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TELEMETRY AND GENETIC IDENTITY OF CHINOOK SALMON IN ALASKA (2): PRELIMINARY SUMMARY OF SATELLITE TAGS DEPLOYED IN 2024

15 January 2025

Prepared for and funded by Commander, U.S. Pacific Fleet under Cooperative Agreement #N62742-24-2-0005

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Cover photo: Chinook salmon fishing activities conducted near Sand Point, Alaska. Photo credit, Michael B. Courtney.

Ethics statement: Research activities were conducted under the University of Alaska Fairbanks Institutional Animal Care and Use Committee assurance 495247 and State of Alaska Aquatic Resource Permit CF-24-102.

Suggested Citation: Seitz, A.C., and M.B. Courtney. 2025. Telemetry and genetic identity of Chinook salmon in Alaska (2). Prepared for: Commander, U.S. Pacific Fleet; U.S. Navy. Prepared by: College of Fisheries and Ocean Sciences, University of Alaska Fairbanks under Cooperative Agreement #N62742-24-2-0005. 15 January 2025.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
01-15-2025	Monitoring report	2020–2022

4. TITLE AND SUBTITLE
TELEMETRY AND GENETIC IDENTITY OF CHINOOK SALMON IN ALASKA (2): PRELIMINARY SUMMARY OF SATELLITE TAGS DEPLOYED IN 2024

5a. CONTRACT NUMBER
N62742-24-2-0005

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Andrew C. Seitz
Michael B. Courtney

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
College of Fisheries and Ocean Sciences, University of Alaska Fairbanks

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Commander, U.S.Pacific Fleet, 250 Makalapa Dr. Pearl Harbor, HI

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSORING/MONITORING AGENCY REPORT NUMBER

12. DISTRIBUTION AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
Chinook salmon is an iconic species found throughout the North Pacific Ocean, yet little is known about its ocean ecology. The U.S. Navy conducts training exercises in the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA), and Western Maneuver Area (WMA). The Navy is interested in understanding the overlap of occurrence between populations of Chinook salmon and these training activities. To provide insights into Chinook salmon ocean ecology while occupying waters of the North Pacific Ocean (NPO), including overlap with the TMAA and WMA, we have previously deployed 183 pop-up satellite archival tags (PSATs) on Chinook salmon at eight locations around the GOA, and collected tissue samples to determine stock of origin of tagged fish. To expand the scope of this research, and to include additional locations further west, we conducted research near Sand Point, AK in August 2024, and Dutch Harbor in November 2024. During these efforts, 16 Chinook salmon were tagged near Sand Point in 10 days of fishing, and zero Chinook salmon were captured in 12 days of fishing effort near Dutch Harbor. To date, 14/16 PSATs deployed near Sand Point, AK, have reported to satellites, providing approximately 400 days of depth, temperature, and location data. Reporting locations of tags were concentrated in the western GOA. Preliminary analyses of depth and temperature data documented tagged Chinook salmon occupying waters from 0 to 278 m, while experiencing a thermal environment of 4–13°C. Furthermore, diagnostic evidence from tag data provided evidence that 11 Chinook salmon experienced predation by endothermic fish(s) (n = 8), ectothermic fish (n = 1), and a marine mammal(s) (n = 2). Currently, results are preliminary and we are waiting on two remaining tags to transmit archived data to satellites on their programmed pop-up dates. Once all of the transmitted PSAT data are received (~ spring 2025), a comprehensive data analyses will

commence. These analyses will provide additional insights into movement, depth distribution, temperature occupancy, and natural mortality of Chinook salmon in the North Pacific Ocean, particularly to the west of previous tag deployments.

15. SUBJECT TERMS
Acoustic monitoring, Chinook Salmon, Gulf of Alaska Temporary Maritime Activities Area, pop-up satelllite tags

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
			UU	12	Department of the Navy
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPONE NUMBER (*Include area code)***
Unclassified	Unclassified	Unclassified			808-471-6391

ABSTRACT

Chinook salmon is an iconic species found throughout the North Pacific Ocean, yet little is known about its ocean ecology. The U.S. Navy conducts training exercises in the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA), and Western Maneuver Area (WMA). The Navy is interested in understanding the overlap of occurrence between populations of Chinook salmon and these training activities. To provide insights into Chinook salmon ocean ecology while occupying waters of the North Pacific Ocean (NPO), including overlap with the TMAA and WMA, we have previously deployed 183 pop-up satellite archival tags (PSATs) on Chinook salmon at eight locations around the GOA, and collected tissue samples to determine stock of origin of tagged fish. To expand the scope of this research, and to include additional locations further west, we conducted research near Sand Point, AK in August 2024, and Dutch Harbor in November 2024. During these efforts, 16 Chinook salmon were tagged near Sand Point in 10 days of fishing, and zero Chinook salmon were captured in 12 days of fishing effort near Dutch Harbor. To date, 14/16 PSATs deployed near Sand Point, AK, have reported to satellites, providing approximately 400 days of depth, temperature, and location data. Reporting locations of tags were concentrated in the western GOA. Preliminary analyses of depth and temperature data documented tagged Chinook salmon occupying waters from 0 to 278 m, while experiencing a thermal environment of 4–13°C. Furthermore, diagnostic evidence from tag data provided evidence that 11 Chinook salmon experienced predation by endothermic fish(s) (n = 8), ectothermic fish (n = 1), and a marine mammal(s) (n = 2). Currently, results are preliminary and we are waiting on two remaining tags to transmit archived data to satellites on their programmed pop-up dates. Once all of the transmitted PSAT data are received (~ spring 2025), a comprehensive data analyses will commence. These analyses will provide additional insights into movement, depth distribution, temperature occupancy, and natural mortality of Chinook salmon in the North Pacific Ocean, particularly to the west of previous tag deployments.

