SPIRIT BEAR RESEARCH FOUNDATION 2016

SpiritBEAR RESEARCH FOUNDATION

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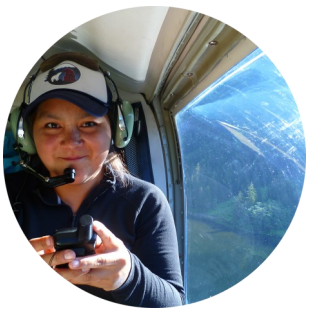

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Gratitude

Long term monitoring programs are only possible with long term support and investment. We are immensely gratefully to new and continued supporters for investing in Spirit Bear Research Foundation. Your contributions directly support our research, the coastal bears of the Great Bear Rainforest, the community of Klemtu, and the Kitasoo/Xai'xais First Nation. We welcome all contributions and are able to coordinate tax deductible receipts for donations over $250.

The 2016 research season was a tremendous success due to the remarkable support from community members, private donors, and partners. We are grateful to David Vernon, Lush Cosmetics, Kitasoo Forestry Corporation, Wilburforce Foundation, Tides Canada, and Hakai Institute/Tula Foundation for their on-going support. We would also like to thank our collaborators: the Kitasoo/Xai'xais Nation, Raincoast Conservation Foundation, and the Hakai–Raincoast Applied Conservation Science lab at the University of Victoria.

Thanks also to Cael Cook for use of the cover photo of this report and to Philip Charles for the photo on page six, team photo on page eight, grizzly bears on page 16, and of the 'Muscle to Mussel' trip on page 18.

Spirit Bear Research Foundation is a collaboration between the Kitasoo/Xai'xais Nation and conservation scientists.

Together we conduct locally relevant, ecosystem-based wildlife research to address pressing conservation concerns in British Columbia's Great Bear Rainforest.

Vision

- To advance **locally relevant scientific knowledge** of the ecosystems in Kitasoo/ Xai'xais Territory.
- To support and assist with the development of local **scientific monitoring capacity** within the Kitasoo/Xai'xais Nation.
- To incorporate **perspectives, knowledge, and priorities from the Kitasoo/Xai'xais Nation** into the development and implementation of our scientific programs.

Objectives

Monitor grizzly bear distribution and habitat use

SBRF continues to monitor changing grizzly bear distribution on islands. We aim to compile this information for the Kitasoo/Xai'xais Nation to increase protection for island habitats.

Monitor movement of bear species

As species with high spatial needs, bear movement occurs on a landscape scale and varies over time and space. Assessing seasonal movement effectively requires long term data within and across bear monitoring regions (in partnership with the Gitga'at, Heiltsuk, Wuikinuxv, and Nuxalk First Nations). We aim to collect data that will help identify important connectivity corridors for local land use planning.

Investigate impacts of grizzly bear presence on black & Spirit bear diet

We aim to assess how the presence of grizzly bears might impact foraging strategies of the less dominant black and Spirit bears. This information will help us understand how to best target conservation for black and Spirit bears on islands.

Monitor population size and trends

Long term monitoring is necessary to gain an understanding of current status and trends of bear populations. By annually adding to our genetic inventory of individuals we aim to estimate a minimum population size. Further modelling over the coming years will allow for a full Territory population estimate, from which we can detect trends in relation to habitat and food resources.

Monitor local salmon populations by creating a genetic library

We aim to launch a pilot project that will identify unique salmon populations using genetics. This advance will allow migration routes to be identified and will inform fisheries management to benefit terrestrial wildlife.


We·no·nah
NATIVE BALLER


GARMIN
SPIRIT BEAR

Bear Monitoring Program

Methods

Hair Snags

We use non-invasive hair snags throughout the Territory as a method to collect bear hair, an important material that provides our researchers a window into the life of each bear we sample. Through DNA analysis, a single hair can identify the individuality, sex, and species of each bear we sample. Certain chemical signatures in the sampled hair (stable isotopes) provide insight into how much salmon each bear ate in the previous year. This dietary information helps to answer an important question central to our research program: how does salmon availability influence bear population health?

