Temperature-depth profiles from archival tags deployed on basking sharks tagged from F/V Ezyduzit in the Northwest Atlantic Ocean from 2004-2011 (Basking Shark Geochem Tracers project)

Website: https://www.bco-dmo.org/dataset/476294
Data Type: Other Field Results
Version: 1
Version Date: 2014-01-21

Project
» Resolving Migratory Connectivity of Basking Sharks (Cetorhinus maximus) in the Western Atlantic Ocean: Integrating Novel Geochemical Tracers with Satellite Archival Tags (Basking Shark Geochem Tracers)

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Abstract
This dataset contains pop-up satellite archival transmitting (PSAT) tag data for 25 individual basking sharks tagged in the North Atlantic Ocean in 2004-2011. Platform terminal transmission (PTT) numbers are used as individual identification numbers throughout the dataset. Unique identification (UID) numbers provide a daily index value.

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Coverage

Temporal Extent: 2004-09-24 - 2012-04-02

Dataset Description

This dataset contains pop-up satellite archival transmitting (PSAT) tag data for 25 individual basking sharks tagged in the North Atlantic Ocean in 2004-2011. Platform terminal transmission (PTT) numbers are used as individual identification numbers throughout the dataset. Unique identification (UID) numbers provide a daily index value.

Methods & Sampling

Basking sharks were tagged with Wildlife Computers PAT and miniPAT pop-up archival tags. These tags logged temperature and pressure at regular intervals through the deployment. Software on the tag then summarized the temperature-depth and time-at-depth information over 12 or 24 hours and this summary information is then transmitted via ARGOS satellites to the researcher upon tag release on pre-determined date set by the researcher. Geolocation of the sharks through time is then achieved either by light level geolocation or by matching with ARGO float profiles as outlined below (see 'Processing Description').

Data Processing Description

Depth temperature profiles derived from each individual basking shark tag were matched to all ARGO float profiles in the Atlantic (above 20°S) within 2 weeks of the day the profile was recorded on the tag. The ARGO profile with the smallest mean square error was selected as the most likely location of the shark. These profile-derived location estimates were then combined with light-based geolocation estimates and fed into the kftrack movement model to acquire a final estimate of the individual's most probable track. A final bathymetric correction was performed to ensure the final estimated location allowed the shark to reach the maximum depth recorded by the tag for that day. (See the shark tracking estimates dataset (http://www.bco-dmo.org/dataset/476315) for these location data.)

Related references:
Skomal, G.B., Zeeman, S.I., Chisholm, J.H., Summers, E.L., Walsh, H.J., McMahon, K.W., and Thorrold, S.R. 2009. Transequatorial migrations by basking sharks in the western Atlantic Ocean. *Current Biology*, v.19, p. 1019. doi: 10.1016/j.cub.2009.04.019

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Data Files

File
shark_profiles.csv (Comma Separated Values (.csv), 1.26 MB) MD5:69d1bd91bc272e3e99428e674437de9c Primary data file for dataset ID 476294

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Parameters

Parameter	Description	Units
ptt	Platform terminal transmission (PTT) number; used as a unique identification number for the individual shark.	dimensionless
date	Date (year-month-day) in YYYYmmdd format.	unitless
uid	Unique identification (UID) numbers that provide a daily index value.	dimensionless
day	2-digit day of month.	dd (01 to 31)
month	2-digit month of year.	mm (01 to 12)
year	4-digit year in YYYY format.	unitless
depth	Depth.	meters
temp_min	Minimum temperature.	degrees Celsius
temp_max	Maximum temperature.	degrees Celsius
temp_mean	Mean temperature.	degrees Celsius

