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BOOK OF ABSTRACTS

(alphabetical by first author last name)

BUILD AN ISLAND – TERNS WILL COME!

Kim Abplanalp[1] (kabplanalp@mdcoastalbays.org), David F. Brinker[2], David Curson[3], Roman Jesien[1]

[1]Maryland Coastal Bays Program, Berlin, MD, USA. [2]Maryland Department of Natural Resources, Annapolis, MD, USA. [3]Mid-Atlantic Audubon, Baltimore, MD, USA

In 1991, 1,268 pairs of Common Tern (Sterna hirundo) bred in Maryland's coastal bays; by 2020 this population segment had declined to ~35 pairs as a result of habitat deterioration from sea level rise related island erosion and loss. In 2021, a 1,024 sq. ft. floating raft was constructed and deployed to provide needed breeding habitat. The raft was enlarged in 2022 to 2,304 sq. ft. In 2021, 23 pairs of Common Tern fledged 19 chicks from the raft (0.83 fledglings/nest). Nearly 80% of 19 nesting adult terns marked with field readable bands in 2021 returned to breed on the raft in 2022. During 2022 the breeding colony fledged 147 chicks from 155 nests (0.94 fledglings per nest). In 2023, 82% of 110 adult terns marked during the previous two breeding seasons returned to breed on the raft, including 89% of the 2021 adult birds. The raft produced 323 nests in 2023, but reproductive success was lower because of a storm that killed ~90 small chicks (<10 days old) through exposure and starvation. Innovative design elements of the raft include dock hinges that allow raft segment articulation to absorb storm wave energy and wheeled dock floats to facilitate deployment, removal and storage. The raft design withstood sustained winds of 50 mph during tropical storm Elsa in 2021 and a sustained 8-day northeaster in May 2022. While not inexpensive (approximately $110,000), artificial islands are an important conservation technique to provide critical breeding habitat while permanent natural habitat solutions are implemented.

HIGHLY PATHOGENIC AVIAN INFLUENZA VIRUSES AFFECTING ALASKA SEABIRDS AND OTHER WILDLIFE EXHIBIT EVIDENCE OF INTERSPECIES TRANSMISSION AND GLOBALLY DIVERSE RECENT COMMON ANCESTRY

Christina Ahlstrom[1] (cahlstrom@usgs.gov), Mia Kim Torchetti[2], Kristina Lantz[2], Krista Dilione[2], Robert Gerlach[3], Kimberlee Beckmen[4], Megan Boldenow[5], Angela Matz[5], Eric Taylor[5,6], Bryan Daniels[7], David Sinnett[8], Laura Scott[1], Evan Buck[1], David Stallknecht[9], Rebecca Poulson[9], Julianna Lenoch[10], Andrew Ramey[1]

[1]USGS Alaska Science Center, Anchorage, USA. [2]USDA National Veterinary Services Laboratories, Ames, USA. [3]Alaska Department of Environmental Conservation, Anchorage, USA. [4]Alaska Department of Fish and Game, Fairbanks, USA. [5]US Fish and Wildlife Service, Anchorage, USA. [6]Bureau of Ocean Energy Management, Anchorage, USA. [7]Yukon Delta National Wildlife Refuge, Bethel, USA. [8]USDA Wildlife Services, Anchorage, USA. [9]Southeastern Cooperative Wildlife Disease Study, Athens, USA. [10]USDA Wildlife Services, Fort Collins, USA

The ongoing panzootic of highly pathogenic H5 clade 2.3.4.4b avian influenza (HPAI) spread to North America in late 2021, with detections of HPAI viruses in Alaska beginning in April 2022. HPAI viruses have since spread across the state, affecting many species of wild birds, including numerous seabirds, as well as domestic poultry and wild mammals. To better understand the dissemination of HPAI viruses spatiotemporally and among hosts in Alaska and adjacent regions, we compared the genomes of 178 confirmed HPAI viruses detected in Alaska during April 2022–January 2023. Results suggest multiple viral introductions into Alaska between November 2021 and August 2022, as well as dissemination to areas within and outside of the state. We found evidence for transmission of HPAI viruses between wild bird species, wild birds and domestic poultry, and wild birds and wild mammals. At least six species of seabirds were affected by diverse HPAI viruses during 2022, including viruses of four distinct genome constellations sharing recent common ancestry with globally diverse sources. Continued monitoring for and genomic characterization of HPAI viruses in Alaska will be important to understand the evolution and dispersal of these economically costly and ecologically relevant pathogens.

FROM MUSING TO MARVELLING: INROADS INTO UNDERSTANDING PENGUINS AT SEA

David Ainley[1] (dainley@harveyecology.com), Rory Wilson[2]

[1]HT Harvey & Associates, Los Gatos, CA, USA. [2]Swansea Lab for Animal Movement, Swansea University, Swansea, Wales, United Kingdom

Just 40 years ago, we mused about what penguins did at sea because so little was known about this part of their lives, other than their distribution, despite them being the most specialised bird for life in, and under, the ocean surface --- the quintessential 'seabirds,' known initially to Europeans as some sort of feathery fish. Advances in methods and technology have fundamentally changed that now. We discuss how we have advanced our approaches to the study of penguins at sea, what we have learnt about penguin behavioural ecology, and how it can help us understand how fickle prey and the cold, dark sea have shaped these birds to be the incredible creatures that they are. True 'fish-birds.' Penguins have 'figured out' how to use or cope with the incredible physical attributes of dwelling in water --- holding their breath, heat tax, buoyancy, propulsion and drag. Finally, we will muse over what are critical issues that we should address for the penguins of the future.

VARYING POPULATION SIZE OF THE CAPE ROYDS ADÉLIE PENGUIN COLONY, 1955-2020: A SYNTHESIS

David Ainley[1] (dainley@harveyecology.com), Virginia Morandini[2], Megan Elrod[3], Michelle LaRue[4], Kerry Barton[5], Phil Lyver[6], Jean Pennycook[1]

[1]HT Harvey & Associates, Los Gatos, USA. [2]National Museum of Natural Sciences of Madrid, Madrid, Spain. [3]Point Blue Conservation Science, Petaluma, USA. [4]University of Canterbury, Christchurch, New Zealand. [5]Manaaki Whenua Landcare Research, Nelson, New Zealand. [6]Manaaki Whenua Landcare Research, Lincoln, New Zealand

Among the longest Antarctic biological time series is that of Adélie Penguin Pygoscelis adeliae population size at Cape Royds, 1955 to the present. Demographic trends over the 66 years fall into 5 periods: (1) decrease then recovery due to control of tourism from McMurdo Station/Scott Base; (2) further increase responding to removal of >20,000 trophically competing Antarctic Minke Whales Balaenoptera bonaerensis from colony wintering area waters; (3) failure to decrease upon ban of whaling in 1982, and whale recovery, countered by increased winds facilitating McMurdo Sound Polynya presence (easier ocean access during nesting); (4) decrease in 2001-2005 when two mega-icebergs, B15/C16, opposed the wind effect by increasing sea ice cover thus to retard ocean access; and (5) after iceberg departure, minimal recovery due to increased velocity of wind-generated Ross Gyre retarding penguin breeding probability. A multivariant model using 1998-2018 data confirmed the role of gyre speed (negative) and open water (positive) in colony growth. Additional negative influence came from high nest predation by South Polar Skuas Stercorarius maccormicki, reducing productivity, as well as perhaps increased trophic competition from nearby Weddell Seals Leptonychotes weddellii. Clearly, long time series increase understanding of penguin population dynamics responding to a complex of factors.

STATUS OF TRINIDAD, CALIFORNIA COMMON MURRE COLONIES AND INTERACTIONS WITH RAVENS, EAGLES, AND CLIMATE EXTREMES

Daniel Barton (daniel.barton@humboldt.edu), Lily Stricker, Jocelyn Garcia

Cal Poly Humboldt, Arcata, USA

The Trinidad, California area hosts the largest unprotected complex of seabird colonies on the U.S. Pacific coast, including Green, White, Blank, Flatiron, and Pilot Rocks, which each host breeding Common Murre (*Uria aalge*). We conducted unmanned aerial system (UAS) surveys and direct observations of these colonies from 2019-2023. Since last reported on in 2014, some of these colonies appear to have declined dramatically in size, and these changes appear to be associated with increased numbers of locally-breeding Bald Eagle (*Haliaeetus leucocephalus*), interactions with Common Raven (Corvus corax), and, in at least on instance, an extreme local heating event. We present, in an inductive framework, a series of observations and a series of hypotheses that may explain our observations, along with suggestions for future hypothetico-deductive research that may help disentangle the observed apparent relationships between adult predators, nest predators, and climate extremes. We also suggest re-implementation of abandoned long-term monitoring efforts of Common Murre in the region, given the rapid changes in murre population size we observed at Trinidad.

A LEGACY OF RESTORATION: A REVIEW OF CALIFORNIA NATURAL RESOURCE DAMAGE ASSESSMENT RESTORATION FUNDED SEABIRD RESTORATION PROJECTS OVER THE LAST DECADES.

Jennifer Boyce[1] (jennifer.boyce@noaa.gov), Annie Little[2], Carolyn Marn[3], Laird Henkel[4]

[1]NOAA Restoration Center, Long Beach, USA. [2]NPS, Ventura, USA. [3]USFWS, Sacramento, USA. [4]CDFW, Santa Cruz, USA

The California coast has been impacted by a series of oil spills and hazardous releases for over a century. These anthropogenic events resulted in wide-spread impacts to seabird populations both in California and beyond including other Countries. Through innovative thinking and dedication- Natural Resource Damage Assessment professionals from both State and Federal agencies were able to achieve ground-breaking settlements with companies responsible for the damages and implement a suite of wide-reaching and diverse restoration projects that have resulted in significant benefits for seabird populations breeding along the California coast. This talk will highlight the approaches used to achieve the settlements and review the diverse array of restoration projects implemented.

BRIDGING SUCCESS: NAVIGATING THE RECOVERY OF THE DOUBLE-CRESTED CORMORANT IN THE STRAIT OF GEORGIA AMID URBAN AND ECOLOGICAL CHALLENGES

Samantha Broadley (samantha.j.r.b@gmail.com), Rachel Stapleton, Ruth Joy

Simon Fraser University, Burnaby, Canada

The Pacific subpopulation of double-crested cormorants (*Nannopterum auritum*; DCCO) found along the British Columbia to California coast has experienced recent population declines. Reasons for the decline are largely unknown due to a lack of monitoring, though suggested threats include bald eagle (BAEA) disturbance, predation, and human disturbance. Legal protections have been essential for DCCO recovery; however, most efforts also shield and encourage BAEA population growth. To improve monitoring methods and our understanding of DCCO habitat use, photogrammetric and computer vision methods, along with mark-recapture models were used to monitor three DCCO colonies in the Georgia Strait. Results suggest that the two natural colonies on island seacliffs experienced low nest success and produced little to no offspring, whereas the one artificial colony on a Vancouver highway bridge was more successful. Fewer BAEA disturbances have been observed at the bridge than at the seacliffs, suggesting that the bridge structure may provide refuge from disturbance. Thus, the bridge colony is thought to be an important recruitment site for DCCO in BC. Municipal and provincial governments have discussed excluding birds from the bridge using large-scale magnetic nets to eliminate any potential impacts of acidic guano on the bridge structure. With BAEA presence in the northern Georgia Strait leading to lower nest success at natural seacliffs and humans increasing competition for waterfront access, finding ways to preserve bridge safety while maintaining its DCCO nest site functionality is important to support the recovery of the Pacific subpopulation.

THE POTENTIAL ROLES OF ALGAL BIOTOXINS AND AVIAN INFLUENZA IN A RECENT AVIAN MORTALITY EVENT IN THE NEAR ISLANDS

Elizabeth Byrd, Douglas Causey (dcausey@alaska.edu), Eric Bortz

Department of Biological Sciences, University of Alaska Anchorage

In our rapidly changing climate, harmful algal blooms (HABs) have emerged as a growing threat to the health of seabirds. The specific biotoxins produced by some algal species, such as saxitoxin (STX) and domoic acid (DA), are ultimately fatal at high concentrations. Due to the fact that biotoxins are often only detected in seabirds post-mortem, there is very little understood about what the sublethal effects of biotoxins may be in these organisms. Specifically, there is a lack of comprehensive understanding regarding symptoms the birds undergo before reaching the point of death. The process of how algal toxins bioaccumulate in seabirds, if at all, also remains unknown. Between late July and early August 2023, we conducted a comprehensive survey of land and waterbirds in the Near Islands (Agattu I, Attu I, Alaid-Nizki I, Shemya I) located in the far Western Aleutian Islands archipelago. In conjunction with population assessments of coastal breeding birds made by staff and volunteers of the Alaska Maritime NWR, we surveyed and collected target species as part of ongoing studies on their population genomics and disease ecology. During the expedition, we observed and collected specimens of several breeding species, including Common Murres, Glaucous-winged Gulls, Black-legged Kittiwakes, Pigeon Guillemots, and Tufted Puffins. Concurrently, there was a significant algal bloom. Some of these individuals were dead or in distress, exhibiting symptoms such as respiratory difficulties and uncoordinated muscular movements. In contrast, other breeding species (Pelagic and Red-faced Cormorants, Aleutian Terns, Marbled and Kittlitz's Murrelets, Whiskered Auklets, Horned Puffins, and Northern Fulmars) appeared unaffected, as did many individuals of the affected species. After collection and swabbing for avian influenza virus, which was present in many specimens, all were necropsied. We focused our analysis on liver and gastrointestinal contents and used enzyme-linked immunoassays (ELISA) to detect the presence of algal biotoxins. We also utilized high-performance liquid chromatography (HPLC) to quantify the concentrations of different saxitoxin congeners and domoic acid. We present the preliminary results of an investigation into algal biotoxin as a potential cause of mortality, with plans to further analyze potential sublethal effects. The observation that not all species nor individuals were affected raises questions about whether this event represents a minor mortality occurrence, the beginning of a potentially escalating event, coincident with presence of AIV or HPAI, or variations in individual tolerance levels to biotoxin exposure if algal biotoxins are found to be the causative factor.

PREPARE FOR THE WORST - HIGHLY PATHOGENIC AVIAN INFLUENZA IN THE EAST ASIAN AUSTRALASIAN FLYWAY

Simba Chan (simba2018reborn@gmail.com)

Japan Bird Research Association, Tokyo, Japan. Wild Bird Society of Japan, Tokyo, Japan

Since late 2021, HPAI have been devastating wild bird populations globally on an unprecedented scale. Although East Asia has been suggested as a major hub of H5N1 and there was a serious outbreak in cranes wintering in Japan and Korea in 2022, no confirmed devastating report has been documented in seabirds along the East Asian Australasian Flyway except cases of alcid deaths in the Sea of Okhotsk in 2022 and 2023 (reported in Russia but no casualties found in Hokkaido). In 2022, the East Asian Australasian Flyway Partnership restructured the Avian Disease Working Group for better preparation of forthcoming avian pandemics, especially the current HPAI attack on seabirds globally. Some globally threatened seabirds such as the Chinese Crested Tern, the Christmas Island Frigatebird, the Short-tailed Albatross, only breed at a few localities and are highly susceptible to avian diseases. We are now raising the awareness to researchers and site managers along the flyway and hope to establish a stronger link with seabird researchers in other parts of the world for confrontation of avian diseases.

IMPACT OF INVASIVE RODENT ON STREAKED SHEARWATERS (*CALONECTRIS LEUCOMELAS*) BREEDING ON MIENHUA ISLET, TAIWAN

Han-Po Chang (ddavid1028@gmail.com), Chung-Hang Hung, Hsiao-Wei Yuan, Yun-Xuan Lin, An Chou

School of Forestry and Resources Conservation, National Taiwan University, Taipei, Taiwan

Many seabirds around the world are threatened by invasive rodent, which gnaw on seabirds at all living stages from eggs to breeding adults, and compete terrestrial habitat in the colonies. Reduction in survival and reproductive success can be destructive to population viability since low intrinsic growth rate in many seabird species. Hence, eradication was executed among colonies to minimize impact on seabird colonies and following up monitoring is needed while rodents can be recurrence easily. Recent field survey showed that presence of Norwegian rat (*Rattus norvegicus*) may be responsible for restricted population size and low breeding success of Streaked shearwater (*Calonectris leucomelas*) breeding on Mienhua islet, Taiwan. As a consequence, rodent traps were applied since 2021, with setting baiting stations came up during winter of 2022-2023 due to rats becoming trap-shy. To discover the efficiency of eradication project of Mienhua islet, we analyzed data from camera traps setting up in front of burrows to find out difference of activity patterns between shearwater and rats. Result of hourly patterns during nighttime showed breeding shearwater were more active after midnight, and rats showed up more frequently before midnight. Monthly patterns in 2022-2023 breeding seasons indicated rats presence excluding breeding shearwater; while post-eradication, fewer rats were captured near burrow entrances with increasing shearwater activity. Additionally, to find out effect of eradication on population trajectory, we simulated population viability analysis (PVA), and found removing rats can change population trend of streaked shearwater on Mienhua islet.

DEEP LEARNING APPLICATIONS ON REMOTE ISLANDS WITH ACOUSTIC IDENTIFICATION AND POPULATION MONITORING OF BURROW-NESTING SEABIRDS.

An Chou (choudavid0@gmail.com), Chung-Hang Hung, Hsiao-Wei Yuan

School of Forestry and Resources Conservation, National Taiwan University, Taipei, Taiwan

Traditional methods like point count surveys, tend to miss observing nocturnal and burrow-nesting seabirds, making Passive Acoustic Monitoring (PAM) a more effective alternative, which has been applied in detecting rare species, identifying population trends, and assessing the impact of conservation strategies. This research confronts the difficulties of monitoring the Streaked Shearwater (Calonectris leucomelas), a nocturnal seabird commonly found on remote islands by implementing Automatic Recording Units (ARUs) that are affordable and less invasive to wildlife. Our study integrates PAM with a deep learning model—Go Go Owl Ranger—to find out the Streaked Shearwater's population fluctuations, daily activities, and seasonal patterns on Mienhua Islet. An eight-month data collection period yielded high accuracy in species identification, despite some inaccuracies where insect sounds were mistaken for bird calls. Results identified two pronounced breeding peaks during April-May and August-September, which can inform pointed conservation measures. The application of PAM and AI in this study not only support seabird research methodologies but also point out the way of conservation policy in Taiwan. Sustained monitoring and continual improvements to the recognition model will be the most effective conservation solutions.

THE HOME RANGE AND BREEDING SEASON MOVEMENT OF BRIDLED TERNS *ONYCHOPRION ANAETHETUS* IN HONG KONG, SOUTH CHINA

Chun Ting Chung (cjohnct@hkbws.org.hk), Yat Tung Yu

The Hong Kong Bird Watching Society, Kowloon, Hong Kong

The Bridled Tern (*Onychoprion anaethetus*) constitutes regular summer visitors that breed on the offshore islands of Hong Kong, situated in southern China's coastal region. Despite their prevalence in the area, the movement and migration ecology of this species remain inadequately understood.

During the summer of 2023, ten Bridled Terns were captured using mist nets and affixed with GPS trackers on one of the breeding islands in Mirs Bay, Hong Kong. Subsequently, GPS data was successfully gathered from eight individuals throughout the breeding season.

Among these eight individuals, five exhibited close association with the colony and utilized the proximate area within Mirs Bay. Conversely, the remaining three individuals, presumed to be immature and/or non-breeding, traversed the coastline of South China. Remarkably, one of the tagged Bridled Terns ventured as far as the coast of Vietnam, reaching the Gulf of Tonkin—an approximate distance of one thousand kilometers from the tagging site—before returning to Mirs Bay after three weeks. Additionally, the other two individuals journeyed approximately 500 kilometers away from the colony, visiting Penghu County, Taiwan, and Quanzhou, China, respectively.

The preliminary tracking data of the Bridled Terns in Hong Kong unveils the expansive range that non-breeding individuals can cover during the breeding season. Future data collection, particularly concerning migration and wintering patterns, will be undertaken upon the terns' return to the Mirs Bay colony in the summer of 2024. This endeavor aims to further elucidate the movement dynamics of Bridled Terns within South China.

PREDICTING ALBATROSS BYCATCH HOTSPOTS ACROSS THE NORTH PACIFIC OCEAN

Thomas Clay[1,2] (tclay@edf.org), Scott Shaffer[3], Josh Adams[4], David Anderson[5], Steven Bograd[6,2], Jonathan Felis[4], Yuliana Bedolla Guzmán[7], Elliott Hazen[6,2], Michelle Hester[8], David Hyrenbach[9], Julio César Hernández Montoya[7], Frederick Dallas Jordan[10], Federico Méndez Sánchez[7], Bungo Nishizawa[11], Rachael Orben[12], Kiyoaki Ozaki[13], Evaristo Rojas-Mayoral[7], Fumio Sato[13], Robert Suryan[14], Jean-Baptiste Thiebot[11], Lesley Thorne[10], Heather Welch[6,2], Lindsay Young[15], Gemma Carroll[16]

[1]Environmental Defense Fund, Monterey, USA. [2]University of California, Santa Cruz, Santa Cruz, USA. [3]San Jose State University, San Jose, USA. [4]U.S. Geological Survey, Santa Cruz, USA. [5]Wake Forest University, Winstom-Salem, USA. [6]Southwest Fisheries Science Center, NOAA Fisheries, Monterey, USA. [7]Grupo de Ecología y Conservación de Islas, Ensenada, Mexico. [8]Oikonos Ecosystem Knowledge, Kailua, USA. [9]Hawai'i Pacific University, Waimanalo, USA. [10]Stony Brook University, Stony Brook, USA. [11]National Institute of Polar Research, Tachikawa, Japan. [12]Oregon State University, Newport, USA. [13]Yamashina Institute for Ornithology, Abiko, Japan. [14]Alaska Fisheries Science Center, NOAA Fisheries, Juneau, USA. [15]Pacific Rim Conservation, Honolulu, USA. [16]Environmental Defense Fund, Seattle, USA

Bycatch remains a barrier to sustainable fisheries and continues to threaten many seabird populations. Albatrosses are killed in longline and trawl fisheries across the North Pacific and are particularly vulnerable due to their extremely wide-ranging movements and propensity to forage around vessels. Identifying when and where bycatch risk is greatest is crucial to prioritize vessel monitoring and inform management recommendations at relevant spatiotemporal scales. Here, we collated 20 years of biologging data for 1,000 albatrosses from 11 populations of three species that breed in the North Pacific (short-tailed, Laysan, and black-footed) to provide a holistic, ocean basin-scale risk assessment. We generated monthly predictions of bird densities for each population and breeding stage (incubation, brood-guard, post-brood and non-breeding) using species distribution models and overlaid these with Automatic Identification Systems data for longline and trawl vessels. All species overlapped substantially with trawl and demersal longline fleets off Alaska, and to a lesser extent, off Russia and the US West Coast. Laysan and black-footed albatrosses overlapped with pelagic longline fleets in the subtropics during winter and spring and predicted hotspots of bycatch risk were mostly from US, Taiwanese, and Japanese fleets around Hawaii and in the northwest Pacific. The majority (mean: 56%; range: 0-98% depending on the population) of predicted albatross–fisheries overlap occurred in the High Seas where fleets have low (<5%) observer coverage and variable bycatch mitigation. These results stress the urgent need for enhanced observer coverage and compliance with mitigation measures to reduce future conflicts between fisheries and albatrosses.

TMX RECOMMENDATION 3: UPDATES AND PATH FORWARD

Nikolas Clyde[1] (nik.clyde@ec.gc.ca), Caroline Fox[2], Natalie Lund[1]

[1]Environment and Climate Change Canada, Vancouver, Canada. [2]Environment and Climate Change Canada, Nanaimo, Canada

In 2019, the Canada Energy Regulator approved the Trans Mountain Expansion (TMX) project, subject to 156 conditions and 16 non-binding recommendations. These conditions were intended to mitigate, avoid, or lessen potential effects associated with the project and related marine shipping. Recommendation 3 of 16 was to implement a marine bird monitoring and protection program to improve the understanding of the impacts to marine birds from ships in the Salish Sea. In response to this, Environment and Climate Change Canada initiated a multi-year research and monitoring program to address these needs. Over the past 5 years, a wide variety of projects have been funded and carried out as a result of this, primarily focused in two broad overlapping regimes: 1) A large-scale multi-year at-sea survey program designed to establish current quantitative baselines for marine birds in the Salish Sea, and 2) A number of targeted research projects focused on understanding the impact of stressors on marine birds, including studies on drivers of marine bird distribution, trophic dynamics, food web health, foraging and habitat use patterns, contaminant burdens and plastic pollution, wild bird health, and ecosystem linkages sensitive to disturbance. As we move towards the final year of funding for this initiative, we would like to take this opportunity to share preliminary results and discuss plans for the final year of the program, including plans for outreach, communication, and mobilization of results and data.

INVESTIGATING ALEUTIAN TERN BREEDING AND MIGRATION SEASON MOVEMENTS USING SATELLITE TELEMETRY 2019-2023

Robin Corcoran[1] (robin_corcoran@fws.gov), Jill Tengeres[2], Don Lyons[3], Kelly Nesvacil[4], Tory Rhoads[5], Susan Oehlers[6], Timothy Lawes[7], Katelyn Stoner[8]

[1]U.S. Fish & Wildlife Service, Kodiak National Wildlife Refuge, Kodiak, USA. [2]U.S. Fish & Wildlife Service, Migratory Bird Management, Orland, USA. [3]Oregon State University & National Audubon Society, Corvallis, USA. [4]U.S. Fish & Wildlife Service, Austin Ecological Services Field Office, Austin, USA. [5]Alaska Department of Fish and Game, Juneau, USA. [6]U.S. Forest Service, Yakutat, USA. [7]Western Ecosystems Technology, Inc., Corvallis, USA. [8]Oregon State University, Corvallis, USA

Aleutian Tern (Onychoprion aleuticus) counts at known breeding colonies in Alaska have declined dramatically over the last several decades. Unfortunately, conservation planning is limited by the lack of information on breeding season site fidelity, formation of new colonies, and with-in season dispersal after colony failure and abandonment. We studied breeding season and migratory movements by fitting Aleutian Terns (n = 20) with 2g satellite telemetry tags at nesting colonies in the Kodiak Archipelago and Nome, AK from 2019-2023. Most tagged terns displayed extended fidelity to their capture location, with the maximum distance from their respective capture sites ranging from 60 to 190 km until the onset of migration from late July to mid-August. Several terns also spent time onshore near previously documented colonies and visited sites that potentially represent previously undocumented colonies. Onshore movements to active or previously documented colonies suggests these individuals may have attempted renesting after nest failure at their tagging site. All individuals with working tags at the time of migratory departure displayed steady long-distance migrations to Southeast Asia. Our initial results demonstrate that satellite telemetry tags are useful tools to study movements of Aleutian Terns and can help assess within-season colony attendance patterns and identify previously unknown colony sites.

POPULATION ESTIMATES AND CONSERVATION CONCERNS OF ALEUTIAN TERNS BREEDING IN THE KODIAK ARCHIPELAGO

Robin Corcoran[1] (robin_corcoran@fws.gov), Jill Tengeres[2]

[1]U.S. Fish & Wildlife Service, Kodiak National Wildlife Refuge, Kodiak, USA. [2]U.S. Fish & Wildlife Service, Division of Migratory Birds, Orland, USA

During the Outer Continental Shelf Environmental Assessment Program minimum population estimates of Aleutian terns (*Onychoprion aleuticus*) in the Kodiak Archipelago were 2400-3000 terns, based on eight colonies monitored in 1976-77. Unfortunately, a statewide species assessment in 2013 concluded that populations declined by approximately 90% at known breeding colonies in Alaska over the last several decades. We monitored Aleutian tern colonies in the Kodiak Archipelago from 2013-23 using two methods: 1) direct flush counts at colonies, and 2) transect based at-sea surveys. Direct colony counts of all known active Aleutian tern colonies in the archipelago resulted in population estimates of 513 in 2020, and 292 in 2023. Population estimates based on at-sea transect surveys were 1090 (95% CI 621-1559) in 2011-13, 1036 (95% CI 252-1819) in 2014-16, and 491(95% CI 229-754) in 2019-22. In addition, we intensively monitored colonies along the Kodiak road system by using nest cameras to determine nest survival and identify causes of failure. These colonies were consistently the largest breeding sites in the archipelago and were all highly disturbed with varying levels of livestock grazing. Trampling or consumption of eggs by livestock was the fourth leading cause of nest loss from 2017-2020 (n = 148 nests). Livestock grazing continued to be an issue in July 2023, when cattle were moved onto nesting habitat at the largest Aleutian tern colony in the archipelago destroying multiple nests. Management practices to insulate colonies from livestock disturbance could improve nest survival for this species of conservation need.

HPAI-LINKED MORTALITIES IN EASTERN CANADA: A QUIET YEAR (2023) FOLLOWS A YEAR OF MASS MORTALITIES (2022) BUT POPULATION LEVEL IMPACTS ARE EVIDENT

Tabatha Cormier[1] (cormier.tab@gmail.com), Stephanie Avery-Gomm[2], Tatsiana Barychka[3], Matthew English[1], Jean-François Rail[4], Robert Ronconi[5], Sabina Wilhelm[6], Matthieu Beaumont[7], Campbell Bowser[7], Tori Burt[8], Sydney Collins[8], Steven Duffy[9], Jolene Giacinti[10], Scott Gilliland[1], Jean-François Giroux[11], Carina Gjerdrum[12], Magella Guillemette[13], Kathryn Hargan[14], Megan Jones[15,16], Andrew Kennedy[1], Stéphane Lair[17,18], Andrew Lang[14], Christine Lepage[4], Gretchen McPhail[19], William Montevecchi[19], Glen Parsons[20], Jennifer Provencher[21], Ishraq Rahman[14], Gregory Robertson[22], Yannick Seyer[13,4], Catherine Soos[10], Christopher Ward[1], Regina Wells[12], Jordan Wight[14], Zoe Lucas[23]

[1]Canadian Wildlife Service, Environment and Climate Change Canada, Sackville, Canada. [2]Wildlife and Landscape Science Directorate, Science and Technology Branch, Environment and Climate Change Canada, Saint John, Canada. [3]Wildlife and Landscape Science Directorate, Science and Technology Branch, Environment and Climate Change Canada, Quebec, Canada. [4]Canadian Wildlife Service, Environment and Climate Change Canada, Quebec, Canada. [5]Canadian Wildlife Service, Environment and Climate Change Canada, Dartmouth, Canada. [6]Canadian Wildlife Service, Environment and Climate Change Canada, Newfoundland, Canada. [7]Canadian Wildlife Service, Environment and Climate Change Canada, Canada, Canada. [8]Psychology and Biology Departments, Memorial University of Newfoundland, St. John's, Canada. [9]Fisheries and Oceans Canada, Newfoundland, Canada. [10]Wildlife and Landscape Science Directorate, Science and Technology Branch, Environment and Climate Change Canada, Ottawa, Canada. [11]Département des sciences biologiques, Université du Québec à Montréal & Société Duvetnor Ltée, Quebec, Canada. [12]Canadian Wildlife Service, Environment and Climate Change Canada, St. John's, Canada. [13]Department of Biology, Chemistry and Geography, Université du Québec à Rimouski, Quebec, Canada. [14]Department of Biology, Memorial University of Newfoundland, St. John's, Canada. [15]University of Prince Edward Island, Charlottetown, Canada. [16]Canadian Wildlife Health Cooperative, Charlottetown, Canada. [17]Centre québécois sur la santé des animaux sauvages, Canadian Wildlife Health Cooperative, Quebec, Canada. [18]Faculté de médecine vétérinaire, Université de Montréal, St. Hyacinthe, Canada. [19]Psychology Department, Memorial University of Newfoundland, St. John's, Canada. [20]Department of Natural Resources and Renewables, Nova Scotia, Nova Scotia, Canada. [21]Wildlife and Landscape Science Directorate, Environment and Climate Change Canada, Ottawa, Canada. [22]Wildlife and Landscape Science Directorate, Science and Technology Branch, Environment and Climate Change Canada, Newfoundland, Canada. [23]Sable Island Institute, Nova Scotia, Halifax, Canada

In early 2022, Highly Pathogenic Avian Influenza (HPAI - H5N1) emerged as an important wildlife disease in North America, causing unprecedented mass mortality events in domestic and wild birds. The incursion and transmission of the HPAI - H5N1 subtype was especially lethal on seabird breeding colonies in the northern hemisphere. To understand the potential population- and/or species-level effects of the virus during the last two years, it has been necessary to accurately document, quantify and model mortalities in affected species. In eastern Canada between April and October 2022 (i.e., seabird and sea ducks breeding season), we estimate 47,000 sick or dead migratory birds were observed including tens of thousands of Northern Gannets, several thousand

Common Murres, and several thousand American Common Eiders and gulls. Early results suggest that mortality in Northern Gannets and American Common Eiders has had population-level impacts. Contrary to expectations, the 2023 breeding season has not experienced any mass mortality events related to the virus. Despite increased beached bird surveys and disease surveillance efforts, we found that the number of reported mortalities and positive detections of HPAI virus in wild birds was exponentially lower than in 2022. The possible reasons for this surprising and positive outcome will be discussed.

