

2024 Mariana Islands Conservation Conference Abstracts

Monday, February 26th

Time	Presenter & Affiliation	Co-Authors & Affiliations	Title	Abstract
9:45	Dacia Wiitala, CNMI Division of Fish and Wildlife	Brad Eichelberger, CNMI DFW	Nest success rates for Nosa' Luta and conservation status update	The nosa Luta (Rota white-eye, <i>Zosterops rotensis</i>) is endemic to the island of Rota and was federally listed as endangered in 2004. The CNMI department of fish and wildlife has reached several milestones for delisting the species including setting critical habitat boundaries, establishing a brown tree snake prevention program, and yearly population monitoring which has shown a steady and healthy increase since 2004. Our project aims to carry out research that directly addresses the rest of the USFWS recovery plans objectives in order to move forward with delisting the species. We will conduct a nest success study to identify the primary threats to nosa Luta nest success including the impacts of non-native rats and black drongos. We will produce a model for predicting nesting habitat, enabling targeted habitat conservation and enhancement actions. We will evaluate the relative abundance and density of introduced black drongo and rats within nosa Luta habitat which will enable us to more effectively manage for the introduced nest predators in the future. Most importantly our study is filling key gaps in our knowledge of nosa Luta ecology that will progress us toward achieving recovery plan objectives for the down listing of the species.
10:00	Anne Heitman, Pacific Bird Conservation/Sedgwick County Zoo		Nosa' Luta Husbandry Techniques to Establish Best Practices for Translocation	Pacific Bird Conservation (PBC) has been successfully translocating birds in the Marianas Archipelago since 2008. As an organization created, led, and staffed by animal care experts from several Association of Zoos & Aquariums (AZA) institutions, PBC brings a unique skill set to in situ conservation. AZA professionals are leaders in the fields of zoo animal husbandry and health care. Our ability to hold birds in temporary captivity and complete health screenings ensures that our translocation efforts consist of a robust and viable group of birds. In 2023, PBC began working with Nosa' Luta, or Rota White-eyes (<i>Zosterops rotensis</i>), in preparation for potential future translocations. Using our previously successful Nosa' (Saipan Bridled White-eye, <i>Zosterops saypani</i>) protocols, we brought eleven Nosa' Luta into temporary captivity. The birds were cared for using the same care protocols that had been used for the nosa' but with a few alterations to the diet. Daily weights and food consumption were recorded for each bird to monitor their adjustment to the captive diet. After holding the birds for an average of five days, the birds were released back at the capture site. The observational and weight data acquired during the project will inform husbandry protocols for the Nosa' Luta when future translocation efforts commence.
10:30	Richard Camp, U.S. Geological Survey, Pacific Island Ecosystems Research Center (Virtual - HI)	Paul. M. Radley, CNMI DFW, Saipan; Current address: Center for Conservation Research and Training, Pacific Biosciences Research Center, University of Hawai'i at Mānoa, Honolulu, Hawai'i Frederick A. Amidon, Ann P. Marshall, and Curt Kessler - U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai'i P. Marcos Gorresen, Hawai'i Cooperative Studies Unit, University of Hawai'i at Hilo, Hawai'i National Park, Hawai'i	Status and Conservation Considerations of the Micronesian Megapode (<i>Megapodius laperouse</i>) Across the Mariana Archipelago	Accurate baseline information on wildlife population distribution and abundance is important to track trends of these populations over time and to identify threats to their long-term persistence. Using passive and call playback facilitated surveys in 2008 through 2010, we employed point-transect distance sampling to assess island-level and archipelago-wide status of Micronesian Megapodes (<i>Megapodius laperouse</i>) across the Mariana Islands. Islands surveyed included Aguiuan, Tinian, Saipan, Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Asuncion, and Maug. Surveys on Anatahan were limited to call playback-only counts, while presence/absence surveys were conducted solely on Uraacas. Surveys were not conducted on Farallon de Medinilla for safety reasons, nor on Rota or Guam because of a lack of contemporary evidence a population exists on either island. We examined megapode abundance as a function of human presence and vegetation type and structure. We defined human presence as the occurrence of humans on islands and the alteration and degradation of habitat and/or the presence of feral ungulates and introduced predators. We detected 657 megapodes and estimated an archipelago-wide abundance of 11,542 individuals (95% CI: 5,456—17,623) from 699 sampling points across 10 islands. Three islands, Asuncion, Guguan, and Sarigan, supported 86% of the megapode population, but cumulatively comprise only 2% of the archipelago's land area. Survey results indicate that human presence and availability of suitable habitat may limit the abundance and distribution of megapodes across the Mariana Islands. The probability of detecting megapodes was significantly greater in native forest than either coconut or ironwood forests. Although the probability of detecting megapodes was significantly greater on islands without high human presence, on human occupied islands significantly more megapodes were detected in native forests with dense or closed understory. Additional studies investigating incubation sites and megapode movement on and between islands would provide fundamental information on megapode ecology and enhance conservation efforts. Continued and expanded ungulate removal, predator control, and habitat restoration would also enhance the likelihood of Micronesian Megapode persistence. Ongoing monitoring of megapode populations on each island to detect any concerning declines would support science-based conservation efforts over the long-term.
10:45	Amanda Santos, CNMI Division of Fish and Wildlife		Wildlife Management on Managaha	Mañagaha, a small islet in the Saipan lagoon, hosts one of few known colonies of breeding Wedge-tailed Shearwaters (<i>Puffinus pacificus</i>) in the CNMI. In more recent years it has become home to colonies of black nobby Anous minutus, and the endangered Micronesian megapode <i>Megapodius laperouse</i> . Managaha is a conservation area but also a popular and iconic tourist destination on Saipan. During the covid-19 pandemic Managaha was closed for visitors, and during that time the avian population grew. Currently, Managaha averages 700-800 tourist a day, with efforts from the current concessionaire to increase those numbers. Here we present a case study of the complex relationship between species conservation, habitat management, human interaction, and disturbance from tourism on the islet.
11:00	Amanda Bender, Saint Louis Zoo / Pacific Bird Conservation Partner		Ga'ga Karisu Conservation	Pacific Bird Conservation (PBC) is a collaborative effort of biologists, educators, and zoo professionals that work in partnership with the Commonwealth of the Mariana Islands Division of Fish and Wildlife (CNMI DFW) to conserve and protect endemic bird species of the Marianas. In February of 2024, PBC and DFW will be focusing on work with the Ga'ga Karisu, or Saipan reed warbler. DFW has been working with the species for several years focusing on habitat assessment and telemetry work. This will be the first year that PBC will aid in capture and husbandry techniques in preparation for future conservation work. The Ga'ga Karisu is critically endangered and in need of more data collection and conservation effort. I will be giving a "live" update of the field season of 2024 and what we have learned so far.
11:15	Kaeli Swift, University of Washington	Fletcher Moore and Dr. Beth Gardner-School of Environmental and Forest Science, University of Washington, Seattle, WA	An experimental study of the impacts of invasive rodent and vine removal on artificial Tinian monarch nests	Like other islands in the CNMI, Tinian's ecosystem and endemic species have been heavily influenced by both a loss of natural habitat and the introduction of non-native plants and animals. The Tinian monarch (<i>Monarcha takatsukasae</i>) is an endemic songbird that, while currently de-listed, remains vulnerable to population decline through habitat loss, climate change and invasive species. Previous work has demonstrated that invasive rodents pose the greatest direct threat to Tinian monarch reproductive success, accounting for 45% of all nest failures, and 81% of predation events. Invasive vines threaten to further degrade monarch habitat by suppressing native trees, and by their interactions with invasive rodents. We have previously observed rats on Tinian using vines as both sources of food and connective pathways through the canopy structure. These activities may make monarch nests more vulnerable to predation by increasing arboreal rat activity and access to nest sites. Controlling these two groups of invasives may therefore have important implications for monarch management. In the current ongoing study, we are using artificial nests to evaluate the impact of vine, rat, and combination removal treatments on Tinian monarch nest success across the island's main habitat types: native forest, secondary forest and <i>Leucaena leucocephala</i> forests. Here we will share preliminary findings, report on vine distribution and biomass patterns across study areas, and discuss the utility of Goodnature A24 self-resetting traps for rodent control.

11:30	Jimmy Camacho, TTT; Dacia Wiitala, CNMI DFW; Henry Fandel, CNMI DFW; Rachel Jolley, University of Guam; Haldre Rogers, Virginia Tech & TTT;		Improving Recruitment and Retention in Conservation-Related Jobs in the Marianas	
13:15	Rachel Jolley, University of Guam		Monitoring Forest Recovery Following the Removal of Ungulates	Feral pigs and deer have been a part of Guam's forest systems since they were introduced to the island during the 17th and 18th centuries. As with many other tropical islands, Guam's ecosystems evolved in an environment devoid of large mammals. Thus, plants did not evolve resiliency to grazing and trampling by ungulates as they do in habitats where grazers are part of the natural ecosystem. Research suggests that the feral ungulates have substantially impacted Guam's forest, including the reduction of native seedling survival, spread of disease, damage to root systems, and increased erosion and runoff. Native species recruitment has become further jeopardized in recent decades with the extirpation of forest birds, eliminating most of the island's native seed dispersers. This study compares the forest understory community composition prior to, and three years following, the removal of ungulates within a 33-hectare enclosure of native limestone forest. The goal of this study was to document changes in species composition, mainly species recruitment, with the removal of ungulate disturbances. Three years following ungulate removal, there are fewer non-native and early seral species in the understory community, along with an increase in native and late seral species. Monitoring results suggest that the forest is showing signs of recovery with the absence of ungulate disturbance. This study will provide useful data to land managers regarding forest succession in the absence of feral ungulates.
13:30	Vince Fabian, University of Guam Center for Island Sustainability	Dr. Else Demeulenaere, UOG CIS	Identifying reforestation tactics to help restore Guåhan's limestone forests	Tropical native limestone forests in the Marianas are threatened by invasive flora and fauna. Guåhan, the southernmost island in the archipelago, showcases the effects that severe invasion can have on a functioning ecosystem. Ground disturbance from ungulates, the loss of keystone birds by introduced snakes, and recruitment of non-native trees have drastically altered natural forest dynamics. These threats have the potential to spread to other islands in the Pacific, warranting the need to research restoration management tactics. Prior work has covered passive forest succession in areas following ungulate exclusion as well as sites with remnant bird populations, but currently, little to no work has been done on non-native and native plant interactions. There exists a major gap in techniques and impacts for invasive tree removal and native species outplanting. In this study, we (1) tested mechanical and chemical removal techniques on different size classes of a woody and highly invasive tree <i>Vitex parviflora</i> , (2) evaluated below and above ground planting methods for five native plant species, and (3) observed the changes to forest structure, composition, and environment that resulted from these combined management tactics over 2 years. We found that all our removal techniques resulted in relatively high mortality for all size classes, but herbicidal efficacy seems more dependent on injection technique than concentration. With native outplanting, success is more species dependent than methodology dependent. Lastly, a combination of the above habitat management practices prompt gradual light penetration to the understory, result in negligible damage from falling tree limbs, greatly increase fern density, and show signs of increased native seedling recruitment. In conclusion, we have identified a cost-effective non-destructive removal method for woody invasive trees, started the necessary foundational work to determine optimal methods and species for native flora outplanting in limestone forests, and documented the first two years of forest change of a much longer-term study.
13:45	CJ Paulino, Tåno Tåsi yan Todu	Jimmy T. Camacho, Rachel Prado, Ian Entilla, Zia Crytzer, Tåno Tåsi yan Todu	Monitoring methods for forest restoration in the Marianas	Forests dominated by native species on the island Guåhan are in decline. According to the Guam Forest Action Plan (2020-2030), native forests cover 36% of the island Guåhan. These remaining forests, however, are in a state of decline. Factors such as native frugivore extirpation, non-native ungulates, and invasive plant and arthropod species must be accounted for to slow their decline and increase resilience against external factors such as climate change and encroaching habitat degradation. Restoration activities with adaptive monitoring techniques are needed to protect and restore limestone forests, critical habitat for threatened and endangered species, and CHamoru traditions and cultural practices. However, there are few empirical studies which support limestone forest restoration across the Mariana Islands. Here we discuss forest health monitoring methods utilized in I Hålom Tåno Para I Yo'åmte (The Forest for a Deeper Healing). Specifically, we discuss four primary vegetation monitoring methods, Unmanned Aerial Vehicle (UAV) Surveys, LiDAR Survey, Vegetation Transect Surveys, and Photopoint Surveys and how they support efforts to remove invasive plant and ungulate species and increase native plant diversity and abundance. We intend to share these activities to increase information sharing and foster collaboration among natural resource managers and local stakeholders to better advance forest conservation in the Mariana Islands.
14:30	Lyza Johnston, Johnston Applied Marine Sciences		NGO-Driven Coral Reef Restoration in the Commonwealth of the Northern Mariana Islands: Status and Next Steps	Island communities rely heavily on coral reefs for coastal protection, food, income from fisheries and tourism, and cultural and recreational activities. Unfortunately, the CNMI is among many regions globally that have experienced catastrophic coral die-offs due to unprecedented marine heatwaves over the last ten years. Survey reports indicate that over 65% of coral cover was lost on shallow reefs of Saipan from 2012 to 2018, with some sites losing over 95% of their corals. In response to this decline and dire future climate projections, local and federal resource managers began to prioritize reef restoration efforts that will improve ecosystem and community resilience to climate change. Subsequently, the first ocean-based coral nursery was established in the Saipan lagoon in 2019. This nursery was funded by the National Oceanic and Atmospheric Administration and implemented by Johnston Applied Marine Sciences (JAMS). Since that time, under the continued management of JAMS, the nursery has expanded, new species and propagation techniques have been incorporated, and small-scale restoration has begun. With demonstrated success in pilot efforts, outplanting to degraded reef sites will be scaled-up substantially in the coming year and beyond. Additionally, state-of-the-art technologies will be incorporated to improve the resilience of restored coral communities. This presentation will provide an overview of these efforts to date as well as the next steps.
14:45	Ilan Bubb, Johnston Applied Marine Sciences	Dr. Lyza Johnston-JAMS Dr. Verena Schoepf UoA	Thermal Tolerance Among Nursery <i>Acropora Pulchra</i> Genotypes	The 2013-2017 global bleaching events resulted in over 60% loss of shallow water corals in Saipan. As a response, the Commonwealth of the Northern Mariana Islands (CNMI) environmental management agencies and non-governmental organizations (NGOs) drafted a Coral Restoration Action Plan that called for the development of coral nurseries to facilitate the restoration of reefs impacted by bleaching. Since then, government and NGO nurseries have been established. A key objective of reef restoration is to improve resilience of coral populations to future climate change. Research suggests that individual corals within the same species have a differential potential to acclimate and adapt to warming waters through environmental and genetic mechanisms, often with minimal trade-off effects. As such, to maximize the impact restoration has in the CNMI, nursery corals need to have thermal thresholds tested to determine which genetic individual (i.e., genotypes) are most likely to withstand end of century ocean temperatures. Using the Coral Bleaching Automated Stress System (CBASS) we tested the thermal tolerance of 10 genotypes of <i>Acropora pulchra</i> housed at the ocean-based coral nursery managed by Johnston Applied Marine Sciences. Corals were put through short term stress tests (~18 hrs) at eight different thermal profiles ranging from native summer water temperatures to projected end of century temperatures. Thermal tolerance was measured using visual and photographic analysis of color changes associated with loss of symbiotic dinoflagellates under thermal stress (i.e., bleaching), as well as survival and symbiont count. Thermal tolerance was then compared among genotypes while relationships between thermal tolerance and environmental parameters of the collection sites for each genotype were assessed. Environmental parameters included average summer daily temperature max, daily temperature fluctuation, and proximity to human population centers. Information will be used to guide restoration in the CNMI, including sexual and asexual propagation approaches.

