# Tourism and multiple stressors in Antarctica

**Dr Tom Hart**
**Department of Biology**

UNIVERSITY OF
OXFORD

# WHAT IS THE OBSERVED AND POTENTIAL IMPACT OF TOURISM ON ANTARCTIC PENGUINS?

An Evidence-Based Executive Summary

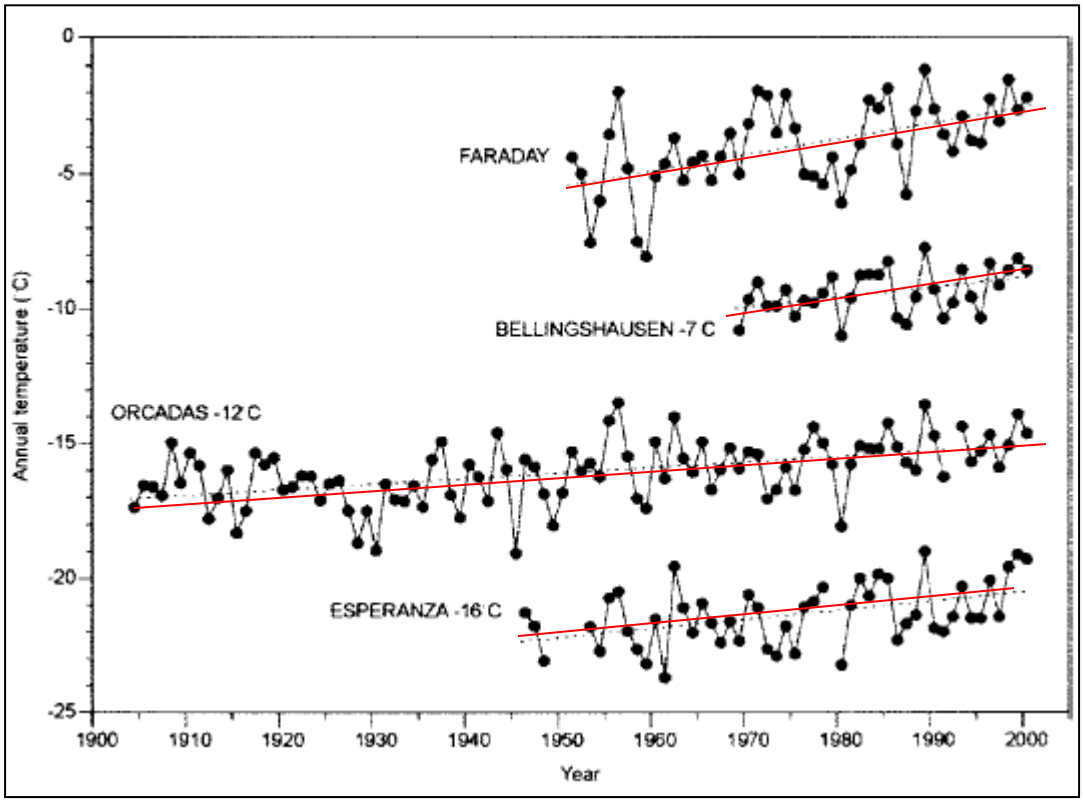
UNIVERSITY OF OXFORD

Stony Brook University

Christo Baars Australian Antarctic Division

Image: The Antarctic Butcher', a painting by Standish Backus (1956); from the U.S. Naval Art Collection via The Conversation.

Warming trend over the past century (+2.6°C)