STABLE ISOTOPE ANALYSIS REVEALS PRIMARY FLIGHT FEATHER MOULT PATTERNS OF ATLANTIC PUFFINS (*FRATERCULA ARCTICA*)

Carolyn Currie (curriec1@myumanitoba.ca), Emily Runnells, Gail Davoren

University of Manitoba, Winnipeg, Canada

Feathers are essential for bird survival but constantly degrade, requiring regular replacement (i.e., moult). Although necessary, moult is energetically costly and has evolved to be temporally separated from other activities such as breeding. Wing-propelled pursuit divers in the family Alcidae ('alcids') have high wing loading (body mass/wing area) and, thus, may become flightless when wing area is reduced during primary feather moult. This would increase their vulnerability to changing environmental conditions (e.g., prey availability), so knowledge about the timing of moult is valuable. As alcids typically moult while offshore, little is known about the flight feather moult patterns of most species, including Atlantic Puffins (*Fratercula arctica*). We examined whether the primary flight feather moult pattern of Atlantic Puffins is descendent (slow, sequential replacement of primary feathers from the innermost (P1) to the outermost (P10)) or catastrophic (near-simultaneous replacement of P1-P10) using stable isotope ratios of carbon (δ13C) and nitrogen (δ15N). Puffin carcasses (n = 25) were collected from James Island, Newfoundland, Canada during August 2020-2022 and differences in isotope ratios between P1, P2, P5, and P10 were compared. Similar mean differences in δ13C and δ15N across feather pairs suggest a catastrophic moult pattern; however, higher P1-P10 differences in some birds indicate these individuals may have a descendent moult pattern or may moult half of their primaries before breeding, and half after. These findings increase our understanding of moult patterns in alcids, which is important to understand vulnerable periods associated with primary feather moult.

DIVERGENT FORAGING EFFORT OF ATLANTIC PUFFINS AND RAZORBILLS IN COASTAL NEWFOUNDLAND, CANADA

Megan Dalton (daltonm1@myumanitoba.ca), Matthew Legard, Kristina McOmber, Gail Davoren

Univeristy of Manitoba, Winnipeg, Canada

Although seabird foraging effort is known to vary with dynamic prey conditions, some species may vary more in foraging effort than others due to diverse competitive abilities. Pursuit-diving seabird species of the family Alcidae, including Atlantic puffins (*Fratercula arctica*) and razorbills (*Alca torda*), breed sympatrically in coastal Newfoundland, Canada. Razorbills have a higher trophic level diet, primarily consuming fish, whereas puffins rely on lower trophic level prey (invertebrates and zooplankton, in addition to fish). Razorbills also average two-thirds heavier than puffins. For other seabird species, a larger body size indicates a competitive advantage, which could explain the higher trophic level diet of razorbill relative to puffins. While previous studies have described foraging effort and locations for breeding razorbills in coastal Newfoundland, comparatively little is known about puffins. Our objective was to compare foraging effort and locations for chick-rearing razorbills and puffins using bird-borne GPS-Time-Depth Recorders. We tested the hypothesis that foraging effort and locations would differ between species and predicted that puffins would travel farther from the colony, due to the predicted competitive advantage of razorbills. Findings supported this prediction, evidenced by puffins foraging farther from the colony than razorbills, resulting in spatially segregated foraging areas. Next steps include collecting another year of data (2024) to determine whether this differential foraging effort is maintained under varying inter-annual biomass of the main forage fish prey species (capelin, *Mallotus villosus*).

USING GAME CAMERAS AT TRAP LOCATIONS TO FURTHER INVESTIGATE TRAP EFFECTIVENESS AND PREDATOR BEHAVIOR

Joshua DeCambra (jdecam808@gmail.com)

Maui Nui Seabird Recovery Project, Paia, USA

Haleakalā towers over the island of Maui at 10,023 feet in elevation, with five different climate zones. The upper elevations are home to a marvel of nature, the federally endangered ʻuaʻu, Hawaiian petrel (Pterodroma sandwichensis). The Maui Nui Seabird Recovery Project (MNSRP) monitors and protects ʻuaʻu in the Nakula Natural Area Reserve and Kahikinui Forest Reserve, which are located in the sub-alpine climate zone with lava rocks, cinder, native shrubs and trees blanketing the terrain. This area provides great habitat for breeding ʻuaʻu however, invasive mammal predators that harm the native ecosystem have also made this place their home. MNSRP and project partners collaborate on predator trapping, including but not limited to padded leg hold traps often accompanied with game cameras and other trap types. We have previously reported on the limitations of conventional predator control. In 2023, MNSRP scaled up all predator control efforts, and began standardized monitoring of traps, as suggested by Kelsey et al. (2019). New methods include the use of Timms traps, documented as being effective in ʻuaʻu habitat on Haleakalā. Here we present data and important anecdotes on our trap site methods including how we can assess predator behavior and make effective adjustments to our trap sites.

MULTIPLE OBSERVER COMPARISON OF SATELLITE-BASED COUNTS OF THE ENDANGERED SHORT-TAILED ALBATROSS (PHOEBASTRIA ALBATRUS).

Risa Dickson[1] (dicksofa@oregonstate.edu), Jane Dolliver[1], Jennifer Spegon[2], Kristopher Pacheco[2], Rachael Orben[1]

[1]Oregon State University, Corvallis, USA. [2]U.S. Fish and Wildlife Service, Anchorage, USA

One fundamental question in conservation biology is the number of individuals supporting the breeding population. This is especially true in the conservation and management of long-lived, upper trophic species of marine birds, particularly albatross, where changing attendance is a bellwether for both anthropogenic and ecological stressors. We conducted an inter-observer error analysis of 24 very high resolution satellite images (spatial resolution ~0.3m) from three satellite platforms (WorldView-2, WorldView-3, Pleiades Neo) that span five breeding colony plots on three islands (Torishima in the Izu Islands, and Kita-kojima and Minami-kojima in the Senkaku Islands). The goal is to identify the image, species and colony-based metadata that affect two observer variability. For images counted to-date, variability is low for Torishima (~10-15%), but is expected to rise for Kita-kojima and Minami-kojima. Furthermore, we assessed the consistency of within season counts of each study plot. Together, these counts provide the single most comprehensive assessment of short-tailed albatross colony attendance to-date. Given continued interest in this globally vulnerable population, our results provide evidence for an innovative and cost-effective tool to monitor the short-tailed albatross and other imperiled albatross species worldwide.

EXPLORING K-VALUES TO IMPROVE MURRE POPULATION ESTIMATES AT ALASKA MARITIME NATIONAL WILDLIFE REFUGE MONITORING SITES

Brie Drummond (brie_drummond@fws.gov), Heather Renner, Nora Rojek

Alaska Maritime National Wildlife Refuge, Homer, USA

Accurately estimating seabird population trends is a major element of seabird monitoring. Murre populations are usually monitored by counting individual birds attending the cliffs during the breeding season. Because these counts may include a mix of breeders, their mates, and non-breeders, generating estimates of breeding population size from attendance counts requires a conversion factor (k-value). This ratio has been shown to vary with behavioral and demographic variation and environmental conditions, so not accounting for that change confounds accurate estimation of population trends. K-values varied almost twofold with changing survival and attendance at some Scottish murre colonies over several decades; unfortunately estimates of k-values at Alaskan colonies are rare and more than twenty years old. When long-term count data from common murre colonies on the Alaska Maritime National Wildlife Refuge showed severe population declines following a marine heat wave in 2015-2016, we began to examine our count data more fully and consider how we could incorporate estimates of k-values. Beginning in 2019 we recorded numbers of breeding pairs and counts of individual murres on fixed plots to calculate k-values at six of our long-term monitoring colonies. We explore how these data may be used to improve murre population monitoring and inference at Alaskan colonies.

ANALYSIS OF LAYSAN ALBATROSS DIETS FROM TWO COLONIES ON OAHU, HAWAII

Philip Duchild[1] (phda2020@mymail.pomona.edu), Nina Karnovsky[1], Lindsay Young[2]

[1]Pomona College, Claremont, USA. [2]Pacific Rim Conservation, Honolulu, USA

The purpose of this study was to assess the presence, quantity, and types of non-natural items and natural diet items found in the boluses of Laysan albatross (*Phoebastria immutabilis*) chicks. We tested for inter-colony and interannual differences in diets. Laysan albatrosses forage in surface waters across vast areas of the Northern Pacific. Throughout much of this range, buoyant plastics and fishing refuse are present. Consequently, individuals of this species provision their offspring with varying quantities of non-natural items in addition to diet items. We sorted and measured the contents of Laysan albatross boluses from Kaena Point Natural Area Reserve (n= 36) and Kuaokala Game Management Area (n= 16), both located on Oahu, HI. We separated, counted and weighed natural items and classified them into subcategories based on taxonomy. We sorted, counted, measured, and weighed non-natural items and sorted them into subcategories based on type of material, size, identity, and color. All boluses from both colonies contained plastic fragments. Fishing paraphernalia was present in 93.8% of Kuaokala samples and 80.6% of Kaena samples. All boluses from both colonies contained squid beaks, crustacean pieces, and unknown flesh to varying degrees. We found that the dry mass of non-natural material was not correlated with the number of squid beaks. Final analyses of non-natural items on the basis of year (2020-2024), material, color, and length are forthcoming. Comparing diets of Laysan albatross chicks from different colonies represents an important step in elucidating the patterns of consumption of marine pollution in this species.

MEDICAL HISTORY AND POST-RELEASE SURVIVAL OF REHABILITATED CALIFORNIA BROWN PELICANS PELECANUS OCCIDENTALIS CALIFORNICUS, 2009–2019

Rebecca Duerr[1] (rebecca.duerr@birdrescue.org), Deborah Jaques[2], Barton Selby[3], Julie Skoglund[1], Suzanne Kosina[1]

[1]International Bird Rescue, Fairfield, USA. [2]Pacific Eco Logic, Crescent City, USA. [3]EH1, San Carlos, USA

California Brown Pelicans (Pelecanus occidentalis californicus) rehabilitated in 2009–2019 were released with metal federal and blue plastic auxiliary leg bands. Resighting data were obtained from the USGS Bird Banding Laboratory, International Bird Rescue's citizen science online reports, and communal roost site surveys. Clinical and demographic data were assessed in relation to whether birds were resighted, whether alive at the most recent resighting, and by longevity after release. The 1418 blue-banded individuals in the study were admitted for rehabilitation and released 1465 times; 49.9% were resighted at least once. At the most recent re-encounter, 79.2% were alive. Mean (± SD) post-release longevity was 3 (3.1) years, which represents minimum survival time for those last encountered alive. Survival analysis was performed utilizing annualized resightings and dead recoveries for each bird, averaging 0.70 for birds admitted as post-fledge hatch-year and 0.80 for birds admitted as after-hatch-year. Dedicated surveys resulted in a higher probability of live detections after 2015. Annual survival estimates averaged 0.83 during this period. Mean minimum longevity of the 2015–2019 cohort was estimated at 5.67 years. Minimal differences were found related to pre-release medical problems (e.g. fishing gear injuries, fractures, or extreme emaciation/anemia). As of November 2023, at least 90 of these 1418 birds are known to have reached >10 years of age based on age at release and most recent observation. This study shows that Brown Pelicans can be successfully rehabilitated and returned to the wild with a reasonable expectation of many years of life after release.

HIGHLY PATHOGENIC AVIAN INFLUENZA: A PERSPECTIVE FROM THE WILD BIRD HEALTHCARE REALM

Rebecca Duerr (rebecca.duerr@birdrescue.org)

International Bird Rescue, Fairfield, USA

Highly Pathogenic Avian Influenza (HPAI) H5 clade 2.3.4.4b is continuing to spread around the world and poses an immediate and ongoing threat to wild bird species worldwide. Colonial seabirds are especially vulnerable, while avian predator and scavenger species have also been hard hit by the disease. Wildlife workers worldwide, including wild bird rehabilitation centers, oil spill response organizations, biologists, and wildlife regulatory agencies are being challenged by this disease like never before. Initial management by avian caregivers in the US was focused on immediate euthanasia for birds with symptoms of (presumed) HPAI when entering care to prevent exposure of other patients, developing and implementing effective quarantine protocols initially based on data known about the disease in poultry, securing access to timely (and often expensive) testing to allow continued treatment of birds presenting with more recoverable conditions, and avoidance of disease spread within facilities. As the event persists, and becomes endemic in many areas, broad collaborative research efforts are working to 1) assess how the disease presents in various species, 2) manage infectious risks within wildlife centers, 3) develop and validate rapid, inexpensive, reliable, point-of-care and field-usable testing methods, and 4) develop vaccines and treatment protocols for T & E species.

DIFFERENTIAL RESPONSE OF NEST SURVIVAL TO OCEANOGRAPHIC CONDITIONS INDICATES LOCALIZED ADAPTATIONS FOR CASSIN'S AUKLET (*PYTCHORAMPHUS ALEUTICUS*) AT THE CALIFORNIA CHANNEL ISLANDS

Amelia J DuVall[1] (ajduvall@uw.edu), Josh Adams[2], David Mazurkiewicz[3], Catherine A Carter[4], Sarah J Converse[5]

[1]Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington, Seattle, USA. [2]U.S. Geological Survey, Western Ecological Research Center, Santa Cruz Field Station, Santa Cruz, USA. [3]Channel Islands National Park, Ventura, USA. [4]California Institute of Environmental Studies, Davis, USA. [5]U.S. Geological Survey, Washington Cooperative Fish and Wildlife Research Unit, School of Environmental and Forest Sciences & School of Aquatic and Fishery Sciences, University of Washington, Seattle, USA

A greater understanding of temporal and spatial variation among demographic rates and environmental conditions is key for predicting climate change impacts on wildlife species. The Cassin's Auklet (*Pytchoramphus aleuticus*) was identified as an ecosystem sentinel of ocean climate change for the California Current system, but the strength of the relationship between reproductive success and oceanographic conditions differs across its extensive breeding range. We investigated this relationship in the California Channel Islands, where auklets breed at two colonies that, although close to each other, can experience different oceanographic conditions. We analyzed 989 nest records collected between 1999 and 2022 and hypothesized that nest survival is driven by either local oceanographic conditions (as measured by satellite-derived sea surface temperature), regional oceanographic conditions (as indicated by the Biologically Effective Upwelling Transport Index), or an interaction between local and regional oceanographic conditions. We developed a daily multievent nest survival model to estimate state-specific survival probabilities in the face of uncertain observations of nest status. We modeled survival as a function of covariates and conducted model selection using Bayes Factors. The top supported model only included local oceanographic conditions, which indicates auklets are most influenced by conditions within core foraging zones near their breeding colonies. In addition, a differential response to sea surface temperature at each colony indicates auklets may have localized adaptations to oceanographic conditions, and we suggest that auklets in different breeding colonies may not respond uniformly to ocean climate change.

DEVELOPING A PROCESS TO FUND OFFSETS FOR CUMULATIVE RESIDUAL IMPACTS OF OFFSHORE WIND ENERGY TO MARINE BIRDS

Aspen Ellis[1] (aaellis@ucsc.edu), Evan Adams[2], Aonghais Cook[3], Wing Goodale[2], Holly Goyert[2], Julia Gulka[2], Kate Searle[4], Elizabeth Masden[5], Kate Williams[2], Donald Croll[1]

[1]University of California, Santa Cruz, Santa Cruz, USA. [2]Biodiversity Research Institute, Portland, USA. [3]The Biodiversity Consultancy, Cambridge, United Kingdom. [4]UK Centre for Ecology & Hydrology, Oxfordshire, United Kingdom. [5]University of the Highlands & Islands - North, West and Hebrides, Daliburgh, United Kingdom

Climate change poses a formidable threat to seabird populations. Concurrently, offshore wind energy development (OWED), vital for achieving global renewable energy goals, presents potential threats to marine wildlife, including seabirds. To ensure the sustainable development of OWED, it is crucial to mitigate those threats. This study focuses on developing a strategy to offset seabird impacts that cannot be prevented via avoidance and minimization measures. Compensatory mitigation and voluntary offsets have been implemented for seabird impacts of offshore wind energy internationally by individual facilities, but managing residual impacts on a site-by-site basis may be challenging for seabirds given their broad ranges. Thus, there is a need to consider management on a regional or global scale. To implement effective compensation in the U.S., a comprehensive and transparent process is required to estimate residual impacts using modeling and identify a monetary value for their replacement via conservation interventions that may be paid into a regional fund to support conservation actions. The proposed approach outlines a systematic process, post-site selection, to evaluate and compensate for OWED impacts on seabirds. It stresses a quantitative framework, including site-level impact evaluation and scaling site-level impacts to assess cumulative impacts regionally. Additionally, the paper addresses the valuation of impact and proposes a funding mechanism where OWED developers contribute to a regional fund, which could help to more effectively foster seabird conservation along with the growth of OWED facilities. This comprehensive framework aims to facilitate a net positive impact on seabird populations while advancing global renewable energy objectives.

OPTIMIZING RANGE-WIDE MONITORING STRATEGY FOR TUFTED PUFFINS

Matthew Farr[1] (farrm@uw.edu), Beth Gardner[1], Lisanne Petracca[2], Peter Hodum[3], Robb Kaler[4], Scott Pearson[5], Heather Renner[6], Sarah Converse[7,1]

[1]University of Washington, Seattle, USA. [2]Texas A&M University, Kingsville, USA. [3]University of Puget Sound, Tacoma, USA. [4]U.S. Fish & Wildlife Service, Anchorage, USA. [5]Washington Department of Fish and Wildlife, Olympia, USA. [6]U.S. Fish & Wildlife Service, Homer, USA. [7]U.S. Geological Survey, Seattle, USA

Wildlife conservation often requires transboundary coordination, as breeding ranges of many species cross jurisdictional boundaries. A unified approach to species monitoring can facilitate assessment and effective conservation action among jurisdictions. Coordination can be particularly challenging when a species displays strikingly different population dynamics across its range, as monitoring performance can be sensitive to differences in population dynamics. The conservation of Tufted Puffins (*Fratercula cirrhata*) exemplifies the challenges of transboundary coordination. The species is declining in the southern portion of its North American range (i.e., California Current Marine Ecosystem) and stable to increasing in the north (i.e., Aleutian Islands Marine Ecosystems). We evaluate options for a range-wide monitoring strategy for Tufted Puffins that provide for unified inference about population trends while allowing flexibility in monitoring methodology across multiple jurisdictions. To combine multiple data collection protocols (e.g., boat-based colony counts, plot-based burrow counts, time-lapse photographic surveys), we developed an integrated model to estimate shared population abundance and growth metrics. Our model is hierarchical, allowing us to estimate population parameters, while accounting for variation in sampling at multiple spatial scales. Through simulation, we compare monitoring design performance (i.e., minimization of mean square error) across multiple future scenarios of population change to evaluate robustness of candidate monitoring strategies. Our approach to evaluating range-wide Tufted Puffin monitoring strategies provides a potential avenue for a unified and transboundary monitoring approach, while allowing for monitoring designs to be adapted to local conditions.

HOW LOW IS LOW ENOUGH? RESTORING SEABIRD POPULATIONS IN INVADED ECOSYSTEMS

Michael Fox[1] (mfox677@aucklanduni.ac.nz), Todd Landers[2,1], Brendon Dunphy[1], James Russell[1]

[1]University of Auckland, Auckland, New Zealand. [2]Auckland Council, Auckland, New Zealand

Human activities such as overexploitation, habitat destruction, and the movement of invasive alien species (IAS) are causing wildlife populations to decline globally, including burrowing seabirds (*Procellariidae*). Grey-faced petrel/ōi (*Pterodroma gouldi*) are a model species that offer an opportunity to study restoration in the presence of ongoing IAS impacts.

In invaded ecosystems, conservation and management of vulnerable species often involve IAS control, a major and expensive activity. Where eradication is not possible, IAS are reduced to some desirable level ("as low as possible") for as long as possible ("indefinitely"). An alternative approach utilises maximum allowable IAS density and minimum control effort of IAS, resulting in a pre-determined limit (threshold) where positive biodiversity outcomes occur (survival & breeding of vulnerable species).

Our research addresses a critical knowledge gap in procellarid conservation by developing density impact functions (DIFs) for rat (*Rattus* spp.) and mustelid (*Mustela* spp.) abundance (using trail cameras) and the breeding success of grey-faced petrel across 11 recovering mainland colonies in north-western New Zealand. Despite the presence of rats across various sites, our findings reveal that grey-faced petrel are only moderately vulnerable to rats during incubation and early chick-rearing. In contrast, they are highly vulnerable to mustelids throughout the chick-rearing period. Using the DIFs, we identified the maximum allowable density for rats and mustelids during these periods and identified the minimum number of traps required to reduce IAS below this threshold. Our approach offers an effective strategy for restoring and conserving procellarids in invaded ecosystems where eradication is not currently possible.

SIGNS OF SUCCESSFUL SEABIRD SOCIAL ATTRACTION AT PALMYRA ATOLL

Katie Franklin[1], Dana Sabine[1] (dana.sabine@tnc.org), Alex Wegmann[2], Nick Holmes[3]

[1]The Nature Conservancy, Honolulu, USA. [2]The Nature Conservancy, Sacramento, USA. [3]The Nature Conservancy, Santa Cruz, USA

Seabird populations are declining globally due to threats from invasive species, harmful fishing practices, hunting, and habitat loss. Restoring seabirds to invasive predator-free islands with suitable habitat is key for seabird conservation and ecosystem functioning. Palmyra Atoll, a U.S. territory in the Northern Line Island Archipelago, offers a unique conservation opportunity for seabirds in this region of the Pacific Ocean. Currently, Palmyra has 11 resident seabird species. Additionally, eight species were likely extirpated by the WWII-era introduction of black rats and habitat disturbance. Over 20 years of careful conservation and management at Palmyra by The Nature Conservancy, the U.S. Fish and Wildlife Service, and partners has resulted in the eradication of rats and restoration of native habitat. Beginning in 2020, a seabird social attraction program was implemented to target extirpated seabirds with the intention of establishing new nesting populations. Methods implemented include seabird decoys with mirror boxes, sound systems broadcasting seabird vocalizations, and artificial burrows. Monitoring techniques include remote camera systems, acoustic recording devices, and audio/visual observations. Since program initiation, individuals and pairs of numerous targeted seabird species have been documented at Palmyra, including wedge-tailed shearwaters, Christmas shearwaters, blue noddies, and grey-backed terns. In April 2023, nesting by grey-back terns near one of the social attraction sites resulted in a successful fledging event – a promising sign for more seabirds returning in the future. Our program at Palmyra contributes to a growing list of successful seabird restoration programs around the world aimed at restoring seabird populations and enhancing ecosystem resilience.

MARBLED MURRELET CHICK PROVISIONING UNDER DIVERGENT OCEAN CONDITIONS

Cecelia E. Frisinger (cecelia.frisinger@oregonstate.edu), Jonathan C. Dachenhaus, Kaitlyn E. Osborne, Daniel D. Roby, S. Kim Nelson, Matthew G. Betts, James W. Rivers

Oregon State University, Corvallis, USA

Under rapid environmental change, flexible parental care strategies may be important to offspring survival. From 2018 to 2022, we conducted a large-scale study in western Oregon aimed at identifying the factors affecting population recruitment in the threatened Marbled Murrelet (*Brachyramphus marmoratus*). During our study, a shift from warmer to cooler ocean conditions provided an opportunity to study how environmental variability influenced parental care. To quantify parental care, we used chick provisioning behaviors obtained from continuous video recordings at 18 nests and documented >1300 feeding events. Fledging ages spanned from 30 to 45 days, with mean fledging age increasing by 7.5 days in years characterized by warmer ocean temperatures. Preliminary results suggest a difference in the mean daily feeding rates between warmer ocean temperature years (2.0 ± 1.2 feedings per day) and cooler ocean temperature years (2.9 ± 1.4 feedings per day). Additionally, early findings indicate that days with 0 feeding events were observed in at least 5 nests provisioned under unfavorable ocean conditions. Further results from this study will enhance our understanding of the marine-driven mechanisms that may be limiting reproductive success in murrelets. This is likely to have important conservation implications, especially as a changing climate continues to alter marine food web dynamics.

CONTINUED OBSERVATIONS OF ASSORTATIVE MATE CHOICE IN A SYMPATRIC COLONY OF BROWN BOOBY SUBSPECIES IN MAUI COUNTY

Martin Frye[1] (mfrye@hawaii.edu), Eric VanderWerf[2], Jenni Learned[1], Zach Pezzillo[3], Alex Calma[1], Sophia Rooney[1], Skye Anderson[1], Cheryl King[1], Mariah Rivera[1], Joshua DeCambra[1], Jay Penniman[1]

[1]Maui Nui Seabird Recovery Project, Pāʻia, USA. [2]Pacific Rim Conservation, Honolulu, USA. [3]Plant Extinction Prevention Program, Kahului, USA

Brewster's Brown Booby (*Sula leucogaster brewsteri*, ʻĀ) are a morphologically and genetically distinct Brown Booby subspecies whose range has expanded Westward from the Eastern Pacific Ocean into the Central Pacific. Since 2020, S. l. brewsteri have been documented on Moku Mana, an islet in East Maui, Hawaiʻi. The more commonly reported Brown Booby subspecies in the Central Pacific region (*Sula leucogaster plotus*), had been nesting in low numbers on Moku Mana since at least 2004, representing the Easternmost documented colony of Brown Boobies in the Hawaiian Archipelago. As shown by Vanderwerf et al. 2023, the solidifying zones of range overlap of S. l. brewsteri and S. l. plotus offer an opportunity to examine mate choice patterns where the two subspecies are sympatrically nesting. We present observations and photographs from the period of 2022-2023. As in 2021, we note asynchronous breeding activity across several months of the year, with various reproductive stages present in the colony during most visits. All observed nests were attended by pairs sorted by subspecies; there continue to be no observed pairs of mixed subspecies. Documentation of this colony represents solidification of evidence for range expansion in the Central Pacific, and the continued monitoring of nest pairs may offer evidence of behavioral barriers to genetic introgression between the two subspecies.

A SPATIAL APPROACH TO QUANTIFYING ECOLOGICAL CAUSES AND CONSEQUENCES OF COMMON TERN AGGRESSION

Kay Garlick-Ott[1] (kgarlickott@ucdavis.edu), Don Lyons[2,3], Elisha Hull[1]

[1]University of California, Davis, Davis, USA. [2]Audubon Seabird Institute, National Audubon Society, Bremen, USA. [3]Department of Fisheries, Wildlife, and Conservation Sciences, Oregon State University, Corvallis, USA

Seabirds experience a wide range of ecological conditions at their breeding sites, and they must navigate these challenges while also subject to a dynamic social environment. Social behaviors like aggression can affect fitness directly, as well as indirectly mediate the impact of environmental change on breeding success. Studying aggressive interactions at nest may help researchers understand how processes like climate change and resource availability scale-down to impact specific colonies where management is happening. However, until recently, the effect of social behavior on reproductive outcomes has largely been ignored.

We have devised novel methods for mapping aggression in Common Tern colonies to learn about the ecological causes and consequences of this behavior. Specifically, we plan to identify colony-wide patterns in aggression across space and time, then connect these patterns to breeding success at nest. Preliminary results from a subsample of videos recorded during our 2022 season confirm that aggression varies strongly with time of day and across breeding periods, with higher rates of behavior when the colony is more active overall. Density likely correlates with aggression, but not always; and quantifying vegetation structure in these areas may help parse variation in levels of aggression. Continued analysis will reveal trends and test hypotheses regarding the interaction of ecological variables with patterns in behavior. In sum, our aggression landscape perspective presents a promising and valid behavioral method that may lead to important recommendations for the management of this species' social environment and for conservation across this taxon.

HOW DO MARINE PROTECTED AREAS PROTECT SEABIRDS NOW AND IN THE FUTURE?

Morgan Gilmour[1] (morgan.e.gilmour@nasa.gov), Josh Adams[2], Nick Holmes[3], Sara Maxwell[4], Scott Shaffer[5], Alex Wegmann[6]

[1]NASA Ames Research Center, Moffett Field, USA. [2]USGS Western Ecological Research Center, Santa Cruz, USA. [3]The Nature Conservancy, San Francisco, USA. [4]University of Washington, Bothell, Bothell, USA. [5]San Jose State University, San Jose, USA. [6]The Nature Conservancy, Sacramento, USA

Marine protected areas (MPAs) are a tool that can help conserve resources and protect marine species. However, remote MPAs are difficult to monitor, and estimating how these designated areas might protect resources and species in the future is complex. We tracked three seabird species (great frigatebird, *Fregata minor*; red-footed booby, *Sula sula*; sooty tern, *Onychoprion fuscatus*) at Palmyra Atoll to assess habitat use in relation to the boundaries of the Pacific Remote Islands Marine National Monument. We combined animal telemetry and remote sensing data in species distribution models to characterize breeding seabird habitats and to ask whether the MPA protected these resources under current environmental conditions and under two climate change scenarios. On average, the MPA overlapped with 40 ± 52% (±SD) of the area where these species traveled, and 60 ± 44% of the MPA contained highly suitable habitat. Estimated future habitat gains and losses within the MPA depended on the climate change scenario: under a "sustainability" scenario (SSP 1-2.6), there was an overall loss of habitat predicted for the decades 2040–2050 and 2090–2100. Surprisingly, there was an overall gain in habitat predicted for a "rocky road" scenario (SSP 3-7.0) for frigatebirds and boobies, but decreased habitat predicted for sooty terns. These results suggest that the Palmyra MPA currently protects some seabird habitats and may buffer some habitat changes in the future. Animal telemetry and remote sensing are useful marine spatial planning tools to assess conservation measures.

COMBINING BIO-LOGGING, STABLE ISOTOPES AND DNA METABARCODING TO REVEAL THE FORAGING ECOLOGY AND DIET OF THE ENDANGERED BERMUDA PETREL *PTERODROMA CAHOW*

Letizia Campioni[1], Francesco Ventura[2], José Pedro Granadeiro[3], Jeremy Madeiros[4], Carina Gjerdrum[5] (carina.gjerdrum@ec.gc.ca), Mónica Silva[6]

[1]MARE – Marine and Environmental Sciences Centre / ARNET - Aquatic Research Network, Ispa – Instituto Universitário de Ciências Psicológicas, Sociais e da Vida, Lisbon, Portugal. [2]Biology Department, Woods Hole Oceanographic Institution, Woods Hole, USA. [3]CESAM - Centre for Environmental and Marine Studies, Departamento de Biologia Animal, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, Lisbon, Portugal. [4]DENR - Department of Environment and Natural Resources, Ministry of Home Affairs, Paget DV04, Bermuda. [5]Canadian Wildlife Service, Environment and Climate Change Canada, Dartmouth, Canada. [6]CE3C- Centre for Ecology, Evolution and Environmental Changes, Departamento de Biologia Animal, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, Lisbon, Portugal

Under central-place breeding constraints, foraging by wide-ranging predators is challenging due to highly variable environmental conditions and prey availability. Gadfly petrels (Pterodroma spp.) leverage sustained wind conditions to travel vast distances to maximise prey encounter, but our understanding of their foraging ecology and spatiotemporal distribution remains limited. Here, we studied foraging behaviour, ecological niche, and diet of the endangered Bermuda Petrel, Pterodroma cahow, endemic to the western North Atlantic. We tested how intrinsic biological and extrinsic oceanographic and atmospheric factors shape its foraging behaviour and ecological niche during reproduction. We used global positioning system (GPS) loggers in 2019 and 2022 to track foraging trips during incubation and chick-rearing, and employed DNA metabarcoding and stable isotope analyses to characterize dietary habits. We found petrels reduced their foraging ranges and time at sea during chick-rearing by foraging closer to the colony than during incubation. Their choice of where to forage was affected by a different set of environmental variables during incubation compared to chick-rearing, and included distance to colony, mesoscale oceanographic features, and wind speed. Petrels showed narrow isotopic niches, and the ranges of δ15N and δ13C values suggested consistency in trophic habits. We found high taxonomic diversity of prey, including exclusively meso-bathypelagic fishes and cephalopods. Our results contribute critical new knowledge on Bermuda Petrel foraging-behaviour plasticity, a feature that can help predict how a small population of an endangered pelagic species may respond to climate changes in wind regimes and oceanic processes expected in the North Atlantic Ocean.

