—報告—
Report

Report on the Southern Ocean Continuous Plankton Recorder (SO-CPR) Standards Workshop 2016: SCAR SO-CPR Database Expert Group

Kunio T. Takahashi[1, 2] *, John A. Kitchener[3], Karen Robinson[4] and Graham W. Hosie[5]

南極研究科学委員会の連続プランクトン採集器データベース グループワークショップ 2016 報告

高橋邦夫[1, 2] *・John A. Kitchener[3]・Karen Robinson[4]・Graham W. Hosie[5]

(Received May 7, 2017; Accepted June 4, 2017)

要旨: 2016 年 12 月 12–16 日にオーストラリア南極局にて「南極研究科学委員会（以下 SCAR）連続プランクトン採集器（以下 CPR）データベース専門家グループワークショップ 2016」を開催した．南大洋 CPR 観測プロジェクトを主導する日本，オーストラリア，ニュージーランドの実務担当者の間で，観測データの品質管理，種同定やデータ分析手法の再確認，および今後の活動についての詳細な討議を行った．前半はこれまでのプロジェクト活動を総括し，各国のマネージメントの状況を確認し，さらには将来的な観測計画を議論した．後半は動物プランクトンの種同定リストの更新のため，具体的な分類カテゴリーの種同定を実施した．特に有孔虫とオキアミ類の幼生期について，確認を行った．まとめられた種同定基準を用いて新たなマニュアル作成を開始することになった．今後，2 年に一度を目途にプロジェクト参加国の技術者を集めたワークショップを開催し，各国間で統一された試料処理およびデータ管理を維持していくことを目指すこととなった．

Abstract: The “Southern Ocean Continuous Plankton Recorder (SO-CPR) Survey Standards Workshop” was held at the Australian Antarctic Division on 12–16 December 2016. The purposes of the workshop were 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, and to discuss future training methods, including a SO-CPR manual that will include a counting rule book, and a future road map for the SO-

[1] 情報・システム研究機構国立極地研究所．National Institute of Polar Research, Research Organization of Information and Systems, 10–3 Midori-cho, Tachikawa, Tokyo 190-8518.
[2] 総合研究大学院大学複合科学研究科極域科学専攻. Department of Polar Science, School of Multidisciplinary Sciences, SOKENDAI (The Graduate University for Advanced Studies), 10–3 Midori-cho, Tachikawa, Tokyo 190-8518.
[3] オーストラリア南極局．Australian Antarctic Division, 203 Channel Highway, Kingston, Tasmania 7050, Australia.
[4] ニュージーランド国立水圏・大気圏研究所． National Institute of Water and Atmospheric Research Ltd., Private Bag 14-901, Kilbirnie, Wellington, New Zealand.
[5] アリスター・ハーディ卿海洋科学財団．Sir Alister Hardy Foundation for Ocean Science, Citadel Hill, Plymouth PL1 2 PB, UK.
* Corresponding author. E-mail: takahashi.kunio@nipr.ac.jp

南極資料，Vol. 61，1–10，2017
Nankyoku Shiryô (Antarctic Record), Vol. 61, 1–10, 2017

CPR program. During the workshop we discussed a range of topics including: taxonomic resolution issues (particularly for Foraminifera and euphausiid larval identification and staging); laboratory methods (preservation and storage, with emphasis on maintaining correct pH); shipboard techniques; training methods; data handling (metadata, database, data sharing); gap analysis (spatial, temporal, data, quantitative); and future workshops/ conferences, including comprehensive training workshops for emerging SO-CPR survey partners (India). We agreed that there should be a larger workshop every two years to ensure that the high standards of the SO-CPR program are maintained.

Keywords: Continuous Plankton Recorder

1. Background

The Southern Ocean Continuous Plankton Recorder (SO-CPR) Survey commenced in 1991 with the purpose of mapping spatial and temporal variations in zooplankton patterns, and to make use of the sensitivity of plankton to environmental change as an early indicator of the health of the Southern Ocean ecosystem (Hosie *et al*., 2003). A continuous plankton recorder (CPR) can continuously collect surface zooplankton over a distance of 450 nautical miles during a single tow at normal ship speed. This enables rapid sampling over large areas, and mapping of the distribution of the surface zooplankton community in relation to ocean environments at large oceanic scales. The SO-CPR Survey involves numerous countries and analyses conducted by experienced and well recognized plankton and Antarctic researchers, albeit in several widely separated laboratories. Consequently, when we meet we take every opportunity to run workshops on methods and taxonomy to ensure that for quality control and assurance purposes the highest standards in procedures and identification are maintained.

