



Research projects: past, present, and future

Canadian Polar Bear Habitat

Current Studies and Projects

Ongoing data collection or not yet published

Seaweed Trial

*Fecal microbiome characterization and analysis of blood metabolites and anti-inflammatory markers from polar bears (*Ursus maritimus*) in human care, that are fed marine macroalgae from Churchill, MB*

Stephanie Collins, Dalhousie University

Our bears were fed seaweed from the Hudson Bay coast for a trial period of 28 days. Blood, saliva, and fecal samples were collected and analyzed to identify changes and possible benefits. Polar bears are seen eating seaweed in the wild before the ice forms, and no one knows why – yet.

Polar Bear Energy Budget

Development of dynamic energy budget models in complex vertebrate mammals to understand past and future population dynamics

Stephanie Penk, University of Toronto

Weekly measurements are taken from each bear, including their body length and head length. Since Henry is an adolescent male, he can provide valuable information as he grows. The bears' diets, weights and these measurements are then used to calculate how much energy polar bears use as they grow. The non-invasive voluntary collection method was created by CPBH and is now the world's largest data set for these measurements in polar bears that exists.

Multispectral Imaging of Polar Bears

Erin Moreland, The United States National Oceanic and Atmospheric Administration

Researchers used drones to take thermal, UV and colour pictures of our polar bears in their natural enclosures to fine tune technologies that are used on other species and could be used to better track and estimate polar bear population numbers in the wild.

Optimal Housing of Male Polar Bears

*Analyzing Hormone Patterns of Captive Male Polar Bears (*Ursus maritimus*) Housed Under Different Social Conditions*

Dylan McCart, Canadian Polar Bear Habitat

Daily fecal samples were taken from male polar bears housed with and without females, during breeding and non-breeding season. Since testosterone had been linked to aggression, this study will help identify optimal housing conditions, and raise welfare standards for polar bears in human care around the world.

Ear Measurement

Elisabeth Kruger, World Wildlife Fund

Different measurements of our bears ears were taken and used to help engineers create a new ear tag for polar bears in the wild. Currently the only way to track polar bears in the wild successfully is using collars, which only works on female polar bears. This new tag system can track both sexes, giving us more information on wild polar bear population dynamics.

Baseline Microbiome

Establishing baselines of fecal microbiome and hormones in captive polar bears (Ursus maritimus)

Stephanie Collins, Dalhousie University

Every month, our staff collects fecal and hair samples from each bear to help understand the biological roles of marine macroalgae in the diet of polar bears and enhance polar bear nutrition-related health and well-being in human care.

Drone Study

Unoccupied aerial systems (UAS) as a novel non-invasive tool to track polar bear energy dynamics and vital signs

Michelle Shero, Woods Hole Oceanographic Institution; Erin Curry, The Center for Conservation and Research of Endangered Wildlife

Drones are used to take multiple pictures of our bears in a stationary position, to create a 3D model. This model can be used to estimate body mass, along with respiration and thermal information. If successful, this will be the first method to collect body mass of bears non-invasively.

Dietary Mineral Development

Stephanie Collins, Dalhousie University

We provided samples of our bears' diets for analysis and it was cross-referenced with the polar bear care manual to see what nutrients, if any, are lacking. A dietary mineral mix — the first ever specifically for polar bears — was created and will be sent to the Habitat shortly for a trial with our bears.

Past Studies and Projects

Seal Trial

Captive studies to improve diet estimates of polar bears in the wild

Greg Thiemann, York University

Bears were fed seal meat and blubber for three months, to identify indicators in their blood and tissue samples. This can be replicated in the wild to track seal distribution and species/amount of seal polar bears are consuming.

Whisker Print Study

Using WhiskerPrint software to non-invasively collect census individual data on polar bears in the tourist area of Churchill, Manitoba

Jane Waterman, University of Manitoba

Our bear's faces were photographed and analyzed with WhiskerPrint software to better understand how the software could be used to identify wild polar bears in different circumstances, including those under increasing stress. The results helped understand a new potential method for noninvasive polar bear identification and tracking.

Polar Bear Maturity Study

Monitoring sexual maturation of polar bears via non-invasive fecal analyses

Erin Curry, The Center for Conservation and Research of Endangered Wildlife

Biweekly fecal samples were collected from our youngest male polar bear for two years, to analyze changes in reproductive hormones as polar bears age. As of yet, there are not studies that identify hormone patterns in adolescent polar bears.

Testosterone in Urine Samples

Testosterone in ursids: Examining the seasonality of breeding in males and females

Katrina Knott, Department of Conservation and Research, Memphis Zoo

Urine samples were collected from one of our older males, Inukshuk, up to three times a week. Those samples were analyzed and compared to other male polar bears, Inukshuk had the highest levels of testosterone of any male polar bears tested in North America.