INCORPORATING SEABIRD-DERIVED INFORMATION INTO U.S. FISHERIES MANAGEMENT

Thomas Good[1] (tom.good@noaa.gov), Stephani Zador[2], William Sydeman[3]

[1]NOAA Fisheries/Northwest Fisheries Science Center, Seattle, USA. [2]NOAA Fisheries/Alaska Fisheries Science Center, Seattle, USA. [3]Farallon Institute, Petaluma, USA

Seabirds are known indicators of the marine environment, and seabird data may reflect ecosystem health and status of fishery stocks. To assess the use of seabird-derived information as part of ecosystem-based fisheries management, we reviewed U.S. fisheries stock assessments from five NOAA Fisheries regions. We scored over 300 stock assessments spanning almost 20 years on an ordinal scale on the extent of seabird information included. Most stock assessments lacked any seabird information. Of those that did incorporate seabird information, most did as background information on the fishery stock. Less commonly, qualitative use of seabird information involved reporting seabird-derived data but not including it in analyses or explicitly linking seabird data to stock assessment parameters. Even rarer was the quantitative use of seabird data in stock assessment models. There was an increase over time in including seabird information qualitatively or quantitatively in stock assessments. This was due in part to the increasing use of ecosystem information in U.S. fisheries management in general but was more due to stock assessments in the Alaska region including seabird information in recent years as part of a risk table framework evaluating environmental/ecosystem concerns and informing harvest recommendations. Seabird indicators are also now reported in some regional ecosystem status reports produced for fishery councils, reflecting their growing recognition as an important component of the marine ecosystem. Including seabird-derived information in stock assessments and via other fishery management levers will require collaboration between seabird and fisheries scientists and will substantially improve U.S. ecosystem-based fisheries management.

ASSESSING FACTORS THAT AFFECT MARBLED MURRELET FORAGING BEHAVIORS IN THE SOUTH PUGET SOUND

Erik Grey (egrey@pugetsound.edu), Peter Hodum

University of Puget Sound, Tacoma, USA

Seabird populations worldwide face increasing pressures due to a variety of anthropogenic factors. Marbled Murrelets (MAMU, *Brachyramphus marmoratus*), classified as Endangered in multiple states and as Threatened federally under the Endangered Species Act, are a classic example of the population-level consequences of multiple anthropogenic stressors. Although the species and their marine habitat usage patterns have been well studied throughout much of their breeding range in the Pacific Northwest, their foraging behavior and marine habitat characterization in the southern Salish Sea area are poorly understood. The principal objectives of this study were to characterize foraging habitat and foraging behaviors in waters surrounding Browns Point Lighthouse, Tacoma, WA, continuing a time series begun in 2021. We used land- and boat-based methods to map the distribution of MAMUs in waters around the lighthouse, characterize marine habitat, quantify foraging behaviors, assess MAMU responses to boat traffic, and analyze forage fish abundance and distribution. We have determined that the site is a consistent foraging hotspot for MAMUs within and between seasons, and it is the largest known breeding season foraging assemblage in the southern Salish Sea. Results from this study will contribute to conservation planning for MAMUs in the region.

THE THERMAL STRESS RESPONSE OF AN ARCTIC SEABIRD IS MAGNIFIED BY HIGH TEMPERATURES AND SENSITIVE TO BODY CONDITION, BUT IS NOT AFFECTED BY MERCURY EXPOSURE

Melissa Grunst[1,2] (mgrun002@ucr.edu), Andrea Grunst[1,2], David Grémillet[3,4], Jérôme Fort[1]

[1]La Rochelle University, La Rochelle, France. [2]Indiana State University, Terre Haute, IN, USA. [3]CEFE, Univ Montpellier, CNRS, EPHE, IRD, Montpellier, France. [4]Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch, South Africa

When confronted with acute stressors, animals mount a suite of physiological reactions, including a rapid elevation of body temperature (Tb), referred to as the thermal stress response (TSR). The TSR primes animals to respond to survival threats while maintaining thermoneutrality. Exposure to chemical contaminants, such as the neurotoxin and endocrine disruptor, mercury (Hg), may interfere with the TSR, disrupting animals' ability to cope with stressors and regulate Tb . The implications of such an effect could be magnified in the context of rising temperatures related to climate change. We evaluated independent and interactive effects of environmental conditions, Hg contamination, and body condition metrics on the TSR of an Arctic seabird, the little auk (Alle alle). As Arctic denizens, little auks are cold-adapted and face contemporary rates of warming nearly four times the global average. We assessed the TSR by measuring changes in the maximum temperature of the eye region (TEYE) in response to capture stress via infrared thermography. Hg contamination did not independently, or interactively, affect TEYE. However, ambient temperature (Ta) increased the magnitude of the TSR. Furthermore, birds in poor body condition displayed a lower magnitude TSR, and those with higher blood albumin had higher initial TEYE and a lower magnitude TSR. Thus, we found no evidence that Hg contamination modifies the dynamics of the TSR in a high Arctic predator. However, the nature of the TSR was environment- and state-dependent, which could have implications for the efficacy of responses to predators in the context of global change.

RISK-TAKING BEHAVIOR RELATED TO MERCURY CONTAMINATION IN AN ARCTIC SEABIRD

Andrea Grunst[1,2] (agrun001@ucr.edu), Melissa Grunst[1,2], David Grémillet[3], Olivier Chastel[4], Salomé Friry[5], Aby Giraud[2], Antoine Grissot[6], Dariusz Jakubas[6], Akiko Kato[4], Katarzyna Wojczulanis-Jakubas[6], Jérôme Fort[7]

[1]Indiana State University, Terre Haute, IN, USA. [2]La Rochelle University, La Rochelle, France. [3]CEFE, University of Montpellier, CNRS, EPHE, IRD, Montpellier, France. [4]Centre d'Etudes Biologiques de Chizé (CEBC), Villiers-en-bois, France. [5]University of Zurich, Zurich, Switzerland. [6]University of Gdansk, Gdansk, Poland. [7]La Rochelle University, LIENS, CNRS, La Rochelle, France

Understanding how animal personality traits are modified by environmental stressors, including chemical contaminants, is of increasing importance given rapid anthropogenic environmental change. In this context, we investigated whether mercury (Hg) exposure is associated with neophobia and risk-taking behavior in dovekies (or little auks, Alle alle), an Arctic seabird facing altered Hg exposure due to climate change. We presented novel objects of different colors at dovekie nests at Hornsund, Svalbard, and quantified latency of birds to enter the nest with food under control conditions and when confronted with novel objects. We related behavior to blood Hg and baseline corticosterone (CORT), as CORT might be modulated by Hg and affect behavioral stress responsiveness. We also determined repeatability and asked whether birds investing highly in reproduction displayed reduced neophobia. Dovekies displayed neophobia, with latency to enter the nest increasing from ~40 to 80 sec on average in response to novel objects. Latency to enter was individually repeatable within and across control and novel object sessions, suggesting repeatability in cautiousness. However, neophobia (increased latency relative to controls) exhibited non-significant repeatability, perhaps due to habituation. Birds with elevated Hg for this population (range: 0.3-0.8 mg g-1 dry weight) took longer to enter the nest upon first appearance in control and novel object sessions, suggesting elevated cautiousness, but did not show higher neophobia or reduced habituation. CORT negatively correlated with neophobia. Findings support prior work suggesting that Hg might alter risk-taking behavior, calling for more work on this topic in animals at high Hg exposure risk.

TRAIL CAMERAS, GOPROS, AND THEIR ABILITY TO MONITOR COMMON AND ROSEATE TERN CHICK PROVISIONING

Sarah Guitart[1] (sguitart@umass.edu), Michelle Staudinger[2]

[1]University of Massachusetts Amherst, Amherst, USA. [2]University of Maine, Walpole, USA

Consistent diet monitoring of seabird colonies is needed to understand shifts in prey availability and the resultant impact on populations. However, the current methodology of in-person monitoring by field technicians is resource-burdensome for many managers, resulting in intermittent diet data for many populations. To address this issue, we tested motion-triggered Browning® trail cameras and GoPro® cameras against the standard in-person monitoring protocol on a mixed Roseate (*Sterna dougallii*) and Common Tern (*Sterna hirundo*) colony in Buzzards Bay, Massachusetts. The field-ready trail cameras were set to capture four images per triggering event and then mounted on semi-permanent productivity plots at the beginning of the 2023 chick-rearing period. Plot selection was based on visual obstructions, disturbance levels, and the total number of nests. The more fragile GoPro® cameras were mounted on Volta® charging stands and set to record continuous video immediately prior to the beginning of monitoring periods. To measure the cameras' performances, we conducted two-hour in-person monitoring stints (n = 16) on one camera plot per species throughout the chick-rearing period. Performance metrics of each monitoring method (in-person, trail camera, and video) were analyzed and compared. Ultimately, in-person monitoring outcompeted both technologies, although GoPro® cameras provided quality data for a reduced number of nests and trail cameras captured most of the observed dietary diversity. This research informs seabird managers of two cameras' capabilities as proxies for in-person monitoring and provides a protocol for future usage as a management tool.

GUIDANCE FOR DETECTING CHANGES IN SEABIRD DISTRIBUTIONS AND HABITAT USE RELATED TO OFFSHORE WIND ENERGY DEVELOPMENT IN THE UNITED STATES

Julia Gulka[1] (julia.gulka@briwildlife.org), Kate Williams[1], Iain Stenhouse[1], Holly Goyert[1], Edward Jenkins[1], Kate McClellan Press[2], Caleb Spiegel[3], Tim White[4]

[1]Biodiversity Research Institute, Portland, USA. [2]New York State Energy Research and Development Authority (NYSERDA), Albany, USA. [3]U.S. Fish and Wildlife Service-Northeast Region, Hadley, USA. [4]Bureau of Ocean Energy Management, Stirling, USA

Offshore wind (OSW) development is rapidly increasing in the U.S., necessitating guidance on how to measure the range of potential effects to seabirds. Among the most observed effects are behavioral changes that lead to avoidance from, or attraction to, OSW facilities. To ensure research into these responses is consistent and well-designed, a committee of subject matter experts developed guidance for conducting studies of changes in bird distributions and habitat use at OSW facilities. Under the auspices of New York's Offshore Wind Environmental Technical Working Group and chaired by federal regulatory agencies, the workgroup included subject matter experts from the U.S., Canada, and the UK. Participants developed guidance informed by a literature review of existing studies, power analyses, and expert elicitation. The guidance document identifies key research questions and provides an overall process for the selection of research questions, focal taxa, and data collection methods. It describes how to design studies that provide adequate statistical power to detect effects and details the strengths and limitations of study methods, as well as specific recommendations for the use of observational surveys, and how best to achieve data consistency and transparency. The guidance is intended for use by government and regulatory agencies, OSW developers, and other stakeholders, to improve the quality of site-specific monitoring efforts. The guidance document outlines enhancements in study design, methods, and data sharing for studies on the effects of OSW development, which will serve to inform meta-analyses, cumulative impact assessments, and other large-scale assessments of OSW effects on seabird populations.

UPDATE ON THE ABUNDANCE AND DISTRIBUTION OF MACARONI PENGUINS (*EUDYPTES CHRYSOLOPHUS*) IN THE ANTARCTIC PENINSULA REGION

Madeline Hallet[1] (madeline.hallet@stonybrook.edu), Heather Lynch[1,2]

[1]Department of Ecology and Evolution, Stony Brook University, Stony Brook, NY, USA. [2]Institute for Advanced Computational Sciences, Stony Brook University, Stony Brook, NY, USA

Several studies have examined the potential impacts of climate change on the abundance and distribution of Antarctic penguin species, particularly in the genus *Pygoscelis*. However, less attention has been given to traditionally sub-Antarctic penguin species. In Antarctica, the Macaroni penguin (*Eudyptes chrysolophus*) has historically been restricted to colonies on islands north of the Antarctic Peninsula, but their status in the region has not been updated in decades. We compiled census data on all known Macaroni penguin breeding colonies in the Antarctic Peninsula region and estimate a population of 8,053 breeding pairs, which represents an 11% increase since the last regional census in 1993. We discuss local population changes at different colonies in comparison to historical census data. We also identify vagrant sightings in the region, as they may reflect prospecting of new breeding habitat, especially as ice-free areas continue to expand due to climate change. Our assessment identifies the South Shetland Islands and South Orkney Islands as notable data gaps particularly in light of the potential for range expansion under climate change.

VEGETATION COVER AND LANDSCAPE FEATURES PREDICT BREEDING SEABIRD SPACE USE ON A PACIFIC ATOLL

Eve Hallock[1] (eveh@uw.edu), Sarah Converse[2], Jayna DeVore[3,4], Amelia DuVall[5], Beth Gardner[1]

[1]School of Forest and Environment Sciences, University of Washington, Seattle, USA. [2]U.S. Geological Survey, Washington Cooperative Fish and Wildlife Research Unit, School of Environment and Forest Sciences & School of Aquatic and Fishery Sciences, University of Washington, Seattle, USA. [3]Tetiaroa Society, Tetiaroa, French-Polynesia. [4]Université de la Polynésie française, Puna'auia, French-Polynesia. [5]School of Aquatic and Fishery Sciences, University of Washington, Seattle, USA

Pacific atolls are space-limited, remote environments with relatively low biodiversity and endemism. However, these coral islands are tropical seabird hotspots that provide critical breeding and roosting sites. Many Pacific atolls were formerly copra plantations or underwent other types of anthropogenic disturbances, and the associated vegetation changes have had unknown impacts on seabirds. We investigated relationships between vegetative cover and seabird distribution on Tetiaroa Atoll in the Society Islands of French Polynesia. Vegetation on Tetiaroa is composed of residual *Cocos nucifera* monocultures, re-emerging native forests, patches of coastal herbaceous vegetation, and more than a dozen mixed microhabitats. Currently, eleven seabird species (three *Sula spp*., two *Fregata spp*., and six Larids) breed on Tetiaroa, with potential for re-colonization by additional species, facilitated by recent rat and crazy yellow ant eradications. To estimate the spatial distribution and habitat selection of nesting seabird species, we collected vegetation data and conducted nearly 700 point counts at 110 locations across 11 of 12 Tetiaroa's islets. In addition to providing important baseline data for assessing effects of eradications, these data are also allowing us to understand the factors driving high spatial variation in seabird distribution. Our initial results indicate that several Larid species select *Pisonia grandis*, *Pandanas tectorius*, and other native trees for breeding. *Cocus nucifera* stands, by contrast, appear to provide little habitat for seabirds. Our results can inform vegetation restoration across Pacific atolls for the purpose of conserving seabird populations, along with the important ecosystem services that they provide.

LOCAL COMMUNITY PARTNERSHIPS ENABLE MONITORING OF SEABIRDS IN REMOTE BRITISH COLUMBIA

Angela Hansen (angelamklhansen@gmail.com), Liam Ragan

BC Federation of Naturalists, IBA Program, Vancouver, BC, Canada

The conservation of specific sites is among the most effective methods of reducing global biodiversity loss. Identifying sites of high and unique biodiversity value is critical for timely conservation. The Key Biodiversity Areas (KBA) approach aims to identify important areas for species conservation. The KBA program in Canada is a multi-sector collaborative effort. The inaccessibility of many specific sites results in a lack of effective and timely monitoring of seabird populations. There are significant data deficiencies for many sites that need to be filled for KBA designation approval. The solution is local community engagement, and the benefits are numerous. Successful monitoring of many remote sites by engaging local indigenous communities and local caretakers is ongoing. Surprising results have been found about the endangered and rapidly declining Marbled Murrelet (*Brachyramphus marmoratus*) population, and monitoring of multispecies herring spawn aggregations has resulted in unconventional local conservation efforts. Partnering with local communities enhances monitoring outcomes when resources are limited, while simultaneously allowing for conservation values and outcomes to be internalized within local communities, supporting long-term stewardship.

SEX-RELATED VARIATION IN THE DISTRIBUTION AND RELATION WITH LONGLINE FISHERIES OF BLACK-FOOTED ALBATROSSES

Haruka Hayashi[1], Bungo Nishizawa[1], Naoki Tomita[2], Daisuke Ochi[1] (otthii80s@gmail.com)

[1]Fisheries Resources Institute, Japan Fisheries Research and Education Agency, Yokohama, Japan.
[2]Yamashina Institute for Ornithology, Abiko, Japan

Some albatross species exhibit difference in distribution between male and female, possibly reflecting to sex-based difference in bycatch risk. In February and March 2020-2023, female and male black-footed albatrosses Phoebastria nigripes breeding at Torishima Island, Japan, were fitted with GPS-PTT transmitter to obtain location data over multiple years. During the breeding period, they mainly foraged along Izu Islands and reach Honshu. After the breeding period, they migrated northward off Honshu to the Kril Islands and sea of Okhotsk. Some individuals migrated off the northwestern Pacific Ocean. The estimated daily operating hours of longline vessels in the northwest Pacific during the same period were obtained from Global Fishing Watch. Using Bhattacharyya's affinity as degree of coincidence between male and female distributions, these were more similar during the breeding period than during the non-breeding period. As an degree of overlap of albatrosses and fishing vessels, the seasonal average of the total daily operating hours of all longline vessels within 30km of each bird's location for both of sex were calculated. The degree of overlap with fishing vessels during the breeding period had no significant differences between males and females(Brunner-Munzel test, $p>0.05$). During non-breeding period, the degree of overlap of females were higher than males. Comparing between periods, females had greater overlap in the non-breeding period than in the breeding period, and males had lower overlap in the non-breeding period.

NOAA FISHERIES NATIONAL SEABIRD PROGRAM: A COLLABORATIVE CONSORTIUM

Annette Henry[1] (annette.henry@noaa.gov), Mi Ae Kim[2], Thomas Good[3], Lee Benaka[4], Joshua Moffi[5]

[1]NOAA Fisheries SW Fisheries Science Center, La Jolla, CA, USA. [2]NOAA Fisheries Office of International Affairs, Trade, & Commerce, Silver Spring, MD, USA. [3]NOAA Fisheries NW Fisheries Science Center, Seattle, WA, USA. [4]NOAA Fisheries Office of Science & Technology, Silver Spring, MD, USA. [5]NOAA Fisheries Alaska Regional Office, Juneau, AK, USA

NOAA Fisheries' National Seabird Program (NSP) comprises a team of scientists and managers from all Regional Offices and Science Centers, several headquarters' offices (Protected Resources' Science & Technology' International Affairs, Trade, & Commerce' Sustainable Fisheries' and Habitat Conservation); NOAA General Counsel; and the National Ocean Service. The Program's two overarching goals are to: 1) Monitor and Mitigate Seabird Bycatch, and 2) Promote Seabirds as Ecosystem Indicators.

In order to increase the effectiveness of our program, we work in partnership with other federal agencies (e.g., U.S. Fish and Wildlife Service, U.S. Bureau of Ocean Energy Management, U.S. Geological Survey, U.S. Department of State), regional fisheries management councils and organizations, States, and non-governmental organizations. These internal and external partnerships benefit the goals of the NSP by providing significant leveraging at regional, national, and global levels. Bringing together diverse knowledge bases allows us to explore new and innovative ways in which to solve problems and make decisions together. In turn, this advances our ability to promote and conserve seabirds as an integral part of the management and stewardship of marine ecosystems.

WHOLE GENOME SEQUENCING REVEALS STEPPING-STONE DISPERSAL BUFFERED AGAINST FOUNDER EFFECTS IN A RANGE EXPANDING SEABIRD

Rachael Herman[1] (rachael.herman@stonybrook.edu), Gemma Clucas[2], Jane Younger[3], John Bates[4], Bryce Robinson[2], Sushma Reddy[5], Julia Stepanuk[6], Katie O'Brien[7], Krishna Veeramah[1], Heather Lynch[1]

[1]Stony Brook University, Stony Brook, USA. [2]Cornell University, Ithaca, USA. [3]University of Tasmania, Hobart, Australia. [4]Field Museum, Chicago, USA. [5]University of Minnesota, Minneapolis, USA. [6]Biodiversity Research Institute, Portland, USA. [7]University of Bath, Bath, United Kingdom

Many species are shifting their ranges in response to climate driven environmental changes, particularly in high latitude regions. However, the patterns of dispersal and colonization during range shifting events are not always clear. Understanding how populations are connected through space and time can reveal how species navigate a changing environment. Here we present a fine-scale population genomics study of gentoo penguins (Pygoscelis papua), a presumed site-faithful colonial nesting species that has increased in population size and expanded its range south along the Western Antarctic Peninsula. Using whole genome sequencing, we analyzed 129 gentoo penguin individuals across 12 colonies located at or near the southern range edge. We inferred that gentoo penguins historically dispersed rapidly in a stepping-stone pattern from the South Shetland Islands leading to the colonization of Anvers Island, and then the adjacent mainland Western Antarctica Peninsula. Recent southward expansion along the Western Antarctic Peninsula also followed a stepping-stone dispersal pattern coupled with limited post-divergence gene flow from colonies on Anvers Island. Genetic diversity appeared to be maintained across colonies during the historical dispersal process, and range edge populations are still growing. This suggests large numbers of migrants may provide a buffer against founder effects at the beginning of colonization events to maintain genetic diversity similar to that of the source populations before migration ceases post divergence. These results coupled with a continued increase in effective population size since approximately 500-800 years ago distinguishes gentoo penguins as a robust species that is highly adaptable and resilient to changing climate.

MORE THAN MEETS THE EYE: USING SEABIRD EYEBALLS AND BRAINS TO EXPLORE THREATS TO SEABIRDS

Ariel-Micaiah Heswall[1] (ahes107@aucklanduni.ac.nz), Peter Hadden[1], Dane Gerneke[1], Agustina Dominguez[2], Lynn Miller[2], Kristal Cain[1], Megan Friesen[3], Anne Gaskett[1]

[1]The University of Auckland, Auckland, New Zealand. [2]BirdCare Aotearoa, Auckland, New Zealand. [3]Saint Martin's University, Lacey, USA

Sensory ecology is the study of how animals interact in the environment using their sensory features and is a useful tool for understanding conservation threats. Seabirds face a myriad of threats that are strongly linked to their sensory systems including bycatch, plastic ingestion and light pollution. Previous research has shown that species variation in eye and nostril size correlates with the risk of seabird bycatch. However, for most species of seabirds the underlying morphology of sensory systems are unknown. We aim to describe the visual morphology of different native New Zealand seabirds using spectrometry to examine the seabird's ocular transmission as well as using MicroCT scans to examine the brain's sensory features including the olfactory bulb (smell) and midbrain (vision). We also examine how species differences in sensory anatomy could correlate with vulnerability to plastic and light pollution. We report that Suliformes eye lens cannot transmit ultraviolet A (UV-A) whereas most Procellariformes can. In regards to the brain's sensory anatomy, we found differences between the different seabird species and a negative correlation between plastic ingestion and the relative size of the midbrain and olfactory bulb. This suggests that larger bodied seabirds with a larger absolute size of sensory features were more likely to ingest plastic.

TEMPORAL CHANGE IN DISTRIBUTION AND QUANTITY OF KITTLITZ'S MURRELET NESTING HABITAT IN THE KENAI FJORDS REGION

Brendan Higgins (bhiggins3@alaska.edu) Tuula Hollmen

University of Alaska Fairbanks, Fairbanks, USA

The Kittlitz's murrelet (Brachyramphus brevirostris) is a relatively little studied seabird that nests singly in alpine tundra and talus slopes in Alaska and Siberia. In southcentral Alaska, Kittlitz's murrelets are strongly associated with tidewater glaciers. Ablation of glaciers on the Kenai Peninsula has the potential to increase available nesting habitat due to previously ice-covered areas becoming available as nesting habitat. Alternatively, invasion of talus habitat by successional communities, or shrubification, in historically suitable nesting habitat has the potential to decrease the amount of suitable nesting habitat. We used remote sensing techniques to evaluate the change in amount and distribution of Kittlitz's murrelet nesting habitat in the Kenai Fjords region in Southcentral Alaska. We utilized a two-step approach where a training set of nests from Kodiak was used to define a combination of spectral indices to describe Kittlitz's murrelet nesting habitat. This model was then used predictively to classify appropriate nesting habitat in the Kenai Fjords region for two different time periods 17 years apart. Between 2006 and 2023 the average elevation above sea level of nesting habitat increased and the distribution of suitable Kittlitz's murrelet nesting habitat changed spatially.

THE STAMP EGG COLLECTION AT THE NIST BIOREPOSITORY

Jennifer Hoguet (jennifer.hoguet@nist.gov), Rebecca Pugh

National Institute of Standards & Technology, Charleston, USA

Seabird eggs have demonstrated a valuable role in the monitoring of environmental pollutants. As such, in 1999, the Seabird Tissue Archival and Monitoring Project (STAMP) was established as a long-term collaboration between the National Institute of Standards and Technology (NIST) and a multitude of local, state, and federal agencies to monitor pollutant trends in the Alaskan marine environment. To do so, standardized protocols were developed and implemented for the systematic collection and processing of seabird eggs. Resultant egg contents and eggshell samples are archived at the NIST Biorepository in Charleston, SC. The goals are to minimize contamination and ensure long-term stability, both key for optimal real-time and retrospective analyses. Since STAMP's inception in Alaska, approximately 1850 eggs from target species (e.g., *Uria* spp., *Larus* spp.) spanning 45 colonies have been collected, the majority of which have been utilized for environmental monitoring studies.

In 2010, the 111th U.S. Congress tasked NIST with expanding its capabilities to the Pacific region. As a result, STAMP was extended to the Pacific Islands with target species including Laysan albatross (*Phoebastria immutabilis*), black-footed albatross (*P. nigripes*), wedge-tailed shearwater (*Ardenna pacifica*), sooty tern (*Onychoprion fuscatus*), gray-backed tern (*Sterna lunata*), masked booby (*Sula dactylatra*), and brown booby (*S. leucogaster*). To date, approximately 821 eggs spanning 28 colonies have been collected and archived. In contrast to the Alaskan collection, the Pacific Island collection has been underutilized but remains a valuable resource for environmental monitoring. STAMP sample usage is highly encouraged and may be requested through a tissue access policy.

SEX, BUT NOT SIZE, IS RELATED TO FORAGING SUCCESS AND EFFICIENCY IN MAGELLANIC PENGUINS

Katie Holt (katie.aleada@gmail.com), Sarah Converse, Dee Boersma

University of Washington, Seattle, USA

Body size can affect species' foraging success and efficiency which consequently influence survival and/or reproductive success. Males of most seabird species (74%) are larger than females and threatened species are more likely to have skewed sex ratios than non-threatened species. Recent studies of declining seabird colonies found that female mortality is higher than male mortality and suggest this is because larger males have higher foraging success than smaller females, however few have quantified the foraging success of males and females and/or of large and small conspecifics. We used automatic weigh scales and linear mixed models to quantify the foraging success of sexually size dimorphic Magellanic penguins at Punta Tombo, Argentina between 2015 and 2020 (n foraging trips = 986, n individuals = 158). We found males brought back 38% more food than females even though males are only 18% larger in mass than females (female foraging success = 0.50 ± 0.06 kg, male foraging success = 0.69 ± 0.06 kg). Size did not have an influence on foraging success (i.e. large males did not bring back more food than smaller males). Males were more efficient foragers than females, bringing back 46% more food per day than females (female foraging efficiency = 0.37 ± 0.096 kg/day, male foraging efficiency = 0.54 ± 0.024 kg/day). Preliminary results show trip duration and trip location were similar for males and females. These results suggest it is not size but other sex-specific foraging behaviors that are driving differences in foraging success and potentially mortality rates.

IMAGERY ANALYSIS FOR DEVELOPING A NEW ACCURATE ESTIMATION METHOD OF PERUVIAN GUANO BIRDS

Cinthia Irigoin-Lovera[1] (cirigoin@cientifica.edu.pe), Mathieu Bonneau[2], Carlos Zavalaga[1], Guillermo Luna-Jorquera[3], Teo Cochou[2]

[1]Universidad Cientifica del Sur, Lima, Peru. [2]INRAE, Guadeloupe, France. [3]Universidad Catolica del Norte, Antofagasta, Chile

The estimation of Peruvian guano seabird numbers has traditionally relied on methods that have endured for nearly a century. In this study, we develop and testes the accuracy of an unsupervised segmentation method to enhance the precision of guano seabird number estimates through the utilization of drone imagery.

A comprehensive survey was conducted, capturing aerial images of two distinct guano bird species—guanay cormorants and Peruvian boobies—in three different developmental stages (non-breeding, incubating, and chick-rearing). This survey spanned twelve sites along the Peruvian coast over the period from 2016 to 2022. To assess the effectiveness of the developed software, both manual and automated counts were conducted. The software's accuracy was scrutinized by calculating the percentage of error and identifying variables that could impact its performance.

Upon analyzing 187 images, the mean software's percentage of error was computed as $\bar{X}$ = 9.5±9.9%, revealing a marginally fluctuating accuracy. Additionally, the accuracy of the software count was influenced by the interaction between guano bird species and their developmental stage.

The development of precise methodologies for estimating wild species populations not only yields result with minimal error but also streamlines the analysis process, significantly reducing the time investment for researchers.

SUBSTANTIAL AND CONTINUOUS USEAGE OF MESOPELAGIC MICRONECTON BY BREEDING BLACK-TAILED GULLS

Motohiro Ito[1] (ito@toyo.jp), Hikari Ozawa[1], Kazuhiko Hirata[2], Teru Kanaida[1]

[1]Toyo University, Itakura, Japan. [2]Coastal Branch of Natural History Museum and Institute, Katsuura, Japan

The Black-tailed gull *Larus crassirostris* is a coastal related, diurnal surface-fishing gull, breeding in the Far East region. Previous study revealed that Black-tailed gulls forage manly on pelagic fish species such as anchovy, sardine and sandlance. In this study, however, we found the substantial and continuous usage of the deep-sea living mesopelagic micronekton species by Black-tailed gulls. We collected the stomach contents of the gulls from two islands in the Tohoku region, Nisaijima Island, Iwate (in 2019), and Bentenjima Island (in 2014, 2019, 2022 and 2023), Aomori, Japan. We conducted conventional stomach content analysis and DNA analysis for detailed species identification for the samples. We also obtained GPS tracks from breeding the gulls, simultaneously, in both islands (except 2019 in Bentenjima Island). Though, the major prey species of the gulls in both islands were Japanese sardine *Sardinops melanostictus* in 2019, and Japanese anchovy *Engraulis japonicus* in Bentenjima Island in 2014, 2022 and 2023, mesopelagic micronekton species such as Garnet lanternfish *Stenobrachius nannochir*, Spotted barracudina *Arctozenus risso*, Deep-sea Shrimp *Bentheogennema borealis* and mesopelagic living squid *Eogonatus tinro* appeared substantially and continuously especially in Nisaijima Island in 2019, IRI: 37% (except in 2022 in Bentenjima Island). GPS tracks revealed that the gulls conducted trips not only to the coastal area, but also far pelagic area such as the area 800-3000 m in bathymetric depth. The tracks also revealed their substantial amount of night trips during the study period. Those behavioral characteristics might be closely involved to their mesopelagic micronekton use.

BEYOND BODY CONDITION: EXPERIMENTAL EVIDENCE THAT PLASMA METABOLITES IMPROVE NUTRITIONAL STATE MEASUREMENTS IN A FREE-LIVING SEABIRD

Lauren M. Jackson[1] (lauren.jackson@mail.mcgill.ca), Don-Jean Léandri-Breton[1,2], Shannon Whelan[1,3], Alexandre Turmaine[1], Scott A. Hatch[3], David Grémillet[4,5], Kyle H. Elliott[1,3]

[1]Department of Natural Resource Sciences, Mcgill University, Sainte-Anne-de-Bellevue, Canada. [2]Centre d'Études Biologiques de Chizé, CNRS-Université de La Rochelle, UMR-7372, Villiers-en-Bois, France. [3]Institute for Seabird Research and Conservation, Anchorage, USA. [4]CEFE, Univ Montpellier, CNRS, EPHE, IRD, Montpellier, France. [5]Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch, South Africa

The ability to efficiently measure the health and nutritional status of wild populations in situ is a valuable tool, as many methods of evaluating animal physiology do not occur in real-time, limiting the possibilities for direct intervention. This study investigates the use of blood plasma metabolite concentrations, measured via point-of-care devices, as indicators of nutritional state in free-living seabirds. We experimentally manipulated the energy expenditure of wild black-legged kittiwakes on Middleton Island, Alaska, and measured the plasma concentrations of glucose, cholesterol, B-hydroxybutyrate, and triglycerides throughout the breeding season, along with measures of body condition (size-corrected mass [SCM] and muscle depth). Supplemental feeding improved the nutritional state of kittiwakes by increasing feeding rate (higher glucose and triglycerides, lower cholesterol), and flight-handicapping caused a slight nutritional decline (lower glucose and triglycerides, higher cholesterol and B-hydroxybutyrate). Glucose and triglycerides were the best indicators of nutritional state when used alongside SCM, and improved upon commonly used metrics for measuring individual condition. Metabolite concentrations varied across the breeding period, suggesting that the pre-laying stage, when feeding rates tend to be lower, was the most nutritionally challenging period for kittiwakes (low glucose, high cholesterol). Muscle depth also varied by treatment and breeding stage, but differed from other nutritional indices, suggesting that muscle depth is an indicator of exercise and activity level rather than nutrition. Here we demonstrate potential for the use of blood plasma metabolites measured via point-of-care devices as proxies for evaluating individual health, population health, and environmental food availability.