Beginning in early May, we set up 71 hair snags throughout the Territory to collect bear hair. We select these locations based on habitat suitability and success from previous years of sampling. Using helicopters sparingly allows us to increase the our sampling scope and geographical extent by providing access to remote and mountainous regions of the Territory. This increase in sampling area allows for more accurate population estimates.

Sites consist of a barbed wire corral surrounding a large pile of debris, meant to mimic a kill, or a rub tree wrapped with barbed wire. After constructing the site, we pour a non-reward bait (no calories to avoid defense or habituation of the site) on the debris pile. Sites are then left and revisited twice during the spring season, every 8-12 days. During each revisit we collect hair from the barbed wire, record the state of the site, and then re-bait it. Following spring sampling, we remove all hair snags.

Remote Cameras

We deploy remote cameras across the Territory to monitor bear presence/absence and variation in the times that bears use habitat and salmon. This year, we placed cameras at 42 of the 71 research sites. These cameras record data by capturing images or videos at specific time intervals or when they are triggered by infrared detectors. Thousands of images and videos were collected and subsequently reviewed for presence/absence of grizzly, black, and Spirit bears. This information helps us understand which habitats are important for bears and how the movement of grizzly bears on to islands might influence black bears.

Results

Bear Movement

Detecting the same individuals within and across seasons and years provides insight into bear movements across the landscape (Figure 1). Grizzly bears generally travel greater distances than black bears. Remarkably, we have detected one male grizzly bear that traveled as far ~100km between sampling rounds. Understanding how bears are moving across the landscape provides information on potentially important corridors that are critical for the connectivity of bear populations. This important information can inform land use plans to support healthy bear populations.

Figure 1. Lines show shortest path between detection locations, not actual routes taken. Each dot represents the number of individuals captured at each site in a single year (2012-2016). Darker dots represent overlapping sites or multiple years. Larger dots represent more bears detected in a single year.

Bear Diet

Bear hair provides non-invasive and useful opportunities for studying these animals. The chemical signatures in bear hair can tell us which food resources made up that bear's diet over the time it grew its hair. Different types of food resources have different chemical signatures, which allows us to calculate the proportion of these foods in the overall diets of bears. We use dietary data to show patterns of consumption in male and female black and grizzly bears across the Territory in order to identify important habitat for bears.

Our work shows that males consistently eat more salmon than females (compare Figure 2 right to left), and grizzlies eat more salmon than black bears (compare Figure 2 top to bottom). The opposite is true for plants; males eat equal or less plants than females and grizzlies consistently eat less plants than black bears (Figure 3). For intertidal foods, grizzly bears eat more than black bears but males and females of the same species eat approximately the same (Figure 4). For deer, black bears eat more than grizzly bears, with males and females of the same species eating approximately the same (Figure 5). Deer is essentially absent from the diet of coastal grizzly bears sampled.

