

Survey Newsletter

An update from the
Australian Continuous Plankton (AusCPR) Recorder Survey

Australian Continuous Plankton Recorder Survey (AusCPR)

The Australian Continuous Plankton Recorder (AusCPR) survey measures plankton communities as a guide to the health of Australia's oceans. It is part of the Ships of Opportunity (SOOP) Facility in Australia's Integrated Marine Observing System (IMOS) and is jointly operated by CSIRO Marine and Atmospheric Research (CMAR) and the Australian Antarctic Division (AAD).

A note from the AusCPR project directors...

Anthony J. Richardson (CSIRO/UQ) & Graham Hosie (AAD)

Thanks once again for taking the time to browse through our fourth newsletter. The motivation for this 6-monthly newsletter is to give people more information about what the AusCPR survey is, what we do, and what data are available.

Following the announcement in the last newsletter of **new routes starting in Northern Australia**, we have now performed 4 tows in the **Northwest Cape** aboard the RV Solander and 2 tows on the GBR aboard the RV Cape Ferguson. We thank AIMS for their continued support and particularly Craig Steinberg for his assistance. We have also just completed a successful pilot tow from **Brisbane to Fiji** for PI-GOOS (Pacific Island Global Ocean Observing System). Thanks to Dr Phillip Wiles the coordinator of PI-GOOS for making this happen. We are keen to help develop a CPR survey in the **Pacific region**. We are also planning to tow between **New Zealand and Tasmania** aboard the fishing vessel *Rehua* in June and we would like to thank Ryan Downie from CSIRO, collaborators from New Zealand and crew and staff from Australian Longline / Sealord / Petuna for assisting with logistics for these tows.

We are entering a new phase in AusCPR – a concerted push toward value-added products to demonstrate the usefulness of our data and to better serve the community. You will see the fruits of these over the next year. Three products are worth mentioning here. The first is the **Australian Zooplankton Taxonomic Guide and Atlas** with Dr Kerrie Swadling from University of Tasmania, that builds on the two previous editions of the south eastern Australian taxonomic guide. This guide and atlas will be useful for students beginning to identify zooplankton and also more advanced para-taxonomists. We are compiling taxonomic reference sheets and distribution maps for 200 species of zooplankton, and these will be freely available by the end of the year on a website. The second product is a **Tropical Australian Phytoplankton Taxonomic Guide**. This will be a long-term collaboration with Professor Gustaaf Hallegraeff from the

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University of Tasmania, and follow on from his highly successful 2010 book on Phytoplankton in Temperate Australian Waters. The taxonomy of tropical phytoplankton is currently very poorly documented, this book will take several years to complete and will fulfill a global need. We are seeking additional support for these taxonomic products.