The Scientific Committee on Antarctic Research (SCAR) Expert Group on CPR Research (EG-CPR) was established to assist development and expansion of CPR research in the Southern Ocean and Antarctic waters. At the SCAR Standing Scientific Group–Life Science (SSG-LS) business meeting in Malaysia in August 2016, the EG-CPR was assessed in relation to progress and its continuation beyond the usual eight-year duration for expert groups. The success and output of the group was noted. It was decided that the group will continue but transition to form the SO-CPR Database Group, which will be focused more on maintaining quality control and assurance of data entered into the SCAR SO-CPR Database. This will be achieved primarily by conducting taxonomic and methodological standardization and training workshops.

The terms of reference for the SO-CPR Database Expert Group are to:

1. continue to develop and maintain the SO-CPR Database and improve access for users;
2. ensure quality assurance and control of the data through regular training and standardization workshops; and
3. encourage other nations, especially developing Antarctic nations, to participate in the workshops, and so improve the spatial and temporal coverage of CPR tows around Antarctica.

An important future task aimed at maintaining high quality data is to develop and enhance the skills of current and new technicians. As a first step it is necessary to confirm

that the methods and identification procedures yield consistent high quality taxonomic results.

2. Purpose of the workshop

The primary aim of the workshop was to confirm that the three main analysts involved in the SO-CPR survey are maintaining consistent high standards in relation to species identifications, methods, and data quality. A secondary aim of the workshop was to discuss future training methods, including production of a SO-CPR manual that contains a counting rule book, and a future roadmap for the SO-CPR program. This workshop followed on from the 2010 Tokyo Standards Workshop (Takahashi *et al*., 2011), which was held to ensure quality control in the analysis of zooplankton species, and associated survey and laboratory methods.

3. Workshop agenda and participants

Five participants from three countries attended the workshop (Table 1), including three CPR analysts (one from each country). The agenda for the workshop is shown in Table 2.

4. Workshop summary

4.1. Taxonomic resolution issues

The 2.5-day workshop focused on the resolution of issues associated with the taxonomic identification of species currently registered in the SO-CPR database (Fig. 1); most of the time was spent considering Foraminifera and euphausiid larvae.

At the time of the 2010 Tokyo workshop, pelagic foraminiferans were considered to comprise one species (*Neogloboquadrina pachyderma*) south of the Sub-Antarctic Front (SAF). A biogeographic study of Southern Ocean foraminiferans (Meilland *et al*., 2016) has

Table 1. Workshop participant list.

Name	Position	Affiliation	Countory
Kunio Takahashi	Assistant Professor, Director SO-CPR	National Institute of Polar Research	Japan
Graham Hosie	Emeritus Life Fellow, CPR Ambassador	Sir Alister Hardy Foundation for Ocean Science	Australia
John Kitchener	CPR Senior Analyst, Co-Chair SCAR EG-CPR	Australian Antarctic Division	Australia
Karen Robinson	Plankton Analyst	National Institute of Water and Atmospheric Resarch	New Zealand
Andrew Davidson	Senior Research Scientist	Australian Antarctic Division	Australia

Table 2. Agenda for the "SO-CPR Standards Workshop".

SO-CPR standards workshop "SCAR SO-CPR Database Expert Group"	
Agenda	
12 Dec.	
10:00-12:30	Background and purpose of workshop
	-Report of the SCAR Business meeting in Kuala Lumpur, 2016
	-New terms of reference of SO-CPR Database Task Group
	-Report of the Status Report workshop in Tokyo, 2016
14:00-15:00	Project fund and future workshops
	-Road map for next five years
	-Training workshop for India and Korea
	-Future larger workshop
15:00-17:00	Data base and taxonomic list
	-WoRMS matching
	-Foraminiferans and formalin preservation
13 Dec.	
10:00-12:00	Training methodology
	-Previous workshops
	-PCI and micro plastic
13:30-15:00	Planning of the India workshop
15:00-17:00	"SO-CPR Manual" and "Counting role book" preparation
14 Dec.	
10:00-11:00	Sample processing situation
11:00-12:00	Instruction of laboratory
12:00-13:00	Taxonomic laboratory work
	-checking specimens (Foraminiferans)
14:30-17:00	Taxonomic laboratory work
	-checking specimens (Foraminiferans)
15 Dec.	
10:00-12:00	Taxonomic laboratory work
	-checking specimens (Foraminiferans & Eupahusiids larvae)
13:30-14:00	Collation of taxonomic list
14:00-16:00	Taxonomic laboratory work
	-checking specimens (All)
16:00-17:00	Collation of taxonomic list
16 Dec.	
10:00-12:00	Taxonomic laboratory work
	-checking specimens (Eupahusiids larvae)
13:30-15:00	Taxonomic laboratory work
	-checking specimens (All)
15:00-16:00	Review of identification and counting rules
16:00-17:00	Workshop report