Vaughan et al. 2003

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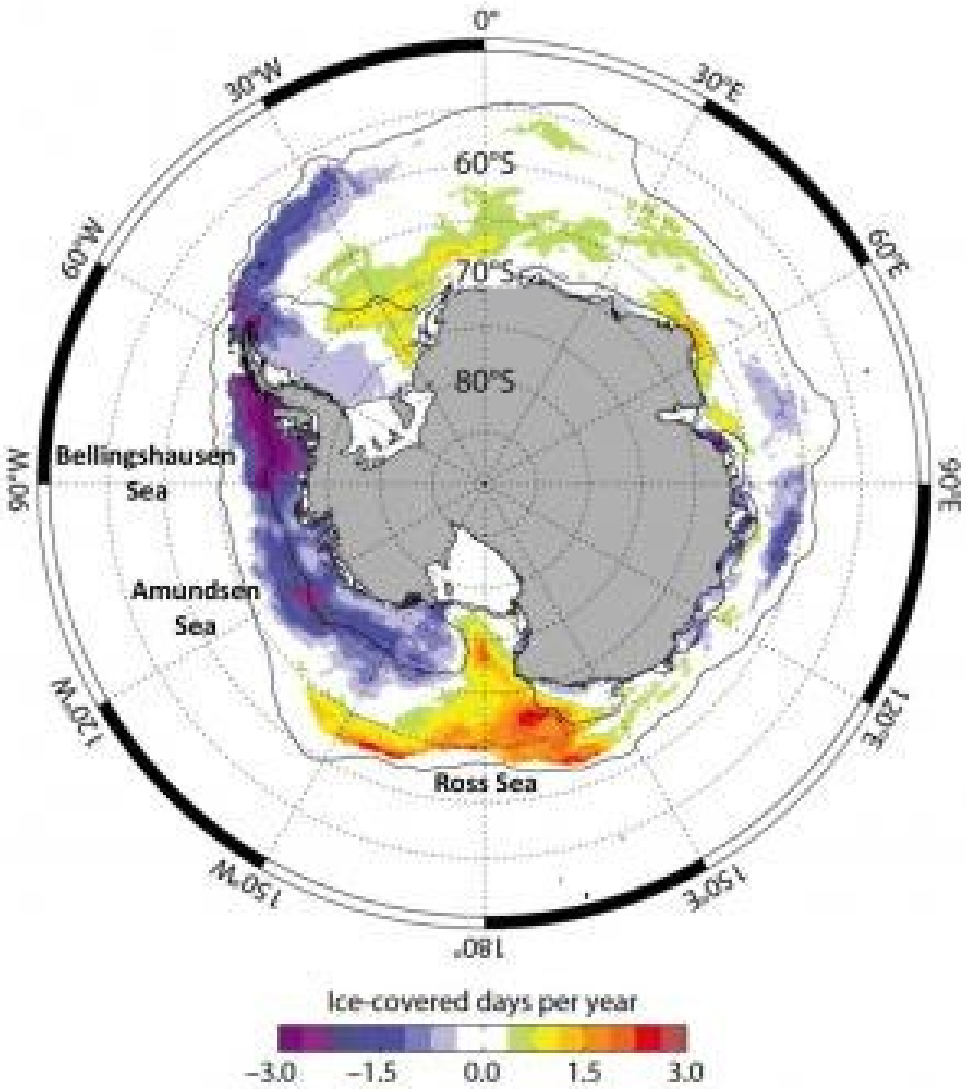
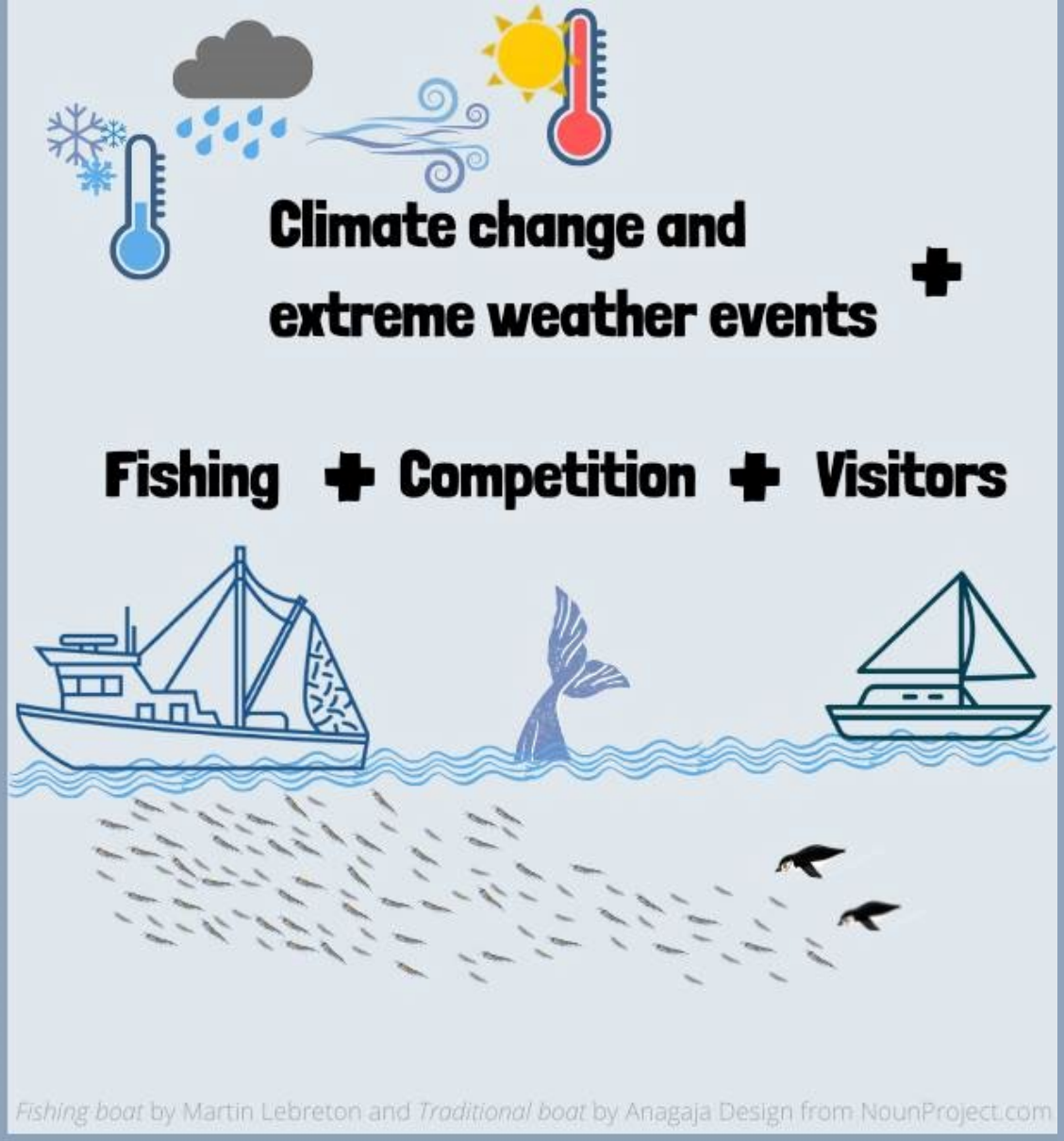
Sea ice trends over the last 40 years




