

Fluorometer data (volts) from CTD casts from NOAA Ship R/V Nancy Foster cruises NF1704 and NF1802 in the Gulf of Mexico, May 2017 and 2018

Website: <https://www.bco-dmo.org/dataset/835566>

Data Type: Cruise Results

Version: 1

Version Date: 2021-01-07

Project

» [Collaborative Research: Mesoscale variability in nitrogen sources and food-web dynamics supporting larval southern bluefin tuna in the eastern Indian Ocean](#) (BLOOFINZ-IO)

» [Effects of Nitrogen Sources and Plankton Food-Web Dynamics on Habitat Quality for the Larvae of Atlantic Bluefin Tuna in the Gulf of Mexico](#) (GoMex Tuna Foodweb B)

Program

» [Second International Indian Ocean Expedition](#) (IIOE-2)

Contributors	Affiliation	Role
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Abstract

Fluorometer data (volts) from CTD casts from NOAA Ship R/V Nancy Foster cruises NF1704 and NF1802 in the Gulf of Mexico, May 2017 and May 2018.

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Coverage

Spatial Extent: N:28.336 E:-87.303 S:25.401 W:-90.184

Temporal Extent: 2017-05-11 - 2018-05-19

Acquisition Description

Samples for HPLC chlorophyll were collected pre-dawn from Niskin bottles mounted on a 24-place rosette system equipped with a Seabird SBE911 CTD and a Seapoint fluorometer. Seapoint fluorometer data (volts) for chlorophyll a is compared with discrete HPLC bottle data.

HPLC samples (2.2-L) were collected for pigment analyses by high-pressure liquid chromatography (HPLC) at the Horn Point Analytical Services Laboratory (University of Maryland Center for Environmental Science). Pigment samples (2.2-L) were filtered onto GF/F filters, frozen in LN2 and stored at -85°C until extracted, and analyzed using an automated 1100 HPLC system with Agilent temperature-controlled autosampler, Peltier temperature-controlled column oven compartment, PDA detector and ChemStation software. The HPLC method uses a C8 column and a reversed phase, methanol-based solvent system (Van Heukelem and Thomas, 2001; Hooker et al., 2012). MVCHLa and DVCHLa are detected at 665 nm. Carotenoid and xanthophyll accessory pigments are detected at 450 nm.

Processing Description

BCO-DMO Processing Notes:

- data submitted in Excel file "GoM CTD Upcast data.csv" extracted to csv
- added conventional header with dataset name, PI name, version date
- renamed columns to conform with BCO-DMO naming conventions (removed spaces and special characters)
- formatted Date to ISO (yyyy-mm-dd)
- replaced blank cells with no data value 'nd', the default missing data identifier in the BCO-DMO system.
- removed blank rows

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Related Publications

Gerard, T., Lamkin, R. T., Kelly, T. B., Knapp, A. N., Laiz-Carrión, R., Malca, E., Selph, K. E., Stukel, M. R. et al. (2021) Bluefin Larvae in Oligotrophic Ocean Foodwebs, Investigations of Nutrients to Zooplankton: Overview of the BLOOFINZ-Gulf of Mexico study. J. Plankton Res.

Results

Selph, K.E., Swalethorp, R., Stukel, M.R., Kelly, T.B., Knapp, A. N., Fleming, K., Hernandez, T. and Landry, M. R. (2021) Biomass and composition of phytoplankton communities in the oligotrophic Gulf of Mexico. J. Plankton Res.

Results

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Related Datasets

IsRelatedTo

Selph, K. E. (2021) **Phytoplankton carbon biomass by taxa from NOAA Ship R/V Nancy Foster cruises NF1704 and NF1802 in the Gulf of Mexico, May 2017 and 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-01-07 <http://lod.bco-dmo.org/id/dataset/835741> [[view at BCO-DMO](#)]

Selph, K. E. (2021) **Pigment data by phytoplankton taxa from CTD casts from NOAA Ship R/V Nancy Foster cruises NF1704 and NF1802 in the Gulf of Mexico, May 2017 and 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-01-07 <http://lod.bco-dmo.org/id/dataset/835619> [[view at BCO-DMO](#)]

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Parameters

Parameter	Description	Units
Cruise	cruise identifier	unitless
Station	station identifier	unitless
Date	cast date, UTC	unitless
Lat	latitude; north is positive	decimal degrees
Lon	longitude; east is positive	decimal degrees
CTD_cast	cast number	unitless
Cycle	Series of stations following a Lagrangian drift array, as described in Gerard et al., 2021	unitless
Day	sequential day of Cycle	unitless
Depth	depth	meters
FL_VOLTS	fluorometer voltage measurement output of the CTD-mounted Seabird fluorometer	volts
CHL_BOTTLE	total chlorophyll a (monovinyl + divinyl chlorophyll a) from HPLC analyses of bottle data from the same casts as the Seabird fluorometer	micrograms/liter (ug/L)