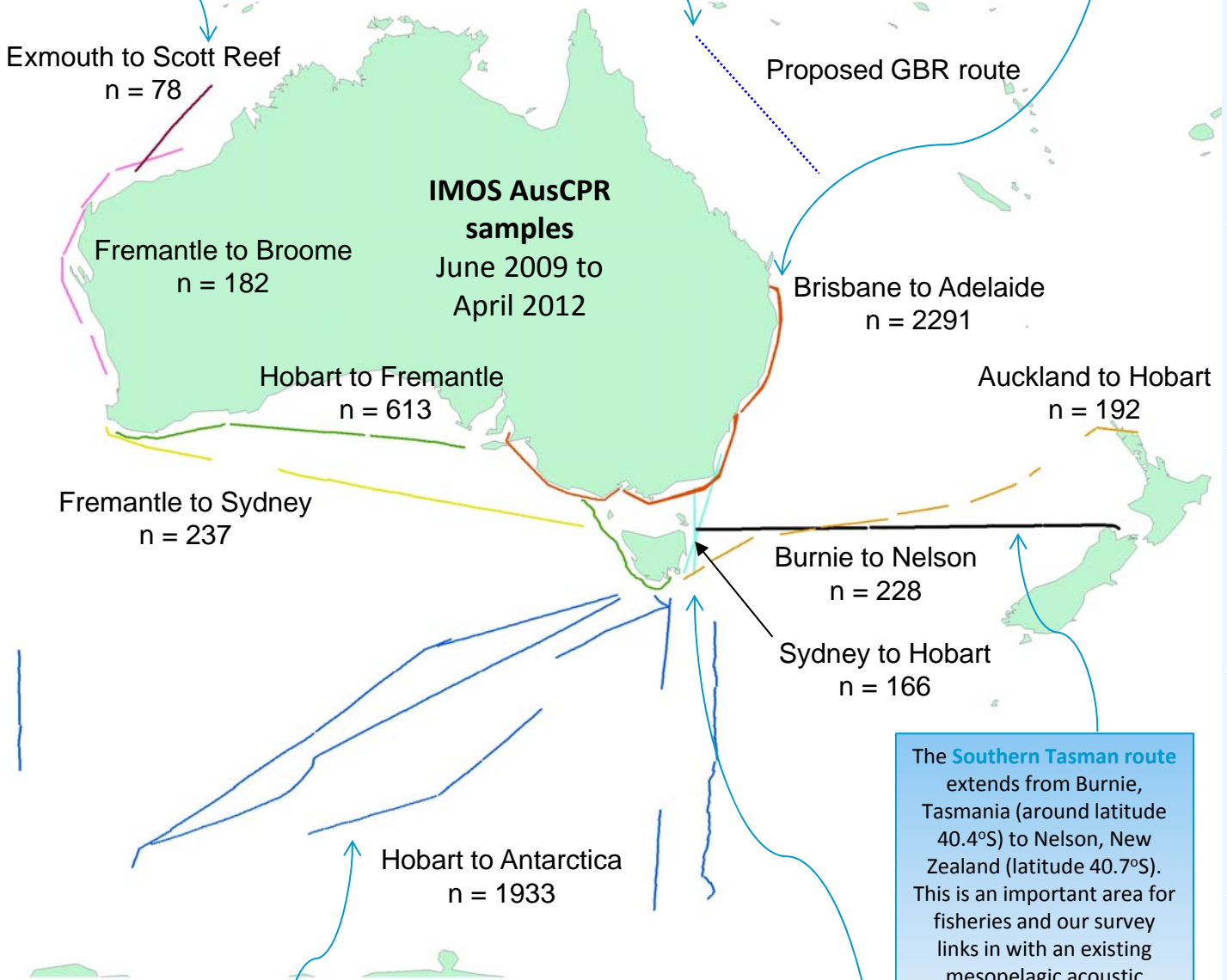
The last product we are working on is the **Plankton Ecosystem Assessment Report** for IMOS and CSIRO Wealth from Oceans. This will be a regular product that will summarise the major changes in the state of the base of the foodweb around Australia, using data from the IMOS Australian Continuous Plankton Recorder survey (AusCPR) and the National Reference Stations (NRS). It will be organised around key themes important for marine managers including climate change, ocean acidification, productivity supporting fisheries, biodiversity, ecosystem health and marine litter. Wayne Rochester (CSIRO) has been working hard to develop new visualisation tools for the Report. We thank Tim Moltmann, Director of IMOS, and David Smith (CSIRO) for their support.

Finally, we have a **curated archive** of all our samples dating back to 2008 that is available to the research community. We are currently providing specimens of **forams** for Dr Aradhna Tripathi from the University of California Los Angeles to compare with the fossil record, and Dr Luigi Vezzulli (University of Genoa, Italy) investigating the increase in marine vibrio virus as temperatures warm. Contact us if you are interested in using the archive.

The new **WA route** is likely to run between latitude 12.3°S to latitude 21.8°S down the Leeuwin Current. The north-west region has potential for strong development of industries such as gas and mining. We will be working in collaboration with the Australian Institute of Marine Science (AIMS).