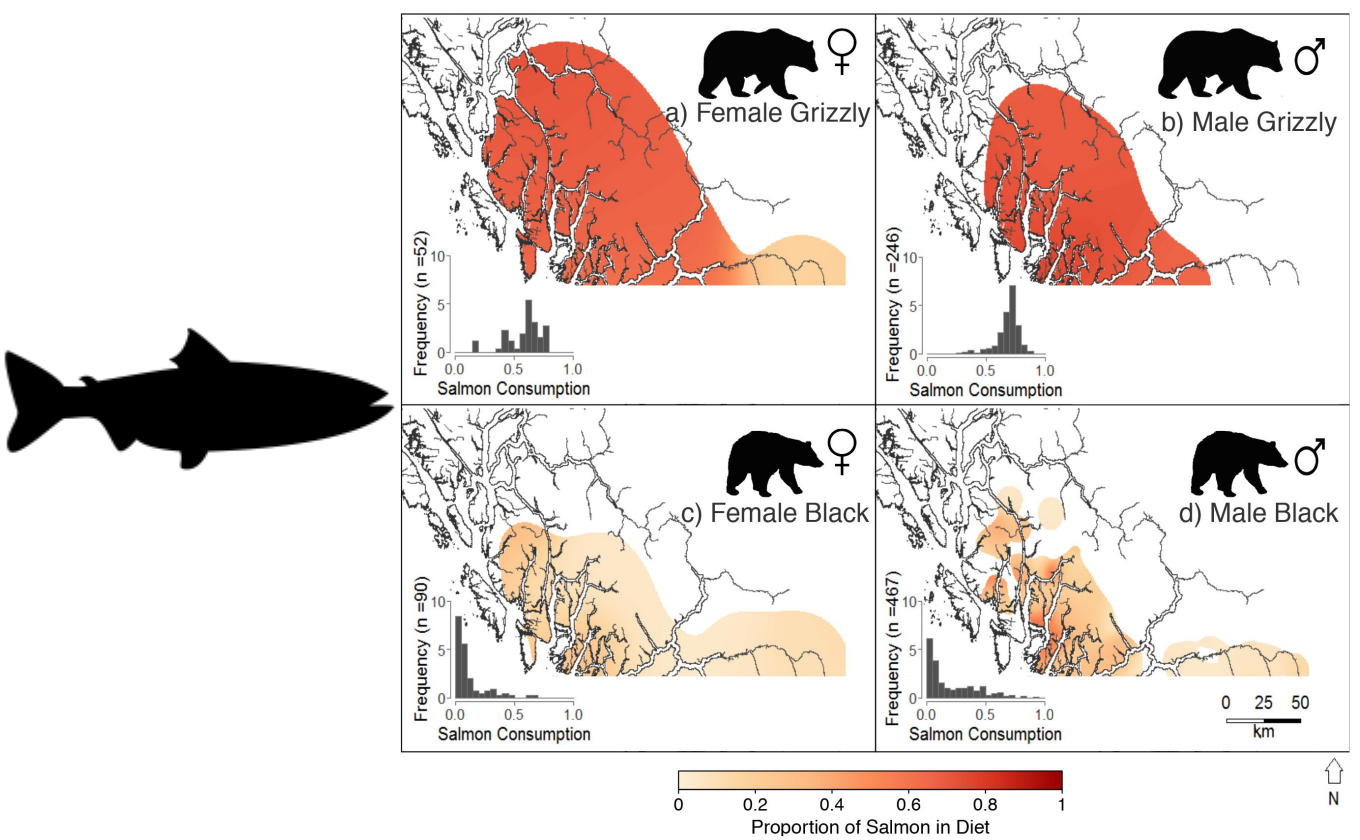


Figure 2. Proportion of salmon in diet of female (left) and male (right) grizzly bears (top) and black bears (bottom) 2012-2015. Darker colours indicate higher levels of consumption of the food resource. Maps in Figures 2-5 produced by M. Adams (Advisory Board Member).

Figure 3.
Proportion of plants in diet of female (left) and male (right) grizzly bears (top) and black bears (bottom) 2012-2015. Darker colours indicate higher levels of consumption of the food resource.

