MARIANA AVIFAUNA CONSERVATION (MAC) PROJECT

Preliminary Report:

Preparation, Translocation, and Monitoring of Bridled White-eyes (*Zosterops conspicillatus*) on Sarigan, 22 April – 13 May 2008

Project Report Number 1

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2008 MAC WORKING GROUP PARTICIPANTS AND ASSOCIATES

This conservation introduction was a joint effort between the Commonwealth of the Northern Mariana Islands' Division of Fish and Wildlife (CNMI DFW), the U.S. Fish and Wildlife Service (USFWS), the Association of Zoos and Aquariums (AZA), and the U.S. Geological Survey (USGS). The team of researchers that were actively involved as part of the MAC Working Group in 2008 includes:

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Members of the MAC Working Group with Bridled White-eyes (in field transport boxes) on Saipan, CNMI, prior to translocation to Sarigan.

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The Bridled White-eyes arrive at Sarigan, CNMI, 3 May 2008.

TRANSLOCATION OF BRIDLED WHITE-EYES ON SARIGAN

INTRODUCTION

The Commonwealth of the Northern Mariana Islands (CNMI), in cooperation with the U.S. Department of the Interior, determined that Saipan supports an incipient population of the Brown Treesnake (*Boiga irregularis*; Colvin et. al. 2005). In response to the potential threat of the Brown Treesnake to the CNMI's endemic avian populations, biologists with the CNMI Division of Fish and Wildlife (DFW), the U.S. Fish and Wildlife Service (USFWS), and the Association of Zoos and Aquariums (AZA) convened to determine the best method to safeguard Saipan's and the Commonwealth's unique avian species.

It was determined that the long-term survival of these species required the establishment of satellite or "insurance" populations of them on other islands in the Mariana archipelago that afford safety from the Brown Treesnake. As a result of this interagency meeting, the Marianas Avifauna Conservation (MAC) Project was initiated to identify and implement conservation actions necessary to ensure the persistence of CNMI's avifauna.

On 3 May 2008, biologists with the MAC Project introduced to the island of Sarigan, CNMI, 50 Bridled White-eyes (*Zosterops conspicillatus*) captured on the island of Saipan (MAC Working Group 2008). This translocation effort, along with the period of monitoring that immediately followed, served as a pilot effort to develop, test, and refine the techniques necessary for future Conservation Introductions of threatened or endangered avian species within the Mariana archipelago.

METHODS AND RESULTS

Study Site

The uninhabited island of Sarigan is an extinct volcano with no recorded history of activity that lies 95 nautical miles north of Saipan (Fig. 1). It is approximately 500 ha (5 km^2) in area, 549 meters at its highest elevation, and most of its shoreline is irregular with steep, rugged, and eroded cliffs created by old lava flows and landslides (Berger et al. 2005). At an elevation of between 100-106 meters lies a plateau to the north and east of the peak that constitutes the island's highest point; on this plateau are situated Sarigan's "upper camp" and the release site (both at 16° 42' N, 145° 47' E; Fig. 2a and 2b).

As much as 45% (223 ha) of Sarigan is covered by forest, the remainder consisting of either grass or areas of barren rock. A DFW survey of the island in 2006 indicated that forest cover consisted of approximately 75-90 ha of native forest (34%-40% of total forest cover) and 133 ha of old coconut plantations or agricultural forest (60% of total forest cover; Martin et al. 2008). Both the upper camp and the release site are located at an interface between grass and barren rock and primarily native forest.

Pre-Translocation

Between 22 and 24 April 2008, 77 Bridled White-eyes were captured in the Marpi area of Saipan (all within ~100 m radius of 15º 15' N, 145º 48' E), all of which were weighed, marked with

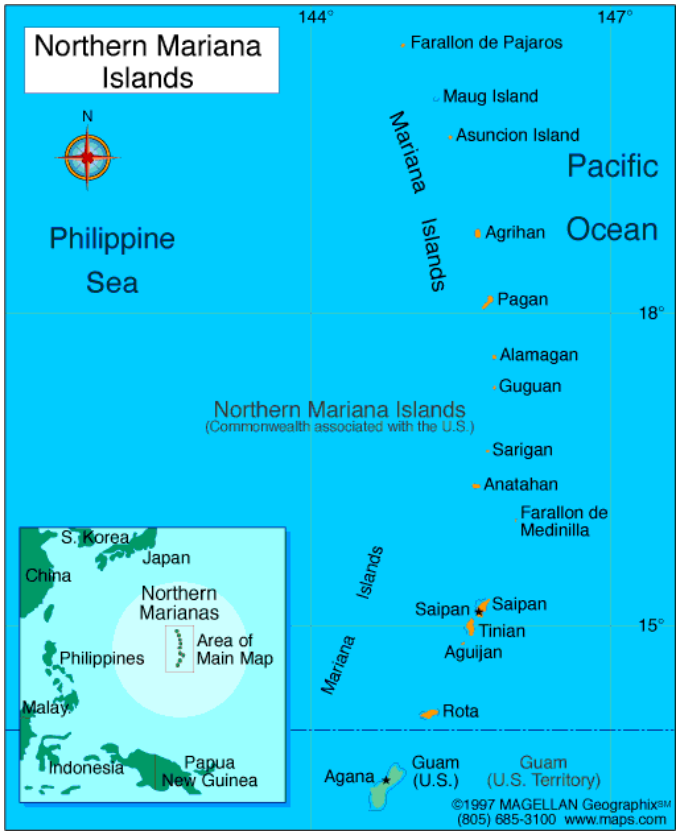

Figure 1. The Northern Mariana Islands (taken from http://www.infoplease.com).