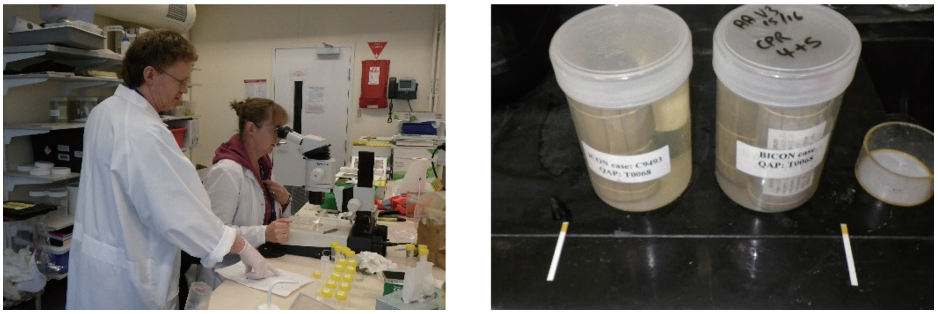

Fig. 1. Photograph showing checking of the taxonomic resolution in the laboratory (left), and assessing the pH of returned samples (right).

since revealed the occurrence of four major species (*N. pachyderma, N. incompta, Globigerinita uvula*, and *Globigerina bulloides*) south of the SAF. The identification rules and counting points for the four major species and some minor species were checked in the laboratory. We agreed to identify the seven species/taxa of foraminiferans according to the latest version of the species list (Table 3). The identification of euphausiid larvae was also checked, especially northern species including *Euphasusia vallentini* and *E. longirostris*. The taxonomic rules will be further updated in a new laboratory procedures manual.

4.2. Laboratory methods

We discussed the importance of maintaining the correct preservation fluid pH for long-term storage of calcareous shelled zooplankton (Fig. 1). Formaldehyde is readily oxidized by atmospheric oxygen to formic acid, so the CPR samples are fixed using a borax-buffered 4% formaldehyde and seawater solution to prevent shell dissolution. However, we discovered that the pH of the preservation solution for some returned field samples and archived samples had become too acidic (< 7), and many of the archived foraminiferan samples were soft/soggy. Consequently, we agreed to routinely check the pH of the returned samples prior to processing.

The workshop also established a Dropbox folder, which participants can use for collating and archiving, and for exchange of taxonomic notes, guides, drawings, photographs, and other information that will assist analysts and managers.

4.3. Species list

The newest species list for the SO-CPR database was checked using the Taxon Match of the World Resister of Marine Species (WoRMS: http://www.marinespecies.org/index.php) name validation tool. WoRMS is an open-access inventory of all marine species, and is >90% complete (Costello *et al*., 2013). The tool performs a cross check of the spelling and taxonomic status of species against the WoRMS database, and returns standard taxonomic information with valid names. As a result of using Taxon Match there have been only minor adjustments needed to species/group names: for example, Amphipod to Amphipoda; Medusa to Cnidaria; Squid to Teuthida; Fish to Pisces. We also changed "Small calanoid copepods" to "Calanoida indet (small)" to match similar naming formats used for other

*Table 3. Zooplankton species/taxa list for the SO-CPR Survey. C: Calyptopis stage, F: Furcilia stage. *Class; **Phylum; ***Infraclass; ****Subphylum. (1/3)*