INTRODUCTION

Chinook salmon (*Oncorhynchus tshawytscha*) is an iconic species found throughout the North Pacific Ocean (NPO) and supports valuable subsistence, commercial and recreational fisheries (Healey 1991; Quinn 2005; Riddell et al. 2018). In addition to the economic value of the fisheries, the Chinook salmon is culturally important and vital to the well-being of many Indigenous communities throughout western North America. Furthermore, Chinook salmon is an important food source for many apex marine predators, including endangered Southern Resident killer whales (*Orcinus orca*) (Ford et al. 1998; Adams et al. 2016; Chasco et al. 2017).

The U.S. Navy (Navy) conducts at-sea training in the Gulf of Alaska (GOA), including in the Temporary Maritime Activities Area (TMAA) and the Western Maneuver Area (WMA). As part of the Navy's Marine Species Monitoring Program, there is interest in understanding the overlap of occurrence between populations of Chinook salmon, particularly the Evolutionary Significant Units (ESU) that are listed under the U.S. Endangered Species Act, and Navy at-sea training activities that occur in the GOA.

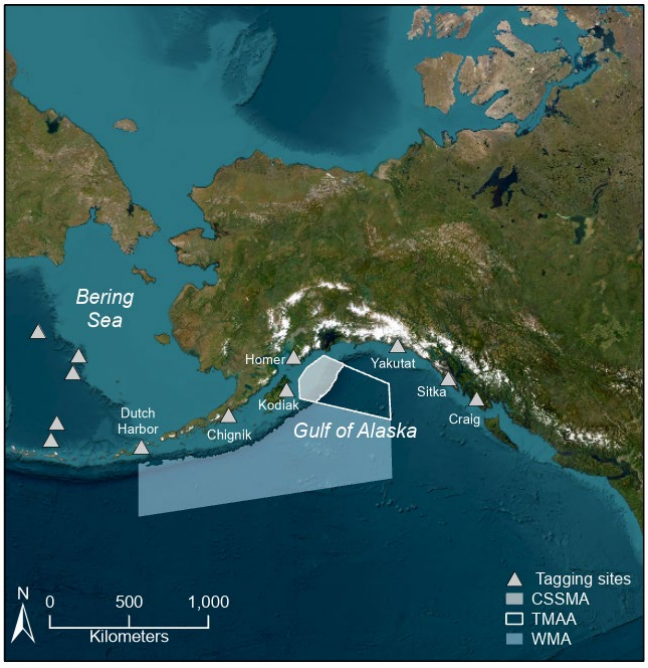

Figure 1. Locations (gray triangles) including the central Bering Sea, Dutch Harbor, Chignik, Kodiak, Homer, Yakutat, Sitka, and Craig, Alaska where Chinook salmon were captured and tagged with pop-up satellite archival tags during past research (2013–2022). U.S. Navy training areas are denoted in polygons.

While Chinook salmon is an important fish species in the GOA, little is known about its ocean ecology. To provide insights into Chinook salmon ocean ecology while occupying waters of the NPO, including the TMAA and WMA, we have deployed 183 pop-up satellite archival tags (PSATs) on Chinook salmon for over a decade (2013–Present) (Fig. 1) (Seitz and Courtney 2017; Seitz and Courtney 2018; Courtney et al. 2019; Seitz and Courtney 2019; Seitz et al. 2019; Seitz and Courtney 2024). In continuation of our research objectives and to expand the geographic scope, we conducted research activities further to the west, near Sand Point, AK in August 2024 and Dutch Harbor in November 2024, to deploy additional tags (up to 20 tags per site) and collect tissue samples from tagged and captured Chinook salmon to determine stock of origin. This information will provide an improved understanding of the biology and ecology of the ocean phase of large, immature Chinook salmon in the NPO, which may be useful for understanding potential spatiotemporal interactions between this species and Navy exercises.

In this Preliminary Summary, we describe our field efforts from 2024 in two locations along the northwestern GOA and southeastern Bering Sea coast, provide preliminary data summaries from tags that reported to satellites, and consider paths forward for this research project.

