**NWSF Project: #19-004-01**

Ringed Seal Health Study in Iqaluit, NU

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**Final Report: Ringed Seal Health Study in Iqaluit, NU**

This project has been completed. All samples and Inuit Qaujimajatuqangit interviews have been conducted. All sample analyses of Ringed Seal tissues have returned, and analyzed, and the thesis defence associated with the project has been completed.

The project was well received during the sample-collection phases. Hunters and community members appeared interested and eagerly await the results.

***Project objectives:***Project objectives have not changed. Enough samples were obtained to address all questions including 1) identify concerns of community members related to Ringed Seal Health, 2) Determine levels of heavy metals in muscle and liver tissue, and 3) Determine level of exposure to 5 different pathogens.

***Materials and Methods:***

*Inuit Qaujimajatuqangit*

Semi-structured interviews were conducted with nine Local Knowledge holders (LKH). LKH were classified as Inuit or life-long residents of Nunavut who are actively hunting and have specific knowledge with regards to nattiit within Frobisher Bay, as well as hunting and preparation of country foods. LKH were selected based on their knowledge and experience with nattiit within Frobisher Bay by a community knowledge referral system where participants identified other individuals based on their local expertise and involvement in local hunting/land programs. These individuals were also active hunters and experienced in seal skin preparations.

All interviews were conducted in September 2018 either in English or Inuktitut by the author. Interviews were conducted until data saturation was reached. Because of the nature of the questions, data saturation was reached early. Data saturation point was determined based on affirmation of points previously made by other interviewees. Interviews were recorded via a digital audio recorder when consent was given by the participant. Notes were also taken and combined with transcribed interviews. Themes were identified based on the nine questions.

*Seal samples*

All samples were obtained from local Inuit hunters during their subsistence harvests within Frobisher Bay in spring 2017, and spring and fall 2018. Hunters were provided with 10-mL Vacutainer® tubes for blood sampling (with spray-coated silica and polymer gel for serum separation; Becton Dickinson and Company) prior to leaving for their hunt. They were instructed to collect free-flowing blood from the bullet wounds. Selection of the seals being harvested was left entirely to the hunters’ decision, since an important goal of this project was to assess the health of seals that would normally be consumed in the community. The following information was recorded: hunter’s name, location of the seal’s capture, its sex (most cases), approximate age, standard length, axillary girth, and blubber thickness over the sternum. Age classification was based on standard length, girth, and in some cases pattern of the pelt, and typically was left for the hunter to determine. Some seals were not aged in the field, and the jaws were submitted for age analysis to the Matson’s Laboratory (Milltown, MT, U.S.A.). Seals were classified as: young of the year, juvenile (approximately 1-5 years old), adult, and unknown.

Body condition for all seals was assessed based on blubber thickness, girth, and size. The following tissues were sampled: tongue and diaphragm, tonsils, lung, mediastinal lymph node, mesenteric lymph node, liver, kidney, spleen, and muscle.

Histology and bacteriology was also conducted on select samples that displayed gross lesions.

Table 1. Analyses performed on samples collected from nattiit harvested in Frobisher Bay, 2017-2018, and location of laboratories where these analyses were performed.

|  |  |
| --- | --- |
| **Analysis performed** | **Location** |
| Heavy metals and trace elements | Animal Health Laboratory, University of Guelph, Ontario |
| Serology for *Brucella* and *Leptospira* | Veterinary Diagnostic Laboratory (Dr. Jeremiah Saliki), College of Veterinary Medicine, University of Georgia |
| Serology for *Erysipelothrix* | Laboratory of Dr. Susan Kutz, University of Calgary Veterinary Medicine, Alberta |
| Serology for *Toxoplasma* | Laboratory of Dr. Emily Jenkins, Western College of Veterinary Medicine, University of Saskatchewan |
| Identification of *Trichinella* in tongue and diaphragm | Laboratory of Dr. Emily Jenkins, Western College of Veterinary Medicine, University of Saskatchewan |
|  |  |

*Statistical Analysis and ethics*

         Fisher’s Exact test of independence was used to determine sex predilection for seals that were positive for *Brucella, Erysipelas,* *Leptospira* and*, Toxoplasma*. A three-by-two Fisher’s test was used to analyze age predilection by comparing young-of-year seals (YOY), juveniles, and adult seals. An additional two-by-two Fisher’s exact test was used to test significance between YOY and adult seals. P values <0.05 were considered statistically significant. All analyses were done using StataCorp, 2013 (*Stata statistical software: Release 13.* College station, TX: StataCorp LP).

         Researchers associated with this project obtained community approval through Iqaluit’s Amaruk Hunters and Trappers Association. This project was approved by the University of Prince Edward Island’s Research Ethics Board (Project ID A612809). Licenses were obtained from Department of Fisheries and Oceans for License to Fish for Scientific Purposes (DFO LFSP S-17/18 1005-NU). Nunavut Wildlife Management Board also approved this project, and requirements of The University of Prince Edward Island’s Biosafety Committee were fulfilled for shipping and handling of samples.