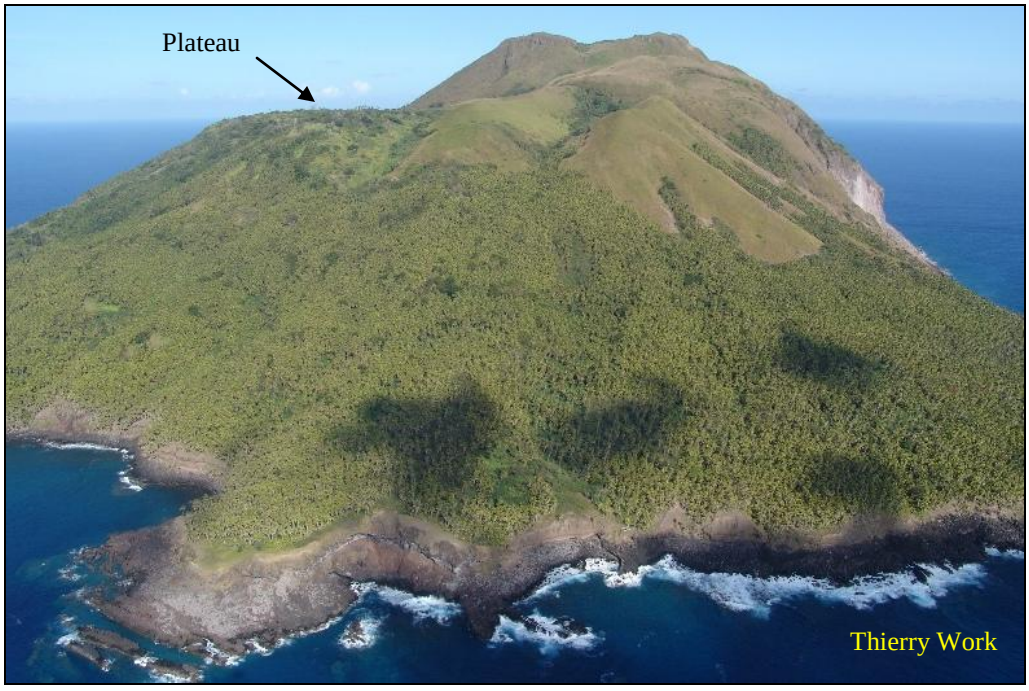

Figure 2a. Sarigan viewed from the north and northeast. Note the plateau where the release site is located, the peak behind and to the right, and the coconut forest in the foreground.

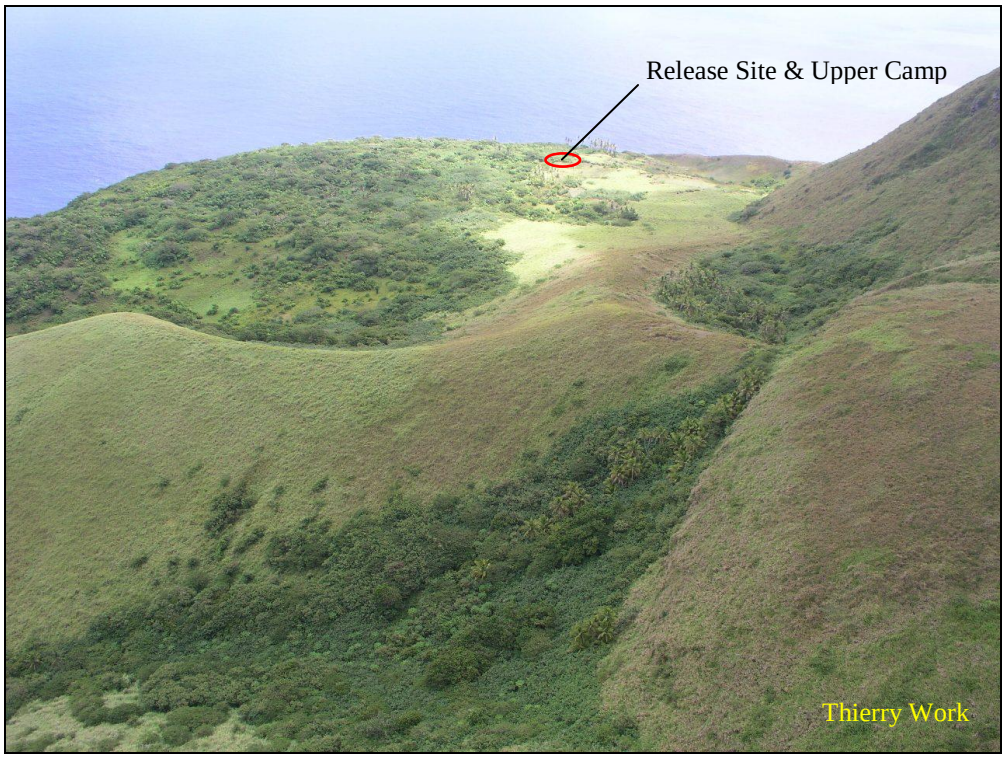

Figure 2b. The plateau on Sarigan from the southeast, primarily covered with native forest, and the location of the release site and upper camp as indicated.

numbered aluminum leg bands, and assessed for health issues. The first 20 of these birds were used to conduct a snail consumption study (MAC Working Group 2008) to ensure that they did not pose a realistic threat to endemic snails in Sarigan. Bridled White-eyes that were to be used for the snail consumption study were held and maintained in the Brown Treesnake (BTS) lab facilities on the DFW compound on Saipan. These facilities are air conditioned and quieter than the open aviary on the DFW compound, providing an environment of lower stress for the captives. The remaining individuals were held specifically for choosing 50 candidates to introduce to Sarigan. Of the 77 birds held, two died in captivity on Saipan from inanition.