METHODS

Fishing activities

During 12–25 August 2024, research activities were conducted near Sand Point, AK (Fig. 2a) on a 32' commercial fishing gillnetter, outfitted with sportfishing trolling equipment. While no local Chinook salmon fishery exists in this region, fishing efforts were concentrated near locales

known to have Chinook salmon by commercial fishers who capture this species as bycatch in various trawl, seine, and gillnet fisheries. These locales included nearshore areas (< 100 m bottom depth) adjacent to Popof Island, Korovin Island, Guillemot Island, and the mainland of the Alaska Peninsula from Lumber Bay to Renshaw Point (Fig. 2a). Hook and line sampling methods included trolling artificial lures and bait in ~10–60 m of water at ~4.5–6.5 km/h

Additionally, during 1–24 November 2024 research activities were conducted near Dutch Harbor, AK (Fig. 2b), in the southeastern Bering Sea, aboard a 30' recreational fishing vessel. Fishing efforts were concentrated near productive areas used in past Chinook salmon tagging research (Seitz and Courtney 2017; Seitz and Courtney 2019), including Captains Bay, Nateekin Bay, Broad Bay, Hog Island, Amaknak Island, Wide Bay, Summer Bay, and Eider Point (Fig. 2b). Hook and line sampling methods included trolling artificial lures in 10–90 m of water at ~3.5–5.5 km/hr.

Fish tagging

After hooking, fish were retrieved quickly, brought on board the fishing vessel in a padded net and assessed visually assessed for signs of stress or abnormal behavior, including external injuries, loss of scales, bleeding, loss of equilibrium, pupil dilation, abnormal coloration, frayed fins, and rapid opercular movement. Only Chinook salmon deemed to be healthy according to these metrics and > 60 cm fork length (FL) were selected for tagging. Upon selection, candidate fish were placed in a custom-fabricated cradle and blindfolded to reduce visual stimuli that can contribute to behavioral stress reactions. Satellite tags were attached to Chinook salmon while in the cradle using a tag attachment system used for similarly sized Dolly Varden char (Courtney et al. 2016) and steelhead trout (Courtney et al. 2022), and during previous Chinook salmon tag deployments (Courtney et al. 2019). In short, the tag backpack system, which consists of the tag that is tethered to two padded straps, was secured with surgical-grade wire through the dorsal musculature and bony fin-ray supports of Chinook salmon. This tag attachment technique prevents muscle damage and premature rejection of the tether system caused by tearing through muscle tissue due to hydrodynamic drag of the tag. After tagging, the axillary process of a pelvic fin was removed as a tissue sample for subsequent genetic analysis. After tissue sampling, Chinook salmon were identified by tag number, photographed, and released into the ocean.

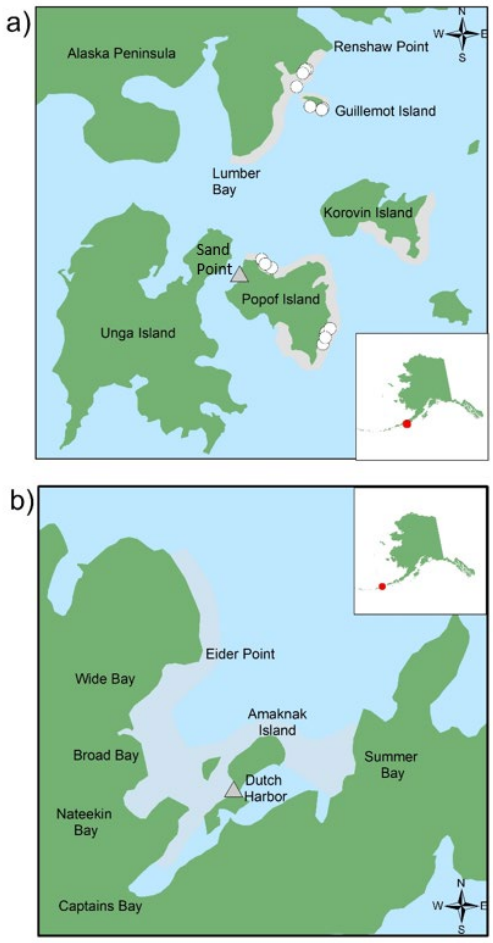

Figure 2. Fishing locations near Sand Point (a) and Dutch Harbor, AK (b) in 2024. Gray polygons denote where fishing efforts were concentrated. White circles are locations where pop-up satellite archival tags were attached to Chinook salmon and were subsequently released.

Research handling permits

All fieldwork was conducted under the University of Alaska Fairbanks Institutional Animal Care and Use Committee assurance 495247 and State of Alaska Aquatic Resource Permit CF-24-102.

