Instructions for Guam Vertebrate Restoration Expert Elicitation

Contact Hannah Sipe (sipeh@uw.edu) with any questions about this document

Timeline:

- Round 1 will be sent out July 31st/ August 1st and will be due on August 12th/August 13th
- Discussion meeting on August 14th/ August 15th over Zoom and online
- Round 2 will be sent out August 25th/August 26th and will be due September 8th/September 9th
- Discussion meeting will be held TBD

Instructions and steps:

Please do not consult others in the group when providing answers for Round 1 or Round 2. You can use other means available to answer questions, such as consulting literature, or drawing on your own experience or research. See the 'Resources to consult' section below for potentially helpful resources. Feel free to reach out with any questions that come up during any point in this process.

Round 1 – sent out July 31st/ August 1st.

1. You will be sent a link to a Google spreadsheet with questions on July 31st/ August 1st. Please answer all questions and return your answers by August 12th/August 13th. Please do not consult others in the group, as explained above, but you can use any other sources to inform your answers. Note that all answers will be shown to the group, but individual responses will remain anonymous.

2. Each question will ask you to provide estimates for the following questions:
    a. Realistically, what is your best guess for X?
    b. Realistically, what do you think the lowest possible value for X could be?
    c. Realistically, what do you think the highest possible value for X could be?
    d. How confident are you that your interval, from lowest to highest, contains the true value of X? Please enter a number between 50% to 100%.

3. Round 1 will be due by August 12th/August 13th.

Discussion meeting – held on August 14th/ August 15th.

1. Feedback: Once all the Round 1 responses are in, we will compile the groups responses in graphs like those in Figure 1 below. The graph shows elicited intervals for each individual and the average interval for the group. We will also provide a table with the elicited values and average group values. All values will be standardized to a 90% confidence interval, which allows us to easily compare values across experts.

2. Discussion: We will meet on August 14th/ August 15th to discuss the results from Round 1. During this meeting, we will again share the compiled results and have a discussion

about them. Discussion is an important stage in this process. Prior to this meeting, please allocate some time to looking over the compiled values and come ready to share your thoughts. It is valuable to disagree and debate during discussion, but make sure you are ready to share any sources or rationale that back up your argument.

3. After this meeting, the discussion will continue online through sharing thoughts on a Google Document showing the compiled results. Please contribute to the discussion from August 14th/ August 15th until August 25th/August 26th.