The white-eyes being maintained for the purpose of translocation were originally kept in holding cages within the aviary on the DFW compound (MAC Working Group 2008). These cages were constructed of 1.3 cm by 2.5 cm welded wire hardware cloth and were comprised of two compartments abreast, each measuring 45.7 cm wide by 50.8 cm high by 60.9 cm deep. On 27 April, 32 of these birds were weighed (mean = 6.5 grams; range = 5.0 – 7.4 grams; one died during the process) and a mean weight loss of 11.9% from mass at capture was noted, along with abrasions to the anterior portion of the head on many as a result of the holding cage. To reduce the effects of cage stress upon the remaining 54 birds prior to translocation, they were transferred on 28 April to containers used to ship Golden White-eyes (*Cleptornis marchei*) to AZA institutions in the states. Each container was a solid, well ventilated box constructed of plywood with four compartments each that measured 15.2 cm wide by 20.3 cm high by 30.5 cm deep. Two birds were placed in each compartment and the containers were placed in the air conditioned BTS facilities.

All Bridled White-eyes held for translocation had blood drawn for the purposes of pathogen screening and sexing. Blood smears produced for screenings were analyzed by Thierry Work (Wildlife Veterinarian/Disease Specialist, USGS, Honolulu, Hawaii); all samples tested negative for presence of blood parasites. Blood samples collected for sexing were sent to the molecular lab of the veterinary hospital at the St. Louis Zoo for analysis; 20 of the birds introduced on Sarigan were female, 29 were male, and one was unknown (sex ratio of 1:1.45 female to male).

Snail Consumption Study

Peer review of an earlier draft of the Bridled White-eye Conservation Introduction Plan revealed concerns about possible impacts that an introduction of the species to Sarigan may have upon the island's snail populations, specifically those of the humped tree snail (*Partula gibba*). As a response, the MAC team undertook an experiment based upon study designs outlined by Avery et al. (2001, 2005), Cummings et al. (2002), Hile and Tordoff (2005), and Linz et al. (2006), to assess these potential impacts. The results of this experiment were to be used to decide the fate of the Bridled White-eye conservation introduction to Sarigan (MAC Working Group 2008).

The original experimental design included as an appendix of the conservation introduction plan was slightly revised in the lab by AZA personnel when the experiment was undertaken on Saipan. The objectives of the revised experiment were to determine 1) if Bridled White-eyes would select snails over other food sources (papaya and nectar), and 2) if they would consume snails when food stressed.

Just prior to the arrival of AZA personnel in mid-April, DFW personnel collected live humped tree snails, as well as *Succinea* sp. and *Elasmius* sp. snails of various sizes on both the islands of Rota (CNMI) and Sarigan (Fig. 1). Snails were held and cared for in captivity for nearly two weeks, their cages cleaned and fresh greens provided daily. Shortly before the execution of the experiment the snails were divided up into two size classes (as described in MAC Working Group [2008]); small (1-4mm) and large (>4-8mm).

The snail feeding trials, which were originally planned to run for four days, were conducted on 26 and 27 April (because of the high level of stress the birds were put under during the experiment, AZA personnel decided to end it after the second day for humane reasons). Twenty Bridled White-eyes were randomly divided into two study groups (#1 and #2) of 10 each, both groups comprising five samples, each sample consisting of two Bridled White-eyes placed together in a cage (for a total of 10 cages). Study Group #1 included white-eyes maintained on a normal captive diet (e.g., papaya and other local fruit, wax worms, etc.) during the experiment, while Study Group #2 consisted of birds subjected to a period of reduced food availability prior to the introduction of snails to simulate a condition of food stress or deprivation.

On both 26 and 27 April, each sample of both study groups was presented with a tray of eight snails (four each of the two different size classes) for a period of three hours, whereupon all snails were removed and replaced with the usual captive diet regimen. The evening prior to each morning of the experiment, food was removed from all cages of both study groups at 19:00. At 07:00 on both days of the experiment, Study Group #1 was presented their allotment of snails on the same trays as their morning serving of papaya or other fruit. Study Group #2 was given trays containing only snails at 10:00 on 26 April (18 hrs. food deprivation) and at 07:00 on 27 April (15 hrs. food deprivation; AZA staff decided to shorten the duration of food deprivation because

of the high level of stress placed upon birds the first day, and one sample was removed altogether).

Empirically, the results of the experiment indicated that although when food stressed most Bridled White-eyes would eat snails within the two size categories tested, they will not select snails when other food resources are available (Table 1). As these results were intended to help guide the final determination of the fate of the Bridled White-eye translocation to Sarigan, they were the main topic of discussion during a teleconference held on 29 April between CNMI DFW, USFWS, U.S Geological Survey (USGS), the University of Guam's Marine Laboratory (UOG), and AZA.

Table 1. Results of the Snail Consumption Study conducted on Saipan, 26 and 27 April 2008.