MARINE BIRD POPULATIONS TRENDS IN PRINCE WILLIAM SOUND, ALASKA, 1989-2022

Robb Kaler (robert_kaler@fws.gov)

U.S. Fish and Wildlife Service, Anchorage, USA

In 1989, the T/V Exxon Valdez grounded on Bligh Reef in northeastern Prince William Sounds (PWS) Alaska and spilled 40 million liters of crude oil. Over 30,000 marine bird carcasses were recovered following the spill and direct mortality to marine birds in PWS and the Gulf of Alaska was estimated at approximately 250,000 birds. With support from the Exxon Valdez Oil Spill (EVOS) Trustees Council, the U.S. Fish and Wildlife Service has conducted boat-based summer marine birds surveys for over three decades in PWS. In addition to the oil spill, the marine ecosystems of PWS have been affected by climate variability. Declines of many piscivorous marine bird populations between the 1970s and 1990s paralleled changes in the climate system of the northeastern Pacific Ocean in the late 1970s. Ongoing climate perturbations, including an extreme marine heatwave event in 2014-2016, continue to affect ecosystems in PWS. In 2022, numbers of bald eagles, buffleheads, goldeneyes, grebes, glaucous-winged gulls, harlequin ducks, black oystercatchers, cormorants, loons, murres, American crows, and scoters were stable or increasing, while black-legged kittiwakes, short-billed gulls, fork-tailed storm-petrels, mergansers, murrelets, pigeon guillemots, puffins, and terns were declining. Given that EVOS oil is no longer bioavailable in PWS, these declines suggest broad-scale declines in prey or overall habitat quality.

AVIAN INFLUENZA RESPONSE AND SURVEILLANCE EFFORTS FOR ALASKAN SEABIRDS

Robb Kaler (robert_kaler@fws.gov), January Frost

U.S. Fish and Wildlife Service, Anchorage, USA

The U.S. Fish and Wildlife Service in Alaska continues to coordinate with tribal, state and federal partners to track causes of seabird die-offs. All seabird carcasses submitted to the U.S. Geological Survey National Wildlife Health Center are screened for avian influenza, with a specific focus to detect Highly Pathogenic Avian Influenza (HPAI). From 2017 to 2021, 3% (four of 117 carcasses) of seabird carcasses tested positive for Low Pathogenic Avian Influenza, and none tested positive for HPAI. In December 2021, HPAI was detected in Canada with the first confirmed case in Alaska reported in April 2022. Currently, Alaska has reported 294 wild birds testing positive for HPAI, with wild mammals also being infected, including red fox, black bear, and brown bear. Seabird species affected include gulls, jaegers, terns, kittiwakes, and murres. The ongoing HPAI outbreak in North America has become the largest recorded on the continent for both wild and domestic birds. Preliminary genetic analyses conducted at the USGS Alaska Science Center suggests that genomic characterization of viruses from Alaska will provide new information about the introduction, evolution, and maintenance of HPAI viruses in Alaska and North America.

THE HABITAT SELECTION OF BLACK-TAILED GULL DURING BREEDING AND NON-BREEDING PERIODS

Teru Kanaida[1] (teru.715.2000@gmail.com), Hikari Ozawa[1], Kazuhiko Hirata[2], Ui Shimabukuro[3], Motohiro Ito[1]

[1]Faculty of / Graduate School of Life Sciences, Toyo University, 1-1-1 Izumino, Itakura, Ora, Gunma, 374-0193, Japan. [2]Coastal Branch of Natural History Museum and Institute, Chiba, 123 Yoshio, Katsuura, Chiba, 299-5242, Japan. [3]Meiji Institute for Advanced Study of Mathematical Sciences, 4-21-1 Nakano, Tokyo 164-8525, Japan

Foraging habitats of migratory seabirds during breeding and wintering periods often differ, and habitat selections during both periods might be critical for their life history strategies. We tracked Black-tailed gulls Larus crassirostris in both breeding and non-breeding periods using GPS loggers, geolocators and bird-ring observations in Bentenjima Island, Aomori (2013, 2014, 2022 and 2023) and Nisaijima Island, Iwate (2018-2020), Japan. During the breeding periods, the average foraging ranges of gulls in both islands were approximately 20 km from their colonies. At Bentenjima Island, the breeding gulls mainly foraged in the coastal area, < 200 m in bathymetry. At Nisaijima Island, the breeding gulls foraged in the deeper offshore area (including areas with > 1000 m in bathymetry), because the bathymetry near the coast around the site geographically steep. It seemed that breeding gulls selected specific foraging habitats around each colony, within the constraints of the Central Place Foraging. After the breeding period, the migratory routes and distance varied greatly among individuals (approximately 400 - 1000 km from their colony), several individuals from both colonies migrated toward north (the coast of Eastern Hokkaido, Oyashio Cold Current region) and return to their colony in December, and several individuals migrated toward south (the coast of middle of Japan and eastern Korea, the Kuroshio and Tsushima Warm Current region). The wintering area ware sometimes overwrapped between colonies. Some others stayed around their site during whole non-breeding period. These results suggested that gulls might have different migratory strategies among individuals, even within the same population.

SOWING SEEDS OF FUTURES IN SEABIRD CONSERVATION THROUGH PARTICIPATION IN HABITAT RESTORATION WORK ON ANACAPA ISLAND

Nina Karnovsky (nina.karnovsky@pomona.edu)

Pomona College, Claremont, USA

Undergraduate students at Pomona College enrolled in the upper-division course Advanced Animal Ecology participated in seabird habitat restoration work on Anacapa Island, in the Channel Islands National Park, off the coast of Southern California. Prior to the field trip, students learned about the impact of introduced animals on seabirds and studied the rat eradication that occurred on Anacapa Island in 2000-2001 and the positive response of the Scripps' murrelet (*Synthliboramphus scrippsi*) population after the removal. While they were on the island, they planted native plants and repotted plants reared in the greenhouse as part of the Scripps' murrelet nesting habitat restoration work occurring on the island. In addition, they had the opportunity to interact with island biologists and park service staff. Upon return to the mainland, students created projects to communicate about their experience on the island. The purpose of this study was to evaluate the impact of this brief (36 hour) experience participating in seabird conservation work. I sent out surveys to graduated students who participated in the field trips in 2017 and 2021 to assess how their experience on Anacapa Island influenced their lives over the years. This study provides evidence that the experience of participating in authentic conservation work can be life changing. The results show that the field trip influenced their career choices after graduation. Students said that the field trip had a lasting legacy; participation increased their sense of belonging to the scientific community, increased their scientific identity, and empowered them to tackle conservation crises.

COULD AN OCEANIC JOINT VENTURE WORK FOR SEABIRDS?

Brad Keitt[1] (bkeitt@abcbirds.org), Sea McKeon[2]

[1]American Bird Conservancy, Santa Cruz, USA. [2]American Bird Conservancy, Orlando, USA

Problems facing marine birds are both diverse and diffuse, often spanning multiple regulatory jurisdictions. Thus, effective solutions require multifaceted partnerships able to work across boundaries to find a path forward for seabirds. In essence, because of their wide ranges, the solution to a localized seabird impact is often not a local response. Therefore, a mechanism to bring together stakeholders with a broad knowledge of threats and associated conservation opportunities across the geographic range of seabird species of concern is needed to adequately ensure that conservation work is effective across multiple scales - a group to see the big picture and coordinate the needed partnerships and actions across these scales. Migratory Bird Joint Ventures are collaborative partnerships that often include government agencies, non-profit organizations, corporations, tribes, and individuals that conserve habitat for the benefit of priority bird species, other wildlife, and people. First established in 1986, Joint Ventures have grown to support the conservation of migratory birds across much of North America. While marine waters have been represented in some coastal habitat Joint Ventures, and in the taxon focused effort of the Sea Duck Joint Venture, seabirds have largely been left out. We propose that Oceanic Joint Ventures are timely and much-needed entities to support migratory birds across the seascapes of North America and extending to their breeding grounds, including internationally, through the coordination, implementation and execution of adaptive management conservation programs, and compensatory conservation to offset impacts from human activities.

UPDATED MARINE BIRD VULNERABILITY INDEX TO INFORM RISKS OF OFFSHORE WIND ENERGY PROJECTS WITHIN THE PACIFIC OUTER CONTINENTAL SHELF REGION

Emma Kelsey[1] (ekelsey@usgs.gov), Josh Adams[1], Jonathan Felis[1], David Pereksta[2]

[1]USGS Western Ecological Research Center, Santa Cruz, USA. [2]BOEM Pacific Region, Camarillo, USA

From 2012–2016, BOEM and USGS collaborated to develop the first comprehensive database to quantify marine bird vulnerability to OWEI offshore of California, Oregon, and Washington on the Pacific Outer Continental Shelf (POCS; Adams et al. 2017, Kelsey et al. 2018). These data were used to quantify marine bird vulnerabilities to collision with and displacement by OWEI, as well as associated uncertainties. In the 7 years since this work was completed, the field of research on this topic has expanded. New data have been published that better inform vulnerability index inputs (e.g., nocturnal and diurnal flight activity, flight height, and habitat flexibility). In addition, thinking has evolved on vulnerability calculation methods, moving away from the use of ordinal metric values such as those used in Adams et al. (2017) and Kelsey et al. (2018). Herein, we present an update to the marine bird vulnerability index based on new research and an updated vulnerability calculation method. These updated marine bird vulnerability values can inform future OWEI research and management needs in the POCS.

ACCOUNTING FOR NON-BREEDING WHEN ESTIMATING POPULATION DYNAMICS OF A LONG-LIVED SEABIRD, THE KITTLITZ'S MURRELET

Michelle Kissling[1] (kissling.michelle@gmail.com), Paul Lukacs[1], Scott Gende[2], Grey Pendleton[3], Jonathan Felis[4]

[1]University of Montana, Missoula, USA. [2]National Park Service, Juneau, USA. [3]Alaska Department of Fish and Game, Juneau, USA. [4]US Geological Survey, Santa Cruz, USA

For long-lived species, movement associated with non-breeding can complicate estimation of population dynamics because non-breeders are not necessarily tied to a breeding site where surveys usually occur. We developed an integrated population model (IPM) for the Kittlitz's murrelet (*Brachyramphus brevirostris*) to account for temporary emigration arising from variable annual site fidelity of non-breeders, a parameter for which we lacked explicit data. We populated the IPM with data from at-sea surveys, banding, telemetry flights, and nest monitoring in Icy Bay, Alaska, 2007–2012. Our results indicated that the population declined by 6% per year over the study period and, assuming this trend continues, has a 41% chance of reaching the quasi-extinction threshold by 2048. Posterior medians of annual site fidelity were negatively skewed and ranged from 0.58 (95% credible interval [CrI]=0.06–0.97) in 2009 to 0.82 (CrI=0.44–0.99) in 2008. Importantly, by more fully accounting for the biological processes with our IPM, we reduced the uncertainty of the trend estimate by 85%. We found weak evidence supporting any of our hypotheses about skipped breeding each year, suggesting that a combination of carryover effects, prospecting behavior, and overwinter and spring conditions could interact and drive population dynamics of the Kittlitz's murrelet. While our IPM has several assumptions, its results are more biologically realistic than trend estimates using only at-sea surveys, as it links population change and demographic processes. We recommend using multiple data sources to assess the viability of highly mobile species with complex life histories, like *Brachyramphus* murrelets.

REGARDING THE PROTECTION OF THE CRESTED MURRELET AND OTHER RARE CREATURES IN KAMINOSEKI TOWN, YAMAGUCHI PREFECTURE, JAPAN

Airi Kowata[1] (kairi3151126@icloud.com), Midori Takashima[2], Hisayoshi Yamamoto[2], Takehiro Yoshimoto[2]

[1]Waseda University, Tokyo, Japan. [2]The Kaminoseki Nature Conservation Society, Kaminoseki, Japan

"Kaminoseki Town in Yamaguchi Prefecture is located in the Seto Inland Sea, a semi-enclosed water area in the southwestern part of Japan. The Kaminoseki Nature Conservation Society opposes the construction plan of a nuclear power plant by Chugoku Electric Power on Nagashima in Kaminoseki Town. They also demand the conservation of the Kanmuri Umisuzume (Synthliboramphus wumizusume), listed as Vulnerable on the IUCN Red List, and other rare species in the surrounding waters of Kaminoseki Town. Since April 2008, they have been conducting surveys on the habitat status of these organisms.

JSG and PSG jointly submitted recommendations on the conservation of seabirds in the area to the Prime Minister in September 2011. Additionally, the Ministry of the Environment designated the Kaminoseki Sea area as an "important area from the perspective of biodiversity" in 2016. Currently, in the Kaminoseki Sea area, feeding behavior and family groups of Kanmuri Umisuzume continue to be observed, and the presence of other rare species has been confirmed.

Following the Fukushima Daiichi nuclear power plant accident caused by the earthquake on March 11, 2011, construction preparations for the Kaminoseki Nuclear Power Plant were temporarily suspended. However, in August 2023, plans were announced to construct a spent nuclear fuel interim storage facility within the planned site. Concerns are raised about the significant environmental impact of these constructions on Nagashima and the surrounding marine area. In this region, the establishment of systems for special protection, such as marine protected areas and World Natural Heritage sites, is essential."

GLOBAL PREVALENCE OF SETTING LONGLINES AT DAWN HIGHLIGHTS BYCATCH RISK FOR THREATENED ALBATROSS

David Kroodsma[1] (david@globalfishingwatch.org), Joanna Turner[1], Cian Luck[1], Tim Hochberg[1], Nathan Miller[1], Philip Augustyn[2], Stephanie Prince[3]

[1]Global Fishing Watch, Washington DC, USA. [2]BirdLife International, Cape Town, South Africa. [3]BirdLife International, Sandy, United Kingdom.

Longline fishing kills over 160,000 seabirds annually, with bycatch in these fisheries contributing significantly to the widespread, global decline in albatross populations. One of the most effective ways to reduce this bycatch is for pelagic longliners to set their hooks entirely at night, when albatross are least active, and setting at night is recommended in some areas of the ocean by Regional Fisheries Management Organizations. To develop a global dataset of where and when longliners actually set their hooks, we apply machine learning to four years of GPS data of the global longline fleet (~5000 vessels). Our data reveal the vast footprint of longline fishing: over 40 % of the ocean is, at least one time during a year, within 30 km of a set, the distance within which an albatross can detect a vessel. On a given day, about 1.5 % of the ocean is within this distance of a set. Almost all of these sets were during daylight hours, with only 3 % of sets occurring entirely at night. In regions with threatened albatross species, night setting is more common (4–9 %), but it is much lower than suggested by on-board observer programs, highlighting the limitations of current monitoring. Furthermore, in albatross habitat, vessels more often set their lines during dawn hours when these birds are most active and bycatch risk is highest.

SEEING THE BIGGER PICTURE: USING AERIAL PHOTOGRAPHY TO ASSESS TUFTED PUFFIN HABITAT ON THE OREGON COAST

Carina Kusaka[1,2] (carina.kusaka@oregonstate.edu), Melanie Davis[1,2], James Peterson[1,2], Shawn Stephensen[3]

[1]Oregon State University, Corvallis, USA. [2]Oregon Cooperative Fish and Wildlife Research Unit, Corvallis, USA. [3]U.S. Fish and Wildlife Service, Newport, USA

Tufted puffins (*Fratercula cirrhata*) are an iconic species in the Pacific Northwest that provide a wide range of ecological, economic, and historically important services such as ecotourism for local communities- and bringing marine derived nutrients to terrestrial habitats. The tufted puffin population on the Oregon Coast has declined dramatically over the past 30 years from over 4,858 birds in 1988 to only 553 birds in 2021. In 2018, the tufted puffin Species Status Assessment (SSA) determined that factors related to breeding site conditions are one of the most probable causes of puffin decline. However, little is known about the specific characteristics of nesting habitat along the Oregon Coast or how it relates to their population demographics. To address this knowledge gap, we conducted a spatial analysis to examine the distribution of suitable breeding habitat for tufted puffins on the Oregon Islands National Wildlife Refuge, USA. Specifically, we compared the percent cover of vegetation at tufted puffin breeding sites from 1992 to 2022 using a combination of ground truth data, aerial photographs of the islands, and data from the National Agriculture Imagery Program (NAIP). Preliminary results suggest a decrease in the percent cover of live vegetation at critical breeding habitat. After measuring the magnitude of habitat change, we related vegetation loss to climatic and environmental variables to determine potential key drivers of habitat change. Assessing how suitable puffin breeding habitat characteristics have changed over time will provide necessary information to guide refuge managers in habitat restoration and support adaptive management decisions.

OPTIMIZING NUMBER AND DISTRIBUTION OF TRANSMITTERS TO MAXIMIZE POPULATION-LEVEL REPRESENTATIVENESS IN AUTOMATED RADIO TELEMETRY STUDIES OF ANIMAL MOVEMENT

Juliet Lamb[1] (juliet.lamb@tnc.org), Pam Loring[2], Peter Paton[3]

[1]The Nature Conservancy, Cold Spring Harbor, NY, USA. [2]U.S. Fish and Wildlife Service, Charlestown, RI, USA. [3]University of Rhode Island, Kingston, RI, USA

Telemetry is a powerful tool for evaluating wildlife distribution patterns in systems where opportunities for direct observation are limited. However, the effort and expense required often results in small sample sizes, making it difficult to fully capture spatial, temporal, and individual variability within target populations. To understand the influence of sampling design on results of automated radio telemetry studies, we conducted a retrospective power analysis of data collected by the Motus Wildlife Tracking System for two bird species along the United States Atlantic Coast: a shorebird, the piping plover (Charadrius melodus), and a seabird, the common tern (Sterna hirundo). We found that, while ~40 individuals were sufficient to represent a single breeding site, at least 100 tracked individuals were required to identify >90% of receiver stations used by the regional metapopulation. The percentage of used stations detected was always higher for common terns when tags were deployed in a single site and year than for piping plovers, which required more sites and years to achieve a representative sample. Detecting locations visited by lower percentages of the population (e.g., stations away from migratory stopover and staging sites) required larger sample sizes. Our results provide guidance for the number and distribution of tagged birds required to obtain representative Motus data, while also highlighting the importance of accounting for station network configuration and species-specific differences in behavior. These results have broad applications for designing studies to detect and monitor movements of small-bodied wildlife, particularly in the context of offshore wind energy development.

DIVERGENT HABITAT USE BY MIGRATORY AND RESIDENT GULLS CREATES CONTRASTING OPPORTUNITIES FOR PATHOGEN ACQUISITION AND SPREAD

Juliet Lamb[1,2] (juliet.lamb@tnc.org), Thierry Boulinier[1]

[1] Centre d'Ecologie Fonctionnelle et Evolutive, Montpellier, France. [2] The Nature Conservancy, Cold Spring Harbor, NY, USA.

Urban gulls forage on both anthropogenic and natural food resources and act as reservoirs for a variety of pathogens. As a result, they play an important role in transmitting zoonoses among human, livestock, and wildlife across terrestrial and marine systems. Predicting pathways by which gulls acquire and spread pathogens requires understanding habitat use and movements across the annual cycle, which can vary widely among individuals with different foraging specializations and migratory strategies. We studied year-round movements of yellow-legged gulls (*Larus michahellis*; n = 30) breeding at an urban colony off the coast of Marseille, France. Migration strategies of tracked gulls were split between resident birds that occupied their nest sites year-round (52%), local migrants that left the breeding area for 1-2 months during the post-breeding period and traveled < 50 km (14%), and long-distance migrants that traveled 300-500 km and left the breeding area for 4-5 months (33%). Both local and long-distance migrants migrated northward and inland, toward agricultural areas near large urban centers, where they foraged in fields during harvest and roosted on industrial buildings. Resident birds preferentially occupied transfer stations throughout the year, while migrants spent more time in agricultural areas and natural wetlands even during the breeding season. There were no clear physiological differences between residents and migrants, and migratory strategies were highly consistent among years. Nearly all gulls in our study had high levels of antibodies to avian influenza, suggesting recent infection, with similar titers across all migratory strategies. Our results suggest that specialization on landfills plays an important role in allowing gulls to remain resident year-round, and that any action to reduce this supplemental food resource might result in increased migratory behavior, potentially increasing opportunities for pathogen transmission among urban centers.

A POTENTIAL TRACKING RESEARCH OF SENKAKU-TYPE SHORT-TAILED ALBATROSS IN TAIWAN

Yun-Xuan Lin[1] (d12625003@ntu.edu.tw), Scott Shaffer[2], Rachael Orben[3], Hsiao-Wei Yuan[1], Chung-Hang Hung[1], Han-Po Chang[1], An Chou[1]

[1]National Taiwan University, Taipei, Taiwan. [2]San José State University, Washington, USA. [3]Oregon State University, Oregon, USA

Senkaku-type Short-tailed albatrosses *Phoebastria albatrus* only breed on Diaoyutai/Senkaku Islands, with less than 200 breeding pairs remaining. The territorial dispute over Diaoyutai/Senkaku Islands among Taiwan, Japan, and China has hindered understanding of their foraging range and the distribution in non-breeding season. Post-COVID-19, pelagic seabird watching in Taiwan flourished, gradually unveiling the mysterious veil of Senkaku-type STALs. Notably, they frequently appear in the northeast waters of Taiwan from February to April, as documented in eBird records. While there is a belief that they arrive in November, aligning with the breeding season, the absence of concrete data is attributed to the formidable winter monsoon. Two at-sea surveys are planned for this winter to address these knowledge gaps. With comprehensive information, we're able to formulate and evaluate the method of tagging and tracking Senkaku-type STALs.

BLACK SKIMMER (RYNCHOPS NIGER) DIET USE AS COMPARED TO AVAILABILITY

Ellie Madigan[1,2] (ellie.madigan@noaa.gov), Collette Lauzau[3]

[1]National Oceanic and Atmospheric Administration, Silver Spring, MD, USA. [2]University of Rhode Island, Kingston, RI, USA. [3]Rookery Bay National Estuarine Research Reserve, Naples, FL, USA

The Black Skimmer (Rynchops niger) colony at Big Marco Pass Critical Wildlife Area (CWA) in Marco Island, Florida has been severely impacted by a bacterial infection. An ecosystem-wide review of the colony and surrounding area is being conducted to discover potential contaminant pathways, however, there has been no research into the diet of the black skimmers. It was hypothesized that the vector in which the disease is being transmitted to the colony is through the fish the black skimmers are bringing to their colony. Based upon field observations the skimmers were not seen foraging as frequently at the locations proximal to the colony, but instead throughout Rookery Bay National Estuarine Research Reserve (NERR) and inland freshwater sources. To determine the usage of Tigertail Lagoon and the Gulf of Mexico for foraging habitat, photographs were taken of the skimmers bringing fish back to their colony. These photos were organized and used to identify fish to the nearest family. To assess local food availability, the lagoon adjacent to the colony, Tigertail Lagoon was seined at three different sites during all three tidal cycles. Photograph analysis shows the highest quantity of fish species for mate feeding were within the Killifish family (Fundulidae). However, results from seining the lagoon show a quantifiably higher availability of fish from the Sardine (Clupeidae) and Mojarra (Gerreidae) families. Therefore, it is unlikely that the skimmers are foraging directly next to their colony.

WIDE-RANGING YEAR ROUND MOVEMENT OF ALEUTIAN ISLAND BREEDING CRESTED AUKLETS DURING 2011-2015

Heather L Major[1] (hmajor@unb.ca), Katherine F Robbins[2], Jill Robinson[3], Carley R Schacter[4], Jeffrey C Williams[5], Ian L Jones[3]

[1]University of New Brunswick, Saint John, Canada. [2]Credit Valley Conservation, Mississauga, Canada. [3]Memorial University of Newfoundland, St. John's, Canada. [4]Cal Poly Humbolt, Arcata, USA. [5]Alaska Maritime National Wildlife Refuge, Homer, USA

Among Alcidae, at least preliminary year-round movement data from representative populations has been obtained from only about half of extant species. Accordingly, during 2011-2015 we quantified year-round movement of Crested Auklets (a first for this species) from breeding sites at Buldir and Gareloi islands, western Aleutian Islands, Alaska. We captured adults brooding nestlings, fitted them with 31 2-g and 185 1-g leg-attached archival light-based geolocation tags, and recaptured them the following year. We obtained tracks from a total of 93 tags. We found tagged birds from Buldir and Gareloi islands used a long-distance triangular migration route during 2011-2015, apparently to exploit seasonally abundant prey availability, with timing likely influenced by daylight, weather, sea ice, and other factors. Upon departure from the colony tagged birds moved north, remained in the northwestern Bering and Chukchi seas through November, moved southwest into the western North Pacific and Sea of Okhotsk (94%), or eastern Bering Sea shelf and eastern Aleutian passes (6%), for January-March, and were back near breeding colonies by mid-April. No significant differences were detected in movement phenology between the two colonies, sexes, or years. Despite the striking inter-island similarities, the full pattern of variation of Crested Auklet movement from representative populations and over time remains uncertain, requiring additional rigorous and challenging measurements in the field.

DIFFERENTIAL PATTERNS OF MOVEMENT BY GULLS INDICATE MECHANISMS FOR COLONIZATION

Lisa Manne (caloenas@gmail.com), Richard Veit

CUNY College of Staten Island, Staten Island, USA

Long distance movements by birds have been persistently underestimated, or dismissed on the grounds that birds that travel very long distances are in some way abnormal; this characterization desperately needs re-evaluation. These long-distance movements are intentional, and are driven in large part by aspects of the environment, and individual birds' condition. We attached satellite transmitters to 15 Lesser Black-backed Gulls (Larus fuscus) spanning the ages of first winter through adult, in January-February 2023, and monitored their movements from February – October 2023. Our transmittered birds exhibited movement behavior consistent with exploration, and different from what any model of migration would predict. Birds reversed direction often, as if testing new ground for its suitability. We characterized these direction changes using frequency histograms of steps and step lengths as well as plots of individual tracks. Contrary to the idea that birds overwinter at a single location, several birds initiated northward flights of > 500 km, then returned to their previous locations. Individual gulls sorted themselves into three groups: adults that migrated for breeding, juveniles that travelled much lower distances during the same time period, and a middle group, comprised of third-winter birds, who traveled intermediate distances. This last group seemed to be conducting exploratory trips to suss out possible future breeding or foraging locations. We set these movement behaviors in the context of a more nuanced model of colonization of newly-available habitats

PREDATOR DISTURBANCE CONTRIBUTED TO COMMON MURRE URIA AALGE BREEDING FAILURES IN COOK INLET, ALASKA, FOLLOWING THE 2014–16 PACIFIC MARINE HEATWAVE

Caitlin Marsteller (cmarsteller@usgs.gov), Mayumi Arimitsu, Sarah Schoen, Sam Stark, John Piatt

USGS Alaska Science Center, Anchorage, USA

The 2014–16 Pacific marine heatwave caused unprecedented die-offs and multi-year reproductive failures for Common Murres *Uria aalge* along the west coast of North America. Lingering impacts, such as declines in colony attendance and productivity, have persisted at some colonies following the heatwave and are largely attributed to changes in prey availability and quality. Here we present evidence of an additional, top-down mechanism contributing to Common Murre breeding failures on Gull Island (Alaska), aerial predator disturbance and associated egg predation. We collected time-lapse images over six murre breeding seasons (2016-2021) on Gull Island to document the frequency, duration, and intensity of disturbances caused by aerial predators, as well as to calculate disturbance-associated egg predation. To identify seasonal and interannual variability of disturbances, we calculated a daily disturbance index and compared years using generalized additive models. In all years, Bald Eagles *Haliaeetus leucocephalus* were the primary cause of disturbance, which led to periods of prolonged colony abandonment by murres and facilitated high levels of murre egg predation by Glaucous-winged Gulls *Larus glaucescens* and Herring Gulls *L. argentatus*. We found that the seasonality of disturbance was an important factor determining egg predation rates. In years when disturbance levels were high and persisted later in the season, the colony experienced complete breeding failures due to disturbance-associated egg predation. These findings, which were informed by annual monitoring data at an easily accessible seabird colony in southcentral Alaska, point to the complex factors that may influence murre population dynamics following recent and future marine heatwaves.

THE STATUS OF CRAVERI'S MURRELETS ON ALCATRAZ AND SAN PEDRO MÁRTIR ISLANDS IN THE GULF OF CALIFORNIA, MEXICO

Jaime Martinez, Lauren Dolinski (lauren.dolinski@prescott.edu), Paulina Camarena, Lorayne Meltzer

Prescott College, Bahía de Kino, Mexico

The Craveri's Murrelet (Synthliboramphus craveri) is an endangered seabird in the Alcidae family and an endemic species to the Gulf of California where they breed on rocky islands. Published nesting records are outdated by over 50 years, so more information is needed about their distribution, breeding biology and phenology. We regularly monitored nests on Alcatraz (from 2020) and on San Pedro Mártir Islands (from 2022) to determine productivity. On Alcatraz, we utilized trap cameras to learn about their phenology. We also performed nocturnal surveys around San Pedro Mártir to estimate the breeding population. On Alcatraz, we observed breeding behavior from December-April, with chicks leaving the nest as early as January. For the past four seasons on Alcatraz, we calculated average clutch size, hatching and nesting success to be 1.6, 1.09, and 70%, respectively. We also captured inter-species interactions with the trap cameras, revealing previously unrecorded predation threats. The breeding population seems to be growing on San Pedro Mártir, from an estimate of 38 breeding pairs in 2022 to 99 in 2023, confirming recovery of Craveri's Murrelets on San Pedro Mártir after the 2007 eradication of the Ship Rat [KB1] (Rattus rattus) on that island. The importance of both San Pedro Mártir and Alcatraz as nesting sites for this rare and endangered species is clear. Future studies are important to get a better estimation of the nesting population of CRMU in the region, and to classify and quantify the specific impacts of inter-species interactions upon nesting success.

EFFECTS OF INCREASING REPRODUCTIVE COSTS ON BEHAVIOR AND TELOMERE LENGTH IN THE RHINOCEROS AUKLET, A LONG-LIVED SEABIRD

Kazuya Matsumoto[1] (matsumoto.kazuya.sy@alumni.tsukuba.ac.jp), Kohei Oshima[1], Chris Tyson[2], Yasuaki Niizuma[3], Yutaka Watanuki[4], Tatsuki Kojima[5], Akiko Shoji[1]

[1]Graduate School of Science and Technology, University of Tsukuba, Tsukuba, Japan. [2]Postdoctoral Behavioural Ecology Group, Wageningen University & Research, Wageningen, Netherlands. [3]Faculty of Agriculture, Meijo University, Tenpaku-ku, Japan. [4]Graduate School of Fisheries Sciences, Hokkaido University, Hakodate, Japan. [5]Graduate School of Life Sciences, Toyo University, Oura-gun, Japan

Long-lived seabirds breed repeatedly over their lifetimes, so necessitating the strategic allocation of resources between survival and reproduction to maximize overall lifetime fitness. Reproductive costs are influenced by physiological state and food availability, thereby impacting reproductive activities. While theoretical studies propose that such allocation affects senescence, limited research particularly in seabirds has confirmed these phenomena. To understand their life history strategies, it's crucial to elucidate the relationships between reproductive costs, behavior, and senescence. In this study we manipulated flight costs through partial wing clipping on Teuri Island, Japan during the breeding seasons of 2022 and 2023. We assessed parental behavior through the arrival and departure times at the burrow, and foraging-trip duration, while reproductive performance was evaluated based on chick growth rate, weight, and wing length at fledging. To seek evidence of senescence, we focused on changes in relative telomeres lengths (RTL) before and after the manipulation. Blood samples were collected during the early chick-rearing period in both years for RTL analysis and sexing. A comparison of parental behavior and RTL changes was conducted between experimental and control groups. Contrary to expectations, increased flight costs resulted only in delayed arrival times, with no discernible effects on other behaviors, reproductive performance, or RTL changes. Negative changes in RTL were observed in parents that concluded breeding later in the season. Our findings suggest that increased reproductive costs were mitigated through adjustments in homing behavior, with no effect on telomere length changes. Nevertheless, reproductive phenology was associated with reduced telomere length.

FORAGING STRATEGIES AND SWIMMING MODE AFFECT DIVE DURATIONS IN DIVING BIRDS

Hiroya Matsushita[1] (matsushita.hiroya@nipr.ac.jp), Yuuki Watanabe[2,1,3]

[1]Department of Polar Science, The Graduate University for Advanced Studies, SOKENDAI, Tokyo, Japan. [2]Research Center for Integrative Evolutionary Science, The Graduate University for Advanced Studies, SOKENDAI, Kanagawa, Japan. [3]National Institute of Polar Research, Tokyo, Japan

Diving animals provide models for studying the interaction between physiological constraints and foraging ecology. Their dive durations vary greatly across species, indicating that they face physiological limits. On the other hand, diving animals sometimes dive for longer than the physiological limits depending on foraging effort. We previously showed that wing-propelled birds dive longer than foot-propelled birds, but the difference was smaller than expected from the difference in locomotor efficiency. We hypothesize that the discrepancy is due to varying foraging behavior. Here, we estimated the aerobic dive limit (ADL) of 43 avian divers from their total body oxygen stores, coupled with their consumption rates based on the biomechanical model. The estimated ADL was compared with the dive duration observed in the wild. Our results showed that foot-propelled birds tend to reach or exceed their ADL, whereas wing-propelled birds tend to remain within ADL. This tendency might reflect differences in foraging styles. For example, many foot-propelled birds are benthic foragers that tend to dive for longer than pelagic foragers, including many wing-propelled birds. Our study suggests that foot-propelled birds dive for long periods despite high locomotor costs due to their foraging strategy. We propose the importance of foraging strategies and swimming mode affecting the dive duration for the foraging ecology of diving birds.

