

Jilda Alicia Caccavo¹, Thierry Raclot², Timothée Poupart³, Yan Ropert-Coudert³ and Frédéric Angelier³

¹ Università di Padova, ² Institut Pluridisciplinaire Hubert Curien UMR7178, ³ Centre d'Études Biologiques de Chizé UMR7372

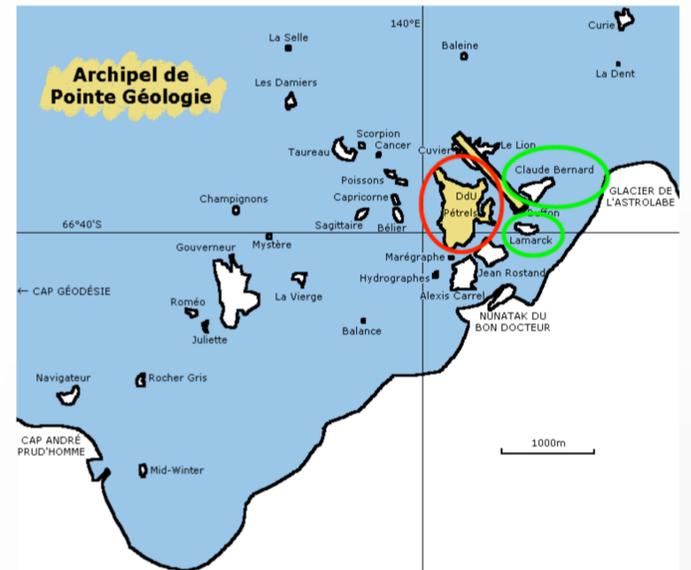
Introduction

There is a growing need for the identification of physiological variables that can be used to assess the environmental impact of human activities on Antarctic wildlife. Telomeres have been suggested as a promising molecular tool to investigate the fitness of wild vertebrates. Telomeres are well-conserved repeated sequences of non-coding DNA located at the terminal ends of chromosomes. They shorten with advancing age and this telomere attrition is accelerated by the occurrence of environmental stressors. Telomere length appears to be a reliable predictor of longevity and survival in captive and wild vertebrates.

In this study, we examined the relationship between telomere length and various degrees of long-term human exposure in Adélie penguin chicks (*Pygoscelis adeliae*) from Terre Adélie, East Antarctica.

Study Design

- Disturbed sites ($n = 2$) with sustained and continuous human activity (Petrels Island)
- Undisturbed sites ($n = 2$) with little or no human presence (Lamarck and Bernard Islands)



Map of Study Area, adapted from goo.gl/Vyh4my. Disturbed site, Petrels Island (location of Dumont d'Urville station) circled in red; Undisturbed sites Bernard and Lamarck Islands circled in green.

Methods

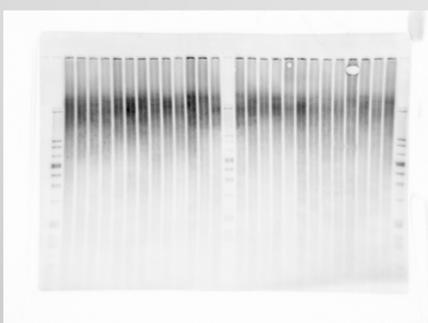
Southern Blots were used to quantify telomere length from genomic DNA extracted from blood samples collected from chicks at all four sites.

Quantitative PCR (qtPCR) was also used to quantify telomere length, but inconsistency in output precluded the integration of qtPCR data into the current study.

Sex, mass and flipper length were taken into account when comparing sites.



Adélie penguins near Dumont d'Urville station, goo.gl/mGK73B.



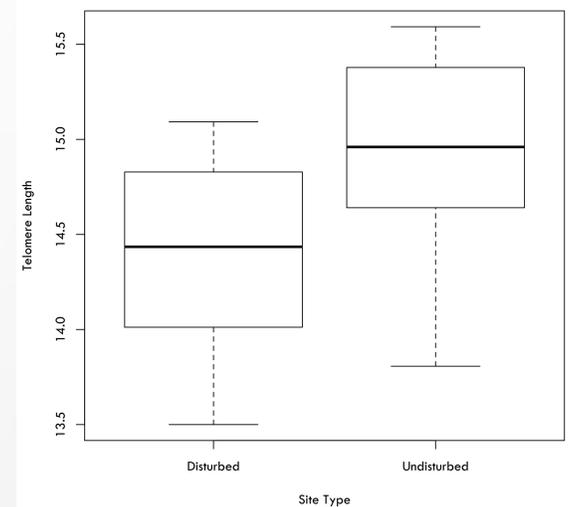
Southern Blot of Adélie chick telomeres.

Results

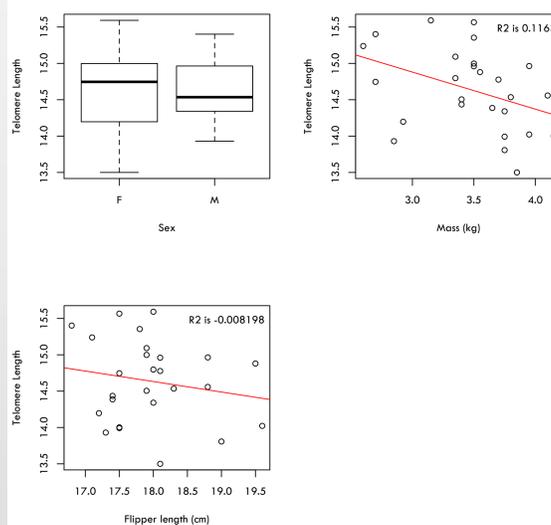
Chicks from disturbed sites had significantly shorter telomere restriction fragments (TRF) than chicks from undisturbed sites ($p = 0.01624$).

Chick mass was also found to be associated somewhat with TRF length ($p = 0.04926$), however, when the model comparing site type (disturbed or undisturbed) to TRF was controlled for Mass, Site Type still had a significant effect on TRF ($p = 0.02478$).

Sex and flipper length had no impact on TRF length ($p = 0.9153$ and $p = 0.3809$ respectively).



Plot of telomere length of chicks from **disturbed** and **undisturbed** sites.



Plots describing telomere length as a factor of **Sex**, **Mass (kg)** and **Flipper length (cm)**.

Conclusions

Telomere length is significantly shorter in Adélie chicks from disturbed sites near Dumont d'Urville station on Petrels Island than in chicks from undisturbed sites on nearby Lamarck and Bernard Islands.

These results support the use of telomere length as an eco-indicator for environmental stress in Antarctica.

Future investigations will aim to assess the predictive value of telomere length differences in Adélie penguins, as well as expand their use to other Antarctic avian species impacted by anthropogenic encroachment.

Contact

Jilda Alicia Caccavo

Email: ergo@jildacaccavo.com

Website: jildacaccavo.com

Jilda Alicia Caccavo acknowledges support from the Erasmus+ program for funding her participation in this project at the CEBC, as well as support from AntEco for providing travel funds for her to attend the POLAR2018 conference.



We also acknowledge support from the following organizations.