Cage #	Study Group	Trial 1; 26 April Snails eaten (Large/Small)	Trial 2; 27 April Snails eaten (Large/Small)
1	#1	0/0	0/0
2	#1	0/0	0/0
3	#1	0/0	0/0
4	#1	0/0	0/0
5	#1	0/0	0/0
6	#2	4/3	2/0
7	#2	0/0	4/4
8	#2	0/1	4/4
9	#2	3/4	1/4
10	#2	0/0	-*

*Cage #10 removed from trial early due to excessive stress.

The humped tree snail is currently not covered under Section 7 of the Endangered Species Act (ESA); however, the species is a candidate for listing (Steve Miller, USFWS, pers. comm.). At the time of this writing, this snail was not covered under the ESA because the USFWS had not been allowed by the current federal administration to list any species for the previous several years. If this were not the case, the humped tree snail would be listed and the results of the Section 7 consultation for the introduction of Bridled White-eyes to Sarigan would have likely been different (Steve Miller, USFWS, pers. comm.).

Barry Smith of UOG argued that the results of the experiment strongly indicate that Bridled White-eyes will indeed eat snails of appropriate size when environmental conditions deem it necessary. Their main concern was the occurrence of ecological release on the part of the white-eye, where in a new environment that may lack suitable food resources and that is absent of suitable predators or competitors, the species' niche could broaden allowing it to exploit new habitats and food sources (Barry Smith, UOG, pers. comm.). Representatives of the CNMI countered that suitable food sources, as well as predators and competitors do exist on Sarigan, all of which were amply discussed and defended in the conservation introduction plan (MAC

Working Group 2008). They additionally asserted that the humped tree snail and the Bridled White-eye have long coexisted on Saipan (MAC Working Group 2008) and that the likelihood of losing all avian populations on Saipan is far greater than extirpating snail populations on Sarigan.

Based upon the fact that the humped tree snail was not currently listed, and because Section 7 approval was previously given by them in 2006 when the grant for translocation was approved, USFWS decided during the teleconference that the project could proceed as planned. However, USFWS stated that it would contact Bryan Clarke (University of Nottingham, UK), a specialist in the genetics of Partulid snails, to determine the importance of the snail population on Sarigan. If he felt that the population was of no real significance, USFWS would not require any post-translocation mitigation. If on the other hand the Sarigan snail population was determined to be of importance, the MAC Working Group and the CNMI would need to: (1) collect Partulid snails on Sarigan and put them into captivity (Berger et al. 2005); (2) develop and implement a plan to monitor the Partulid snail population on Sarigan for the year following translocation to determine if the introduced Bridled White-eyes are effecting a decline in Partulid numbers; and (3) remove the Bridled White-eyes if the snail population on Sarigan show a significant decline.

Preparing Bridled White-eyes for Translocation

The initial protocol laid out in the Conservation Introduction Plan (MAC Working Group 2008) called for the Bridled White-eyes involved in the snail consumption study to be released immediately after conclusion of the feeding trials. However, because of lower than expected weights of birds being held for translocation, the birds involved in the experiment were retained to ensure that only those individuals in the best body condition and exhibiting the least weight loss were selected for translocation. During the afternoon of 1 May all 75 remaining birds were recaptured and weighed to assess their suitability for translocation to Sarigan.

As originally planned, 20 of the 50 Bridled White-eyes translocated to Sarigan were to be tagged with 0.35 gram 148 Mhz VHF radio transmitters (model LB-2N) purchased from Holohil Systems Ltd., (Carp, Ontario, Canada; MAC Working Group 2008). Transmitter size had been based upon weights for 60 Bridled White-eyes (mean = 7.6 grams, range = 6.5 – 9.5 grams; P. Luscomb, unpublished data) captured on Saipan in 2006. However, the mean (6.6 grams; range = 5.3 – 7.6 grams) of the 75 birds held in April 2008 came up one gram short of what was expected based upon the 2006 data. The likely reason for this disparity is that weights obtained for white-eyes in 2006 were based upon mass at capture, while the weights used in 2008 for the selection of candidates for radio-tagging were based upon mass after approximately eight days in captivity. The mean mass at capture (22-24 April) for these birds was 7.4 grams (range = 5.9 – 9.1 grams; n = 77 [two birds later died in captivity]), which is 8.9% greater than the mean mass after the eight days of captivity.

In light of these lower than expected weights, to recruit enough birds for radio-tagging the MAC Working Group set the minimum acceptable weight for candidates at 7 grams; this left 19 birds considered suitable for transmitter attachment (mean = 7.2 grams; range = 7.0 – 7.6 grams). From these 19 birds, 15 were chosen as the most robust based upon a combination of two criteria: 1) the percentage of weight loss since capture; and 2) whether birds had continued to lose weight after capture or if weights stabilized or even showed an increase (capture weights were subsequently taken on 27 and 28 April and 1 May). Radio transmitters were adhered with *Krazy-Glue* to trimmed feathers of the inter-scapular regions of these 15 individuals following Johnson et al. (1991; also refer to MAC Working Group 2008) and a blue colored band was

attached to each bird's leg. Radio-tagged birds were then placed back into the Golden White-eye shipping boxes, two per compartment, to allow the glue holding the transmitters to set.

