BioSpace25 - Biodiversity insight from Space
10 - 14 February 2025 | ESA-ESRIN | Frascati - Italy

Albatrosses From Space: A citizen science approach to monitor remote colonies using satellite imagery

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British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

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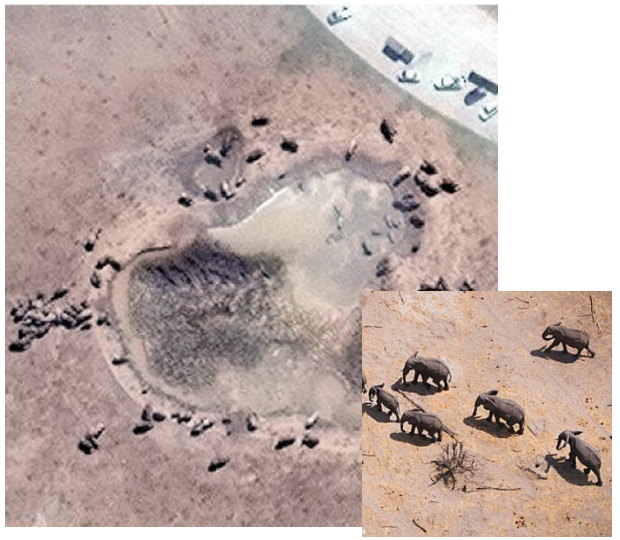
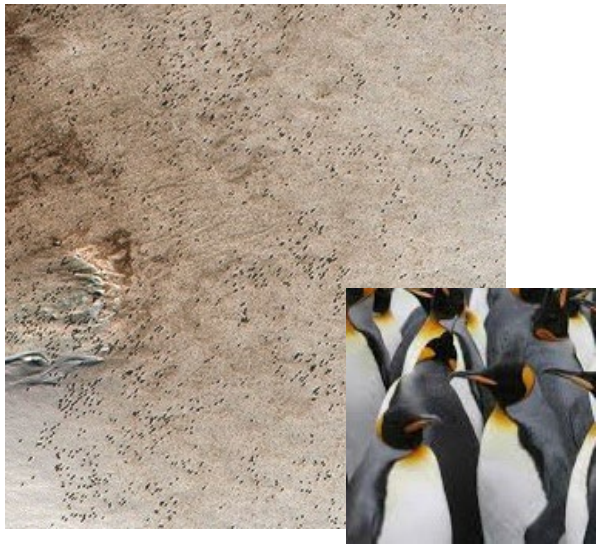
Counting wildlife from space