Thermoregulation Study

Investigating the Relationship Between Ambient Conditions and Thermoregulatory Responses in Polar Bears

Laura Graham, University of Guelph

Thermal images and internal temperatures were taken of our bears during extreme winter climates to analyze how polar bears thermoregulate internal temperatures compared to ambient temperatures. Our bears were given ingestible thermometers, where temperatures were measured every five minutes for 36-48 hours.

Harp Seal & Arctic Charr Feeding Trials

In vivo Digestibility Trials of a Captive Polar Bear (Ursus maritimus) Feeding on Harp Seal (Pagophilus groenlandicus) and Arctic Charr (Salvelinus alpinus)

Markus Dyck, Queen's University; Patricia Morin, Polar Bear Habitat

One of our bears was offered novel diets (Arctic charr and harp seal meat/fat) to understand how they were digested and energetically used. Energy content, proximate nutrient values, digestive efficiency, metabolizable energy requirements, and body mass change associated with these two diets were quantified, which broadened the understanding of the species. \

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Future Studies and Projects

Voluntary Semen Collection

Erin Curry, The Center for Conservation and Research of Endangered Wildlife

This project is in its initial stages, and funding will need to be secured to move forward. The goal is to create the first method to voluntarily collect semen from male polar bears and figure out best preservation methods. Current semen collection is done under anesthesia, with small samples volumes being collected. Voluntary semen collection can help understand polar bear reproductive physiology, as well as how to better preserve semen for future needs, and bank valuable semen in case of catastrophic events.

Supplemental Feeding

Development of a supplemental / diversionary feeding program to ensure polar bear sustenance and survival

Stephanie Collins, Dalhousie University

The intention is to create diversionary and / or supplemental diet to polar bears over the winter months to help ensure the survival of this species and reduce the incidence of dangerous human / bear interactions. Specialized diets will be created based on bears of different sex, age, and reproductive stages. Fecal and hair samples from bears at the Habitat helped understand polar bears' microbiomes, and a test batch of the supplemental diet will be offered to them as part of this project.

Macronutrient Requirements

Macronutrient requirements and intake of polar bears

Karyn Rode, U.S. Geological Survey

Over the course of two weeks, our bears will be offered two different meat diets — one lean and one high in fat — to identify the preferred (and likely optimal) protein to lipid ratios of polar bears. This will help optimize diets for polar bears in human care environments and determine the potential impacts of decreasing prey availability and dietary shifts in wild populations.

Isotope Feeding Trial

Stable isotope discrimination in polar bear serum as a method for estimating diet composition and lipid intake

Karyn Rode, U.S. Geological Survey

Our bears will be fed a consistent diet of meat and fat ranging from 30-60% dry matter lipid content for 60 days. Samples will be collected every 15 days then analyzed for carbon and

nitrogen isotopes. This data will be used to quantify polar bear diets from archived blood samples collected from wild polar bears over the past 30 years.

Fecal Sample Collection

*Acquisition of Fecal Samples from the Southern Hudson's Bay Polar Bear (*Ursus maritimus*) Population*

Stephanie Collins, Dalhousie University; Laura Graham, University of Guelph

The Habitat will coordinate and collect fecal samples from wild polar bears, which will help determine nutritional status, heavy metal content, and endocrine function. This information will help understand annual trends of polar bears, track any changes within the target subpopulation, and be used towards conservation efforts of the entire species. This could also be used to improve nutritional guidelines for polar bears in human care.

Hormone Reference Ranges

Serum Thyroxine levels of polar bears in human care

Laura Graham, University of Guelph

There are currently no polar bear thyroxine reference ranges from voluntary blood draws. This study aims to compile reference ranges of serum thyroxine (T4) levels as well as complete blood cell count (CBC) and thyroid functions from polar bears (*Ursus maritimus*) in human care, by collecting blood voluntarily. These samples will be compared with fecal triiodothyronine (T3) metabolites to better understand the method of hormone secretion or extraction in polar bears.

Isotopic Body Condition Study

Anthony Pagano, U.S. Geological Survey; Peter Molnar, University of Toronto; Stephanie Penk, University of Toronto; Toronto Zoo; Canadian Polar Bear Habitat

A solution containing deuterium will be given to our bears orally, and samples (saliva, urine, feces, or blood) will be taken at regular intervals until an equilibrium is reached. This will be the first-ever voluntary isotopic dilution method created with voluntary participation from polar bears. This will help create better estimates of body composition and conditions of bears at different ages, sexes, and sizes.