Tag specifications data acquisition

All PSATs (MiniPAT, Wildlife Computers; Redmond, WA; https://wildlifecomputers.com/our-tags/minipat/) weighed 60 g in air and were slightly buoyant when in water. While attached to a Chinook salmon, the PSATs measured and archived temperature, depth and ambient light data at user-programmable intervals, typically between 1 and 15 seconds. After releasing from the fish, the tags floated to the surface of the sea and transmitted, via satellite (Argos Satellite System), summarized temperature and depth data (resolution 10 min), daily dawn and dusk times determined from light data, and a highly accurate end location (Keating 1995). In this study, PSATs were programmed to release at staggered intervals between 150 and 270 days post-tagging. Additionally, tags were programmed to release before their scheduled pop-up date if they triggered a fail-safe mechanism by remaining at a constant depth (depth window of ± 2.5 m) for a pre-defined period of time (3 days in this study), under the assumption that live Chinook salmon in the ocean change depths frequently (Hinke et al. 2005; Walker and Myers 2009; Courtney et al. 2019) and a lack of change in depth indicates mortality (see below).

Data analyses

To understand the horizontal movement of tagged Chinook salmon, displacement (the minimum distance travelled) was calculated as the great arc circle distance between tagging and end locations. End locations were assigned as the location of first transmission to satellites of each PSAT with an Argos location class 1–3, corresponding to an accuracy of <1.5 km and these end locations were plotted in GIS software (ArcMap 10.4; Environmental Systems Research Institute Inc., Redlands, California). In addition, for Chinook salmon whose tags had >21 days of data, the most likely movement paths were estimated by a Hidden Markov Model (HMM), similar to past comparable research (e.g., Strøm et al. 2017; Courtney et al. 2019; Rikardsen et al. 2021).

To understand the occupied depths and thermal environment of tagged Chinook salmon, all individual depth and temperature records were visually inspected. Descriptive statistics (e.g., minimum, maximum, and median) for data from each individual tag and for all aggregated data were calculated.

In this study, natural mortality of tagged fish by marine mammals, endothermic fishes, ectothermic fishes, and unknown predators, was identified by qualitatively examining light, depth and temperature data, similar to past PSAT research (Lacroix 2014; Seitz et al. 2019; Strøm et al. 2019).

PRELIMINARY RESULTS

Fishing activities and tagging

Fishing near Sand Point was productive and 41 Chinook salmon were captured in 10 days (~120 hours) of effort. Of these Chinook salmon captured, 16 candidate (>60 cm FL and deemed 'healthy') Chinook salmon were tagged with PSATs and released (Table 1). Tagged Chinook salmon ranged from 65 to 82 cm FL (73.3 ± 4.9 cm, mean ± SD). In addition to Chinook salmon, roughly 200 other Pacific salmon (coho salmon *Oncorhynchus kisutch*, pink salmon *O. gorbuscha*) were captured. Sonar observations (i.e., fish finder) revealed dense forage fish aggregations at most sites.

Catching target fish near Dutch Harbor was unsuccessful as no Chinook salmon were captured in 12 days of fishing (~100 hours) effort. Other species caught during research activities included juvenile coho salmon (~10), Pacific halibut *Hippoglossus stenolepis* (~50), black rockfish *Sebastes melanops* (~ 40), and walleye pollock *Gadus chalcogrammus* (~ 5). Observations of sonar revealed scant evidence of schooling bait or juvenile/adult Chinook salmon. In addition, little bird and whale activity was observed during fishing activities.

Table 1. Deployment information for 16 PSATs attached to Chinook Salmon near Sand Point, Alaska during 2024.

Argos ID	Tag SN	Deploy date	Deployment latitude	Deployment longitude	Fork Length (cm)
266507	24P0330	2024-08-19	55.53943	-160.3893	71
266508	24P0331	2024-08-16	55.53692	-160.3654	70
266509	24P0332	2024-08-23	55.27718	-160.3145	77
266511	24P0334	2024-08-18	55.35455	-160.4493	69
266512	24P0375	2024-08-16	55.53692	-160.3654	82
266513	24P0376	2024-08-16	55.35933	-160.4567	70
266514	24P0378	2024-08-21	55.57647	-160.4109	69
266515	24P0379	2024-08-19	55.56037	-160.4206	77
266516	24P0380	2024-08-13	55.28801	-160.3068	73
266517	24P0381	2024-08-14	55.35088	-160.4355	70
266518	24P0383	2024-08-19	55.58073	-160.4068	65
266519	24P0384	2024-08-12	55.28292	-160.3142	80
266521	24P0386	2024-08-23	55.26952	-160.3180	81
266523	24P0388	2024-08-21	55.58122	-160.4031	73
266524	24P0390	2024-08-22	55.53858	-160.3636	73
266526	24P0396	2024-08-12	55.27897	-160.3153	72

a) Argos ID refers to the transmitter identification number in each tag supplied by the Argos Satellite System
b) Tag SN refers to serial number of tag, provided by the tag's manufacturer

Summary of data available

To date, 14/16 tags attached to Chinook salmon near Sand Point, AK, have reported to satellites (n = 13) or been recaptured in fisheries (n = 1). In sum, these 14 tags provided approximately 400 days of depth, temperature and location data. Preliminary analyses of these depth, temperature, and light data suggest that two tags released from fish for unknown reasons (i.e., floaters), while 11 tagged fish experienced predation (Seitz et al. 2019). One tag was recovered in a commercial fishery. Finally, the two remaining tags are still attached to Chinook salmon and are scheduled to report to satellites in winter/spring 2025.

