

Skeletal measurements from fossil seals from the western Ross Sea, Antarctica

Website: <https://www.bco-dmo.org/dataset/732661>

Data Type: Other Field Results

Version: 1

Version Date: 2018-03-29

Project

» [Collaborative Research: Exploring the Vulnerability of Southern Ocean Pinnipeds to Climate Change - An Integrated Approach](#) (Southern Ocean Pinnipeds)

Contributors	Affiliation	Role
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Abstract

This dataset includes skeletal measurements from fossil seals from the western Ross Sea, Antarctica.

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Coverage

Spatial Extent: N:-76.67755 E:164.72143 S:-78.9066 W:160.58937

Temporal Extent: 2005 - 2013

Dataset Description

These data are published and discussed in:

Brault, E. (2017). An Examination of the Ecological and Oceanographic Effects of Mid-to-Late Holocene Climate Changes on the Ross Sea Ecosystem. UC Santa Cruz. ProQuest ID: Brault_ucsc_0036E_11435. Merritt ID: ark:/13030/m5dg1n5d. Retrieved from <https://escholarship.org/uc/item/99s5j3fk>

Acquisition Description

Sample collection:

Fossil seal samples were collected during the austral summers of 2005/06, 2006/07, 2012/13, and 2013/14 in Antarctica in the Dry Valleys and along the Victoria Land Coast (especially Inexpressible Island on Terra Nova

Bay), Antarctica. Since this region experiences unusually dry and cold conditions, carcasses and bones are well-preserved, potentially for several thousand years, and therefore have unchanged isotopic compositions in most cases. The sampled species were crabeater, Weddell, leopard, and southern elephant seals. Latitude and longitude of each specimen was recorded and several photographs were taken of each specimen. Bone and carcass weathering states were determined. Several samples were gathered from the specimens. Most commonly, bone was collected, followed by skin and fur; nails, teeth, and whiskers were not frequently available for sampling, but taken when possible. Samples were collected with ethanol-cleaned tools, stored in Whirl-Pak bags, and refrigerated (~4 °C) when we returned from the field.

Species identification and radiocarbon analysis:

When possible, species identification of each specimen was conducted in the field via examination of teeth or bones with features unique to the four pinniped species. Additionally, the team at the University of Durham in the United Kingdom extracted and analyzed DNA from many specimens (described in [Fossil Seal Bulk Isotopes 14C](#)) to confirm or establish the species identification. Full details on radiocarbon dating are supplied in that sheet as well.

Most skeletal measurement were made in the field with a steel tape measure or calipers (for tooth row length). In many cases, parts of bones were obscured by tissue, so measurements are approximate. Refer to the [Bone Measurement Guide](#) (PDF).

Processing Description

BCO-DMO Processing:

- modified parameter names (replaced spaces with underscores)
- changed date format from mm/dd/yyyy to yyyyymmdd.

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Supplemental Files

File
Bone_Measurement_Guide.pdf (Portable Document Format (.pdf), 1.06 MB) MD5:8c242cdb9020fa4a20f8f8827a325c1b

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Related Publications

Brault, E. (2017). An Examination of the Ecological and Oceanographic Effects of Mid-to-Late Holocene Climate Changes on the Ross Sea Ecosystem. UC Santa Cruz. ProQuest ID: Brault_ucsc_0036E_11435. Merritt ID: ark:/13030/m5dg1n5d. Retrieved from <https://escholarship.org/uc/item/99s5j3fk>
Results

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Related Datasets

IsRelatedTo

Koch, P. L., Hall, B., Costa, D. P., Hoelzel, A. (2018) **Location, weathering, bulk isotope, and 14C data for fossil seals from the western Ross Sea, Antarctica from from 2013-2014**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2018-03-28
<http://lod.bco-dmo.org/id/dataset/732524> [[view at BCO-DMO](#)]