Maksym et al. 2012

# Understanding the problem

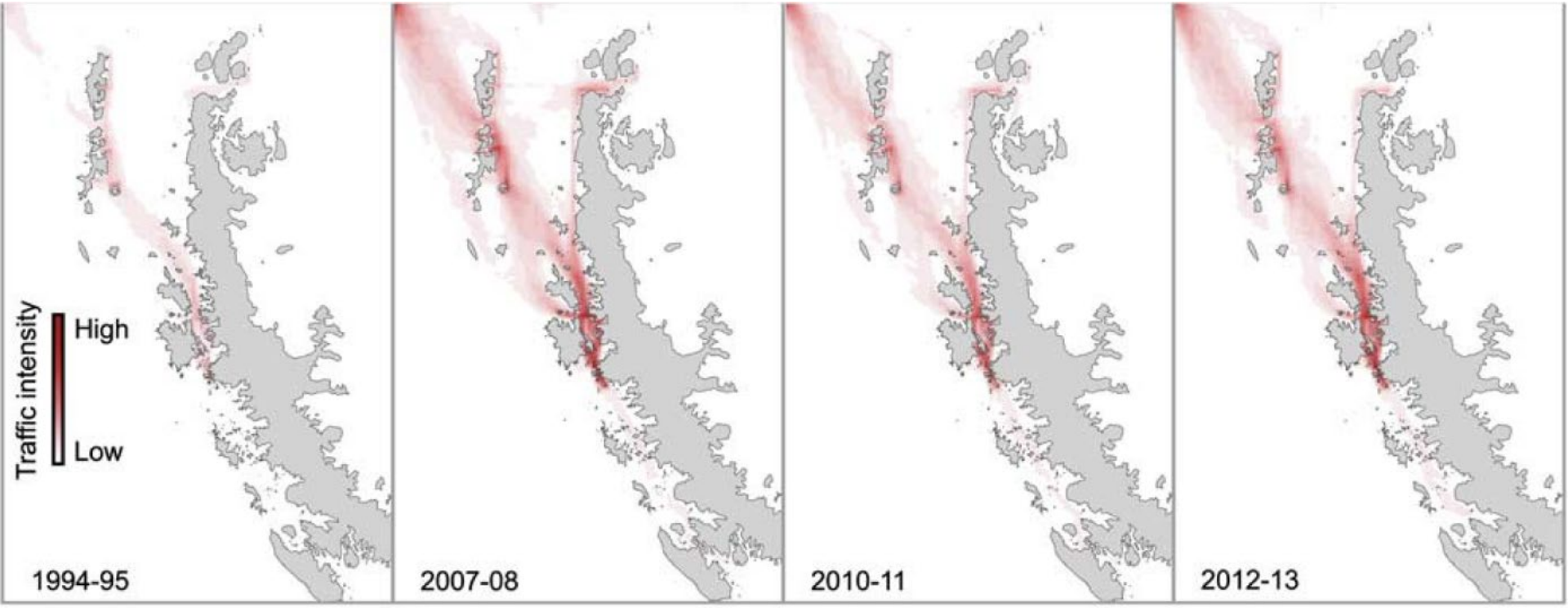
Population changes




*Fishing boat* by Martin Lebreton and *Traditional boat* by Anagaja Design from NounProject.com

↪ Untangling confounding threats

PENGUIN WATCH



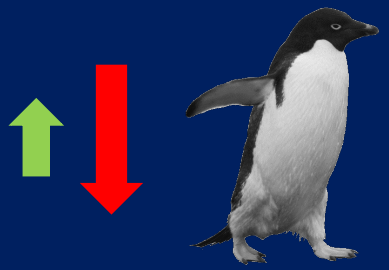

