Water chemistry analysis of samples collected at the Carlsbad Desalination Plant along the coast of Southern California in 2014-2016 (Effluent Impacts on Coastal Ecology project)

Website: https://www.bco-dmo.org/dataset/564132
Data Type: Other Field Results
Version: 4
Version Date: 2016-09-22

Project
» Brine Discharge From Desalination Plants - Impacts On Coastal Ecology, Public Perception, and Public Policy (Effluent Impacts on Coastal Ecology)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:33.1459 **E**:-117.336641 **S**:33.1355 **W**:-117.35295
Temporal Extent: 2014-12-01 - 2016-11-30

Dataset Description

This dataset includes water chemistry results from samples collected at the surface and bottom water offshore of the discharge channel of Carlsbad Desalination Plant, Carlsbad Beach, California.

Related datasets:
Benthic macrofaunal abundance
Macrofauna species distribution
Phytoplankton cell count
Sediment fauna and plastic
Sediment grain size

Methods & Sampling

Samples were collected in a perimeter of ~1 km offshore of the discharge channel of Carlsbad Desalination Plant, Carlsbad Beach, California (33°08'18.9"N 117°20'21.3"W).

Samples were collected in four trips:
Pre-discharge: Dec 2nd-4th 2014 and Sep 21st-24th 2015.
Post-discharge: May 9th-12th 2016 and Nov 8th-11th 2016

Transect lines were deployed going from the discharge channel (Outflow) and the Intake to 1000 m offshore. Sampling was done every 25 m until 200 m offshore, then at 400, 600, 800 and 1000 m ("stations"). The "Parallel" transect ran continuous parallel to the beach ~200 m offshore and samples stations were deployed every ~100 m. Station 1 is the southern-most sampling point (south of discharge channel). At each station surface (~1 m depth) and bottom water samples were taken and a sediment sample.

The benthic surveys were done continuously at the first 200 m offshore if water conditions allowed. At station 400, 600, 800 and 1000 and on the parallel stations, 10 1x1m quadrates were deployed.

Water was filtered and preserved within 4 hours of collection

Temperature: Temperature was measured with a YSI 85 probe immediately after collection.

pH: pH was measured with a handheld pH probe

Salinity: Water samples were analyzed on a Guideline Portasal instrument.

Chl A: 250 ml seawater was pumped through a GFF filter and the filters were kept in the dark and frozen until analysis. Filters were treated with 90% acetone for 24 hours and analyzed on a TD-700 fluorometer.

Nutrients: Samples were filtered and immediately frozen. Samples were analyzed using a flow injection nutrient auto-analyzer (Lachat). Total nitrogen is determined as nitrate following oxidation with persulphate and UV radiation and total dissolved phosphorus as phosphate following UV radiation.

DOC: 50 ml filtered water was acidified with concentrated HCl. Samples were analyzed on a Shimadzu TOC-V CHS

Data Processing Description

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- added year column
- sorted data by year, site, direction, station, depth

Version 1: 2015-08-03
Version 2: 2015-08-11 (added lat_site/lon_site for mapping purposes)
Version 3: 2016-09-21 (added 2015 data)
Version 4: 2017-09-22 (revised 2014 data and added 2016 data)

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Data Files

File
effluents_chemistry_v4.csv(Comma Separated Values (.csv), 22.78 KB) MD5:611ebd13dd40a98b3d390df84aedf216 Primary data file for dataset ID 564132

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Parameters

Parameter	Description	Units
year	sampling year	unitless
date_Fieldtrip	local date of field sampling formatted as Mon-yyyy	unitless
Site	sampling location: either near intake or outfall	unitless
location_water_col	relative sampling location within the water column: surface or bottom	unitless
Station	distance along transect line	meters
Latitude	latitude; north is positive	decimal degrees
Longitude	longitude; east is positive	decimal degrees
Salinity	salinity	PSU
Temp	temperature	degrees Celsius
Chl_A	chlorophyll-a concentration	umol/L
pH	pH of water	unitless
Dissolved_organic_carbon	Dissolved Organic Carbon concentration	? micromole Carbon/liter
NO3	nitrate concentration	micromoles/liter
PO4	phosphate concentration	micromoles/liter
SiO	silicate concentration	micromoles/liter

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	flow injection nutrient auto-analyser (Lachat)
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	handheld pH probe
Generic Instrument Name	pH Sensor
Generic Instrument Description	An instrument that measures the hydrogen ion activity in solutions. The overall concentration of hydrogen ions is inversely related to its pH. The pH scale ranges from 0 to 14 and indicates whether acidic (more H+) or basic (less H+).