African elephant
31 cm resolution



Polar bear
50 cm resolution

Emperor penguin
31 cm resolution

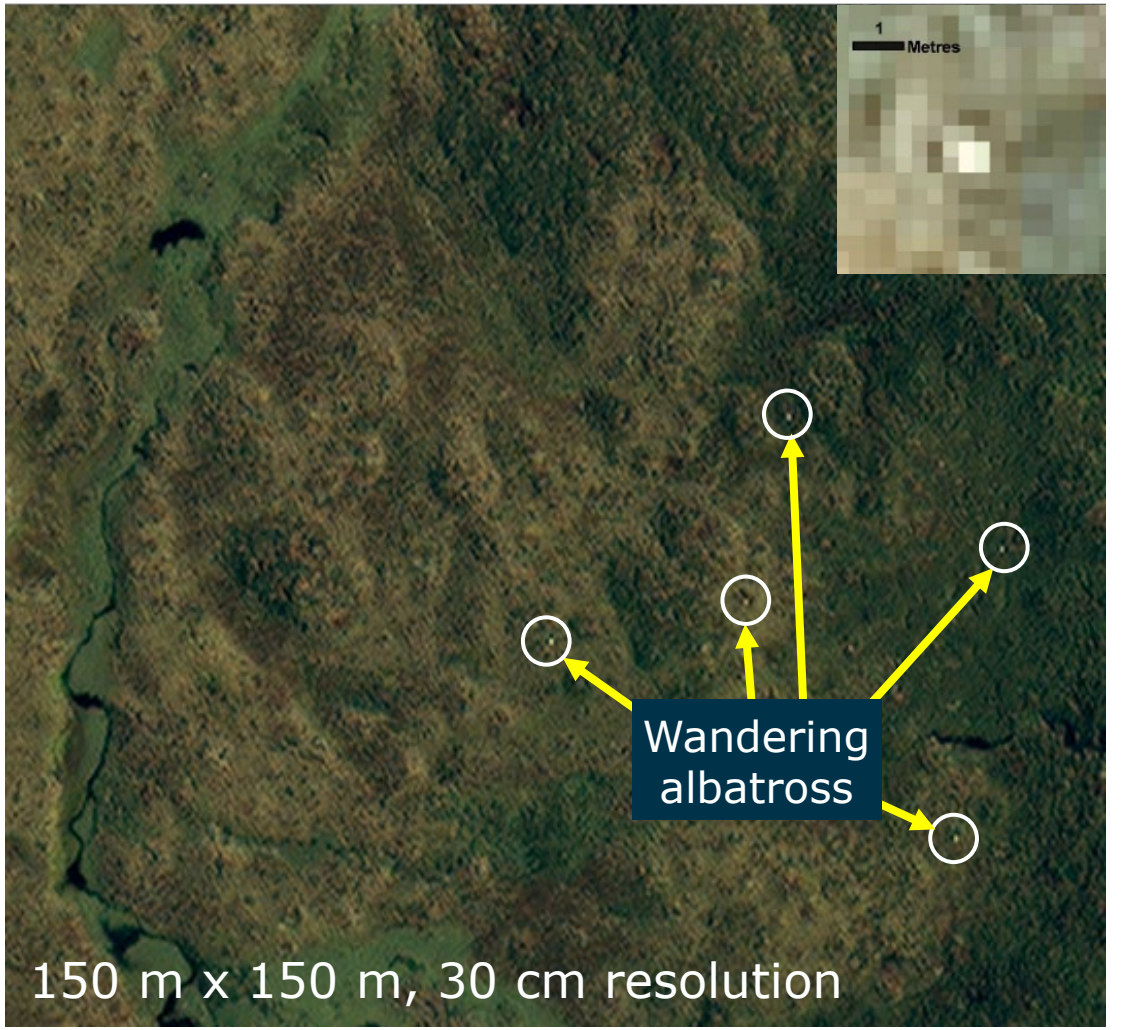


Walrus
31 cm resolution

Duporge *et al.* 2020; Cubaynes *et al.* 2019; Stapleton *et al*. 2014; Green *et al.* 2023

