

Southern Ocean Data Rescue: Extending time-series into the past

Background

Realising the potential of historical data

Research priorities often focus on the gathering of new data through expensive fieldwork and experimentation, without exploring the potential of the large quantities of existing historical datasets. This approach often means that the stewardship of important historical information is neglected. Proper consideration of historical datasets can secure stewardship as well as provide an important historical context to current observations, and encourages the extension of time series to investigate long term trends and changes.

However, the use of historical datasets for scientific purposes is usually hampered by the inability to access good quality, long-term data with adequate metadata (information describing the context, content and structure of records and their management through time). This problem is recognised by the EUR-OCEANS network and the international research programme Integrating Climate and Ecosystem Research in the Southern Ocean (ICED), which have designated data rescue as an important research priority.

Southern Ocean data from the heroic age of exploration

The Southern Ocean is subject to some of the most severe weather conditions on Earth, making fieldwork both difficult and expensive. Despite this, research vessels have been visiting the region since the days of sail and steam.

Some of the ships and crew from the Discovery Expeditions

Crew of RRS William Scoresby (Oxford Mail), the second ship used during the Discovery Expeditions.



RRS Discovery 1901-2 (Photographer unknown, British Antarctic Survey).



RRS Discovery II in the pack ice (South Latitude), the third and last ship used during the Discovery Expeditions.

Southern Ocean scientists have identified the need for biological datasets spanning the longest possible temporal and spatial range, in order to fully understand the ecological processes affecting the Southern Ocean ecosystem. Data collected during these early expeditions were carefully recorded at the time, but in formats (sometimes handwritten notebooks) that are no longer viable for long-term access. Data from more recent expeditions had lost their value by becoming separated from the metadata needed to understand them fully or had been collected aboard several collaborating ships over a number of years and considered in addressing specific scientific questions but had not been brought together as one data resource.

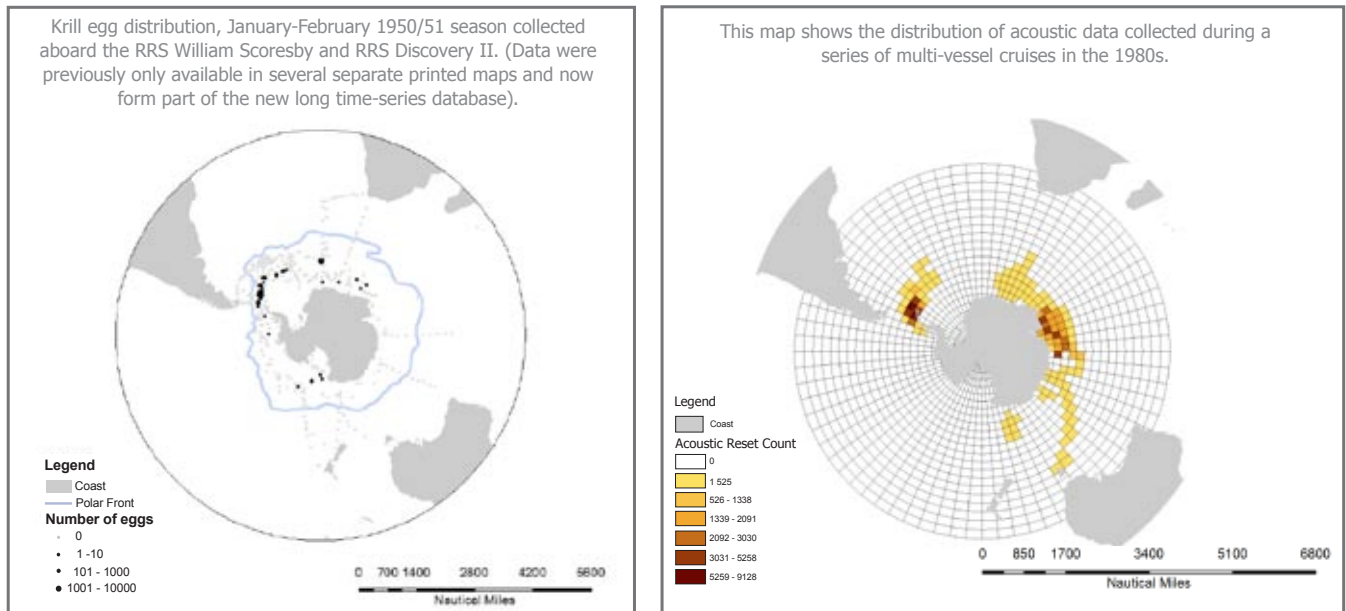


Mackerel Icefish *Champsocephalus gunnari*.
(Photograph: Inigo Everson, British Antarctic Survey).

The EUR-OCEANS Data Rescue scheme funded a project aimed to address this by revisiting a range of data sources from research cruises in the Southern Ocean between 1925 and 1985. The project retrieved data on the biological components of the Southern Ocean ecosystem, including abundance and distribution of land based predators, fish and cephalopods, with the objective of understanding how the ecosystem has changed over time.

Adding value to historical data

Some raw data from very early cruises are still untraced (although further work is underway to address this) and only available as published hard copy tables or printed maps. These data were scanned or entered electronically and GIS techniques used to generate more dynamic and comprehensive maps showing the temporal and spatial distribution of the rescued data. More recent data were brought back together with metadata essential for their interpretation, and combined with early data to create a time-series for some species spanning more than sixty years.



Figures 3. and 4. Examples of two new maps showing the distribution of small sections of the time series rescued.

Data legacy

Scientists benefit tremendously from initiatives such as the Southern Ocean data rescue project. Fieldwork carried out in the past cannot be replicated and its loss to science would leave a significant gap in our observations and knowledge. Full exploitation of these data not only extends time series into the past, but also enables the use of new techniques for data exploration that were not available when the data were originally collected. The Southern Ocean project used standard database software to ensure data remained in existence, but also used new technologies for data visualisation to enable users to explore and investigate what is available and how it might be relevant to current research. The data were also linked to virtual globe tools enabling users to interactively determine the temporal and spatial coverage of the datasets. The ability to view information in this way provides a valuable tool for scientists to realise the full potential of rescued data.

The combination of new visualization and analytical technologies with historical data can reap rewards for scientists. The techniques used in this project could be applied to a wide variety of historical datasets, potentially creating significant new data resources for future research. The work begun under this programme will continue to be developed and contribute to the historical data synthesis activities of the ICED programme.

Action points

1. Effort should be placed on securing funding for the identification and curatorship of historical data in order to generate valuable long-term datasets.
2. New fieldwork and experimentation plans should be properly assessed with regards to the availability of similar historical data and the scientific added value of collecting new data.
3. Consideration of the existing data resources to which new fieldwork or experimentation will contribute.
4. Provision of resources to ensure the adoption of data standardisation and management must be secured, in order to ensure maximum long-term value of data to future scientists.

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