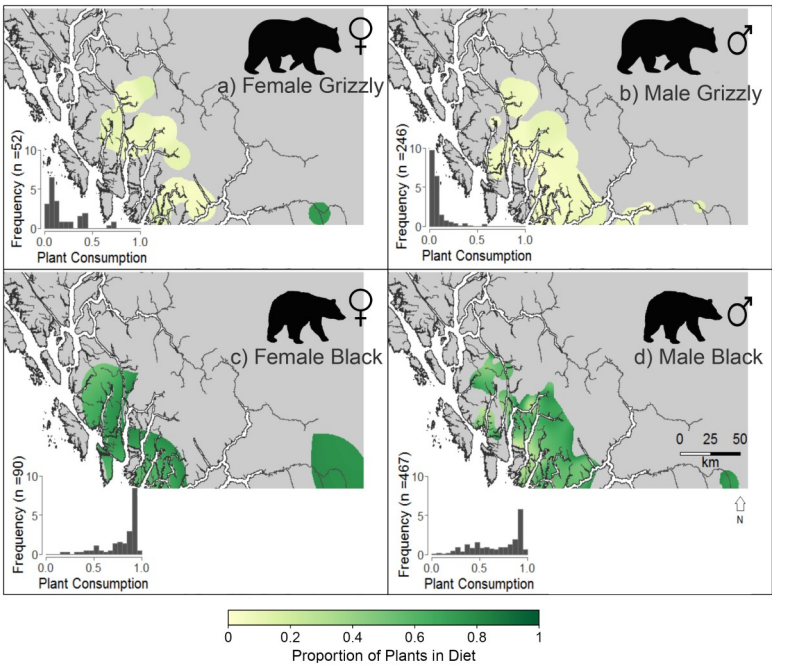


Figure 4.
Proportion of intertidal in diet of female (left) and male (right) grizzly bears (top) and black bears (bottom) 2012-2015. Darker colours indicate higher levels of consumption of the food resource.

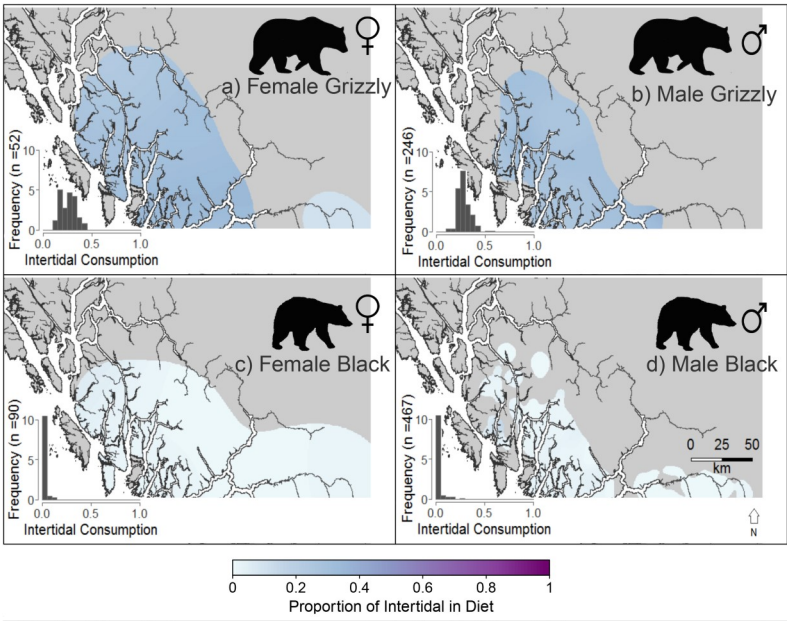
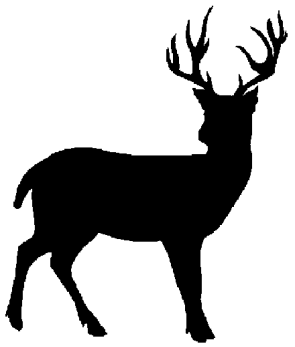
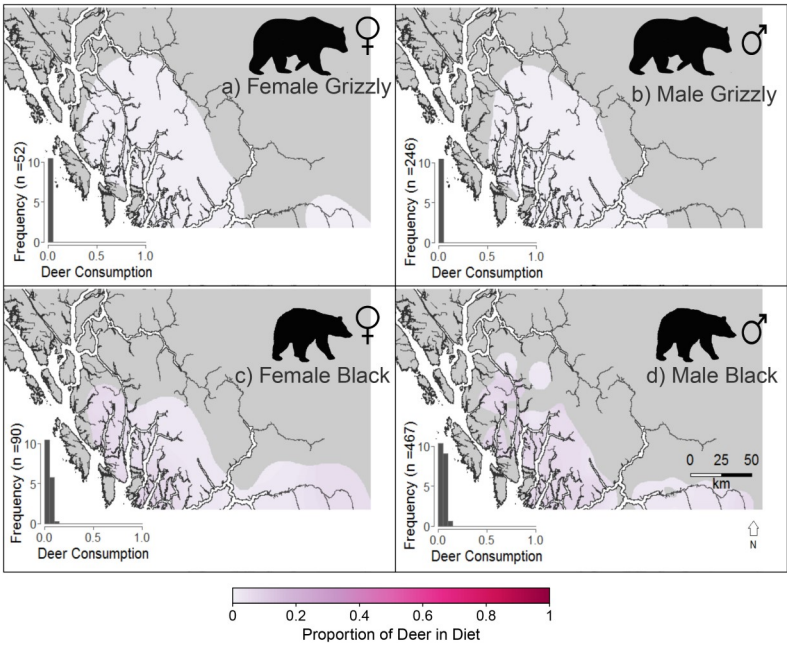