15:00	Mikayla Reuter, University of Guam (virtual - OR)	Héctor Torrado, University of Guam; David Combsch, University of Guam	Using CBASS to Identify Target Species for Coral Restoration on Guam	Staghorn Acropora corals have significant environmental, ecological, and cultural value in the southern Mariana archipelago. Unfortunately, they experienced severe mortality over the past decade, due to a combination of local and global anthropogenic stressors. Regional restoration efforts are focused on staghorn corals to preserve the environmental benefits they provide. Successful coral restoration relies on knowledge of species-specific diversity and resilience to prevent local extinctions and outplant species back to their natural habitats. Species-specific resilience to anthropogenic stressors such as heat tolerance remain understudied in the Southern Marianas Islands. In this study, we address the latter using a Coral Bleaching Automated Stress System (CBASS) to determine species-level differences in heat tolerance. Preliminary results indicate that the most heat-tolerant coral species are <i>A. aspera</i> , <i>A. muricata</i> , and <i>A. teres</i> . <i>Acropora virgata</i> was the least heat tolerant and <i>A. acuminata</i> , <i>A. vaughni</i> , <i>A. austera</i> , and <i>A. pulchra</i> were all mildly heat tolerant. These results give insight into restoration activities, highlighting species that may be better suited for outplanting locations where heat stress is possible. In this talk, I will address the detailed results of this study and address the potential implications for coral restoration and management on Guam.
15:15	Lyza Johnston, Johnston Applied Marine Sciences	Margaret Miller (SECORE International), Aric Bickel (SECORE International), Miles McGonigle (SECORE International)	Development of Novel Settlement Substrates to Improve the Efficiency of Coral Reef Restoration using Sexually Propagated Corals	Supportive breeding of wild corals through assisted fertilization, settlement, and dispersal is a strategy that has the potential to increase the spatial scale of coral reef restoration and improve the resilience and adaptive capacity of restored coral populations. Despite recent advances in large-scale coral larval culturing, outplanting of sexually produced corals remains an inefficient bottleneck. To address this challenge, we developed and conducted initial tests of novel settlement substrates designed to improve the efficiency of outplanting, or seeding, of sexually propagated juvenile corals. These so called "Coral Seed Beads," or CSBs, are made of non-toxic, ceramic material and are much smaller than traditional settlement substrates used in coral restoration, measuring only ~15 mm max length. We anticipate that their smaller size will make them easier to handle and disperse at large spatial scales. CSBs also have microhabitat features such as holes, ridges, and grooves designed to protect settled corals from abrasion during handling and dispersal and from predators and grazers once out on the reef. Three prototype designs were initially produced and tested. To compare larval settlement rates among these designs and a more traditional settlement substrate, we conducted a series of choice assays using larvae of five different species of coral. We found significant variation in settlement as well as short term survival among the substrate types. These results will guide ongoing development of and optimization of the CSBs. While tests are still ongoing, our preliminary results are very promising and we anticipate that CSBs will become an important tool for large-scale coral reef restoration.
15:30	Sydney Madden, Johnston Applied Marine Sciences	Dr. Lyza Johnston, JAMS; Dr. Margaret Miller, SECORE; Aric Bickel, SECORE; Miles McGonigle, SECORE	Reef retention rates of novel coral larval settlement substrates on exposed forereefs of Saipan	Corals are facing many challenges, from rising water temperatures to ocean acidification, that may cause the loss of entire colonies, genotypes, or entire species. To address this challenge, supportive breeding of in-situ (wild) and ex-situ (aquaria) corals has been an important tool in coral restoration that provides an array of potentially resilient and adaptive coral populations. Despite recent advances in large-scale coral larval culturing, outplanting of sexually produced corals remains an inefficient bottleneck. In response, Johnston Applied Marine Sciences (JAMS)-in collaboration with SECORE International-have engineered small (10 mm-15 mm), ceramic "coral seed beads" (CSBs) that sexually propagated coral larvae can settle on and be outplanted on the reef. The idea is that the CSBs will self-stabilize in small holes and other features on the reef without the need of an adhesive, which would greatly increase the efficiency of outplanting. However, their small size might also make them more susceptible to wave processes that would cause them to move over time. To assess retention rates of CSBs on wave-exposed reefs, we established 10 1-meter radial plots at three sites on the forereef of Saipan's western lagoon. In each plot, we outplanted 25 CSBs and monitored them over time. We used structure-from-motion (SfM) photogrammetry to map and track the location of CSBs. Hundreds of pictures were collected of each plot during two timepoints (August and December 2022) and processed in the software Agisoft Metashape to create a 3D model and orthomosaic- one continuous picture of the entire area. Here we will present preliminary results of this study.
4:00:00 PM - 17:30 PM	Poster Session			
	Jun You, Cloie Seo, and Lorna Liban		CNMI Renewable Energy Initiative	Global food waste is an emerging problem that causes sustainability concerns. Despite the devastating consequences, little is known to the community. Statistics have shown that the vast majority are unaware of the importance of proper food waste management, while the major food industry has produced significant amounts of waste, contributing to greenhouse gas emissions. This study analyzed the general knowledge of the public to educate countermeasures for converting food waste into renewable energy.
	Francisco C. Villagomez		Age-based life history of the Mariana Islands' deep-water snapper, <i>Pristipomoides filamentosus</i>	The deep-water snapper <i>Pristipomoides filamentosus</i> , locally known as opakapaka, holds significant commercial importance in the Mariana Islands. Despite its economic importance, the life history parameters crucial for effective species management have remained inadequately defined and unvalidated for Mariana Islands populations. To address this gap, I conducted a comprehensive investigation into the life history of opakapaka in the region. Utilizing bomb radiocarbon (¹⁴ C) dating, I aimed to validate traditional age estimates for opakapaka. Histological methods were employed to determine the sex of the fish, and logistic regression analysis was utilized to explore sex-based differences in length and age at maturity. Fish age was estimated from annuli counts in sagittal otolith transverse sections, with ¹⁴ C-validated otoliths used to confirm visual age estimates. The von Bertalanffy growth function was applied to examine the relationship between age and length, considering potential regional variations between the northern and southern Mariana Islands. The study revealed that males and females of opakapaka reach maturity at 27.6 cm FL and 41.2 cm FL, respectively, with corresponding ages of 2.8 years and 5.0 years. Although no significant differences were observed in growth parameters between males and females, variations were noted between the northern and southern Mariana Islands. Nevertheless, caution was exercised in interpreting these regional differences due to limitations in age and size distributions in the Northern Mariana Islands sample. A unified growth curve for opakapaka in the Mariana Islands was established, with L_{∞} at 54.5 cm and K at 0.201. Maximum ¹⁴ C-validated age and visually estimated age were determined to be 25 years at 61.1 cm FL and 31 years at 65.5 cm FL, respectively. The study affirmed the reliability of visual methods for age estimation, with otolith mass and thickness emerging as dependable predictors of age. This research underscores that opakapaka in the Mariana Islands exhibit slow growth and a moderately long lifespan, aligning with findings from other Pacific life history studies and highlighting regional disparities with Hawaiian populations. The insights garnered from this study have direct implications for the effective fisheries management of opakapaka in the Mariana Islands.

	Alexander Tudela & Kina Rangamar	Dr. Beylul Solomon, Northern Marianas College Dr. Larisa Ford, Texas A&M University Corpus-Christ	Project HOPE: Healthy Oceans & People Empowerment	<p>Project HOPE is an educational collaboration between PSS students, college students, and community elders. Project HOPE is a free ocean science program uniquely tailored to CNMI students' needs, incorporating local elders' ocean expertise into a Western science curriculum. Activities are designed to offer students a tactile learning opportunity geared toward improving their ocean literacy while forming meaningful connections with their community.</p> <p>The Survey-of-Ocean-Literacy-and-Experience instrument was shortened from the original instrument and used as pre- and post-surveys for Project HOPE. From Cohort 1, average scores on the survey for students' post-activities were higher ($M = 15.61$, $SD = 3.18$) than pre-activities ($M = 13.47$, $SD = 2.67$), however, this difference was only marginally significant, $t(23) = -1.96$, $p = .06$. No statistical difference was found between pre- and post-survey results on the average attitudes toward protecting the ocean. For Cohort 2, a paired sample t-test found robust differences for those students' scores; scores pre-survey were 14.45 ($SD = 5.5$) and post-survey were 17.18 ($SD = 4.87$), $t(10) = -2.92$, $p = .02$. On average students' attitudes toward protecting the ocean increased after participation in ocean activities ($M = 3.75$, $SD = 1.03$) versus prior ($M = 3.58$, $SD = .91$); $t(19) = -2.36$, $p = .02$. For Cohort 3 and Cohort 4, paired sample t-tests found no differences in participants' scores in the pre- and post-ocean knowledge survey data. However, for Cohort 4, the participants who completed both the pre-survey ($M = 3.54$, $SD = .88$) and post-survey ($M = 3.65$, $SD = .92$) had more favorable attitudes toward ocean science; $t(19) = -2.09$, $p = .05$.</p> <p>Study limitations included cohort sample sizes that varied, and were relatively small. Also, the lack of significant difference for pre- and post-participation data suggests students may have already had an interest in protecting the ocean. Future projects may find it beneficial to focus on fewer topics rather than covering a wide array of topics to aid with information retention. Inevitably, we hope participants will interact within their households, their extended families, and in community gatherings thereby expanding overall public awareness of ocean conservation practices.</p>
	Mark Terlaje Pangelinan Jr.	Dr. Willson Gaul, Northern Marianas College	Geographic Distribution of Yellow Crazy Ants on Saipan	<p>Anoplolepis gracilipes, commonly known as the Yellow Crazy Ant, is an invasive species and they have been found throughout Saipan. Yellow Crazy Ants are known to drive out native ants and impact other plants and wildlife. Their introduction to the CNMI, intentional or not, was likely a result of human transport. The question I seek to answer is where Yellow Crazy Ants occur on Saipan. This study will produce a map that shows the distribution of Yellow Crazy Ants on the northern half of Saipan.</p>
	Rebecca Krasa		Population and Abundance of Mariana Common Moorhen on the Tinian Military Lease Area	<p>The endangered Mariana Common Moorhen (<i>Gallinula chloropus guami</i>) is an endemic waterbird found in the Commonwealth of the Northern Mariana Islands and Guam with a current population estimated under 400 birds. Historically, Moorhens were found on Saipan, Guam, Tinian, Pagan, and Rota, but have since declined due to habitat loss, degradation of wetlands, and introduced competitors and predators. Effective management of Mariana Common Moorhen populations and habitat is currently hindered by a lack of recent information on population size, distribution, and nest success. A cooperative agreement between the Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife (CNMI DFW) and the Naval Facilities Engineering Systems Command, Marianans (NAVFAC MAR) aims to assess the population and habitat of the endangered Mariana Common Moorhen. This project is continuing long term efforts to monitor the abundance and presence of moorhens on the Tinian Military Lease Area (MLA). Twenty minute point count surveys are conducted quarterly at Lake Hagoi and Bateha Wetlands beginning at dawn. Three surveys at each location were completed in 2023 with 27 moorhens detected on average per quarter, and 6 moorhens total were detected at seasonal Bateha Wetlands in September. The number of moorhens recorded through the year indicates an increase in population size from previous years. Additionally, an increase in detection indicates moorhen recovery or return following the devastation of Super Typhoon Yutu to the island of Tinian in 2018. Detections of moorhen and additional migratory shorebirds, including Black-winged Stilts, Common Sandpipers, and Wood Sandpipers at seasonal wetlands indicates some habitat use when the wetlands are inundated with water.</p>
	Andrew Gumataotao		SoundKnowledge: Listening for Conservation in the Mariana Islands	<p>Indigenous communities have long pointed to onto-epistemologies of earth as "imbued with the power of sacred discourse, the energy of rhythmic movement" (Allen 2020). Voicings situated in relation to emergent ceremonial practices perform complex interactions that extend concepts of listening beyond focusing overtly on the ears when in reality, sound is felt as much as it is heard (McCartney 2012). Pacific Island Worlds and ceremonies in relation to earth/ocean compels one to remember things they've never known and restore them to consciousness (Mojica in Allen, Chadwick 2015). My poster will present on on-going research in the Mariana Islands that interweaves Pacific scholarship while also proposing ecosociological methods such as soundwalking to contextualize recent fieldwork activities in Chamorro and Carolinian communities in the Marianas archipelago as a means of engaging purposeful acts of listening to and discussing sociopolitical issues of island places. SoundKnowledge proposes that sound-based practices is a way to situate conservation that takes into account cultural concerns. It aims to open up possibilities for discussing how listening practices, sonic ties and movements of Pacific Island communities are key for local stewardship efforts to address multi-entangled issues with global implications.</p>
	Virginie Ternisien	Virginie Ternisien (CEMML Guam) and Stephen Mosher (NAVFAC Marianas)	Overview of CEMML Biosecurity Inspections of Military Cargo for FY 2022-2023 in the Mariana Islands to Prevent the Spread of Invasive Species	<p>Colorado State University's Center for Environmental Management of Military Lands (CEMML) supports the U.S. Department of Defense (DoD) in compliance with the Mariana Islands Training and Testing Biological Opinion issued by the U.S. Fish and Wildlife Service. Bio-sanitation protocols in the form of biosecurity inspections of military cargo are implemented to prevent the spread of invasive species via DoD and commercial conveyances moving into, out of, and within the Mariana Islands during military and non-military training events. The Armed Forces Pest Management Board Technical Guide No. 31 (AFPMB TG-31) Operational Washdown and Agricultural Inspection Preparation for Military Conveyances and Equipment outlines the cleanliness standards that CEMML implements during the biosecurity inspection process. CEMML Biosecurity inspectors attach a unique barcode to every inspected item and record data on a handheld tablet using a custom Access database to streamline data collection and processing.</p> <p>This poster presents a comprehensive overview of the biosecurity inspection results conducted by CEMML during the fiscal years 2022 and 2023. It includes the cargo's region of origin and destination, inspection types, item categories, intercepted biomaterials, and failure/pass percentages. The results highlight the continued importance of adhering to the AFPMB TG-31 cleanliness standards to prevent the spread of various biological materials that could have been transported between islands if biosecurity arrival and pre-departure inspections were not in place. The CEMML biosecurity team on Guam is fully committed to enhancing the data collection methods, increasing the biosecurity program awareness, improving its efficiency, expanding the database, and advancing knowledge of invasive species in the Mariana Islands. This will further aid in protecting and conserving ecosystems from invasive species in the Pacific region.</p>