Bender et al. 2016

Image: F. M. Jones

Gentoo penguin
- Northerly breeding
- Avoids sea-ice

King Penguin
- Northerly breeding
- Avoids sea-ice
- Deep sea forager, eats squid and fish

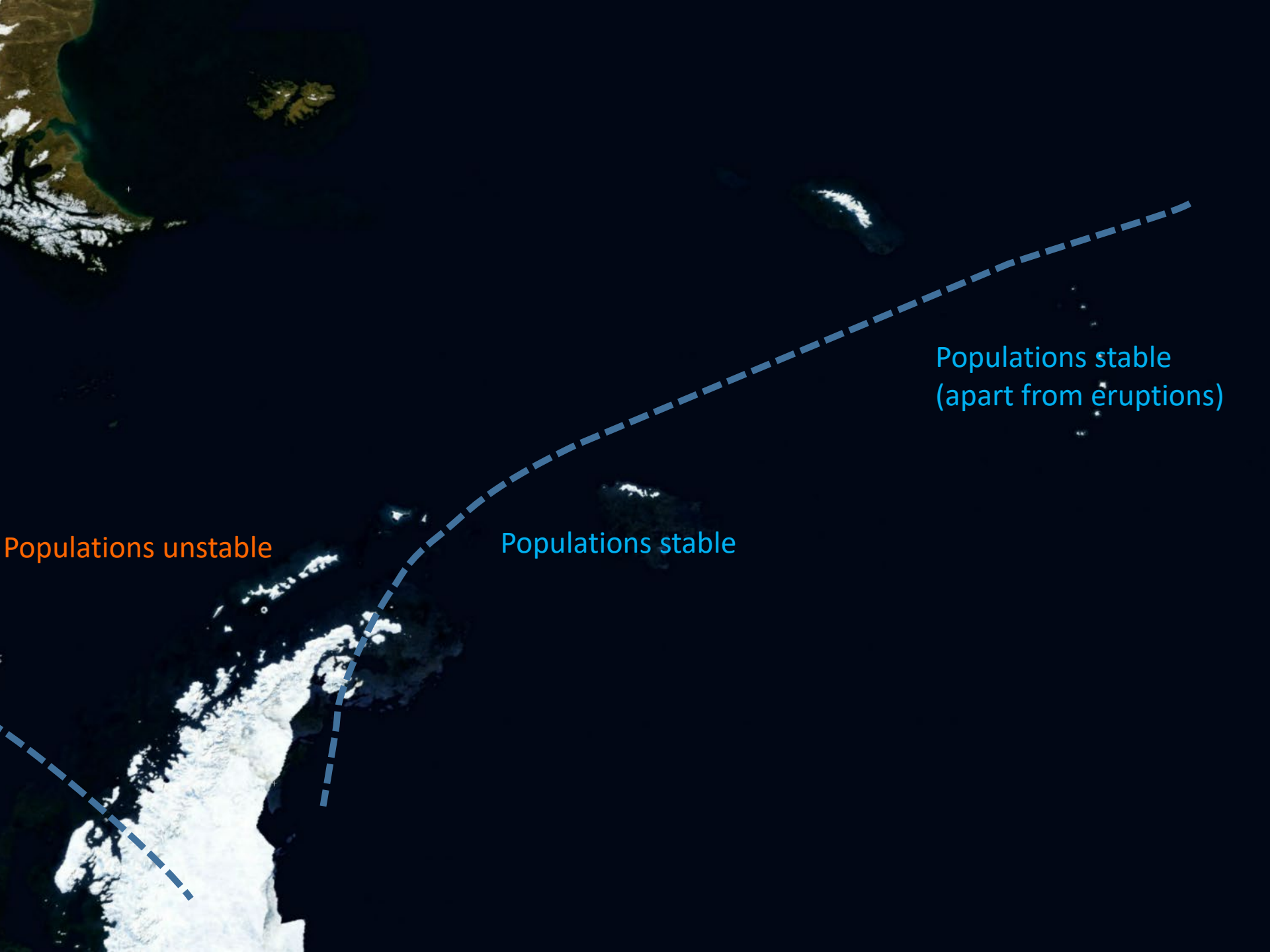
Chinstrap penguin
- Intermediate breeding distribution
- Avoids sea-ice



