Estimation of food consumption by Hawaiian monk seals relative to ecosystem biomass and fisheries overlap in the main Hawaiian Islands

Sprague, Rachel S 1; Litman, Charles L 2
(1) NOAA Fisheries Pacific Islands Regional Office, 1601 Kapiolani Blvd, Suite 1110, Honolulu, HI, 96814, USA
(2) NOAA Fisheries Pacific Islands Fisheries Science Center, 1601 Kapiolani Blvd., Suite 1000, Honolulu, HI, 96814, USA
Corresponding author: rachel.sprague@noaa.gov

Hawaiian monk seals (Monachus schauinslandi) are critically endangered: only ~1,100 individuals remain and the species is declining across most of its range. However, a small population in the main Hawaiian Islands has been increasing in recent years. While encouraging for the species, the increasing seal population, combined with a continuing decline in fishery catch, has raised public concerns about the impact of monk seals on the ecosystem and on species targeted by humans. There are many misconceptions about the magnitude of seal consumption, often fueled by a lack of broader ecological context, which can lead to animosity and even intentional killing of monk seals. This study used disparate data sets to make calculations that are explicit with assumptions and sources of error to give context to monk seal consumption, with reasonable estimates of ecosystem biomass and other species’ consumption. We estimate that the current population of ~200 seals in the main Hawaiian Islands eats a maximum of ~0.007% of the available biomass. We estimate that other apex predatory fish around Hawaii consume at least 50 times more biomass than monk seals. Nearshore recreational and commercial fisheries are estimated to land ~3 times more than seals consume. At most, ~27% of commercial landings, and ~40% of recreational landings (excluding pelagic species) are from fish families also found in monk seal diet. Given imperfect data sets, we show that it is still possible to provide the public and stakeholders with reasonable estimates that are rooted in the best available science. On an ecosystem level, there is no support for assertions that monk seals have significant negative effects on the marine ecosystem. The Hawaiian Monk Seal Recovery Program continues to work to identify potential localized effects and mitigation of direct interactions through improved communication with fishermen and direct observation of seal foraging behaviors.

Sex specific differences in the ranging patterns of Indo-Pacific bottlenose dolphins in southwest Australia.

Sprogis, Kate Rose-Ann 1; Smith, Holly K 1; Wells, Randall S 1; Kobryn, Halina T 1; Johnston, David W 1; Pollock, Kenneth H 1; Bejder, Lars 1
(1) Cetacean Research Unit, School of Veterinary and Life Sciences, Murdoch University, 90 South St, Perth, WA, 6150, Australia
(2) Chicago Zoological Society, c/o Shedd Aquarium, 700 E Monroe St, Chicago, IL, 60601, USA
(3) School of Veterinary and Life Sciences, Murdoch University, 90 South St, Perth, WA, 6150, Australia
(4) Division of Marine Science and Conservation, Nicholas School of the Environment, Duke University Marine Laboratory, 135 Duke Marine Lab Rd, Beaufort, NC, 28516, USA
(5) Department of Biology, North Carolina State University, Campus Box 7617, Raleigh, NC, 27695, USA
Corresponding author: k.sprogis@murdoch.edu.au

The analysis of ranging patterns is important to the understanding of species ecology, population dynamics and social and genetic structure. Ranging patterns are influenced by social systems, predation risk, foraging strategies and resource availability. Bottlenose dolphins display a high degree of variability in population structure among different geographic locations. In this study, we investigated differences in ranging patterns between adult male and female Indo-Pacific bottlenose dolphins (Tursiops aduncus) in a temperate environment in Bunbury, Western Australia. To achieve this, we conducted systematic boat-based surveys (n=530) along pre-determined transect lines throughout the 540 km² study area. Photo-identification data were collected year-round over six consecutive years (2007-2013). More than 1280 dolphin groups were encountered, where over 440 dolphins were catalogued by distinctive fin markings and sex was determined for 55 males and 140 females through genetic analysis or visual observations. A sensitivity analysis was carried out to determine the minimum number of sightings required to most accurately portray range size. Results from minimum convex polygons and fixed kernel estimators revealed that adult males had larger ranges than females and several key areas for females were highlighted. We hypothesize that adult males range further in search for potential mates and that female range patterns are affected by ecological parameters, such as, availability of resources and protection from predators. The key areas identified may be of interest for conservation and management purposes.

Variable influence of regional vs. global climate dynamics on marine mammals in open and semi-closed systems: Case for a paradigm shift in climate change based conservation

Srinivasan, Mirudula 1; Pearson, Heidi C. 1; Wursig, Bernd 1; Murtugudde, Raghu 1
(1) Office of Science and Technology, National Marine Fisheries Service, 3135 East West Highway, Silver Spring, MD, 20910, USA
(2) Department of Natural Resources, University of Alaska Southeast, Juneau, Alaska, 99801, USA
(3) Marine Mammal Research Program, Department of Wildlife and Fisheries Sciences and Marine Biology, Texas A & M University, Galveston, TX, 77553, USA
(4) Department of Atmospheric and Oceanic Science, Earth System Science Interdisciplinary Center, University of Maryland, College Park, MD, 20740, USA
Corresponding author: mirudula.srinivasan@noaa.gov

