

The Continuous Plankton Recorder Recorder (CPR) Survey



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What is the CPR Survey?

The Continuous Plankton Recorder (CPR) is an instrument that is towed behind ships (e.g. research vessels or commercial ships), collecting plankton onto a band of silk that is preserved for later analysis in the laboratory. The CPR Survey was founded in 1931, by the organisation formerly known as the Sir Alister Hardy Foundation for Ocean Science (SAHFOS), and is the longest-running, most geographically extensive marine biological survey in the world. In April 2018, the CPR Survey was incorporated in the Marine Biological Association (MBA), based in Plymouth, UK.

As of 2017, the Survey has towed over 6.5 million nautical miles. Over the years, the instrument has been augmented by adding sensors for physical and chemical measurements (e.g. temperature, salinity, depth, chlorophyll, microplastics, oxygen, nutrients), and more recently a Water and Microplankton Sampler (WaMS), aimed at the smaller size-fraction plankton community (e.g. flow cytometry, molecular probes and barcoding, Harmful Algal Bloom microarrays). A pCO₂ instrument is also in development.

Why are biological observations important?

Marine biological datasets provide a wide range of environmental and climatic indicators to address marine environmental management issues such as Harmful Algal Blooms, pollution, climate change and fisheries. Time-series data are vital to be able to track changes over time in populations, migrations and ecosystem health, particularly in the context of global climate change.

CPR data are used to produce “applied ecological indicators,” which provide information that can be easily understood and used for policy and environmental management. This information includes trends in climate change impacts, biodiversity and invasive species, ecosystem health and ocean acidification. These trends are published, together with a very concise, 1-page summary for policy makers by the CPR Survey and the Global Alliance of CPR Surveys (GACS) every two years in their Global Marine Ecological Status Report (<https://www.cprsurvey.org/publications/scientific-reports/ecostatus-reports/>).



Preparing the Continuous Plankton Recorder. Photo: Philipp Wenta



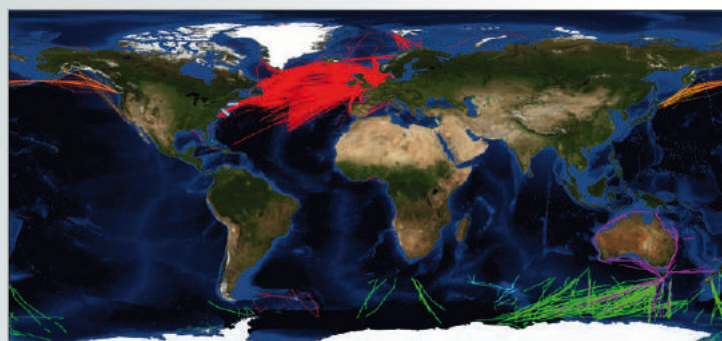
The Continuous Plankton Recorder. Photo: The CPR Survey

Going Global

GACS was established in 2012 to understand changes in plankton biodiversity at ocean basin scales through a global network of CPR surveys. An important goal was the creation of a centralised global database unifying all the data collected by various CPR surveys around the world, but also to establish common standards and methodologies and to facilitate new surveys through capacity building in different regions of the world. To date, 10 regional surveys have joined GACS, including well-established surveys in Australia, Brazil, France, Japan, New Zealand and South Africa. Our newest surveys are now operating in Cyprus and India.



Where are the gaps?



Map showing current coverage of CPR surveys. Image: Rob Camp, CPR Survey

Although progress has been made in expanding the coverage of CPR surveys, there are still large gaps, particularly in the sub-tropical and tropical regions of the Atlantic, Pacific and Indian Oceans. Through capacity building, and in collaboration with the Partnership for Observation of the Global Oceans (POGO) and other international organisations, GACS and the CPR Survey aim to fill these gaps by providing training for scientists and technicians who want to set up their own CPR survey. After the training, these scientists are invited to join GACS as a forum for sharing of data, best practices and mutual support.

Success Stories

1. India

The first successful Continuous Plankton Recorder (CPR) tow in Indian waters was set up in 2017 by Dr R. Jyothibabu, a researcher from the National Institute of Oceanography, India.

Following an intensive training period at the CPR Survey, supported by a POGO travel fund, Jyothibabu returned to India to join a 25-day cruise in the Bay of Bengal on board the ORV Sindhu Sankalp. During this cruise, the inaugural CPR tow in these waters was completed by Jyothibabu and his research group, enabling them to collect marine plankton along an 80 mile transect.