	Rachael Kaiser	Faegre, Sarah, University of Washington, Hannon, Phillip, San Diego Zoo Wildlife Association,	Rear-and-Release of the Critically Endangered Aga, or Mariana Crow	The Mariana Crow (<i>Corvus kubaryi</i>), also known by their Chamorro name, Aga, is a critically endangered forest crow with a single remaining population of 62 breeding pairs on the island of Rota, CNMI. The Aga was extirpated from Guam due to predation by the introduced Brown Tree Snake (<i>Boiga irregularis</i>) and the population on Rota declined by 87% from 1,348 individuals in 1982 to 178 in 2014. Hypothesized causes of decline include predation by introduced predators, disease, inbreeding depression, and human persecution. The population has stabilized since 2014 but remains extremely vulnerable to extinction. While research into methods of mortality reduction for wild Aga continues, measures to increase the reproductive output of the species through captive augmentation are an important conservation measure. Here we present captive rear-and-release data from 2016-2022.
	Eunice Molina	Ashling, Harmony Yomai	Field cameras for pollination	
Tuesday, February 27th				
8:00	Jasper Dierick, <i>Vrije Universiteit Brussel (Virtual)</i>	Cara Lin (Guam Coral Reef Initiative); Prof. Dr. Ludwig Triest & Prof. Dr. Tom Van der Stocken (<i>Vrije Universiteit Brussel</i>)	Extreme clonality of <i>Enhalus acoroides</i> seagrass beds in Guam: implications for resilience and management	<i>Enhalus acoroides</i> , commonly known as lo'u or tape grass, is the largest of three seagrass species in Guam, and provides a wide range of valuable ecosystem services, including sediment stabilization, carbon sequestration, coastal protection and vital habitat for marine organisms. Despite its robust resilience to sedimentation and eutrophication, a recent analysis of satellite imagery found a concerning 27.5% decline in <i>E. acoroides</i> area between 2015 and 2021. Similar to other seagrass species, <i>E. acoroides</i> uses both sexual and asexual reproductive strategies, influencing the genetic and clonal diversity crucial for seagrass bed resilience. Field observations in Guam have found male <i>E. acoroides</i> flowers, however no female flowers and only a single open fruit has been sighted recently, suggesting low sexual reproduction. To investigate this, we studied the clonal richness and genetic diversity of ten sites with <i>E. acoroides</i> meadows in southern Guam using 15 microsatellite loci. Our findings reveal exceptionally high levels of clonality across all surveyed sites, with primarily one genotype found in all seagrass areas of the island, a phenomenon previously undocumented for <i>E. acoroides</i> . This high level of clonality has far-reaching implications for the effective conservation of <i>E. acoroides</i> beds in Guam and potentially throughout other Pacific islands. Ongoing efforts in Guam include intensified monitoring of flowering events, collaboration with experts and stakeholders for valuable insights, and engaging the community through citizen science observations.
8:15	Else Demeulenaere, University of Guam	J. Gordon Burleigh (University of Florida), Tom Schils (UOG), James Bamba (Rota Forestry), Stefanie M. Ickert-Bond (University of Alaska Fairbanks)	Clarifying the conspecificity of Micronesian <i>Serianthes</i> island taxa and why it matters for conservation in an island archipelago.	The Mimosoid genus <i>Serianthes</i> (Fabaceae) contains 18 species of shrubs and trees which are mainly distributed on islands in the Indo-Pacific region and include island endemics and threatened species. Genetic diversity assessments are integral to the development of management plans for threatened populations, but an integrative taxonomic approach that includes evidence beyond the genetic data alone is needed to firmly delimit species. <i>Serianthes nelsonii</i> (Håyun lāgu on Guåhan and Tronkon guåfi on Luta) is the tallest tree of the Mariana Islands. With only 1 remaining adult tree (now damaged during typhoon Mawar) on Guåhan and less than 50 trees on Luta the species is endangered. We present the first robust, genus-wide phylogeny of <i>Serianthes</i> based on phylogenomics and densely sampling all species and inferring the phylogeny for the Micronesian taxa. Clarifying the conspecificity of the populations on Guåhan and Luta as well as assessing their genetic diversity will enable us to outline conservation strategies for the endangered <i>S. nelsonii</i> . Clear historic and geographic clades with unique genotypes were identified on the Guåhan and Luta for <i>S. nelsonii</i> . Genomics combined with phylogenetic methods allowed us to assess evolutionary distance among taxa, and to delimit the Guåhan and Luta as conspecific. These genotypes can be used to increase the genetic diversity in each of the islands and to help recovery efforts that can protect the last in situ Guåhan population. Another Micronesian species, the Ukall or Kumer (<i>Serianthes kanehirae</i>) on Palau, also known as Gumor on Yap represents a much larger population size as compared to <i>S. nelsonii</i> . <i>Serianthes kanehirae</i> populations are disjunctly distributed in Yap and Palau and based on leaf pubescence differences var. <i>yapensis</i> from Yap and the typical var. <i>kanehirae</i> from Palau are recognized. In our integrative taxonomic framework we corroborate these phenotypes as distinct evolutionary units by assessing their genetic distance. We inferred var. <i>yapensis</i> (from Yap) to be sister to accessions from the typical variety on Palau. Our research supports distinct clades for species, varieties, and island populations in <i>Serianthes</i> . Conservation and recovery programs should extend beyond cryptic species to protect varieties and distinct island populations.
8:30	James C. Bamba Org: CNMI Endangered Species Program		Manhasan na Tinanom Luta	Manhasan na Tinanom Luta, or the Rota Rare Plants Program is the ongoing Commonwealth of the Northern Mariana Islands (CNMI) Department of Lands and Natural Resources (DLNR) Endangered Species Program's endangered plant species project in Luta. Focused on the survey & mapping, propagation, outplanting, and monitoring. We plan to present on the project's progress over the years and current state of the island's federally and locally listed endangered species.
8:45	Alexander M Kerr, University of Guam		Katot yan panao: A case study of indigenous botanical nomenclature in the scientific literature	This talk explores how indigenous plant names have been referenced in the botanical literature. There are two species of trees in the Mariana Islands known in the indigenous language Chamoru as katot, a word referencing their irritating hairs and bark, <i>Dendrocnide latifolia</i> (Gaudich.) Chew (Urticaceae) and <i>Claoxylon marianum</i> Muell.Arg. (Euphorbiaceae). At least some speakers additionally distinguish between the two species, respectively, via the terms katot palao'an ("female katot") and katot lahi, ("male katot"). The latter species, <i>C. marianum</i> and at least one unidentified species has also been recorded in the literature as panao, an untranslatable term with many Austronesian cognates that is also applied to another tree <i>Guetlardia speciosa</i> L. (Rubiaceae). Despite its early provenance, this name's application in the literature to <i>C. marianum</i> appears in error and in the Marianas the name panao (or pânao) has likely only referred to <i>G. speciosa</i> just as it does today.
9:00	Harmony Yomai, Virginia Tech Ecology of Bird Loss Project		Floral traits of common native limestone forest species in Marianas	The interplay between dependence on pollinators and the plant's capacity for self-pollination is a complex facet of plant biology. Some plants have the capacity to self-pollinate while other plants require a pollinator. It revolves around the notion that selection for floral traits should maximize recruitment. For instance, typically, white, and dull flowers are associated with nocturnal or wind pollination while large and showy flowers are adapted for diurnal biotic pollination. The idea being that producing large colorful petals, nectar, or scent requires a lot of energy. Thus, flowers evolve their morphologies to maximize seed production. Islands are known for their depauperate pollinator populations, compared to mainland communities, and they also exhibit an overrepresentation of traits that promote seed set in the absence of pollinators, specifically self-compatibility. This underscores the pivotal role played by plant-pollinator interactions in the context of seed production. The purpose of this study is to survey floral traits of common native limestone forest plants in the Marianas. We aim to answer the following questions, 1) are there commonly associated floral traits among native limestone forest species and 2) are floral traits associated with selfing present in all native species 3) do floral traits generally promote outcrossing or selfing in species? and 4) what are the likely pollinators of native limestone forest plants based on these traits? To answer these questions, we surveyed seven floral traits of 19 native limestone species on Saipan, Guam, and Rota. We expect to find a diverse range of floral traits across species and with some general patterns of heterostyly to promote outcrossing (different style lengths within a species/individual) and dichogamy (overlapping of anther dehiscence and stigma receptivity) to ensure selfing can happen in the absence of pollinators. Our results show that 82% of our species are hermaphroditic with some potential of self-pollination (anthers and style are close to each other).

9:15	<i>Jonae Sayama, University of Guam (virtual)</i>	Dr. Ross Miller, University of Guam	Pollen Identification in <i>Apis mellifera</i> L. (Hymenoptera: Apidae) Apiaries on Guam Using DNA Metabarcoding	<p>Honey bees on Guam forage on both native and non-native plant species, however little is known regarding the species from which pollen and nectar are collected. DNA metabarcoding was employed to identify the sources of pollen collected from ten honey bee apiaries on Guam. Pollen was sampled quarterly from each of three hives from each apiary for one year beginning in January 2022. Metabarcoding was performed on pollen samples collected on Guam, by Jonah Ventures Laboratory, Boulder, Colorado. In the metabarcoding results, 139 plant taxa were identified across all apiaries, with 39% of the samples identified to the species level and the remaining 61% identified to family or genus. The most abundant plant species identified in all pollen samples was <i>Leucaena leucocephala</i> (14.12%), followed by <i>Enterolobium timbouva</i> (4.19%), and <i>Casuarina equisetifolia</i> (2.70%). Among samples not identified to the species level, Fabaceae accounted for 50.59% of remaining samples and Aracaceae for 4.16%. The remaining 6.25% were spread across 52 families and 49 genera.</p> <p>Keywords: honey bee, <i>Apis mellifera</i>, pollen collection, DNA metabarcoding, Micronesia</p>
9:45	<i>Coralynn Coaplant, Texas A&M University Corpus Christi (Virtual)</i>	Eric Garcia, Kevin Labrador, Sharon Magnuson, Rebecca Hamner, Christopher E. Bird, Texas A&M University – Corpus Christi; Dacia Wiitala, Bronson Curry - CNMI DLNR	Evolutionary Origin of the Endangered Rota Blue Damsel fly (<i>Ischnura luta</i>)	<p>The Rota blue damselfly (<i>Ischnura luta</i>) is an endangered species isolated to the tropical Pacific island of Rota in the Commonwealth of the Northern Mariana Islands (CNMI). The Rota blue damselfly was described only 23 years ago, is uncommon, and consequently, little is known about its biology, evolutionary history, and relationships with other <i>Ischnura</i> spp., including the Aurora bluetail (<i>I. aurora</i>) which is the most abundant congener in Rota. The Aurora bluetail is much more broadly distributed (Australia, East Asia, Pacific Islands) and common on Rota. Here we present an evolutionary reconstruction of the mitochondrial cytochrome c oxidase 1 gene (COI) for the genus <i>Ischnura</i>. This phylogeny includes the first genetic sequences for <i>I. luta</i> and for <i>I. aurora</i> from Rota, which were amplified from tarsi that were non-lethally collected from 10 individuals in Nov. 2023. These sequences also provide our first glimpse at the level of genetic diversity in these populations, which can be proportional to population size. Using phylogenetic character state mapping, we will infer potential colonization routes, providing a richer understanding of the origin of <i>I. luta</i> and the connectivity of <i>I. aurora</i> to other populations. The genetic resources developed here for <i>I. luta</i> will be used to develop a species-specific qPCR test that can be applied to environmental DNA samples to gain a better understanding of its distribution. This will aid in the development of targeted strategies for conserving this rare endangered species.</p> <p>DNA barcoding, COI sequences, phylogenetic analysis, <i>Ischnura luta</i>, conservation genetics, endangered species, Rota Island.</p>
10:00	<i>Eric Garcia, Texas A&M University Corpus Christi (Virtual)</i>	Coralynn Coaplant (1), Bronson Curry (2), Rebecca M. Hamner (1, 3), Kevin Labrador (1), Sharon Magnuson (1), Dacia Wiitala (3), and Christopher E. Bird (1). (1) Department of Life Sciences, Texas A&M University – Corpus Christi, Corpus Christi, Texas 78412, USA. (2) USFWS – Pacific Islands Fish and Wildlife Office. (3) CNMI Division of Fish and Wildlife, Department of Lands and Natural Resources	Using environmental DNA (eDNA) to determine the distribution and biological associations of the endangered Rota Blue Damselfly	<p>The Rota blue damselfly (<i>Ischnura luta</i>) is an endangered insect endemic to Rota, the southernmost island in the Commonwealth of the Northern Mariana Islands (CNMI), which is in the tropical northwestern Pacific Ocean. While the species was initially described 23 years ago, much of its basic ecology remains unknown, such as distribution, environmental preferences, and interspecific interactions. In spite of extensive visual censuses, only a few adults have ever been documented from a few specific sites and naiads (aquatic larvae) have yet to be taxonomically identified. We extensively surveyed environmental DNA (eDNA) from water samples (n = 30 with 3 replicates each) in November 2023 to detect the presence and relative abundance of <i>I. luta</i> and other co-occurring species across all streams and ponds on Rota. Here we will report on the progress made in recovering eDNA from the oligotrophic streams and the barcoding of co-occurring species to better characterize the distribution and composition of riverine biodiversity by constructing a customized barcode database. We obtained tissue samples for DNA barcoding from <i>I. luta</i>, <i>I. aurora</i> (the most abundant congener in the island) as well as 12 other invertebrates and 1 fish. We predict that the positive detection of <i>I. luta</i> eDNA will help determine the presence, breeding grounds and complete distribution, and the identified biotic community will provide information on the potential competitors, prey, and predators of the endemic damselfly. Ultimately, this eDNA dataset will be combined with concurrent water quality and habitat surveys to provide a comprehensive description of the potential habitat preferences and ecological associations of the Rota blue damselfly, which can play a crucial role in the conservation on this endangered species.</p>
10:15	Jerilyn Calaor, Virginia Tech Ecology of Bird Loss Project	Susan Kennedy - Trier University, Haldre Rogers - Virginia Tech	Evaluating arthropod community changes in the Marianas	<p>Community composition is shaped by several factors. We set out to test whether top-down control by vertebrates shapes arthropod communities across the Marianas. To do this, we collected arthropods along transects set in limestone forests in Saipan, Tinian, Rota, and Guam. We sampled arthropods on vegetation by branch beating and ground-dwelling arthropods from the leaf litter using a leaf sifter and Winkler funnel. We then prepared DNA libraries of collected arthropods targeting the COI region for Illumina sequencing and curated an OTU table based on the NCBI database. We analyzed differences in arthropod taxa across the islands. Preliminarily, we find support for the role of birds and lizards in impacting arthropod communities however the impact may interact with the influence of legacy effects and ungulates.</p>
10:30	<i>Brook Milligan, New Mexico State University (Virtual)</i>		Seeking the Goldilocks zone in conservation genetics: balancing genomic and individual sampling	<p>Conservation of pollinators and the ecosystem services they provide is becoming increasingly crucial as insect populations decline throughout the world. Genetic information can provide valuable insight into the nature of pollinator populations in an archipelago by, for example, quantifying movement among islands. However, such studies have traditionally been resource intensive and insect conservation is notoriously underfunded. As a result, conservation genetics applied to pollinators is exemplary of the need to reduce barriers and develop approaches to conservation genetics that are feasible in resource-limited situations. Traditional approaches such as those based upon microsatellites can provide information on large samples of individuals, but are generally limited to few genetic loci and therefore yield uncertain inferences. Genomics approaches that sequence all or most of a genome can provide information on a large subset of the genome, but are generally limited to few individuals and therefore also yield uncertain inferences. We are working to create genetic approaches that are feasible for large samples of individuals each studied at many loci, thereby reducing uncertainty. The goal is ease of use and low cost, both of which are strict requirements for applications in conservation, especially under resource-limited conditions. One promising approach leverages the biotechnology of CRISPR for conservation genetics. Tools are commercially available and generically applicable, which means they can be widely used. Our assessments are on-going, but the approach seems to offer promise.</p>