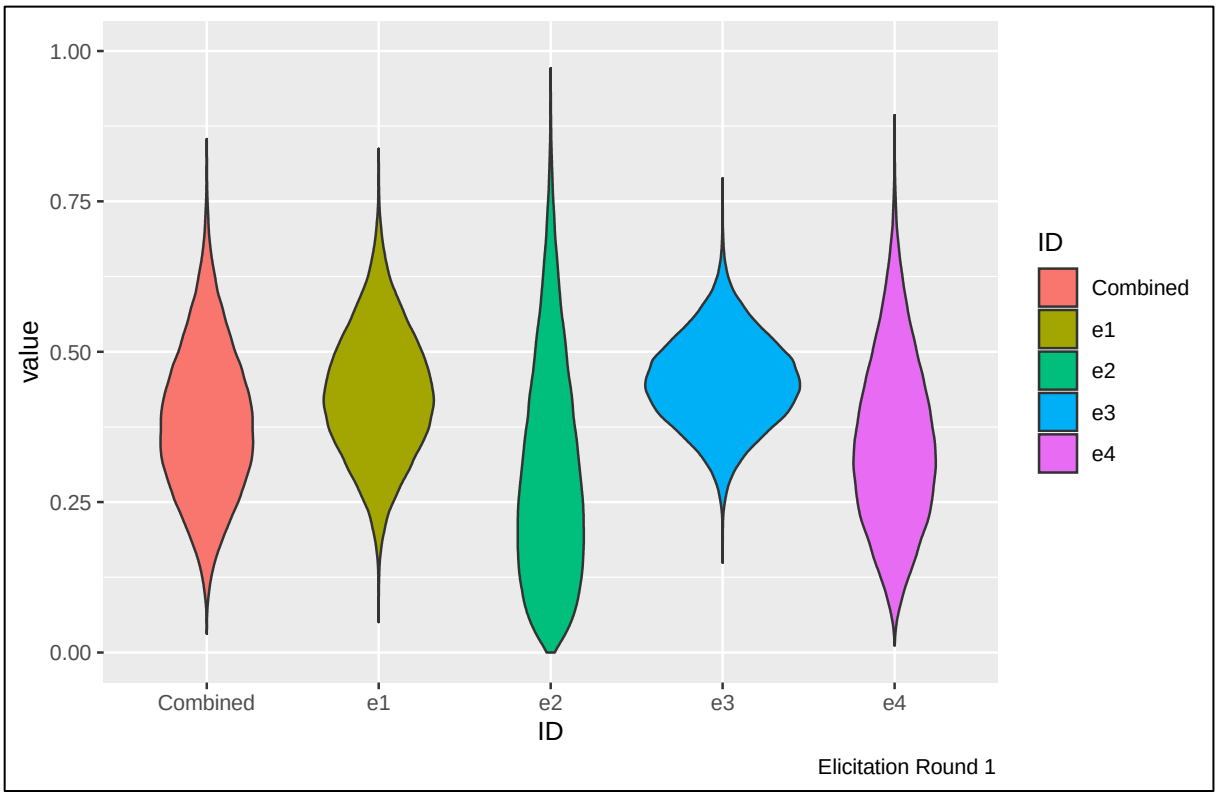

Figure 1. Example output showing individual responses from each expert and the combined group average, all standardized to 90% confidence interval.

Round 2 – sent out on August 25th/August 26th.

1. Following the discussion meeting, we will email out a second Google spreadsheet link for you to revise your answers in light of the group discussion. Consider any reasoning or information that came up during the discussion when revising your answers.
2. Round 2 is due on September 8th/September 9th.

Final analysis

1. Following the end of Round 2, we will aggregate the results. We will email final figures and tables out to the group. Unless we decide otherwise as a group, we will use those

answers as the final results. If the group prefers, we will conduct additional rounds of elicitation.

Resources to consult when answering questions:

- Resources with species demographic information can be found in the folder emailed to you, named 'Species References', or on the Google drive at this link: https://drive.google.com/drive/folders/19bFBzOuejNDBwDSK6DniaI-9A8DdwPip?usp=share_link
- Full descriptions of scenarios, definitions of specific parameters or life stages, and information about sites can be found below in 'Parameter definitions, scenario descriptions, and site information' section, below.

Parameter definitions, scenario descriptions, and site information

- Below you will find a list of parameter definitions for Sali and Ko'ko', a description of each scenario, and details about the sites we will ask you about.
- Provide responses to each question on the Google spreadsheet using the link that was emailed to you. Contact Hannah Sipe (sipeh@uw.edu) with any questions about this document.

Parameter definitions:

Sali:

- Adult survival – annual survival probabilities for birds that are 1 year old or older.
- Juvenile survival – survival probabilities of juveniles from 1 month post-fledge to 1 year of age (i.e., over an 11-month period).
- Fledgling survival – survival probabilities of birds that are fledglings (i.e., just left nest) to 1 month post-fledge.
- Nest success – probability that a nest produces ≥1 fledgling.
- Fledglings per nest – the number of fledglings produced per successful nest.
- Nest attempts – the number of nesting attempts per adult per year.

Ko'ko':

- Adult survival – annual survival probabilities for birds that are 1 year old or older.
- Juvenile survival – survival probabilities of juveniles from hatching to 1 year of age (i.e., over a 12-month period).
- Nest success – probability that a nest produces ≥1 hatchling.
- Hatchlings per nest – the number of hatchlings produced per successful nest in a year.
- Nest attempts – the number of nesting attempts per adult per year.

Scenario descriptions:

For each scenario, we will assume:

- Sali or Ko'ko' are already present at the site, i.e., they have been successfully translocated and have survived the acclimation period after the translocation (we will ask about translocation actions in another session).
- There is a snake and ungulate barrier maintained at the site.

- Dogs and ungulates have been eradicated from the site.
- Nest boxes or nesting substrate have been provided at the site.
- The site is closed to public access.

Variable BTS control scenarios:

Scenario 1a:

Under this scenario, we assume that BTS have been eradicated, there is ongoing rodent and cat control, and active forest restoration has been undertaken (i.e., removal of non-native plants and planting of natives).

Scenario 1b:

Under this scenario, we assume that there are ongoing aerial bait drops, there is ongoing rodent and cat control, and active forest restoration has been undertaken (i.e., removal of non-native plants and planting of natives).

Scenario 1c:

Under this scenario, we assume there are ongoing aerial bait drops and supplemental hand or trap captures of BTS, there is ongoing rodent and cat control, and active forest restoration has been undertaken (i.e., removal of non-native plants and planting of natives).

Variable BTS control, no rodent control, and only problem cats are removed scenarios:

Scenario 2a:

Under this scenario, we assume that BTS have been eradicated, there is no rodent control, targeted cat removal, and active forest restoration has been undertaken (i.e., removal of non-native plants and planting of natives).

