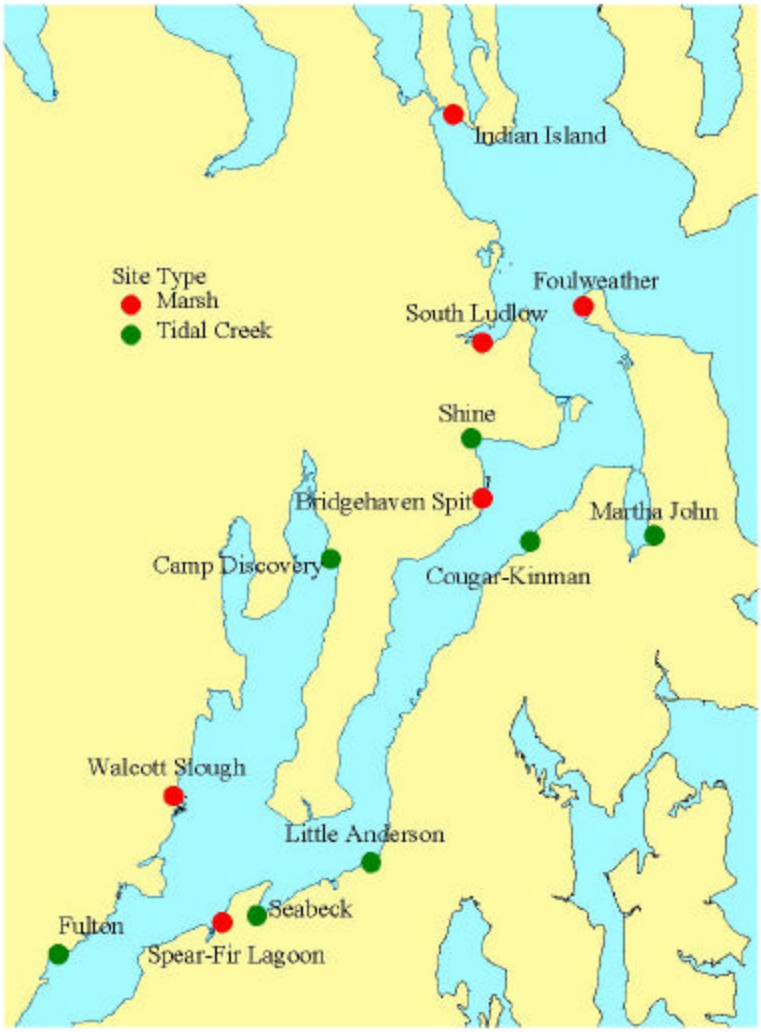
Total number of fish by species is detailed below in Table 2. Fork length and weight for up to 20 individuals per species was recorded. In year one we did not complete a detailed habitat characterization at each site that would support comparisons with other areas – this will be accomplished in year two.

Table 1. Sampling site information.

NAME	HABITAT TYPE	GEOGRAPHIC AREA	LOCATION (Township, Range, Section)
Foulweather Bluff Marsh	Marsh	NE	T 28 N, R 1 E, S 12
Martha John Creek	Tidal Creek	NE	T 27 N, R 2 E, S 16
Cougar-Kinman Creek	Tidal Creek	NE	T 27 N, R 1 E, S 22
Little Anderson Creek	Tidal Creek	EC	T 25 N, R 1 W, S 12
Seabeck Creek	Tidal Creek	EC	T 25 N, R 1 W, S 29
Spear/Fir Lagoon *	Marsh	EC	T 25 N, R 2 W, S 25
Fulton Creek	Tidal Creek	WC	T 25 N, R 2 W, S 31
Walcott Slough	Marsh	WC	T 26 N, R 2 W, S 35
Camp Discovery Creek	Tidal Creek	WC	T 27 N, R 1 W, S 22
Bridgehaven Spit/ Indian Island Marsh *	Marsh	NW	T 27 N, R 1 E, S 16 and T 29 N, R 1 E, S 7
Shine Creek	Tidal Creek	NW	T 28 N, R 1 E, S 32
South Ludlow	Marsh	NW	T 28 N, R 1E, S 17

* Due to logistical problems, the Spear Lagoon sampling site was replaced in July 2002 with a site at nearby Pretty Impressive Fir Creek (also classified as a marsh-type site, since the stream here is seasonal). Similarly, in September 2002 the Bridgehaven Spit marsh site was replaced with a comparable site at the south end of Indian Island.