10:45	Ken Puliafico, Colorado State University Center for Environmental Management of Military Lands (CEMML)		Terrestrial Arthropod Reference	The development of the new Marine Corps Base Camp Blaz has included restoration of the former Andersen Air Force Base Southern Annex (Andy South) into an Urban Training Complex (UTC). This site is near the location where Little Fire Ants (LFA, <i>Wasmannia auropunctata</i>) were first detected on Guam in 2011. Historic, but illegal trash disposal in Andy South resulted in numerous LFA infestations scattered across the installation prior to the transfer of the property to the US Marine Corps. Beginning in 2017 CEMML and the University of Guam (UoG) conducted extensive surveys of the area and detected eight LFA infestations. After UoG successfully eradicated LFA in four of these areas, CEMML began management of the largest infestations in 2022 under the direction of the Marine Corps and NAVFAC-Marianas. Here we report on the progress and challenges of our eradication treatments of these large infestations, covering almost 81 acres of secondary limestone forest. The impacts of Typhoon Mawar needed new adaptive management strategies that allowed us to continue to suppress LFA despite the widespread devastation caused by the storm. Another 7.5-acre site is home to the endangered Guam tree snail, <i>Partula radiolata</i> , which has required close consultation with Department of Defense and the US Fish and Wildlife service. Finally, we are planning a ground-based eradication of the UTC's largest site, a 56-acre contiguous LFA infestation in dense tropical jungle that has required a significant logistical effort. Following a staged approach, we first completed detailed delineation surveys, established containment buffers around the site and will soon start a multi-phase treatment plan over the next couple of years to eradicate LFA from this area.
11:00	Dr. Ashley Rohde, New Mexico State University (virtual)	Brook Milligan, New Mexico State University	Foundational research on the impacts of urbanization and non-native species introductions on the native pollinator fauna in the Commonwealth of The Northern Mariana Islands	An important contributor to ecosystem stability is pollination, which often depends on bees. Most ecosystems are so complex that it is difficult to determine which environmental drivers most strongly influence bee faunas, and therefore pollination services. However, the geographical, ecological, and social features of the Commonwealth of the Northern Mariana Islands (CNMI) provide a unique opportunity to overcome these difficulties; the islands represent ecosystems that are both relatively simple and largely dependent on bees for pollination. This project will achieve four specific aims. First, we will quantify species richness and abundance on at least six islands, a task not attempted for over thirty years. We will use both an intensive sampling effort and opportunistic sampling through citizen science. Second, we will quantify the impact of human activity and honey bee presence on native bees. Generally, this is impossible or extremely difficult to do; however, the CNMI has different patterns of human occupation and honey bee introduction than anywhere else in the U.S., so the islands form a natural factorial experiment, enabling us to assess the differential impact of each of those central factors. Third, we will use landscape genetics methods to quantify native and introduced bee population density, movement, and stability among islands. This is particularly important for understanding whether wild pollinator populations are stable and abundant enough to support ecological systems as well as food production for increasing agricultural needs, as homesteading and other developments are likely to increase in the northern islands in the near future. Finally, we will identify the forage plants that native bees currently use through plant species surveys and barcoding analysis of pollen collected by captured specimens. This will help inform assessments of the bees' resiliency against environmental change, since generalist populations are likely to be more stable and resilient in the face of disturbances and climate change. Importantly, the findings from this study can be applied to the CNMI as well as more complex ecological systems that are less experimentally tractable.
11:30	Jesse Czekanski-Moir, SUNY-ESF (Virtual)		Ants of Palau	The Palau Islands are a small archipelago at the Southwest of Micronesia, closest to source biotal areas like the Philippines, Wallacea, and Indonesian Sahul. Most of Palau's more than 500 small islands were connected as one large island at various times during the Pleistocene. Thus, Palau is both biogeographically important to understanding evolutionary patterns in Micronesia, and a useful 12,000 year-old "natural experiment" of lowland rainforest fragmentation. I provide an overview of the biogeography of the Palau ant fauna, and discuss beta diversity patterns within the archipelago, based on hundreds of collection events between 2006 and 2022. I also touch upon important areas of uncertainty within the Palau system, including exactly which ants are native and which were likely introduced, and the age of the terrestrial environments within the archipelago. I conclude with brief comments on how ant biogeographic and beta diversity patterns compare with those of other taxa, such as land snails and arachnids.
11:45	G. Curt Fiedler, University of Guam CNAS (virtual)	Scott Vogt, NAVFAC AAFB Exequiel Bando, University of Guam Mary Heather Jingco	Tree Snails Populations and Typhoon Bottlenecks	Three species of federally listed tree snails (<i>Partuliidae</i>) are extant on Guam: <i>Partula radiolata</i> , <i>Partula gibba</i> and <i>Samoana fragilis</i> . Population surveys using Photo Mark-Recapture (PMR) methods were conducted for <i>P. radiolata</i> at Andersen Air Force Base (2021-2023), for <i>S. fragilis</i> at Naval Base Ordinance Annex (2022-2023) and <i>P. gibba</i> at Haputo, Camp Blaz (2022-2023). PMR uses software matching of photos instead of physical marking to determine "recaptured" individuals. Population estimates for each species and plot were calculated using Program Mark. We also searched for cross season matches between PMR quarters to estimate longevity or persistence of snails between quarterly or seasonal surveys. Estimated snail numbers for all species at all sites declined markedly in the aftermath of Typhoon Mawar, which struck Guam on 24 May, 2023. Subsequent surveys in Fall of 2023 showed an even further decline of <i>P. radiolata</i> at all AAFB sites. For all species, very few snails captured pre-typhoon were recaptured after the typhoon. This study is the first to document the impact of a major typhoon on partulid snails. The data indicate an extraordinary bottleneck for tree snail populations due to the typhoon, which compounds other persistent threats to these species. These results amplify the need for thorough monitoring and management of existing populations of partulid snails on Guam and captive cultivation of the most vulnerable species.
12:00	Chris Looney, Washington State Department of Agriculture (Virtual)	Cassie Cichorz, Nathan Roueché, Karla Salp, Sven Spichiger, Telissa Wilson Washington State Department of Agriculture, 7321 Linderson Way SW, Tumwater WA, 98501 USA Jacqueline M. Serrano USDA-ARS Temperate Tree Fruit and Vegetable Research Unit 5230	Using agency and community resources to eradicate exotic hornets in the North American Pacific Northwest: a case study for preventing social wasp invasions	The genus <i>Vespa</i> , or true hornets, comprises a group of predaceous social wasps, some of which can be significant ecological and agricultural pests. Several species have been introduced outside of their native range in the past few decades, including <i>Vespa tropica</i> , recently established on and now found throughout Guam, and <i>Vespa velutina</i> , which has spread throughout western Europe and parts of Asia and was recently detected in southeastern North America. Both species have proven to be problematic to the apiculture industry and exceedingly difficult to control. In 2019, the northern giant hornet (<i>Vespa mandarinia</i>) was detected for the first time in North America. This discovery led to more detections of living hornets and reports of suspicious honey bee hive kills, spurring a robust survey and eradication program ongoing since 2020. The program relied on a trapping network and public reports, which were then used to select sites for live-trapping or net surveys. Live hornets captured with these efforts were fitted with radio tags and followed to nests. We located and destroyed four nests between October 2020 and September 2021. There were no reports of hornets from the public in 2022-2023, and no hornets collected in the agency's trapping program. This presentation will highlight the approaches we used and how they can be adapted for survey and eradication of other exotic hornet species.

12:15	Christiana-Jo Quinata, Iowa State University, Ecology of Bird Loss Project	Haldre Rogers, Virginia Tech; Erica Baken, St Johns & St Bens; Micah Freedman, University of Toronto	Butterfly wing morphology change after 40 years of relaxed bird predation in Guåhan	Butterflies in the Marianas and have faced habitat loss and interruptions to species interactions. The invasive brown treesnakes (<i>Boiga irregularis</i>) that caused the extirpation of birds disrupt the common predator-prey interaction of birds and butterflies in Guåhan. Birds are often cited as a primary selective force on morphological wing traits of butterflies such as forewing and hindwing shape and size. Butterfly species that are considered toxic or distasteful to birds tend to be larger, have elongated forewing shapes, and use more gliding flight than palatable, nontoxic species which have shorter stubbier wings conducive for evasive flight behavior to escape bird predation. Here, we use the Mariana Islands to test whether relaxed selection over the last 40 years due to the extirpation of birds in Guåhan has led to changes in butterfly wings. We used morphometric methods to compare forewing and hindwing shape and size of <i>Hypolimnys anomala</i> , in Guåhan before snake establishment (1930-1970's) and after snakes (1990-2021) to examine the effects of bird selection over time in Guåhan. We also conducted a cross-island comparison of wing morphology between Guåhan and Northern Mariana Islands in two nontoxic (<i>Hypolimnys anomala</i> and <i>Melanitis leda</i>) and one putatively toxic (<i>Euploea eunice</i>) species to test whether non-toxic species respond more strongly to reduced bird presence than toxic species. We did not find a signal of reduced bird predation in <i>H. anomala</i> over time in Guåhan, or in the cross-island comparison of the three butterfly species regardless of toxicity. There were strong sex-specific differences in size and shape for <i>E. eunice</i> and <i>H. anomala</i> across islands and time frames. Interestingly <i>H. anomala</i> wings became larger over time on all islands. Collectively this study supports established sexually dimorphic patterns and finds an intriguing new pattern of increased forewing and hindwing size over time in <i>H. anomala</i> but does not show evidence for plasticity or rapid adaptation in butterfly wing morphology because of bird loss. Future research should examine changes in butterfly flight behavior as behavior may change more quickly than morphology.
13:45	tori manley, tori manley speaking		Championing Science with community members; volunteerism and conservation	
14:00	Bertha M. Reyuw, Micronesia Conservation Trust		Micronesia Conservation Trust Capacity Building Program	<p>The Micronesia Conservation Trust (MCT) Capacity Building Program is a comprehensive initiative aimed at supporting the growth and development of emerging leaders from the Micronesia Challenge jurisdictions, which includes, the Commonwealth of the Northern Marianas (CNMI), Guam, the Federated States of Micronesia (FSM), the Republic of Palau, and the Republic of the Marshall Islands. The program offers several opportunities to nurture the potential of young champions, including the Micronesia Challenge Young Champion (MCCYC), Bill Raynor Micronesia Challenge Scholarship (BRMCS), Micronesians in Island conservation, and professional fellowships.</p> <p>Through these various programs, the MCT Capacity Building Program has supported over 100 Micronesians in capacity building. The program aims to empower young leaders, increase their knowledge and skills, and ultimately contribute towards achieving the goals of the Micronesia Challenge. Many of the MCT Capacity Building Program beneficiaries hold leading positions in their islands and are champions in community conservation work. The program is a testament to MCT's commitment to investing in the next generation of environmental leaders and ensuring a sustainable future for the Micronesia region.</p>
14:15	David Benavente, Mariana Islands Nature Alliance (MINA)	Elizabeth Furey, MINA Program Manager; Roberta Guerrero, MINA Executive Director	Building and Sustaining Local Capacity for Conservation in the CNMI; MINA's Tasi Watch Ranger Program	<p>This abstract outlines the significant strides made by the Tasi-Watch program, illustrating its pivotal role in enhancing conservation efforts while uplifting the lives of young islanders. The Mariana Islands Nature Alliance (MINA) initiated the Tasi-Watch Ranger Program in 2010, aimed at fostering stewardship of the Mariana Islands' marine resources. Translating to "the face of the sea" in Chamorro, <i>i mattan i tasi</i> encapsulates the program's core essence. Tasi-Watch recruits recent high school graduates or local undergraduates, equipping them to become community conservation messengers. Through comprehensive training, these rangers become effective environmental technicians and communicators, disseminating knowledge about marine environment threats to peers, families, villages, and the wider island population.</p> <p>Tasi-Watch initially concentrated efforts on Laolao Bay, conducting outreach, patrolling sites, and monitoring activities, including addressing illegal practices. In 2012 the program expanded to include Garapan beaches on Saipan. Building upon its success since its initiation, the program has evolved into a mechanism to truly develop local capacity to conduct meaningful conservation of our island's natural resources. The program's impact transcends common classroom education, as the volunteer community rangers learn and develop their skills through hands-on training. Whether collaborating with local management agencies to better conserve and protect our natural resources or conducting outreach to the CNMI's youth, Tasi-Watch strives to catalyze active community awareness and participation in conservation initiatives.</p> <p>Beyond its conservation impact, the program addresses unemployment by providing stipends to participating rangers, offering meaningful employment opportunities. Acknowledging the program's temporary nature, MINA ensures ongoing support for rangers beyond their tenure, aiding their educational pursuits or transition to permanent employment.</p> <p>The Tasi-Watch Ranger Program stands as a beacon of successful community-driven conservation, fostering a new generation of passionate stewards for the Mariana Islands' marine ecosystems. Its multifaceted approach not only safeguards the natural environment but also contributes to the socioeconomic welfare of the community.</p>
14:30	Tiffany Evans, Saint Louis Zoo/Pacific Bird Conservation		Engaging Community Conservation in the Marianas Through Collaborative Outreach and Education	<p>Pacific Bird Conservation (PBC) is a collaborative effort of biologists, educators, and zoo professionals that works in partnership with the Commonwealth of the Mariana Islands Division of Fish and Wildlife (CNMI DFW) to conserve and protect endemic bird species of the Marianas. Prior to 2018, there was no collaboration between this conservation effort and the Public School System (PSS) in the CNMI. Since then, PBC has developed educational outreach curriculum, community programs, and teacher professional development training on Saipan, Tinian, and Rota. Developed with CNMI teachers, the goal of our outreach is to increase knowledge of the native bird species and spread awareness of the conservation efforts that take place in the CNMI. We do this by providing hands-on experience in a variety of settings to introduce students to a diverse set of careers in science. Our goals and impacts are measured by evaluation methods including pre and post questionnaires for students and teachers, engagement assessments, and observations during programs. Results have shown that outreach programs have a positive impact on students with experiential field trips having the most impact. Further work will be done to implement, evaluate, and collaborate with local teachers and students and the community in the CNMI.</p>

