

Derived indices CPR product

Product Specification

Document Change Control

Version Number	Date of Issue	Brief Description of Change
Version 0.1	06/09/2021	Draft version for review and comment
Version 0.2	03/08/2022	Final

Introduction

Summary

This dataset includes derived indices obtained from the Continuous Plankton Recorder (CPR) data, as part of the Australian Plankton Survey (AusCPR) and phytoplankton from the Southern Ocean Continuous Plankton (SO-CPR). The dataset comprises the phytoplankton colour index (PCI), as an estimate of the amount of chlorophyll in the water. The colour of the silk is measured using Pantone colour charts against a numeric scale indicating increasing greenness or chlorophyll.

- 0 - No colour
- 1 - Very Pale Green
- 2 - Pale Green
- 3 - Green

To understand how CPR plankton data is analysed we recommend reading Richardson et al., 2006. All parameters included in this product are derived from data already provided in other CPR collections.

Product Specifications

General information

Product name	Derived indices CPR product
Geographic coverage	Australian coastal, open ocean region and Southern Ocean
Temporal coverage	2007 -- present
Temporal resolution	Variable
Update frequency	Weekly
Delivery mechanism	AODN Portal OGC WFS
Format	CSV

Details of product contents

Name	Description	Units/ format	Data type
TripCode	Code for the sampling trip	<station_code> YYYYMMDD	string
Sample_ID	Unique code for sampling trip		string
Latitude	Nominal latitude (North) of the station where sample was collected	Degrees (deg)	double precision
Longitude	Nominal longitude (East) of the station where sample was collected	Degrees (deg)	double precision
SampleTime.UTC	UTC date and time of sample collection	YYYY-MM-DD HH:MM:SS	string
SampleTime_Local	Local date and time of sample collection	YYYY-MM-DD HH:MM:SS	string
Year_local	Year of sample collection	YYYY	integer

Month_local	Month of sample collection	MM	integer
Day_local	Day of month of sample collection (local time)	DD	integer
Time_local24hr	Local 24hr time of sample collection	HH:MM	string
PCI	Phytoplankton colour index		integer
BiomassIndex_mgm3	Total mass of living organisms in sea water	Milligrams per cubic metre (mgm ⁻³)	real
Region	Oceanic region		string
ZoopAbundance_m3	Number of zooplankton animals in sea water	Number of taxon (defined as any zooplankton) per cubic metre (taxon m ³)	real
CopeAbundance_m3	Number of copepods in sea water	Number of taxon (defined as any copepods) per cubic metre (taxon m ⁻³)	real
AvgTotalLengthCopepod_mm	Mean total length of copepods	Millimetres (mm)	real
OmnivoreCarnivoreCopepodRatio	Ratio between omnivorous to carnivorous copepods	N/A	real
NoCopepodSpecies_Sample	Number of copepods species per sample	N/A	real
ShannonCopepodDiversity	Shannon diversity index for copepods	N/A	real
CopepodEvenness	Shannon evenness index for copepods	N/A	real
PhytoBiomassCarbon_pgm3	Total phytoplankton carbon	Picograms per metre cube (pgm ⁻³)	real

		³⁾	
PhytoAbundance_Cells_m3	Total number of any phytoplankton cells in sea water	Phytoplankton cells per litre (cells m ⁻³)	real
DiatomDinoflagellateRatio	Ratio between Diatoms to Dinoflagellates	N/A	real
AvgCellVol_um3	Mean biovolume of phytoplankton cells	Cubic micrometres (μm ⁻³)	real
NoPhytoSpecies_Sample	Number of phytoplankton species per sample	N/A	real
ShannonPhytoDiversity	Shannon diversity index for phytoplankton	N/A	real
PhytoEvenness	Shannon evenness index for phytoplankton	N/A	real
NoDiatomSpecies_Sample	Number of diatoms species per sample	N/A	real
ShannonDiatomDiversity	Shannon diversity index for diatoms	N/A	real
DiatomEvenness	Shannon evenness index for diatoms	N/A	real
NoDinoSpecies_Sample	Number of dinoflagellates per sample	N/A	real
ShannonDinoDiversity	Shannon diversity index for dinoflagellates	N/A	real
DinoflagellateEvenness	Shannon evenness index for dinoflagellates	N/A	real

Indices specification

Biomass

This index includes the total mass of living organisms in sea water collected through the CPR. Thus, values provided by this parameter comprise the organic carbon from the plankton.