Climate change has been implicated in impacting marine mammal abundance and distribution. Although climate dynamics are often examined at the global scale, all global warming impacts are local. Fortunately, use of high resolution climate data to explain regional variability in marine mammal populations is yielding promising results. But we also need to consider if and how anthropogenic stressors and ecosystem change exacerbate climate impacts or cause region-specific effects on marine mammals. Previously, we qualitatively evaluated relationships between regional and global climate and oceanographic variables and potential declines in dusky dolphin (Lagenorhynchus obscurus) encounter and feeding rates in the semi-enclosed, wintertime habitat of Admiralty Bay, New Zealand. Results indicated that regional climate-ecosystem dynamics were more influential on dolphin feeding and occurrence patterns than global climate indicators. Here, we quantitatively determine the effects of global and regional climate dynamics on dolphin occurrence in the year-round, open ocean habitat off Kaikoura, New Zealand. We used tour boat data to calculate dolphin sightings per unit effort (SPUE = num. groups sighted per year/num. tour days per year) and we correlated SPUE with total and anomaly data for region-specific oceanographic and climate variables (sea surface height, sea surface temperature (SST), wind stress, ocean velocity, sea surface salinity, chlorophyll) and global climate variables (Southern Oscillation Index, SST Niño-3.4). Unlike Admiralty Bay, regional and global SST anomalies were significantly correlated (r = 0.61, p < 0.05). However, we found no correlation between dolphin SPUE and regional or global climate or oceanographic variables (all p > 0.05). In contrast to Admiralty Bay, we suggest that fine-scale variability in dolphin behavior off Kaikoura may be more strongly influenced by ecosystem changes and/or anthropogenic stressors rather than climate variability. The ability of ecosystems to integrate weak climate links should be considered for further data gathering and ecosystem-climate interaction studies.

Passive acoustic monitoring of beaked whales and other cetaceans off Cape Hatteras, North Carolina

197
Mysticetus software is designed for field data collection, real-time tracking and mapping of animals and objects, data logging, GIS analyses and GIS compatible field formats. It was developed specifically to provide an "all-in-one", simple-to-use tool that can be modified by the user. It operates on PC laptops, touch-screen tablets, and iPad/iPhones. Mysticetus has been successfully used in over 20 marine animal surveys since 2010. The birth of Mysticetus was guided by the needs/requests of marine mammal biologists using boat, aerial, passive-acoustic monitoring (PAM), and shore-based (e.g., radiofloat) platforms (but can also be applied to terrestrial systems). Data collected simultaneously from visual and acoustic line-transect surveys (e.g., sightings, towed hydrophone array and sonobuoy data) have been integrated and mapped in real time. Mysticetus can share data across multiple computer displays via AIS and/or LAN. Users can easily configure Mysticetus to: (1) customize data sheets, (2) select measuring units, (3) summarize effort by a user-defined variable (e.g., km, nm, hour, type, Beaufort), (4) summarize sightings by user-defined variables (e.g., species, depth, slope, distance from shore) (5) plot sightings/effort on report-ready bathymetric maps, (6) edit data (in Mysticetus), (7) export data to various formats (e.g., Microsoft-Excel, Microsoft-Access, MATLAB, in csv, txt, shp, kml format, and; (8) post-process/link previous (non-Mysticus) data to geographic or oceanographic attributes. GPS coordinates are automatically recorded. Determining the elevation of a shore station platform is often a tedious and complex calibration method requiring a visible shoreline. Mysticetus can simply integrate and incorporate hundreds of WAAS-enabled GPS positions to obtain an elevation and a measure of its accuracy. A free trial of Mysticetus is available at www.mysticetus.com.

Examples of Mysticetus capabilities will be demonstrated for this presentation.

Genetic identity of humpback whales migrating past New Zealand

Steel, Debbie 1,2; Carroll, Emma 1; Constantin, Rochelle 1,3; Anderson, Megan 2; Childerhouse, Simon 1,2; Garrigue, Claire 1,2; Double, Mike 1,3; Gibbs, Nadine 1,2; Hauser, Nan 1; Olavarria, Carlos 1; Poole, Michael M 1,2; Robbins, Jooke 1,2; Schmitt, Natalie 1; Tagarro, Alden 1; Ward, Juney 1,2; Baker, Scott 1,2

(1) Oregon State University, Marine Mammal Institute, 2030 SE Marine Science Drive, Newport, Oregon, 97365, USA
(2) South Pacific Whale Research Consortium, P.O. Box 3069, Avarua, Barotonga, Cook Islands.
(3) School of Biological Sciences, University of Auckland, Private Bag 92019, Auckland, New Zealand
(4) Southern Cross University, Whale Research Centre, P.O. Box 157, Lismore, New South Wales, 2480, Australia
(5) Blue Planet Marine, P.O. Box 919, Jamison Centre, ACT, 2614, Australia
(6) Opération Cétacés, BP 12367, 98802 Nouméa, New Caledonia
(7) Australian Marine Mammal Centre, Australian Antarctic Division, 203 Channel Hwy, Kingston, Tasmania, 7050, Australia
(8) Department of Conservation, P. O. Box 10-420, Wellington, New Zealand
(9) Cook Islands Whale Research, P.O. Box 3069, Avarua, Barotonga, Cook Islands
(10) Marine Mammal Research Program, BP698, 98728 Maharaere, Moorea, French Polynesia
(11) Provincetown Center for Coastal Studies, 3 Holway Avenue, Provincetown, Massachusetts, 02657, USA
(12) American Samoa Department of Marine and Wildlife Resources, P.O. Box 1730,Pago Pago, 96799, American Samoa
(13) Ministry of Natural Resources and Environment, Government of Samoa, Apia, Samoa

Corresponding author: debbie.steel@oregonstate.edu

The relationship of migratory corridors to breeding grounds is poorly understood in humpback whales. Here we compare genotypes from individual humpback whales on their northbound migration through Cook Strait, New Zealand (n=173) to breeding grounds in Oceania (n=1,171) and a migratory corridor along east Australia (n=856). The individual