The **GBR route** will extend from approximately latitude 14.3°S to latitude 23.4°S. The Great Barrier Reef is an area likely to be strongly affected by warming and ocean acidification. We will be working in collaboration with the Australian Institute of Marine Science (AIMS).

The **EAC route** extends from Brisbane (Queensland, latitude 27°S) to Adelaide (South Australia, latitude 34°S) down the east coast of Australia and follows the southward-flowing warm-water East Australia Current. This region is forecast to warm more than anywhere else in the Southern Hemisphere this century.



The **Southern Tasman route** extends from Burnie, Tasmania (around latitude 40.4°S) to Nelson, New Zealand (latitude 40.7°S). This is an important area for fisheries and our survey links in with an existing mesopelagic acoustic survey.

The **Southern Ocean routes** below Australia are conducted by the SCAR SO-CPR Survey through the AAD and NIPR Japan, with support of the AusCPR. These routes extend from just south of Australia to the sea-ice edge or the Antarctic continent. Together with the EAC route, the Southern Ocean sampling allows an almost continuous transect running between the warm tropical waters of QLD and the cold polar waters of the Antarctic.

The **TAS route** extends down the east coast of Tasmania, which is also subjected to the influence of the EAC. There is already some evidence of warm-water species moving southward.

Plankton data update

Route	Start	Ship	Freq	Dist (nm)	Tows	# PCI Samples	# Phyto samples	# Zoo Samples	Total phyto taxa	Total zoo taxa
Brisbane – Sydney	Jun 2009	ANL <i>Windarra</i>	2 monthly	5199	13	897	227	228	101	383
Sydney – Melbourne	Jun 2009	ANL <i>Windarra</i>	2 monthly	6662	13	1107	281	280	82	339
Melbourne – Adelaide	Sep 2010	ANL <i>Windarra</i>	2 monthly	2735	3	260	80	65	48	175
Sydney – Hobart	Sep 2010	<i>Southern Surveyor</i>	ad hoc	409	1	82	20	20	19	121
Burnie – Nelson	Aug 2010	<i>FV Rehua</i>	annual	1143	1	228	57	57	30	101
Fremantle – Broome	April 2010	<i>Southern Surveyor</i>	ad hoc	698	1	182	21	3	64	80
Exmouth– Scott Reef	Nov 2011	<i>RV Solander</i>	quarterly	1200	4	-	-	-	-	-
Great Barrier Reef	April 2012	<i>RV Cape Ferguson</i>	quarterly	200	1	-	-	-	-	-
Australia – Antarctica*	Nov 2008	RSV <i>Aurora Australis</i>	spring to autumn	12790	37	2558	2426	2558	92	179

* This is a part of ~35,000 data records (175,000 nmiles) from 646 tows, for 240 zooplankton and 83 protistan taxa available from the SO-CPR survey that has been operating for the past 22 years.



Above left: The ANL *Windarra* (Image: Les Blair www.marinetraffic.com).

Above right: The RSV *Aurora Australis* (Image: AAD).

Bottom left: The *FV Rehua* (Image www.action-engineering.co.nz).

Bottom right: The *RV Southern Surveyor* (Image: Edwina Hollander, CSIRO www.scienceimage.csiro.au).

Improved availability of all IMOS plankton data

Claire Davies

Over the last few months we have been working to make our data more easily accessible through the IMOS data portal (<http://imos.aodn.org.au/webportal/>) including information from AusCPR and the IMOS National Reference station, through a CSIRO hosted public web server (<http://www.cmar.csiro.au/geoserver/web/>). To access the data click layer preview, and search on "imos". Six layers will then appear. The maps depict samples from which data is available, download this data (formats in particular, WFS Formats: CSV, shapefile) to use in your data software of choice. This data server is a work in progress and will be continually improved to allow easy access to our data.