Order	Taxa	Order	Taxa
Amphipoda	Amphipoda indet	Calanoida	*Calanoides macrocarinatus*
Amphipoda	*Brachyscelus crusculum*	Calanoida	*Calanus australis*
Amphipoda	*Cyllopus lucasii*	Calanoida	*Calanus propinquus*
Amphipoda	*Cyllopus magellanicus*	Calanoida	*Calanus simillimus*
Amphipoda	*Dairella californica*	Calanoida	*Calanus* sp.
Amphipoda	*Hyperia* sp.	Calanoida	*Calocalanus* sp.
Amphipoda	*Hyperia spinigera*	Calanoida	*Candacia bipinnata*
Amphipoda	*Hyperiella antarctica*	Calanoida	*Candacia cheirura*
Amphipoda	*Hyperiella dilatata*	Calanoida	*Candacia falcifera*
Amphipoda	*Hyperiella* sp.	Calanoida	*Candacia maxima*
Amphipoda	Hyperiidae indet	Calanoida	*Candacia* sp.
Amphipoda	*Hyperoche medusarum*	Calanoida	*Centropages aucklandicus*
Amphipoda	*Hyperoche* sp.	Calanoida	*Centropages bradyi*
Amphipoda	*Phronima* sp.	Calanoida	*Centropages* sp.
Amphipoda	Platysceloidea indet	Calanoida	*Clausocalanus brevipes*
Amphipoda	*Primno macropa*	Calanoida	*Clausocalanus laticeps*
Amphipoda	*Scina* sp.	Calanoida	*Clausocalanus* sp.
Amphipoda	*Themisto australis*	Harpacticoida	*Clytemnestra* sp.
Amphipoda	*Themisto gaudichaudii*	Hexanauplia*	Copepoda indet
Amphipoda	*Themisto* sp.	Hexanauplia*	Copepoda nauplius indet
Amphipoda	*Vibilia antarctica*	Calanoida	*Ctenocalanus citer*
Amphipoda	*Vibilia armata*	Calanoida	*Ctenocalanus* sp.
Amphipoda	*Vibilia* sp.	Cyclopoida	Cyclopoida nauplius indet
Branchiopoda*	Branchiopoda indet	Calanoida	*Drepanopus* sp.
Chaetognatha**	Chaetognatha indet	Calanoida	*Euaugaptilus* sp.
Phragmophora	*Eukrohnia hamata*	Calanoida	*Eucalanus hyalinus*
Aphragmophora	*Pseudosagitta gazellae*	Calanoida	*Eucalanus* sp.
Aphragmophora	*Pseudosagitta* sp.	Calanoida	*Euchirella rostrata*
Aphragmophora	Sagittidae indet	Calanoida	*Euchirella rostromagna*
Aphragmophora	*Solidosagitta marri*	Calanoida	*Euchirella* sp.
Choreotrichida	Tintinnina indet	Harpacticoida	*Euterpina* sp.
Cirripedia***	Cirripedia cyprid	Calanoida	*Haloptilus oxycephalus*
Cirripedia***	Cirripedia nauplius	Harpacticoida	Harpacticoida indet
Diplostraca	*Evadne* sp.	Calanoida	*Heterorhabdus austrinus*
Diplostraca	*Podon* sp.	Calanoida	*Heterorhabdus lobatus*
Siphonophorae	Abylidae indet	Calanoida	*Heterorhabdus* sp.
Siphonophorae	*Chelophyes* sp.	Poecilostomatoida	*Heterorhabdus spinifrons*
Cnidaria**	Cnidaria indet	Calanoida	*Lubbockia* sp.
Siphonophora	Siphonophora nectophore	Calanoida	*Lucicutia* sp.
Siphonophora	*Siphonophora* sp.	Calanoida	*Mecynocera clausi*
Narcomedusae	*Solmundella bitentaculata*	Calanoida	*Mesocalanus tenuicornis*
Calanoida	*Acartia danae*	Calanoida	*Metridia gerlachei*
Calanoida	*Acartia* sp.	Calanoida	*Metridia lucens*
Calanoida	*Aetideus* sp.	Calanoida	*Metridia* sp.
Calanoida	*Calanoides acutus*	Calanoida	*Microcalanus pygmaeus*

*Table 3. Zooplankton species/taxa list for the SO-CPR Survey. C: Calyptopis stage, F: Furcilia stage. *Class; **Phylum; ***Infraclass; ****Subphylum. (2/3)*