***Results***

*Inuit Qaujimajatuqangit*

Nine interviews were conducted, with eight being with local hunters, and one with a very experienced sealskin preparation woman. All Local Knowledge Holders (LKH) were long-time residents of Iqaluit, NU. Six interviews were in Inuktitut, and three were in English, all conducted by the author. After completion of the final interview, the responses to the questions were sufficiently consistent across all LKHs, and it was determined that additional interviews were not needed. There were six themes identified in the thematic analysis of the interviews.  
All but two seals were deemed safe for consumption by the hunters.

*Serology*

Thirty seals were young-of-the-year, 10 were juvenile (over one-year-old), 11 were adults, and four were of unknown age. Twenty-six seals were female, 21 were male, and eight were of unknown sex. All tested seals were negative for *Brucella canis,* and 20.5% (nine of 44) were seropositive for *B. abortus.* Of 52 seals tested for *Erysipelothrix rhusiopathiae (*21%) were seropositive. All tested seals were negative for *Leptospira interrogans* serovars Canicola and Hardjo, with 61.5% (27 of 44) positive for serovar Bratislava, 4.5% (two of 44) for serovar Grippotyphosa, 90.9% (40 of 44) for serovar Icterohaemorrhagiae, and 22.7% (ten of 44) for serovar Pomona. The seroprevalence for *Toxoplasma gondii* was 9.8% (five of 51). All tested samples were negative for *Trichinella.* There were no significant associations between age classes and seroprevalence for all of the serological results. The only significant association between sex and seroprevalence was for *Erysipelothrix* (males > females)*;* all others had no significant associations.

***Discussion and Management Implications***

This project had the primary goal of examining nattiq health through quantitative methods, to assess heavy metal content and exposure to important pathogens, and through qualitative methods, by conducting IQ interviews with local hunters. The last two aspects of the project were examined thoroughly in this thesis, while heavy metals were briefly addressed and will be more fully evaluated in further work. The serological survey focussing on the four pathogens, *Brucella* spp., *Erysipelothrix rhusiopathiae*, *Leptospira interrogans*, and *Toxoplasma gondii*, was completed. The digestion assay for *Trichinella* was also completed, and indicated no presence of the parasite in nattiit of Frobisher Bay. The serological results could indicate several things: 1) high seroprevalence of *Leptospira interrogans* serovar Icterohaemorrhagiae (91%) may indicate that nattiit are a maintenance host for this pathogen, and 2) seroprevalence of *Brucella (*20.5%)*, E. rhusiopathiae* (21%), and *Toxoplasma* (9.8%) may prove to be worth monitoring over the coming years, as the climate changes and new marine species move further north. In future phases of this project, the serological work will be complemented by additional diagnostic approaches, such as PCR and ELISA, which will further clarify current and past infection status of seropositive nattiit. In particular it could be valuable to test specifically for marine strains of *Brucella*, namely, *B. pinnipedialis*, which has not been associated with illness in other seals, but merits investigation since the tests used in this study may potentially miss the marine strains. Finally, on going monitoring through future serological surveys could aid in identifying any potential risks or changes in seal health as they occur.

Conducting the IQ interviews proved to be extremely valuable in many ways, chief among them being that the community members were involved and aware of the research project while the research was happening. It also gave community members, through experienced hunters, a real, sincere space to voice their concerns and discuss the research they wanted to see done. We saw this through the redirection of research interest from nattiit to the harp seals, which are increasing in number every year. The interviews also provided the link that is often missing from other research conducted on animals that are harvested for country food. Because the methods for processing food, which parts are consumed, and how the seal is consumed, were recorded specifically for nattiit in Iqaluit, we can adjust future nattiq surveys to target potential areas of disease transmission from seal to people, and educate people on identifying signs of illness that may be helpful in identifying subtle or new manifestations of disease.

As Inuit continue to harvest nattiit for sustenance of self, culture and community, this study did not identify any major health risks from consuming seals from the waters of Frobisher Bay.

***Reporting to Communities:*** July 2, 2019

**Budget**

|  |  |  |  |
| --- | --- | --- | --- |
| **Budget Item** | **Budgeted** | **Disbursed** | **Variance** |
| Hunter Honorarium | $6000 | $7100 | -$1,100 |
| IQ Honorarium | $1000 | $700 | $300 |
| Shipping samples | $1000 | $928.65 | $71.35 |
| Travel | $4000 | $3291 | $709 |
| Training | $3,000 | $2982 | $12 |
| Total | $15,000 | $15,001.65 |  |

To summarize, all of the allotted funding has been spent since the deposit in March 2017. Hunter honoraria went over budget because of our increase in honoraria in the 3rd field season. IQ honorarium was under budget because the original plan to do 30 was deemed too many by the MSc committee. Instead, 10 interviews were conducted.

**Original Contributions**

|  |  |
| --- | --- |
| **Contributor** | **Funds** |
| CanNor | $44,500 |
| CWHC | $25,000 |
| Person Years | 3 (2 for Enooyaq, 1 for Pierre-Yves) |
| NWMB | $15,000 |
| Nunavut Arctic College | In Kind |

Additional contributor: Department of Fisheries and Oceans Canada. DFO will be providing funding for Enooyaq’s second year stipend ($25,000), for further analysis of heavy metals, including mercury ($5000), and additional travel to Iqaluit (TBD).

I certify that this is an accurate statement of the Board project funds received and disbursed in accordance with the joint contribution agreement.

Enooyaq Sudlovenick