

Aquatic Resource Permit SF2018-123 Research Report
Sun'aq Tribe of Kodiak, Natural Resources Department
March 18, 2019

Introduction/Goals:

In September 2017, the United States Fish and Wildlife Service (USFWS) Tribal Wildlife Grant (TWG) Program awarded Sun'aq Tribe of Kodiak (STK) grant funding for the project titled "*Distribution, Movement and Diet of Invasive Crayfish Populations in Buskin River Watershed on Kodiak Island, Alaska*". The main purpose of the project is to gain an understanding of the dynamics of the Signal Crayfish (*Pacifastacus leniusculus*) population. The purpose of this report is to fulfill Stipulation #3 of the Alaska Department of Fish and Game (ADF&G) Aquatic Resource Permit (ARP) SF2018-123 issued to STK. This report addresses 2018 data and previous years' data, for chronological comparisons.

Project objectives, methods, and results include:

Objective 1: Delineate the spatial distribution of Signal Crayfish in Buskin Lake through snorkeling transect surveys annually.

Methods and Results:

After obtaining the ARP, a three-person crew (two snorkelers, one boat operator/data recorder) was hired to sample predetermined transects along the shore of Buskin Lake from May-August 2018 (Figure 1). A 30.5 m line perpendicular to the shore was drawn. Then, one to three transect lines (depth dependent) measuring 18.3 m were drawn parallel to the shore (Figure 2). The crew snorkeled to depths of about 3 m. Following the methods of Pilotto et al. 2008, the snorkelers placed a 1 m² quadrat randomly at five locations along each transect. In each quadrat, all Signal Crayfish were captured and removed. Additionally, percent cover of substrate was recorded.

Morphometric and geo-reference data were collected for all captured crayfish including: carapace length, total length, sex, life stage and location. In total, 30 sites were located on Buskin Lake equidistant from one another and were sampled multiple times throughout the summer (Figure 3). Signal Crayfish were captured in the northeast, southeast, and southwest portions of Buskin Lake (Figure 4). In addition, salmon redd locations were mapped to note overlap with Signal Crayfish spatial distribution (Figure 5). Snorkeling will continue during 2019 and will help determine whether the crayfish population is increasing, decreasing or static.



Figure 1. Buskin Lake sampling locations.



Figure 2. Transect design showing perpendicular line and three lines parallel to the Buskin Lake shore.



Figure 3. Completing a transect survey in the southwest portion of Buskin Lake.



Figure 4. Signal Crayfish distribution/capture locations in 2018 (locations are in green).