Order	Taxa	Order	Taxa
Harpacticoida	*Microsetella norvegica*	Decapoda	Decapoda megalopa indet
Harpacticoida	*Microsetella rosea*	Decapoda	Decapoda nauplius indet
Harpacticoida	*Microsetella* sp.	Decapoda	Decapoda phyllosoma indet
Calanoida	*Neocalanus gracilis*	Decapoda	Decapoda zoea indet
Calanoida	*Neocalanus tonsus*	Decapoda	*Munida gregaria*
Cyclopoida	*Oithona frigida*	Decapoda	*Nematocarcinus longirostris*
Cyclopoida	*Oithona similis*	Decapoda	Sergestidae indet
Cyclopoida	*Oithona* sp.	Stomatopoda	*Squilla* sp.
Poecilostomatoida	*Oncaea curvata*	Noctilucales	*Noctiluca scintillans*
Poecilostomatoida	*Oncaea* sp.	Echinoidea*	Echinoidea larvae
Calanoida	*Onchocalanus* sp.	—	Egg indet
Calanoida	*Paracalanus* sp.	—	Egg mass
Calanoida	*Paraeuchaeta antarctica*	Euphausiacea	*Euphausia crystallorophias*
Calanoida	*Paraeuchaeta barbata*	Euphausiacea	*Euphausia crystallorophias* calyptopis
Calanoida	*Paraeuchaeta biloba*	Euphausiacea	*Euphausia crystallorophias* furcilia
Calanoida	*Paraeuchaeta exigua*	Euphausiacea	*Euphausia frigida*
Calanoida	*Paraeuchaeta* sp.	Euphausiacea	*Euphausia frigida* calyptopis
Calanoida	*Paraheterorhabdus farrani*	Euphausiacea	*Euphausia frigida* furcilia
Calanoida	*Paralabidocera antarctica*	Euphausiacea	*Euphausia hanseni* furcilia
Calanoida	*Pleuromamma abdominalis*	Euphausiacea	*Euphausia longirostris*
Calanoida	*Pleuromamma borealis*	Euphausiacea	*Euphausia longirostris* calyptopis
Calanoida	*Pleuromamma gracilis*	Euphausiacea	*Euphausia longirostris* furcilia
Calanoida	*Pleuromamma piseki*	Euphausiacea	*Euphausia lucens*
Calanoida	*Pleuromamma robusta*	Euphausiacea	*Euphausia recurva*
Calanoida	*Pleuromamma* sp.	Euphausiacea	*Euphausia similis*
Calanoida	*Pleuromamma xiphias*	Euphausiacea	*Euphausia similis* furcilia
Calanoida	*Rhincalanus gigas*	Euphausiacea	*Euphausia spinifera*
Calanoida	*Rhincalanus gigas* nauplius	Euphausiacea	*Euphausia spinifera* calyptopis
Calanoida	*Rhincalanus* sp.	Euphausiacea	*Euphausia spinifera* furcilia
Poecilostomatoida	*Sapphirina* sp.	Euphausiacea	*Euphausia superba*
Calanoida	*Scaphocalanus farrani*	Euphausiacea	*Euphausia superba* C1
Calanoida	*Scolecithricella minor*	Euphausiacea	*Euphausia superba* C2
Calanoida	*Scolecithricella* sp.	Euphausiacea	*Euphausia superba* C3
Calanoida	Calanoida indet (small)	Euphausiacea	*Euphausia superba* calyptopis
Calanoida	*Stephos longipes*	Euphausiacea	*Euphausia superba* F1
Calanoida	*Subeucalanus longiceps*	Euphausiacea	*Euphausia superba* F2
Calanoida	*Subeucalanus* sp.	Euphausiacea	*Euphausia superba* F3
Calanoida	*Sulcanus conflictus*	Euphausiacea	*Euphausia superba* F4
Calanoida	*Temora turbinata*	Euphausiacea	*Euphausia superba* F5
Poecilostomatoida	*Triconia antarctica*	Euphausiacea	*Euphausia superba* F6
Crustacea****	Crustacea nauplius indet	Euphausiacea	*Euphausia superba* furcilia
—	Nauplius indet	Euphausiacea	*Euphausia triacantha*
Ctenophora**	Ctenophora indet	Euphausiacea	*Euphausia triacantha* calyptopis
Cumacea	Cumacea indet	Euphausiacea	*Euphausia triacantha* furcilia
Decapoda	Decapoda (natant) indet juv	Euphausiacea	*Euphausia vallentini*

*Table 3. Zooplankton species/taxa list for the SO-CPR Survey. C: Calyptopis stage, F: Furcilia stage. *Class; **Phylum; ***Infraclass; ****Subphylum. (3/3)*