Scenario 2b:

Under this scenario, we assume that there are ongoing aerial bait drops, there is no rodent control, targeted cat removal, and active forest restoration has been undertaken (i.e., removal of non-native plants and planting of natives).

Scenario 2c:

Under this scenario, we assume there are ongoing aerial bait drops and supplemental hand or trap captures of BTS, there is no rodent control, targeted cat removal, and active forest restoration has been undertaken (i.e., removal of non-native plants and planting of natives).

No forest restoration scenario:

Scenario 3:

Under this scenario, we assume that BTS have been eradicated and there is ongoing rodent and cat control. There has been no active forest restoration under this scenario.

Site information:

We will be asking you to provide values for each species under the 7 scenarios at 4 sites in Guam. These sites are the Habitat Management Unit (HMU), the Refuge or Ritidian Unit, Anao Conservation Area (hereafter, Anao), and North Finegayan. A map is provided below in Figure 2.

HMU:
The Habitat Management Unit is a 55-ha parcel located on Andersen Airforce Base and administered by Department of the Navy (DoN). The area is comprised of disturbed native limestone forest, has an existing BTS one-way exclusion fence (i.e., snakes can leave but not enter; NOTE: we will assume that repairs have been made to the fence post-typhoon), has been treated with toxicant via aerial baiting and other methods of BTS control (Dorr et al. 2016, Siers et al. 2017), and is ungulate free. The Habitat Management Unit falls within the Guam National Wildlife Refuge (GNWR) Air Force overlay unit, which constitutes DoN lands suitable for providing habitat for federally listed species, in cooperation with USFWS (Guam National Wildlife Refuge and U.S. Fish and Wildlife Service 2010, U.S. Department of Navy 2019).

The Refuge or Ritidian Unit:
The 385-acre Ritidian Unit on Guam National Wildlife Refuge is managed by the USFWS, contains native and degraded limestone forest habitat, and is designated critical habitat for Fanihi, Sihek, and Åga (U.S. Fish and Wildlife Service, 2004). Managers of the Ritidian Unit have proposed constructing a multi-species barrier and conducting invasive species control within the barrier, to establish an area for vertebrate and native plant restoration. The Ritidian Unit also contains limestone cave habitat for cave-dependent species as well, e.g., Yåyaguak (Guam National Wildlife Refuge and U.S. Fish and Wildlife Service 2010).

Anao:
Anao was designated as one of three areas for conservation owned by the Government of Guam. Anao is approximately 764 acres, with native and degraded limestone forest habitat. The site allows limited public access (Guam Division of Aquatic and Wildlife Resources 2006). Anao has been open to ungulate hunting in the past (Guam Division of Aquatic and Wildlife Resources 2006), and while there is no ongoing predator control there, of the conservation lands owned by Government of Guam, Anao has been identified as having the greatest potential for conservation management due to the habitat characteristics and location (L Duenas, pers comm; Thierry and Rogers, 2020).

North Finegayan:
The North Finegayan Site, a 976-ha parcel also on DoN land, contains native and degraded limestone forest. It is adjacent to Hapatu Ecological Restoration Area, which is owned by Joint Region Marianas, and also lies within the Air Force overlay unit of GNWR. Land within North Finegayan has, in recent years, undergone forest enhancement and ungulate fencing and removal, with multi-species exclusion barriers planned for conservation areas within the site (U.S. Department of Navy 2019). Note that we are asking only about North Finegayan in your assessment and you should not include the Hapatu Ecological Restoration Area as part of this site.