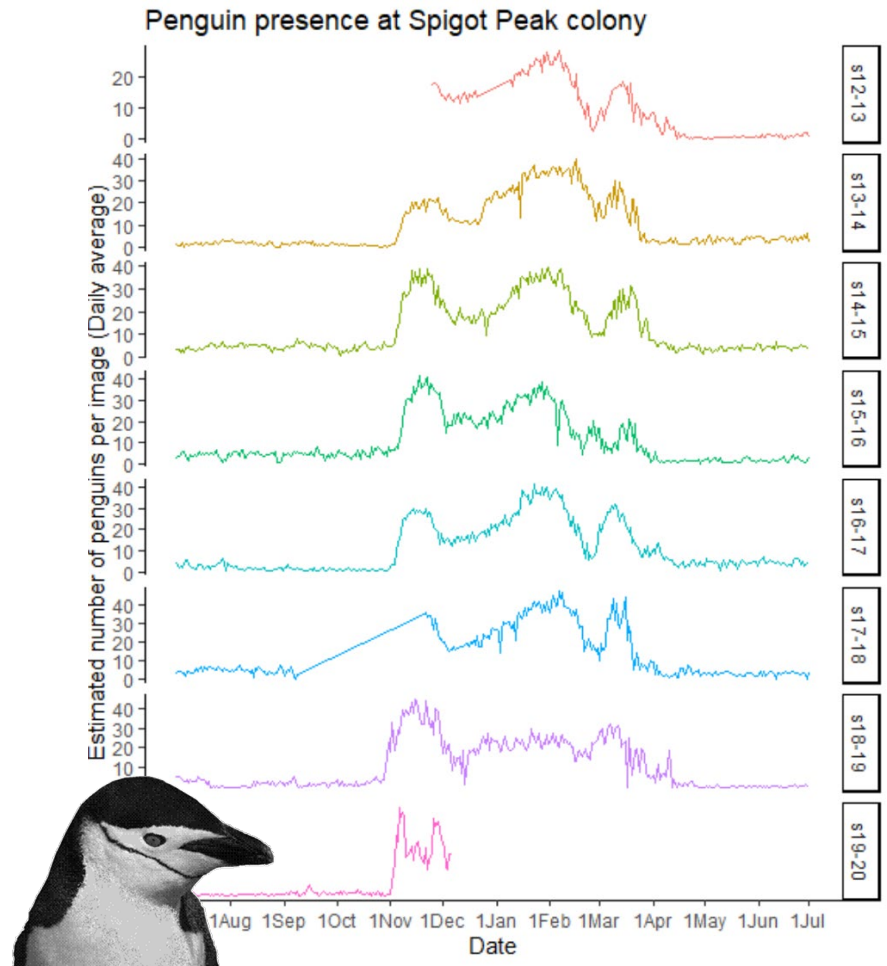
Adélie penguin
- Southerly breeding distribution
- Requires pack-ice for foraging

