



**SCAR Sub-Group**  
 SG / SC  
 Person  
 Responsible:

**SO-CPR**  
 LS  
 Kunio  
 Takahashi

**XXXVII SCAR Delegates Meeting**  
**India, September 2022**

**EG-Continuous Plankton Recorder and**  
**the SCAR Southern Ocean CPR Survey**  
**(SO-CPR)**  
**2020-22 Report**

**Summary**

**Report Author(s)**

Kunio T. Takahashi (JAPAN)  
 John A. Kitchener (AUSTRALIA)

**Summary of activities from 2020-22**

Since the last report 2020, we have completed over 20 CPR tows during the 2020/21 and 2021/22 Antarctic field season. Due to the influence of COVID-19, each country reduced the Southern Ocean research, so the number of towing was about half of the normal level.

As a task of the EG-CPR of ten years, we published a special report on the “Status and Trends of Southern Ocean Zooplankton” to SCAR Britten in June 2021. This report brings together all information from 25 years of the SO-CPR Survey into one report. This report also identifies any trends (seasonal or long-term) in relation to changes in abundance, shifts in distribution, timing of events, or changes in composition and community composition.

Our important future task for maintaining high quality data is developing and enhancing the skills of current and new technicians. We have held standards workshop by technicians from each country every two years, but due to the influence of COVID-19, we have not been holding them for the past three years. It is difficult to hold online because we need to actually observe the sample. We are planning to hold a workshop in 2023. The purpose of the workshop is to ensure that high standards of data quality are being maintained, in terms of species identification and methodology, among the main analysts of the SO-CPR survey, and to discuss future training methods and a future roadmap for the SO-CPR program. We also aim to publish SO-CPR processing manuals and zooplankton counting rulebooks for the purpose of training for new technicians.

**Summary Budget 2021 to 2024**

|        | 2021  | 2022      | 2023    | 2024    |
|--------|-------|-----------|---------|---------|
|        | Spent | Allocated | Request | Request |
| (US\$) | 0     | 0         | 3000    | 0       |

## Progress to date

### Sub-group Outcomes Summary

| Sub-group | Activity/Outcome/Benefit/Achievement                  |
|-----------|---|
| EG-CPR    | Published a Zooplankton Status Report in SCAR Britten |
|           |   |
|           |   |

### Sub-group Cash Flow

(Since previous report to Delegates in 2020)

| Sub-group | Allocation | Amount spent |      |      |
|-----------|------------|--------------|------|------|
|           |            | 2020         | 2021 | 2022 |
| EG-CPR    | 3000       | 0            | 0    | 0    |
|           |            |              |      |      |
|           |            |              |      |      |

## Future plans

### Planned activities in 2022 to 2024

| Sub-group | Planned activity   |
|-----------|--------------------|
| EG-CPR    | Standards workshop |
|           |                    |
|           |                    |

### Planned use of funds for 2022 to 2024

| Year (YYYY)  | Purpose/Activity   | Amount (in USD) | Contact Name    | Contact Email              |
|--------------|--------------------|-----------------|-----------------|----------------------------|
| 2022         |                    |                 |                 |                            |
| 2023         | Standards workshop | 3000            | Kunio Takahashi | takahashi.kunio@nipr.ac.jp |
| 2024         |                    |                 |                 |                            |
|              |                    |                 |                 |                            |
| <b>Total</b> |                    |                 |                 |                            |

### Any additional detail on funds usage and desired results/outcomes

The SCAR funding provides the opportunity to bring the various groups together to ensure that their taxonomic analysis, sampling methodology, quantitative analysis methodology and data quality remains at the highest common standard. The SCAR funding does not cover all costs of the workshops, but does provide very useful seed money to leverage additional support. It is difficult to define the precisely the percentage of future funds that will be directed to early career scientist, or scientists with developing Antarctic programmes.

**Percentage of the budget to be used for support of early-career researchers**

2022:0%

2023:?

2024:?

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2022:0%

2023:?

2024:?

## Membership

### Leadership

| Role         | First Name | Last Name | Affiliation | Country   | Primary Language | Email                      | Date Started |
|--------------|------------|-----------|-------------|-----------|------------------|----------------------------|--------------|
| Chair        | Kunio      | Takahashi | NIPR        | Japan     | Japanese         | takahashi.kunio@nipr.ac.jp | 2012         |
| Deputy Chair | John       | Kitchener | AAD         | Australia | English          | John.kitchener@awe.gov.au  | 08/2016      |
|              |            |           |             |           |                  |                            |              |

*(Please identify early-career researchers with \* in first column)*

### Other members

| First Name | Last Name | Affiliation | Country      | Primary Language | Email                     |
|------------|-----------|-------------|--------------|------------------|---------------------------|
| Karen      | Robinson  | NIWA        | NZ           | English          | Karen.robinson@niwa.co.nz |
| Marianne   | Wootton   | SAHFOS      | UK           | English          | mawo@sahfos.ac.uk         |
| Hans       | Verheye   | DHA         | South Africa |                  | hans.verheye@gmail.com    |
| Philippe   | koubbi    | UPMC        | France       |                  | phiippe.koubbi@upmc.fr    |
| Erik       | Muxagata  | URG         | Brazil       |                  | e.muxagata@gmail.com      |
| Julie      | Hall      | NIWA        | NZ           | English          | j.hall@niwa.co.nz         |
| Ben        | Raymond   | AAD         | Australia    | English          | Ben.Raymond@aad.gov.au    |
| Graham     | Hosie     | SAHFOS      | Australia    | English          | Graham.hosie@iinet.net.au |
|            |           |             |              |                  |                           |