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Parameters

Parameter	Description	Units
Sample_ID	Sample identification code	unitless
Collection_date	Date of collection formatted as yyyyymmdd	unitless
General_area	General location of sampling	unitless
Sampling_region	More specific sampling location	unitless
Brief_description	Attributes of the specimen	unitless
Taxon_final	Final determination of the species: Cr = crabeater seal; Lp = leopard seal; SES = southern elephant seal; Wd = Weddell seal; ? = tentative identification	unitless
Age_class	Age class of the specimen (adult, sub-adult, pup, unknown)	unitless
Body_length	straight line length from nose to tips of hind flippers	meters
Comments_body_length	comments related to body length	unitless
Left_skull_width_mastoid_M1	half width across skull at the mastoid (Pg. 1, Bone Measurement Guide (PDF).)	millimeters
Right_skull_width_mastoid_M1	half width across skull at the mastoid (Pg. 1, Bone Measurement Guide)	millimeters
Comments_skull_width_mastoid_M1	comments related to skull width at the mastoid	unitless
Left_skull_width_zygomatic_M2	half width across skull at the zygomatic (Pg. 1, Bone Measurement Guide)	millimeters
Right_skull_width_zygomatic_M2	half width across skull at the zygomatic ((Pg. 1, Bone Measurement Guide)	millimeters
Comments_skull_width_zygomatic_M2	comments related to skull width at the zygomatic	unitless
Skull_length_occiput_premax_M3	length of skull from occipital condyles to proximal premaxilla (Pg. 1, Bone Measurement Guide)	millimeters
Comments_skull_length_occiput_premax_M3	comments related to skull length	unitless
Left_upper_tooth_row_length_M4	length of upper tooth row from P1 to M1 alveolus) (Pg. 1, Bone Measurement Guide)	millimeters
Right_upper_tooth_row_length_M4	length of upper tooth row from P1 to M1 alveolus) (Pg. 1, Bone Measurement Guide)	millimeters
Comments_upper_tooth_row_length_M4	comments related to upper tooth row length	unitless
Left_mandible_length_condyle_incisor_M1	length of mandible from mandibular condyle to proximal most bone under incisors (Pg. 1, Bone Measurement Guide)	millimeters
Right_mandible_length_condyle_incisor_M1	length of mandible from mandibular condyle to proximal most bone under incisors (Pg. 1, Bone Measurement Guide)	millimeters
Comments_mandible_length_condyle_incisor_M1	comments related to madible length	unitless
Left_lower_tooth_row_length_M7	length of lower tooth row from P1 to M1 alveolus) (Pg. 1, Bone Measurement Guide)	millimeters
Right_lower_tooth_row_length_M7	length of lower tooth row from P1 to M1 alveolus) (Pg. 1, Bone Measurement Guide)	millimeters

Comments_lower_tooth_row_length_M7	comments related to lower tooth row length	unitless
Atlas_greatest_breadth_M1	maximum distance across atlas (Pg. 2, Bone Measurement Guide)	millimeters
Comments_atlas_greatest_breadth_M1	comments related to maximum distance across atlas	unitless
Atlas_height_M2	maximum dorso-ventral length (Pg. 2, Bone Measurement Guide)	millimeters
Comments_atlas_height_M2	comments related to atlas height	unitless
Axis_greatest_length_of_arch_M1	maximum length of arch, including processes (Pg. 2, Bone Measurement Guide)	millimeters
Comments_axis_greatest_length_of_arch_M1	comments related to axis greatest length	unitless
Axis_height_M2	axis height	millimeters
Comments_axis_height_M2	comments related to axis height	unitless
Left_scapula_greatest_length_M1	from medial edge of the blade to glenoid tubercle (Pg. 3, Bone Measurement Guide)	millimeters
Right_scapula_greatest_length_M1	from medial edge of the blade to glenoid tubercle (Pg. 3, Bone Measurement Guide)	millimeters
Comments_scapula_greatest_length_M1	comments related to scapula greatest length	unitless
Left_scapula_collum_minimum_width_M3	minimum distance across the neck of the scapula (Pg. 3, Bone Measurement Guide)	millimeters
Right_scapula_collum_minimum_width_M3	minimum distance across the neck of the scapula (Pg. 3, Bone Measurement Guide)	millimeters
Comments_scapula_collum_minimum_width_M3	comments related to scapula collum	unitless
Left_humerus_length_M1	maximum length of humerus (with or without epiphyses) (Pg. 4, Bone Measurement Guide)	millimeters
Right_humerus_length_M1	maximum length of humerus (with or without epiphyses) (Pg. 4, Bone Measurement Guide)	millimeters
Fusion_state_humerus_length_M1	fusion state of epiphyses: proximal/distal. 0 = epiphysis lost or not visible; 1 = unfused (epiphysis off or loose); 2 = partially fused (epiphysis attached, but suture conspicuous); 3 = fully fused (epiphysis strongly attached, suture obscured).	unitless
Comments_humerus_length_M1	comments related to humerus length	unitless
Left_radius_length_M1	maximum length of radius (with or without epiphyses) (Pg. 4, Bone Measurement Guide)	millimeters
Right_radius_length_M1	maximum length of radius (with or without epiphyses) (Pg. 4, Bone Measurement Guide)	millimeters
Fusion_state_radius_length_M1	fusion state of epiphyses: proximal/distal. 0 = epiphysis lost or not visible; 1 = unfused (epiphysis off or loose); 2 = partially fused (epiphysis attached, but suture conspicuous); 3 = fully fused (epiphysis strongly attached, suture obscured).	unitless
Comments_radius_length_M1	comments related to radius length	unitless
Left_ulna_length_M1	maximum length of ulna (with or without epiphyses) (Pg. 5, Bone Measurement Guide)	millimeters
Right_ulna_length_M1	maximum length of ulna (with or without epiphyses) (Pg. 5, Bone Measurement Guide)	millimeters