Figure 5.
Proportion of deer in diet of female (left) and male (right) grizzly bears (top) and black bears (bottom) 2012-2015. Darker colours indicate higher levels of consumption of the food resource.





Access to Salmon Diversity

Using the data from the bear hair we collect, we investigated how black bear salmon consumption might vary in the presence and absence of grizzly bears and with differing levels of salmon abundance (escapement) and spawning salmon species diversity. Because grizzly bears are larger and more dominant than black bears, we might expect them to negatively affect black bear salmon consumption.

We found that in grizzly bear presence, black bears ate approximately 40% less salmon. Surprisingly, we found little effect of salmon abundance on diet. Rather, there was a diversity effect, where black bears consumed more salmon when more diverse salmon runs (i.e. many different species) were available in the watersheds where they foraged (Figure 6). We predict that this may be because of the different strategies that salmon species employ in terms of run timing and habitat—as a result bears with access to watersheds with more salmon species may have more days during the year which they can fish and a greater amount of stream habitat that hosts salmon for foraging. This result suggests that fisheries management may include consideration for maintaining salmon species diversity, in addition to escapement targets. We aim to use this research to inform how salmon can be better managed to benefit terrestrial wildlife.

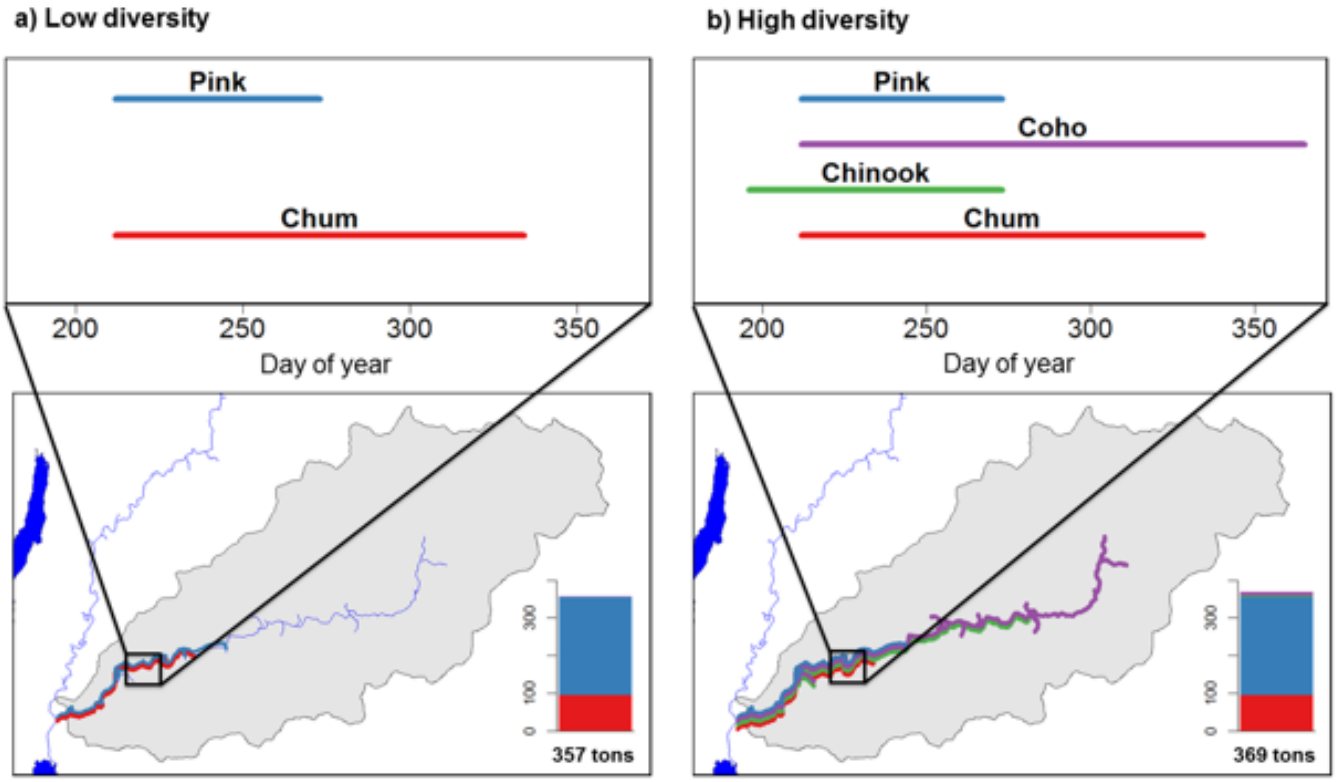


Figure 6. Bear foraging opportunities over space and time at a) low (two species) vs. b) high (four species) diversity runs. Actual watershed diversity values shown in b) are predicted to lead to 40% more salmon consumption by black bears compared to the reduced diversity shown in a).

Remote Cameras

In 2015, 41 remote cameras were deployed across the landscape in the spring and 36 were deployed in the fall. These cameras returned over 60,000 photographs and videos. With the help of dedicated volunteers, we were able to sift through this information and catalogue each unique bear visit (lots of other species also made an appearance) and record information such as the species, size class, sex, time of day, temperature, location, and behaviour.

From the data collected, ~5,200 of these files included bears, from which we logged 683 unique visits by bears to our research sites with cameras. This information is immediately useful because we can access it after only 8-12 days (the length of time between research visits), whereas data from the hair takes many months to be analyzed. SBRF researchers are currently working towards incorporating this information into a peer-reviewed publication that documents changing activity patterns of black bears in the presence of grizzly bears and salmon availability.

Bears are not the only visitors to our research sites, other species recorded include: wolves, wolverines, cougars, humans, dogs, cats, squirrels, mice, otters, martens, deer, and a number of birds such as sandhill cranes, Canada geese, robins, bald eagles, and ravens.