14:45	Tammy Mildestein, University of Guam	Scott Vogt, (AAFB) NAVFAC-Marianas; Jill Liske-Clark, (Tinian, Navy) NAVFAC-Marianas; Bronson Curry, CNMI-Division of Fish and Wildlife; Jeried Calao, Cherokee Nation; Nathan Johnson, Micronesia Ecological Services	Fanihi conservation: it takes a village	The Mariana fruit bat (fanihi) is a federally-listed species that has been a focus of research and conservation for over five decades. Ample funding and expertise have been made available to the management of fanihi on Andersen Air Force Base (AAFB), where the longest-running records of colonies and sightings on Guam are known. Although the AAFB cooperative project team is small, it's commitment to a collaborative and community-based approach has led to major advances in what is known about fanihi in the past ten years. The cooperative project's annual base-wide survey has relied on partners and citizen-scientists to get estimates of the fanihi population abundance, and these show a stable population size of more than 100 bats on AAFB. With the support of our collaborators at Naval Base Guam and the Guam Division of Aquatic and Wildlife Resources (GDAWR), the success of this methodology has been extended to a whole island approach, which provides a more comprehensive strategy for managing this wide-ranging species across Guam. In 2022, we collaborated with the Commonwealth of the Northern Mariana Island's Division of Fish and Wildlife (CNMI-DFW) to bring this community-based island-wide survey approach to Tinian, which ultimately led to the discovery of a fanihi colony of 52 bats. This is especially noteworthy, because fanihi has been recorded as extirpated on Tinian for decades. Coordinating a partnership approach has allowed us to track trends in fanihi population size on a landscape scale appropriate to the bats' wide range, to discover four new colonies and roosting locations, and even to identify the likely source of the seasonal 3 to 15-fold increase in bat numbers on Guam through surveys by CNMI-DFW on Rota. The future of fanihi conservation is dependent on continued community engagement and coordinated collaboration across partners, which promise insights and solutions to conservation challenges beyond the sum of our parts.
15:00	Samuel Stier, AAFB Fanihi Monitoring Project	Marybelle Quinata, Park Ranger/Education and Outreach Coordinator, US Fish and Wildlife Service, Guam National Wildlife Refuge, Ritidian Unit; Tammy Mildestein, Bat Specialist, AAFB Fanihi Monitoring Project	Engaging the next generation in fanihi conservation	Wildlife doesn't get protected through data alone. Rather, conservation biologists serve double duty, not only conducting ecological research, but also learning from and communicating with managers and the public about the species they aim to conserve. In the Mariana Islands, there are cultural traditions and a vast local knowledge about native ecology, but these are often not considered by conservation-focused researchers. Taking bats in the Mariana Islands as an example, bat bones are found in pre-contact middens, and the species is a familiar and valued symbol of the Marianas' natural heritage, especially among older generations on the lesser developed islands. In a survey at the San Isidro fiesta on Rota, older participants were 1.67 times more accurate about fanihi populations and ecology and nearly twice as concerned about fanihi conservation. With new regulations and a more technology-focused younger generation, there is a risk of losing this centuries-old knowledge and rich commitment to our native species. Biologists need to be all the more persistent and creative about engaging the youth in local communities in the conservation process. The military's fanihi monitoring project and the Guam National Wildlife Refuge have begun a yearly education summit in which Guam's GK-12 teachers learn about fanihi, native limestone forest habitat, and ways to engage their students in place-based and biomimicry education. In an age when technology is more valued than ever, a new tool in the biologist's communication toolbox is bioinspiration (a.k.a. biomimicry or Innovation inspired by Nature). Bioinspiration is the continuation of a vital tradition: indigenous cultures have always learned from and valued Nature for what it could teach us. Maneuverable drones covered in mechanosensory filaments inspired by the patagium hairs of bats, carbon-negative concrete manufacturing methods inspired by coral, non-toxic industrial adhesives inspired by marine mussels, and anti-bacterial surfaces inspired by the skin of sharks are all examples of recent biomimetic technologies in use today. By exploring wildlife conservation through the lens of bioinspiration, researchers can acquire new capacities for reaching audiences traditionally less-interested in Nature and more interested in the human-built world, but it remains largely untapped by conservation biologists.
15:15	Olympia Terral/Martin Kastner, Friends of Islan Dano	Olympia Terral, Friends of Islan Dano'	Update on BTS captures by the Friends of Islan Dano' volunteer group	Islan Dano', located in Cocos Lagoon south of Malessos', Guam, is an island of high cultural and ecological importance, but a recently discovered population of invasive Brown Treesnakes (BTS) puts those values at risk. We established Friends of Islan Dano' to assist in the eradication of BTS from the island. Our primary objectives are to enable community members to contribute directly to BTS removal efforts, and to accelerate BTS removals for the benefit of native wildlife. Between June 2021 and January 2024, we completed 98 night searches on the island, with the assistance of 255 individual volunteers. We have captured a total of 39 BTS, at an overall rate of 0.40 BTS per search night. Our capture rate has decreased over time, with 0.50 BTS captured per search night during our first 30 searches compared to 0.27 during our last 30 searches. However, our capture efficiency has increased over time, with 65% successful captures during our first 30 searches compared to 100% during our last 30 searches. We will provide a further update on our search efforts on the island, and explore temporal and morphological trends in our BTS captures.
15:30	Sheila Babauta and Cami Egorrola, Micronesia Climate Change Alliance		Amut Walks- Building a Path towards healing & unity in the Pacific	
Thursday, February 29th				
8:00	Joshua Guilbert, Biodiversity Research Institute & CNMI Division of Fish and Wildlife (DFW) (Virtual)	Ellie Roark (DFW), Charles Mendiola (DFW), Robert Ulloa (DFW), Emilie Kohler (DFW, Washington Department of Fish & Wildlife), Marcos Gorresen (USGS), Paul Cryan (USGS), Tammy Mildestein (UoG) & Bronson Curry (DFW, FWS)	The status of bats in the Mariana Islands and required work for their recovery.	<p>The Mariana Islands is currently home to two bat species: the endangered fanihin ganas (Pacific sheath-tailed bat, <i>Emballonura semicaudata rotensis</i>) and the threatened fanihi (Mariana fruit bat, <i>Pteropus mariannus</i>). The little Mariana fruit bat (Guam flying fox, <i>Pteropus tokudae</i>) is considered extinct with the last confirmed sighting occurring in 1967. Preventing the extinction of the remaining two Mariana bat species is a high conservation priority for the CNMI Division of Fish and Wildlife (DFW).</p> <p>The fanihin ganas is a small (<8g), cave-dwelling, insectivorous bat that was once abundant and found from Guam to Saipan, possibly on Maug. Currently, the only persisting population is on Aguiguan, with population counts of 323 (2016) and 385 (2022) by DFW and USGS at Black Noddy Cave. While these are likely undercounts, being found on only one Island is a considerable risk to this species. To address this, DFW plans to reintroduce the species to Rota, where it was extirpated in the 1970s. There are many barriers to this, including an Environmental Assessment to evaluate all aspects of a potential reintroduction on Rota and developing a comprehensive reintroduction procedure.</p> <p>The larger (500g), tree-roosting, frugivorous fanihi continues to face considerable challenges to its recovery, including the Brown Tree Snake, illegal hunting, and typhoons. Rota is the fanihi stronghold in the southern islands but viable populations are also required on at least two other Southern Mariana Islands to meet recovery plan criteria. Recent population counts and observations may suggest these criteria require review. Increased monitoring effort is also necessary to assess the population trends in the Mariana Islands north of Saipan.</p>

8:15	Jack Christie, Institute for Wildlife Studies, Cal Poly Humboldt (Virtual)	David Garcelon, Institute for Wildlife Studies. Dan Barton, Cal Poly Humboldt	How many hilitai?: Spatial capture recapture to estimate abundance and density of a native predator	The Mariana monitor lizard (<i>Varanus tsukamotoi</i>), or hilitai, is the largest terrestrial reptile on Guam and poses an interesting dilemma for conservation. While native themselves, they have been implicated as a potential nest predator of Guam's imperiled native birds. Islan Dano was selected as an introduction site for the endangered Guam rail, or ko'ko', and concerns over potential predation led to a monitor control program on the islet that began in 2009. The Mariana monitor is associated with water, especially coastal habitat, and accordingly they seem to be quite numerous on Islan Dano. However, there is little available data on the abundance and density of monitors across this islet, which is vital to evaluating the efficacy of ongoing control efforts and to inform future management decisions. Here we describe an effort to determine the first estimate of monitor lizard abundance and density using a spatial capture-recapture framework. Our predicted density estimate of 17.52 monitors per ha resulted in a population estimate of 639 (± 164) individuals made by integrating data from both hand captures and telemetry. We suggest that evaluation of both impacts of hilitai on ko'ko' and the efficacy of the hilitai control program would benefit from use of this estimate, or improvements on this estimate, based on intensive field study.
8:30	Martin Kastner, Virginia Tech Ecology of Bird Loss Project (virtual)	Henry Pollock, Michigan Technological University; Kayla Baker, Virginia Tech; Eben Paxton, United States Geological Survey; Haldré Rogers, Virginia Tech	Preliminary analysis of landscape-level patterns of Sáli (Micronesian Starling, <i>Aplonis opaca</i>) productivity and survival on Andersen Air Force Base, Guam	Islan Dãno', located in Cocos Lagoon south of Malesso', Guam, is an island of high cultural and ecological importance, but a recently discovered population of invasive Brown Treesnakes (BTS) puts those values at risk. We established Friends of Islan Dãno' to assist in the eradication of BTS from the island. Our primary objectives are to enable community members to contribute directly to BTS removal efforts, and to accelerate BTS removals for the benefit of native wildlife. Between June 2021 and January 2024, we completed 98 night searches on the island, with the assistance of 255 individual volunteers. We have captured a total of 39 BTS, at an overall rate of 0.40 BTS per search night. Our capture rate has decreased over time, with 0.50 BTS captured per search night during our first 30 searches compared to 0.27 during our last 30 searches. However, our capture efficiency has increased over time, with 65% successful captures during our first 30 searches compared to 100% during our last 30 searches. We will provide a further update on our search efforts on the island, and explore temporal and morphological trends in our BTS captures.
8:45	Willson Gaul, Northern Marianas College	Ellie Roark, CNMI Division of Fish and Wildlife	Daily vocalization patterns of the Saipan Reed Warbler <i>Acrocephalus hiwae</i>	We investigated how detectability and vocalization of Saipan Reed Warblers (<i>Acrocephalus hiwae</i>) varies by time of day. We used long-duration sound recordings from eleven locations occupied by Saipan Reed Warblers. Saipan Reed Warblers sang during all daylight hours. We did not find any evidence of a dawn or evening chorus in this species. These results are relevant for determining what time of day surveys of Saipan Reed Warblers should be conducted.
9:00	Keena Leon Guerrero, CNMI Division of Fish & Wildlife		Age, Growth, Reproduction, and Mortality of the Lined Surgeonfish (<i>Acanthurus lineatus</i>) from Saipan, Northern Marianas	Fisheries in the Commonwealth of the Northern Mariana Islands (CNMI) consist of shore-based and boat-based catches of coral reef species. Surgeonfish (Family Acanthuridae), especially Lined Surgeonfish <i>Acanthurus lineatus</i> , contribute significantly to total landings in the nearshore coral reef fishery of the CNMI. Despite being an important component of the nearshore fishery, there is limited information about the biology and life history of the Lined Surgeonfish in the CNMI. The objective of this study was to investigate the age-based demography and reproductive biology of <i>Acanthurus lineatus</i> from Saipan, CNMI to enhance our understanding of their life history. To determine age and growth, longevity, mortality rates, age- and length-at-maturity, and spawning seasonality, fishery-dependent specimens collected during May 2017 to October 2019 were examined. There were no significant mean length differences between the distribution of male and female specimens. The combined length-weight relationship for all specimens across all years was $W=0.031 \times 10^{-(5)} [(FL)]^{2.957}$. Growth model parameters were a mean asymptotic length (L_{∞}) of 20.5 cm FL, a growth coefficient (K) of 0.24 $[(year)^{-1}]$ and a t_0 of -3.2 years. The maximum recorded age was 20 years. Otolith weight was a good predictor of age for both males and females. Estimated total mortality was 0.495 $[(year)^{-1}]$, natural mortality (M) was 0.315 $[(year)^{-1}]$, and fishing mortality was 0.18 $[(year)^{-1}]$. The overall sex ratio was male to female = 1:1.81. For females, the length at 50% sexual maturity (L_{50}) was 18.8 cm fork length and age at 50% maturity (t_{50}) was 6.2 years. Maturity for males was not estimated due to an insufficient number of immature males. Spawning capable and active <i>A. lineatus</i> females and males were observed during all months with sample collection, potentially supporting a year-round spawning cycle. The outcomes of the work could be used to inform length-based fishery regulations and indicator-based single species stock assessment approaches to support the sustainable fishery management of <i>A. lineatus</i> in the CNMI.
9:15	Francisco C. Villagomez, CNMI Division of Fish & Wildlife		CNMI Fish Life History Research Program	Since its inception in 1996, our life history research program has been dedicated to acquiring comprehensive baseline information on key food fish in the Commonwealth of the Northern Mariana Islands (CNMI). The initiative involves the collection of data on various species to determine age, growth, and longevity using fish otoliths, and to determine sexual maturity and spawning seasonality using fish gonads. The pioneer species in our investigation, the Spotcheek Emperor (<i>Lethrinus rubrioperculatus</i>), was studied from 1996 to 2002. Subsequent research brought forth significant findings, unveiling differences in age-based growth curves and size at maturity across different locations. Additional studies on species like the Bluebanded Surgeonfish (<i>Acanthurus lineatus</i>) have provided valuable insights into age, growth, and size at maturity. Recent investigations, particularly on the Bluebanded Surgeonfish and Redlip Parrotfish (<i>Scarus rubroviolaceus</i>), have incorporated techniques such as histological analysis to accurately determine sexual reproductive status. These studies have uncovered growth variations between sexes and maturity estimates derived from gonadal analysis. The recent shift to in-house processing of otoliths reflects our commitment to advancing research capabilities. The success of our life history research is deeply intertwined with key partnerships forged with funding agencies, training institutions, environmental services, histopathology labs, and age-reading experts. Collaborations with regional partners emphasize the importance of shared resources and expertise. However, fish collection presents challenges, from cost considerations to navigating government procurement processes. Collaboration needs include establishing new partnerships, accessing fishing and life history data, securing funding and logistical support, exploring DNA processing for species identification, and collaborating with Guam partners for data sharing. Our historical life history research in the CNMI has yielded valuable insights into the dynamics of commercially important fish species. To enhance our understanding and contribute to the sustainability of marine ecosystems, we emphasize the importance of avoiding duplication of work, contributing to fish life history knowledge, and assessing impacts on fish populations. Through continued collaboration, we strive to address complex research questions and work towards a shared goal of sustainable fisheries management.