Order	Taxa	Order	Taxa
Euphausiacea	*Euphausia vallentini* calyptopis	Gastropoda*	Gastropoda indet
Euphausiacea	*Euphausia vallentini* furcilia	Thecosomata	*Limacina* sp.
Euphausiacea	Euphausiidae calyptopis indet	Gastropoda*	Pteropoda indet
Euphausiacea	Euphausiidae furcilia indet	Gymnosomata	*Spongiobranchaea australis*
Euphausiacea	Euphausiidae indet	Teuthida	Teuthida indet
Euphausiacea	Euphausiidae metanauplius indet	Isopoda	Isopoda indet
Euphausiacea	Euphausiidae nauplius indet	Bivalvia*	Bivalvia larvae
Euphausiacea	*Nematoscelis megalops*	Mysida	Mysidae indet
Euphausiacea	*Nyctiphanes australis*	Ostracoda*	Ostracoda indet
Euphausiacea	*Nyctiphanes australis* calyptopis	Chordata**	Pisces egg
Euphausiacea	*Nyctiphanes australis* furcilia	Chordata**	Pisces larvae
Euphausiacea	*Thysanoessa gregaria*	Myctophiformes	Myctophidae indet
Euphausiacea	*Thysanoessa gregaria* calyptopis	Perciformes	*Pleuragramma antarctica*
Euphausiacea	*Thysanoessa gregaria* furcilia	Myctophiformes	*Protomyctophum* sp.
Euphausiacea	*Thysanoessa macrura*	Phyllodocida	Alciopidae indet
Euphausiacea	*Thysanoessa macrura* C1	Phyllodocida	Iospilidae indet
Euphausiacea	*Thysanoessa macrura* C2	Phyllodocida	Lopadorrhynchidae indet
Euphausiacea	*Thysanoessa macrura* C3	Phyllodocida	*Maupasia* sp.
Euphausiacea	*Thysanoessa macrura* calyptopis	Phyllodocida	*Pelagobia longicirrata*
Euphausiacea	*Thysanoessa macrura* F1	Phyllodocida	*Phalacrophorus pictus*
Euphausiacea	*Thysanoessa macrura* F2	Phyllodocida	*Phalacrophorus* sp.
Euphausiacea	*Thysanoessa macrura* F3	Polychaeta*	Polychaeta indet
Euphausiacea	*Thysanoessa macrura* F4	Polychaeta*	Polychaeta larvae
Euphausiacea	*Thysanoessa macrura* F5	Phyllodocida	*Tomopteris carpenteri*
Euphausiacea	*Thysanoessa macrura* F6	Phyllodocida	*Tomopteris* sp.
Euphausiacea	*Thysanoessa macrura* furcilia	Phyllodocida	*Travisiopsis levinseni*
Euphausiacea	*Thysanoessa macrura* metanauplius	Phyllodocida	*Travisiopsis* sp.
Euphausiacea	*Thysanoessa* sp.	Phyllodocida	*Typhloscolex muelleri*
Euphausiacea	*Thysanoessa* sp. furcilia	Phyllodocida	*Vanadis antarctica*
Foraminifera**	Foraminifera indet	Phyllodocida	*Vanadis longissima*
Rotaliida	*Globigerina bulloides*	Radiozoa**	Radiozoa indet
Rotaliida	*Globigerinita uvula*	Appendicularia*	Appendicularia indet
Rotaliida	*Globorotalia* sp.	Doliolida	Doliolidae indet
Rotaliida	*Neogloboquadrina incompta*	Copelata	*Fritillaria* sp.
Rotaliida	*Neogloboquadrina pachyderma*	Copelata	*Oikopleura* sp.
Rotaliida	*Turborotalita quinqueloba*	Pyrosomatida	Pyrosomatidae indet
Thecosomata	*Clio pyramidata*	Salpida	*Salpa fusiformis*
Thecosomata	*Clio* sp.	Salpida	*Salpa* sp.
Gymnosomata	*Clione limacina antarctica*	Salpida	*Salpa thompsoni*
Gymnosomata	*Clione* sp.	Salpida	*Thalia* sp.

groups in the list. We updated the list to the latest version, which currently includes 260 species/taxa (Table 3).