ANNUAL CHANGES IN COMMON MURRE (URIA AALGE) CHICK PROVISIONING: SOME YEARS ARE BETTER THAN OTHERS

Jacque McKay[1] (jamckay@csumb.edu), William L. Kennerley[2], Robert Suryan[3,2], Amanda Gladics[2], Rachael A. Orben[2]

[1]California State University Monterey Bay, Marina, USA. [2]Oregon State University, Newport, USA. [3]National Oceanic & Atmospheric Association, Juneau, USA

Common Murres (Uria aalge) are colonial breeders that provision chicks with singular prey. They can provide insight into marine prey availability during varying climate conditions. We analyzed 13 years of murre monitoring data at Yaquina Head Outstanding Natural Area, Oregon to determine how chick diets vary annually (2011-2023). We studied provisioning rates in relation to prey composition, diversity, and quality. We determined the provisioning rate by observing 10-39 chicks per year, during dawn to dusk feeding frequency observations. We identified prey items using bill-load photography and measured prey size via fish to bill ratio. Chick diets included three low lipid prey (salmon, rockfish, and flatfish, <15% lipid dry mass) and three high lipid prey (smelt, sand lance, and herring). Chick provisioning rate ranged from 0.103 feeds/hour in 2016, to 0.254 feeds/hour in 2013. Marine heatwaves (MHW) occurred in multiple study years, The Blob (2014-2016), Blob 2.0 (2019-2020), and 2023. Blob years (2014-2016) did not impact prey quality as expected; despite reproductive failure, murres delivered a high proportion of high lipid prey. During Blob 2.0 (2019), however, murres delivered a high proportion of low lipid prey. Overall, MHW conditions impacted diet diversity negatively, resulting in low species richness and evenness from 2014-2016 and 2019. Our results demonstrate how marine predators interact with a changing environment; low reproductive success for murres during some heatwave years indicate foraging limits were reached and only a small portion of murres were able to compensate for poor environmental conditions.

GAINING NEW INSIGHTS INTO SEABIRD PRE-LAYING BEHAVIOUR USING ARCHIVED GEOLOCATOR DATASETS

Kristina McOmber (xtinakristina@gmail.com), Gail Davoren

University of Manitoba, Winnipeg, Canada

Technological advances in the last 20 years have resulted in the development of a variety of lightweight dataloggers that can be deployed on seabirds year-round. Specifically, Global Location Sensor (GLS) dataloggers have allowed the collection of year-round data on light level and immersion status. As GLS were intended to estimate daily locations, data have primarily been used for this purpose and other uses have not been explored until recently. Our objective was to examine archived year-round geolocator (MigrateTech C65+ and C330) datasets for Atlantic Puffins (*Fratercula arctica*, n=22) and Razorbills (*Alca torda*, n=28) to provide insights into the pre-laying period of 2020-2023 nearby a breeding colony (James Island) on the northeast Newfoundland coast. These tags recorded summary light data on a continuous scale every five minutes, so we employed the use of Generalized Additive Models (GAMs) and a quantitative approach for locating distribution minima to set thresholds and convert these data to categories (e.g., dark vs. light). Light level and immersion sensor data were then integrated to define time in the burrow or crevice (dry and dark), time spent at sea (wet), and colony attendance (dry and light). We used data from GLS dataloggers that recorded light, temperature and depth values every 10 seconds (Lotek LAT2800) deployed on Razorbills (n=5) to validate these behavioural codes. This study supports the feasibility of gaining new insights into bird behavior with archived geolocator datasets, allowing researchers to add to the body of knowledge without additional stress to the study species.

NICHE PARTITIONING BETWEEN SYMPATRIC ATLANTIC PUFFINS (FRATERCULA ARCTICA) AND RAZORBILLS (ALCA TORDA) DURING THE PRE-LAYING PERIOD IN THE NORTH ATLANTIC

Kristina McOmber (xtinakristina@gmail.com), Gail Davoren

University of Manitoba, Winnipeg, Canada

Similar co-existing species can be expected to use available abiotic and biotic resources differently ('niche partitioning') under limited resources. We investigated potential interspecific differences in resource use of Atlantic Puffins (*Fratercula arctica*) and Razorbills (*Alca torda*) in a mixed species colony on the northeast coast of Newfoundland during the pre-laying period. As the annual inshore migration of their main forage fish prey (capelin, *Mallotus villosus*) typically coincides with chick-rearing, pre-laying represents a period of low prey availability coupled with high energy demands during egg formation. As these circumstances suggest a high potential for competition, we hypothesized that razorbills and puffins would partition their niche along multiple niche axes including diet and timing of foraging trips. We used archived geolocator (MigrateTech C65+ and C330) datasets over four years (2020-2023; n=50) to develop time activity budgets (10 minute resolution) and carbon and nitrogen stable isotope ratios ($\delta^{13}C$, $\delta^{15}N$) of eggshell membranes (2022 and 2023, n=30/species) to quantify isotopic niche overlap. Time-activity budgets revealed that puffins initiate colony attendance later than razorbills and spend more time at sea during the pre-laying period. Stable isotope analysis revealed no isotopic niche overlap of puffins and razorbills, with razorbills foraging at a higher trophic level (higher $\delta^{15}N$ values) and a wider variety of prey types (higher range in $\delta^{13}C$ values), suggesting a greater diversity of prey for razorbills. Overall, findings support our hypothesis and suggest niche partitioning among sympatrically breeding seabirds may be important for coexistence during pre-laying on the northeast coast of Newfoundland.

VARIABILITY OF THE DIETARY COMPOSITION OF GUANAY CORMORANTS (PHALACROCORAX BOUGAINVILLIII) ALONG THE PERUVIAN COAST IN THREE DIFFERENT EL NIÑO EVENTS

Maria Andrea Meza-Torres (mmeza@imarpe.gob.pe), Cynthia Romero, Jhonatan Esplana, Delia Vega

Instituto del Mar del Perú, Lima, Peru

The guanay cormorant has been the most abundant seabird in the ecosystem of the Peruvian Humboldt Current System,from Lobos de Tierra Island (6°25´S, 80°51´W) to the guano-headland Punta Coles (17°42´S, 71°22´W). Guanay cormorants feed on a wide of fish species, but they prefere Peruvian Anchovy *Engraulis ringens*. The latitudinal variation in the composition of fish prey and the proportion of anchovy ingested by guanay cormorants reflect the availability of the fish species along the coast. The aim of this work is to compare the variability of the composition of guanay cormorant diet in three different El Niño-like events, 1997-1998, 2015-2016 and 2023. The Peruvian Marine Research Institute (IMARPE) monitors systematically the guano-seabird diet in several islands and headlands along Peruvian coast, including guanay cormorants. We chose five coastal locations that the most consistent sampling and continuous information. Diet data come from guanay regurgitates collected in the locations, the otoliths were counted and categorized by fish prey. We compared the variation of the diet composition among the three periods. The results showed during the El Niño event from 1997-1998, guanay cormorant diet was composed by a higher number of species in relation with the other periods. Peruvian anchovy was the main prey of guanay cormorant diet; however, we recorded a difference in the prey consumed by latitude. In the last period (2023), we detected that contribution of anchovy in the diet was greater than 90%.

FLYING FISH DISTRIBUTION AND CO-OCCURRENCE WITH SOOTY TERNS IN THE NORTHERN GULF OF MEXICO

Pamela Michael[1] (pamela.e.michael@gmail.com), J Chris Haney[1], Jeffery S. Gleason[2], Kathy M. Hixson[3], Yvan G. Satgé[3], Patrick G. R. Jodice[4]

[1]Terra Mar Applied Sciences, Washington, DC, USA. [2]U.S. Fish and Wildlife Service, Migratory Bird Program/Science Applications, Chiefland, FL, USA. [3]South Carolina Cooperative Fish and Wildlife Research Unit, and Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC, USA. [4]5U.S. Geological Survey South Carolina Cooperative Fish and Wildlife Research Unit, Clemson University, Clemson, SC, USA

Flying fish play an important role in marine food webs, linking sub-surface and aerial predators. The association of seabirds with sub-surface predators in subtropical and tropical regions through facilitated foraging events is a well-known phenomenon and is sometimes used to identify fishing grounds for flying fish, flying fish roe, and tunas. In the northern Gulf of Mexico (nGoM), few studies have assessed flying fish distribution, and none have directly evaluated flying fish–seabird co-occurrence. Using vessel-based observations, we characterized the distribution of flying fish and their co-occurrence patterns with seabirds occurring in the nGoM. We modeled flying fish distribution and abundance using Generalized Additive Models. We then assessed co-occurrence patterns of flying fish with all seabird species seen in the area, encompassing the footprint of flying fish observations. Flying fish were observed across the U.S. Exclusive Economic Zone, with densities greater on the mid-continental shelf and into pelagic waters south of Louisiana, and greater densities were associated with regionally low chlorophyll-a and warm water. Sooty terns (Onychoprion fuscatus), considered to be near-obligate commensals with tuna, contributed a much higher percent of assemblage-wide density of the seabirds co-occurring with flying fish versus without flying fish within the footprint that flying fish were observed. The observed greater percent of Sooty terns co-occurring with flying fish than without flying fish aligned with known habitat and foraging patterns for these species and suggests flying fish could be an important part of facilitated foraging events in the nGoM as in other sub-tropical and tropical regions.

A "DARK SKIES" PROGRAM HAS REDUCED SEABIRD LIGHT ATTRACTION FALLOUT AT PMRF

Leah Miller[1], Stephen Rossiter[1] (sr71@hawaii.edu), Daniela Casillas[1], Tessa Broholm[1], Katherine Finney[1], Brooke McFarland[2]

[1]Pacific Cooperative Studies Unit, Research Corporation of the University of Hawai'i, Kekaha, USA.
[2]Natural Resources Program, Pacific Missile Range Facility, Kekaha, USA

The Navy's Pacific Missile Range Facility (PMRF) on Kaua`i supports training and testing as the world's largest instrumented multi-environment range. Three Federally-designated endangered seabirds fly over PMRF: Newell's shearwater (*Puffinus newelli*), Hawaiian petrel (*Pterodroma sandwichensis*), and Band-rumped Storm-petrel (*Oceanodroma castro*). These species are susceptible to light attraction fallout, occurring when fledglings are disoriented by artificial light on their first flight to the ocean. Fledglings are vulnerable to predation or dehydration if grounded but not located and rehabilitated. To effectively manage risk to these species and support PMRF's mission, the PMRF Commanding Officer has implemented a successful annual Dark Skies program during the seabird fledging season from September 15 to December 15. The Dark Skies program eliminates non-essential exterior lighting and requires an authorized waiver with minimization and monitoring measures for any essential lighting during the fledging season. Future-year risk calendars are distributed for planning purposes to identify opportunities to align essential lighting requests on lower risk nights. Outreach, downed bird rescue training for relevant staff, and weekly lighting surveys to monitor compliance are key components of the program. From 2007 to 2014, average fallout was at 5.75 seabirds per year. In 2014, the Dark Skies program was initiated and subsequently fallout has averaged one seabird per year, with four years of zero fallout. This indicates that by using these tools, serious reductions in fallout-take are possible throughout Kaua`i and the other Hawaiian islands.

EVALUATING CLIMATE IMPACTS ON DIET AND PRODUCTIVITY IN CALIFORNIA LEAST TERNS

Erica Mills (emills3021@sdsu.edu)

San Diego State University, San Diego, USA. California Department of Fish and Wildlife, San Diego, USA

The California Current System supports a high level of biodiversity in part fueled by seasonal upwelling of cool, nutrient-rich waters. Contemporaneous and projected changes in ocean conditions will likely influence the timing, intensity, and duration of upwelling events and sea surface temperature anomalies, affecting many species that forage and breed in this region. One such species is the California least tern (CLTE), a federally endangered seabird that nests during the summer months on beaches between central California and Baja Mexico. Since 2009, CLTE have experienced a steady population decline attributed to low reproductive success, despite widespread implementation of site management interventions. This suggests that population recovery and recruitment could be limited by changes in ocean conditions which influence fish distributions, abundance and availability. Fish population declines or spatial shifts may lead to direct and indirect effects on CLTE reproductive success. This study leverages new and existing datasets pertaining to ocean conditions, CLTE foraging behavior, nesting activity, and recruitment. Stable isotope analysis using generalized linear models and Bayesian standard ellipse areas revealed significant interannual variability in breeding season dietary niche across a 20-year period. Linear mixed effects models were used to quantify the strength and directionality of relationships between interannual changes in ocean conditions and observed isotopic shifts in diet. Furthermore, structural equation modeling will identify whether these changes are key drivers of declining California least tern reproductive output. Understanding how these factors influence CLTE productivity will provide necessary evidence to effectively support and promote successful population recovery for CLTE.

A REVIEW OF SEABIRD BYCATCH AND MITIGATION EFFORTS IN ALASKA FISHERIES FROM 2013 THROUGH 2022.

Joshua Moffi (joshua.moffi@noaa.gov)

NOAA National Marine Fisheries Service Alaska Region, Juneau, USA

Alaska has some of the most productive marine ecosystems in the world. Over 90% of U.S. breeding seabird populations, approximately 50 million birds from 39 species, use waters off Alaska during their life cycle. In waters off Alaska, hook-and-line fishing vessels use seabird avoidance measures to minimize seabird bycatch. However, despite these avoidance measures, seabirds are caught unintentionally as bycatch in certain commercial fisheries off Alaska. NOAA's National Marine Fisheries Service (NOAA Fisheries) is responsible for managing coastal and marine habitats through statutory authorities and agency policies. Additionally, NOAA Fisheries views seabirds as important ecosystem indicators and monitors seabird bycatch in many Federal fisheries. Knowledge about changes in seabird bycatch is important to scientists and managers because such changes could reveal long-term ecosystem effects or changes in coastal and marine habitats that seabirds depend on for various life stages. A summary of seabird bycatch and mitigation efforts off Alaska in the federal commercial groundfish (2013-2022) and halibut fisheries (2013-2022) will be presented.

SEABIRD RESEARCH AND CONSERVATION IN THE NORTH INDIAN OCEAN: A REVIEW OF PAST AND CURRENT STUDIES, CONSERVATION AND POLICY FRAMEWORKS

Ravichandra Mondreti (ravichandra.mondreti@gmail.com)

Independent Consultant, Bengaluru, India

Seabirds occur in a diverse range of environments, ranging from coastal environments to high seas. They spend a significant portion of their lives at sea, coming to land only for breeding. They are one of the widely studied marine organisms in most parts of the world. However, in the Indian subcontinent, seabird studies are limited and opportunistic in nature. Most of the existing knowledge on seabirds is largely scattered and is in the form of grey literature. These publications are chiefly either sighting records or natural history accounts. The present paper is a preliminary attempt to collate and synthesize important seabird studies in this region. It also identifies and addresses the major knowledge and data gaps in seabird research; and discusses the existing conservation and policy frameworks. Further, it emphasises the need for robust conservation, management and long-term monitoring interventions.

DIETARY PLASTICITY OF SOCOTRA CORMORANTS IN ABU DHABI, UNITED ARAB EMIRATES.

Sabir Muzaffar[1,2] (s_muzaffar@uaeu.ac.ae), Mohamed Al Mussalami[1]

[1]United Arab Emirates University, Al Ain, UAE. [2]Natural History Museum, London, United Kingdom

Socotra cormorants (Phalacrocorax nigrogularis) are regionally endemic cormorants that occur in the Arabian Gulf and the Gulf of Oman. Recent populations estimates suggest that the populations in Saudi Arabia and Bahrain appear to be less than 60,000 individuals. The populations breeding is in the United Arab Emirates appear to be stable and the species remains classified as IUCN as Vulnerable (Globally) due to low number of breeding islands (~20). Socotra cormorants, like many species of cormorants are regarded as detrimental to local fisheries. We collected 60 samples of regurgitated food loads from nesting Socotra Cormorant chicks on November 12-13, 2021 from Butina Island, Abu Dhabi, an important breeding colony with at least 13,000 breeding pairs. Socotra cormorants fed on at least 15 species of fish, with Lethrinus lentjan (25% biomass), Lethrinus ehrenbegii (14%) and Gerres longirostris (5%) dominating in the diet. The diverse assemblage of fish in their diet suggests that they are generalist predators that take advantage of local forage fish. Most species in the diet were not of commercial importance. This is consistent with other studies from the region. Fisheries in the region are focused on large fish and measures must be taken to limit disturbance of fishing activities at or near important foraging areas. Conflict between fisheries and cormorants need to be resolved through awareness campaigns and strict implementation of existing regulations.

THE SUCCESSFUL FLEDGE OF A MARBLED MURRELET IN OREGON USING WILDLIFE REHABILITATION TECHNIQUES

Ginger Nealon (ginger@coastwildlife.org), Erica Long-Bobian, Stefanie Collar

Wildlife Center of the North Coast, Astoria, USA

The Marbled Murrelet (Brachyramphus marmoratus) is a small seabird that occurs along the Pacific coast of North America from central California to Alaska. Uniquely, breeding pairs forage in near-shore habitat but may travel up to thirty miles inland to establish their nests in old-growth forests. First classified as federally Endangered in 1992, the Marbled Murrelet was added to the Oregon Endangered Species list in 2021. Though indigenous peoples, birders, and biologists have long known about and sought to study these birds in Oregon, because of their unusual breeding strategy and the outstanding camouflage of their nests, a thorough understanding of their breeding biology remains elusive.

In August of 2022, the Wildlife Center of the North Coast received a Marbled Murrelet chick from the Siuslaw National Forest and succeeded in raising and releasing it back into the wild. The WCNC has established protocols for seabird rehabilitation, and used the available scientific information on Marbled Murrelet diet and growth to tailor a specific care regime, resulting in a successful fledge. ODFW and USFWS licenses wildlife rehabilitation centers, which provide real-time information on the health of Oregon's more common native species, as well as the potential opportunity to observe the growth and behavior of cryptic terrestrial and aquatic species. The success of the Marbled Murrelet chick raised at WCNC reveals another strategy to help Oregon's declining Marbled Murrelet population rebound.

EXPOSURE RISK FOR ALCIDS FROM MARINE VESSEL ASSOCIATED OIL POLLUTION IN WESTERN CANADA.

Patrick O'Hara[1] (patrick.ohara@ec.gc.ca), Douglas Bertram[2], Sonya Pastran[2], Alexandra King[2], Ken Morgan[1], Caroline Fox[3], Shanti Davis[4], Gary Kaiser[5], Laurie Wilson[4], Vivian Pattison[2], Yuri Zharikov[6]

[1]Canadian Widlife Service, ECCC, Sidney, Canada. [2]Science and Technology Branch, ECCC, Sidney, Canada. [3]Canadian Widlife Service, ECCC, Nanaimo, Canada. [4]Canadian Widlife Service, ECCC, Delta, Canada. [5]Royal BC Museum, Victoria, Canada. [6]Parks Canada, Ucluelet, Canada

Oiling risk from vessel traffic and port developments has been identified as an increasing threat for marine birds in Western Canada. Here we define exposure risk to oil pollution as a function of the likelihood of pollution and the likelihood of sensitive marine birds occurring in the same area. We infer subregions within the Canadian Pacific Exclusive Economic Zone (EEZ) of elevated concentrations of five species of Alcids: Ancient Murrelet, Marbled Murrelet, Common Murre, Rhinoceros Auklet, and Pigeon Guillemot seasonally (winter = Oct – Mar, summer = Apr – Sept), based on at-sea transects and coastal swath and point count observation data compiled from multiple sources. We use Kernel Density Estimation (KDE) techniques to quantify the seasonal relative distribution and identify subregions of core utilizations for our target species across the EEZ, while accounting for effort that is heterogenous spatially and temporally. We account for spatial distribution changes over the years by basing our KDEs on data pooled among decades since the year 2000. Similarly, we use KDEs based on AIS (Automatic Identification System) vessel traffic data and coastal maritime infrastructure (i.e., docks, marinas, fuel docks) data to estimate likelihood of oil pollution occurring subregionally. We parse AIS data into vessel categories and use these categories along with coastal infrastructure to infer likelihood of occurrence for two general pollution categories (high frequency smaller discharges; low frequency larger potentially catastrophic spills). We combine bird and pollution likelihood to identify subregions of elevated risk of exposure to oil discharges.

CONSISTENCY OF MERCURY CONCENTRATIONS IN TAIL FEATHERS OF STREAKED SHEARWATERS

Hikari Odagiri[1] (odagiri.hikari.k0@elms.hokudai.ac.jp), Sarara Azumi[1], Yoshinori Ikenaka[2], Mayumi Ishizuka[3], Hideshige Takada[4], Yoshito Chikaraishi[5], Ken Yoda[6], Jean-Baptiste Thiebot[1], Yutaka Watanuki[1]

[1]Graduate School of Fisheries Science, Hokkaido University, Hakodate, Japan. [2]Graduate School of Veterinary Medicine, Hokkaido University, Hakodate, Japan. [3]Graduate School of Veterinary Medicine, Hokkaido University, Sapporo, Japan. [4]United Graduate School of Agricultural Science, Tokyo University of Agriculture and Technology, Fuchu, Japan. [5]Institute of Low Temperature Science, Hokkaido University, Sapporo, Japan. [6]Graduate School of Environmental Studies, Nagoya University, Chikusa, Japan

The global anthropogenic mercury (Hg) emissions have been steadily increasing, emphasizing the importance of continuous monitoring of Hg pollution levels in the oceans. Seabird feathers have been used to monitor Hg contamination, since values in each feather reflect the blood Hg concentration at the time of the feather molting. In the coastal and oceanic areas around Southeast Asia, where Hg emissions are high, our research program aims to create a Hg pollution map using pelagic seabirds' feather molting areas, We used Streaked Shearwaters *Calonectris leucomelas* as a bio-indicator. We linked the Hg concentrations in outermost tail feathers R6 that molted during the wintering period, with the wintering areas of individuals tracked using light-based geolocation loggers. Although in this species, the birds have been reported to use the same individual wintering areas across years, the year-to-year consistency of Hg concentrations in their feathers remains unknown. Therefore, this study aims to examine the interannual consistency of Hg concentrations in tail feathers R6. Over two years from 2020 to 2022, geolocators were attached and retrieved, and tail feathers R6 were collected from 40 Streaked Shearwaters that bred on the Awa Island, Japan. Most birds showed inter-annual consistency in their individual wintering area. Also, similar Hg concentrations were generally observed in the same individuals, from one year to the next. These results suggest that the Streaked Shearwater may be a useful and reliable indicator of Hg contamination in marine ecosystems. Continuous monitoring of Hg pollution in this region under severe anthropogenic stress seems imperative.

PREY SIZE ESTIMATION FOR SEABIRDS TRANSPORTING PREY TO THEIR NESTS IN THEIR BILLS USING FREE, OPEN-SOURCE SOFTWARE.

Kaitlyn E. Osborne[1] (osbornka@oregonstate.edu), Cecelia E. Frisinger[1], Daniel D. Roby[2], James W. Rivers[1]

[1]Department of Forest Engineering, Resources, & Management, Oregon State University, Corvallis, USA. [2]Department of Fisheries, Wildlife, and Conservation Sciences, Oregon State University, Corvallis, USA

The Marbled Murrelet (Brachyramphus marmoratus) is an endangered seabird that nests high in large trees within late-successional coastal forests. Given the difficulty in locating and observing active murrelet nests, there are few data on the size of forage fish provisioned to murrelet chicks. The Oregon Marbled Murrelet Project detected >1300 chick-feeding events at nests using remote video cameras during 4 nesting seasons. Video footage recorded bill-load prey at oblique camera angles that made estimating prey length difficult. To validate visual estimates of prey length, we developed methods to measure length using the image processing software ImageJ and a photoset of known-length specimens of top prey taxa for murrelets (Pacific sand lance Ammodytes personatus, surf smelt Hypomesus pretiosus, northern anchovy Engraulis mordax, and Pacific herring Clupea pallasii). Size was visually estimated by naïve observers from photos of 58 fish, each placed in 30 positions. ImageJ was used to measure the eye diameter of each prey item in photos and the Pelagic Species Traits Database was used to obtain morphometric ratios for estimating total length from eye diameter. All estimates were compared to known total length to assess accuracy. Preliminary results show that visual estimates are near-exact (within 6 mm) as often as they are over- or under-estimated, while ImageJ measurements consistently estimated prey with near-exact precision. Validating estimates of prey length from digital images and using image processing software can provide more accurate and precise estimates of chick-provisioning for seabird species that transport whole prey to their nests in their bills.

ECOLOGICAL TRANSFER OF MERCURY FROM SEABIRDS TO TERRESTRIAL BIOLOGICAL COMMUNITY: INSIGHTS FROM RHINOCEROS AUKLET BREEDING GROUNDS

Kohei Oshima[1] (oshima.kohei.aw@alumni.tsukuba.ac.jp), Kazuya Matsumoto[1], Yasuaki Niizuma[2], Yutaka Watanuki[3], Shigeki Wada[4], Akiko Shoji[1]

[1]Graduate School of Science and Technology, University of Tsukuba, Tsukuba, Japan. [2]Faculty of Agriculture, Meijo University, Tenpaku-ku, Japan. [3]Graduate School of Fisheries Sciences, Hokkaido University, Hakodate, Japan. [4]Shimoda Marine Research Center, University of Tsukuba, Shimoda, Japan

Seabirds are biovectors that transport nutrients and pollutants from marine to terrestrial ecosystems. Mercury assimilated by seabirds at sea is disseminated in colonies through mainly feces, affecting plant roots in breeding grounds. However, more research has yet to explore the impact of seabird-derived mercury throughout the food web, encompassing herbivores, scavengers, and detritivores. In this study, we investigated the transfer of mercury from Rhinoceros auklets (*Cerorhinca monocerata*) to the terrestrial food web. We collected plants, arthropods, as well as prey, feces, blood, and feathers of auklets, which enabled us to analyze mercury and C/N isotope ratios. The results show that mercury concentration of feces was similar to that of the prey species. Within breeding grounds, elevated mercury concentrations were observed in plant roots, woodlice, carrion beetles, and spiders (Avg.THg ppm ± SD woodlice: affected 0.26 ± 0.03; control 0.05 ± 0.02, carrion beetles: affected 0.57 ± 0.12; control 0.12 ± 0.04, spiders: affected 1.18 ± 0.22; control 0.26 ± 0.08). Arthropods with high mercury concentrations exhibited elevated δ13C values, suggesting the influence of seabird-derived carbon in the breeding site's food web. However, some arthropods, like herbivores, showed no discernible effects of seabirds on mercury concentrations and δ13C, indicating that feeding habits and life history influence the spread of mercury. Effects of allochthonous mercury inputs are not confined only to plant roots; they spread to arthropods in breeding ground. Our findings enhance our understanding of mercury transfer in ecosystems and underscore the importance of considering species-specific ecological interactions in such dynamics.

ACOUSTIC SURVEYS FOR JAPANESE MURRELETS *SYNTHLIBORAMPHUS WUMIZUSUME* AT BIROJIMA, MIYAZAKI JAPAN

Kuniko Otsuki[1] (boomam@sa2.so-net.ne.jp), Yoshitaka Minowa[2], Nina Karnovsky[3], Maria Kai[4]

[1]Marine Bird Restoration Group, Fukushima, Japan. [2]Marine Bird Restoration Group, Narashino, Japan. [3]Pomona College Dept. of Biology, Claremont, USA. [4]Kadogawa Town, Kadogawa, Japan

Acoustic surveys using songmeters for the Japanese Murrlet *Synthliboramphus wumizusume* (hereafter, "JAMU") at Birojima, Miyazaki-ken Japan were conducted in 2019, 2020, and 2023. This project was carried out to be able to more accurately predict the best time of year to carry out annual nocturnal at sea population counts. The acoustic patterns of adult Japanese murrelets in 2023 differed from 2019 and 2020. The peak of acoustic activity was earlier in 2023. In addition, the first egg was laid 1-2 weeks earlier. The peak of acoustic activity for both adults and chicks occurred almost simultaneously, which we hypothesize indicates the nights when fledging occurs.

Based on the three-year record, we found that the timing of the breeding season changes from year to year. Based on the acoustic data, the appropriate period for the annual population survey is between the end of March and before April 10 because all breeding individuals on Birojima are presumed to be incubating at this period. We found that the acoustic data are important for informing timing of breeding activity. In the future we would like to be able to monitor acoustic data in real time from mainland. If it were technically possible, we would like to install a songmeter in the colony and analyze the results every day on a computer in the laboratory on the mainland so that we can carry out the annual population survey at the best time in the breeding season for assessing the population of this rare seabird.

THE ECOLOGICAL RESPONSES OF RHINOCEROS AUKLETS ON LONG-TERM AND SHORT-TERM MARINE ENVIRONMENTAL EVENTS

Hikari Ozawa[1] (hikari.ozawa0303@gmail.com), Nanaka Tojo[1], Teru Kanaida[1], Shunsuke Nibe[1], Kohei Oshima[2], Ui Shimabukuro[3], Kazuhiko Hirata[4], Motohiro Ito[1]

[1]Faculty of / Graduate School of Life Sciences, Toyo University, 1-1-1 Izumino, Itakura, Ora, Gunma, 374-0193, Japan. [2]Graduate School of Science and Technology, University of Tsukuba, Tsukuba, Ibaraki, 305-0006, Japan. [3]Meiji Institute for Advanced Study of Mathematical Sciences, Nakano, Tokyo 164-8525, Japan. [4]Coastal Branch of Natural History Museum and Institute, Chiba, 123 Yoshio, Katsuura, Chiba, 299-5242, Japan

Long-term/short-term environmental changes and variabilities in the ocean may impact on marine species. Seabirds are known to be sensitive to those environmental events, and they may change their food selection and foraging locations under the events. We investigated diet and chick growth (2016-2017 and 2021-2023), and foraging sites (2019, and 2021 to 2023) of Rhinoceros auklets *Cerorhinca monocerata* in three adjacent islands (Matsumae-Kojima Is., Taijima Is, and Bentenjima Is.) in the Tsugaru Strait, Japan. Anchovies were the most dominant prey for auklets in all islands from 2021 to 2023 (WW%:72.2% - 83.0%), however, in 2016, 2017, and 2019, anchovies were low in their diet (WW%: 0.5 - 22.1%), maybe because of the decadal oceanic warm / cold regime shifts. The chick growths were higher in the years when anchovies were highly available. In contrast to the drastic change in diet and breeding performance by responding to long-term changes in fish abundance, foraging site selection did not differ between years in the auklets in all the breeding colonies. The auklets in each island selected the specific, segregated, near each breeding site, and coastal sea area as their foraging site, especially during 1day trips, and also they shared the similar foraging site at the Point Esan in the Pacific coast as a “hot spot” during >2days trips. Around those foraging sites, small eddies and upwellings were often developed because of strong current flow, thus, those would increase the predictability of their diet distribution, regardless of long-term / short-term environmental events.

HIGHLY PATHOGENIC AVIAN INFLUENZA H5N1 2.3.4.4B MORTALITY EVENT HAS SEVERE IMPACTS TO CASPIAN TERNS (*HYDROPROGNE CASPIA*) NESTING IN WASHINGTON USA AND TO THE PACIFIC FLYWAY TERN POPULATION

Scott Pearson[1](scott.pearson@dfw.wa.gov), Katherine Haman[1], Sarah Tanedo[1], Katie Laushman[1], Chad Norris[1], Allison Black[2], Lauren Frisbie[2], M. James Lawonn[3]

[1]Washington Department of Fish and Wildlife, Olympia, USA. [2]Washington Department of Health, Olympia, USA. [3]Oregon Department of Fish and Wildlife, Portland, USA

Highly pathogenic avian influenza (HPAI) virus H5N1 2.3.4.4b is having global impacts on wild bird and mammal populations, with the most significant losses observed in colonial surface-nesting seabirds and marine mammals. Though the overall North American mortality from H5N1 has been relatively low, there have been some regional impacts. We assessed an H5N1 outbreak on Caspian Terns (*Hydroprogne caspia*) nesting on Rat Island, Washington USA. During the July – August 2023 tern H5N1 outbreak, we removed and counted carcasses and euthanized moribund birds almost weekly. Using aerial photographs taken prior to the first carcass collection, we estimated the Caspian Tern colony to be 1800-1900 adults. We counted a minimum of 1101 dead adults and 520 chicks, indicating a loss of 56% of the adult population. When including all the HPAI related tern carcasses counted in other locations in Washington and Oregon, we estimated that 10-14% of the Pacific Flyway population was lost this summer. Interestingly, very few adult Glaucous-winged Gulls (*Larus glaucescens* and hybrids) nesting on the same Island died (~3% of 1100), even though gull chick mortality was high. Comparison of Caspian Tern H5N1 genomes indicated that the virus was likely introduced to Washington from Caspian Terns in Oregon. The genomic signature also indicates spillover of H5N1 from Caspian Terns to harbor seals (*Phoca vitulina*) hauling-out on Rat Island. Monitoring and surveillance for H5N1 is necessary to understand the epidemiology of this virus, its impacts on susceptible species, and to provide support for data-driven management.