The remaining 60 captive Bridled White-eyes were ranked based upon weight and percentage of weight loss and the 35 best fit for translocation were selected. All 50 birds chosen for introduction to Sarigan in 2008 were marked with a red band on the leg opposite their numbered aluminum band; radio-tagged birds were marked on the same leg with both blue and red bands. The 50 birds to be translocated to Sarigan were divided into the six "field transport boxes" and the remaining 25 white-eyes (those not chosen for translocation) were transported to the capture site in Marpi and released (the field transport boxes, also referred to as "field holding boxes," are described in detail in Appendix C of MAC Working Group 2008).

On the morning of 2 May, as AZA staff transferred the radio-marked birds from the Golden White-eye shipping boxes to the field transport boxes (Appendix C of MAC Working Group 2008), they discovered that four transmitters attached to birds the previous afternoon had come off. It was determined that as the freshly radio-tagged birds moved about within the Golden White-eye shipping boxes the previous night, the antenna ends of the units some individuals were wearing became caught in the fine ventilating mesh in these boxes. These birds were then hung up for a brief period of time until they managed to pull themselves free, each leaving behind the transmitter with the attached wad of trimmed feathers that had been pulled from them. The four dropped transmitters were retrieved by two DFW biologists before they departed via helicopter for Sarigan later on the morning of 2 May. These units were to be reattached onsite to the birds immediately before their release on the island.

Translocation

Transport and Release on Sarigan

By 07:00 on 3 May, AZA personnel delivered the six field transport boxes holding 50 Bridled White-eyes to the *Americopters* heliport on Saipan for transport to Sarigan. The boxes were placed in the shade of the hanger as the flight crew prepared the Bell 206 *JetRanger* helicopter. When the aircraft was ready for flight, the flight crew removed the rear seat cushion and stacked two rows of three boxes on the seat frame, securing them in place with ropes and bungee cords (Fig. 3). At shortly after 07:00, the helicopter departed with birds and the wildlife veterinarian (Thierry Work, USGS, Honolulu, Hawaii) for Sarigan.

At 08:10 that day the helicopter arrived at the upper camp on Sarigan where it was met by two DFW biologists (Paul Radley and Julia Boland) who had arrived by helicopter the early afternoon of 2 May to prepare the field camp and the captive release site. The release site was established 30 to 40 meters east of the field camp in a stand of native forest and comprised an area of roughly 8-10 square meters cleared of low vegetation (mostly ferns and seedlings) to accommodate four "field release cages" (Fig 4.; for details refer to Appendix A). (The field release cages had been delivered to Sarigan several weeks prior to the translocation during an unrelated trip to the island by Curt Kessler, USFWS, Honolulu, Hawaii). After the aircraft was shut down, the field transport boxes were quickly carried to the shade of the captive release site where the white-eyes would be transferred into the waiting release cages.

Bridled White-eyes that were not radio-marked were the first to be transferred from the transport boxes into the field release cages (Fig. 5). This process went quickly through the sliding side doors on both the release cages and the transport boxes with little apparent stress to

the birds. Next, the two transport boxes holding the radio-marked white-eyes were inspected for transmitters possibly dropped from birds between the previous morning and their arrival on Sarigan. As a result, four were retrieved from the bottom of the two boxes for a total of eight that needed to be reattached on-site prior to release.

Figure 3. *Americopters* flight crew secure transport boxes in the helicopter on Saipan.

Figure 4. Field release cage at the release site prepared on Sarigan, CNMI, 3 May 2008.

Figure 5. USGS Wildlife Veterinarian Thierry Work (left) and DFW Biologist Paul Radley (right) transfer Bridled White-eyes from the field transport boxes to field release cages on Sarigan, CNMI, 3 May 2008. Note the sliding side door on the field transport box in image A, lower left (photos: Julia Boland).

To determine which white-eyes required radio transmitters to be reattached, birds were removed individually from the two field transport boxes by flushing them through the sliding side door and into a small net held over the opening. Once in-hand, each bird was inspected visually for the presence of a transmitter. All birds wearing securely attached radio units were immediately released (a measure taken to avoid any more units possibly being pulled from birds in the field release cage), while those without transmitters were refitted and released after allowing time (approximately 5-8 minutes) for the glue to set with the bird in-hand. Before reattachment, all transmitters were trimmed of feathers and glue with a razor blade. During the process of removal from the transport boxes one bird escaped before transmitter reattachment, leaving only 14 of the 15 originally radio-marked birds. To remedy this disparity, another white-eye was selected for transmitter attachment from those that were not originally radio-marked. However, during the attachment process it was found that one of the previously attached transmitters was faulty and not functioning correctly. This radio unit was excluded from redeployment, resulting in the release of 14 radio-marked birds on Sarigan.

After all radio-marked Bridled White-eyes were released the wildlife veterinarian observed and assessed the status of the remainder of birds being held in the captive release cages. At 09:15 these birds were determined ready for release and the cages were opened and the white-eyes flushed out. After all birds were safely out of the release cages and apparently doing well in their new surroundings, Thierry Work gathered his equipment and boarded the helicopter for departure to Saipan.

Post-Translocation Monitoring

Bridled White-eyes released on Sarigan were monitored via ground based radio-telemetry by DFW biologists Paul Radley and Julia Boland from late afternoon of 3 May through late afternoon/early evening of 11 May. The tentative purpose of telemetry was to determine the cause of mortality of any translocated birds, and to gain a feel for their overall movements about the island and the habitats or cover types they traversed. Additionally, on the afternoon of 10

May and the morning of 12 May attempts were made to monitor the birds visually to assess their behavior and foraging activities. Equipment used for radio tracking included *Communication Specialists* (Orange, California) R-1000 handheld telemetry receivers and *Telonics* (Mesa, Arizona) RA-14K "Rubber Ducky" H-antennas. The Unmanned Aerial Vehicle (UAV) that was to serve as the primary component in an aerial locator system (MAC Working Group 2008) was not completed on time for the May 2008 post-translocation monitoring. However, high winds (~30 knots) during this period may have rendered the UAV not useable in any case.