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Instruments

Dataset-specific Instrument Name	HPLC
Generic Instrument Name	High Performance Liquid Chromatograph
Dataset-specific Description	Automated 1100 HPLC system with Agilent temperature-controlled autosampler, Peltier temperature-controlled column oven compartment, PDA detector and ChemStation software.
Generic Instrument Description	A High-performance liquid chromatograph (HPLC) is a type of liquid chromatography used to separate compounds that are dissolved in solution. HPLC instruments consist of a reservoir of the mobile phase, a pump, an injector, a separation column, and a detector. Compounds are separated by high pressure pumping of the sample mixture onto a column packed with microspheres coated with the stationary phase. The different components in the mixture pass through the column at different rates due to differences in their partitioning behavior between the mobile liquid phase and the stationary phase.

Dataset-specific Instrument Name	Seapoint Fluorometer
Generic Instrument Name	CTD-fluorometer
Generic Instrument Description	A CTD-fluorometer is an instrument package designed to measure hydrographic information (pressure, temperature and conductivity) and chlorophyll fluorescence.

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Deployments

NF1704

Website	https://www.bco-dmo.org/deployment/834975
Platform	R/V Nancy Foster
Report	https://datadocs.bco-dmo.org/docs/302/BLOOFINZ_IO/data_docs/cruise_reports/NF1704_CRUISE_REPORT.pdf
Start Date	2017-05-07
End Date	2017-06-02
Description	R/V Nancy Foster cruise in May 2017 as part of a NOAA RESTORE project (aka: BLOOFINZ-GoM).

NF1802

Website	https://www.bco-dmo.org/deployment/834976
Platform	R/V Nancy Foster
Report	https://datadocs.bco-dmo.org/docs/302/BLOOFINZ_IO/data_docs/cruise_reports/NF1802_CRUISE_REPORT.pdf
Start Date	2018-04-27
End Date	2018-05-20
Description	R/V Nancy Foster cruise in May 2018 as part of a NOAA RESTORE project (aka: BLOOFINZ-GoM).

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Project Information

Collaborative Research: Mesoscale variability in nitrogen sources and food-web dynamics supporting larval southern bluefin tuna in the eastern Indian Ocean (BLOOFINZ-IO)

Coverage: Eastern Indian Ocean, Indonesian Throughflow area

NSF AWARD ABSTRACT:

The small area between NW Australia and Indonesia in the eastern Indian Ocean (IO) is the only known spawning ground of Southern Bluefin Tuna (SBT), a critically endangered top marine predator. Adult SBT migrate thousands of miles each year from high latitude feeding areas to lay their eggs in these tropical waters, where food concentrations on average are below levels that can support optimal feeding and growth of their larvae. Many critical aspects of this habitat are poorly known, such as the main source of nitrogen nutrient that sustains system productivity, how the planktonic food web operates to produce the unusual types of zooplankton prey that tuna larvae prefer, and how environmental differences in habitat quality associated with ocean fronts and eddies might be utilized by adult spawning tuna to give their larvae a greater chance for rapid growth and survival success. This project investigates these questions on a 38-day expedition in early 2021, during the peak time of SBT spawning. This project is a US contribution to the 2nd International Indian Ocean Expedition (IIOE-2) that advances understanding of biogeochemical and ecological dynamics in the poorly studied eastern IO. This is the first detailed study of nitrogen and carbon cycling in the region linking Pacific and IO waters. The shared dietary preferences of SBT larvae with those of other large tuna and billfish species may also make the insights gained broadly applicable to understanding larval recruitment issues for top consumers in other marine ecosystems. New information from the study will enhance international management efforts for SBT. The shared larval dietary preferences of large tuna and billfish species may also extend the insights gained broadly to many other marine top consumers, including Atlantic bluefin tuna that spawn in US waters of the Gulf of Mexico. The end-to-end study approach, highlights connections among physical environmental variability, biogeochemistry, and plankton food webs leading to charismatic and economically valuable fish production, is the theme for developing educational tools and modules through the "scientists-in-the-schools" program of the Center for Ocean-Atmospheric Prediction Studies at Florida State University, through a program for enhancing STEM learning pathways for underrepresented students in Hawaii, and through public outreach products for display at the Birch Aquarium in San Diego. The study also aims to support an immersive field experience to introduce talented high school students to marine research, with the goal of developing a sustainable marine-related educational program for underrepresented students in rural northwestern Florida.