Spatial distribution

End locations and most likely movement paths of tagged Chinook salmon were concentrated in the western GOA (Fig. 3), with evidence that one tagged fish briefly occupied the southeastern Bering Sea. Displacement (straight-line distance between tagging and pop-up locations) and track distance (curvilinear distance produced from daily location estimates) for fish tagged near Sand Point, AK, ranged from 13 to 181 km (85 ± 58 km, mean±SD), and 69 to 1087 km (338 ± 317 km, mean±SD), respectively.

Depth and temperature

Preliminary analyses of depth data revealed that median depths occupied by individual tagged Chinook salmon ranged from 10 to 74 m (Fig. 4). Depth distributions of individual tagged Chinook salmon were highly variable and dives to 100 m were common among most tagged fish. While at liberty, median temperatures experienced by tagged fish ranged from 6 to 11°C, with tagged fish occupying an overall thermal range of 4–13°C (Fig. 4).

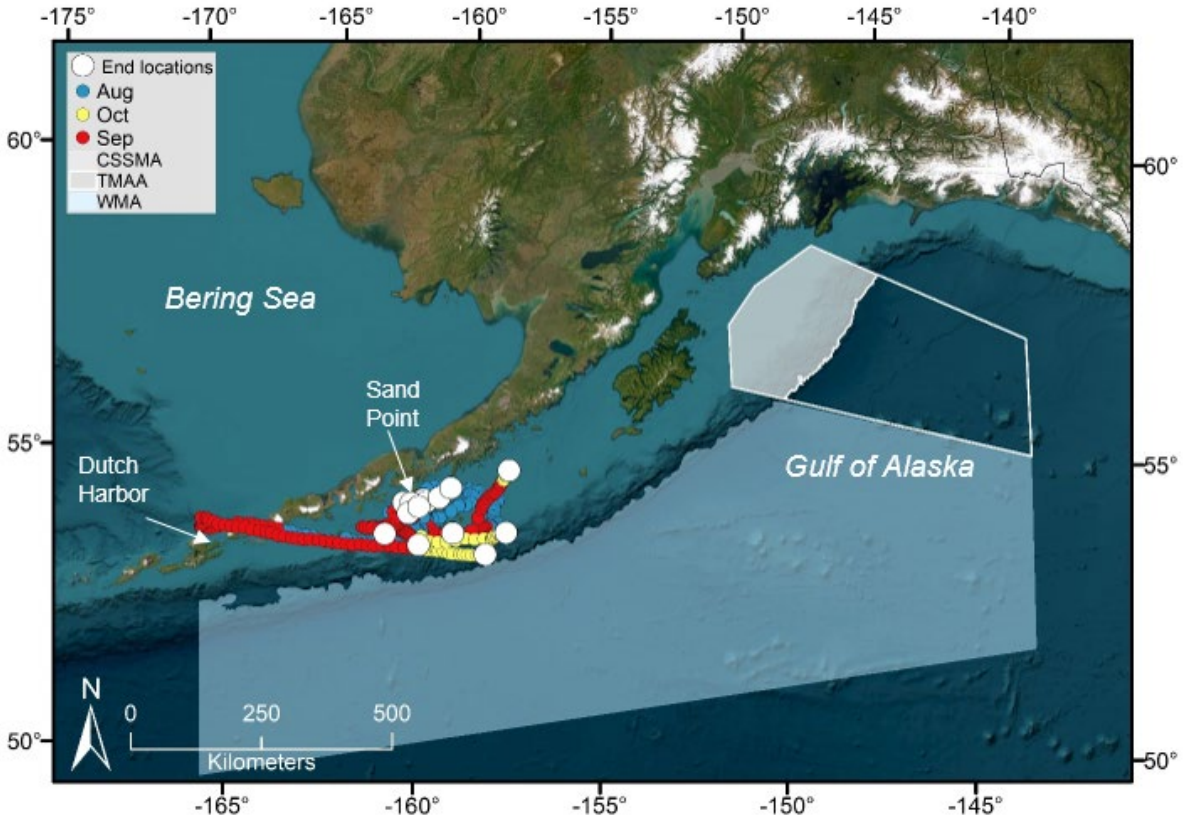

Figure 3. End locations and most likely movement paths of Chinook salmon tagged near Sand Point, AK, in August of 2024. Estimated daily locations produced by a Hidden Markov Model are color coded by month. The Navy GOA TMAA, CSSMA and WMA are denoted.

