Pump casts from the R/V Kilo Moana KM1407, KM1418, KM1506 cruises in the central North Pacific, Station ALOHA from 2014-2015 (SuspendSinkPart project)

Website: https://www.bco-dmo.org/dataset/636310
Version: 11 February 2016
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Project
» Evaluating the relative importance of suspended and sinking particles to the meso and bathypelagic food web in the central North Pacific (SuspendSinkPart)

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Dataset Description

Data depth discrete in situ McLane pump casts illustrating filter sizes used and volumes filtered.

Methods & Sampling

McLane WTS-LV08 in situ pumps were deployed on the CTD wire. Depth of deployment was determined by monitoring the depth of the CTD package and the wire interval let out between the CTD package & each pump. Pumps were pre-programmed to pump for a certain time interval, and were only retrieved once the time interval had completely passed.

Pumps were deployed with filters placed on "mini-MULVFS" filter holders (see Bishop et al., 2012, L&O Methods and Lam and Morris U.S. patent US 20130298702 A1), which contain 3 sequential filtering platforms for 142-mm diameter filters. When 2 filter pore sizes were used, the smaller pore size filter was placed against a lower frit on the filter holder, and the larger pore size filter was placed on the middle tier. When 3 filter pore sizes were used, all 3 filtering platforms were used, with the largest pore size filter on the top, and the smallest on the bottom frit. On a few occasions where 4 filter pore sizes were used, the two smallest filter pore size were placed together on the bottom platform (frit backing). Filters placed on the middle or top platform in all cases were placed with an additional backing mesh of 150 μm Nitex to maintain material integrity of the filter during

flow.

After removal from water, filter holders were detached from pump, carried to an interior lab, and drained gently via vacuum filtration. Filters were removed under laminar flow hood. Samples intended for mercury and thorium analyses were treated using trace-metal clean techniques.

Data Processing Description

BCO-DMO Processing Notes
 - Generated from original file: "Pump_cast_log_KM1407_KM1418_KM1506.xlsx" contributed by Jeff Drazen
 - Parameter names edited to conform to BCO-DMO naming convention found at Choosing Parameter Name
 - "nd" (no data) inserted into blank cells and cells with "-"
 - Dates reformatted to YYYYMMDD
 - "-" removed from CruiseIds to conform to UNOLS cruiseid convention for the KM
 - "HST_end_time" values for KM1418 Cast PC009 is duration in minutes

Parameters

Parameter	Description	Units
CruiseID	Official UNOLS cruise id	text
Date	Date	YYYYMMDD
Latitude	Latitude (South is negative)	decimal degrees
Longitude	Longitude (West s negative)	decimal degrees
Pump_cast	Pump Cast Id	text
Depth	Depth	meters
Filt_size	Filter Size	um
Upper_size_cutoff	Upper size cutoff	um
CTD_cast	CTD Cast Id	dimensionless
Target_feature	Target feature	text
Vol_mech	Vol mech	liters
HST_start_time	Start Time - Hawaiian Standard Time (HST)	HHMM
HST_end_time	End Time - Hawaiian Standard Time (HST)	HHMM
HST_time_on_deck	Time on Deck - Hawaiian Standard Time (HST)	HHMM
HST_time_in_freezer	Time in Freezer - Hawaiian Standard Time (HST)	text
Shipboard_treatment	Shipboard treatment	text
Sampling_Notes	Sampling Notes	text

Instruments

Dataset-specific Instrument Name	McLane WTS-LV08
Generic Instrument Name	McLane Pump
Dataset-specific Description	McLane WTS-LV08 in situ pumps were deployed on the CTD wire
Generic Instrument Description	McLane pumps sample large volumes of seawater at depth. They are attached to a wire and lowered to different depths in the ocean. As the water is pumped through the filter, particles suspended in the ocean are collected on the filters. The pumps are then retrieved and the contents of the filters are analyzed in a lab.

Dataset-specific Instrument Name	mini-MULVFS
Generic Instrument Name	Multiple Unit Large Volume Filtration System
Dataset-specific Description	Pumps were deployed with filters placed on "mini-MULVFS" filter holders (see Bishop et al., 2012, L&O Methods and Lam and Morris U.S. patent US 20130298702 A1),
Generic Instrument Description	The Multiple Unit Large Volume Filtration System (MULVFS) was first described in Bishop et al., 1985 (doi: 10.1021/ba-1985-0209.ch009). The MULVFS consists of multiple (commonly 12) specialized particulate matter pumps, mounted in a frame and tethered to the ship by a cable (Bishop et al., 1985; Bishop and Wood, 2008). The MULVFS filters particulates from large volumes of seawater, although the exact protocols followed will vary for each project.