Wandering albatross – Ideal candidates for satellite monitoring

1. Largest seabird
2. Open breeding habitats
3. High contrast against surrounding tussac due to white plumage

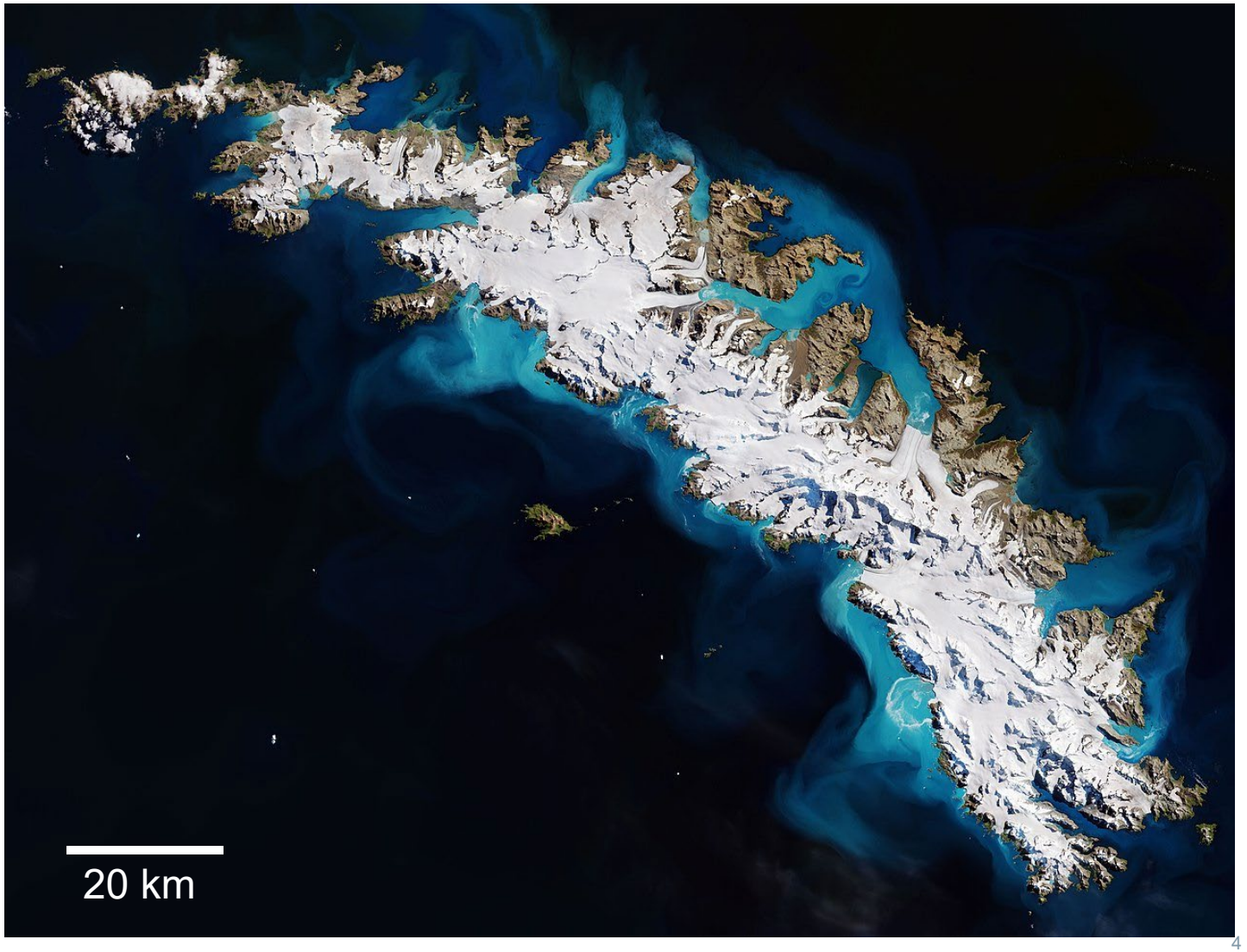


Satellite image © Maxar Technologies

The challenge of monitoring in South Georgia

- Island-wide ground surveys only occur **once every 10 years**

- **Annual ground counts limited** to 3 of the 24 breeding sites



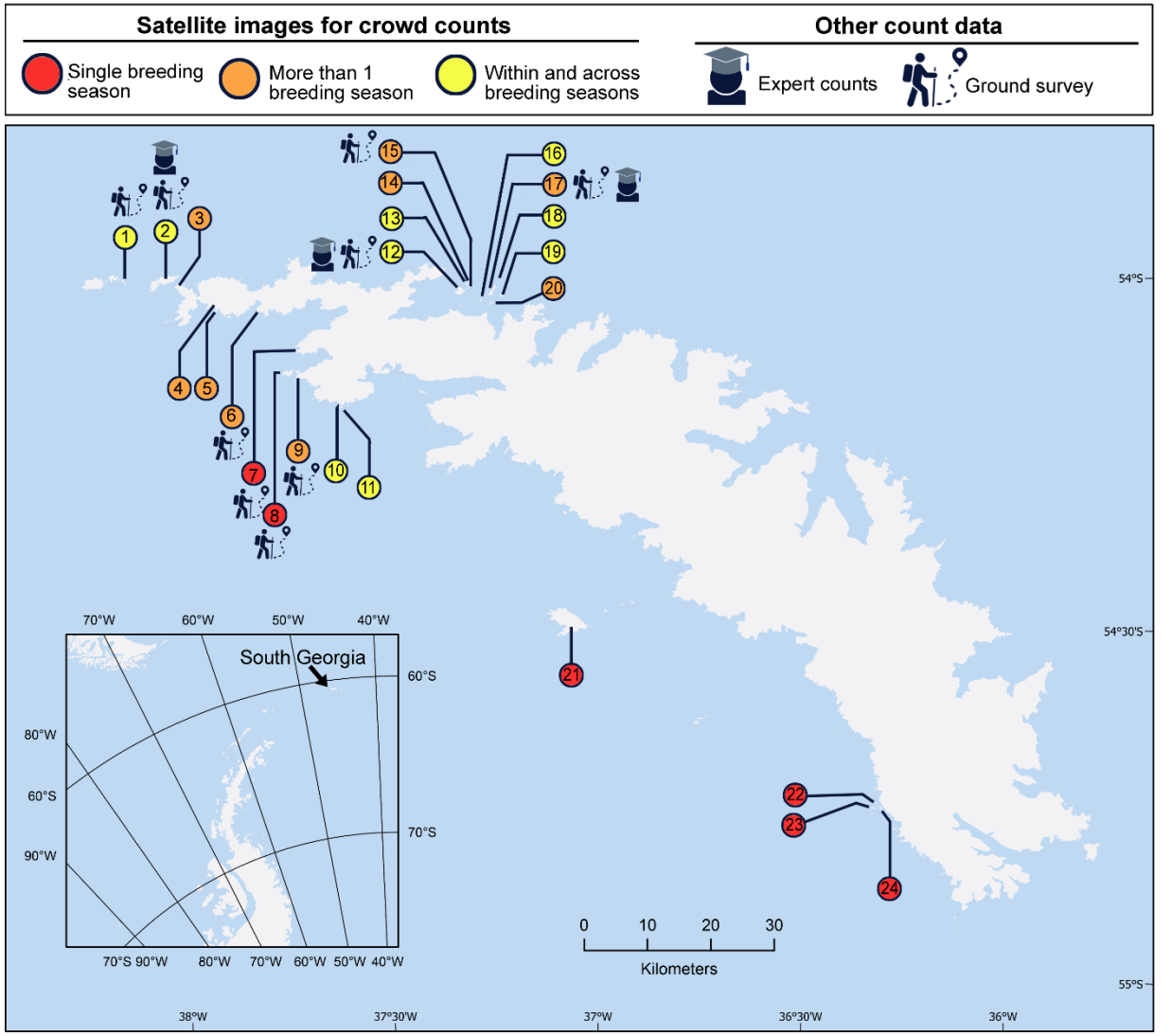
Enlisting the help of citizen science

Can **citizen science** reliability estimate wandering albatross populations using VHR satellite imagery?

ALBATROSSES
FROM SPACE

Albatrosses From Space campaign

- GeoHive platform
- 47 satellite images from 24 breeding sites (2015- 2022, WorldView-3)
- Validated crowd counts by comparing them to:
  1. Ground counts from corresponding years
  2. Satellite counts by 7 experts in wildlife remote sensing



Breeding site

1 Proud Island
2 Bird Island
3 Cape Alexandra
4 Coal Harbour
5 Frida Hole
6 Weddell Point
7 Kade Point
8 Saddle Island
9 Laws Point
10 Granat Point
11 Tidespring Point
12 Albatross Island
13 Crescent Island
14 Mollyhawk Island
15 Invisible Island
16 Petrel Island
17 Prion Island
18 Skua Island
19 Outer Lee Island
20 Inner Lee Island
21 Annenkov Island
22 Kupriyanov Islet
23 Diomedea Island
24 Poncet Island

GeoHIVE

https://geohive.maxar.com/yellowjacket/pages/campaign

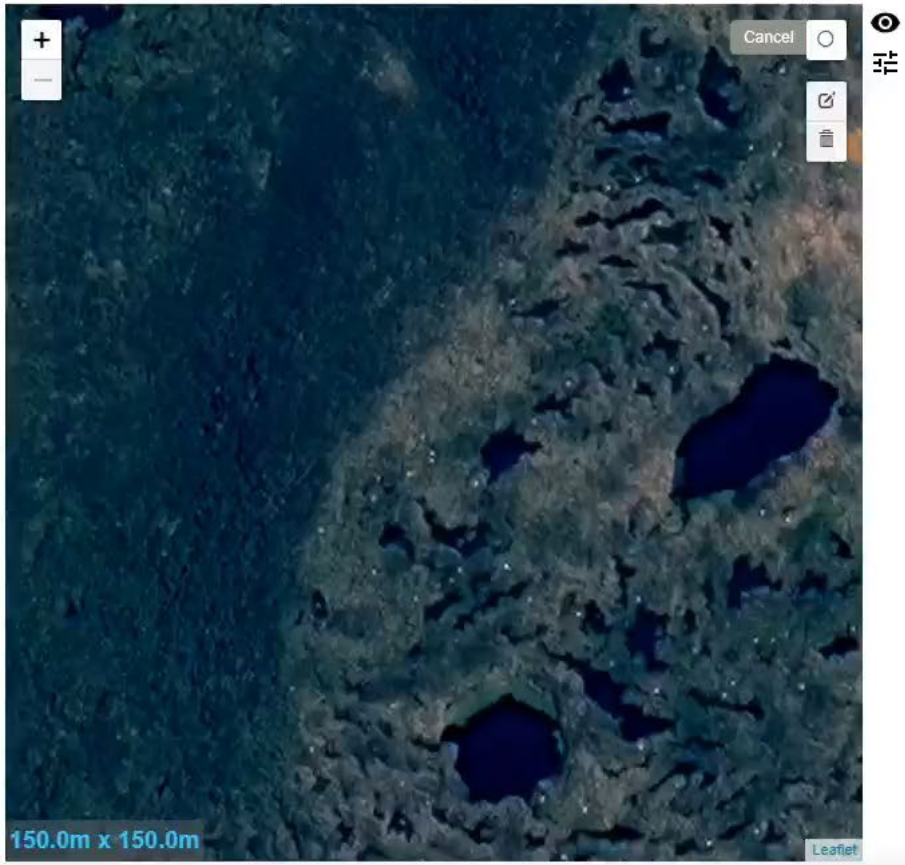
BAS, NERC & UKRI | Sci-Hub: common... | BAS Albatross Proje... | S2 E1: July 16, 1996... | Home - OneDrive | ALCS | Homepage - British... | Log In ‹ British Anta... | All Bookmarks