Bear DNA

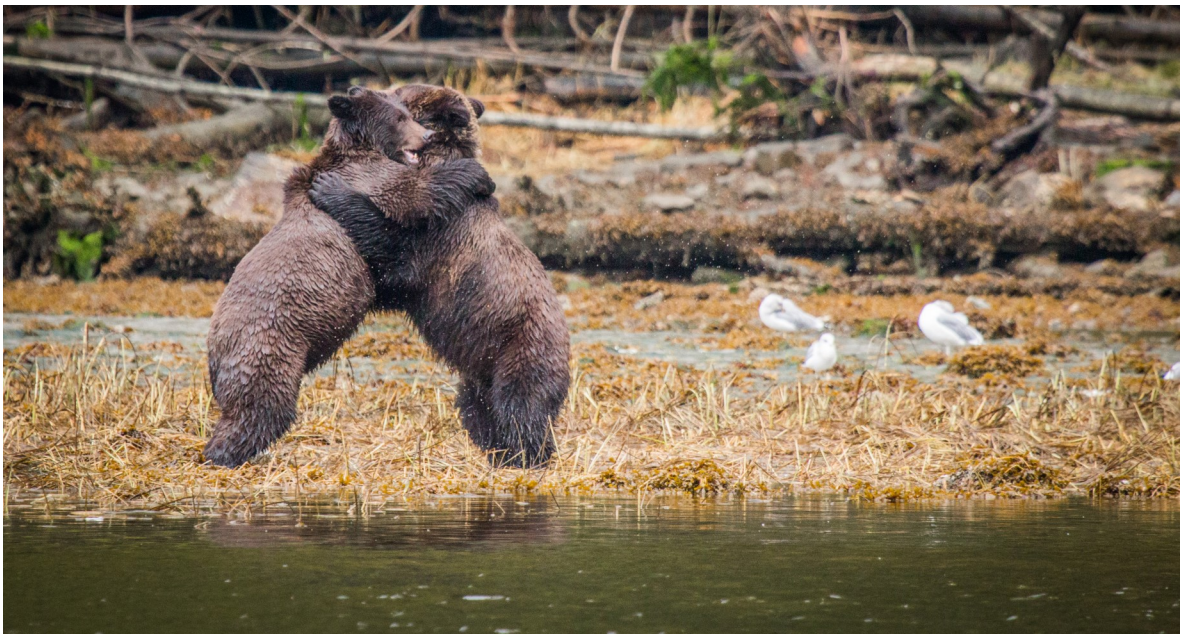
Our 2016 research sites yielded 918 bear hair samples throughout the field season. Of these samples, only a portion were eligible for DNA extraction based on subsampling rules that optimize the probability of detecting new individuals while minimizing costs. Two hundred and eight samples were selected for DNA extraction and 79% of these samples were successfully run in the lab, in line with previous years. This DNA extraction allows us to identify unique individuals (count withheld as sensitive information). The count of unique individuals across years represents the minimum population size; however, during the summer of 2017 we will be working with our collaborators to calculate a full population estimate using all six years of bear monitoring data using more advanced models. This estimate will be the first of its kind in Kitasoo/ Xai'xais Territory.

918

hair samples

208

DNA extractions
(~79% successful)



Spirit Bear Genetics

We are now able to test hair collected from black bears for heterozygosity, a term that describes whether black coated black bears carry the version of a specific gene (mc1r) that is responsible for creating a white coated black bear (Spirit bear). In order to have a white cub, at least one parent must have a white coat (a homozygote) or both parents with a black coat must be heterozygotes (carrying a "Spirit" option at the mc1r gene).

We ran black bear samples of unique individuals detected in 2016 to test for heterozygosity of the Kermode gene. Over the next year we will be exploring how these three types of black bears in Kitasoo/Xai'xais may use salmon resources differently.

Salmon Genetics Project

In fall 2016 we began our pilot season of salmon genetic sampling. In partnership with geneticists at University of Victoria, we sampled fin tissue from spawned out salmon in an effort to understand the genetic diversity of salmon in the Territory. In partnership with the Kitasoo/Xai'xais Guardian Watchmen, we sampled six different rivers in the Territory. Once fully developed, this genetic library will help identify juvenile fish migration routes and inform fisheries allocations at a local scale.

Community

We are grateful for all the interest and support SBRF receives from the community. We love sharing our research in creative ways that allows our science to be useful on the ground. Our goal is to share our research beyond a university - to children and Elders, in Klemtu and beyond. Importantly, we learn from community members and incorporate strategies, insights, and priorities of the Kitasoo/Xaix'ais Nation in our work.

Community Feast

In June, we hosted a community feast in partnership with the Kitasoo/Xai'xais Integrated Resource Authority. SBRF researchers Christina Service and Santana Edgar shared research findings, reflections from the season, and requested community feedback on our research programs. Best of all, we all shared great company and a feast of local traditional foods.