Jyothibabu was involved in a project called VACCIN (Vulnerability Assessment and development of adaptation strategies for Climate Change Impact with special reference to coasts and Island ecosystems of India), which included the use of a CPR as an efficient platform to monitor the marine plankton.

2. Cyprus

The Mediterranean CPR survey (MedCPR), is operated by The Cyprus Institute, to address the glaring lacuna of open sea plankton data in the south-western part of the Mediterranean Sea.

The FP7 EU project PERSEUS funded the initial establishment of the survey, which was facilitated by GACS and the CPR Survey. The technician's training course, the CPR device and sampling equipment were procured through the CPR Survey, which also provided advice and guidance regarding analysis

equipment and laboratory consumables through the plankton identification training, funded by GACS and the CPR Survey. Analysed samples from monthly CPR tows in the Mediterranean provide information on the oligotrophic status south of Cyprus and the effect of mesoscale oceanographic features on zooplankton production south of the Eratosthenes Seamount. Through GACS, The Cyprus Institute has the opportunity to improve operational and analysis techniques, learn about advancements and uses of CPR data, and exchange information and ideas as part of the growing CPR community.

3. NoSoAT CPR tow from Germany to South Africa

In November 2015, the North South Atlantic Transect floating summer school on board RV Polarstern sailed from Bremerhaven in Germany to Cape Town, South Africa. The summer school, organised jointly by the Alfred Wegener Institute (AWI), the Strategic Marine Alliance for Research & Training (SMART) and the Nippon Foundation-Partnership for Observation of the Global Oceans (POGO) Programme, was designed to provide participants with a thorough insight into the fundamental principles of biological oceanography, with an emphasis on 'hands on' practical experience including CPR sampling.

The cruise covered a large biogeographic range with different hydrographic regimes, and the NoSoAT survey aimed to investigate and characterise the different regimes, biomes and the ecological geography of the Atlantic Ocean. The CPR, on loan from the CPR Survey, was deployed with the specific aim of introducing the summer school participants to the device. Maarten Boersma, biological oceanographer at AWI, who had received prior training at the CPR Survey, was in charge of the CPR and teaching/supervising the students in how to load the internals, check the body and deploy the instrument. For him, this was a perfect opportunity to test whether the CPR could be safely deployed from Polarstern, and to assess how much it might interfere with other activities on board, and the level of supervision required for regular deployment.

The whole cruise was a great success. The instrument was in the water for over 6000 miles without a hitch, and they have since been investigating the possibility of making the CPR deployment a more permanent activity during Polarstern cruises.

How do I set up a CPR survey?

1. Determine whether the CPR is suitable for your needs and whether you have the necessary resources (financial, manpower, expertise in plankton analysis and ship availability) to be able to run a survey – see <https://www.cprsurvey.org/services/cpr-guide/> for frequently asked questions.
2. Acquire a CPR, either by purchasing or renting one from the CPR Survey (cost available on request from cprsurvey@mba.ac.uk).
3. Attend a training course on CPR maintenance, setting up and deployment, sample processing and preservation. The CPR Survey offers two IMarEST-accredited training courses. The training is not included as part of the cost of purchasing or renting the CPR, so it is important to factor the training cost into your budget.
4. Source a volunteer ship or research vessel that will tow your CPR. The ship must be operating in open waters, at a speed between 8 and 25 knots and for a minimum of 30 nm (recommended 70nm – see <https://www.cprsurvey.org/services/cpr-guide/> for additional specifications). The CPR Survey "ship liaison" training course will help with the volunteer ship aspects.
5. Sample analysis: if you do not have the capacity/expertise, this can be done by the CPR Survey, or you can attend a training course in the analysis of plankton samples (e.g. International Marine Phytoplankton Workshop, International Marine Zooplankton Workshop or 6-week intensive plankton identification training).
6. Join GACS to interact with and learn from other members of the global community (e-mail gacs@mba.ac.uk) - this can be done at any stage of the process, not necessarily at the end!

How can POGO and other organisations help?

There are a number of opportunities to apply for funding to receive training. For example:

POGO-SCOR fellowships:

<http://ocean-partners.org/pogo-scor-fellowship>

NF-POGO Shipboard Training fellowships:

<http://ocean-partners.org/research-cruise-training>

POGO members can apply for funding to organise/host training courses:

<http://ocean-partners.org/proposals>

SCOR Visiting Professorship:

http://www.scor-int.org/SCOR_Visiting_Scholars.htm

SCAR Visiting Professorship:

<https://www.scar.org/awards/visiting-professors/overview/>