Fusion_state_ulna_length_M1	fusion state of epiphyses: proximal/distal. 0 = epiphysis lost or not visible; 1 = unfused (epiphysis off or loose); 2 = partially fused (epiphysis attached, but suture conspicuous); 3 = fully fused (epiphysis strongly attached, suture obscured).	unitless
Comments_ulna_length_M1	comments related to ulna length	unitless
Left_pelvis_length_M1	maximum length of pelvis (with or without epiphyses) (Pg. 5, Bone Measurement Guide)	millimeters
Right_pelvis_length_M1	maximum length of pelvis (with or without epiphyses) (Pg. 5, Bone Measurement Guide)	millimeters
Fusion_state_pelvis_length_M1	fusion state of epiphyses: proximal/distal. 0 = epiphysis lost or not visible; 1 = unfused (epiphysis off or loose); 2 = partially fused (epiphysis attached, but suture conspicuous); 3 = fully fused (epiphysis strongly attached, suture obscured).	unitless
Comments_pelvis_length_M1	comments related to pelvis length	unitless
Left_crista_iliac_breadth_M2	length of crista ilium (with or without epiphyses) (Pg. 5, Bone Measurement Guide)	millimeters
Right_crista_iliac_breadth_M2	length of crista ilium (with or without epiphyses) (Pg. 5, Bone Measurement Guide)	millimeters
Fusion_state_crista_iliac_breadth_M2	fusion state of epiphyses: proximal/distal. 0 = epiphysis lost or not visible; 1 = unfused (epiphysis off or loose); 2 = partially fused (epiphysis attached, but suture conspicuous); 3 = fully fused (epiphysis strongly attached, suture obscured).	unitless
Comments_crista_iliac_breadth_M2	comments related to crista ilium	unitless
Left_femur_corpus_smallest_length_M9	smallest length of femur corpus (epiphyses not included in measurement) (Pg. 6. Bone Measurement Guide)	millimeters
Right_femur_corpus_smallest_length_M9	smallest length of femur corpus (epiphyses not included in measurement) (Pg. 6. Bone Measurement Guide)	millimeters
Fusion_state_femur_corpus_smallest_length_M9	fusion state of epiphyses: proximal/distal. 0 = epiphysis lost or not visible; 1 = unfused (epiphysis off or loose); 2 = partially fused (epiphysis attached, but suture conspicuous); 3 = fully fused (epiphysis strongly attached, suture obscured).	unitless
Comments_femur_corpus_smallest_length_M9	comments related to femur corpus	unitless
Left_tibia_fibula_length_M3	maximum length of tibia and/or fibula (with or without epiphyses) (Pg. 6. Bone Measurement Guide)	millimeters
Right_tibia_fibula_length_M3	maximum length of tibia and/or fibula (with or without epiphyses) (Pg. 6. Bone Measurement Guide)	millimeters
Fusion_state_tibia_fibula_length_M3	fusion state of epiphyses: proximal/distal. 0 = epiphysis lost or not visible; 1 = unfused (epiphysis off or loose); 2 = partially fused (epiphysis attached, but suture conspicuous); 3 = fully fused (epiphysis strongly attached, suture obscured).	unitless

Comments_tibia_fibula_length_M3	comments related to tibia and/or fibula length	unitless
Overall_comments	overall comments	unitless

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Instruments

Dataset-specific Instrument Name	steel tape measure or calipers
Generic Instrument Name	Measuring Tape
Dataset-specific Description	Most skeletal measurement were made in the field with a steel tape measure or calipers (for tooth row length). In many cases, parts of bones were obscured by tissue, so measurements are approximate.
Generic Instrument Description	A tape measure or measuring tape is a flexible ruler. It consists of a ribbon of cloth, plastic, fibre glass, or metal strip with linear-measurement markings. It is a common tool for measuring distance or length.

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Project Information

Collaborative Research: Exploring the Vulnerability of Southern Ocean Pinnipeds to Climate Change - An Integrated Approach (Southern Ocean Pinnipeds)

Coverage: McMurdo Dry Valleys Region; Royal Society Range, Victoria Land Coast , Antarctic Peninsula, Amundsen Sea, Ross Sea

NSF abstract:

Building on previously funded NSF research, the use of paleobiological and paleogenetic data from mummified elephant seal carcasses found along the Dry Valleys and Victoria Land Coast in areas that today are too cold to support seal colonies (*Miroungina leonina*; southern elephant seals; SES) supports the former existence of these seals in this region. The occurrence and then subsequent disappearance of these SES colonies is consistent with major shifts in the Holocene climate to much colder conditions at the last ~1000 years BCE).

Further analysis of the preserved remains of three other abundant pinnipeds ? crabeater (*Lobodon carciophagus*), Weddell (*Leptonychotes weddelli*) and leopard (*Hydrurga leptonyx*) will be studied to track changes in their population size (revealed by DNA analysis) and their diet (studied via stable isotope analysis). Combined with known differences in life history, preferred ice habitat and ecosystem sensitivity among these species, this paleoclimate proxy data will be used to assess their exposure and sensitivity to climate change in the Ross Sea region during the past ~1-2,000 years

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Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1141849
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1142108

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