9:30	Josefa Muñoz, University of Hawai'i at Mānoa and NOAA Fisheries Pacific Islands Fisheries Science Center (virtual)	Alexander R. Gaos (NOAA Fisheries PIFSC), Camryn D. Allen (NOAA Fisheries PIFSC), Shaya Honarvar (University of Hawai'i at Mānoa Pacific Cooperative Studies Unit), Jessy R. Hapdei (Jessy's Tag Services), Shelbie K. Ishimaru (NOAA Fisheries PIFSC), T. Todd Jones (NOAA Fisheries PIFSC), Brian W. Bowen (Hawai'i Institute of Marine Biology), Summer L. Martin (NOAA Fisheries PIFSC)	Guam's green sea turtles exhibit differences in inter-nesting movements and post-nesting migrations into the Western Pacific	<p>Understanding the inter-nesting movement and reproductive migration of sea turtles is crucial for international and local conservation, especially in the data deficient Central West Pacific (CWP) Distinct Population Segment (DPS), where green turtles (<i>Chelonia mydas</i>) are listed as endangered under the Endangered Species Act. Within the CWP, Guam and the Northern Mariana Islands are the only U.S. Territory and Commonwealth, respectively, where green turtle nesting occurs and currently no data are available on the spatial ecology of Guam's nesting females. Further, there are limited studies available on the inter-nesting movements of green turtles in general, especially using high-precision GPS satellite tags.</p> <p>We equipped 18 nesting females with Fast-loc GPS satellite tags on five of Guam's beaches from 2016 to 2023 to elucidate their inter-nesting movements and post-nesting migrations. We observed three movement patterns during the inter-nesting period and four different end locations following the turtles' post-nesting migration.</p> <p>First, 13 of the 18 turtles exclusively used inter-nesting habitats adjacent (i.e., <2 km) to their nesting beaches. Second, turtles (n = 4) demonstrated more vagile behaviors, traveling ~20-35 km along the coast of Guam to areas near other nesting beaches. Third, one turtle was observed traveling 238 km to a nesting beach on Saipan, where it remained for 69 days before traveling back to Guam. It resided in Guam an additional 16 days and migrated to Indonesia. Combined, these findings highlight the importance of marine habitats adjacent to nesting beaches for females nesting at various locations. Seventeen of the 18 turtles departed Guam after completing oviposition, traveling to multiple countries in the Western Pacific, including the Philippines (n = 11), Japan (n = 3), Indonesia (n = 2), and the Spratly Islands (n = 1). Of the 18 tagged females, one turtle was non-migratory, only traveling from its nesting site on Guam's west coast to the island's eastern side.</p> <p>Guam's nesting green turtles exhibit variability in their inter-nesting and post-nesting movements. Despite these differences, our findings illustrate the importance of particular nearshore habitats around Guam and the Mariana Archipelago, as well as the need for international approaches for green turtle management in the Western Pacific.</p>
10:15	Dr. Romina King, University of Guam (virtual)		Takeaways from the Hawai'i and U.S. Affiliated Pacific Islands Chapter of the Fifth National Climate Assessment	
10:30	Zachary B. Williams, Pacific Coastal Research & Planning	Becky Skeelee and Robbie Greene, PCRP	Building Community Resilience through Agroforestry & Invasive Species Control in the CNMI	<p>Beginning in 2024, the U.S. Forest Service' Urban & Community Forestry Program will fund a multi-year effort led by Pacific Coastal Research and Planning (PCR) to transform both public and private lands in the Commonwealth of the Northern Marianas Islands into functional, healthy green spaces. A historic investment by USFS in the CNMI, the vision entails an environment dominated by native and non-invasive species, producing food for families and communities, while simultaneously boosting local capacity to expand resilient landscapes. A series of forestry projects will be implemented through collaborations between PCR, the Rota Forestry Program, Northern Marianas College (NMC) Cooperative Research, Extension & Education Services (CREES), and the greater CNMI community. These projects range from invasive—e.g. African tulip (<i>Spathodea campanulata</i>)—and hazardous tree removal, agroforestry professional development, expanding tree nurseries on Saipan and Rota, and urban forestry utilizing native and select fruit tree species in public spaces such as schools and parks, homestead lots and other private lands. The projects place an emphasis on building food security and community resilience in the face of natural disturbances and a changing climate, and aim to not only put trees in the ground but to put food on the table. At this early stage, PCR seeks to foster awareness and dialogue to ensure efforts are collaborative, place-based, and endogenous to the CNMI community.</p>
10:45	Dr. Elliott Parsons, Pacific RISCO/Pacific Islands Climate Adaptation Science Center at the University of Hawai'i at Mānoa (virtual)	Andrea Bias, Micronesia Conservation Trust Bradley Eichelberger, Commonwealth of the Northern Mariana Islands (CNMI) Division of Fish and Wildlife, Department of Lands & Natural Resources Chelsea Amott, Hawai'i Department of Land and Natural Resources, Division of Forestry & Wildlife Glenn Dulla, Western Pacific Tropical Research Center, University of Guam	Using Scenario Planning as a Tool to Adapt Invasive Species Management to a Changing Climate in the US Pacific	<p>Climate change indicators for the Mariana Islands include increases in surface-air temperature and shifts in rainfall, and increases in the risk and severity of climate-related disturbances including wildfire, drought, and typhoons. These expected changes are likely to alter the distribution and abundance of invasive species, which already have a significant negative impact on the sustainability and resilience of Pacific Island communities. Yet our understanding of how established nonnative species will respond to a changing climate is limited in the Pacific region, which reduces our ability to plan and implement adaptation strategies. In 2023, the Pacific Regional Invasive Species and Climate Change Management Network (Pacific RISCO), which is dedicated to exploring and addressing the intersection of climate change and invasive species in the US Pacific, led a scenario planning workshop at the Hawai'i Conservation Conference to address this gap. Based on the US National Park Service Climate Response Program scenario-planning model and portfolios created by the Pacific Drought Knowledge Exchange, the workshop sought to chart out how the distributions, abundance, and impacts of selected invasive species would likely shift for two different climate change scenarios and five sites across the Hawaiian Islands. The workshop resulted in productive conversations about climate change, strengthened manager-researcher relationships, and lists of key invasive species along with expectations of how they are likely to change with shifting future conditions. This workshop model could be used similarly in the Mariana Islands and elsewhere in the Pacific to help advance climate adaptation planning for invasive species, especially where uncertainty regarding future impacts is high, and where a lack of tools and resources limits planning options.</p>
11:00	Eise Demeulenaere, University of Guam Center for Island Sustainability and Sea Grant	Caley Chargualaf (UOG/CIS), Jay Gutierrez (DOAG), Jeff Quitugua (DOAG)	Identifying Conservation Strategies for the covered species under the Guam Habitat Conservation Plan	<p>The Guam Habitat Conservation Plan (Guam HCP) has been two years in the making. The Guam Department of Agriculture, in collaboration with the University of Guam Center for Island Sustainability and Sea Grant and ICF, is developing the Guam HCP. This conservation tool will protect and conserve threatened and endangered species and their habitats and support Guam's biological and cultural heritage for future generations while facilitating sustainable economic development and regulatory streamlining. In collaboration with Guam's government agencies, various interest groups, and the community, the Guam HCP development team identified the covered species and activities for the HCP and developed conservation strategies for each of the species. The team also identified ecosystem and landscape goals which are centered around a reserve network that will protect these species and their habitats in perpetuity. The HCP aims to protect Guam's most valuable ecosystems but will require developers to protect these species through avoidance, minimization, and mitigation measures included in the HCP. As part of our outreach, we continue to share the details of this plan, bring awareness and welcome input from the conservation community to ensure input on the plan that can be incorporated into its development. It is crucial that we receive feedback from you all to ensure this plan represents the interests of the people of Guam.</p>
11:15	Maria Hernandez May, Hita Litekyan, Bertha Foundation	Aaron Bejado, Stel Star Productions	For Love of Water	<p>Produced over the course of a year as part of a Bertha Foundation fellowship project, "For Love of Water" is a three part documentary series that explores how finite water resources are in the Pacific region and how the relationship between politics and profit have impacted those preservation efforts. The series highlights risks to Guam's water resources and how Guam's political status as an unincorporated territory of the United States makes the island vulnerable to projects that harm its natural and cultural resources. The second film spotlights community organizers across the Mariana Islands and Hawai'i who center water preservation in their advocacy work; and the third film has a particular focus on historical contamination in Guam's wetlands and lagoon and links to health problems within the community.</p>

11:30	Monaeka Flores, Prutehi Litekyan Save Ritidian (PLSR) and Isa Arriola, Our Common Wealth 670 (OCW 670)		Growing the Grassroots: Responding to Militarization in the Mariñas	Communities throughout the region historically and currently face numerous harmful impacts from U.S. military construction projects, operations, and exercises. Noise and air pollution, soil and water contamination, extinction and destruction of protected species including traditional medicines, occupation and desecration of Native land and sacred areas are just a few of these impacts. Several community groups have led many efforts and are engaged in multiple approaches including legal strategies, local advocacy campaigns, researching and developing educational resources, and bridging regional and international solidarity over our many connected challenges related to militarization, colonization, and the climate crisis. This session will address how two local organizations in Guam and the Commonwealth of the Northern Mariana Islands work to address these issues from the grassroots to government, and beyond. Two organizations Prutehi Litekyan: Save Ritidian from Guam and Our Common Wealth 670 from Saipan have worked and collaborated to support public engagement and critical analysis around environmental harms attributed to various projects and activities from Guam, Tinian, Palau, Palestine, and more. Our Common Wealth 670 (OCW 670) is an Indigenous-led non-profit in the Northern Mariana Islands. Their goal is to ensure that our ancestral lands, seas, and skies are protected from irreparable damage by harmful developments that may pose a threat to our cultures and environments. Prutehi Litekyan: Save Ritidian (PLSR) is a community-based organization dedicated to protecting and preserving the natural and cultural resources of Guam. This includes the areas proposed to be used for relocating U.S. Marine Corps forces currently located in Okinawa, Japan to Guam, and for military live-fire training. Some projects of focus for PLSR and OCW 670 include campaigns for the Guam EIAMD Missile Defense System, the F-15 Beddown and Infrastructure Upgrades at Andersen Air Force Base, the Tactical Multi-Mission Over-the-Horizon Radar Transmitter Facility, Babeldaob Island, and catastrophic atrocities in occupied Palestine. PLSR is also part of two lawsuits with representation from the Center for Biological Diversity and Earthjustice. The lawsuits are related to the Live-Fire Training Range Complex and open burning and open detonation of military hazardous waste munitions in Guam.
11:45	John Gourley, Micronesia Environmental Services	none	The Antiquities Act of 1906 - Tyrannical Conservation in the Western Pacific ?	Aren't all conservation efforts supported by those who really care about our natural resources? What if the decision-making power to designate protected conservation areas is held by one person who doesn't need permission from the US Congress, State Governors, or affected communities? Could these circumstances be considered tyrannical conservation? National marine monuments are created unilaterally by Presidential Proclamations using the authority of a 117-year-old Congressional Law that was passed specifically to protect culturally valuable native American burial sites on Federal Lands from looters and grave robbers. Only in the past 17 years has the Antiquities Act of 1906 been used to designate national monuments wholly in marine environments. Marine national monuments have been designated throughout the Western Pacific in the EEZs of Hawaii, American Samoa, Guam, and the CNMI. We will examine the designation of marine national monuments across the Western Pacific from 2006 to present by three US Presidents and show how the Western Pacific islands were affected. We will also explore potential reasons why the Western Pacific has been a target for marine national monuments. The presentation will conclude with a short statement on the 14-year-old Mariana Trench Marine National Monument.
13:30	Mayor Taisacan, Northern Islands Mayor's Office		Current status and future plans for northern islands villages and residents	
13:45	Willson Gaul, Northern Marianas College/Lee Roy Sablan, CNMI Division of Fish and Wildlife		Insects in the Northern Islands	We will summarize results of insect sampling from the islands north of Saipan. Insect samples were collected by CNMI Division of Fish and Wildlife personnel over multiple years. We present findings about invasive insects, endemic insects, and overall sampling effort in the Northern Islands, as well as knowledge gaps.
14:00	Héctor Torrado, University of Guam Marine Lab (Virtual)	Joe Proietti, Mikay Reuter, David Combosch, University of Guam Marine Lab	Population Genetics of <i>Porites</i> rus Across the Mariana Archipelago	Understanding population genetic patterns in reef-building corals is important for understanding the biology of a species, and for informing conservation practices. However, population genetic patterns, such as connectivity and genotypic diversity, can vary dramatically between species and environments, and are unknown for most coral species. Coral population genetics has never been studied on an archipelago-wide scale in the Mariana Islands, and no population genetic study has been performed on the important coral species <i>Porites</i> rus. In this study, we quantify genomic patterns within and among populations of <i>P. rus</i> in the Mariana Archipelago. A low coverage whole genome resequencing approach was used to generate site-frequency spectrums and a SNP dataset based on genotype likelihoods in ANGSD. We found similar levels of heterozygosity and inbreeding when comparing populations, but differences in the number of clones among and within islands. Among populations, we show direct evidence of related individuals on different islands, and quantify small amounts of population structure based on geographic distance between populations (isolation-by-distance). This research is the first assessment of <i>Porites</i> rus population genetics, and the first archipelago-scale connectivity research in the Mariana Islands. It provides basic information about the species and the area, and may be beneficial for conservation of coral reefs in the Mariana Archipelago.
14:15	John Bender, Pacific Bird Conservation		Applying knowledge of bird diets	Species translocations are a relatively new, but increasingly common, tool in the conservation toolbox. Translocations seeking to start a new population outside of the native range present technical and logistical challenges, and have mixed records of success. Although recipient locations are chosen because they are thought to be ecologically similar to the source locations, biotic and abiotic factors are often impossible to replicate for a variety of reasons. First, understanding the diet in the source location remains a challenge, as most information comes from opportunistic observations and is at broad taxonomic levels (e.g. insects). Variation across individuals and seasons is often unknown, as is an understanding of how community composition influences diet. Second, species may have high plasticity in their resource use, such that they consume different food items in the new location than in their source location. Understanding whether and how species' diets shift after translocation will help managers plan future translocations. With the advent of dietary DNA metabarcoding, a much deeper understanding of species diets is possible. Bird translocations from Saipan, Tinian, and Luta to Northern Islands have been occurring in the CNMI since 2006, to create assurance populations in case the Brown Treesnake reaches the southern CNMI islands. This ambitious program provides an opportunity to improve the success of translocations for conservation managers across the globe. To gain a better understanding of diet composition across species and islands we collected fecal samples of individual birds across Luta, Saipan, and Guguan in both the dry (January - June) and wet (July - December) seasons. Guguan samples include both resident species, and translocated species (Totut, Nosa', and Cuchurikan Tinian). We aim to collect additional samples from Saipan, Luta, Guáhan, and Agrihan in 2024. Using DNA metabarcoding we will characterize the diet of these species, and explore how season (wet vs dry), island (and the associated bird community), and typhoons impact diet. We will also compare diet between the species' native and translocated range. We present preliminary results on arthropod species found in fecal samples of birds on Saipan and Rota in Spring of 2022. Overall, we aim to develop a practical and comprehensive approach to integrating dietary information into translocation decision-making.