Radio Telemetry

The majority of telemetry effort consisted of acquiring signals from 14 receiver sites established throughout 10 days of tracking by the DFW biologists on prominent points of the island (Fig. 6). Establishing receiver sites required a great deal of time and effort cutting through thick vegetation with machetes. When personnel visited receiver sites for signal acquisition, they scanned through the frequencies of all 14 deployed transmitters at each site and recorded the results. Triangulation was attempted on detected transmitters but signals could seldom be acquired from more than one receiver site at a time (likely an effect of Sarigan's rugged terrain). When a stationary signal indicated that the corresponding transmitter had not moved for several days, DFW biologists "homed in" on (i.e., walked to) the signal and located the transmitter on foot to determine the fate of the bird or to retrieve an otherwise shed or dropped unit.

During the early portion of the monitoring period personnel established and visited sites together for safety reasons. Thus, all available receiver sites were never visited each day of monitoring white-eyes on Sarigan; nonetheless, efforts were made as best possible to detect all birds each day of tracking. To mitigate for the possibility of frequency drift, each transmitter frequency was scanned 20 degrees above and below its known value. Of 14 Bridled White-eyes originally radio-tagged, signals were detected at some point during post-release monitoring for all but four, one of which was blocked by bad signal interference and was thus rendered unusable (Table 2). Dropped or shed transmitters were recovered for five birds with no evidence of fatalities and the ultimate fate of five others was unknown (Table 2).

Radio tracking birds on Sarigan proved to be physically challenging. Conditions were hot and humid, terrain was steep and rugged, and vegetation was thick and at first easily led to disorientation of field personnel. In response to the high temperatures, personnel tracked birds in the morning and mid to late afternoon and took the hot early afternoon hours to rest. As traversing Sarigan's topography was difficult and potentially dangerous, for safety the two person crew often worked together when moving about the island, especially during the first few days of monitoring activities. Thus, locating and reaching prominent points for the establishment of receiver sites was time consuming and ongoing during post-release monitoring.

The last detections for four birds (TR02, TR04, TR07, and TR12) were acquired within approximately 48 hours (between mid-morning of 3 May and late morning of 5 May) of their release on Sarigan (Table 2). In all but one of these cases, these birds were detected only once before contact was lost for good; TR07 was detected twice on 3 May. Although the fates of these individuals could not be determined by tracking effort, there was no indication of mortality as signal oscillation suggested that the birds were active and moving.