Our data are also being made publicly available through the Global Alliance of CPR surveys (<http://www.globalcpr.org/about-gacs.aspx>), Atlas of Living Australia (<http://www.ala.org.au/>), OBIS (<http://www.iobis.org/>) and NOAA's copepod website (<http://www.st.nmfs.noaa.gov/plankton/>). Making plankton data from IMOS are available through the major databases for marine biological data will ensure global uptake and maximum scientific benefit. Through these sites global plankton data is available to search, download and analyse for all your project needs. For more information about AusCPR and the Australian National Mooring Network zooplankton data, please contact imos-plankton@csiro.au.

CPR detects the red-tide dinoflagellate *Noctiluca scintillans* in the Southern Ocean for the first time

David J. McLeod, Gustaaf M. Hallegraeff, Graham W. Hosie and Anthony J. Richardson

Noctiluca scintillans is a red-tide forming, heterotrophic dinoflagellate that was found for the first time in the Southern Ocean ($45^{\circ} 31' S 147^{\circ} E$) in December, 2010. The 'bloom' of *Noctiluca* extended over 242 km and was detected during a CPR transect conducted between Tasmania and Antarctica as part of the Southern Ocean CPR (SO-CPR) and Australian CPR (AusCPR) Surveys. This record of *Noctiluca* is the most southerly, oceanic record globally and can be linked to the intensification of the East Australian Current (EAC), a situation apparently caused by altered circulation patterns associated with global warming.

The east coast of Australia has been recognised as a climate change 'hotspot' and poleward migrations of a number of species in the region have already been documented including phytoplankton, zooplankton, invertebrates and coastal fish. On present evidence, the current observation of *Noctiluca* in the Southern Ocean is an extension of coastal Tasmanian populations. Sea surface height and sea surface temperature data at the time indicated that a warm-water eddy of the EAC extending to Tasmania and beyond provided a potential vector for the transport of *Noctiluca* offshore into a cool, oceanic environment not generally associated with this organism. *Noctiluca* is thought to be a neritic species with oceanic occurrences uncommon.

Noctiluca cells found in this study appeared 'healthy' and 'well-fed', seemingly full of mainly diatom prey. This indicates that despite their apparent unplanned venture into the oceanic environment they were able to feed on Southern Ocean productivity. Data from the same CPR transect showed that copepod abundance was apparently limited by the presence of the *Noctiluca* indicating potential competition for food. If viable populations of *Noctiluca* become established in the Southern Ocean in the future, there is likely to be additional competition for phytoplankton with copepod grazers, with unknown effects for the food web. Given predictions that the EAC is likely to continue to strengthen and transport more warm water and eddies further south there may be more frequent seeding of *Noctiluca* into cooler waters in the future and it could become resident in the Southern Ocean.

Results of this research have recently been published and highlighted on the front cover of the journal: McLeod et al., (2012) Climate-driven range expansion of the red-tide dinoflagellate *Noctiluca scintillans* into the Southern Ocean. *J. Plankton Res.* (2012) 34 (4): 332-337.



Copepods from the waters off North Stradbroke Island, QLD Anita Slotwinski



Update from the Brisbane, Queensland Team

Frank Coman

The Brisbane laboratory has been busy since October last year. AusCPR staff have continued to count both continuous plankton recorder samples and also zooplankton samples from the national reference station (NRS) project. Staff from the Brisbane and Hobart laboratories will also be taking over counting the NRS phytoplankton samples later this year, when Pru Bonham from CSIRO Hobart retires. In preparation, staff from Brisbane and Hobart attended training in Hobart with Pru and other invited experts (Gustaaf Hallegraef, David Thomas and Ruth Eriksen) in March where we covered more taxonomy and also the protocol for microscope counting of the NRS phytoplankton samples. Prior to this training, Claire and Frank also attended an NRS workshop in Hobart to ensure sampling at all sites around Australia is being conducted in a consistent manner. After the phytoplankton training, all AusCPR zooplankton counters, including Joanna Strzelecki from Western Australia, attended informal training on separating copepod nauplii into calanoids, cyclopoids and harpacticoids. This training was conducted by Felipe Gusmao (CSIRO) at the AAD laboratories at Kingston.