4.4. Database

The SCAR SO-CPR Database is registered with the Australian Antarctic Data Centre (AADC), and can be accessed at http://data.aad.gov.au/aadc/metadata/metadata.cfm?entry_id=AADC-00099. From there it is distributed to various databases including GACS, biodiversity.aq, OBIS, GBIF, the Atlas of Living Australia, and others.

5. Future directions

5.1. Status Report

We proposed production of a special report to SCAR on the status and trends of Southern Ocean zooplankton, as a last task of the EG-CPR of eight years. This would be based primarily on SO-CPR data (cross-referenced with other studies, if available), and would collate current knowledge of the status of zooplankton including known species, community structure and biogeography, and perhaps assessment of their possible roles in the ecosystem. Much of this work has already been published in CPR-based research papers, atlases, reviews, and theses (>50 in total). The report will also identify 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. It will bring together in one document all information derived from 25 years of the SO-CPR Survey. We set the aim of completing the report for presentation at the SCAR Business Meeting and Open Science Conference in Switzerland 2018.

5.2. India training workshop

To date we have surveyed approximately 70% of the Southern Ocean, but clearly there are distinct gaps where sampling has been limited or has not occurred because of the lack of shipping activity. To expand the program we are at various stages of involving and assisting other nations (new ToR 3) in participating. We are planning a training workshop for 2017 to help India initiate Southern Ocean CPR work. The International Indian Ocean Expedition (IIOE) provides the opportunity to address the paucity of knowledge of Indian Ocean plankton, and subsequently contribute to understanding of their role in ecosystem dynamics. We have had discussions with scientists at the Goa National Centre for Antarctic and Oceanic Research (NCAOR) about running a CPR from Goa to Antarctica during the annual resupply of India's Antarctic station. To achieve this we will need to provide the necessary training to participants. We discussed the format for the Indian workshop.

5.3. Future workshops/conferences

The next "SCAR Biology Symposium" will be held in Leuven, Belgium, in July 2017, and the "SCAR Business Meeting and Open Science Conference" will be held in Davos, Switzerland in 2018. We will encourage high-level attendance by participants in our project, and a SO-CPR Database Group meeting to discuss the development of our CPR program will be held in association with the symposium.

The new SO-CPR Database Group will focus more on maintaining the quality control and assurance of data entered into the SCAR SO-CPR Database. Our dataset is an important SCAR Business Product, and is dependent on regular taxonomy and methodology standardization workshops to maintain and ensure quality assurance and control of the data. We agreed that there should be a larger workshop every two years to ensure that the high standards of the SO-CPR program are maintained. We will plan a larger standardization workshop in 2018. Countries interested in joining SO-CPR will be encouraged to participate in those workshops.

Acknowledgements

The workshop was supported financially or through in-kind support by the SCAR Expert Group on CPR Research. We are particularly grateful to the AAD for its generous support in organizing and hosting the workshop.

References

Costello, M.J., Bouchet, P., Boxshall, G., Fauchald, K., Gordon, D., Hoeksema, B.W., Poore, G.C.B., van Soest, R.W.M., Stöhr, S., Walter, T.C., Vanhoorne, B., Decock, W. and Appeltans, W. (2013): Global Coordination and Standardisation in Marine Biodiversity through the World Resister of Marine Species (WoRMS) and Related Databases. PLoS ONE, **8**, e51629, doi:10.1371/journal.pone.0051629.

Hosie, G.W., Fukuchi, M. and Kawaguchi, S. (2003): Development of the Southern Ocean Continuous Plankton Recorder survey. Prog. Oceanogr., **58**, 263−284, doi:10.1016/j.pocean.2003.08.007.

Meilland, J., Fabri-Ruiz, S., Koubbi, P., Lo Monaco, C., Cotte, C., Hosie, G.W., Sanchez, S. and Howa, H. (2016): Planktonic foraminiferal biogeography in the Indian sector of the Southern Ocean: Contribution from CPR data. Deep Sea Res. Part I Oceanogr. Res. Pap., **110**, 75−89, doi:10.1016/j.dsr.2015.12.014.

Takahashi, K.T., Hosie G.W., Kitchener, J.A., McLeod, D.J., Stevens, C., Robinson, K., Jonas, T. and Fukuchi, M. (2011): Report on the Southern Ocean Continuous Plankton Recorder (SO-CPR) Standards Workshop: SCAR Expert Group on CPR Research. Nankyoku Shiryô (Antarctic Record), **55**, 279−286.