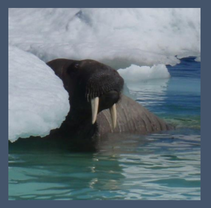

Linking laboratory data with Inuit Knowledge to better understand the ecology of the Arctic zoonotic parasite *Trichinella nativa*

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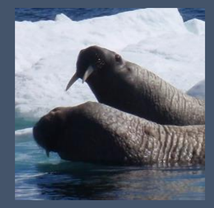

Introduction

- *Trichinella nativa* is a **parasitic nematode** transmitted through the ingestion of infective encysted larvae
- Due to capacity of larvae to tolerate freezing conditions, *T. nativa* is found in Arctic animals including **polar bears** (*Ursus maritimus*), **Atlantic walruses** (*Odobenus rosmarus rosmarus*) and **ringed seals** (*Pusa hispida*)
- **Outbreaks of trichinellosis** occurred since the mid-1980s in Inuit communities of Nunavik, QC, Canada
- As a result, the **Nunavik Trichinellosis Prevention Program** was created in 1997 to prevent other trichinellosis outbreaks (Larrat *et al.* 2012)
- Recent Nunavik outbreaks were thought to be linked to walrus **foraging behavior** (Jenkins et al. 2013)
- **Inuit Knowledge** provided valuable information about Arctic wildlife feeding ecology and health (Martinez-Levasseur *et al.* 2017)

Objectives

1) Define the **prevalence** of *T. nativa* (proportion of infected individuals) in the three species
2) Identify if the variables **sex**, **age** and **stock** explaining the variability in the prevalence of *T. nativa* in walruses
3) Investigate walrus **feeding behavior** in relation to *T. nativa* prevalence (laboratory data & Inuit Knowledge)

Study Area

Figure 1. Study area including communities that provided samples

REFERENCES

Jenkins *et al.* (2013) *Adv. Parasitol.* **83**:33-204
Leclair *et al.* (2004) *Parasitol Res* **93**:507-509
Lesage *et al.* (2010) *Mar Ecol Prog Ser* **419**:249-265
Larrat *et al.* (2012) *Int J Circumpolar Health* **71**:1-9
Martinez-Levasseur *et al.* (2017) *Polar Biol* **40**:1501-1513

Objective 1 - Define the prevalence of *T. nativa* in Atlantic walruses, polar bears and ringed seals from Nunavik

METHODS

- **755** Atlantic walrus samples were collected between 1994 and 2013. Atlantic walruses are divided in two stocks: the **Southern-Eastern Hudson Bay stock** and the **Hudson Bay-Davis Strait stock**
- **97** samples were obtained from polar bears harvested between 1989 and 2009
- **48** ringed seals samples were collected in 1998 and in 2002
- Muscle samples (10-50g) were tested using the artificial digestion and double separatory funnel technique (Leclair *et al.*, 2004)

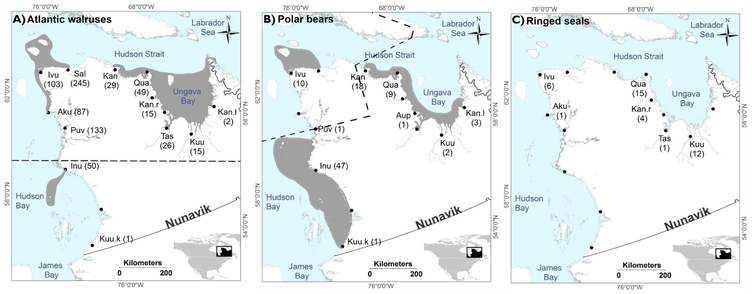

Figure 2. Approximate sampling areas of A) Atlantic walruses, B) polar bears and C) ringed seals. Number of samples tested per community in parentheses