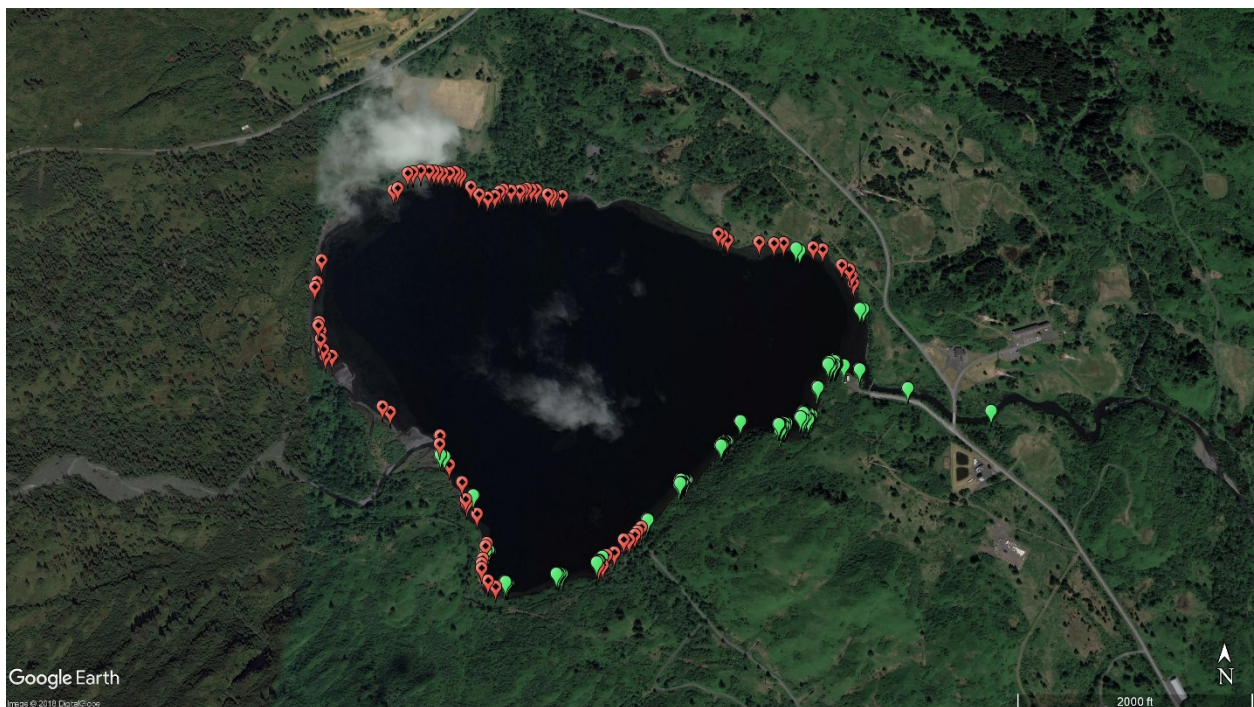


Figure 5. Signal Crayfish distribution/capture locations in 2018 (green) and salmon redd locations (red).

Objective 1

Methods and Results continued:

The bathymetric information for Buskin Lake was incomplete and outdated. STK partnered with ADF&G to create an up-to-date bathymetric map of Buskin Lake. ADF&G utilized an autonomous underwater vehicle (AUV) to help see different lake contours and areas where crayfish may be concentrated. The mapping effort took place during summer 2018 (Figure 6).

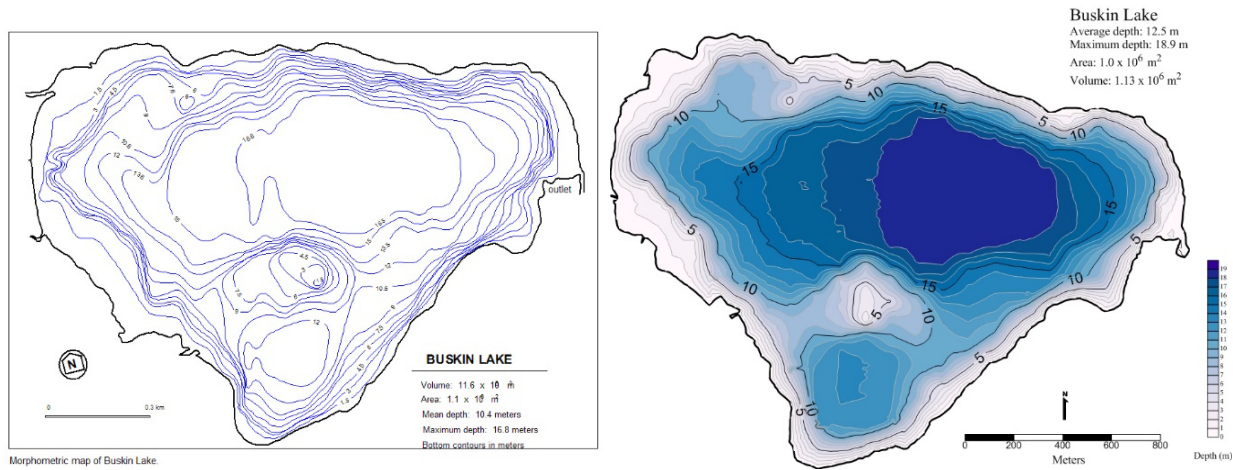


Figure 6. Bathymetry maps for Buskin Lake (left – from 1984, right – updated 2018).