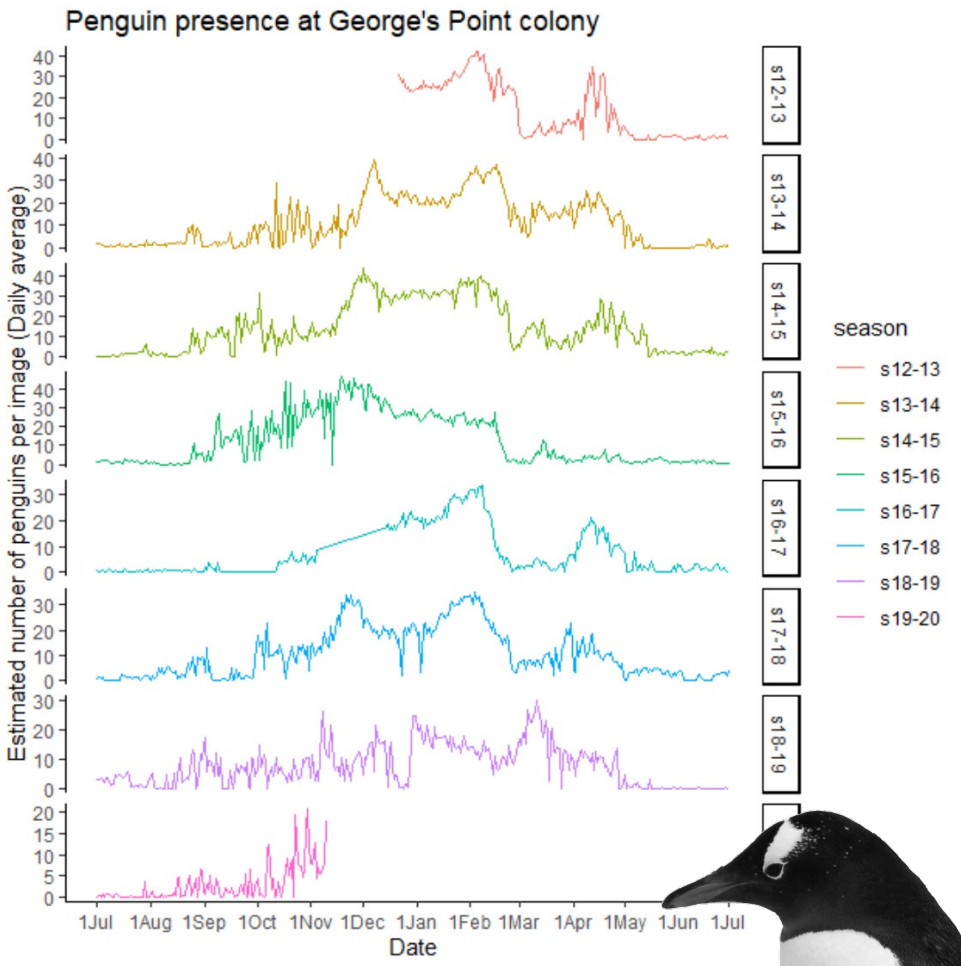
Emperor Penguin
- Southerly breeding
- Requires fast-ice.
- Declining where monitored
- But possible changing distribution.

Macaroni Penguin
- Sub-Antarctic
- Avoids sea-ice
- Krill –rich waters


Populations stable
(apart from eruptions)
Populations stable
Populations unstable

