

Cryptosporidium and Giardia in Clams in Iqaluit, Nunavut

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Clams collected from harvesters

Clam with attached anemone



Boats returning from clam harvesting in Iqaluit



Boats returning from clam harvesting at night

BACKGROUND

- The highest incidence of self-reported enteric illness in the global literature is in the Canadian North.^{1,2}
- Recent work has revealed high rates of *Cryptosporidium* and *Giardia* in the stools of enteric illness patients in the Qikiqtaaluk region of Nunavut, with molecular analyses suggesting a potential animal or foodborne source of these pathogens.³
- In response, the **People, Animals, Water, and Sustenance (PAWS)** project was developed, which aims to understand, respond to, and reduce the burden of foodborne, waterborne, and zoonotic enteric pathogens in Northern locales.
- Following literature reviews and extensive stakeholder engagement, the PAWS project is using EcoHealth⁴ principals to examine *Cryptosporidium* and *Giardia* in country food, drinking water, and pets as potential sources of illness in humans.
- Locally harvested country foods provide nutrition and a sense of cultural continuity in Inuit communities.²
- Clams are a commonly consumed and easily accessible country food, but can accumulate parasites from surrounding waters.⁵



GOALS

- The goal of this work is to better understand clams as a potential source of cryptosporidiosis and giardiasis in Iqaluit, Nunavut.
- The objectives were to:
 1. Estimate prevalence;
 2. Identify risk factors;
 3. Genetically characterize *Cryptosporidium* and *Giardia* in clams from Iqaluit for analysis.

METHODS

- Clams were collected from local harvesters in exchange for small gifts in September 2016 over a peak clam harvesting weekend, and location of clam harvest was recorded.
- Hemolymph (circulatory fluid) and digestive gland samples from each clam were tested for *Cryptosporidium* and *Giardia*.
- Initial screening was performed by PCR targeting *18S*⁶ and *gdh*⁷ genes of *Cryptosporidium* and *Giardia*, respectively.
- Suspected positive PCR amplicons were confirmed using sequence analyses.

RESULTS

- Clams (n=404) were collected from local harvesters in September 2016; hemolymph was sampled from 326 clams and digestive gland was sampled from 390 clams.
- Following sequence analyses, 2 clam hemolymph samples (0.51%) were confirmed positive for *Giardia duodenalis* Assemblage B, and no clams were confirmed positive for *Cryptosporidium* (Figure 1).
- Both *Giardia* sequences from clams contained 2 single nucleotide polymorphisms (SNPs) which distinguished them from each other, from *Giardia* sequences in GenBank, and from the *Giardia* used as a positive control.