Objective 2: Maintain a holistic perspective by spot monitoring other locations in the Buskin River Watershed via snorkel transects to note presence of Signal Crayfish.

Methods and Results:

The crew surveyed other Buskin River Watershed bodies once during summer 2018 for the presence/absence of Signal Crayfish (Figure 7). Waterbodies surveyed included: Buskin River, Upper Buskin Tributaries, Lake Catherine, Lake Louise, Boy Scout Lake, and Dark Lake. For the lakes, the perimeter of each lake was snorkeled by the crew. For Buskin River and Upper Buskin Tributaries, the crew swam or walked equidistant from one another covering the width of the river. No Signal Crayfish were found at any of the lake locations or in the Upper Buskin Tributaries. Several Signal Crayfish were found on the upper portion of Buskin River (closest to the mouth where Buskin Lake meets Buskin River, have been previously found in this location). All locations will be surveyed again in 2019.



Figure 7. Surveying an Upper Buskin Tributary for presence/absence of Signal Crayfish.

Objective 3: Track and plot the seasonal habitat use of Signal Crayfish through a pilot radio tagging study in Buskin Lake during mid-summer and early fall of the second project year.

Methods and Results:

To determine seasonal habitat use and activity of Signal Crayfish, a pilot radio tagging study will occur during the second year of the project. After determining where crayfish are located spatially within the lake, in spring 2019, one Signal Crayfish will be captured and fitted with a NanoTag radio transmitter within the laboratory. Once the method of NanoTag attachment has been determined to be successful, 15 Signal Crayfish will be captured by the snorkeling crew in mid-summer, after molting occurs. A NanoTag will be attached to the carapace of each crayfish and the crayfish will be released back into the capture location within Buskin Lake. Weekly, the snorkeling crew will locate each crayfish on Buskin Lake via use of a radio receiver and antenna. Location and specimen information will be downloaded each week. At the end of the pilot study, data will be compiled and plotted to see seasonal habitat use. Georeferenced maps will be created using STK's in-housing GIS resources. All tagged crayfish will be located and captured at the end of the pilot study. Following the methods of Bubb et al. 2004, this pilot study will be replicated in early fall of the second year, to better understand the seasonal habitat use of Signal Crayfish.

Objective 4: Analyze Signal Crayfish for stable isotopes during the first year to identify diet.

Methods and Results:

Following Hollows et al. (2002), stable isotopes will be utilized to analyze the diet of Signal Crayfish. In particular, any seasonal shifts in diet will be noted. Signal Crayfish from various locations and different age classes were sacrificed (by freezing) and placed securely in a Ziploc bag for shipment. The samples were then sent to the Alaska Stable Isotope Facility (University of Alaska-Fairbanks) for carbon and nitrogen analysis in March 2019. At the lab, the samples were dried and ground into a homogenous powder for whole body mass spectrometry analysis. In field season 2019, the same procedures will occur again in late spring, mid-summer and early fall (if capture is feasible) to note any seasonal variation in isotope values.

Objective 5: Collect size structure, abundance and female/male ratio data from all Signal Crayfish specimens sampled during the project.

Methods and Results:

All Signal Crayfish captured during 2018 surveys were sampled for carapace length, total length, sex and life stage. Additionally, GPS locations were noted, along with general weather conditions of the capture site. This information will contribute to a better understanding of population dynamics and what habitats different size-classes prefer. The ARP Collections Report, which details this information, was submitted in October 2018. In total, 1,299 Signal Crayfish were captured and removed from Buskin Watershed during the 2018 field season (Table 1).

Various age classes were captured during the survey (Table 2). The mean total carapace length was 33.4 mm (1.3 inches), with the smallest specimen carapace being 5 mm (0.2 inches) and the largest specimen carapace being 60 mm (2.4 inches). The sex ratio was 1.01 (female=641): 1 (male=632). 26 juveniles were unable to be sexed due to their small size.