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Deployments

KM1407

Website	https://www.bco-dmo.org/deployment/635932
Platform	R/V Kilo Moana
Start Date	2014-02-19
End Date	2014-02-28
Description	Original cruise data are available from the NSF R2R data catalog

KM1418

Website	https://www.bco-dmo.org/deployment/636002
Platform	R/V Kilo Moana
Start Date	2014-08-29
End Date	2014-09-11
Description	Original cruise data are available from the NSF R2R data catalog

KM1506

Website	https://www.bco-dmo.org/deployment/636095
Platform	R/V Kilo Moana
Start Date	2015-05-03
End Date	2015-05-12
Description	Original cruise data are available from the NSF R2R data catalog

Project Information

Evaluating the relative importance of suspended and sinking particles to the meso and bathypelagic food web in the central North Pacific (SuspendSinkPart)

Coverage: Subtropical waters north of Hawaii; Station Aloha (22° 45'N, 158° 00'W)

Description from NSF award abstract:
The ocean's midwaters are the largest living space on the planet. The mesopelagic food web plays key roles in the biological carbon pump and the production of food for commercially harvested species, but its functioning is understudied because it is remote and technologically challenging to sample. Recent estimates indicate respiratory demand outstrips measured sinking particle supply by up to 2-3 orders of magnitude suggesting that some food inputs to the mesopelagic food web have been underestimated or missed. Suspended particles frequently are not sampled effectively and may be an overlooked food source. Because identifying the principal inputs of organic matter to the deep-sea food web is critical to understanding its function, the investigators propose to evaluate the relative importance of suspended and sinking particles to the meso- and bathypelagic food web in the central North Pacific. They will characterize the isotopic compositions of specific groups of mesopelagic and bathypelagic zooplankton and micronekton, and identify the extent to which they consume suspended or sinking particles using mass balance approaches. The investigators recently have recognized differences in delta 15N and delta 13C values of amino acids (AA) of sinking and suspended particles; these patterns diverge with depth, providing a means to distinguish between food web pathways. The research will define the source-specific isotopic values of suspended and sinking particles at several depths from the surface to the bathypelagic and test proposed microbial mechanisms driving these depth patterns. At corresponding depths, MOCNESS trawls will sample diverse metazoa: zooplankton size fractions, plus targeted resident, migrating and likely suspension-feeding taxa of zooplankton and micronekton. Preliminary data suggest that suspended particles are a secondary food source, containing less labile organic matter than sinking particles that exhibit a seasonal cycle in flux in the central North Pacific. This study will determine if suspended particles become more important to zooplankton and micronekton during a time of year when sinking particle flux is low (Jan/Feb) in comparison to when it is high (Aug), allowing an evaluation of how temporal change in surface ocean productivity affects the functioning of mesopelagic food webs.

Recent research has called for additional study of the ocean's deep midwaters. This study will provide new insights into the functioning of the meso- and bathypelagic food web and its coupling with surface ocean processes in the central North Pacific. The recently-demonstrated ecological tool of amino acid-specific isotopic analysis will provide a novel and comprehensive approach with which to address our hypotheses, and the project will develop the first AA isotopic dataset spanning particles to fish. Results will help identify the ecological underpinnings of increasing delta 15N values with depth in zooplankton -- apparently a common pattern. Zooplankton consumption of suspended particles also could constitute a mechanistic link between the microbial loop and higher trophic levels. The processes controlling the enormous attenuation of particle flux by mesopelagic consumers -- and thereby the strength of carbon sequestration to the deep ocean -- are not understood. Seasonal sampling will help us relate mesopelagic food web processes to changes in surface ocean productivity, furthering our understanding of future climate change impacts on deep-sea food webs and carbon flux. With regard to fisheries, many oceanic top predators such as tuna and swordfish feed on mesopelagic micronekton. A clearer understanding of the structure of mesopelagic food webs will help inform ecosystem models which are used to understand variation in fisheries production.

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1333734