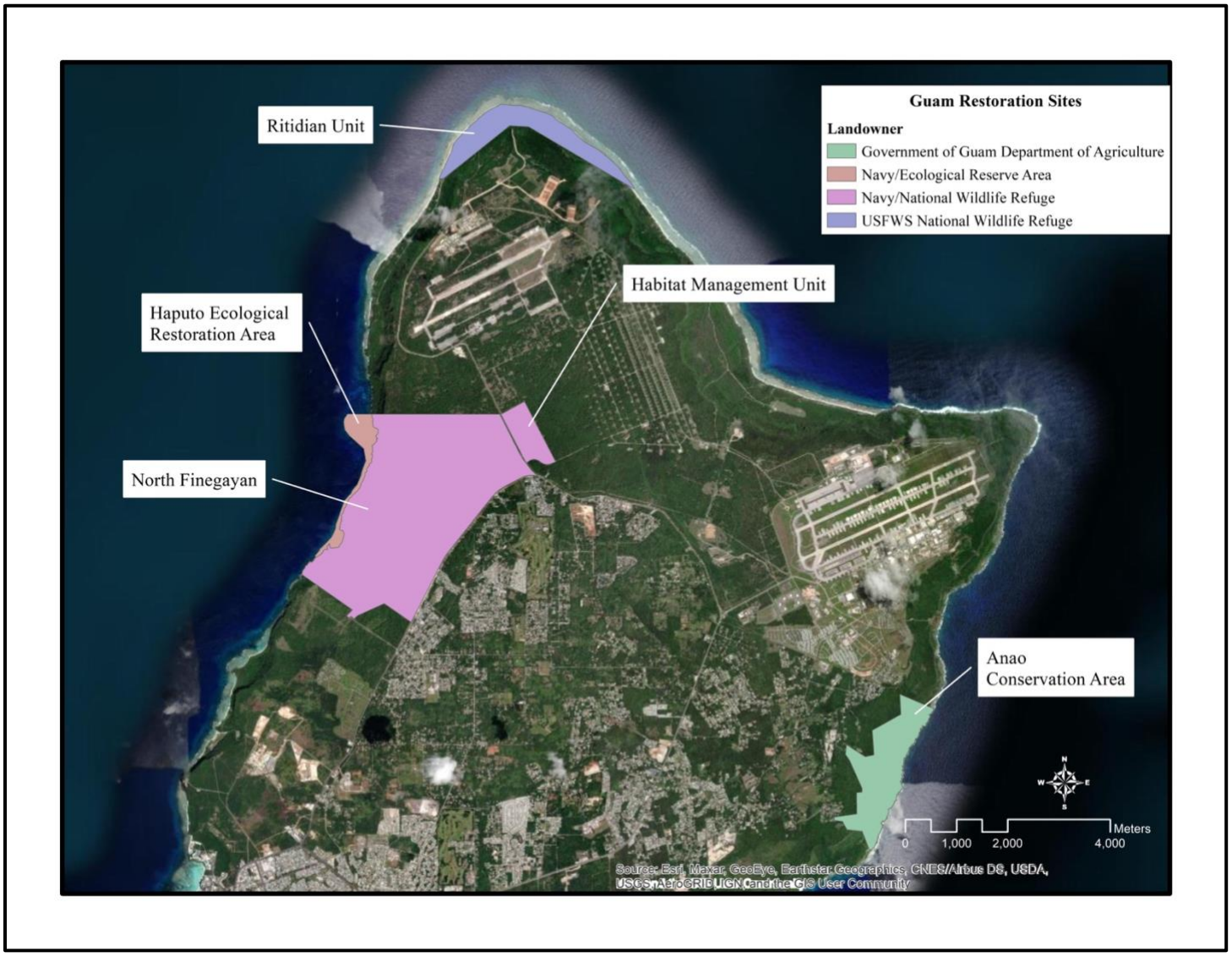

Figure 2. Map showing the location of the 4 sites, with landowner or agency owner information.

References from 'Site Information' section

Dorr, B. S., C. S. Clark, and P. J. Savarie. 2016. Aerial application of acetaminophen treated baits for control of brown treesnakes. ESCP Demonstration Project RC-200925, Fort Collins, CL: USDA APHIS WS National Research Center:58 pp.

Guam Division of Aquatic and Wildlife Resources. 2006. Guam comprehensive wildlife conservation strategy. Department of Agriculture, Government of Guam, Mangilao, Guam:259 pp.

Guam National Wildlife Refuge and U.S. Fish and Wildlife Service. 2010. Guam National Wildlife Refuge: comprehensive conservation plan. Guam National Wildlife Refuge, Dededo, Guam:357.

Siers, S. R., J. A. Savidge, and E. Demeulenaere. 2017. Restoration plan for the Habitat Management Unit, Naval Support Activity Andersen, Guam. Naval Facilities Engineering Command Marianas:238 pp.

Thierry, H., and H. Rogers. 2020. Where to rewild? A conceptual framework to spatially optimize ecological function. Proceedings of the Royal Society B: Biological Sciences 287:20193017.

U.S. Department of Navy. 2019. Integrated natural resources management plan for Joint Region Marianas. Prepared for Joint Region Marianas and NAVFAC Marianas, Guam by Cardno, Honolulu, HI:936 pp.

U.S. Fish and Wildlife Service. 2004. Endangered and threatened wildlife and plants; Designation of critical habitat for the Mariana fruit Bat and Guam Micronesian Kingfisher on Guam and the Mariana Crow on Guam and in the Commonwealth of the Northern Mariana Islands. Federal Register 69:62944–62990.