

Environmental Studies Program: Completed Study

Title	Ocean Migration and Behavior of Steelhead Kelts in the Northern Gulf of Alaska, Examined with Satellite Telemetry (AK-19-02-07)
Administered by	Alaska Regional Office
BOEM Contact(s)	Sean Burrell (sean.burrell@boem.gov)
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Conducting Organizations(s)	CMI, UAF
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PICOC Summary	
<i><u>Problem</u></i>	Information about the ocean movement and behavior of steelhead kelts from the Situk River is limited. Preliminary studies indicate these fish migrate through multiple Outer Continental Shelf (OCS) planning areas. Higher resolution data on their ocean migration pathways and behavior will improve assessments of what influence OCS development activities might have on their population.
<i><u>Intervention</u></i>	Steelhead kelts from the Situk River will be tagged with pop-up satellite archival tags during their seaward emigration and oceanic residence time to collect data on their spatial (vertical and horizontal) distribution and time spent in Alaska OCS planning areas, including Cook Inlet.
<i><u>Comparison</u></i>	Results from this study will be compared to baseline results from a similar study, with a small sample size, conducted in 2018.
<i><u>Outcome</u></i>	This study will provide geospatial data describing the distribution and behavior of Situk River steelhead during their ocean residence and a better understanding of their potential interaction with current or future development activities in Alaska OCS oil and gas leasing areas.
<i><u>Context</u></i>	Gulf of Alaska, Cook Inlet, Kodiak Island, Shumagin, and Aleutian Arc OCS Planning Areas.

BOEM Information Need(s): BOEM needs a better understanding of the oceanic distribution and marine migratory pathways of steelhead kelts. This information will improve understanding and provide insight to support cumulative effects analyses for NEPA assessments related to lease sales and potential exploration plans and development and production plans in Cook Inlet.

Background: Steelhead are an important subsistence and recreational fishery species in Alaska. They are the anadromous form of rainbow trout (*Oncorhynchus mykiss*) and are found from Mexico to Alaska and across the Bering Sea to the Kamchatka Peninsula in Russia. Unlike most anadromous salmonids, steelhead can spawn multiple times within their lifetimes. After spawning, adult steelhead return to the sea to feed, during which time they are referred to as “kelts.” Steelhead spend a large proportion of their lives in oceanic waters, but information about this life stage is limited, though it is believed that

marine survival is important driver in steelhead population dynamics. Preliminary satellite telemetry research shows tagged steelhead kelts migrated from the Situk River, Yakutat, AK, through the Gulf of Alaska, Cook Inlet, Kodiak, Shumagin, Aleutian Arc areas, and potentially beyond.

The large proportion of their lives spent in oceanic waters makes steelhead particularly susceptible to marine environmental disturbances, and it is believed that marine survival is an important driver in steelhead population dynamics (Moore et al. 2012; Haesker et al. 2012). Therefore, understanding this species' oceanic ecology is of particular interest to resource managers and analysts. As most steelhead populations have very low abundance, small changes in marine survivorship can have strong impacts on the ability of individual populations to persist.

Emerging satellite telemetry research conducted by the investigators of the proposed study provides unprecedented insights into migratory pathways and behavior of steelhead. Steelhead kelts tagged in the Situk River, AK in May 2018 (n=16) made post-spawning migratory movements along the continental shelf through the Gulf of Alaska to the Aleutian Islands, traversing through the Gulf of Alaska, Kodiak, Shumagin and Aleutian Arc areas, and moving immediately adjacent to the Cook Inlet area. During their migration these steelhead occupied the top 5 m of the water column 89% of the time and the top 1.5 m of the water column 60% of the time. However, the small sample size of the preliminary study precluded population-level inferences on steelhead movements, behavior and occupied habitat.

Objectives: This study will examine:

- The spatial distribution and migratory pathways of steelhead kelts during their oceanic migrations, including their use of the Cook Inlet Planning Area
- The timing of kelt presence, duration of occupation, and movement rate within different areas of the northern Gulf of Alaska
- The relationship of steelhead movements to environmental correlates including temperature, current patterns, and chlorophyll level within these areas, as well as the depths occupied by migratory steelhead

Methods: Thirty-five adult female steelhead kelts will be tagged with pop-up satellite archival tags (PSATs; MiniPAT) during their downstream post-spawning migration in the Situk River, AK. Females will be targeted as they are known to have higher post-spawn survival rates. PSATs will be programmed to release at staggered intervals: 30, 60, 90, 120, and 180 days post deployment. The tag programming is designed to maximize the amount of data gathered by the tag, while minimizing potential long-term effects of the tags on steelhead.

Horizontal distribution, depth, and occupied water temperatures of tagged steelhead. Trends in geographic distribution and depth of steelhead will be related to interannual environmental conditions. Existing data from previous efforts (2018 and 2019; n=~30) will be aggregated with data from this study (n=35).

Specific Research Question(s): The specific research questions are:

1. How much time do steelhead kelts from the Situk River spend in southern Alaska OCS planning areas during their oceanic residence?
2. Is Cook Inlet an important use area for steelhead kelts from the Situk River?

3. What is the horizontal and vertical distribution of steelhead from the Situk River during their ocean residence?
4. How much interannual variation exists in the oceanic migration pathways of steelhead kelts from the Situk River?

Current Status: Completed Study

Publications Completed: <https://doi.org/10.24431/rw1k6c9>

Affiliated WWW Sites:

<http://www.boem.gov/akstudies/>

<http://www.sfos.uaf.edu/cmi/>

References:

- Haesker, S. L., McCann, J. A., Tuomikoski, J., and Chockley, B., 2012. Assessing freshwater and marine environmental influences on life-stage-specific survival rates of Snake River spring-summer Chinook salmon and steelhead. *Transactions of the American Fisheries Society* 141(1):121-138.
- Moore, M. Berejikian, B. A., & Tezak E. P., 2012. Variation in the early marine survival and behavior of natural and hatchery-reared hood canal steelhead. *PLoS One* 7(11):e49645.