Dataset-specific Instrument Name	
Generic Instrument Name	Salinometer
Dataset-specific Description	Guideline Portasal
Generic Instrument Description	A salinometer is a device designed to measure the salinity, or dissolved salt content, of a solution.

Dataset-specific Instrument Name	Shimadzu TOC-V CHS
Generic Instrument Name	Shimadzu TOC-V Analyzer
Dataset-specific Description	Used to measure dissolved organic carbon concentrations
Generic Instrument Description	A Shimadzu TOC-V Analyzer measures DOC by high temperature combustion method.

Dataset-specific Instrument Name	TD-700 flourometer
Generic Instrument Name	Turner Designs 700 Laboratory Fluorometer
Dataset-specific Description	Used to measure chlorophyll-a
Generic Instrument Description	The TD-700 Laboratory Fluorometer is a benchtop fluorometer designed to detect fluorescence over the UV to red range. The instrument can measure concentrations of a variety of compounds, including chlorophyll-a and fluorescent dyes, and is thus suitable for a range of applications, including chlorophyll, water quality monitoring and fluorescent tracer studies. Data can be output as concentrations or raw fluorescence measurements.

Dataset-specific Instrument Name	
Generic Instrument Name	Water Quality Multiprobe
Dataset-specific Description	YSI 85 Handheld Oxygen, Conductivity, Salinity, mg/L C and Temperature System
Generic Instrument Description	An instrument which measures multiple water quality parameters based on the sensor configuration.

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Deployments

Paytan_2014

Website	https://www.bco-dmo.org/deployment/564163
Platform	shoreside Carlsbad Desalination Plant
Start Date	2014-12-02
End Date	2014-12-04
Description	study of desalination plant effluent

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Project Information

Brine Discharge From Desalination Plants - Impacts On Coastal Ecology, Public Perception, and Public Policy (Effluent Impacts on Coastal Ecology)

Website: http://desalinationucsc.weebly.com

Coverage: Carlsbad, California

Description from NSF award abstract:
Desalination of seawater accounts for a worldwide water production of about 70 million cubic meters per day. Despite the many benefits the technology has to offer, there are concerns over potential negative impacts on the environment. A key issue that has not been thoroughly investigated is the impact of effluent discharge on coastal marine ecosystems. This project will provide quantitative scientific assessment of the potential impacts of effluent discharge on coastal ecosystems in California and assess how such data influences public perception and public policy. The team of social and natural scientists has experience related to coastal pollution, California coastal ecology, marine biogeochemistry, toxicology, environmental policy and economics, water policy and management, and utility-stakeholder communications. Established relations with desalination facilities in California will ensure an integrative framework for research on the human and environmental aspects related to the increasing abundance of desalination facilities along the California coast, and contribute to both securing freshwater resources and sustaining productive and healthy coastal communities and coastal environments.

The objectives of this project are to (1) determine how effluent discharges from facilities for seawater desalination by reverse osmosis affect key organisms of the California coastal ecosystem with implications for ecosystem structure and function, (2) describe the spatial extent of the effect for different discharge schemes, and (3) evaluate how results from this and similar environmental impact studies influence public perception and decision making regarding desalination plant construction and operation. The project will combine in situ field chemical and biological measurements, controlled laboratory experiments, and assessments of how people and organizations interpret and use this data for making environmentally sound

and sustainable decisions. Field studies will be performed at three different desalination plants to identify and quantify the possible effects of stressors associated with effluent discharge on local biota. Observed effects will be validated through controlled laboratory bioassay experiments. The scientific results will be communicated to the general public and decision makers to assess how scientific data is used by different stakeholders.

This project is supported under NSF's Coastal SEES (Science, Engineering and Education for Sustainability) program.

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1325649