Mortality

Eleven tags provided evidence that Chinook salmon experienced predation. In these cases, PSATs recorded abrupt changes in temperature and/or changes in depth-based behavior, and low light levels indicating complete darkness, all of which suggest that the tag was in the stomach of a predator, and not on a free-swimming Chinook salmon (Seitz et al. 2019). Of these tags, one provided evidence of predation by an ectothermic fish. Eight other tags provided evidence of predation on Chinook salmon by salmon sharks (*Lamna ditropis*) with stomach temperature ~25ºC. Finally, two tags provided evidence of predation on Chinook salmon by marine mammal(s) with a stomach temperature of 38ºC. Reporting locations of tags after predation events suggest that consumption of tagged Chinook salmon was concentrated in the western GOA (Fig. 5).

PRELIMINARY PROJECT SUMMARY AND FUTURE CONSIDERATIONS

Sand Point tagging summary

Sand Point tagging operations were a successful collaborative and pioneering research effort between local commercial fisherman and university scientists. There is no sportfishing fleet near Sand Point, nor any directed commercial fisheries for Chinook salmon. Given the absence of directed commercial and recreational fisheries for Chinook salmon in this area, this research provides strong evidence that chartering a commercial fishing boat outfitted with sportfishing gear can be an effective platform for Chinook salmon tagging research. The effectiveness of this

platform was the result of a commercial boat captain and university scientists, all of whom have experience catching Chinook salmon, even as bycatch, cooperating to achieve a very challenging goal of not only finding, but also catching and tagging Chinook salmon. Unfortunately, due to the commercial fishing seasons, the weather conditions experienced, and the Captain's availability, we were only able to fish for ten of the 15 planned days. Five additional days of fishing would likely have resulted in deploying all 20 tags that were allocated for this fieldwork.

Dutch Harbor tagging summary

Unfortunately, even after >100 hours of fishing with proven methods, gear, and locations, no Chinook salmon were captured during Dutch Harbor fieldwork. While many uncertainties remain, the poor Chinook salmon fishing near Dutch Harbor, is likely explained by overall low and patchy abundance of Chinook salmon in the area. This rationale is supported by many discussions with local residents and Alaska Department of Fish and Game (ADFG) biologists, who have reported little to no Chinook salmon caught during the last three years. Furthermore, a similar satellite tagging research project on Chinook salmon in the Bering Sea conducted by ADFG/UAF has faced similar challenges in recent years. Specifically, during this research project, only four Chinook salmon have been tagged over multiple surveys conducted in the Bering Sea during the last three years (Sabrina Garcia, personal communication).