*(Please identify early-career researchers with \* in first column)*

## Additional information (optional)

### Notable Papers

1. Ryan F. Heneghan, Jason D. Everett, Patrick Sykes, Sonia D. Batten, Martin Edwards, Kunio Takahashi, Iain M. Suthers, Julia L. Blanchard, Anthony J. Richardson (2020) A functional size-spectrum model of the global marine ecosystem that resolves zooplankton composition. *Ecological Modelling*. DOI: 10.1016/j.ecolmodel.2020.109265

This is the scientific paper that used our dataset for a functional size-spectrum model of the global marine ecosystem. They suggested that including zooplankton complexity in ecosystem models could be key to better understanding the distribution of fish biomass and trophic efficiency across the global ocean.

2. Leonie Suter, Andrea Maree Polanowski, Laurence John Clarke, John Andrew Kitchener, Brue Emerson Deagle (2020) Capturing open ocean biodiversity: Comparing environmental DNA metabarcoding to the continuous plankton recorder. *Molecular Ecology*. DOI: 10.1111/mec.15587

This work assessed whether eDNA metabarcoding could capture similar Southern Ocean zooplankton biodiversity as conventional CPR bulk sampling. They suggested that eDNA metabarcoding could become an efficient tool for monitoring open ocean biodiversity with refinement and standardization of methodology.

3. Kunio T. Takahashi and Graham W. Hosie (2021) The status and trends of Southern Ocean zooplankton based on the SCAR Southern Ocean Continuous Plankton Recorder (SO-CPR) survey. *SCAR Bulletin*, No. 206, 97p.

This report brings together all information from 25 years of the SO-CPR Survey into one report. This report also identifies any trends (seasonal or long-term) in relation to changes in abundance, shifts in distribution, timing of events, or changes in composition and community composition.

4. Kunio T. Takahashi, Tomomi R. Takamura and Tsuneo Odate (2021) Zooplankton communities along a Southern Ocean monitoring transect at 110°E from three CPR surveys (Dec 2014, Jan 2015, Mar 2015). *Polar Biology* 44: 1069-1081. DOI: 10.1007/s00300-021-02862-z

This work provides a temporal variability of zooplankton community structure using CPR data collected along Japanese monitoring transect in three months during 2014/15 seasons.

5. Max Campbell, David Schoeman, William Venables, Rana Abu-Alhaija, Sonia Batten, Sanae Chiba, Frank Coman, Claire Davies, Martin Edwards, Ruth Eriksen, Jason Everett, Yutaka Fukai, Mitsuo Fukuchi, Octavio Esquivel Garrote, Graham Hosie, Jenny Huggett, David Johns, John Kitchener, Philippe Koubbi, Felicity McEnulty, Erik Muxagata, Clare Ostle, Karen Robinson, Anita Slotwinski, Kerrie Swadling, Kunio Takahashi, Mark Tonks, Julian Uribe-Palomino, Hans Verheye, William Wilson, Marco Worship, Atsushi Yamaguchi, Zhang Wuchang, and Anthony Richardson (2021) Testing Bergmann's Rule in marine copepods. *Ecography* 44: 1283-1295. DOI: 10.1111/ecog.05545

This is the scientific paper that used our dataset for a near-global comparative analysis on marine copepods to test Bergaman's rule. Their results provide strong support for Bergaman's rule in copepods, but emphasises the importance of other drivers in modifying this pattern.

### **Direct support from outside organisations received for your activities**

Each national partner in the SO-CPR Survey financially support their own tows, logistics, analysis and contributions to the database.

### **Major collaborations your group has with other SCAR groups and with organisations/groups beyond SCAR**

#### **Within SCAR**

1. The SO-CPR database is hosted by the Australian Antarctic Division Data Centre. The data are transmitted to SCAR's biodiversity.aq.

#### **Outside SCAR**

1. Global Alliance of CPR Surveys (GACS)  
The SO-CPR Survey is a founding member of the Global Alliance of CPR Surveys (GACS). The general goal of GACS is to understand changes in plankton biodiversity at ocean basin scales through a global alliance of CPR surveys
2. Our data are transmitted to other data portals such as Ocean Biogeographic Information System (OBIS), Southern Ocean Observing System (SOOS), Global Ocean Observing System (GOOS), Atlas of Living Australia, and the data are offered to Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR).

### **Outreach, communication and capacity-building activities**

Over the last decade, EG-CPR has conducted numerous training workshops in Australia, Japan, New Zealand, UK, Brazil, and South Africa. A standardisation workshop for the current team of SO-CPR analysts was held on December 2018 to confirm that consistent and high standards of species identification, methodology, and data quality were being maintained amongst the main analysts in the SO-CPR Survey. Small training sessions have been conducted for those participating in Australia's and Japan's Antarctic programme.

### **Contributions to equality, diversity, and inclusion (EDI)**

*(Any specific actions the group has undertaken to advance EDI within the group and/or within SCAR)*

## SCAR fellowship reviewers

| First Name | Last Name | Email                      | Principal Expertise |
|------------|-----------|----------------------------|---------------------|
| Kunio      | Takahashi | takahashi.kunio@nipr.ac.jp | Marine Biology      |
|            |           |                            |                     |
|            |           |                            |                     |
|            |           |                            |                     |
|            |           |                            |                     |
|            |           |                            |                     |