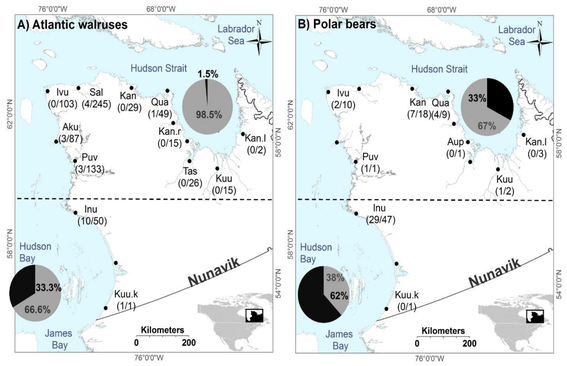

Figure 3. Prevalence of *Trichinella nativa* per geographical area (Hudson Strait and SE Hudson Bay) of A) Atlantic walruses and B) polar bears in Nunavik, QC, Canada

CONCLUSIONS

- While none of the ringed seals were infected with *T. nativa*, approximately half of polar bears and nearly 3 % of Atlantic walruses were infected, which agree with previous findings for Nunavik and other observations across the Arctic
- Differences in prevalence between regions in walruses (χ^2 = 101.91, *df* = 1, p < 0.001) and polar bears (χ^2 = 6.89, *df* = 1, p = 0.009)

Objective 2 - Identify if the variables sex, age class and stock explaining the variability in the prevalence of *T. nativa* in Atlantic walruses

METHODS

Statistical analyses (in R): Top down strategy for generalized linear models
- Walrus prevalence ~ Stock + Age + Sex + (1|Year)

RESULTS

Table 1. Deletion tests (likelihood ratio tests; left half of the table) used to obtain the estimated values of the minimal adequate model (right half) explaining part of the variation in *T. nativa* prevalence in Atlantic walruses (*AUC* = 0.694) harvested around Nunavik

Exp. Var	df	χ^2	p	Exp. Var	Estimate	Odd (CI 95%)	χ^2	p
Year	1	0.010	0.919	Intercept	-0.647	0.524 (0.172, 1.422)	1.589	0.208
Sex	1	0.861	0.354	Huds. Strait	-3.127	0.044 (0.012, 0.160)	18.763	**< 0.001**
Age	1	3.545	0.060					
Stock	1	18.763	**< 0.001**					

CONCLUSIONS

- No difference in *T. nativa* prevalence among sexes nor age classes in Atlantic walruses
- Important spatial heterogeneity of *T. nativa* prevalence between the two stocks

Objective 3 - Investigate walrus feeding behavior in relation to *T. nativa* prevalence (laboratory data & Inuit Knowledge)

METHODS

- Nitrogen stable isotope analyses (δ^{15}N) (Lesage *et al.*, 2010)
- 103 Atlantic walruses (1998 and 2001; n=21 for the SE Hudson Bay stock, n=83 for the Hudson BD Strait stock)
- 33 semi-directive interviews with Inuit walrus hunters (Martinez-Levasseur *et al.* 2017)

RESULTS

Figure 4. Evidence of Atlantic walruses eating seals around Nunavik (circles), as reported by Inuit hunters

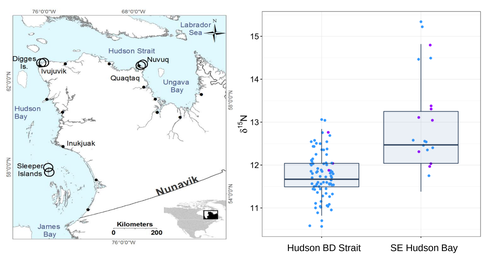

Figure 5. δ^{15}N for the two stocks of Atlantic walruses (infected in purple; non-infected in blue)

CONCLUSIONS

- No difference in walrus feeding behaviour between the two stocks (IK)
- Different isotopic signatures between the two stocks (Mann-Whitney U = 1401.5, p = < 0.001)
- Infected walruses did not present a different isotopic signature than non-infected ones within the same geographic area, suggesting that infected and non-infected individuals are eating at the same trophic level
- Future Investigations of *T. nativa* in more ringed seals and other seal species are warranted

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