	2016	2017	2018
Method	# Captured	# Captured	# Captured
Electrofishing	169	436	104
Kick Seine	0	0	0
Snorkeling	195	52	1,191
Dip netting/hand capture	14	220	4
Minnow trapping	44	0	0
Total	422	708	1,299

Table 1. Signal Crayfish captured per sampling method in 2016, 2017, and 2018.

	2016	2017	2018
Mean carapace length	29.0 mm (1.1 inches)	36.7 mm (1.4 inches)	33.4 mm (1.3 inches)
Largest specimen	64 mm (2.5 inches)	117 mm (4.6 inches)	60 mm (2.4 inches)
Smallest specimen	5 mm (0.2 inches)	5 mm (0.2 inches)	5 mm (0.2 inches)
Sex Ratio	1.2 (F) : 1 (M)	1.2 (M) : 1 (F)	1.01 (F) : 1 (M)
# females	193	309	641
# males	159	382	632
# unknown (juveniles)	63	17	26

Table 2. Signal Crayfish size classes and sex ratios in 2016, 2017, and 2018.

Electrofishing occurred in the southeast portion of Buskin Lake on August 29 and September 10, 2018 (Figure 8). Prior to the electrofishing, members of the crayfish crew were trained in the field by ADF&G Habitat staff on proper electrofishing methods. In addition, the crew completed USFWS Course CSP2203 (Principles and Techniques of Electrofishing). In total, 104 Signal Crayfish were captured using the backpack electrofisher. During the survey, the electrofishing team avoided sockeye redd locations. Any juvenile salmon that were unintentionally captured during electrofishing activities were released far from the electrofisher.



Figure 8. Electrofishing for Signal Crayfish near Buskin Lake outlet.

Electrofishing will continue in the 2019 and/or 2020 field seasons as part of a mark-recapture portion added to the project to determine estimated crayfish abundance.

Objective 6: Publish project data online yearly to maximize data sharing among tribes, landowners/managers, other agencies and the public.

Methods and Results:

To encourage data sharing, all project data and updates will be published on the Sun'aq Tribe of Kodiak Natural Resources Department webpage in Spring 2019 and 2020. All data published will be in a compatible spreadsheet format (.xls) and ArcGIS format for download.

Objective 7: Raise public awareness about Signal Crayfish and encourage sport harvest of Signal Crayfish through quarterly social media, website and flyer postings.

Methods and Results:

Informational flyers and signs were posted at lake and river access points in 2018 to heighten public awareness of invasive species, particularly Signal Crayfish. These signs urged resource users to help capture crayfish, and report any sightings to STK. In addition, STK utilized multimedia capabilities (radio, newspaper and social media) to inform the public about Signal Crayfish. Because of the annual influx of visitors to Kodiak Island, flyers will also be posted about Signal Crayfish at the Kodiak Airport in 2019. Additionally, the Tribal Biologist presented project findings at the Alaska Invasive Species Workshop in 2018, and will present again in 2019 or 2020 with the final project findings.



Figure 9. Signal Crayfish harvested from Buskin Lake.

Members of the public continued to harvest crayfish during 2018 (Figure 9). STK collaborated with members of the public by requesting harvest information. A spreadsheet was placed on the bulletin board near Buskin Lake outlet. Harvesters wrote down the date, number captured, location, number of females with eggs, and their contact information. As of mid-October 2018, 1,758 crayfish were captured by the public, including 43 females with eggs. Most captures occurred in the southeast corner of Buskin Lake.



Figure 10. Signal Crayfish harvested by a Salmon Camper at Buskin Lake.

STK continued public outreach efforts. Crayfish dissections took place in two classes at Peterson Elementary and also at Dig Afognak (Culture Camp coordinated by Native Village of Afognak). STK also had a booth with crayfish information at the Coast Guard Base Kodiak “Welcome Aboard” event. Additionally, STK taught two lessons on invasive species and Signal Crayfish for USFWS Salmon Camp and Adventure Camp (Figure 10).