Julian Uribe has continued to assist Felipe Gusmao by sorting samples collected for the ARC linkage project on Moreton Bay. Anita has attended a course on describing new species and the staff have been involved in extra field sample trips, including sampling in 100 m of water to collect samples for Lydie Courtier's PhD on manta rays, and also assisting on a university field course on links between oceanography and biology conducted at North Stradbroke Island.

Since the last newsletter the team at the Queensland laboratory has made deployments between Brisbane and Adelaide, in December and April, but the Windarra was in dry dock in February, so no samples were collected then. We were also able to collect samples from the Southern Surveyor between Hobart and Brisbane in April, and have prepared cassettes on board the vessel again to sample between Brisbane and Fiji. We have now also began a collaboration with AIMS (Australian Institute of Marine Science) to tow CPRs behind two of their research vessels; the RV Solander which works off the North West coast of Australia and the RV Cape Ferguson which works along the Great Barrier Reef, the first tows off both these vessels were completed in this period, and more are planned for the very near future.

Sampling at the National Reference station at North Stradbroke Island has continued most months, however persistent big swells have meant we have only been able to get out on a couple of occasions since the beginning of 2012. In October Jurgen Baly Zier from the school of Engineering at Griffith University came along on a sampling trip to see the viability of sampling water turbulence. In April we received equipment to begin collecting microbial molecular samples for Mark Brown and Lev Bodrossy, and we will begin to take these samples from the next sampling trip. The Zooscan system arrived in the lab late last year, but due to some software compatibility issues and problems with the hardware in the computer it has taken a while to get this system fully functional, but we do hope to have this up and running very soon.

Update from the Hobart, Tasmania Team

Dave McLeod

Since the last newsletter in October 2011, 18 CPR tows have been conducted in the Southern Ocean south of Australia from the RSV *Aurora Australis* by the AAD led SCAR SO-CPR Survey, supported by AusCPR. Thanks to captain, crew and volunteers for continuing to deploy and retrieve the CPR time after time for us. We have also prepared for upcoming tows using the RV *Southern Surveyor* including tows from Hobart to Brisbane and Brisbane to Fiji (now there is a cruise you want to be on!). In addition, we are again aiming to utilise the FV *Rehua* this year in August and collect samples from Tasmania across the Tasman Sea to New Zealand. This route is of particular interest due to concurrent acoustics work being undertaken on the same vessel by a CSIRO research group led by Rudy Kloser. There is certainly no shortage of samples to be processed.

We have also updated components of our microscopes at the Hobart lab so that all laboratories counting AusCPR samples now have the same microscope and very similar camera set-ups (see image below). It makes it so much easier with a quality microscope and quality control.



Hobart was recently home to the CSIRO Marine and Atmospheric Symposium which gathered around 400 CSIRO scientists from around the country together in Hobart (see article in this newsletter). It was a good opportunity for the AusCPR team to get together in the one location. On the weekend, a few of the team went to Bruny Island (just south of Hobart) for a couple of nights and did some walking, relaxing, beach cricket and attempted some fishing which was thwarted by a rather strong north west wind. Back in Hobart, it was also a good opportunity whilst all together for some plankton training. We had two days at CSIRO in Hobart being looking at phytoplankton under the expert guidance of Pru Bonham and Gustaaf Hallegraef. We also spent some time at the Antarctic Division learning how to separate copepod nauplii into the three major groups; calanoid, cyclopoid and harpacticoid by Dr. Felipe Gusmao. Both very useful exercises for the group in continuing to develop our skills and we must thank Pru, Gustaaf and Felipe for their time and expertise.

