Report of Oceanites, Inc.
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Information Paper submitted by SCAR

Introduction

This Information Paper describes activities of Oceanites, Inc. since ATCM XXXIX, including: results from the latest, 23\textsuperscript{rd} consecutive field season of the Antarctic Site Inventory; recent scientific papers; update on Oceanites’ Mapping Application for Penguin Populations and Projected Dynamics; update on Oceanites’ climate challenge analyses and penguin conservation efforts; and the inaugural \textit{State Of Antarctic Penguins} report.

Background

Oceanites, Inc. is a nonprofit scientific and educational organization founded in 1987. Since 1994, its Antarctic Site Inventory (ASI) has been monitoring and analyzing penguin and seabird population changes across the Antarctic Peninsula. In 2016, the Mapping Application for Penguin Populations and Projected Dynamics (MAPPPD) launched, which is an open access decision support tool that will be used to assemble Antarctic penguin population data and to make it publicly available. Attention is now focused on distinguishing the direct and interactive effects of climate change, fishing, tourism, and other human activities on the Antarctic Peninsula ecosystem. Oceanites’ principal collaborative partners are: The Lynch Lab at Stony Brook University (US); Black Bawks Data Science Ltd. (UK); Penguin Lifelines at the University of Oxford (UK), and One Oceans Expeditions (Canada). Further details may be found on the Oceanites website (https://oceanites.org).

Discussion

1. Antarctic Site Inventory. The 2016-17 season was the ASI’s 23\textsuperscript{rd} consecutive field season collecting penguin and seabird population data in the Antarctic Peninsula. The 2016-17 season involved 81 census visits at 50 sites. Over 23 seasons, the ASI has completed 1,819 census visits at 226 sites. The 2016-17 ASI field season was assisted by support from: the United Kingdom Foreign & Commonwealth Office; One Ocean Expeditions (Canada); and public contributions.

   The ASI field season generally runs from mid-November to mid-February and comprises two components: utilizing expedition tour ships to reach a regular group of ‘core sites’ whose breeding penguins and seabirds are censused annually, and utilizing yachts/smaller vessels in a directed effort to reach ‘remote, data gap sites’ that are infrequently visited and under-surveyed.

   The ASI’s comprehensive, Peninsula-wide, spatial and temporal approach is unique, aimed at collecting and analyzing data that are otherwise impossible to obtain via ‘single site’ penguin studies or at national Antarctic research stations, and has generated a large body of data, information, and analyses (https://oceanites.org/research-portal/antarctic-site-inventory/publications/ and http://lynchlab.com/publications/).

2. Recent papers.


This paper reports on the South Sandwich Islands in the South Atlantic Ocean, which are a major biological hot spot for penguins and other seabirds. Though the islands’ remoteness and challenging coastlines preclude regular biological censuses, this paper reports on an extensive recent survey, the first since the late 1990s, which was completed through a combination of direct counting, GPS mapping, and interpretation of high-resolution commercial satellite imagery. The South Sandwich Islands host nearly half of the world’s chinstrap penguin (\textit{Pygoscelis antarctica}) population (1.3 million breeding pairs), as well as c. 95,000 breeding pairs of macaroni penguins (\textit{Eudyptes chrysolophus}), and several thousand breeding pairs of gentoo...
penguins (*Pygoscelis papua*). Despite being at the northern edge of their breeding range, there is an unexpectedly large (≥125,000 breeding pairs) population of Adélie penguins (*Pygoscelis adeliae*). Additionally, there were nearly 1,900 pairs of southern giant petrels (*Macronectes giganteus*), 4% of the global population, almost all of which are found on Candlemas Island. The paper notes that the South Sandwich Islands have not experienced the same changes in penguin abundance and distribution as the rest of the Scotia Arc and associated portions of the western Antarctic Peninsula, which adds important context to the broader conversation regarding changes to penguin populations in the Southern Ocean.