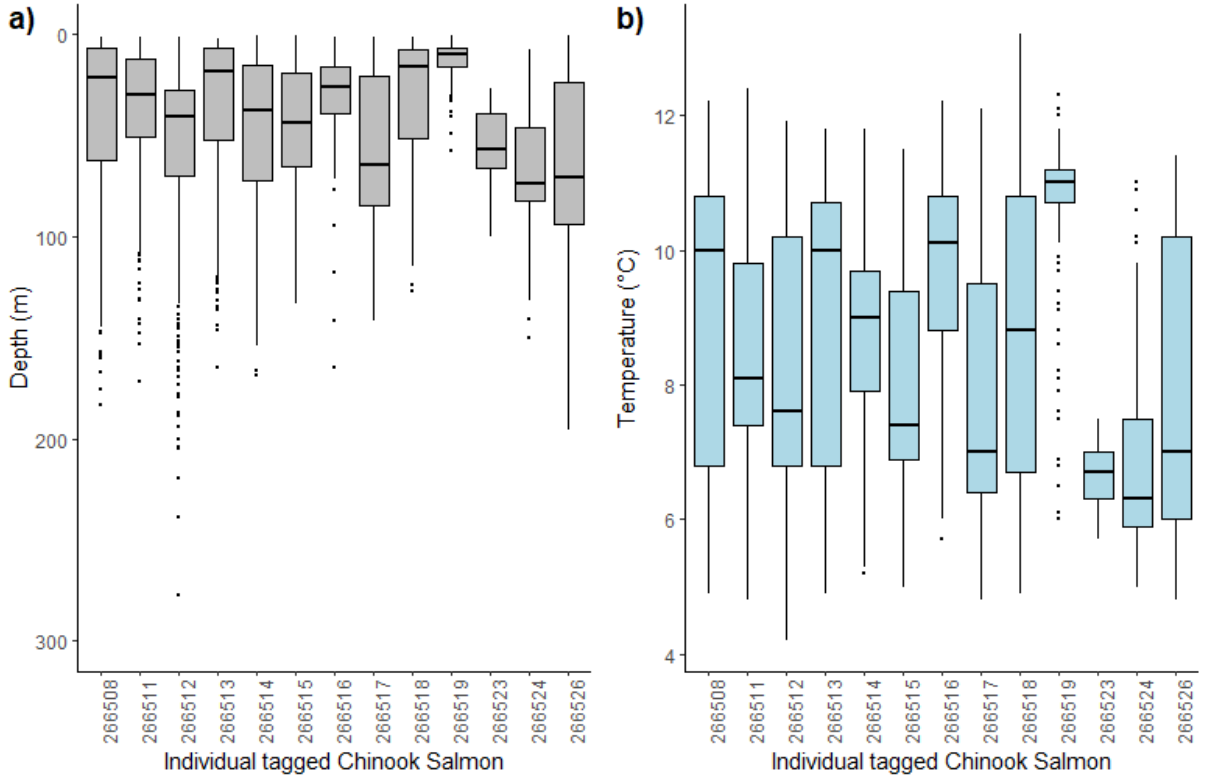

Figure 4. Box and whisker plots of depths (a) and temperatures (b) recorded by pop-up satellite archival tags attached to 13 individual Chinook salmon near Sand Point, AK in August of 2024. Argos ID numbers are included for reference purposes. For boxplots, median depths (a), and temperature (b) are solid lines, and boxes represent the first and third quartiles. Whiskers represent the largest observation less than or equal to the box, plus or minus 1.5 times the interquartile range, and black dots represent outliers.

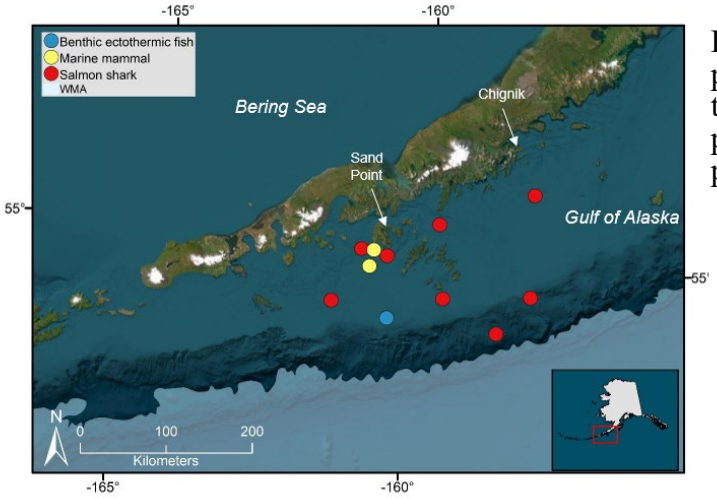

Figure 5. End locations (circles) of pop-up satellite archival tags attached to Chinook salmon that experienced predation, color coded by inferred predator.

Future data analyses

Currently, we are waiting for the remaining two PSATs deployed on Chinook salmon near Sand Point, AK, to transmit depth, temperature and light data to Argos satellites on their programmed pop-up dates. Once the transmitted data are received, more analyses of light, depth and temperature data will commence. Additionally, tissue samples from tagged Chinook salmon will be analyzed by the NMFS Northwest Fisheries Science Center genetics lab to produce stock-origin estimates in 2025.

Considerations for additional tag deployments

To date, 24 PSATs remain to be deployed. Due to the poor fishing conditions experienced in 2024 near Dutch Harbor, the feasibility of deploying the remaining tags in an expedited manner is highly uncertain. Given this uncertainty, current project funding limitations, and anticipated fishing conditions elsewhere, we believe that deploying the remaining tags is more feasible elsewhere. If deploying tags on Chinook salmon near the WMA is the highest research priority, deploying tags near Sand Point, AK or Kodiak, AK during the summer of 2025 are likely the most effective options. Tagging in Sand Point has the potential to be even more productive during a second year of fieldwork as a result of the collaborations made and lessons learned in 2024. Kodiak also is likely an excellent tagging site, as we have had successful tagging operations in a highly successful previous tagging campaigns in 2020, and we remain in close contact with local expert fishers, including the charter boat Captain with whom we fished previously. If tagging spring-run Chinook salmon that will likely return to the US Pacific Northwest within months after tagging is the highest research priority, conducting tagging operations in either Yakutat, AK, Sitka, AK, or Craig, AK, will likely yield the most successful results, based on past tagging campaigns conducted in each of those locations in 2021 and 2022.

REFERENCES

Adams, J., I. C. Kaplan, B. Chasco, K. N. Marshall, A. Acevedo-Gutiérrez, and E. J. Ward. 2016. A century of Chinook salmon consumption by marine mammal predators in the Northeast Pacific Ocean. Ecological Informatics 34:44–51.

Chasco, B., I. C. Kaplan, A. Thomas, A. Acevedo-Gutiérrez, D. Noren, M. J. Ford, M. B. Hanson, J. Scordino, S. Jeffries, S. Pearson, K. N. Marshall, and E. J. Ward. 2017. Estimates of Chinook salmon consumption in Washington State inland waters by four marine mammal predators from 1970 to 2015. Canadian Journal of Fisheries and Aquatic Sciences 74:1173–1194.

Courtney, M. B., M. D. Evans, J. F. Strøm, A. H. Rikardsen, and A. C. Seitz. 2019. Behavior and thermal environment of Chinook salmon *Oncorhynchus tshawytscha* in the North Pacific Ocean, elucidated from pop-up satellite archival tags. Environmental Biology of Fishes 102:1039–1055.