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Instruments

Dataset-specific Instrument Name	Wildlife Computers PAT and miniPAT pop-up archival tags
Generic Instrument Name	Wildlife Computers Mk10 Pop-up Archival Tag (PAT)
Generic Instrument Description	The Pop-up Archival Transmitting (Mk10-PAT) tag, manufactured by Wildlife Computers, is a combination of archival and Argos satellite technology. It is designed to track the large-scale movements and behavior of fish and other animals which do not spend enough time at the surface to allow the use of real-time Argos satellite tags. The PAT can be configured to transmit time-at-depth and time-at-temperature histograms, depth-temperature profiles, and/or light-level curves. The histogram duration (1 to 24 hours) and bin ranges can also be configured. PAT archives depth, temperature, and light-level data while being towed by the animal. At a user-specified date and time, the PAT actively corrodes the pin to which the tether is attached, thus releasing the PAT from the animal. The PAT then floats to the surface and transmits summarized information via the Argos system. Argos also uses the transmitted messages to provide the position of the tag at the time of release.

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Deployments

Thorrold_2004-11

Website	https://www.bco-dmo.org/deployment/506085
Platform	F/V Ezyduzit
Start Date	2004-09-24
End Date	2011-09-21
Description	Multiple deployments of pop-up satellite archival transmitting (PSAT) on basking sharks around Cape Cod. All tags were deployed from the F/V Ezyduzit (a small fishing vessel).

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Project Information

Resolving Migratory Connectivity of Basking Sharks (Cetorhinus maximus) in the Western Atlantic Ocean: Integrating Novel Geochemical Tracers with Satellite Archival Tags (Basking Shark Geochem Tracers)

From NSF abstract:
Animal migrations represent one of nature's most spectacular and yet mysterious phenomena. Movement patterns also have considerable biological significance, determining gene flow among geographically separated populations over ecological time scales and migratory connectivity among populations over ecological time. Unfortunately studies of migration in ocean ecosystems have lagged behind those in terrestrial environments due to the logistic constraints associated with tracking aquatic animals that may travel vast distances in an opaque 3-dimensional environment. Recent research using electronic tags have, however, revealed remarkable basin scale migrations in large pelagic fishes. Nonetheless, limited by size and battery life, artificial tags cannot yet provide lifetime migration histories of long-lived species. The investigators therefore will combine electronic archival tags and natural isotope markers in vertebrae to examine dispersal and migratory connectivity of basking sharks (*Cetorhinus maximus*) in the western North Atlantic Ocean. The project will build on preliminary archival tag data that has shown basking sharks moving from Cape Cod Bay to waters off the coast of Brazil. The results will provide insights relevant to conservation efforts directed at the world's second largest fish species that is globally distributed but listed on the IUCN Red List of Threatened Species as vulnerable due to overfishing throughout its range.

Stable isotopes have been used successfully to trace migratory connectivity in birds and to examine natal homing in teleost fishes. The investigators hope to transform the field by analyzing carbon and nitrogen isotopes in specific organic compounds isolated from vertebral samples to examine lifetime movement patterns of basking sharks. They will avoid confounding movement and a change in diet by analyzing essential and non-essential amino acids that differ in the degree of trophic fractionation for C and N isotopes. Results from pop-up archival tags will be combined with a meta-analysis of plankton carbon and nitrogen isotopes in the North Atlantic Ocean and used to generate predicted stable isotope profiles that will then be tested against observed patterns in the basking shark vertebrae. Fisheries and conservation biologists have come to the realization that many of the biological and physical processes that underlie population dynamics of marine-capture fish species have important spatial aspects. The investigators will develop and apply tools that will provide unique estimates of dispersal and migratory connectivity in a large pelagic shark. The tools will be readily applicable to other large pelagics that make basin-scale migrations and particularly those that take advantage of high primary and secondary productivity in high latitudes during summer months.

Publications resulting from this research:
Skomal, G.B., Zeeman, S.I., Chisholm, J.H., Summers, E.L., Walsh, H.J., McMahon, K.W., and Thorrold, S.R. 2009. Transequatorial migrations by basking sharks in the western Atlantic Ocean. *Current Biology*, v.19, p. 1019. doi: 10.1016/j.cub.2009.04.019

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