Youth

Muscle to Mussel

This year we teamed up with Klemtu's Outdoor Adventure Program, a crew of almost 20 youth, on an epic adventure. We joined on the canoe *Gawagani's* (meaning peacemaker) two-day maiden voyage, visiting research sites along the way. Our favorite part of this memorable journey was watching our youth interns taking the lead in teaching their peers all about our research program in the field.

Kitasoo Community School

Kindergarten

This spring it was a joy to visit the next generation of researchers—the 4 & 5 year-olds of Klemtu. They already know how to spot the difference between black and grizzly bears! We watched videos from our remote cameras, talked about our research program, and spent time doing arts and crafts together.

Middle School

Visiting the middle school class was another highlight for our research team. We got outside and the students helped choose locations for two research cameras that would have the best chance of capturing wildlife near the school. After programing and setting up their cameras, the students were excited to find that one of their cameras captured a wolf right in town!

Spirit Bear Lodge

Klemtu welcomes hundreds of guests from around the world every year at Spirit Bear Lodge. We give research talks to groups at the lodge and hope these guests return home inspired and full of knowledge about bears in Kitasoo/Xai'xais Territory.

Outreach

LUSH Cosmetics

We are excited to be a Lush partner and a recipient of their charitable giving program. In addition to financial support, Lush welcomed us as guests at their Nanaimo location for the day, where we shared our work with their customers. Lush filmmaker Inder Nirwan came to Klemtu to film some of our research and interview our team for their new film, *Trophy.* We were also invited guests at the film debut in Vancouver, where we joined a panel of speakers discussing bear trophy hunting.

International Bear Day

Lead researcher, Christina Service, spoke at Capilano University in Vancouver, BC on April 1st as part of International Bear Day. During her talk, Christina shared information about our research programs, moving data into policy, and the importance of community engagement in science.

Island Grizzly Bear Habitat

Our research in 2012 combined remote camera data, genetic information, and Local and Traditional Ecological Knowledge to document the movement of grizzly bears onto islands. To stay current on these movements, we updated our database of Local and Traditional Ecological Knowledge of grizzly bears on islands with targeted interviews with Klemtu community members in the summer of 2016. This information was combined with our updated remote camera and genetic database and presented to the BC Government in the fall of 2016. We anticipate supporting the Kitasoo/Xai'xais Integrated Resource Authority in continued negotiations to allocate suitable island habitat for grizzly bears in the upcoming months.

Auditor General

In September, members of the Office of the Auditor General of British Columbia visited Klemtu as part of their inquiry into the management of grizzly bears in the province. SBRF staff and elected Kitasoo/ Xai'xais leadership discussed our substantial level of investment in bear monitoring to inform local stewardship and how Klemtu's award winning bear viewing based ecotourism economy is not compatible with trophy hunting.

Looking to 2017

In addition to continuing with our core long term monitoring program to study trends in bear populations, we are looking forward to increasing our capacity in the following ways:

Salmon

We are looking to continue our salmon genetics project. We will continue collecting a genetic baseline of Pacific salmon in local priority streams in fall 2017 to inform salmon management and conservation decisions.

Youth Involvement

We value youth engagement and plan to increase opportunities for youth in 2017 with additional youth intern positions and engagement with Kitasoo Community School.

Research to Support EBM

We are looking forward to expanding our wildlife research program to include local monitoring of other ecosystem-based management (EBM) focal species aside from grizzly bears: northern goshawks, mountain goats, marbled murrelets, and coastal tailed frogs. During 2017 we will be exploring locally appropriate survey methods with the potential to pilot several small scale surveys.

Local Hiring

In 2016 we hired five community members for the research season: one skipper, two field technicians, and two youth interns. Job postings for 2017 will be posted in early April.

SpiritBEAR
RESEARCH FOUNDATION

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