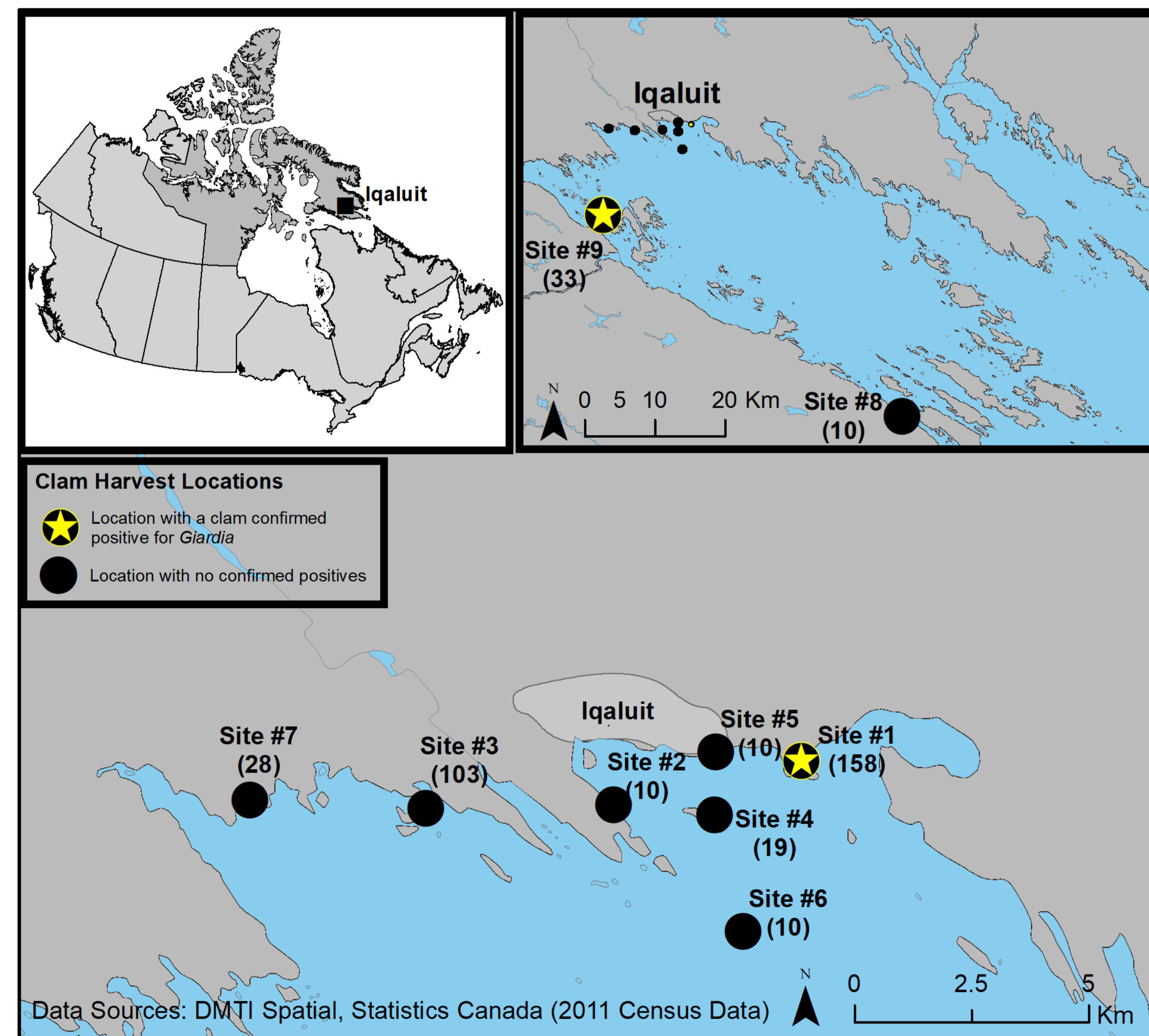


Figure 1: Clam harvesting sites around Iqaluit. Numbers in parentheses indicate the number of clams collected by the research team which were harvested at that location.

CONSIDERATIONS

- The presence of *Giardia* in clams harvested near Iqaluit indicates potential contamination of coastal waters with fecal material from humans or animals.
- The *Giardia* found in clams was identified as Assemblage B, which is zoonotic and may cause illness in people and animals who consume infectious *Giardia* cysts.⁸
- The PCR methods used in this study provide information on the presence of DNA consistent with *Giardia*, but not on the infectivity of the detected parasites.⁶⁻⁸
- The clams in this study were collected from harvesters over one major harvesting weekend; and temporal differences in parasite prevalence could not be evaluated.
- The limits of detection for both PCR assays are 10-100 (oo)cysts;⁹ and clams containing few oocysts may have been missed.
- Results from this study are intended to inform public health messaging in Iqaluit, Nunavut, and other Indigenous communities in Northern Canada.
- This project contributes to a larger, ArcticNet-funded study which is working closely with Northern organizations to create a participatory, community-based surveillance system to understand, respond to, and reduce the burden of foodborne, waterborne, and zoonotic enteric pathogens in Northern locales.

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