Update from the Floreat, Western Australian Team

Joanna Strzelecki

The Western Australian team has been busy working on plankton samples from the Fremantle to Broome AusCPR route, and the Ningaloo, Esperance and Rottneest Island National Reference Station samples. Recent observations and highlights include:

- Processed zooplankton samples from NRS and CPR are dominated by small copepods: juveniles and species of *Paracalanus*, *Clausocalanus*, *Oithona*, *Oncaea*, and *Corycaeus*. Non copepod species include mostly: Chaetognatha (arrow worms), Oikopleuridae (larvaceans), *Penilia avirostris* and *Evadne* spp (water fleas)
- *Trichodesmium* is present in many NRS samples
- *Noctiluca scintillans* was seen in NRS sample from Esperance from October 2010. The very first time *Noctiluca scintillans* was identified in Western Australian waters was in Esperance in 2008 ((Esperance report August, September 2008 Issue, no 4) (http://www.esperanceport.com.au/downloads/Report/rePORT_Aug_08_nr4.pdf)). It was thought that it reached Esperance from North in Leeuwin Current. In summer 2010/2011 water temperatures off the SW coast of WA heated more than 3°C above the long term monthly average (Fisheries Research Report No 222, 2011). This was associated with strong La Nina and strong Leeuwin Current. Biological observations included fish and invertebrate deaths, catches of tropical fish, coral bleaching and discoloured water suggesting plankton bloom.

Taxonomy Workshop

Anita Slotwinski

I participated in a taxonomy workshop from the 16-27 Apr 2012 at the Sven Lovén Centre for Marine Sciences in Kristineberg, Sweden, sponsored by the Royal Swedish Academy of Sciences on species description, including digital drawing, scientific illustration, and writing taxonomic publications. This has provided me with strategic skills that will help improve the taxonomic skills of our lab. Thank you to CSIRO for making Early Career Development Funds available .



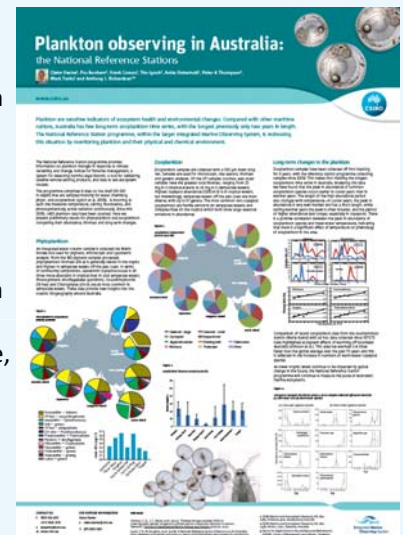
Right: Prof. Tomas Cedhagen, from the Department of Marine Ecology, University of Aarhus, Denmark demonstrating traditional scientific illustration materials.

CMAR Science Symposium

Mark Tonks

From the 19th – 22nd March the AusCPR team attended CSIRO'S Marine and Atmospheric Research Science Symposium in Hobart. Anthony Richardson spoke about climate change ecology while Frank Coman spoke about our IMOS plankton research associated with the National Reference Stations and the use of CPR' s on the various routes around Australia. Frank's talk was a prelude to posters presented by Claire Davies and Anita Slotwinski, which were well attended by many of the symposiums participants. Claire won an award for her poster (see right) – well done!

The symposium provided an opportunity to hear about the broad range of research that CSIRO is undertaking, particularly with respect to understanding the possible effects of climate change on marine and atmospheric systems. On a personal note, I enjoyed a tour of the Australian National Fish Collection, which contains one of the most diverse collections of Australasian fishes in the world.



If you would like to join the

Friends of the AusCPR Survey

mailing list and receive newsletters and updates on research and developments please email Anita.Slotwinski@csiro.au

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Visit the AusCPR website at <http://imos.org.au/auscpr.html>

Visit the NRS website at <http://imos.org.au/anmnrs.html>

Further team contact details can be located at <http://imos.org.au/australiancontinuousplanktonr6.html>

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IMOS is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy and the Super Science Initiative



Australian Government
Department of Innovation, Industry, Science and Research