STK was interviewed by several local media stations. One article was published by Kodiak Daily Mirror and was picked up by AP News (Figure 11). In addition, STK collaborated with ADF&G to publish an article in the Alaska Fish & Wildlife News (Figure 12).

Biologists Survey Invasive Crawfish in Kodiak Island Lake

A team of biologists is surveying a lake on Kodiak Island for crawfish, an invasive species in Alaska that has been observed in higher frequency over past several years.

Aug 14, 2018, at 11:52 a.m.

Biologists Survey Invasive Crawfish in Kodiak Island Lake

AP

KODIAK, Alaska (AP) — A team of biologists is surveying a lake on Kodiak Island for crawfish, an invasive species in Alaska that has been observed in higher frequency over past several years.

The biologists working for the Sun'aq Tribe of Kodiak began the three-year project this spring, analyzing the distribution, movement and diet of crawfish in Buskin Lake, the Kodiak Daily Mirror reported Monday.

Documentation of the crawfish began in 2012. Evidence appeared in 2015 indicating that the population was breeding, said Kelly Krueger, a biologist for the tribe. Since then, the tribe has been making efforts to study if the population is increasing and if crawfish are affecting native wildlife.

The previous research was conducted under a grant from the U.S. Bureau of Indian Affairs' invasive species program and was largely "to test what measures worked best for catching them," Krueger said. For the new survey, which is being funded through a \$200,000 grant from U.S. Fish and Wildlife Service, the team is examining 30 sites in the lake.

"It's repeated sampling, so we're seeing how many crawfish we catch within this one area and then if it's being repopulated when we come back to the same spot," Krueger said. "We've found the crawfish in areas where we didn't think they would be."

The team dives to the lake spots, often finding the crawfish in sandy or plant-filled areas. They take note of the gender, size and other specifications.

The team will work on the project into the late summer.

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Information from: Kodiak (Alaska) Daily Mirror, <http://www.kodiakdailymirror.com>

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Figure 11. Kodiak Daily Mirror article picked up by AP News in August 2018.



Buskin or the Bayou... What's up with all the Crawfish?

By Kristine Dunker



Signal Crayfish caught while snorkeling in Buskin Lake in August 2017. From the fall, the "signal" markings on the claws. Photo Credit: Nickolas Station, Kristine Dunker

As an invasive species biologist with the Alaska Department of Fish and Game (ADF&G) I had heard reports for years of crayfish in Kodiak's Buskin Lake. Last summer, I finally had the opportunity to visit this lake and thought maybe I'd finally have the chance to catch a glimpse of what I had expected to be a rather elusive non-native critter. What I didn't expect was to be at the lake for literally

seconds before finding a crayfish under the very first rock I turned over...and then

Figure 12. Alaska Fish & Wildlife News article on Signal Crayfish.

Objective 8: Annually monitor for other potential aquatic invasive species within Buskin River Watershed, such as *Elodea* species, during snorkeling surveys.

Methods and Results:

While conducting snorkeling transect surveys, the crew noted presence of any other aquatic invasive species, particularly plants in the genus *Elodea*. These aquatic plants have the potential to impact freshwater ecosystems by altering fish habitat, displacing native plants, increasing sedimentation, decreasing water flow, and altering nutrient availability. *Elodea* has invaded ecosystems elsewhere in Alaska, but has not been observed in Kodiak. No invasive aquatic plants were observed in 2018 during surveys. If any invasive species are observed in 2019, location information will be gathered and STK will immediately notify the ADF&G Invasive Species Program. For any unknown species observed in 2019, STK will consult Kodiak Soil and Water Conservation District, who has offered aquatic plant identification assistance for this project.

To gain knowledge on crayfish presence/absence in deeper portions of the lake, scuba diving transect surveys were included in the original study plan. After further discussion, STK determined that scuba diving large transects is not effective. Instead, STK will work with Aqualife Engineering to utilize a camera sled in 2019 to map crayfish distribution where snorkeling is not feasible.

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