14:30	Buck Jolley/Charlene Hopkins, USDA Wildlife Services		Feral ungulate populations on Alamagan	
14:45	Ellie Roark, CNMI Division of Fish and Wildlife		Marianas Avifauna Conservation Plan update: new data from Automated Recording Units	The remote, unpopulated or sparsely populated islands north of Saipan in the Mariana archipelago, referred to as the "northern islands," play an important role as a potential refuge for species at risk of disappearing from the human-dominated landscapes of Saipan, Tinian, and Rota. The Division of Fish and Wildlife (DFW) and its partners have developed a translocation program to move at-risk species to the northern islands to create redundant populations should the species disappear from its current range due to the introduction of the Brown Tree Snake or other anthropogenic threats. At previous MTCC events, we have reported preliminary results about the status of translocated species from follow up surveys to the northern islands. Here, we report additional results on the status and distribution of translocated birds derived from a pilot deployment of Automated Recording Units on Alamagan.
15:00	Panel Discussion			
15:30	James Bamba, Lino Olopai, Moñeka De Oro, Leo Pangelinan, Jun Coleman, Melvin Faisao, Frances Sablan and Cecilio Raiuk			
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Friday, March 1st				
8:30	Kevin Labrador, Texas A&M University - Corpus Christi (Virtual)	Eric Garcia (TAMU-CC); Yajuan Lin (TAMU-CC); Christopher E. Bird (TAMU-CC)	Optimizing Environmental DNA (eDNA) Preservation for Marine Biomonitoring in the Tropics: A Case Study from Rota Island, CNMI	Environmental DNA (eDNA) metabarcoding is a promising, non-invasive biomonitoring tool with the capacity to rapidly survey marine biodiversity across taxa using environmental samples, and it presents a valuable opportunity to augment large-scale biomonitoring initiatives. However, the utility of eDNA metabarcoding is challenging in resource-limited remote areas wherein shipment of samples to overseas facilities for processing and analysis is necessary. Preservation and storage often result in DNA degradation which can affect the biodiversity detected by eDNA metabarcoding. Studies across several research groups have concluded that (1) cold storage, (2) commercially manufactured tissue lysis buffer (TL buffer, Omega Bio-tek; Buffer ATL, Qiagen), and (3) DMSO-EDTA-salt (DESS) are at least as good as more hazardous preservatives such as ethanol which pose shipping issues; however, this combination of preservatives has not been directly compared previously. Further, few studies have investigated the impacts of preservation methods on eDNA samples from remote tropical marine environments. Here we present on the differences in eDNA filtered from the seawater surrounding Rota Island, Commonwealth of the Northern Mariana Islands (CNMI) and preserved using cold storage, TL buffer, or DESS before being shipped to the Genomics Core Laboratory at Texas A&M University – Corpus Christi for processing in November 2023. We hypothesized that eDNA yield and quality will differ as a function of the preservation treatments due to the distinct interactions between the preservatives, the filtered eDNA, and the DNA isolation protocol. The outcomes of this study can help identify the most effective tropical marine eDNA sampling and preservation protocols. This study contributes to a broader investigation comparing reef sites with varying potential resiliency on Rota using eDNA metabarcoding.
8:45	Jude Martinez, NAVFAC Marianas	Naval Information Warfare Center Pacific (NIWC Pacific)	Effects of non-permitted buoys on JRM submerged lands in Guam	<p>Coral reefs provide physical protection for coastal communities and infrastructure by dispersing wave energy. Anchoring on coral reefs can cause significant damage by physically destroying the surrounding benthic habitat (Maynard 2008, Flynn and Forester 2019). Additionally, physical disturbances can fragment some coral species, occasionally resulting in asexual propagation (Highsmith 1982), or stress which may lead to more severe outcomes such as increasing disease incidence (Lamb et al. 2014), or impairing recovery from heat stress events (Bonesso et al. 2017). Therefore, systems should be implemented to avoid, minimize, or mitigate physical damage to coral reefs caused by vessel anchoring.</p> <p>This study captured the intensity and magnitude of marine recreational use in Guam at various locations within Apra Harbor, Orote Ecological Reserve Area (ERA), and Dadi, where many non-permitted buoys (NPBs) have been installed for use by recreational vessels. It is also the first to incorporate the physical removal of NPBs and document the associated impacts to corals. During our observations in July 2021 and May 2023, we found that the quantity of NPBs was greater than the quantity of permitted shallow water mooring system (SWMS) buoys indicating that the marine recreational demand for mooring sites is greater than the current supply of permitted SWMS buoys.</p> <p>Our results demonstrate that NPBs are damaging corals through methods lacking ecological habitat assessments, or legal permitting by the United States Army Corps of Engineers (USACE), prior to installation. In support of the Joint Integrated Natural Resources Management Plan (JRM INRMP), this project is mitigating further damage to marine resources and assisting with removing navigational hazards occurring in, or around, JRM-administered submerged lands. This study is actively contributing to the JRM efforts to protect the marine ecosystem and provide access to popular recreational sites, while also conserving the marine resources in Guam's coral reefs.</p>
9:00	Jonelle Sayama, University of Guam, NASA Guam Space Grant	Dr. Romina King, University of Guam, NASA Guam Space Grant	Geospatial modeling of Guam's mangroves using Unmanned Aerial Systems (UASs)	Mangroves are susceptible to climatic changes and land use alterations due to its existence in a zone with varying management priorities and increasing human activities. Being of utmost importance for coastal protection, marine ecosystems, and for biodiversity purposes, monitoring is necessary to ensure mangrove protection, effective management, and to better understand their current state. In terms of analyzing spectral data of mangroves in Guam, satellite-based imagery (2014 World View 3) is currently available (upon paying); and airborne LiDAR datasets are available for canopy heights analyses. This exploratory thesis used unmanned aerial systems (UASs) to collect spatial data of mangrove forests in Guam, resulting in a high-resolution orthomosaic, a canopy heights model created using Structure for Motion (SfM), and a preliminary health assessment of the mangroves stands in Merizo, Guam. These methodologies utilized in this project were successful in producing a high-resolution orthomosaic (RGB) but insufficient in calculating an accurate canopy height model for mangrove monitoring. The heights were compared to the observed values in an accuracy assessment and the RMSE was calculated at 1.92 m. Under the assumption that a value closer to 0 indicates higher accuracy, this indicates that the height measurements from the canopy heights model derived from SfM were statistically different from in-situ height measurements. Since RGB sensors cannot penetrate the canopy to receive crucial structural measurements, LiDAR sensors should be considered due to their ability to pierce through gaps in the vegetation. The NDVI values are shown primarily near or equal to the value of 1, indicating healthy mangrove areas. This data provides baseline health data for future monitoring missions. This research found that overall, UAVs should be seriously considered to regularly supplement traditional in-situ fieldwork methods but cannot replace in-situ monitoring yet. Results from this project produced unprecedented high-resolution, georectified imagery, which can be valuable for long-term monitoring of change over time and a potential tool for mangrove observation and management.

9:15	Kianna Reyes, CNMI Department of Lands and Natural Resources	Christopher D. Pangelinan, Mary Fern Arena	Coastal Erosion Along the Western Coast of Saipan	<p>A recent analysis of beach erosion on the West-facing beaches of Saipan studied 49 transects across numerous coastlines and recreational areas. Results uncover a mixed picture of stability, improvement, and loss. Of the 49 continuing transects examined, 21 (42%) indicate stability, predominantly located further from the main tourism centers around Killili Beach, Pak Pak, and Sugar Dock. However, 12 (24%) exhibit ongoing erosion, clustered near high-traffic resorts near Micro Beach, where recreational activities collide. Some positive signs appear, with 10 (20%) of transects documented to be accreting sediment, potentially reflective of influences like storm drainage structures and strong channel movement. Yet, with heavy development correlating to the greatest instability, examined data suggests human pressures are taking a gradual toll on Saipan's most beloved beaches. Targeted impact reduction is urgent to ensure that the longevity of cherished recreation sites is not increasingly vulnerable to erosion over time - with 1 in 4 surveyed transects retreating landward and more still undetermined pending further study of these changing shorelines.</p> <p>Conclusions Out of the 49 documented western Saipan transects, 33 (67%) showed either stability (21 transects) or net accretion of sediment (10 transects) as the prevailing condition. In comparison, 12 transects (24%) are known to be definitively eroding at present, indicating that most surveyed sites across various shoreline recreational areas and resorts continue to demonstrate resilience thus far. However, continued vigilant shoreline monitoring remains essential, as transects with undetermined erosion status and visible hotspots confirm the gradual impacts of heavy beach usage - providing data to inform balanced coastal management strategies allowing both development and conservation to protect these treasured recreational shorelines prevailing in stability for now but vulnerable without thoughtful policies informed by ongoing tracking.</p>
9:30	Nicholas Robie, CNMI Division of Fish and Wildlife	Nathan Van Ee, Division of Fish and Wildlife	Spatial Modeling is Foundational for Ecosystem- Based Fisheries Management: A Case Study From Saipan's Lagoon	<p>Small-scale artisanal fisheries are a basic component of coastal communities that sustain the economy, culture, and human health. Despite their importance, local fisheries are severely understudied, often unregulated, and not effectively supported by traditional top-down management. In Saipan, the largest island in the Commonwealth of the Northern Mariana Islands (CNMI), an extensive western lagoon serves in this role to support a population of roughly 50,000 people. The lagoon harvest is an important source of sustenance for the island and is responsible for ~77% of the predominant coral reef fishery. Despite its value, there is an inadequate understanding of fishery changes following reports of severe habitat degradation during the 2013, '14, '16, and '17 bleaching events. To close this knowledge gap, a habitat-stratified random sample design was used to survey 172 randomized points in the southern and central lagoon areas. At each point, fish were identified, counted, and visually sized while images of benthic composition were taken to be estimated ex situ. Using total biomass, abundance, and diversity as ecosystem indicators, we developed spatially explicit models to demonstrate key areas of management significance. This information, in concert with other cultural, economic, and ecological knowledge, can be used to develop data-driven policies that promote natural resource health. Visualization products via spatially explicit models offer a uniquely intuitive perspective to ecosystem managers and community members alike, one that is foundational for informing holistic management in under-researched areas.</p>
9:45	Brett Taylor, University of Guam Marine Lab (virtual)	Peter Houk, UOGML; Jay Gutierrez, Guam Division of Aquatic and Wildlife Resources; Brent Tibbats, Guam DAWR; Jason Biggs, Guam DAWR	Data-rich population assessments for target coral- reef fisheries species of Guam	<p>While much research has been conducted on Guam's coastal fisheries over the years, there has been less work dedicated to conducting fish population assessments that can be used to generate species-based management policies. In lieu of species-based policies, marine protected areas (MPA) and gear restrictions have become focal points of fisheries management that aim to provide broad protection for coral-reef fisheries. While studies have shown policies have been effective in some instances, declines in Guam coastal fisheries through time continue to be reported along with growing geographic gradients that translate into variable landings and fish sizes. The more accessible western reefs have lower abundances and smaller sizes compared to the wave exposed eastern reefs that are only accessible intermittently. Meanwhile, two other primary stressors to Guam fisheries exist in the forms of land-based pollution and climate change disturbances that appear to have secondary, negative impacts to fisheries resources. In sum, the limited nearshore habitat around Guam coupled with the large and growing human population continue to put a strain on fisheries resources.</p> <p>In response, Guam's political leadership has formed a stronger partnership with the natural resource management agencies. Evidence comes from the recently passed bill to ban SCUBA-spearfishing that has been a very contentious topic for over 30 years, despite its known threat to viable reef fish populations. Currently, there is a desire to improve assessments for target species as part of an ongoing fisheries management planning (FMP) process. Here, we present the framework and preliminary findings for one recent collaboration between DAWR, NOAA Fisheries, and UOGML scientists that have performed higher-resolution species assessments using a large suite of available fisheries-dependent and fisheries-independent data from many sources. Using data from diverse sources has facilitated a consensus approach towards species assessment and led to two broad classes of management recommendations. Approximately 75% of the analyzed species have shown significant size and/or biomass reductions through time, across environmental gradients, and/or across management regimes. Species responses will be discussed and the results will feed into the evolving Guam Fisheries Management Planning process that is planned for 2024.</p>
10:00	Rodney Camacho, Division of Coastal Resource Management		CNMI State of the Reef	<p>The State of the Reef report summarizes activities conducted within the long-term marine monitoring program under the Division of Coastal Resources Management from 2020-21. Within the program, the marine monitoring team (MMT) completed > 55 field surveys encompassing coral reef, seagrass, and boulder habitat across the Northern Marianas Islands, including: Rota, Aguijan, Tinian, Saipan, and Pagan. Overall, coral reefs in the CNMI are still recovering from previous mass bleaching events that caused mass coral mortality. In particular, forereef areas around Saipan and Rota have had continued decline in live coral cover due to crown-of-thorns starfish (COTS) predation during outbreaks that began in 2019. The MMT has since documented COTS densities 48x higher than the average recorded over the past twenty years. In 2021, the MMT observed a decline in reported outbreaks, but are continuing surveillance and eradication efforts as needed.</p> <p>Since there has been a break in bleaching events since 2017, coral recovery has been noted at several sites including lagoon areas outside of Marianas Resort and San Antonio back reef. However, Staghorn corals, which decreased by 30.6 – 98.7% in the past ten years, have yet to recover at most of the lagoon reef sites. Seagrass cover in Saipan Lagoon is stable or increasing for many areas. However, a sharp decline in seagrass has been noted at several sites along the shoreline, such as Hafa Adai Drainage and 13 Fish Halodule. These two sites are located outside of the Garapan watershed area, and may be vulnerable to land-based sources of pollution.</p> <p>In June 2021, the MMT was invited to join a multi-agency effort to survey Pagan's natural resources. Surveyed areas were comprised of boulder and fringing reef habitat along the west and north side of the island. The MMT documented 93 species of corals, and were able to revisit sites previously surveyed in the summer of 2014, when a mass bleaching event occurred. Unfortunately, live coral cover at revisited sites dropped from 13% to 8% cover, a decline of 38% since 2014, indicating that Pagan has yet to recover from previous coral bleaching events.</p>