Southern Bluefin Tuna (SBT) migrate long distances from high-latitude feeding grounds to spawn exclusively in a small oligotrophic area of the tropical eastern Indian Ocean (IO) that is rich in mesoscale structures, driven by complex currents and seasonally reversing monsoonal winds. To survive, SBT larvae must feed and grow rapidly under environmental conditions that challenge conventional understanding of food-web structure and functional relationships in poor open-ocean systems. The preferred prey of SBT larvae, cladocerans and Corycaeidae copepods, are poorly studied and have widely different implications for trophic transfer efficiencies to larvae. Differences in nitrogen sources - N fixation vs deep nitrate of Pacific origin - to sustain new production in the region also has implications for conditions that may select for prey types (notably cladocerans) that enhance transfer efficiency and growth rates of SBT larvae. The relative importance of these N sources for the IO ecosystem may affect SBT resiliency to projected increased ocean stratification. This research expedition investigates how mesoscale variability in new production, food-web structure and trophic fluxes affects feeding and growth conditions for SBT larvae. Sampling across mesoscale features tests hypothesized relationships linking variability in SBT larval feeding and prey preferences (gut contents), growth rates (otolith analyses) and trophic positions (TP) to the environmental conditions of waters selected by adult spawners. Trophic Positions of larvae and their prey are determined using Compound-Specific Isotope Analyses of Amino Acids (CSIA-AA). Lagrangian experiments investigate underlying process rates and relationships through measurements of water-column ^{14}C productivity, N_2 fixation, $^{15}\text{NO}_3^-$ uptake and nitrification; community biomass and composition (flow cytometry, pigments, microscopy, in situ imaging, genetic analyses); and trophic fluxes through micro- and mesozooplankton grazing, remineralization and export. Biogeochemical and food web elements of the study are linked by CSIA-AA (N source, TP), ^{15}N -constrained budgets and modeling. The project elements comprise an end-to-end coupled biogeochemistry-trophic study as has not been done previously for any pelagic ecosystem.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

Effects of Nitrogen Sources and Plankton Food-Web Dynamics on Habitat Quality for the Larvae of Atlantic Bluefin Tuna in the Gulf of Mexico (GoMex Tuna Foodweb B)

Coverage: Gulf of Mexico

Amendment #136: Current stock assessments for the Gulf of Mexico require better ecosystem understanding to effectively evaluate how bottom-up processes limit or enhance Atlantic Bluefin Tuna recruitment. The objective of this proposal is to elucidate the underlying mechanisms that link variability in nitrogen sources and food-web fluxes in the Gulf of Mexico to habitat quality, feeding, growth and survival for Atlantic Bluefin Tuna larvae. This proposal addresses the Program Priority: Comprehensive understanding of living coastal and marine resources, food web dynamics, habitat utilization, protected areas, and carbon flows, specifically "(d) Food web structure and dynamics, trophic linkages, and/or predator-prey relationships, especially projects that develop and/or apply new techniques or technologies".

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Program Information

Second International Indian Ocean Expedition (IIOE-2)

Website: <https://web.whoi.edu/iioe2/>

Coverage: Indian Ocean

Description from the [program website](#):

The Second International Indian Ocean Expedition (IIOE-2) is a major global scientific program which will engage the international scientific community in collaborative oceanographic and atmospheric research from coastal environments to the deep sea over the period 2015-2020, revealing new information on the Indian Ocean (i.e. its currents, its influence upon the climate, its marine ecosystems) which is fundamental for future sustainable development and expansion of the Indian Ocean's blue economy. A large number of scientists from research institutions from around the Indian Ocean and beyond are planning their involvement in IIOE-2 in accordance with the overarching six scientific themes of the program. Already some large collaborative research projects are under development, and it is anticipated that by the time these projects are underway, many more will be in planning or about to commence as the scope and global engagement in IIOE-2 grows.

Focused research on the Indian Ocean has a number of benefits for all nations. The Indian Ocean is complex and drives the region's climate including extreme events (e.g. cyclones, droughts, severe rains, waves and storm surges). It is the source of important socio-economic resources (e.g. fisheries, oil and gas exploration/extraction, eco-tourism, and food and energy security) and is the background and focus of many of the region's human populations around its margins. Research and observations supported through IIOE-2 will result in an improved understanding of the ocean's physical and biological oceanography, and related air-ocean climate interactions (both in the short-term and long-term). The IIOE-2's program will complement and harmonise with other regional programs underway and collectively the outcomes of IIOE-2 will be of huge benefit to individual and regional sustainable development as the information is a critical component of improved decision making in areas such as maritime services and safety, environmental management, climate monitoring and prediction, food and energy security.

IIOE-2 activities will also include a significant focus on building the capacity of all nations around the Indian Ocean to understand and apply observational data or research outputs for their own socio-economic requirements and decisions. IIOE-2 capacity building programs will therefore be focused on the

translation of the science and information outputs for societal benefit and training of relevant individuals from surrounding nations in these areas.

A Steering Committee was established to support U.S. participation in IIOE-2. More information is available on their website at <https://web.whoj.edu/iioe2/>.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1851558
National Oceanic and Atmospheric Administration (NOAA)	NA16NMF4320058

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