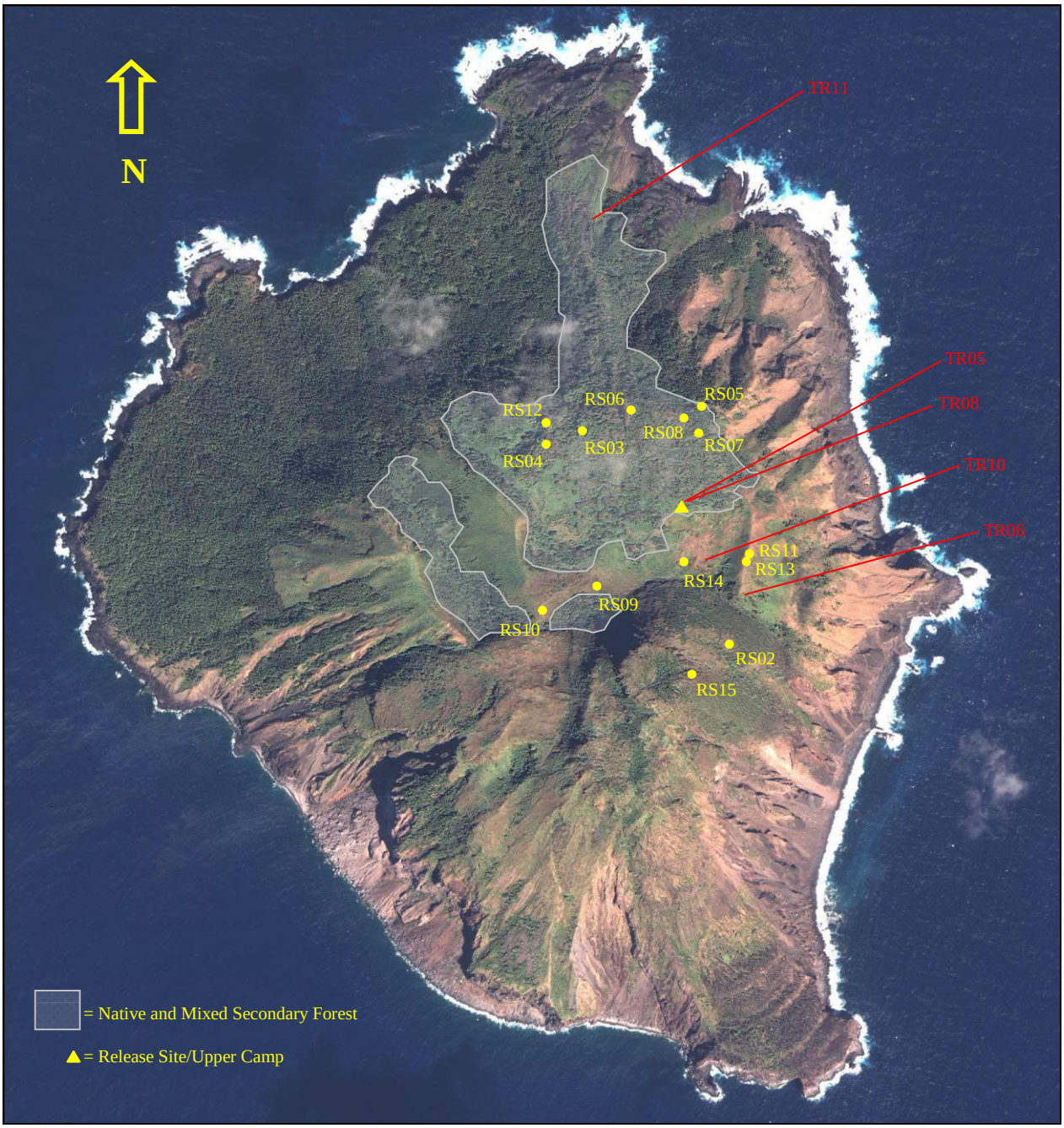

Figure 6. Locations of receiver sites (designated with RS and a number), recovered transmitters (designated with TR and a number), and estimated relevant forest cover on Sarigan, CNMI, 3-12 May 2008 (image taken by Quickbird II satellite, 13 January 2004).

Table 2. Detection status and fate (including locations of recovered transmitters) of 14 radio-tagged Bridled White-eyes monitored on Sarigan, CNMI, 3-12 May 2008.

Trans./Bird No.	No. days detected	Date and Location of last detection	Fate
TR01		-	Never detected
TR02	1	4 May; east of release site	Unknown
TR03		-	Never detected
TR04	1	5 May; due W of RS04	Unknown
TR05	4	-	Transmitter recovered 7 May (near release site)
TR06	1	-	Transmitter recovered 9 May (UTM 370328/1847176)
TR07	1	3 May; NE of release site	Unknown
TR08	4	-	Transmitter recovered 7 May (near release site)
*TR09		-	Never detected
TR10	3	-	Transmitter recovered 10 May (UTM 370215/1847241)
TR11	5	-	Transmitter recovered 11 May (UTM 369956/1848247)
TR12	1	4 May; SE of RS08	Unknown
TR13		-	Never detected
TR14	3	9 May; NW of RS12 and RS06	Unknown

* = Transmitter blocked by signal interference; unusable

Another white-eye (TR14), whose ultimate fate also could not be determined for certain, was last detected on the morning of 9 May (Table 2) northwest of receiver site RS12 (Fig. 6). This bird was previously detected on 4 May from RS06 and again on 5 May from RS12, both detections distant and to the northwest (310º–320º). The shift of signal detection between receiver sites, variation in signal strength between detections, and signal oscillation all suggest that TR14 was alive and active during the post-translocation monitoring period.

Radio transmitters were recovered for five Bridled White-eyes post-release (Table 2). Although not immediately recovered that day, TR06 was determined on 3 May to have been shed; a 45 minute search in thick, tangled vegetation yielded no transmitter and the attempt to find it was postponed due to lateness of day (Table 2). On 9 May, after a 35 minute search at the same location, the transmitter was extracted from the scrubby vegetation, located in mostly open habitat near a small patch of mixed secondary forest (Fig 6). While searching for this shed transmitter on 3 May, a Collared Kingfisher (*Todiramphus chloris*) was observed giving chase to a white-eye flying with another over open cover; neither of these white-eyes were wearing a

transmitter. This is the only observation of aggressive behavior by kingfishers, or any other avian species, towards the birds released on Sarigan.

Not far from the recovery location of the transmitter for TR06, the transmitter shed by TR10 was located and retrieved on 10 May (Table 2) from under low scrubby vegetation in open cover (Fig 6). Signals from the late afternoon of 3 and 4 May suggest that the bird had been occupying an area of native/mixed secondary vegetation below a cliff-line to the northeast of the release site. However, signals taken from receiver site RS11 on 9 May suggest that the transmitter had already been dropped in the location of its recovery on 10 May. The transmitters shed by both TR05 and TR08 were recovered on 7 May (Table 2) within 20 meters approximately north of the release site (Fig. 6). Signals detected on 3, 4, and 5 May indicate that these two birds spent the majority of their time within the native forest in the vicinity of the release site. The last transmitter recovered was that of TR11 located on 11 May (Table 2) in a patch of secondary forest at approximately 18-21 meters elevation (Fig. 6). This transmitter was the farthest recovered from the release site and the only one not located on the upper plateau (Fig. 6).

In all cases of recovered transmitters there was no indication of mortality of any birds that they had been attached to. All transmitters were found on the ground and intact with the patch of trimmed feathers that the units had been glued to, indicating that they had been securely attached. Interestingly, all but one of the shed units was amongst those that had been dropped by birds prior to translocation and needed to be reattached to birds upon their arrival at Sarigan.