10:30	Kami Fox, Fort Wayne Children's Zoo		Veterinarians and Field Conservation	As trained experts in animal health, veterinarians can be an impactful asset to field conservation projects. Assessing an animal's fitness for handling, sample collection, translocation tolerance, and potential reproductive potential is best achieved with a complete physical examination. Disease monitoring, identification, and risk assessment can also be invaluable, especially when considering the translocation of species. Responsible translocations not only prioritize identifying suitable habitat, but the movement of healthy animals, which can thrive post-release and not pose any risk to existing wildlife. In order to accomplish this, health assessments and diagnostics are necessary data to collect. Some of the samples needed for this can be obtained in the field, such as blood, feces, and gross histology evaluation. Safe sample collection for accurate data output is an important skill that veterinarians possess. Therefore, partnerships between field biologists and veterinarians can lead to well-developed biosecurity plans and research goals, especially related to animal health. This can be essential for mitigating any disease transfers. Lastly, and perhaps most obviously, veterinarians are prepared to handle emergencies and treat any trauma or illness that is identified. Although some technical skills can be taught, the extensive knowledge and experience that veterinarians possess, allow for preparedness for the unexpected. Vets are not only skilled when all plans are implemented perfectly, but are also expert problem-solvers. Animal species field conservation projects can, therefore, benefit from the expertise of veterinarians and their broad, yet specialized, skillsets.
10:45	Maureen Kelly, School of Veterinary Medicine and Biomedical Sciences, Texas A&M University (Virtual)	Kris Anderson, Equine Mobile Veterinary Services, Santa Fe, TX, 77510, USA Christine M. Budke, Department of Veterinary Integrative Biosciences, School of Veterinary Medicine and Biomedical Sciences, Texas A&M University, College Station, TX, 77843, USA Guilherme G. Verocai, Department of Veterinary Pathobiology, School of Veterinary Medicine and	Vector-borne pathogens in dogs from Saipan, Northern Mariana Islands	Canine vector-borne diseases (CVBDs) are illnesses caused by pathogens transmitted by blood-feeding arthropods such as ticks and mosquitoes. Many CVBDs, including heartworm disease, anaplasmosis, and ehrlichiosis are globally distributed and may cause a variety of clinical manifestations in dogs. Various pathogens that cause CVBDs are zoonotic, making epidemiological surveillance a joint veterinary and public health effort. In this study, we investigated the frequency of four pathogens from dogs on the island of Saipan, Northern Mariana Islands, a US Commonwealth in the western Pacific Ocean. Blood samples (n= 443) were collected from client-owned, owner surrendered, and shelter dogs that participated in an island-wide spay-and-neuter event from May to June 2023. All samples were assessed using the IDEXX SNAP® 4Dx® Plus, a validated test to detect the antigen of the mosquito-borne D. immitis and antibodies against three tick-borne pathogens, namely Anaplasma spp., Ehrlichia spp., and B. burgdorferi. Overall, 67.7% (n=300/443) of dogs tested positive for at least one pathogen. Among dogs that had a single pathogen, Ehrlichia spp. was most frequently detected (20.0%; n=89/443), followed by Anaplasma spp. (7.2%; n=32/443), and D. immitis (3.6%; n=16/443). For co-detection of two or more pathogens, Ehrlichia spp. + Anaplasma spp. had the highest frequency (25.9%; n=115/443), followed by Ehrlichia spp. + D. immitis (2.4%; n= 11/443), Anaplasma spp. + D. immitis (1.3%; n= 6/443), and Ehrlichia spp. + Anaplasma spp. + D. immitis (6.9%; n=31/443). We analyzed risk factors that could be associated with seropositivity to these CVBDs, including ownership status, age, sex, and location. Our opportunistic sampling shows a high seropositivity of vector-borne pathogens in a dog population living in a poorly studied, insular US territory. Studies like this will help implement strategies for prevention and control of these CVBDs and provide a stronger understanding of associated risk factors using a One Health approach.
11:00	Phil Cannon, USDA Forest Service	Ned Klopfenstein (USDA Forest Service), Mee Sook Kim (USDA Forest Service), Jane Stewart (Colorado State University), Chia-Lin Chung (National Taiwan University).	Phellinus noxius root rot of Trees in CNMI	Phellinus noxius root rot kills many tree species in Saipan, Rota, Guam and other islands of the Western Pacific. In the early 1980s, Dr. Juaquin Tonorio, then the leading Forest Entomologist on Saipan, found that many Flame Trees (Delonix regia) were dying near the Saipan International Airport. He asked Dr. Charles Hodges of the USDA Forest Service to come and inspect these trees and together they determined that these flame trees, and a few other species of trees, were being killed by the root rot fungus Phellinus noxius. Two decades later, a second push was begun to learn much more about this disease. As a result of these efforts, Phellinus noxius has now been found on almost all major islands in the western Pacific region including many additional locations on Saipan, Guam and Rota and the fungus is recognized for its capacity to kill hundreds of different tree species with some of these tree species being killed very swiftly (eg breadfruit being killed in a matter of just months). Tropical storms, and especially typhoons, are extremely unpredictable, but these can significantly accelerate the development of new infection foci caused by this fungus. Via studies made in the field and in pathology labs with molecular genetics capabilities, much has also been learned about how this pathogen operates and also about cost-effective control measures that can be used to manage the fungus. Several of these control measures will be presented.
11:15	Alexander M Kerr, University of Guam Marine Lab		Colony Geometry Modulates Disease Severity in Colonial Organisms	Many marine invertebrates live together as clones in highly integrated colonies that display a bewildering variety of shapes. Explanations for colony shape have been framed primarily as a response to trade-offs in selection for structural integrity while maximising feeding, reproductive success or competitive superiority in fluid flow. For example, colony compactness in reef-building corals is correlated with increasing site exposure to waves, while feeding efficiency appears maximised at sites with intermediate flow. Less wave-resistant morphologies at locations with infrequent, but strong turbulence promote dispersal and vegetative propagation via colony fragmentation. In this study, I used analytical modelling and numerical simulation to explore how colony morphology mediates mortality from disease in reef corals. Spatially explicit polyp-based simulations indicate that colonies with simple morphologies (encrusting, plate-like and hemispherical) incur significantly larger disease lesions and higher disease prevalence than do erect, more complex (columnar, digitate and branching) forms given constant area, polyp-to-polyp transmission rate, and the arrangement and size distribution of polyps. These results suggest that colony shape, by modulating colony-level rates of mortality, are important for understanding the epidemiology of colonial organisms.
11:30	Kelly Mistry, University of Washington (Virtual)	Staci Amburgey, Washington Department of Fish & Wildlife; Amy Yackel Adams, USGS; Shane Siers, USDA; Sarah Converse, School of Aquatic & Fishery Sciences, University of Washington and USGS WA Cooperative Fish & Wildlife Research Unit	Dynamic Monitoring and Management of Brown Treesnakes: Modeling Removal Data to Identify Optimal Eradication Strategies	On Guam, the implementation of landscape-scale suppression of brown treesnakes (BTS; Boiga irregularis) with the goal of eventual vertebrate reintroduction is of increasing interest to agency and community partners, heightening the importance of decision tools that support these plans. Increasing success in the suppression of BTS populations, through the removal of snakes in traps, by hand, or via toxic bait, is driving the conversation about what frameworks can be developed to guide the decisions managers make to learn about (i.e., monitor) and impact (i.e., manage) BTS populations. There are many alternative approaches to both monitoring and management for BTS, leading to a large set of possible combined strategies. Experimenting with each of these strategies to identify optimal solutions for a given situation would take significant time and cost. To more efficiently determine optimal strategies that will maximize eradication impact while minimizing cost, we have developed a simulation-based computer model, informed by BTS data and expert consultation. This model can be used to test management strategy alternatives prior to implementation, including how much monitoring (in the form of removal data from traps or by hand) is required to minimize the level of uncertainty about the impact of the eradication strategy. It is a tool that can be used as part of an iterative adaptive management process, where predicted model results can be compared to real removal data in order to evaluate how well the eradication strategy is proceeding.

11:45	Ella L Norris, University of Guam	Rachel M. Volsteadt, Shane R. Siers (USDA-NWRRC, Barrigada GU)	Response of Brown Treesnakes to Aerial Suppression in Time and Space and a Novel Predation Threat Monitoring Method	The automated aerial delivery system (ADS) is being experimentally evaluated for landscape-scale suppression of Brown Treesnakes (BTS) on Guam. We sought to evaluate the efficacy of ADS suppression efforts in space and time in the 55-ha Habitat Management Unit (HMU, surrounded by a snake-proof barrier) and adjacent untreated forest in the Munitions Storage Area (MSA, unfenced). We analyzed rates of BTS live-lure contacts detected by camera-platforms as a proxy for relative BTS abundance. Our objectives were to: 1) evaluate trends in contact rates at a given camera location over successive nights; 2) observe differences in BTS contact rates between the HMU and untreated MSA; 3) determine whether contact rates varied spatially among subplots within the HMU and MSA; 4) describe differences in BTS contact rates across repeated ADS treatments; 5) assess the trend in BTS contact rates during prolonged delays in treatment; and 6) describe changes in BTS size distribution resulting from ADS treatment. Our results indicate that: 1) contact rates at a given location were lower for the first few nights but leveled off by the third or fourth night and remained stable for the rest of our 14-night trial periods; 2) contact rates were significantly lower in the HMU than in the untreated MSA; 3) contact rates varied significantly among some subplots within both study sites, but variance was greater in the MSA than in the HMU; 4) contact rates did not decrease significantly after one treatment but did after two successive treatments; 5) contact rates increased from roughly 1 to >3.5 nightly lure contacts over a 9-month pause in treatments; and 6) the size distribution of BTS was skewed higher in the HMU than in the MSA. Our results provide validation of the live-lure contact rate method as a tool for monitoring BTS relative abundance and predation threat in response to ADS applications. These monitoring and statistical analysis methods have applications in improving the efficiency and cost-effectiveness of wildlife management efforts, ultimately increasing our capacity for ecological restoration at ecologically meaningful temporal and spatial scales.
13:30	Marijoy Viernes, U.S. Geological Survey, Pacific Islands Ecosystem Research Center, Brown Treesnake Project	Melia Nafus1, William "Trey" Dunn2, Manny Pangelinan3 1 U.S. Geological Survey, Pacific Island Ecosystems Research Center 2 U.S. Fish and Wildlife Service 3 Commonwealth of the Northern Mariana Islands (CNMI) Department of Land and Natural Resources' Division of Fish and Wildlife	Brown Treesnake (BTS) Rapid Response Team (RRT) Mock Response in Saipan 2023	In an effort of early detection and rapid response (EDRR), the BTS RRT, comprised of agency personnel from the Commonwealth of the Northern Mariana Islands (CNMI) Department of Land and Natural Resources' Division of Fish and Wildlife (DLNR-DFW), U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service (USFWS), and Colorado State University (CSU) Center for Environmental Management of Military Lands (CEMML), conducted a mock rapid response in Saipan from October 16-31, 2023. The majority of individuals participating in this joint effort mock RR have received specialized BTS training in Guam. However, in order to better understand the importance of training, USGS intended to also evaluate the relationship between training and search image, as decision support for future RRT scenarios. The mock response set transects along roadsides and existing trails to conduct night visual searches and set snake traps in areas based on historically reported BTS sightings adjacent to critical ports of entry. Based on the best available science, BTS are not believed to be established on Saipan. However, reliance on public sightings alone may result in failure to detect incipient populations until they are well-established, given the nocturnal activity and cryptic coloration of BTS. In response to a reduction in biosecurity protocols following major typhoons in Saipan and on the basis of evaluating a new approach to EDRR, we believe this mock response was important for reevaluating the most effective operational strategy of the BTS RRT program.
13:45	Christiana-Jo Quinata, U.S. Geological Survey, Pacific Islands Ecosystem Research Center, Brown Treesnake Project	Levi Gray, School of Mathematical and Natural Sciences, Arizona State University; Marijoy Viernes, U.S. Geological Survey, Pacific Island Ecosystems Research Center; Eben Paxton, U.S. Geological Survey, Pacific Island Ecosystems	Estimating the effects of control techniques on brown treesnake activity in occupied yayaguak (Mariana swiftlet) caves	As the last remaining endangered forest bird with extant populations on Guam, yayaguak (Mariana swiftlet, <i>Aerodramus bartschi</i>), represent a species of significant conservation value. The only remaining population is known to colonize three caves located on land managed by the Department of the Navy (Naval Magazine) and has been a focal area for snake control over the past decade. The use of nocturnal visual surveys, live-traps, and toxicants has been the primary form of control applied to suppressing brown treesnakes (<i>Boiga irregularis</i> , BTS) for the benefit of yayaguak. Visual surveys remove snakes located in caves occupied by the birds, while trapping and toxicants have been applied outside the cave perimeter. Here, we present changes in BTS activity from removal efforts, as well as survival estimates and information on the proportional cave use of snakes captured in and outside the caves based on telemetry studies. We suggest that control is suppressing BTS activity in the caves and that there are resident snakes that may move between caves to use avian resources.
14:00	Kenneth Puliafico, Colorado State University Center for Environmental Management of Military Lands (CEMML)	Ashley Toves (CSU-CEMML), Jerome Perez (NAVFAC Marianas)	Large scale management of Little Fire Ants at Marine Corps Base Camp Blaz (Guam)	The development of the new Marine Corps Base Camp Blaz has included restoration of the former Andersen Air Force Base Southern Annex (Andy South) into an Urban Training Complex (UTC). This site is near the location where Little Fire Ants (LFA, <i>Wasmannia auropunctata</i>) were first detected on Guam in 2011. Historic, but illegal trash disposal in Andy South resulted in numerous LFA infestations scattered across the installation prior to the transfer of the property to the US Marine Corps. Beginning in 2017 CEMML and the University of Guam (UoG) conducted extensive surveys of the area and detected eight LFA infestations. After UoG successfully eradicated LFA in four of these areas, CEMML began management of the largest infestations in 2022 under the direction of the Marine Corps and NAVFAC-Marianas. Here we report on the progress and challenges of our eradication treatments of these large infestations, covering almost 81 acres of secondary limestone forest. The impacts of Typhoon Mawar needed new adaptive management strategies that allowed us to continue to suppress LFA despite the widespread devastation caused by the storm. Another 7.5-acre site is home to the endangered Guam tree snail, <i>Partula radiolata</i> , which has required close consultation with Department of Defense and the US Fish and Wildlife service. Finally, we are planning a ground-based eradication of the UTC's largest site, a 56-acre contiguous LFA infestation in dense tropical jungle that has required a significant logistical effort. Following a staged approach, we first completed detailed delineation surveys, established containment buffers around the site and will soon start a multi-phase treatment plan over the next couple of years to eradicate LFA from this area.
14:15	Michael Richardson, USFWS, Pacific Islands Fish and Wildlife Office	Christopher Rosario, Guam Department of Agriculture, Biosecurity Division; Jessi Mariano, Guam Department of Agriculture, Biosecurity Division; MJ Mazurek, USFWS, Pacific Islands Fish and Wildlife Office	Creating An LFA-Free Zone on	<p>Since it was first reported on Guam in 2011, the invasive little fire ant (<i>Wasmannia auropunctata</i>) has slowly spread across much of the island to become ubiquitous in many areas. Similar to impacts observed elsewhere, the little fire ant (LFA) now negatively affects human and pet health, agriculture, biodiversity, and the pursuit of conservation and recovery goals on Guam. In this presentation we will discuss a recent LFA control project on Guam that has tremendous conservation implications for areas currently infested with the ant and for those areas that are currently LFA-free.</p> <p>In perhaps the first documented occurrence anywhere of LFA invading a captive rearing facility for rare species, Guam Department of Agriculture staff in 2021, discovered the ant infesting the Guam rail (<i>Hypotaenidia owstoni</i>) (ko'ko') breeding facility in Mangilao. Early attempts to control the ant were unsuccessful and hampered by the devastating impacts of Typhoon Mawar in the spring of 2023. In November 2023, staff from the Guam Department of Agriculture, Biosecurity Division and the U.S. Fish and Wildlife Service Honolulu office, began a renewed, very thorough 8-month treatment of the facility including a buffer area. The goal is to create an LFA-free zone in a sea of surrounding LFA-infested tangantangan forest and adjoining mixed-use properties. This may be the first attempt of such an endeavor and differs from most incipient LFA eradication treatments in Hawaii and other localities where the ant is not firmly established. Initial results of this treatment appear promising, and we will discuss the protocol used here as well as the implications for the CNMI and other islands in the Western Pacific that are currently LFA-free.</p>