CORMORANT OCEANOGRAPHY PROJECT: INSIGHTS FROM CORMORANT MOVEMENT ECOLOGY AND OCEAN OBSERVING OPPORTUNITIES

Adam Peck-Richardson[1] (peckrichardson@gmail.com), Alexa Piggott[1], James Lerczak[2], Greg Wilson[2], Jessica Garwood[2], Xiaohui Liu[2], Tycho Anker-Nilssen[3], John P. Y. Arnould[4], Thomas Cansse[4], Susana Cárdenas-Alayza[5], Nina Dehnhard[3], Mindaugas Dagys[6], Annette Fayet[3], Alexa D. Foster[7], Stefan Garthe[8], Scott A. Hatch[9], Michael E. Johns[10], Miran Kim[11], Kate Layton-Matthews[3], Ariel Lenske[12], Gregory T. W. McClelland[12], Julius Morkūnas[13], Sabir Bin Muzaffar[14], Mahendiran Mylswamy[15], Gayomini Panagoda[16], Victor R. A. Pimenta[17], Flavio Quintana[18], Matt J. Rayner[19,20], Tone Kristin Reiertsen[3], Sampath S. Seneviratne[16], Mariëlle van Toor[21], Pete Warzybok[10], Eleanor A. Weideman[22], Yat-Tung Yu[23], Carlos B. Zavalaga[24], Rachael Orben[25]

[1]Department of Fisheries, Wildlife, and Conservation Sciences, Oregon State University, Corvallis, USA. [2]College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, USA. [3]Norwegian Institute for Nature Research – NINA, Trondheim, Norway. [4]School of Life and Environmental Sciences, Faculty of Science, Engineering and Built Environment, Deakin University, Burwood, Australia. [5]Departamento Académico de Ciencias Biológicas y Fisiológicas, Facultad de Ciencias e Ingeniería, Universidad Peruana Cayetano Heredia, Lima, Peru. [6]Nature Research Centre, Vilnius, Lithuania. [7]Red Sea Research Center, Division of Biological and Environmental Science and Engineering, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia. [8]Research and Technology Centre (FTZ), Kiel University, Büsum, Germany. [9]Institute for Seabird Research and Conservation, Anchorage, USA. [10]Point Blue Conservation Science, Petaluma, USA. [11]Seabirds Lab. of Korea, Wonju, Korea, Republic of. [12]Canadian Wildlife Service, Environment and Climate Change Canada, Delta, Canada. [13]Marine Research Institute, Klaipėda University, Klaipėda, Lithuania. [14]Department of Biology, College of Science, United Arab Emirates University, Al Ain, UAE. [15]Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore, India. [16]Avian Sciences and Conservation, Department of Zoology, University of Colombo, Colombo, Sri Lanka. [17]Department of Ecology and Evolutionary Biology, Federal University of São Carlos - UFSCar, São Carlos, Brazil. [18]Instituto de Biología de Organismos Marinos (IBIOMAR), CONICET, Puerto Madryn, Argentina. [19]Auckland War Memorial Museum, Tāmaki Paenga Hira, Auckland, New Zealand. [20]School of Biological Sciences, The University of Auckland, Auckland, New Zealand. [21]Centre for Ecology and Evolution in Microbial Model Systems, Linnaeus University, Kalmar, Sweden. [22]BirdLife South Africa, Seabird Conservation Programme, Cape Town, South Africa. [23]Hong Kong Bird Watching Society, Hong Kong SAR, China. [24]Unidad de Investigación de Ecosistemas Marinos—Grupo Aves Marinas, Universidad Científica del Sur, Lima, Peru. [25]Department of Fisheries, Wildlife, and Conservation Sciences, Oregon State University, Hatfield Marine Science Center, Newport, USA

The Cormorant Oceanography Project is a pioneering interdisciplinary collaboration between seabird ecologists and oceanographers. We are deploying solar-powered, network-connected (GSM) biologging tags to collect movement ecology data and measure in situ oceanographic data along the daily foraging paths of diving marine birds. We are collaborating with partners from 20 countries, across 6 continents, and collectively, we have deployed biologging tags on more than 15 cormorant and penguin species. These studies have refined our understanding of individual ranges, seasonal movements, and diving behaviors. Here we present an update on tag improvements and international collaborations. We will also share observations of movement behavior from cormorant tagging efforts and compare daily foraging ranges and dive characteristics across multiple species. Furthermore, we have observed long distance movements of Socotra, Brandt's,

Guanay, and Great Cormorants that contrast with regional movements of Black-faced Cormorants, and residential movements in Indian and Neotropic Cormorants and Spotted Shags. In support of concurrent ocean observing objectives, we refined tag sampling and analytical methods to estimate surface current speeds from drifting birds (GPS) and are developing methods to process and share salinity and temperature profiles and bottom soundings from dives (CTD). These cormorant-derived datasets are being assimilated into coastal ocean models to reduce uncertainty in model inputs, such as bathymetry and boundary conditions. This work highlights the value of interdisciplinary seabird research projects; biologging projects are collecting animal movement data that can simultaneously advance oceanographic research as well as our understanding of seabird ecology and population connectivity.

NIHOKU ECOSYSTEM RESTORATION PROJECT: HAWAIIAN PETREL AND NEWELL'S SHEARWATER POST-TRANSLOCATION OUTCOMES

Lauren Pederson[1] (lauren@pacificrimconservation.org), Dylan Blanchard[1], Lindsay Young[1], Robert Kohley[1], Eric VanderWerf[1], Leilani Fowlke[1], Erika Dittmar[1], Andre Raine[2,3]

[1]Pacific Rim Conservation, Honolulu, USA. [2]Kaua'i Endangered Seabird Recovery Project, Hanapepe, USA. [3]Archipelago Research and Conservation, Hanapepe, USA

The Nihoku Ecosystem Restoration Project was created in 2012 to establish the first predator-free nesting area for Newell's Shearwaters (*Puffinus newelli*; NESH) & Hawaiian Petrels (*Pterodroma sanwichensis*; HAPE). These are Hawai'i's only endemic seabirds & both are listed under the Endangered Species Act of 1973. In 2014, a 2,400 foot-long predator-exclusion fence was completed at Kīlauea Point National Wildlife Refuge on Kaua'i, Hawai'i, protecting ~8 acres of habitat. Following construction, invasive mammalian predators were eradicated & non-native plants were removed from ~4 acres. From 2015-2020, 110 HAPE & 87 NESH chicks were translocated from source colonies in north-west Kaua'i to Nihoku where they were housed in artificial burrows & hand-fed until fledging. A total of 106 HAPE & 87 NESH successfully fledged, resulting in an overall success rate of 98%. In 2020 the project transitioned to the post-translocation monitoring phase, involving camera trapping, night-time auditory surveys, weekly burrow checks, & regular burrow maintenance during the breeding season. In 2020 & 2022, the first confirmed translocated HAPE & NESH, respectively, returned to Nihoku as adults. Kermadec Petrel (*Pterodroma neglecta*), Bulwer's Petrel (*Bulweria bulwerii*), & Wedge-tailed Shearwater (*Ardenna pacifica*) activity has also been documented in Nihoku in recent years. 10 years after the inception of the project, the first second-generation HAPE chick successfully fledged from Nihoku, establishing the site as a new breeding colony. Overall 4 pairs of translocated HAPE & 1 pair of NESH have been recorded at the site, along with 1 additional HAPE observed prospecting. In future years, social attraction & post-translocation monitoring will continue to observe this growing colony.

EVALUATING THE INFLUENCE OF ENVIRONMENTAL CONDITIONS ON PIGEON GUILLEMOT BREEDING SUCCESS IN THE SALISH SEA

Liam Pendleton[1] (pendle@uw.edu), Lee Robinson[2], Eric Wagner[3], Scott Pearson[4], Susan Thomas[5], Sarah Converse[6]

[1]Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington, Seattle, USA. [2]US Fish and Wildlife Service, Seattle, USA. [3]Center for Ecosystem Sentinels, Department of Biology, University of Washington, Seattle, USA. [4]Wildlife Science Division, Washington Department of Fish and Wildlife, Olympia, USA. [5]US Fish and Wildlife Service, Washington Maritime National Wildlife Refuge Complex, Sequim, USA. [6]US Geological Survey, Washington Cooperative Fish and Wildlife Research Unit, School of Environmental and Forest Science & School of Aquatic and Fishery Sciences, University of Washington, Seattle, USA

Seabird population dynamics are tightly linked with conditions in marine foraging habitats. Marine environmental conditions have direct effects on prey abundance and quality and can influence demographic outcomes. We evaluated the influence of marine conditions on breeding success of Pigeon Guillemots (*Cepphus columba*) using a long-term data set from Protection Island, Washington, USA. The Pigeon Guillemot has been identified as an indicator species in the Puget Sound region, but the relationship between marine conditions and guillemot breeding success is not well understood. We evaluated the effects of sea surface temperature, chlorophyll-*a* concentration, the Pacific Decadal Oscillation, and the North Pacific Gyre Oscillation on two metrics of breeding success: the probability that a nest produces at least one chick and the probability that a nest produces two chicks, given it produced at least one. We evaluated effects of oceanographic covariates across five temporal scales to identify periods in which particular oceanographic conditions may be most biologically significant. Our results will inform the relationship between marine conditions and Pigeon Guillemot population dynamics, leading to a better understanding of Pigeon Guillemots as an indicator species in Puget Sound.

PETRELS IN THE DESERT: DIEL, SEASONAL AND SPATIAL PATTERNS OF MARKHAM'S STORM-PETREL (*HYDROBATES MARKHAMI*): PAMPA PERDIZ COLONY, ATACAMA DESERT, CHILE

Maya Philipp[1,2] (mayaphilipp1001@gmail.com), Abram Fleishman[1], Jeff Schlueter[1], Cristian Pinto[3], Rodrigo Silva[3], Brad Keitt[4]

[1]Conservation Metrics, Inc., Santa Cruz, USA. [2]University of California, San Diego, La Jolla, USA. [3]Red de Observadores de Aves y Vida Silvestre de Chile, Santiago, Chile. [4]American Bird Conservancy, Santa Cruz, USA

Little information exists for the endangered Markham's Storm-Petrel (*Hydrobates markhami*), a Chilean endemic seabird whose nesting is restricted to saltpeter deposits in the Atacama Desert. This habitat overlaps with human light sources, roadways, and other anthropogenic activities, putting the species at risk. The remote locations where these birds nest are difficult to monitor. Passive acoustic monitoring has been proven effective in studying nocturnal seabirds like Markham's Storm-Petrel. The objective of this study was to determine if passive acoustic monitoring can detect relative abundance and drivers of vocal activity of Markham's Storm-Petrel. Acoustic monitors were placed at six distinct sections within the Pampa Perdiz colony. Acoustic data were processed with a Convolutional Neural Network (CNN) detection model trained to identify Markham's calls and analyzed to investigate diel and seasonal patterns. We found that the mean call rate for each site was correlated with estimated nest densities. Recorders were deployed in late October 2019, and vocal activity was already high, indicating colony attendance began earlier than previously anticipated. The diel pattern of vocal activity peaked at night (4.5 hours after sunset). We found no relationship between lunar phase and vocal activity, unlike many Procellarids. We conclude that call rate may be effective at estimating relative abundance for Markham's Storm-Petrel, especially in the first stages of the breeding season. Future monitoring in known colony areas should have recorders deployed between October and February on a duty cycle of 1 minute every 10 minutes between 70 to 500 minutes after sunset.

PARENTAL DUTIES AND FEEDING STRATEGIES IN RED-BILLED TROPICBIRDS (*PHAETHON AETHEREUS*) DURING THE BREEDING SEASON

Alberto Piña-Ortiz[1] (albertopinaortiz@gmail.com), Diego Adolfo González-Zamora[2], Jesica Andrea Paz[3], Salvador Hernández-Vázquez[4], Eric Mellink[2], Paco Bustamante[5], José Alfredo Castillo-Guerrero[4], Petra Quillfeldt[1]

[1]Justus Liebig University (JLU) Giessen, Department of Animal Ecology and Systematics, Giessen, Germany. [2]Centro de Investigación Científica y de Educación Superior de Ensenada, B. C., Ensenada, Mexico. [3]Universidad Nacional de Mar del Plata, IIMyC, Instituto de Investigaciones Marinas y Costeras, CONICET, Consejo Nacional de Investigaciones Científicas y Técnicas, Mar del Plata, Argentina. [4]Universidad de Guadalajara, Centro Universitario de la Costa Sur, Departamento de Estudios para el Desarrollo Sustentable de la Zona Costera, San Patricio-Melaque, Municipio de Cihuatlán, Mexico. [5]LIttoral, ENvironnement et Sociétés (LIENSs), UMR 7266 CNRS – La Rochelle Université, La Rochelle, France

Breeding seabirds face the challenge of meeting both their own needs and providing for their offspring while constrained by central-place foraging. To address limited resources near their colonies, many pelagic seabirds adopt a bimodal foraging strategy. Parents take short trips to fulfil chick requirements and long trips to sustain their own body condition. The foraging behaviour of red-billed tropicbirds during the incubation and chick-rearing (≤4 weeks of age) stages (2017-2022) at Peña Blanca Islet, Mexico, was studied using GPS loggers. Blood samples from adults and chicks were collected for stable isotope analysis (δ^{15}N and δ^{13}C). Parental presence at the nest, meal size, and feeding events to chicks were also recorded. During incubation, parents took long trips offshore, switching to a bimodal strategy (short and long trips) after chick hatching. δ^{15}N values showed trophic segregation between parents and their offspring, the latter being fed with prey more enriched in ^{15}N. Parental presence at the nest was greater during early chick-rearing, associated with a higher provision rate. The foraging strategies of red-billed tropicbirds appear to be associated with parental duties. Since young chicks require a high level of parental presence as well as frequent feeding, parents adopt a strategy whereby the parent on duty makes only short trips to provide for the chick and does not leave it unattended for long periods, while its mate undertakes long trips for self-feeding. Afterwards, they gradually reduce the time spent at the nest and increase the time spent foraging, compensating with larger offspring's meal sizes.

HISTORY AND SIGNIFICANCE OF ALBATROSS BANDING EFFORTS AT MIDWAY ATOLL, 1936-2023

Jonathan Plissner[1] (jonathan_plissner@fws.gov), Beth Flint[2], Jennifer McKay[3]

[1]U.S. Fish and Wildlife Service, Midway Atoll, United States Minor Outlying Islands. [2]U.S. Fish and Wildlife Service, Honolulu, HI, USA. [3]U.S. Geological Service, Laurel, MD, USA

Since 1936, nearly 270,000 individual albatrosses have been banded at Midway Atoll, with as many as 26,500 banded in a single breeding season. Early banding efforts supported U.S. Navy interests in reducing collisions with aircraft but also provided extensive data on life histories and behaviors of both black-footed and Laysan albatross through the 1960s. Banding efforts increased again in the 1990s, largely focusing on toxicological effects of ingested plastic and other environmental contaminants. Also in the 1990's, numerous study plots were established across the atoll, within which chicks and nesting adults were banded and monitored to assess long-term trends in reproductive success and survivorship. Monitoring efforts continue at many of these plots, providing demographic data for assessing impacts of such factors as climate, habitat changes, and implementation of fisheries bycatch reduction measures on albatross populations. Banding efforts for these programs have secondarily provided information on inter-island dispersal and other movement patterns, longevity, and colony attendance of non-breeding individuals. Banding does pose some risk to individuals that should be considered along with the value of the information to be gathered but remains the most valuable method for long-term monitoring of individual birds.

IDENTIFYING "IN SITU"NORTHERN BULLER´S ALBATROSS (THALASSARCHE BULLERI PLATEI) DURING THE ARTISANAL LONGLINE FISHERY IN OFFSHORE WATERS OF SOUTHERN PERÚ.

Javier Quiñones[1] (javierantonioquinones@gmail.com), Christopher Robertson[2], Carlos Zavalaga[3]

[1]Instituto del Mar del Peru, Lima, Peru. [2]Retired, Wellington, New Zealand. [3]Universidad Cientifica del Sur, Lima, Peru

The current Buller's albatross taxa (Thalassarche bulleri bulleri [southern] and T. b. platei [northern]) engage in transpacific migrations from breeding sites on New Zealand offshore islands to non-breeding areas in the south-eastern Pacific Ocean. Both taxa are identifiable from a combination of plumage colour features in the head and bill that are easy to detect at short distance (<15 m). There is also breeding allopatry between the taxa, with the onset of breeding 2.5 months earlier in the 'northern taxon'. In this study, close-range sightings and captures of lured Buller´s albatross individuals off southern Perú were carried out during two pelagic trips in May–July 2021 during their normal operations when targeting sharks. We report 41 Buller´s albatross, of which 40 were recognized as 'northern taxon' and one as 'southern taxon'. The great majority of the 'northern taxon' were adults (92.5%), with the remaining identified as sub-adults (7.5%). Birds were sighted between 126 and 223 km offshore west-south-west from the port of Ilo, Perú (17°38.64´S, 71°20.77´W). Birds sighted were preferentially in oceanic areas above the abyssal plain (68% of sightings), demonstrating that the 'northern taxon' is a truly oceanic species. No birds were observed by us over the continental shelf. Identification and comparison of photographs for both taxa taken at sea can be problematic, due to varying light conditions, unless the birds can be drawn close to the photographer using attractants, such as offal discards.

DETAILED SPECIES COMPOSITION, OCCURRENCE AND BEHAVIOUR OF SEABIRDS SPECIES DURING THE FISHING OPERATION OF ARTISANAL LONGLINE FISHERIES IN SOUTHERN PERU, AND STRATEGIES TO PREVENT SEABIRD BYCATCH IN OFFSHORE WATERS OF SOUTHERN PERU.

Javier Quiñones[1] (javierantonioquinones@gmail.com), Cynthia Romero[1], Johannes Fischer[2], Igor Debski[2]

[1]Instituto del Mar del Peru, Lima, Peru. [2]Department of Conservation, Wellington, New Zealand

During fall fishing activities, most interactions were observed during recovery of the longline, a particular behaviour of seabirds was noticed, the first to arrive where the White-chinned Petrels (Procellaria aequinoctialis) and South polar skuas (Catharacta maccormickii), the first ones, over 10 individuals, dives in search of the bait, normally chub mackarell (Scomber japonicus) or giant squid (Dosidicus gigas), and the second ones (no more than two) were fighting with the first ones for the food on the surface (bait or offal discards). Then, the Black-browed albatross (Thalassarche melanophris) approached but in a shy manner, not so many animals, maximum six or eight animals per haul, after that other mollymawk species such as the Northern bullers albatrosses (Thalassarche bulleri platei), Salvins albatross (Thalassarche salvini) and Chatham albatross (Thalassarche eremita) approaches to the gear, but the amounts of this species is normally no more than two or three individual per species. During some hauls a few (maximum two) Northern giant petrels (NGP) (Macronectes halli) arrives and outcompete all the other mollymawks and stole their food.

In this Scenario we propose to characterize this artisanal fishery and subsequently test the most feasible and effective bycatch mitigation options, we propose the use of cheap methods such as tori lines but adapted to small numbers of seabirds, weighted branch lines, night setting, and good practices in offal discards. Expensive methods such as hookpod mini should be avoided since will be impossible to implement due to the low income of Peruvian fishermen.

WHO, WHAT AND WHEN? USING A DETAILED ASSESSMENT OF THE BREEDING PHENOLOGY OF TWO ENDANGERED SEABIRDS TO INFORM POWERLINE COLLISION RISK ANALYSIS.

Andre Raine (andreraine@arckauai.com), Marc Travers, Scott Driskill, Jennifer Rothe, Karim Hanna

Archipelago Research & Conservation, Hanapepe, USA

Powerline collisions are one of the biggest conservation challenges facing the endangered ʻaʻo (Newell's Shearwater Puffinus newelli) and ʻuaʻu (Hawaiian Petrel Pterodroma sandwichensis) throughout the Hawaiian Islands. The nocturnal nature of their passage across powerlines and the unsearchable terrain below a large proportion of these lines makes assessing the scale of powerline collisions difficult. To deal with this, acoustic sensors have been used on Kauaʻi for over a decade as an integral tool to accurately quantify annual collisions and help inform minimization actions. A detailed understanding of the breeding phenology of the ʻaʻo and ʻuaʻu is a critical next step to explaining, informing and fine tuning the allocation of strikes for the two species. Using data collected via burrow checks and cameras from over a decade of colony monitoring work we created a comprehensive breeding phenology for both ʻaʻo and ʻuaʻu on Kauaʻi. Life history differences between the two species apparent from this analysis explain relative collision risk through the timing and frequency of burrow attendance. This includes key inflection points such as first arrival dates, exodus periods, chick rearing patterns and fledging dates. A particularly difficult component of powerline collision assessments is estimating the ratio of sub-adult and adult birds within collision estimates, as visually at night there is no difference between the two age groups. We demonstrate how burrow attendance patterns help to define this ratio. Lastly, we discuss next steps for refining this work through acoustic data and attendance patterns at social attraction sites.

HIDDEN MARKOV MODELS IDENTIFY REGIME SHIFT FROM SEABIRD AT-SEA-DENSITY IN THE NORTHERN CALIFORNIA CURRENT

Zoe Rand[1] (zrand@uw.edu), Eric Ward[2], Jen Zamon[3], Thomas Good[2]

[1]Quantitative Ecology and Resource Management, University of Washington, Seattle, WA, USA. [2]Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Seattle, WA, USA. [3]Pt. Adams Research Station, Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Hammond, OR, USA

As the pace of climate change accelerates, tools to detect changes in ecosystem states are increasingly needed. Ecosystem indicators are used to monitor and assess changes in an ecosystem over time and can be useful in identifying regime shifts, or rapid and significant changes in ecosystem attributes. However, it can be challenging to identify indicators that cover a broad range of ecosystem attributes while also limiting the number of indicators that are needed. In this study, we employed hidden Markov models, which distinguish discrete underlying states of a system from noisy data, to develop a model-based approach for identifying seabird species that could be used as ecosystem indicators for the northern California current. We fit models to at-sea-density anomaly data from 2003 to 2022 for 11 seabird taxa. Our analysis supported the presence of two underlying states with a shift occurring in 2011. Based on the changes in the estimated means and variances of density anomalies for each of these taxa, we found that common murres (Uria aalge), Cassin's auklets (Ptychoramphus aleuticus), and sooty shearwaters (Ardenna grisea) could all be useful as indicators in the northern California current, while northern fulmars (Fulmaris glacialis), large gulls (Laridae) and Caspian terns (Hydroprogne caspia) may be indicators of similar processes and therefore only one of these species may be needed. This work demonstrates that hidden Markov models are a valuable tool to identify potential ecosystem indicators and a similar framework could be useful for developing indicators from other data types.

SEX-SPECIFIC MIGRATORY BEHAVIOR IN MAGELLANIC PENGUINS RESULTS IN MORE RISKS FOR FEMALES

Ginger Rebstock (gar@uw.edu), Dee Boersma

Center for Ecosystem Sentinels, Department of Biology, University of Washington, Seattle, USA

Protecting migratory animals requires knowledge of their distributions throughout the year. Spatial or temporal segregation of females and males during part of the annual cycle complicates conservation measures and can lead to sex-biased mortality. Females and males of many seabird species use separate areas during the nonbreeding season and sex-biased bycatch in fisheries is common. We satellite tracked 18 female and 18 male post-breeding adult Magellanic penguins *Spheniscus magellanicus* at Punta Tombo, Argentina, during their fall northbound migration, April-August 2022 and 2023. Tracks were highly variable, with three dominant patterns: 1) penguins swam directly to wintering grounds from northern Argentina to southern Brazil; 2) penguins stayed farther south near the Peninsula Valdés (a few later swam farther north); or 3) penguins swam ~1200 km north to wintering grounds then swam back south almost immediately. In spite of individual variability, females stayed significantly closer to shore than males in both years. Females are likely exposed to fishing gear, pollution, and red tides more than males because the females stayed closer to shore, where anthropogenic threats are concentrated. From May through August, penguins that bred at Punta Tombo were distributed along the continental shelf from Punta Tombo (~44° S) to ~33° S, making protection of the population outside the breeding season difficult.

AN ALASKA-WIDE SURVEY FOR ALEUTIAN TERNS: YEAR ONE

Heather Renner[1] (heather_renner@fws.gov), Megan Boldenow[2], Robin Corcoran[3], Robert Kaler[2], Michael Goldstein[4], Donald Lyons[5], Trent McDonald[6], Elizabeth Moore[2], Susan Oehlers[7], Martin Renner[8], Anne Schaefer[9]

[1]Alaska Maritime National Wildlife Refuge, Homer, USA. [2]U.S. Fish and Wildlife Service, Anchorage, USA. [3]Kodiak National Wildlife Refuge, Kodiak, USA. [4]U.S. Forest Service, Seattle, USA. [5]National Audubon Society, Bremen, USA. [6]McDonald Data Sciences, Lander, USA. [7]U.S. Forest Service, Yakutat, USA. [8]Tern Again Consultingg, Homer, USA. [9]Prince William Sound Science Center, Cordova, USA

The Aleutian tern (Onychoprion aleuticus) is a rare migratory seabird that nests along subarctic coastlines of Alaska and Eastern Russia. Steep declines of Aleutian terns have been observed at known colonies in Alaska. However, uncertainties remain on the total population and importance of currently unknown colonies. Here, we report on year one of a three-year, Alaska-wide survey designed to obtain a statistically robust breeding population estimate. We conducted two-stage surveys, aerial followed by ground, of tern nesting colonies in southeast Alaska from Gustavus to Cordova AK. We identified nesting colonies using fixed-wing aerial double-observer line transect methods. We flew approximately 500m inland from the coast at an altitude of 500 feet, and covered the entire coastline of the study area. We estimated a resource selection function from known current and historic colony locations and used it to guide surveys between 1 and 6 km inland. We returned ground-based observers to a sample of identified colonies to obtain colony size and species composition, because accurate colony size and identification of Aleutian and Arctic terns is difficult from the fixed-wing aircraft. Surveys for the remainder of the Alaskan coastline are planned for 2024 and 2025.

FROM MONTHS TO MINUTES: REAL-TIME BIOSECURITY MONITORING FOR SEABIRD CONSERVATION USING WIRELESS CAMERA TRAPS & AI

Nathaniel Rindlaub[1], Nick Holmes[2], Lara Brenner (lara.brenner@tnc.org)[3], Juliana Matos[3], Sue Pollock[4], Scott Meyler[3], Falk Schuetzenmeister[5]

[1]The Nature Conservancy, Los Angeles, USA. [2]The Nature Conservancy, Santa Cruz, USA. [3]The Nature Conservancy, Ventura, USA. [4]The Nature Conservancy, San Francsico, USA. [5]The Nature Conservancy, San Francisco, USA

Biosecurity, defined as a set of actions to prevent, detect, and rapidly respond to the introduction of invasive species, is crucial to the conservation of fragile seabird communities in island ecosystems. For years, The Nature Conservancy used strategically positioned wildlife cameras on Santa Cruz Island, CA to monitor for potential invasive vertebrate introductions (primarily, rats, raccoons, and cats) that could devastate breeding seabird communities in the Channel Islands. Due to the difficulty of accessing these cameras, data were only retrieved and reviewed on a quarterly basis: ample time for an invasive species to establish a population before we became aware of it. To reduce the risk of an invasive introduction occurring, we replaced SD-card-based wildlife cameras with a mesh network of wireless, solar-powered cameras that have the capacity to transmit images and communicate with one another via low-frequency radio. This new network of interconnected cameras routes images as they are taken to a central base station on the island, which uploads the data to the cloud for processing via a machine learning pipeline. Our system was recently deployed on Nonsuch Island for surveillance of rat incursions in highly endangered cahow (Bermuda petrel) breeding habitat, and for monitoring breaches along predator and ungulate exclusion fences in Hawaii. This combination of wireless wildlife cameras and cloud-based artificial intelligence is a major step towards fully automated invasive species monitoring and effectively reduces the data lag time–and the risk associated with it–from months down to minutes.

ESTIMATING THE NUMBER OF BREEDING PAIRS OF WEDGE-TAILED SHEARWATERS (ARDENNA PACIFICA) IN MAUI NUI BASED ON OCCUPANCY RATES

Mariah Rivera (riverams@hawaii.edu), Jennifer Learned, Martin Frye, Skye Anderson, Cheryl King, Joshua DeCambra, Jay Penniman

Maui Nui Seabird Recovery Project, Pāʻia, USA

The wedge-tailed shearwater (Ardenna pacifica, ʻuaʻu kani) is an abundant seabird that can be found in tropical and subtropical waters around the world. In the Hawaiian Islands, the ʻuaʻu kani is an indigenous and protected seabird. However, this species faces a number of threats due to human disturbance. The populations of wedge-tailed shearwaters in Hawaiʻi have experienced vast fluctuations in size due to these threats. The Maui Nui Seabird Recovery Project monitors and protects ʻuaʻu kani throughout Maui Nui. Here we estimate breeding pairs of ʻuaʻu kani for all of Maui Nui (Maui, Molokai, and Lānaʻi). In 2021, using burrow counts and occupancy rates calculated for three colonies, we estimated at least 3,000 ʻuaʻu kani breeding pairs on the island of Maui. We used the average occupancy rate from Maui (66%) and corresponding burrow counts for Molokai and Lānaʻi to calculate breeding pair estimates for these other islands. In 2022, we replicated our methods for collecting burrow counts and conducting occupancy surveys on the islet of Molokini. We applied the average occupancy rate for Molokini (56%) to other offshore islets within Maui Nui. We combined the pair estimates from the islands and offshore islets to calculate a breeding pair estimate for Maui Nui. Burrow counts from Maui Nui colonies were compared to counts of Oahu-based colonies. Continuing to use this methodology while protecting and monitoring ʻuaʻu kani is crucial for maintaining the presence of this indigenous species in the Hawaiian Archipelago.

HIGH PATHOGENICITY AVIAN INFLUENZA IN SOUTH AFRICAN SEABIRDS: LESSONS LEARNT FROM RESPONSE EFFORTS AND EPIDEMIOLOGICAL OBSERVATIONS

Laura Roberts[1,2,3] (laura.roberts@westerncape.gov.za), Celia Abolnik[1], David Roberts[4], Albert Snyman[4], Katrin Ludynia[4,5], Darrell Abernethy[6,3]

[1]Department of Production Animal Studies, Faculty of Veterinary Science, University of Pretoria, Pretoria, South Africa. [2]Department of Agriculture, Western Cape Government, Elsenburg, South Africa. [3]Centre for Veterinary Wildlife Research, Faculty of Veterinary Science, University of Pretoria, Pretoria, South Africa. [4]Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), Cape Town, South Africa. [5]Department of Biodiversity and Conservation Biology, University of the Western Cape, Bellville, South Africa. [6]Aberystwyth School of Veterinary Science, Department of Life Sciences, Aberystwyth University, Aberystwyth, United Kingdom

High pathogenicity avian influenza (HPAI) has killed at least 30 000 South African coastal birds, after the introduction of two different clade 2.3.4.4b viruses in 2018 and 2021. At least 1000 endangered African Penguins have been affected by these viruses, along with thousands of other seabirds in southern Africa and elsewhere around the globe. Despite international interest, there are few effective and feasible mitigation measures available.

South Africa was among the first countries to respond to mass die-offs of seabirds and formed new networks and partnerships, while accumulating some valuable lessons. A contingency plan was compiled with wide stakeholder input, and a mobile, web-based application was launched to aid in the collection of disease data.

The epidemiology of HPAI in seabirds is poorly understood, which hinders innovation in outbreak response. HPAI in African Penguins was further investigated through a cross-sectional survey across the breeding range and in penguins admitted to a rehabilitation centre.

Vaccination against HPAI is a potential option but fully effective vaccines are not yet available and suitable formulations and protocols for seabirds are unexplored. A trial in captive African Penguins compared antibody response to a conventional inactivated whole virus vaccine with the response to a plant-produced H5 hemagglutinin based virus-like particle vaccine.

Disease response in wild animals is always challenging and HPAI has raised new hurdles as an emerging conservation threat. We will share our experiences and lessons learnt, in the hope that others may build on them and that we can collectively tackle this conservation threat.

ASSESSING THE IMPACTS OF PREDATION AND PREY AVAILABILITY ON NESTING CALIFORNIA LEAST TERNS IN CENTRAL CALIFORNIA

Dan Robinette (drobinette@pointblue.org), Emily Rice, Nadav Nur, Jaime Jahncke

Point Blue Conservation Science, Petaluma, CA, USA

The California least tern (*Sternula antillarum browni*) is a colonial seabird listed as state and federally endangered due to loss of breeding habitat throughout its breeding range. As with many endangered seabirds, management efforts have focused on reducing predator impacts on nests and adults and little attention has been given to incorporating local prey availability into management decisions. Here, we investigate the extent to which predation and prey availability determine annual least tern reproductive success to better inform and guide management throughout the species' range. We used 23 years (2001-2023) of data on annual reproductive success, adult colony attendance, diet composition, and predation rates to investigate the impacts of predation and prey availability on annual reproductive success. We found that annual variability in diet composition explained much of the variability in reproductive success while annual predation rates explained less of the variability in reproductive success. Reproductive success was highest when northern anchovy (*Engraulis mordax*) and/or rockfish (*Sebastes spp*.) dominated the diet and lowest when species richness in the diet was high. High species richness occurred during poor oceanographic conditions, indicating that the terns were spending more time foraging to find alternative prey. Furthermore, adult colony attendance was lower in years with high species richness in the diet, potentially impacting the effectiveness of adult terns in mobbing and chasing away predators. Our results suggest that local prey availability can impact the benefits of predator management and that local oceanographic conditions should be considered when establishing expectations for annual reproductive success.