Courtney, M. B., E. A. Miller, A. M. Boustany, K. S. Van Houtan, M. Catterson, J. Pawluk, J. Nichols, and A. C. Seitz. 2022. Ocean migration and behavior of steelhead *Oncorhynchus mykiss* kelts from the Situk River, Alaska. Environmental Biology of Fishes 105:1081–1097.

Courtney, M. B., B. S. Scanlon, A. H. Rikardsen, and A. C. Seitz. 2016. Utility of pop-up satellite archival tags to study the summer dispersal and habitat occupancy of Dolly Varden in Arctic Alaska. Arctic 69:137–146.

Ford, J. K. B., G. M. Ellis, L. G. Barrett-Lennard, A. B. Morton, R. S. Palm, and K. C. Balcomb III. 1998. Dietary specialization in two sympatric populations of killer whales (*Orcinus orca*) in coastal British Columbia and adjacent waters. Canadian Journal of Zoology 76:1456–1471.

Healey, M. C. 1991. Life history of Chinook salmon (*Oncorhynchus tshawytscha*). Pages 313–393 *in* C. Groot, and L. Margolis, editors. Pacific salmon life histories. University of British Columbia Press, Vancouver, British Columbia.

Hinke, J. T., D. G. Foley, C. Wilson, and G. M. Watters. 2005. Persistent habitat use by Chinook salmon *Oncorhynchus tshawytscha* in the coastal ocean. Marine Ecology Progress Series 304:207–220.

Keating, K. A. 1995. Mitigating elevation-induced errors in satellite telemetry locations. The Journal of Wildlife Management 59:801–808.

Lacroix, G. L. 2014. Large pelagic predators could jeopardize the recovery of endangered Atlantic salmon. Canadian Journal of Fisheries and Aquatic Sciences 71:343–350.

Quinn, T. P. 2005. The behavior and ecology of Pacific salmon and trout. University of Washington Press, Seattle, Washington.

Riddell, B. E., R. D. Brodeur, A. V. Bugaev, P. Moran, J. M. Murphy, J. A. Orsi, M. Trudel, L. A. Weitkamp, B. K. Wells, and A. C. Wertheimer. 2018. Ocean ecology of Chinook salmon. Pages 555–696 *in* R. J. Beamish, editor. The ocean ecology of Pacific salmon and trout. America Fisheries Society, Bethseda, Maryland.

Rikardsen, A. H., D. Righton, J. F. Strøm, E. B. Thorstad, P. Gargan, T. Sheehan, F. Økland, C. M. Chittenden, R. D. Hedger, and T. F. Næsje. 2021. Redefining the oceanic distribution of Atlantic salmon. Scientific reports 11:1–12.

Seitz, A. C., and M. B. Courtney. 2017. Oceanic dispersal and behavior of Chinook salmon in the Bering Sea. Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative, Final report for Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative project #AC-1325, Fairbanks, AK.

Seitz, A. C., and M. B. Courtney. 2018. Do salmon sharks eat Chinook salmon in Cook Inlet? Pacific States Marine Fisheries Commission, Final report for Pacific States Marine Fisheries Commission project #16-103G, Fairbanks, AK.

Seitz, A. C., and M. B. Courtney. 2019. Further examination of the movement, behavior, and predation of Chinook salmon in the Bering Sea. Pollock Conservation Cooperative Research Center, Project Final Report Project #: 17-04, Fairbanks, AK.

Seitz, A. C., and M. B. Courtney. 2024. Telemetry and genetic identity of Chinook salmon in Alaska: Final Report. Prepared for: U.S. Navy, Commander Pacific Fleet. Prepared by: College of Fisheries and Ocean Sciences, University of Alaska Fairbanks under Cooperative Agreement #N62473-20-2-0001, Fairbanks, AK.

Seitz, A. C., M. B. Courtney, M. D. Evans, and K. Manishin. 2019. Pop-up satellite archival tags reveal evidence of intense predation on large immature Chinook salmon (*Oncorhynchus tshawytscha*) in the North Pacific Ocean. Canadian Journal of Fisheries and Aquatic Sciences 76:1608–1615.

Strøm, J. F., A. H. Rikardsen, S. E. Campana, D. Righton, J. Carr, K. Aarestrup, M. J. W. Stokesbury, P. Gargan, P. C. Javierre, and E. B. Thorstad. 2019. Ocean predation and mortality of adult Atlantic salmon. Scientific reports 9:7890.

Strøm, J. F., E. B. Thorstad, G. Chafe, S. H. Sørbye, D. Righton, A. H. Rikardsen, and J. Carr. 2017. Ocean migration of pop-up satellite archival tagged Atlantic salmon from the Miramichi River in Canada. ICES Journal of Marine Science 74:1356–1370.

Walker, R. V., and K. W. Myers. 2009. Behavior of Yukon River Chinook salmon in the Bering Sea as inferred from archival tag data. North Pacific Anadromous Fish Commission Bulletin 5:121–130.