Abundance

Abundance is measured here as total number of elements (or individuals) for a specific taxon in sea water. This derived product is provided for phytoplankton (total number of cells), zooplankton and copepods (total number of animals).

Mean total length of copepods

This index provides the mean total length of copepod in the sample.

Mean volume of cells

This index provides the mean volume of a phytoplankton cell in the sample, calculated from the individual cell size, cell morphology and cell abundance.

Total phytoplankton carbon

Total mass of phytoplankton as carbon is calculated using standard conversion factors of biovolume to carbon for each cell, then summed (Montagnes-Berges 1994, Menden-Deuer & Lessard 2000, Verity & Langdon 1984, Vogt et al 2012, Caron et al 1995).

No of species in sample

Provided for copepods, phytoplankton, diatoms, dinoflagellates as an indicator of richness.

Shannon diversity

The Shannon diversity index is a statistical metric used to quantify rarity and commonness of species in a population. Indeed, Shannon diversity accounts for both species richness (the number of species present) and species abundance (the number of individuals per species) in the analysed population. This index is provided for copepods, phytoplankton, diatoms and dinoflagellates.

Shannon evenness

Shannon evenness provides a measure of biodiversity in the population analysed. The Shannon evenness index is derived from the Shannon diversity index, dividing Shannon diversity by its maximum. Thus, Shannon evenness can vary between 0 and 1, where 1 represents a complete evenness of the species in the analysed population. In this product the Shannon evenness index is provided for copepods, phytoplankton, diatoms and dinoflagellates.

Product delivery

Format

The parameters of this product are available in comma-separated values (CSV) format.

AODN Portal

Dataset collections:

- **IMOS Continuous Plankton Recorder (CPR) - Derived indices product**

The specific product is selected under the *Download as...* drop-down menu on Step 3.

The collections can be subset by

- Geographic bounding box

- Temporal range
- Station name

AODN Geoserver

The product can be accessed via a Web Feature Service (WFS) query to the [AODN Geoserver](#). The relevant layers are:

- imos:cpr_derived_indices_data

The Web Map Service (WMS) layers used for preview in Step 2 on the AODN Portal is

- imos:cpr_derived_indices_map

Data Lineage

Provenance

Data presented in this product are derived from biological data collected from the Continuous Plankton Recorder (CPR) - AusCPR and SO-CPR. All data from which the indices presented here are derived are provided in other CPR products.

Harvest to AODN

The derived indices product is based on raw data harvested from the following WFS layers in the CSIRO Geoserver:

- **cpr_samp** - trip codes, sample codes, latitude, longitude plankton biomass index and PCI.
- **cpr_zoop_raw** - observed zooplankton abundances and taxonomic details of individual taxa identified in each sample
- **cpr_phyto_raw** - observed phytoplankton abundances and taxonomic details of individual taxa identified in each sample
- **zoopinfo** - classification of zooplankton diet

Processing at AODN

- Biomass: sum of the organic carbon from plankton.
- Abundance: sum of elements for every taxon.
- Mean total length of copepods: calculate the mean of all total length of copepod.
- Mean volume of cells: calculate the mean of all phytoplankton cells volume.
- Total phytoplankton carbon: sum of the phytoplankton carbon mass.
- No of species in sample: sum of specific taxon per samples.
- Shannon indices (diversity and evenness): Shannon indices calculations.

AODN Harvest Database schema

Schema name: imos_cpr_db

Tables to hold data & metadata harvested:

- cpr_samp
- cpr_zoop_raw
- cpr_phyto_raw
- zoop_info

Materialised views for Geoserver layers:

- cpr_derived_indices_data

Glossary and abbreviations

AODN	Australian Ocean Data Network
CSV	Comma-separated values
CPR	Continuous Plankton Recorder
IMOS	Integrated Marine Observing System
QC	Quality Control
WFS	Web Feature Service

References

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Montagnes D.J.S., Berges J.A., Harrison P.J., Taylor F.J.R. (1994) Estimating carbon, nitrogen, protein and chlorophyll *a* from volume in marine phytoplankton *Limnology and Oceanography*, 39 (1994), pp. 1044-1060

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