INCIDENTAL MORTALITY OF GUANO BIRDS IN PERUVIAN PURSE SEINE FISHERY TARGETING ANCHOVY

Cynthia Romero (cyromero@imarpe.gob.pe), Gersson Roman, María Meza, Javier Quiñones

Instituto del Mar del Perú, Lima, Peru

The Humboldt Current Upwelling System (HCUS) has a high biological productivity being its key species the Peruvian anchovy which is the main prey of guano birds (Guanay cormoran, Peruvian booby and Peruvian pelican). In this scenario, the Peruvian Purse Seine fishery targeting anchovy, is considered the most productive fishery in terms of catch numbers worldwide. Since 1997, the Peruvian Marine Fisheries Institute (IMARPE) has been operating a long-term observer program on board that covers 2% of their fleet. However, since 2007, secondary capture of top predators and incidental mortality data have started to be recorded. Our analysis of records from 2007 to 2019 revealed from the purse seine hauls had incidental mortality of guano birds, 57% was Peruvian booby, followed by Guanay cormorant with 36.7% and Peruvian pelican with 6.7%. The majority of these Incidental mortality events took place during months when the El Niño Costero Index (ENCI) showed positive temperature anomalies. The increase in incidental captures and their related mortality rates could be influenced by local oceanographic conditions, in which the narrow productive area of cold waters are closer to shore and consequently to produce an overlap between foraging areas of guano birds and fisheries areas.

STRONG REDUCTION OF PERUVIAN PELICAN (*PELECANUS THAGUS*) POPULATION IN PERU BY THE HIGHLY PATHOGENIC AVIAN INFLUENZA VIRUSES (HPAIVS) H1N5 AND ITS CONSERVATION IMPLICATIONS.

Cynthia Romero[1] (cyromero@imarpe.gob.pe), María Meza[1], Liliana Ayala[2], Rodrigo Mena[3]

[1]Instituto del Mar del Perú, Lima, Peru. [2]Asociacion Peruana para la Conservación de la Naturaleza (APECO), Lima, Peru. [3]Museo de Historia Natural de la Universidad Nacional San Agustín (MUSA), Arequipa, Peru

The Peruvian pelican (*Pelecanus thagus*) is categorized as near threatened species International Union for Conservation of Nature. The Peruvian population of this pelican represents more than the 50% of the world population. The Highly Pathogenic Avian Influenza Viruses (HPAIVs) H1N5 arrived to Peru at fourth of November of 2022 with first detection in pelicans died from Los Cangrejos beach (-5.146030; -81.171992) and during the spread of the virus many groups of dead animals were observed. We analyzed data of census of Peruvian population which is monthly done by Institute for the Agricultural and Rural Development (AGRORURAL) in the breeding islands previous to the spread, and the mortality numbers recorded in whole Peruvian coast reported by National Service for Animal Health (SENASA) and Peruvian National Forest and Wildlife Service (SERFOR) and in their breeding islands by AGRORURAL. Pelican population from the last reproductive period was 92 784 individuals and the number of individuals in the previous month to arrive the virus was 85 941 individuals. The mortality records were 76 831 individuals with 72% from the coast and 10.7% from the islands. In reference of the total individuals of last breeding season in progress only 10.6% individuals would remain, and 17.1% of the total individuals of last breeding season concluded. It would mean a reduction of more than 80% population. Finally, this has led to propose this specie to be included the appendix I and II of CMS and design new ways to protect it of their threatens.

SPATIO-TEMPORAL DISTRIBUTION OF HORNBY'S STORM PETREL (*HYDROBATES HORNBYI*) (GRAY, 1854) IN PERU

Cynthia Romero (cyromero@imarpe.gob.pe)

Instituto del Mar del Perú, Lima, Peru

Storm petrels are the least known marine species in Peru, maybe because of their oceanic habits. Hornby's storm petrel, endemic of The Humboldt Current Upwelling System (HCUS), is relatively common in Peruvian sea and many of them are found stranded in city streets every year. We analyzed sightings recorded by seabird observers from scientific cruise to assess hidrobiological resources of the Peruvian Marine Fisheries Institute (IMARPE) to find patterns in its sea distribution and the standings, which is related to the end of the reproductive season. We found a dynamic of expansion and retraction of its distribution which could be related to the breeding season. Furthermore, we recognized an appreciable aggregation of individuals in the central-south coast of Peru that appears to be related to the possible breeding areas. Records from scientific cruises is a source of information to identify the spatio-temporal distributions of the species.

UPDATED STATUS OF RED FOOTED BOOBIES IN MAUI NUI

Sophia Rooney (srooney@alumni.scu.edu), Alex Calma, Jennifer Learned, Martin Frye, Mariah Rivera, Joshua DeCambra, Jay Penniman

Maui Nui Seabird Recovery Project, Pā'ia, USA

Red-footed boobies (Sula sula) breed on most islands within the Hawaiian archipelago. As the most common booby species found in Hawai'i, red-footed boobies have been documented in Papahānoumokuākea Marine National Monument in the northwest Hawaiian islands, and the on the islands of Kaua'i and O'ahu, including off-shore islets Moku Mana and Lehua. The first documentation of red-footed boobies on Maui was not until January 2018 at Pauwalu Point in east Maui. Since the first documentations at Pauwalu Point, Maui Nui Seabird Recovery Project staff have continued to monitor the colony. Pauwalu Point provides excellent red-footed booby habitat due to its high cliffs and tree concentrations ideal for nesting. Using drone cameras and counting software, breeding pair estimates were 445 pairs in 2019, 732 pairs in 2020, and 823 pairs in 2023. Imagery review and comparisons reveal a shift and expansion in the area occupied by the birds. Since 2021, red-footed boobies have been observed roosting in increasing numbers on Molokini, an islet off the coast of Maui. The sudden establishment and rapid increase in the number of these seabirds across Maui suggests that birds are being forced out of previous habitats to find a new home elsewhere, possibly due to sea level rise, human interference, and other threats. On-going monitoring and documentation of the red-footed boobies in Maui Nui is important for continued advocacy and understanding of seabird populations. As climate change persists and sea levels rise, it is imperative to protect seabird habitats like that of Pauwalu Point.

PUFFIN MIGRATORY CONNECTIVITY IN THE NORTHWEST ATLANTIC

Emily Runnells[1] (emily.runnells@umanitoba.ca), Mark Baran[2], Heather Major[3], April Hedd[4], Raphael Lavoie[5], Dave Fifield[4], Tony Diamond[3], Gail Davoren[1]

[1]University of Manitoba, Winnipeg, MB, Canada. [2]SUNY Plattsburgh, Plattsburgh, NY, USA. [3]University of New Brunswick, St. John, NB, Canada. [4]Environment and Climate Change Canada, Mount Pearl, NL, Canada. [5]Environment and Climate Change Canada, Quebec, QC, Canada

Seabird migratory movements can result in spatiotemporal overlap among individuals from multiple breeding colonies during the non-breeding period, raising the possibility that certain areas of the ocean are important to a large part of the population. For many alcids, migration tends towards a gradual, continuous pattern, likely proscribed by their high energetic cost of flight. Atlantic Puffins (Fratercula arctica) have been documented covering long distances during migration and exhibiting high inter-individual variability in movement patterns, which could lead to overlapping space use among individuals from distant breeding areas. Our aim was to determine the migratory connectivity of Atlantic Puffins from different northwest Atlantic colonies throughout the non-breeding period. Individual migration patterns were derived from light-level geolocators deployed in 2017-2021 on puffins from four distinct breeding areas: New Brunswick (Machias Seal Island, n = 25), the Gulf of St. Lawrence (Mingan Archipelago, n = 9), Southeastern Newfoundland (Witless Bay, n = 16), and Northeastern Newfoundland (James Island, n = 14). Daily non-breeding locations were estimated with 'ProbGLS', and migratory connectivity of all four colonies was quantified during each month using Mantel correlation. The migratory connectivity among the four colonies was moderate but varied seasonally. Specifically, spatial overlap among all colonies increased later in the non-breeding season, when individuals have traveled to key winter foraging locations, such as the Gulf of Maine. This insight into the movement patterns and migratory connectivity of these long-lived birds allows accurate definition of management units and helps elucidate the population impacts of marine spatial planning efforts.

CHANGES IN SEABIRD COMMUNITIES WITHIN WEST COAST NATIONAL MARINE SANCTUARIES SINCE THE 1980'S

Tammy Russell[1] (tmrussel@ucsd.edu), Jaime Jahncke[2], Maria Vernet[1], Lisa Ballance[3]

[1]Scripps Institution of Oceanography, La Jolla, USA. [2]Point Blue Conservation Science, Petaluma, USA. [3]Oregon State University, Hatfield Marine Science Center, Newport, USA

Climate change is altering the distribution and abundance of marine organisms. The California Current Ecosystem (CCE) has experienced increased water temperatures, climatic variability, and marine heatwaves due to anthropogenic climate change. This increased variability is likely to influence the distributions of predator abundance and diversity through direct and indirect impacts to their prey. Understanding how the avian predator community has changed can inform us about the underlying food web and how the structure of the ecosystem is changing in relation to the environment. Due to the dynamic nature of the CCE, testing overall trends and environmental relationships can be difficult across the entire ecosystem, whereas the placement of U.S. west coast National Marine Sanctuaries (NMS) provides smaller-scale areas with distinct boundaries within each biogeographic region (i.e., North, Central, and South) of the CCE. Previous research has found that west coast NMSs had similar patterns of seabird relative abundance and community composition as nearshore habitat within their corresponding biogeographic regions, therefore, the NMSs provide smaller subunits along the latitudinal gradient of the CCE to test for temporal trends. Here, we use an extensive compilation of at-sea seabird data derived from 21 different survey programs to investigate how seabird relative abundance and community composition have changed overtime (1980-2018) and in association with environmental conditions within NMSs. Although most NMSs have experienced declines in seabird abundance, the trends in abundance and communities are variable across time and among regions, with different environmental drivers for different species and functional groups.

PROPOSED SEABIRD SURVEYS WITHIN OLYMPIC COAST NATIONAL MARINE SANCTUARY

Tammy Russell[1] (tmrussel@ucsd.edu), Andrew Micks[2], Jenny Waddell[2]

[1]Scripps Institution of Oceanography, La Jolla, USA. [2]Olympic Coast National Marine Sanctuary, Port Angeles, USA

Within Olympic Coast National Marine Sanctuary (OCNMS), there is limited spatial and temporal coverage of seabird surveys, although recent research found higher seabird density and diversity within OCNMS compared to west coast biogeographic regions and National Marine Sanctuaries. Currently, seabird data collected within OCNMS are mostly from nearshore surveys conducted by Washington DFW and NOAA Ecosystem surveys that are conducted every few years and include offshore areas. However, monitoring data should be collected more frequently and over the broader region (i.e. offshore) than what is collected currently. In addition to the ecological importance of seabirds in OCNMS, seabirds can also serve as ecosystem indicators, as they are the most visible component of the marine food web, and their distributions reveals underlying food web spatial patterns and indicates prey availability. With the addition of the R/V Storm Petrel and the sanctuary's expanded at-sea research capabilities, the timing is right to develop a long-term seabird monitoring program within OCNMS. This study evaluated all available historical, OCNMS data to identify what regions and seasons would be most efficient to capture the diverse habitats and seabird communities, and therefore most impactful for seabird monitoring. We also evaluated existing seabird survey methods, data-logging software, and considered the resources available to OCNMS to develop a survey plan. We conducted two dedicated surveys (May and September 2023), along with additional opportunistic survey days. This presentation will provide an overview of the survey design and proposed plan for implementing a long-term seabird survey program for the OCNMS.

DO MORE WITH LESS: IMPROVING THE EFFICENCY OF SEABIRD ATTENDANCE MONITORING ON ST. GEORGE ISLAND

Matthew Rustand[1] (matthew_rustand@fws.gov), Jared Laufenberg[2]

[1]USFWS-AMNWR, Homer, USA. [2]USFWS, Anchorage, USA

Of 50 million seabirds that nest in Alaska, 80% nest on the Alaska Maritime National Wildlife Refuge. The refuge monitors numerous seabird colonies along the coast of Alaska. Seabirds are used as indicators of change in the marine ecosystem, and data from a monitoring program can be used to better understand changes in the marine ecosystem. Population monitoring is one line of evidence used in assessing seabird status by identifying trends in abundance on fixed index plots through time. This general protocol is conducted at many sites across Alaska with the goal of detecting a 20% change in attending adults between years. On St. George Island in the SE Bering Sea, population monitoring of cliff nesting seabirds has been conducted since 1976. The current methodology is labor intensive and logistically challenging. A five-person crew counts six species of seabirds on 54 plots located around the island. To obtain the desired statistical power, a minimum of five replicate counts is needed during the count window, from the middle of egg laying to first fledging. However, environmental factors (e.g., wind, fog, marine mammals) complicate the success of this effort. We evaluate the existing protocol used on St. George Island by analyzing the number and locations of plots, plot size, and count frequency among years to meet or exceed our needs for power to detect change. We recommend protocol modifications to increase survey frequency and reduce survey effort, while maintaining continuity with legacy data.

IDENTIFYING PREDATOR-FACILITATED FORAGING BEHAVIOR IN TROPICAL SEABIRDS USING GPS DATA IN A CORRELATED RANDOM WALK MODEL, VALIDATED WITH VIDEO AND ACCELEROMETRY

Abigail Schiffmiller[1] (awschiffmiller@alaska.edu), Greg Breed[1], Sara Maxwell[2], Scott Shaffer[3], Hillary Young[4], Michael Johns[5]

[1]University of Alaska Fairbanks, Faribanks, USA. [2]University of Washington Bothell, Seattle, USA. [3]San Jose State University, San Jose, USA. [4]University of California Santa Barbara, Santa Barbara, USA. [5]Point Blue Consevation Science, Petaluma, USA

Many seabirds engage in 'facilitated foraging' whereby marine predators (such as tuna) trap aggregations of small fish against the ocean's surface, increasing their accessibility to foraging birds. Evaluating the importance of this foraging strategy to seabird populations is key to understanding how changes in pelagic marine predator populations (tuna, dolphins, billfish etc.) may be linked to seabird population dynamics. Direct observation is not often possible, and wide ranging, free-living species are often only observable via biotelemetry, making detecting and understanding foraging strategies difficult. To address this, we deployed combinations of biologging devices including GPS, animal borne cameras, and accelerometers on 60 red-footed boobies (Sula sula) in the central Pacific breeding at Palmyra Atoll.

To analyze these data, we have developed a preliminary dynamic-parameter behavior-discriminating correlated random walk (CRW) model, fit in Stan with Bayesian HMC methods, that identifies movement patterns associated with predator-facilitated foraging from the GPS data. Matching camera and accelerometry data, along with remotely observed environmental data will be used to estimate 'activity-specific' energy expenditures, and to validate and refine the preliminary CRW models, which will then be used to analyzed GPS data collected as far back as 2007 from the same population. Preliminary video annotation has positively identified facilitated foraging in 30% of clear 30-minute videos from the recorded portions of 9 of the 13 trips processed to date. It has also identified ordinary foraging, and confirmed prey capture events, as well as revealing pelagic predator species, prey type, and seabird species and behaviors in foraging aggregations.

MONITORING GROWTH OF COMMON MURRES FROM WILD EGGS RAISED IN CAPTIVITY

Jenna Schlener[1] (jennas@alaskasealife.org), Tuula Hollmen[1,2], Kristen Steinmetzer[1], Aidan Lee[1], Matthew Smith[3]

[1]Alaska SeaLife Center, Seward, USA. [2]University of Alaska Fairbanks, Fairbanks, USA. [3]USGS, Anchorage, USA

In 2021, common murre (*Uria aalge*) eggs (n = 50) were collected from nesting colonies in Cook Inlet, Alaska to raise as a research flock at the Alaska SeaLife Center. Pelican cases were configured with foam slots and temperature and humidity monitors for safe transportation of the eggs at 99.5°F and 60-90% humidity. Upon hatch at the center, chicks were transferred to a brooder, followed by a move to a larger breeding tote, and introduced to a shallow pool under supervision at approximately day 14. Depending on individual behavior and stability of body mass, at around day 20 chicks were transferred to outdoor enclosures with a pool. Chicks were fed silversides, capelin, and herring 3-6 times daily depending on age and body mass, targeting a 10% daily body mass gain for the first 14 days. To characterize food consumption and chick growth patterns, the number and weight of fish consumed were recorded as well as pre-feeding and post-feeding chick body mass. Chicks were weighed at each feeding for the first two weeks. Once chicks transitioned outdoors, weights were only recorded once daily until approximately day 99. Culmen and tarsus measurements were recorded every three days until day 60. The mass growth curve appears to have a sigmoidal shape, with an initial increase, then a plateau around day 15-20, and another increase until approximately day 90 when birds had reached their adult body mass. Growth patterns among females and males were similar, including mass at hatch and at 90 days.

PARALYTIC SHELLFISH TOXIN (SAXITOXIN) IN MARINE FOOD WEBS ACROSS ALASKA AND ASSOCIATION WITH SEABIRD DIE-OFFS

Sarah Schoen[1] (sschoen@usgs.gov), Mayumi Arimitsu[2], Naomi Bargmann[1], Matthew Smith[1], John Piatt[1]

[1]U.S. Geological Survey, Anchorage, USA. [2]U.S. Geological Survey, Juneau, USA

Seabird die-offs occurred throughout Alaska with unusual frequency and intensity during 2015-2019 coincident with abnormally warm ocean temperatures, raising concerns about possible harmful algal bloom (HAB) involvement. We investigated the role of saxitoxin, a potent neurotoxin produced by the dinoflagellate Alexandrium catenella, in recent Alaskan seabird die-offs by analyzing marine food web samples (mussels, plankton, forage fish, birds) collected during 2015-2022, when seabird die-offs occurred across a range of saxitoxin concentrations. We also synthesized published data from Alaskan seabird die-offs suspected to be caused by saxitoxicosis and from a saxitoxin dosing study. Saxitoxin was detected during all sampling events, indicating it is widespread across Alaskan marine ecosystems. The rate of saxitoxin detection in birds was about four times greater, and saxitoxin concentrations throughout the food web were higher, during saxitoxin mortality events than during die-offs attributed to other causes or in live birds. The highest saxitoxin concentrations were in mussels followed by Pacific sand lance. The bird tissues with the highest concentrations were feces, gastrointestinal tracts, and livers. Saxitoxicosis was rarely identified as the cause of death in seabird die-offs, and blooms didn't always result in seabird mortality, suggesting that seabirds may have mechanisms for evading or buffering toxicity. However, such mechanisms may not be effective when saxitoxin levels are elevated in the environment at the same time that prey abundance and/or quality are reduced. HABs are forecasted to increase concurrently with increasing ocean temperatures, underscoring the importance of monitoring saxitoxin as a cause or contributor to seabird die-offs.

IMPROVING DISTANCE SAMPLING METHODS FOR BIRDS IN FLIGHT

Michael Schrimpf[1] (mbs295@cornell.edu), Alison Johnston[2], Wesley Hochachka[1]

[1]Cornell Lab of Ornithology, Ithaca, NY, USA. [2]University of St. Andrews, St. Andrews, United Kingdom

Line- and strip-transect methods are regularly used to measure density of birds at sea and are generally effective at accounting for the effect of distance on detection. The movement of organisms introduces bias, however, and has limited the use of these methods for birds in flight. Past work by others has demonstrated how the speed and direction of a bird's relative motion can be used to correct for such bias in a strip-transect that assumes equal detection probability within a given area, however combining that approach with a distance-based detection function presents many challenges. In particular, birds predominantly traveling in one direction, as may occur near colonies or in response to prevailing winds, can severely distort the relative abundance observed in different distance bands. We used simulations to study the combined effects of both limited detection and consistent bird motion and have developed a method to simultaneously correct for both. We demonstrate its usefulness on a dataset from the Southern Ocean, where birds are most often observed in flight and conditions often limit detection distance. This method may be more efficient at collecting data on less numerous species that are more likely to be missed by the method of 'snapshot' counts conducted alongside line- or strip-transects in many survey protocols.

ACCOUNTING FOR MULTIPLE SOURCES OF UNCERTAINTY WHEN ESTIMATING REPRODUCTIVE SUCCESS OF ENDANGERED HAWAIIAN PETRELS (ʻUAʻU, *PTERODROMA SANDWICHENSIS*) ON LĀNAʻI

Justin Schuetz[1] (justinschuetz@gmail.com), Rachel Sprague[2], Jonathan Sprague[2], Grazel Caceres[2], Christina Pisani[2], John Deslippe[2]

[1]JGS Projects, Bath, USA. [2]Pūlama Lānaʻi, Lānaʻi, USA

Effective management and recovery planning for Hawaiian Petrels depends on understanding how and why reproductive success varies through space and time. Quantifying Hawaiian Petrel reproductive success presents significant challenges, however. Hawaiian Petrels inhabit rugged terrain in remote areas of the Main Hawaiian Islands, which complicates the logistics of sampling breeding populations. In addition, many Hawaiian Petrel burrows are too deep to allow direct inspection of nest contents, which sometimes precludes detection of breeding activities. Here, we use a state-space model to characterize multiple dimensions of Hawaiian Petrel reproduction on the island of Lānaʻi from 2019-2022 while accounting for uncertainties arising from the sampling process and a partially observable breeding process. We estimate probabilities of burrows transitioning across each of five stages (i.e., available → visited by adult → egg present → chick present → fledgling produced) and the influence of covariates on transitions. Hawaiian Petrels preferentially visited and laid eggs in burrows at lower elevations. Laying, hatching, and fledging probabilities were higher at burrows located in habitats dominated by uluhe ferns (*Dicranopteris linearis*). Random site effects accounted for little spatial variation in reproductive success beyond that explained by elevation and uluhe effects. Estimates of young fledged per egg ranged from 0.75 to 0.85 across years and appeared correlated with ocean temperatures. By developing an extensible framework for analyzing Hawaiian Petrel breeding activity that accommodates different sources of uncertainty, we hope to better understand the effectiveness of ongoing management activities and identify additional factors that may be amenable to management.

VARIED BREEDING RESPONSES OF SEABIRDS TO A REGIME SHIFT IN PREY BASE IN THE GULF OF MAINE

Lauren Scopel[1] (scopella@illinois.edu), Antony Diamond[2], Stephen Kress[3], Paula Shannon[4]

[1]Illinois Natural History Survey, Champaign, USA. [2]University of New Brunswick, Fredericton, Canada. [3]Cornell University, Ithaca, USA. [4]National Audubon Society Seabird Institute, Bremen, USA

Forage fish are keystone species in many marine ecosystems. The Junk Food Hypothesis proposes that high-lipid prey should produce better reproductive performance by seabirds. In the Gulf of Maine, changes in the forage fish community followed rapid warming post-2005 and included a decline in high-lipid Atlantic herring *Clupea harengus*. We studied three auk species (Atlantic Puffin *Fratercula arctica*, Razorbill *Alca torda*, Common Murre *Uria aalge*) over 23 years at three colonies to assess changes in chick diet and its relationships with reproductive success. Puffin and razorbill chick diet changed over time; puffin diet was highly variable taxonomically, whereas razorbill diets were more consistent, showing proportional changes within fewer taxa. For puffins and razorbills, herring was replaced by sand lance *Ammodytes* spp. and other taxa with lower energy density. Puffins did not require high-lipid fish to breed successfully, but diet–reproduction relationships became unpredictable following extremely warm winters (2013 and 2016). Razorbills and murres provisioning with low-lipid fish showed reduced chick condition and breeding success. We concluded that razorbills and murres need higher-quality diets than puffins, which more frequently exploited lower-lipid food during food shortages. However, puffin reproductive output was much more vulnerable to ocean warming owing to their longer breeding season. Different responses of closely-related species to changes in prey are driven by differences in chick-development strategies with clear implications for using seabirds as environmental indicators.

BIRD DIVERSITY, THREATS, AND CONSERVATION PLAN IN NORTHERN LAKES, EGYPT

Basma Sheta (basmasheta@du.edu.eg)

Zoology Department, Faculty of Science, Damietta University, New Damietta, Egypt

Human threats in migratory flyway areas are increasing at an accelerated pace: increased population in remote areas due to tourism development; infrastructure development such as high voltage electric lines, wind farms, and sewage and solid waste treatment centers that attract migrant birds. During the last decades, the lakes were exposed to pollutants from industrial, domestic, and agricultural sources. Pollutants have severely impacted the lake and threatened the Mediterranean Sea and birds inhabiting the lake. Northern lakes were suffering habitat fragmentation and extensive land use such as fish farms, fragmentation by dry areas, and housing by local people inside the lakes. Now after the national project of Northern lakes, the consequent lake reviving is expected to change the lake habitats, water quality, and lake topography. Studying these changes and how they affect the bird community is crucial for both resident breeders and migratory birds.

HIGH PACIFIC DECADAL OSCILLATION INDEX IS ASSOCIATED WITH POOR FORAGING CONDITIONS OF RHINOCEROS AUKLETS ACROSS THEIR ANNUAL CYCLE.

Ui Shimabukuro[1] (shimabukuro.ui@gmail.com), Akinori Takahashi[2,3], Jean-Baptiste Thiebot[4], Alexis Will[5], Yasuaki Niizuma[6], Yutaka Watanuki[4], Alexander S. Kitaysky[5]

[1]Meiji Institute for Advanced Study of Mathematical Sciences, Nakano, Japan. [2]The Graduate University for Advanced Studies, SOKENDAI, Tachikawa, Japan. [3]National Institute of Polar Research, Tachikawa, Japan. [4]Hokkaido University, Hakodate, Japan. [5]University of Alaska Fairbanks, Fairbanks, USA. [6]Meijo University, Nagoya, Japan

Understanding the mechanisms of how climate variability affects the physiological condition of seabirds throughout their annual cycle is essential to predicting their population dynamics. Our previous study showed that a high Pacific Decadal Oscillation (PDO) index was related to poor foraging conditions, as reflected in high corticosterone levels, of breeding rhinoceros auklets Cerorhinca monocerata. During the non-breeding period, auklets migrate over 1000 km from the colony and may be able to find areas with favorable foraging conditions. In this study on Teuri Island, Japan, we measured nitrogen stable isotope signatures (δ15N) and corticosterone levels in primary and breast feathers, representing trophic levels and nutritional status of auklets in the August–September and January–February periods of 2014–2019. We used bird-borne geolocators to estimate the daily locations of migrating auklets. We also examined annual changes in telomere length as a proxy for long-term molecular damage. We found that a high PDO index was associated with high corticosterone levels in primary and breast feathers. High corticosterone in primary feathers was related to the maximum distances individuals traveled from the colony in the autumn and winter periods. Maximum migratory distances in autumn were negatively associated with δ15N in breast feathers, which correlated to changes in telomere length - birds that foraged on lower trophic level prey incurred higher molecular damage. These results indicate that food shortages, associated with a high PDO index, extend into the non-breeding period. Rhinoceros auklets incur short- and long-term physiological costs due to climate-mediated poor foraging conditions.

DEVELOPMENT OF A COMMUNITY ART PROJECT TO BUILD AWARENESS OF PLASTIC POLLUTION

Oxana Sistla (oxanasistla@gmail.com)

TH-Bingen, Tokeland, USA

The idea of my community art originated during my visit to Big Island, HI where I accidentally found a flotsam of brand new plastic caps on the beach. I couldn't sleep for weeks afterward researching the why's and how's and what's. Anger was my initial motivation: 'How can we allow seabirds to consume plastic?' Anger doesn't build bridges and doesn't answer questions, but creativity does. I decided to channel my positive creative energy instead and involve my community to bring awareness. And it worked. With the help of several unnamed plastic caps collectors from my beloved Pacific County and Rita from Lebam, I got enough free material to highlight the majestic albatross. Karen from the local newspaper published my letter to the public. Managers of Pioneer Grocery provided me with the place for the collection box. Christine and volunteers at the PCHS museum in South Bend, WA welcomed my community art piece with cheer. She didn't stop after. She looked into the issue herself and created the webpage. And now my art piece has become educational. Juliet from PSG allowed me to submit our community effort to showcase. I'm so grateful to all of them. The lesson that I learned is that not only my imagination can run free as a bird, but my community can give me wings for it to fly. I think what is done by people, can be solved by people and nature will inspire us all for good deeds.

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ĀINA OLA O HIʻI: FENCE CONSTRUCTION AND PREDATOR REMOVAL IN HAWAIʻI'S LARGEST MONTANE PREDATOR-EXCLUSION AREA ON THE ISLAND OF LĀNAʻI

Rachel Sprague (rsprague@pulamalanai.com), John Deslippe

Pūlama Lānaʻi, Lānaʻi City, USA

Predator-exclusion fences have been wildly successful in creating "islands within islands" to bring back life and health for species affected by non-native terrestrial predators in New Zealand and Hawaiʻi. New Zealand has 50+ fences protecting more than 24,000 acres and 12 fences have been built in Hawaiʻi to date. Hawaiʻi's fences are mostly on coastal peninsulas, other lowland areas, or small (<10 acre) montane fences focused on social attraction of endangered seabirds. We created a new 82 acre predator-exclusion area in the montane mesic forest on Lānaʻi, protecting an important nesting concentration of endangered ʻuaʻu (Hawaiian petrel, Pterodroma sandwichensis) where this species was once considered to be extirpated. Predator and ungulate removal is well underway, with feral cats (Felis catus) removed, all but one axis deer (Axis axis) removed, and invasive rats (Rattus rattus, R. exulans, and R. norvegicus) targeted by an aerial application of rodenticide – the first use of this technique inside a predator-exclusion fence in the United States. With construction completed and confirmation of rodent eradication pending, the area is currently one of the largest fully-enclosed predator-exclusion fences outside of New Zealand and the largest montane predator-exclusion area in Hawaiʻi. We discuss challenges that took construction nearly 4 years from an original estimate of 18 months, as well as important considerations in planning, implementation, and monitoring. The work of restoration has now begun, with habitat management planning, fence maintenance and erosion control, predator monitoring and response planning, and monitoring of target species such as ʻuaʻu to evaluate response.

NON-BREEDING ECOLOGIES OF TUFTED AND HORNED PUFFINS (*FRATERCULA CIRRHATA, F. CORNICULATA*) FROM THE KODIAK ARCHIPELAGO, ALASKA

Katelyn Stoner[1] (stonerk@oregonstate.edu), Robin Corcoran[2], Megan Boldenow[3], Don Lyons[1,4]

[1]Oregon State University, Corvallis, USA. [2]U.S. Fish and Wildlife Service, Kodiak National Wildlife Refuge, Kodiak, USA. [3]U.S. Fish and Wildlife Service, Southern Alaska Fish and Wildlife Conservation Office, Anchorage, USA. [4]National Audubon Society, Bremen, USA

Tufted and Horned Puffins (*Fratercula cirrhata, F. corniculata*) are of conservation concern due to declining populations within their breeding range. However, uncertainty remains regarding the scale of and mechanisms for these declines. Conservation and management efforts are currently limited by lack of data for puffin complete annual cycles. To better understand puffin movements and habitat use during the non-breeding season, we deployed archival geolocation light-sensing (gls) tracking devices on both species in the Kodiak Archipelago, Alaska during the 2022 breeding season. During summer 2023, we retrieved 15 from Tufted and 3 from Horned Puffins. We present preliminary results from tracking data collected during the non-breeding season that represent year-one of a three-year study. Next steps include pairing ecological data on non- breeding distributions with isotopic diets and measurements of corticosterone deposition in winter-grown feathers. Results will allow us to assess non-breeding conditions experienced by individuals from known breeding and wintering locations. Species-specific information on Fratercula puffin non-breeding resource use and response to environmental variability is crucial for identifying and targeting management decisions and actions.

FACTORS DRIVING ASSORTATIVE MATING BASED ON SEABIRD PERSONALITY: INSIGHTS FROM BEHAVIORAL SYNDROME BETWEEN THE PERSONALITY AND FORAGING BEHAVIOR

Wataru Takeda (henryw.t1105@gmail.com), Yusuke Goto, Ken Yoda

Nagoya University, Nagoya, Japan

Personality refers to consistent behavioral differences among individuals. Previous studies have suggested that monogamous seabirds may exhibit assortative mating based on personality, which is crucial for successful breeding. However, the factors that maintain such mating patterns remain unclear. Personality is sometimes linked to foraging behavior; for instance, there exists a correlation between personality and foraging site. Thus, assortative mating based on personality may result in mating with individuals exhibiting similar foraging behavior, although no studies have explored this hypothesis. Our study aims to elucidate the factors leading to assortative mating based on personality by focusing on the correlation between personality and foraging behavior. We investigated the relationship between personality and foraging behavior, along with behavioral similarities within pairs for streaked shearwaters Calonectris leucomelas. Firstly, boldness was quantified by novel object test. We then gathered foraging route data by equipping the birds with GPS loggers. Utilizing this data, we calculated individual foraging site fidelity (IFSF). IFSF is the consistency of foraging sites they used. Finally, we examined the relationship between personality and IFSF within a pair. Our findings revealed that individuals tended to mate with partners possessing similar personality. Additionally, bolder individuals tended to have lower IFSF. As indirectly indicated by these two results, IFSF was also similar within pairs. Combined with evidence from previous studies, which have shown that the similarity in foraging behavior within mating pairs positively impacts reproductive success. Therefore, assortative mating based on personality might be beneficial for mating pair as it leads to similarity in IFSF.