GeoHIVE

CAMPAIGNS LEADERBOARD DASHBOARD ADMIN Staff U

Help & Instructions

Albatross Present 76 No Albatross Present 0 Poor Image 0 Total images reviewed 32



Brightness

-1 0 1

ALBATROSS PRESENT Q

NO ALBATROSS PRESENT W

POOR IMAGE E

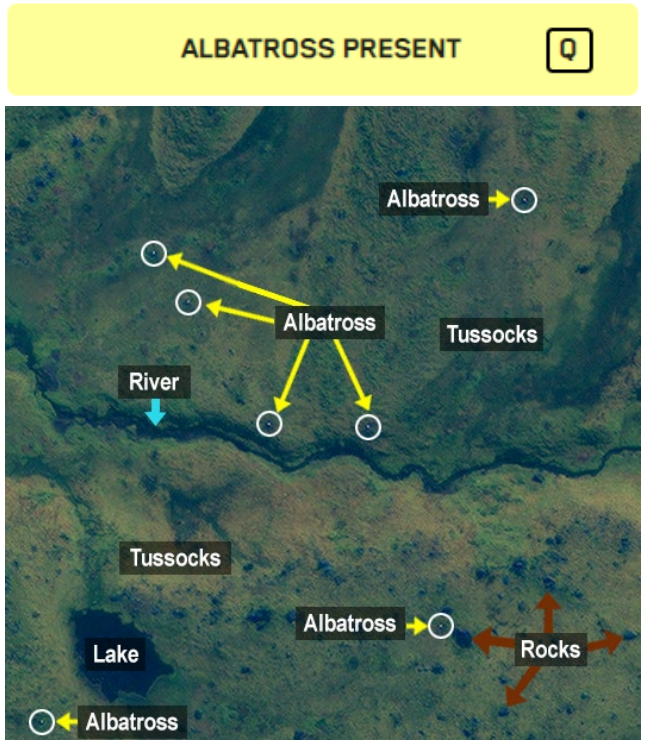
Type here to search

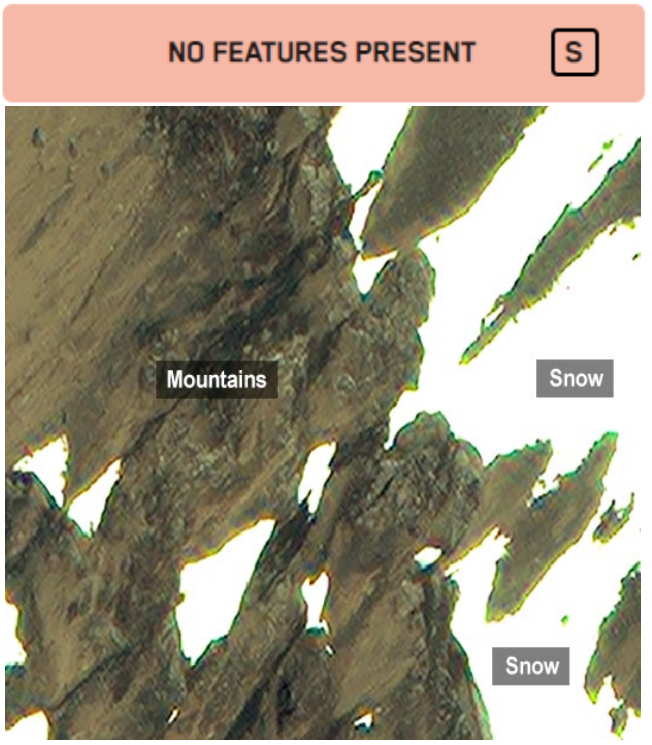
8°C Mostly cloudy

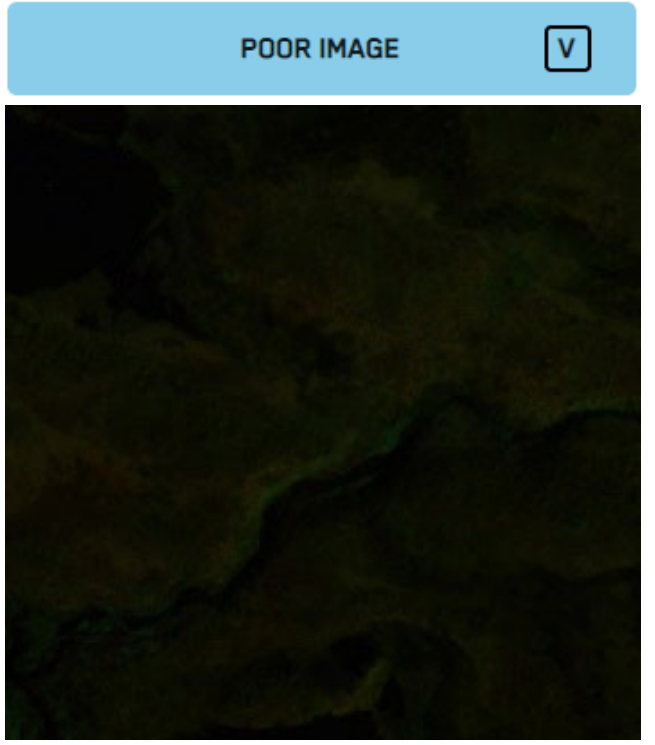
08:28
06/11/2023

Volunteer contributions

- **639 citizen scientists** annotated **11,839 tiles (154 km²)** in **107 days**
- Each tile annotated by **7 volunteers**
- **Tags within 2 m from different volunteers** considered to be the same bird