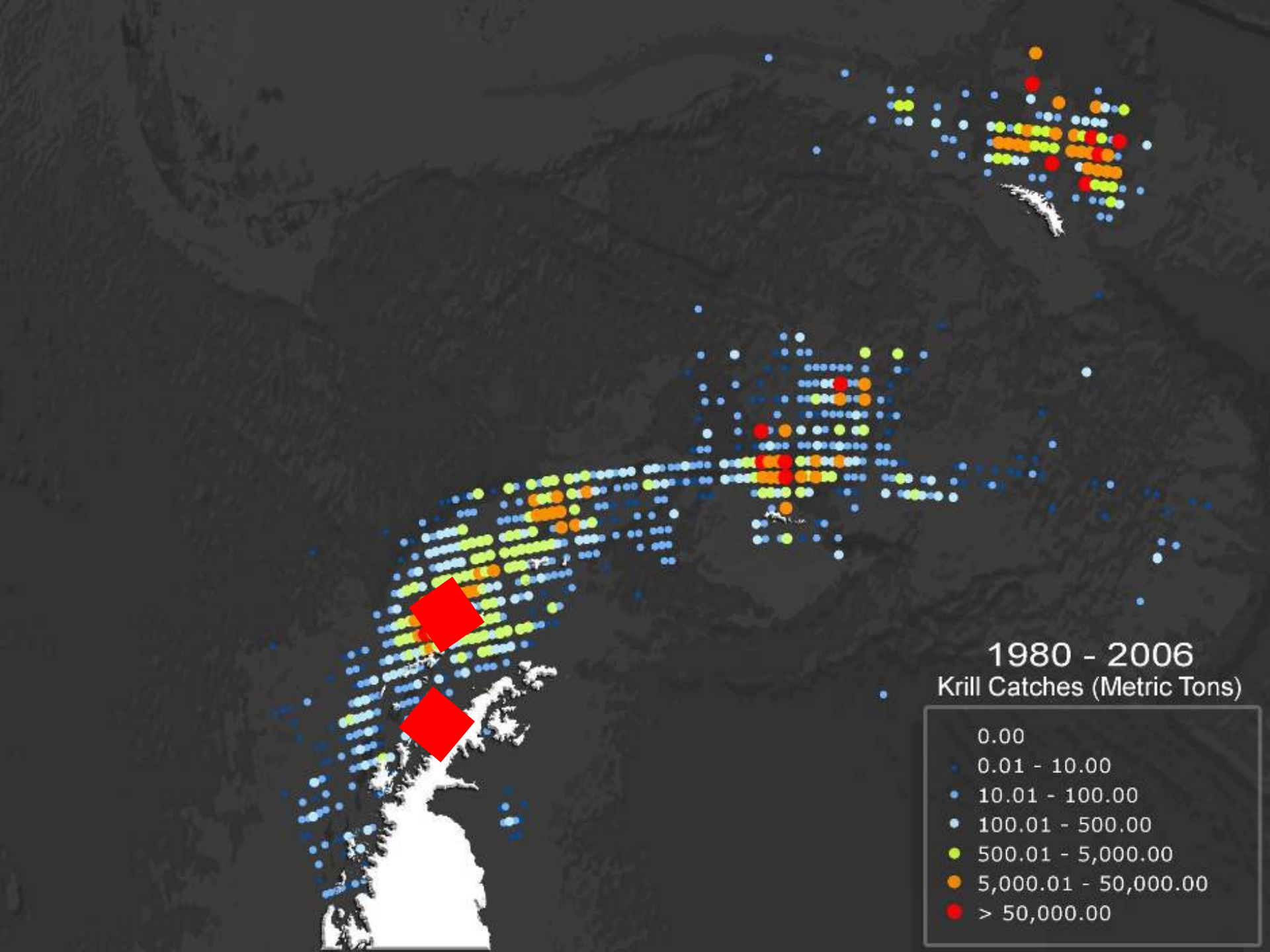
# Unpublished evidence that penguins are breeding earlier



# Summary of current evidence

- There are multiple anthropogenic threats
- No significant adverse effects of tourism on local penguin populations *at current levels and with current activities*
- "Tourism" does not include national programme visits
- We don't know much about disturbance of other species, like seals and whales, or on penguins while in the water.
- Studies examining the impact of site visitations on the Southern Ocean penguin populations have drawn inconsistent conclusions. Details likely matter.
- Other stressors such as climate change and the fishing industry should receive greater attention.
- Future change may be driven by sea ice regardless of other stressors


1980 - 2006
Krill Catches (Metric Tons)
0.00
0.01 - 10.00
10.01 - 100.00
100.01 - 500.00
500.01 - 5,000.00
5,000.01 - 50,000.00
> 50,000.00

Thank you!

# Thanks to:

PENGUIN WATCH
ENVIRONMENTAL RESEARCH
DOCTORAL TRAINING PARTNERSHIP
ZOONIVERSE
REAL SCIENCE ONLINE
UNIVERSITY OF OXFORD
WWF
British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL
DARWIN INITIATIVE
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LSU
LOUISIANA STATE UNIVERSITY
ZSL
LET'S WORK FOR WILDLIFE
FALKLANDS CONSERVATION
NOAA
Australian Government
Department of Sustainability, Environment, Water, Population and Communities
Australian Antarctic Division
HH
HELLY HANSEN
Golden Fleece Expeditions
WOODS HOLE OCEANOGRAPHIC INSTITUTION
1930
OCEANWIDE EXPEDITIONS
Lindblad Expeditions
NATIONAL GEOGRAPHIC
POSEIDON EXPEDITIONS