TWO NOVEL APPROACHES GENERATE INSIGHT INTO SEABIRD INTERACTIONS WITH PLANNED FLOATING OFFSHORE WIND FACILITIES ALONG THE U.S. WEST COAST

Scott Terrill (sterrill@harveyecology.com)[1], Stephanie Schneider[1], Sophie Bernstein[2], Sharon Kramer[2], David Ainley[1], Shari Matzner[3]

[1]H. T. Harvey & Associates, Los Gatos, USA. [2]H. T. Harvey & Associates, Arcata, USA. [3]Pacific Northwest National Laboratory, Sequim, USA

Many Pacific seabirds are of conservation concern due to numerous anthropogenic factors such as habitat loss and degradation, predation by non-native and invasive species, fisheries interactions, and alteration of the food web due to fishing and climate change. How future floating offshore wind facilities along the US West Coast will impact seabirds remains unknown. We present two approaches to help evaluate potential impacts from offshore wind turbines on both broad and site-specific scales: 1) a novel framework developed to assess tradeoffs between energy generation and seabird collision vulnerability on large spatial scales, and 2) observations generated by a novel stereo-vision thermal imager, the ThermalTracker-3D (TT3D), capable of remotely recording site-specific bird flight trajectories. The framework expands on traditional assessments of the distribution and abundance of seabird communities by incorporating their vertical (3D) space-use via an analysis of an extensive flight height dataset. The TT3D was developed and deployed on a wind-profiling LiDAR buoy in the Humboldt Wind Energy Lease Area 25 miles off the coast from 24 May through 13 August 2021 and successfully tracked seabird movements from 10 to 500 m above the sea surface and around the clock. These approaches directly promote conservation by enhancing understanding of the seabird community present at different heights relative to the ocean's surface and, as such, are important for assessing vulnerability to overlap with rotor swept zones and assessing the potential for collisions.

TESTING FOR SYNCHRONY IN TEMPORAL CHANGES IN SEABIRD PREY USE ACROSS NORTHERN HEMISPHERE ECOSYSTEMS

Sarah Ann Thompson (sathompson@farralloninstitute.org), Helen Killeen, William Sydeman, Brian Hoover, Erendira Ceballos, Trond Kristiansen, Gammon Koval, Marisol Garcia-Reyes

Farallon Institute, Petaluma, USA

Rates of environmental change vary between ecosystems with differing consequences for ecological communities, including forage fish. Top predators such as seabirds are both critical to marine ecosystem structure and function, and are considered excellent near-real time sentinels of changes in pelagic food webs. In particular, examination of changes in seabird diets may reveal effects of environmental change. Using a recently compiled data set on seabird prey use (diet composition), we examine temporal trends and geographic variability in prey use to address if changes in patterns of prey use by seabirds in the Northern Hemisphere were synchronous over past decades. We compared compositional changes for time series (n = 27; data at least through 2018) of chick diet from 14 piscivorous seabird species at 18 sites representing different marine ecosystems. Sand lances were the only prey group with substantial data from both the northern Atlantic and Pacific oceans. Patterns of change in diet composition were highly variable, with both long-term declines and increase in use of various forage fish species. Preliminary results indicate little synchrony between ecosystems in patterns of prey use.

A GUIDE FOR RESPONDING TO MORTALITY IN SEABIRDS CAUSED BY HIGHLY PATHOGENIC AVIAN INFLUENZA

Trevor Thompson[1] (trevor.thompson@ec.gc.ca), Michael Brown[1], Émilie Bouchard[1], Carina Gjerdrum[2], Robert Ronconi[2], Chris Sharp[3], Hannah Lewis[3], Stephanie Avery-Gomm[4], Jolene Giacinti[5], Cynthia Pekarik[1]

[1]Wildlife Management and Regulatory Affairs Division, Canadian Wildlife Service, Environment and Climate Change Canada - Government of Canada, Gatineau, Québec, Canada. [2]Atlantic Region Wildlife and Habitat Assessment Section, Canadian Wildlife Service, Environment and Climate Change Canada - Government of Canada, Dartmouth, Nova Scotia, Canada. [3]Ontario Region Wildlife and Habitat Assessment Section, Canadian Wildlife Service, Environment and Climate Change Canada - Government of Canada, Ottawa, Ontario, Canada. [4]Wildlife Research Division, Science and Technology Branch, Environment and Climate Change Canada - Government of Canada, Saint John, New Brunswick, Canada. [5]Ecotoxicology and Wildlife Health Division, Science and Technology Branch, Environment and Climate Change Canada - Government of Canada, Ottawa, Ontario, Canada

The outbreak and evolution of highly pathogenic avian influenza (HPAI) H5Nx clade 2.3.4.4b viruses has caused mass mortalities in seabirds around the world, including multiple species on Atlantic and Pacific coasts (e.g., northern gannet, common murre, Caspian tern). Mounting a response to mass mortality events caused by HPAI is a complex and often multi-sectoral issue that requires coordination across agencies. An effective response is critical as these events can be severe enough to cause population-level impacts in affected seabirds, may pose public safety risks, and can impact local economies. Those jurisdictions that have experienced mass mortality events have produced guidance, best practices, and policy to improve future responses, and, in some cases, for use as public resources. The breadth of guidance for response to mass mortality events is extensive and addresses themes across the One Health spectrum. Drawing from the experience in Canada, we outline and summarize guidance, advice, and recommendations related to occupational health and safety, disease diagnostics, biosecurity, carcass disposal, data collection and management, migratory bird permit holders, wildlife rehabilitation facilities, and the public and hunting communities, that can inform response. We also present a case study of response to mass mortality of roseate and common terns in Nova Scotia, Canada, in 2023, that provides an example of the application of the guidance, advice and recommendations.

BRIDGING SEABIRDS AND MARINE ECOSYSTEM RESEARCH IN ALASKA: RECENT EXAMPLES AND FUTURE APPROACHES

James Thorson[1] (james.thorson@noaa.gov), Mayumi Arimitsu[2], John Piatt[3], Elizabeth Siddon[4]

[1]National Oceanic and Atmospheric Administration Alaska Fisheries Science Center, Seattle, WA, USA. [2]U.S. Geological Survey Alaska Science Center, Juneau, AK, USA. [3]U.S. Geological Survey Alaska Science Center, Anchorage, AK, USA. [4]National Oceanic and Atmospheric Administration Alaska Fisheries Science Center, Juneau, AK, USA

Rapid developments in statistical modelling provide new avenues to understand species interactions in communities and ecosystems. In this talk, we outline three recent examples and two future ideas to bridge between seabird and marine-ecosystem research. We first highlight regression models for stomach contents, which were used to identify decadal-scale prey switching by tufted puffins in Middleton Island. Second, we review how joint spatio-temporal models can identify changes in spatial overlap, including recent analysis of how cold-pool extent structures predator-prey-fishery overlap in the Bering Sea. Third, we introduce dynamic structural equation models, which were recently used to analyze linkages among seabirds and other ecosystem components in the Bering Sea Ecosystem Status Report. We then pivot to quickly review two approaches that have been applied recently to fishes and also seem relevant to seabirds. The first would involve applying phylogenetic comparative methods to better understand how seabird traits contribute to vulnerability (e.g., frequency of die-offs). The second would involve mechanistic modelling of seabird movement to estimate habitat preferences from tagging and at-sea monitoring data. Through these five examples, we hope to highlight new statistical analyses that could connect seabird studies and ecosystem-based fisheries management.

AN UPDATE ON THE DEVELOPMENT OF MACHINE LEARNING TOOLS FOR PRECISION WATERBIRD MONITORING

Anna Vallery[1] (anna_vallery@fws.gov), Krish Kabra[2], Richard Gibbons[3], Arko Barman[4]

[1]USFWS, Honolulu, USA. [2]Rice University, Houton, USA. [3]Audubon Texas, Houston, USA. [4]Rice University, Houston, USA

Monitoring nesting sites is a common technique for tracking population trends of waterbirds, though censusing these sites requires considerable effort and risk. Traditional colony monitoring has included traversing the colony on foot, surveying via boat, or surveying aerially in manned aircraft. Each of these methods has tradeoffs that include time commitment, data quality, bird disturbance, and risks to biologists. Small Unmanned Aerial Systems (sUAS) are now widely available and have become a useful tool in wildlife research. When applied to waterbird studies, the use of sUAS was found to result in more precise count estimates than traditional, ground surveys. Manually counting and digitizing the large image sets, however, is a time-consuming task. To reduce the time needed to generate counts from sUAS imagery, we developed a deep-learning tool that can be applied to the photos to precisely, accurately, and efficiently count and digitize multi-species waterbird colonies. Through continued training and development, these machine-learning algorithms can locate and identify over 16 classes of waterbirds nesting together on islands along the Texas coast using convolutional neural network-based object detectors. Here we compare three bird count methods from surveys of Chester Island; counts derived from on-the-ground surveys, counts from manual digitization of sUAS photos, and counts developed using this deep-learning tool. This work will help us understand how this newly available tool can compare to traditional survey methods and demonstrates how the use of sUAS-collected imagery and deep learning can improve the accuracy of monitoring events, while reducing processing time and colony disturbance.

STATUS OF SOCIAL ATTRACTION AND TRANSLOCATION OF 4 SEABIRD SPECIES ON O‘AHU, HAWAI‘I

Eric VanderWerf[1], Robby Kohley[1], Erika Dittmar[1] (erika@pacificrimconservation.org), Leilani Fowlke[2], Kelly Goodale[3]

[1]Pacific Rim Conservation, Honolulu, USA. [2]San Diego Zoo Wildlife Alliance, Rota, Northern Mariana Islands. [3]USFWS, Kahuku, USA

To mitigate the loss of seabird habitat in the Northwestern Hawaiian Islands, we conducted social attraction and translocation of four seabird species at James Campbell National Wildlife Refuge on O‘ahu: Black-footed (BFAL) and Laysan albatrosses (LAAL), Bonin petrel (BOPE), and Tristram’s storm-petrel (TRSP). From 2015-2021, we translocated LAAL eggs from the Pacific Missile Range Facility on Kauai, BFAL and BOPE chicks from Midway Atoll, and TRSP chicks from Tern Island. In conjunction with translocation, we deployed decoys and broadcast sound recordings for each of the four species. We successfully fledged 47/50 LAAL, 96/102 BFAL, 246/249 BOPE, and 122/152 TRSP chicks. All four translocated species have returned to the refuge. We have socially attracted over 290 LAAL and have observed 20 translocated LAAL return to the refuge. Socially attracted LAAL began nesting in 2017, and in 2023 there were 9 LAAL nests. Since 2022, we have resighted 17 translocated and 2 socially attracted BFAL. We expect BFAL to start nesting as soon as 2024. The first translocated BOPE returned in 2019, only 6 months after the first cohort of chicks fledged. We have resighted at least 55 translocated BOPE and in 2023 we had 19 BOPE nests at the refuge. We have resighted at least 14 translocated TRSP, with the first nest in 2022, and 5 nests in 2023. We continue to monitor the successful return and nesting of these translocated individuals as the new seabird colony grows at James Campbell National Wildlife Refuge.

DISPERSAL, RANGE EXPANSION AND COLONIZATION BY SEABIRDS

Richard Veit (rrveit23@gmail.com), Lisa Manne

CUNY College of Staten Island, Staten Island, USA

Conventional understanding of migration cannot explain dramatic population expansions and instances of very long distance dispersal that have occurred in seabirds, including Northern Fulmars (Fulmarus glacialis), Laysan Albatrosses (Phoebastria immutabilis), Manx Shearwaters (Puffinus puffinus), Gentoo Penguins (Pygoscelis papua), Brown Boobies (Sula leucogaster), Elegant Terns (Thalasseus elegans) and several species of gulls including especially Lesser Black-backed Gulls (Larus fuscus). We propose that what is conventionally called "migration" can be better characterized as repeated instances of exploratory behavior. The similarity of or dissimilarity tracks followed year after year depends on the stability, or lack thereof, of the environment. Thus, what are often referred to as "vagrant" birds are actually not behaviorally different from other birds, nor have they made navigational mistakes, but they have encountered different conditions. These conditions may include density dependence from a growing population or scarcity of resources due to external factors. We tested these ideas by placing satellite-tracked ARGOS transmitters on 15 Lesser Black-backed Gulls of varying age classes at Nantucket, Massachusetts and asked whether their movement behavior was consistent with the process of exploration. We concluded that the rather erratic, back and forth action of these birds was consistent with our Hypothesis of exploration, and continued movement of the type we observed could lead to the dramatic expansion of their range that has been observed.

CLIMATE CHANGE IMPACTS ON BREEDING PHENOLOGY OF AN ENDANGERED SEABIRD

Nacho Vilchis[1] (ivilchis@sdzwa.org), Rachel Smith[1], Justin Schuetz[2]

[1]San Diego Zoo Wildlife Alliance, San Diego, California, USA. [2]JGS Projects, Bath, Maine, USA

Matching egg laying with optimal food availability offers seabirds the best return on their reproductive investment, as fledgling success depends on hatch date synchronization with fish availability. Increased environmental variability however, can cause spring blooms to be less predictable resulting in mismatch between fledge food requirements and prey availability. Thus, understanding how climate change impacts breeding phenology is paramount for seabird conservation, particularly for endangered species. Here, we use Southern California nesting data to investigate how and why California least tern lay dates varied from 2009-2023. We characterized lay date distribution using Bayesian non-parametric mixture models by breeding colony and year. We assumed the mean lay date within the largest mixture component from each model represented the consensus bird response to breeding conditions for that year. Then we performed climate window analyses to identify spatial and temporal windows during which sea surface temperatures and surface chlorophyll concentrations might have influenced lay dates. We detected long lag effects (> 48 months) in which cool sea surface temperatures and high chlorophyll concentrations were associated with earlier lay day dates, potentially because those conditions boosted fish recruitment that cued terns to breed early. We also detected a series of shorter lag effects (~0, 12, 24, and 36 months) in which high chlorophyll concentrations were associated with later lay dates. We speculate that later breeding occurs in these cases because high chlorophyll concentrations may also favor survival and recruitment of young and inexperienced birds to the breeding population, thus pushing back mean lay date.

TO BREED OR NOT TO BREED: PATTERNS OF SKIPPED BREEDING AND REPRODUCTIVE SUCCESS IN MAGELLANIC PENGUINS (*SPHENISCUS MAGELLANICUS*)

Eric Wagner (elwagner@uw.edu), P. Dee Boersma

University of Washington, Seattle, USA

Skipped breeding is a well-known phenomenon in seabirds. Using a 35-year dataset from a declining colony of Magellanic penguins (*Spheniscus magellanicus*) with a male-biased sex ratio, we looked at how skipped breeding rates relate to lifetime reproductive success and marine conditions. On average, 16% of penguins skipped breeding every year. Females and males were equally likely to skip, but with sex-specific drivers. Female skipping rates correlated with marine conditions during the non-breeding season: females were more likely to skip in years with poor conditions, while males showed no relationship. Instead, male skipping rates correlated with the previous year's breeding outcomes: males were more likely to skip if a nesting attempt had failed at the egg or chick stage than if they had fledged a chick, but female skipping rates did not show a strong relationship with breeding outcome. The long-term outcomes of skipping also differed by sex. Females that skipped at least once during their lifetime had more mates, laid more eggs, and fledged more chicks than females that never skipped. Conversely, males that skipped at least once did not have different lifetime reproductive outcomes than males that never skipped. As climate change results in less favorable marine conditions, a propensity to skip could have significant demographic consequences at a declining colony.

FEATHER CORTICOSTERONE INFERS DIFFERING FORAGING RESPONSES BY TWO PERUVIAN SEABIRDS TO INTERANNUAL ENVIRONMENTAL VARIATION

Sara Wang[1] (swang67@lsu.edu), Isabella Díaz-Santibañez[2], Diego Gonzales-DelCarpio[2], Cinthia Irigoin-Lovera[2], Christine Lattin[1], Michael Polito[1]

[1]Louisiana State University, Baton Rouge, USA. [2]Universidad Científica del Sur, Lima, Peru

The Humboldt Current System (HCS) is one of the world's most productive oceanic regions. While it sustains high biomasses of the forage fish anchoveta (Engraulis ringens), it also experiences high interannual variability in environmental conditions due to El Niño Southern Oscillation (ENSO). Endemic seabirds such as the Guanay cormorant (Leucocarbo bougainvillii) and Peruvian booby (Sula variegata) must respond to these fluctuations in food availability and subsequent changes in energetic demand. Energy expenditure is regulated by corticosterone (Cort), a hormone that promotes foraging behavior and feeding, shown in seabirds to be an indirect measure of food availability and/or foraging effort. We examined feather Cort in Guanay cormorants and Peruvian boobies to evaluate food availability and/or foraging effort in multiple years with different ENSO conditions. Preliminary analysis indicates that these species differ in their responses to varying environmental conditions. While levels of feather Cort in boobies varied between years, it did not in cormorants. In addition, Cort concentrations differed between the two, indicating that baseline levels are species-dependent. Boobies may be more sensitive to the influence of ENSO on foraging conditions, potentially due to their greater reliance on anchoveta, shallower diving depths, and/or reproductive flexibility in raising large broods of chicks during years of greater food availability. As the use of corticosterone as a biomarker is highly context-dependent, both across species and systems, this study will next compare feather stable isotope values and Cort to better evaluate their use as predictors of foraging effort in HCS seabirds.

SHOREBIRDS PLASTIC INGESTION: A MULTISPECIES ANALYSIS OF INGESTION RATES AND FEEDING ECOLOGY.

Brian Wijaya[1] (bwij901@aucklanduni.ac.nz), Anne Gaskett[1], Phil Battley[2]

[1]University of Auckland, Auckland, New Zealand. [2]Massey University, Palmerston North, New Zealand

Plastic has been shown to cause negative impact on wildlife. From habitat degradation due to its presence in the natural environment, physical harm such as through entanglement when wildlife interacts with it and its potential to cause blockage or toxin accumulation when mistakenly ingested. Many studies regarding plastic ingestion were done on seabirds and sea-turtles which mainly focus on plastic in marine habitat. Shorebirds, also known as waders in New Zealand, are birds in the order Charadriiformes characterized by their long leg and live in open habitat such as beach, mudflat, farm paddock and grassland. Some shorebird species had been recorded to ingest plastic but the study regarding this topic is scarce compared to other animal group like seabirds. My study focuses on six common species of shorebird in New Zealand which are: variable oystercatcher (*Haematopus unicolor*), South Island pied oystercatcher (*Haematopus finschi*), bar-tailed godwit (*Limosa lapponica*), red knot (*Calidris canutus*), pied stilt (*Himantopus himantopus*), and wrybill (*Anarhynchus frontalis*). I look into and take measurement of their morphological and sensory feature and did dissection on shorebird cadaver to find out whether any of these features affects the plastic ingestion rate. I also measured the amount of plastic in the environment and comparing it to the shorebirds' faecal samples from the same area. I found that shorebird species in New Zealand do ingest plastic and my finding suggest that the rates of plastic ingestion do correlate to their sensory ecology but not with the amount found in the environment.

AT-SEA VOCAL BEHAVIOR OF COMMON MURRES (*URIA AALGE*)

Katrina Wilcox (katrina.wilcox@umanitoba.ca), Gail Davoren

University of Manitoba, Winnipeg, Canada

In animal communication systems, evolutionary theory predicts that acoustic signals have evolved for producers and/or receivers to maximize their fitness. Seabirds often form dense aggregations to forage on patchily distributed prey, and acoustic signals may assist in finding patches and managing conspecific interactions within aggregations. Unfortunately, seabird vocal behavior has been predominantly studied at breeding colonies, although they spend most of their time at sea. We aimed to create an at-sea vocal repertoire of common murres during July-August, 2022-2023. We recorded ~18 hours of calls from a small boat using a handheld parabolic microphone and recorder at persistent foraging areas on the northeast coast of Newfoundland, Canada, and recorded behavior when vocalizing. During an aural/visual (A/V) survey of spectrograms, over 1500 calls were assigned a call type based on qualitative comparisons to previously described colony-based thick-billed murre calls or was assigned a new call type. Acoustic variables (e.g., duration, peak frequency) were measured on high-quality calls (i.e., signal to noise ratio > 20dB above ambient noise) and a supervised multivariate classification analysis (random forest) was used to discern whether call types were discrete or graded. The A/V survey revealed four call types ('eng', 'crow', 'eur', 'arg'), with two previously undescribed. These four call types varied from discrete to graded, with 'crow' call types highly variable across acoustic parameters. Findings provide an at-sea acoustic repertoire of common murres, allowing playback experiments to elucidate call function and passive acoustic monitoring of murre presence to inform marine spatial management decisions.

INVESTIGATION OF BARN OWL DIET AND PREDATION ON SEABIRDS ON KAUA'I

Anne Wiley[1], Alex Dutcher[2] (adutcher@hallux-eco.com), Taylor Wilcox[3], Joanna Elmore[3], Andre Raine[4], Kyle Pias[2]

[1]Bowie State University, Bowie, MD, USA. [2]Hallux Ecosystem Restoration, Kaua'i, HI, USA. [3]USDA National Genomics Center for Wildlife and Fish Conservation, Missoula, MT, USA. [4]Archipelago Research and Conservation, Hanapepe, HI, USA

Kaua'i is home to many native species of seabird, namely the federally endangered 'ua'u (Hawaiian Petrel, *Pterodroma sanwichenses*) and the federally threatened 'a'o (Newell's Shearwater, *Puffinus newelli*). In the remaining 'ua'u and 'a'o colonies on Kaua'i, predator control is essential, preventing the decline of both species locally. Barn Owls (*Tyto alba*), introduced in the 1970's, depredate both adults and chicks within remnant colonies and predator-proof fences, however evidence of owl kills is uncommon. Despite the urgent need, little is known about Barn Owl diet and subsequent impact on 'ua'u and 'a'o. Between 2017 and 2022 Barn Owls were lethally removed within and around seabird colonies on Kaua'i and each owl was necropsied to collect morphometric data and prey items. Prevalence of seabird in Barn Owl diet was investigated utilizing stable isotope analysis and eDNA micro-barcoding of cloacal and esophagus swabs. Investigation of morphological features and isotopic data resulted in a strong relationship between low wing loading values and probability of seabird in diet. Results of eDNA analysis show depredation of multiple seabird species, and a potentially disproportionate consumption of 'a'o, a less agile flyer than 'ua'u and other available seabird prey. In antithesis of past hypotheses our data show that the unexpected foraging behavior of Barn Owls in combination with large foraging ranges highlight the specific vulnerability of 'a'o to owl depredation. Results emphasize a need for Barn Owl control beyond seabird colonies on a landscape-wide scale, and further research in owl behavior.

HABITAT ENHANCEMENT AND SITE SELECTION OF CALIFORNIA LEAST TERNS

Kristina Wolf (kwolf@sdzwa.org), Rachel Smith, Ron Swaisgood, Taylor Garner, Elena Oey, Nacho Vilchis

SDZWA, San Diego, USA

Loss of quality nesting habitat is a limiting factor in California least tern (Sternula anitllarum browni) recovery. One key management tool is to provide materials promoting camouflage and cover. California least terns are known to select open nesting areas (~5% vegetation cover), but preferentially place their nests near vegetation or woody debris within these open areas. Here we used oyster shells to evaluate their use in improving nesting habitat and reducing depredation in a San Diego colony at Naval Base Coronado. We placed oyster shells in a systematic manner, pairing control and treatment plots at two sites. We found that within these paired plots, least terns preferred to place their nests in treatment plots rather than controls, supporting our hypothesis that shells promote camouflage and cover for nesting least terns Further research and development into habitat management tools can assist land managers in improving nesting habitat to aid in the recovery of this endangered seabird.

CHARACTERISTICS OF ACTIVE MARBLED MURRELET NEST SITES IN OREGON

Ethan Woodis[1] (ethan.woodis@oregonstate.edu), James Rivers[2], S. Kim Nelson[3], Daniel Roby[3], Matthew Betts[1]

[1]Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR, USA. [2]Department of Forest Engineering, Resources and Management, Oregon State University, Corvallis, OR, USA. [3]Department of Fisheries, Wildlife, and Conservation Sciences, Oregon State University, Corvallis, OR, USA

Understanding habitat characteristics that influence nest-site selection is crucial for the conservation of threatened and endangered bird species. As part of a large-scale study of Marbled Murrelet (Brachyramphus marmoratus) breeding ecology, we located active nests and quantified characteristics of nest sites, as such data are limited. To do this, we affixed VHF radio tags to murrelets at sea off the central Oregon coast during the summers of 2017-2019, 2021 and 2022 and tracked birds to their nest sites. After the breeding season, we collected measurements using ground-based vegetation surveys and tree climbing methods. Active nests were found 3-34 km inland in large trees (mean height = 62.1 m; mean diameter at breast height = 141.5 cm) containing multiple large platforms (mean = 57.7 platforms; mean platform diameter = 29.9 cm) in stands with high canopy closure (mean canopy closure = 75.5%). The majority (n = 16) of nest trees contained defects ranging from storm damage to burls and canker-like growths to reiterations and broken tops. Such deformations along with large branches provide platforms on which to incubate eggs and care for chicks while also concealing the nest from predators. Understanding these characteristics improves our knowledge of how murrelets select nest sites and can be used in forest management actions to help conserve this species.

EVALUATING POTENTIAL DISPLACEMENT IMPACTS OF OFFSHORE WIND DEVELOPMENT ON LEACH'S STORM-PETRELS HYDROBATES LEUCORHOUS

Keenan Yakola[1] (keenan.yakola@oregonstate.edu), Don Lyons[1,2]

[1]Oregon State Univeristy, Corvallis, Oregon, USA. [2]National Audubon Seabird Institute, Bremen, ME, USA

In the northwest Atlantic, there is strong evidence that one of the most common breeding seabird species in the region, the Leach's Storm-Petrel (Hydrobates leucorhous), is rapidly declining (Wilhelm et al. 2019). Limited burrow survey data also suggests concerns for populations on the Pacific Coast of North America. While research is underway to investigate these declines, forthcoming offshore wind energy production may soon add another potential threat. Unfortunately, relatively little is known about the movement ecology of this species, especially in the Pacific Northwest, making it difficult for managers to access conservation concerns at sea. In addition, almost nothing is known regarding potential collision, avoidance, or attraction risk of this species to offshore wind development. To better understand potential impacts to storm-petrels, we deployed miniaturized GPS tags on both incubating and chick rearing adults at various breeding colonies in Maine during the summers of 2022 (n=67), and 2023 (n=114), and also Oregon in 2023 (n=12). In order to assess potential displacement of storm-petrels with offshore wind turbine arrays, we considered a variety of development scenarios and modeled impacts to trip distance and duration. With this work we aim assess the potential impacts of displacement to seabird populations and the possible value of "wildlife corridors" through and/or between offshore wind energy projects.

FAMILIARITY AND COMPLEMENTARITY: DIVERGENT CONTRIBUTIONS OF MALE AND FEMALE CASSIN'S AUKLETS TO REPRODUCTIVE OUTCOMES WITH MATE FAMILIARITY

Amy Yanagitsuru[1,2] (amemiles@ucdavis.edu), Christopher Tyson[1,3], Frédéric Angelier[4], Mike Johns[5], Thomas Hahn[1], John Wingfield[1], Haley Land-Miller[5,6], Amanda Spears[5], Rebecca Forney[5,7], Elisha Hull[1]

[1]University of California Davis, Davis, USA. [2]University of Nevada Reno, Reno, USA. [3]Wageningen University & Research, Wageningen, Netherlands. [4]Centre d'Etudes Biologiques de Chizé, CNRS, La Rochelle Université, Villiers en Bois, France. [5]Point Blue Conservation Science, Petaluma, USA. [6]McGill University, Montreal, Canada. [7]Oregon State University, Corvallis, USA

One benefit of perennial monogamy, whereby individuals mate with the same individual year after year, is improved reproductive productivity. This has been observed in a range of perennially monogamous taxa, but the proximate mechanisms are relatively unknown. By exploring nest attendance frequency across a range of mate familiarity in known-age Cassin's auklets, we found different, but complementary roles played by the egg-laying (female) and non-egg-laying (male) sexes and suggest that the benefits of mate familiarity are due to adjustments in these contributions with increased familiarity. Female contributions were mostly to the egg: we found higher egg volumes in females with a familiar mate, regardless of age. This implied an energetic constraint, as her nest attendance post-lay was negatively correlated with body condition. Her attendance did not influence hatching success and was only positively correlated with chick mass when she entered the breeding season in good condition. The contributions of the male were in providing parental care, informed by mate familiarity: male nest attendance was correlated with the attendance of the female in a familiarity-dependent manner, with no effect of age. This has implications for the fate of the nest, as his attendance was a primary determinant of hatching success and was positively correlated with the maximum mass attained by the chick, irrespective of age or body condition. These findings suggest that males and females each contribute differently to their joint reproductive fortunes, and that improvements in their respective roles may result in the benefits of mate familiarity.

HAWAIIAN PETRELS AND NEWELL'S SHEARWATERS ON O'AHU, HAWAI'I

Lindsay Young[1], Eric VanderWerf[1], Erika Dittmar[1] (erika@pacificrimconservation.org), Zoey Gustafson[2], Chris Miller[3]

[1]Pacific Rim Conservation, Honolulu, USA. [2]Conservation Metrics Inc., Santa Cruz, USA. [3]Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife, Pearl City, USA

Hawai'i's only two endemic seabirds, the Newell's Shearwater (NESH) and Hawaiian Petrel (HAPE) are listed as threatened and endangered, respectively, under the Endangered Species Act. Threats to both species include light attraction and fallout, collisions with power lines and other structures, predation by non-native animals, and habitat degradation. Both species were assumed to have been extirpated from O'ahu, despite limited survey effort and fossil evidence indicating that extensive colonies existed post-human contact. Since 2016, we have deployed up to 15 automated acoustic recording units (song meters) annually and have obtained 37,876 recording hours. Additionally, from 2018-2023, we conducted 693 hours of nocturnal auditory surveys. We have detected NESH regularly at eight sites and HAPE at five sites. All sites where we detected seabirds were in nearly intact native forests with steep slopes, similar to areas where these species nest on Kauai. Seabirds were detected on multiple nights throughout the breeding season, sometimes calling up to 25 times in a single night. Evidence suggests that, at a minimum, both species are regularly prospecting on O'ahu, and are likely breeding on the island. If these rare seabirds are breeding on O'ahu, these individuals could represent a missing link in the population connectivity of both species across the main Hawaiian island chain. Protecting any remnant populations would be of high conservation value given their recent catastrophic population declines.

UNPRECEDENTED MORTALITY OF PERUVIAN PELICANS (PELECANUS THAGUS) DURING THE 2022-2023 H5N1 INFLUENZA VIRUS OUTBREAK IN PERU

Carlos Zavalaga[1] (czavalaga@cientifica.edu.pe), Cinthia Irigoin-Lovera[1], Diego Gonzales-DelCarpio[1], Sebastian Lozano-Sanllehi[1], Cristina Burga[2], Lucero Chavez[1], Fernando Mejia-Vargas[3], Jessica Oliden-Garcia[2]

[1]Universidad Cientifica del Sur, Lima, Peru. [2]Agrorural, Lima, Peru. [3]Agrorual, Lima, Peru

On 14 November 2022, the first confirmed case of the highly pathogenic avian influenza A(H5N1) virus was detected in northern Peru from dead wild Peruvian pelicans (Pelacanus thagus). Daily ground counts of carcasses were undertaken by rangers from november 2022 to march 2023 in 30 islands and headlands along the Peruvian coast within a Marine Protected Area (RNSIIPG). Mortality rapidly escalated in the RNSIIPG with a total of 10,404 dead pelicans counted between 3 November 2022 and 28 February 2023. Almost 95% of the impacted pelicans died in a three-week period (Nov-Dec 2022). A latitudinal analysis of dead pelican cases over time revealed that the disease spread from north to south. Ground counts of dead pelicans on beaches and other marine reserves in Peru obtained from governmental official sources (https://www.dge.gob.pe/influenza-aviar-ah5) indicated an extra 29,390 pelican carcasses in the same period. Thus, based on the maximum annual number of pelicans present before the H5N1 outbreak (N = 125,794 birds in August 2022), a minimum mortality rate of 32% is estimated. However, simultaneous aerial drone and ranger ground counts on two islands revealed that in the RNSIIPG ground counts may underestimate reported numbers by a factor from 1.3 to 3.6. This scenario, coupled to a recent strong El Niño, places Peruvian pelicans in a critical condition.

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