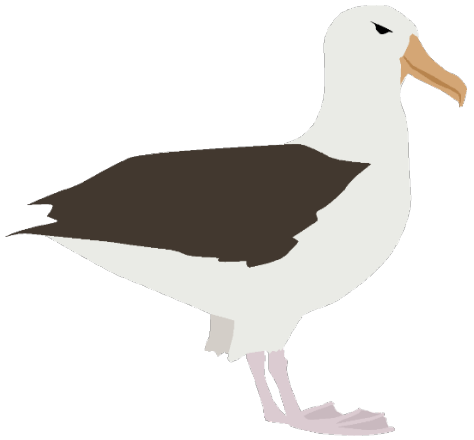
Accuracy of crowdsourced bird counts

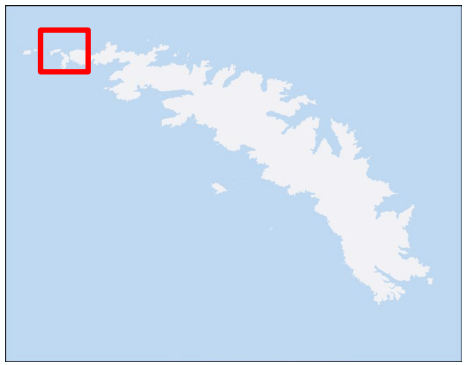
- Crowd counts closely aligned with expert satellite counts and on-the-ground surveys
- **Percent deviation:** Difference in bird counts between experts and crowd

Breeding site	Breeding season	Adjusted bird count from ground survey	Crowd satellite count	Expert satellite counts	Percent deviation (expert vs crowd)
Bird Island	2017	723	803	845	**0.1%**
Albatross Island	2017	152	143	140	**2.1%**
Prion Island	2017	39	43	40	**7.5%**
Prion Island	2021	37	38	36	**5.6%**