As previously mentioned, four birds (TR01, TR03, TR09, and TR13) were never once detected during 10 days of post-release monitoring on Sarigan (Table 2). Tests of all transmitter frequencies immediately prior to release indicated that all radios were functioning properly upon arrival on the island. As there were areas on the island that safety and feasibility dictated simply could not be reached by foot, full radio coverage of the island was not entirely achieved, particularly of the lower portion of its western and southwestern slopes (Fig. 6). In these instances the UAV (MAC Working Group), which could not be completed on time for the translocation, may have been very helpful in covering un-navigable terrain to locate stray radio-marked birds. However, this system will be operational and available for future such endeavors and will likely be tested in April/May 2009.

Visual Observations

During the afternoon of 10 May, personnel systematically searched areas of suitable cover on the upper plateau of the island for actively foraging Bridled White-eyes. When an area of suitable habitat was entered, the observer would quietly stand in one place for 15 minutes, looking and listening for sign of white-eyes foraging or passing through. The observer would then move to another point within like cover, 60-80 meters distant, and repeat the process; approximately five such locations were sampled. The effort yielded no results until the release site was reached. Throughout the 10 days of post-release monitoring small numbers of birds could be found foraging in the forest canopy at this site.

Personnel spent the morning of 12 May documenting observations of Bridled White-eyes in the immediate vicinity of the release site. A total of 10 to 15 birds were observed foraging in the mid- to upper-canopy, at least one of which had been radio-tagged but no transmitter was evident. All birds were active and vocal, moving around readily from place to place and sharing foraging areas with Micronesian Honeyeaters (*Myzomela rubratra*); aside from one white-eye

being displaced from a perch by a honeyeater, little interaction was noted between the two species. Much of their time was spent foraging amongst low, thick edge vegetation to the east and southeast of the release site (Fig. 7). Species of tree on which white-eyes were observed foraging in and around the release site include *Erythrina variegata* (whose nectar is important to various passerine bird species worldwide [L. Williams, CNMI DFW, pers. comm.]), *Aglaia mariannensis*, and *Pipturus argenteus* (Fig. 8).

Figure 7. Low edge vegetation Bridled White-eyes were observed foraging in to the east and southeast of the release site on Sarigan, CNMI, 12 May 2008 (photos: Paul Radley).

Figure 8. Trees and cover Bridled White-eyes were observed foraging in at the release site on Sarigan, CNMI, 12 May 2008 (photos: Paul Radley).

RECOMMENDATIONS FOR IMPROVEMENT

While both preparing for and executing the introduction of Bridled White-eyes to Sarigan in 2008, the MAC Working Group identified several issues that require revision and improvement. These improvements will be implemented in future such avian conservation efforts in the CNMI, including a tentative introduction of another 50 white-eyes to Sarigan in 2009.

- Birds held on Saipan prior to translocation should be placed in smaller, solid sided cages. Solid sides, bottoms, and tops should reduce stress and decrease the incidence of mortality and physical trauma to the captives.
- Fewer birds should be held per cage allowing a certain degree of isolation for better individual monitoring.
- A more effective method of attaching transmitters should be discussed and determined. As gluing radios to trimmed feathers may have lead to their premature loss by some birds on Sarigan, the viability of adhering units directly to the skin should be assessed.
- The feasibility of additional field help for the purpose of tracking and monitoring the translocatees post-release should be assessed and determine.
- Written assurances from USFWS regarding Section 7 and other federal regulatory issues need to be secured to avoid any possible unforeseen obstacles or last minute hurdles that may hamper future avian conservation introduction activities in the CNMI.

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Appendix A. Details of Field Release Cages Used on Sarigan

Compiled by: Peter Luscomb, General Curator, Honolulu Zoo, Honolulu, Hawaii, and Paul Radley, Ornithologist/Wildlife Biologist, CNMI DFW, Saipan, MP

A specifically designed Captive Release Cage was used for holding and observing Bridled White-eyes prior to release on Sarigan (Fig 1). Each box measured 91.4 cm wide by 30.5 cm high by 45.7 cm deep and was divided into two compartments of 45.7 cm wide by 30.5 cm high by 45.7 cm deep. The top, bottom, and back walls were constructed of 0.6 cm plywood and the side and dividing or middle walls were 1.3 cm plywood. The side and middle walls each had a built-in sliding door, with an opening of 7.6 cm by 10.2 cm, which allowed birds to be transferred into either of the two compartments from outside the cage, between the two compartments, or released from the cage entirely (Fig. 1).

Figure 1. Front angle and back angle of the field release cage used to hold Bridled White-eyes for observation prior to release on Sarigan, CNMI, 3 May 2008 (photos: Paul Radley)

The front of the cage (and thus each compartment) was constructed of 1.3 cm by 2.5 cm welded wire hardware cloth with a 15.2 cm by 10.2 cm door in the middle of sections covering the front of each compartment (Fig 1A and Fig. 2). Below the door was another narrow door (measuring 10.2 cm in height) that ran the length of each compartment (Fig. 2). This second door allowed the removal of subfloors built into each compartment to facilitate cleaning. To serve as perches, four 0.6 cm by 91.4 cm dowel rods were inserted width-wise into the cage at approximately 6.4 cm above its floor, each spaced equally from the front of each compartment to the back. A shade cloth screen, which could be draped over the hardware cloth front wall, was secured to the top front edge of the release cage to provide privacy for the birds held within. This shade cloth covering could also be pulled up and placed over the top of the box to allow a clear view of its occupants.

Figure 2. Front view of one compartment of the field release cage while in use on Sarigan, CNMI, 3 May 2008 (photo: Julia Boland).

Field release cage with doors open after Bridled White-eyes have been released on Sarigan, CNMI, 3 May 2008 (photo: Julia Boland).