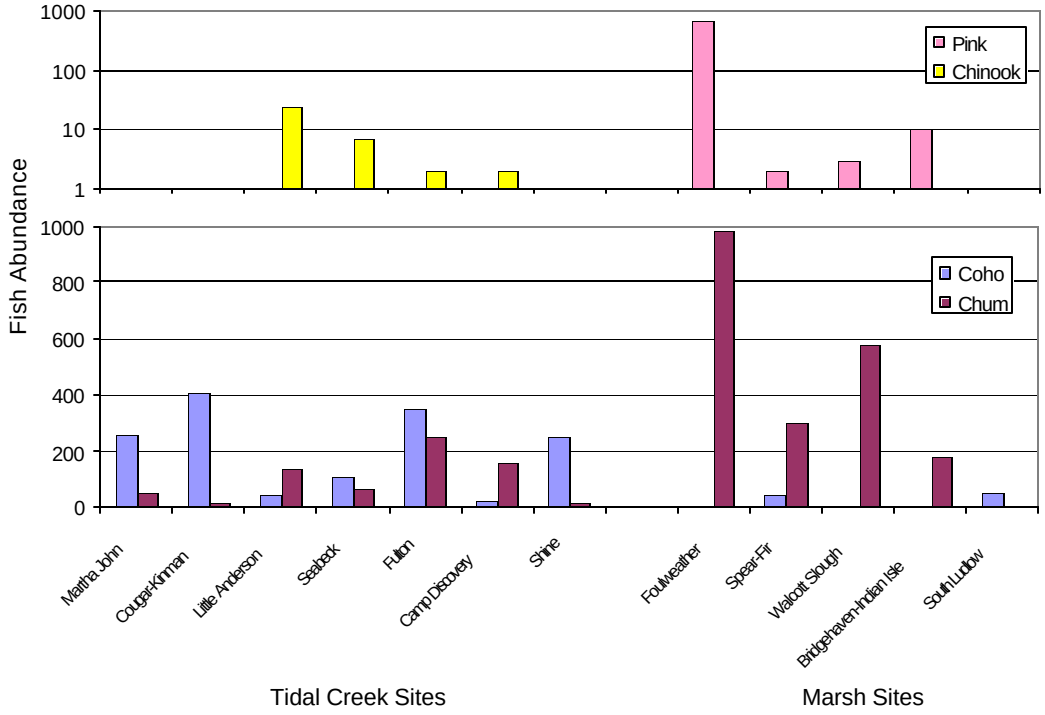
Figure 1. Map of Sampling Sites in North Hood Canal



Initial Findings – Patterns of fish use and timing varied considerably among the twelve sampled sites. Coho and chum salmon were the most abundant salmonids captured (Table 1). Other abundant fish species included larval plainfin midshipman (numbering in the thousands), staghorn sculpin, three-spine stickleback, and shiner perch. Coho and chinook salmon were generally more abundant at tidal creek sites, while chum and pink salmon were most abundant at independent marsh sites (Figure 2). Coho salmon were present at nine of the 12 sites (75%), chum present at all 12 sites, while pink salmon were sampled at 4 sites (33%) and chinook at 6 sites (50%).

The timing of peak abundance also varied significantly by species. Cutthroat trout were generally more abundant during summer-fall. Chum and pink salmon peak abundance occurred in April-May, and April was also the month most chinook were encountered. In contrast, peak coho abundance varied by site ranging April-September.

Figure 2. Total Salmon Abundance at All Sites



Since none of the sampled sites are in watersheds that support chinook or pink salmon, we surmise that these fish immigrated to these areas from other watersheds in Hood Canal or Puget Sound. Juvenile chinook salmon from the Fraser River, B.C. have been captured in Sinclair Inlet, near Bremerton, WA (Doris Small, WDFW personal communication). In our study, nearly all chinook were captured between March and June and ranged 45-70 mm suggesting these were young-of-the-year fish. Chinook salmon were captured in the lower reaches of Cougar-Kinman, Seabeck, Little Anderson Fulton creeks, and Spear Lagoon (just north of Stavis Creek). In previous sampling by Ron Hirschi and Jim Lichatowich, chinook salmon have also been captured in the lowermost reaches of Shine Creek – one of our "tidal creek" sites.

Another significant finding was the year-round presence of abundant coho populations in tidal environments, a habitat that is not generally associated with this species. Though the timing of peak coho abundance varied considerably by site, nearly all sites where they occurred harbored some coho across the year. Also significant was the timing of chum fry peak abundance; though most fish biologists associate March-April as the period of peak chum fry counts, we observed abundant chum fry in tidewater at many sites in January-February (Figure 3). These sites included Cougar-Kinman, Little Anderson, and Seabeck creeks. At this time we are uncertain if these may be early emigrating summer chum salmon. However, a similar early and late chum out-migration peak was observed in the Hamma Hamma River, where a rotary screw smolt trap was in operation during winter-summer 2002 (C. Gray, Port Gamble S'Klallam Tribe and Long Live the Kings unpublished data).