Attard *et al.* In Prep

Filling in the gaps

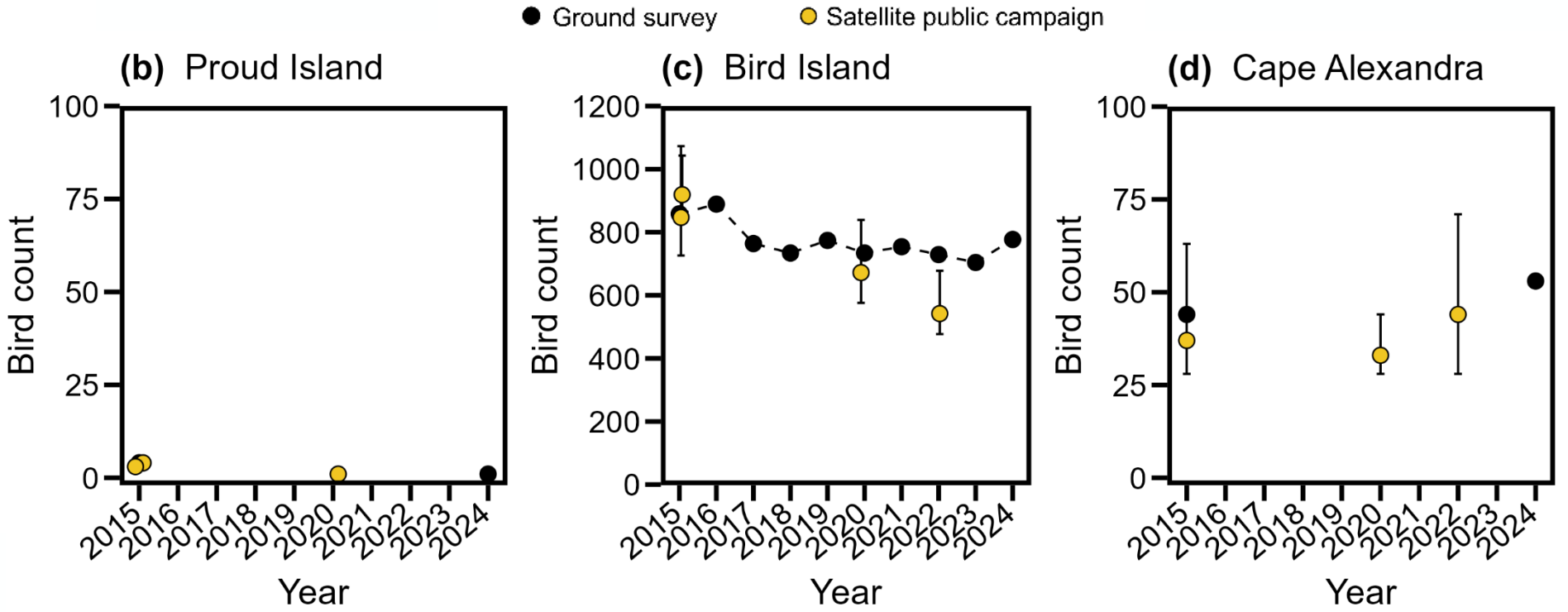




Agreement ≥ 2

Agreement ≥ 3

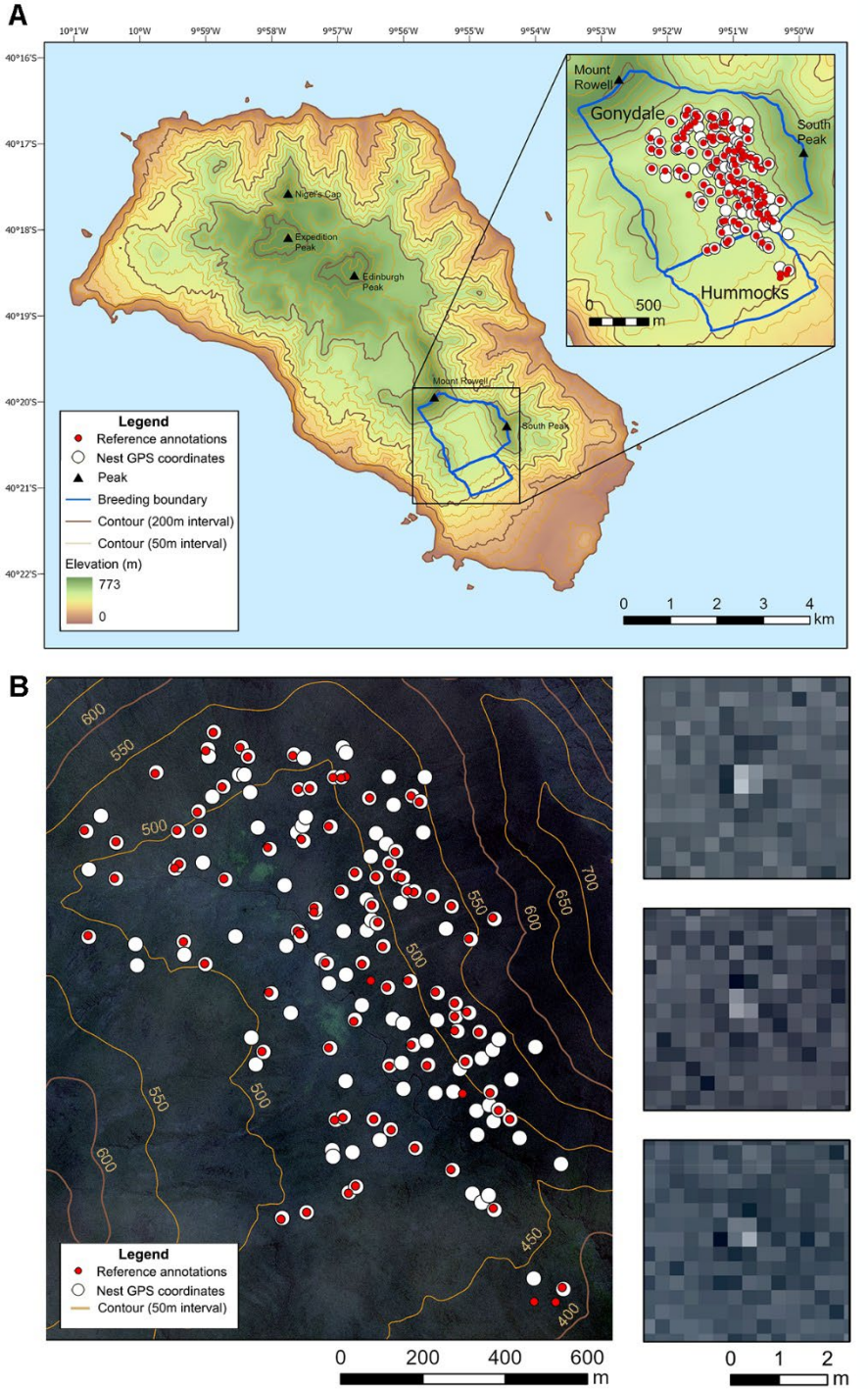
Agreement ≥ 4



Attard *et al.* In Prep

One size does not fit all!