This paper reports on the development of the Mapping Application for Penguin Populations and Projected Dynamics (MAPPPD), which is a web-based, open access, decision-support tool designed to assist scientists, non-governmental organisations and policy-makers working to meet the management objectives as set forth by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and other components of the Antarctic Treaty System (ATS), including ATS Consultative Meetings and the ATS Committee on Environmental Protection. MAPPPD was designed specifically to complement existing efforts such as the CCAMLR Ecosystem Monitoring Program (CEMP) and the ATS site guidelines for visitors. The database underlying MAPPPD includes all publicly available (published and unpublished) count data on emperor, gentoo, Adélie and chinstrap penguins in Antarctica. Penguin population models, still under development, will be used to assimilate available data into estimates of abundance for each site and year. Results are easily aggregated across multiple sites to obtain abundance estimates over any user-defined area of interest. A front end web interface located at www.penguinmap.com provides free and ready access to the most recent count and modelled data, and can act as a facilitator for data transfer between scientists and Antarctic stakeholders to help inform management decisions for the continent.

3. MAPPPD.

The MAPPPD tool, described in the previous paragraph, went live in October 2016. Presently, its database comprises data from 660 sites across the entire Antarctic continent, including 3,176 records from 101 sources of on-the-ground colony counts and satellite photo analyses. As described below, the extensive MAPPPD database was used to produce a penguin colony buffer zone map, assisting krill fishers and the inaugural State Of Antarctic Penguins report. In March 2017, an international, external advisory board was formed to assist MAPPPD’s long-term success and to ensure that it becomes, as intended, the ‘one-stop’ shop for Antarctic penguin abundance and distribution information and the ‘go to’ open access, decision support tool for the entire community of Antarctic governments, scientists, fishing and tourism stakeholders, environmental NGOs and concerned citizens.

Contributions of additional data to MAPPPD are encouraged, in particular, regarding sites that have not been recently censused.

4. Climate Challenge.

Participants in the Future Of Antarctica Forum in February/March 2016 (ATCM XXXIX IP41) noted the key roles of Antarctic science, management and diplomacy in addressing climate change; and specific concern about overall changes across the Antarctic and Southern Oceans, the notable warming trend in the western Antarctic Peninsula, and its implications for the Antarctic ecosystem. Participants agreed that future policy decisions in this regard would be significantly aided by an interdisciplinary, international effort to seek to:

“Distinguish the direct and interactive effects of climate change, fishing, tourism, and national operations on ecosystems in the Antarctic Peninsula region for improved environmental management.”

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In this context, Oceanites accepted the challenge of establishing an international interdisciplinary effort to bring together available scientific, tourism and fisheries data for the Antarctic Peninsula region, in an attempt to distinguish the direct and interactive effects of climate change and other human activities on this ecosystem. To this end, Oceanites has concluded a memorandum of understanding with Aker BioMarine AS that will enable Oceanites to independently analyze the company’s krill fishing catch/effort data vis-a-vis data on penguin breeding/foraging locations and climate change impacts in the Antarctic Peninsula. The first tranche of such data are expected to flow shortly, which will begin what is expected to be up to three years of analytical work.

In addition, Aker BioMarine AS and other members of the Association of Responsible Krill fishing companies (ARK) announced at the 2016 CCAMLR meeting a voluntary effort to avoid fishing near Antarctic Peninsula penguin colonies during the penguins’ breeding season. Oceanites, relying on data in the MAPPPD database, generated a penguin colony buffer zone map that ARK companies utilized during this current fishing season (https://oceanites.org/wp-content/uploads/2017/03/Area-48.jpg).


Oceanites’ inaugural State Of Antarctic Penguins report was released on World Penguin Day, April 25, 2017 (https://oceanites.org/future-of-antarctica/penguin-conservation/state-of-antarctic-penguins-reports/). The report comprehensively summarizes the status — population size and population trends — of Antarctica’s five penguin species, continent-wide and in key regions — the Antarctic Peninsula (CCAMLR Areas 48.1, 48.2 and 48.5), the Ross Sea (CCAMLR Areas 88.1 and 88.2), and East Antarctica (CCAMLR Areas 58.4.1 and 58.4.2).

These species total at least 5.7 million breeding pairs nesting at 660 or more sites across the entire Antarctic continent. The report aggregates and utilizes the most current scientific data, which, as noted above, includes 3,176 records from 101 sources of on-the-ground colony counts and satellite photo analyses. The report highlights that, over the past 60+ years gentoo penguin populations have increased significantly; Adélie penguin populations have, in general, declined significantly; and chinstrap penguin populations have declined and, at some locations, significantly. By contrast, Adélie penguin populations in East Antarctica and the Ross Sea appear to be increasing.

In addition to noting population trends, the report also draws attention to key concerns, including ice sheet and glacier collapses both in West Antarctica and East Antarctica, which potentially affect penguin populations.