Figure 3. Salmonid Abundance at Little Anderson Creek Mouth

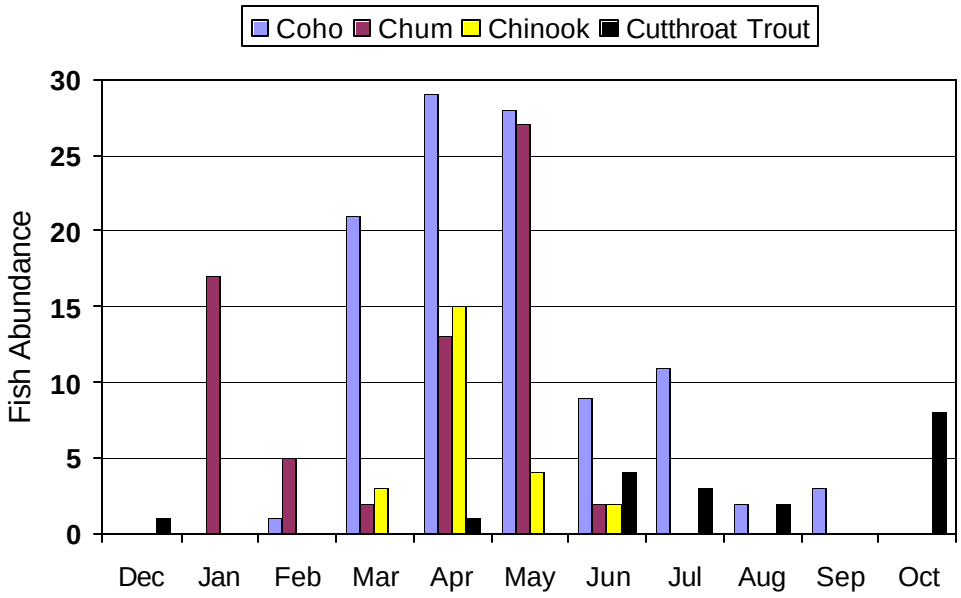


Table 2. Total number of fishes collected, all sites December 2001-October 2002.

Species	**Number**
Coho salmon (*Oncorhynchus kisutch*)	1527
Chum salmon (*Oncorhynchus keta*)	2734
Pink salmon (Oncorhynchus gorbuscha)	677
Chinook salmon (*Oncorhynchus tshawytscha*)	37
Cutthroat trout (*Oncorhynchus clarki clarki*)	265
Unidentified salmonid	13
Unidentified trout (<60 mm)	25
Unidentified sculpin	128
Staghorn sculpin (*Leptocottus armatus*)	3147
Tidepool sculpin (*Oligocottus maculosus*)	756
Prickly sculpin (*Cottus asper*)	853
Three-spine stickleback (*Gasterosteus aculeatus*)	6724
Bay pipefish (*Syngnathus griseolineatus*)	35
Sand sole (*Psettichthys melanostictus*)	2
Shiner perch (*Cymatogaster aggregata*)	2336
Gunnel (*Pholis* spp.)	13
Starry flounder (*Platichthys stellatus*)	404
Unidentified flounder	3
Plainfin midshipman (*Porichthys notatus*), adults only *	1
Unidentified blenny (Family Stichaeidae)	1
Surf smelt (*Hypomesus pretiosus*)	21
Northern anchovy (*Engraulis mordax*)	5

* Larval plainfin midshipman were the most abundant fish sampled (numbering in the thousands). Due to their extremely high counts, we did not quantify their absolute abundance.

Management Implications – While we do not presently know the overall significance of tidal creek and independent marsh environments to regional fish populations, their use of these habitats means we must not continue to ignore these areas in our fishery and land use management policies. In an often-cited study, Reimers (1973) examined returning chinook scale patterns to determine that over 90% of the spawning adult population was composed of the few juveniles rearing for extended periods in the relatively small Sixes River estuary. That these tidal creek and independent marsh environments are relatively small does not mean their significance to regional fish populations is negligible. Juvenile salmon often congregate in areas that favor high detritus retention since their preferred invertebrate food sources themselves feed on detritus (Healey 1985). In this respect the tidal creek and independent marsh environments we sampled are similar to eelgrass beds, and are no less important components of the "estuarine landscape" that is critical to salmon in Puget Sound.

References

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