- **Low detectability of Tristan albatross nests** (68%) in 30 cm resolution satellite imagery, possibly due to variations in vegetation and terrain shadows.



Attard *et al.* (In Press) **Feasibility of using very high-resolution satellite imagery to monitor Tristan albatrosses *Diomedea dabbenena* on Gough Island.** *Endangered Species Research*

Future work and recommendations

1. **Machine learning and automation for wandering albatross counts**

2. **Expanding satellite-based population counts to a global scale**

Future work and recommendations

1. **Machine learning and automation for wandering albatross counts**
2. **Expanding satellite-based population counts to a global scale**
3. **Evaluating detectability of other wildlife from space**

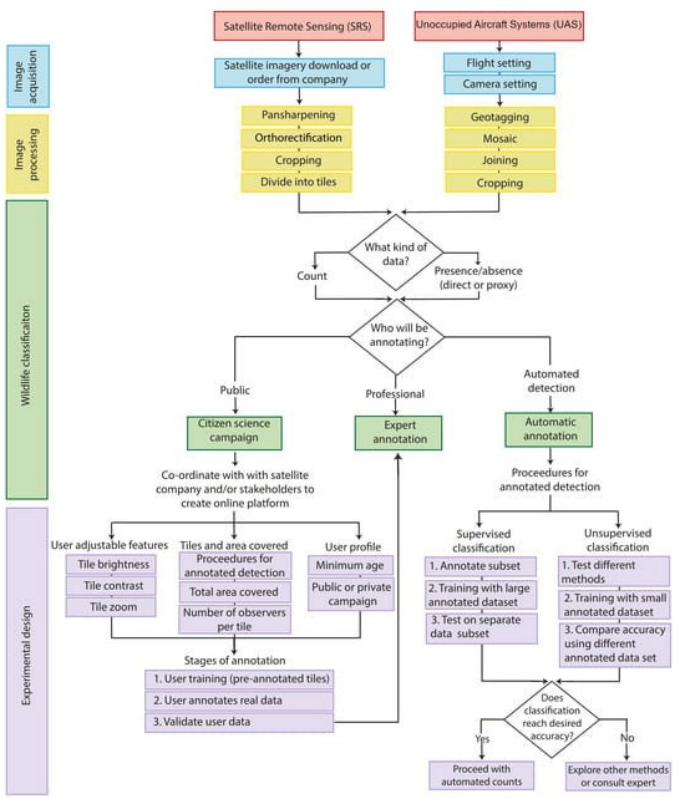
remote sensing

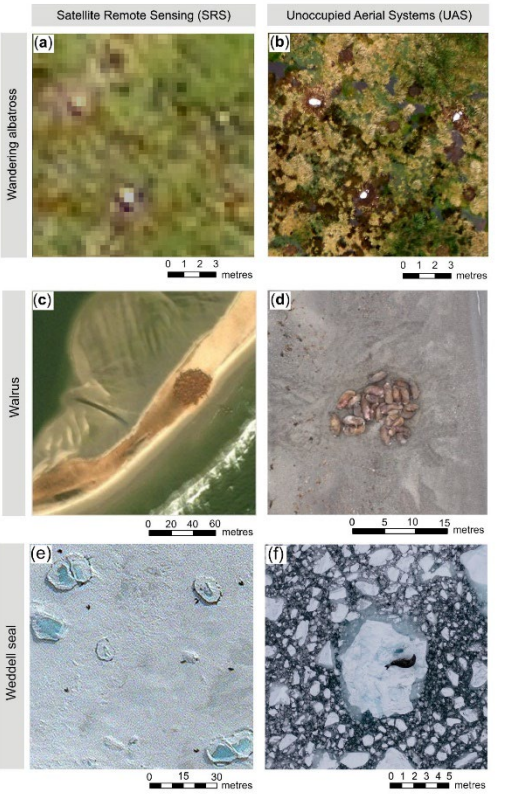
MDPI

Review

Review of Satellite Remote Sensing and Unoccupied Aircraft Systems for Counting Wildlife on Land

Marie R. G. Attard [1], Richard A. Phillips [1], Ellen Bowler [1], Penny J. Clarke [1,2], Hannah Cubaynes [1], David W. Johnston [3] and Peter T. Fretwell [1,*]





Acknowledgements

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