THE TROPICAL MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (TMAPS) PROGRAM IN AMERICAN SAMOA: 2013 REPORT

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Habitat near the Aoloau TMAPS Station, Tutuila, and a Purple-capped Fruit Dove

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EXECUTIVE SUMMARY

Few data exist on the ecology, population status, and conservation needs of landbirds in American Samoa. In an effort to improve our understanding of this insular avifauna and to provide baseline population data for these species, we initiated a Tropical Monitoring Avian Productivity and Survivorship (TMAPS) program on Tutuila Island in 2012. Long-term goals of this project are to: (1) provide annual indices of adult population size and post-fledging productivity; (2) provide annual estimates of adult population densities, adult survival rates, proportions of residents, and recruitment into the adult population (from capture-recapture data); (3) relate avian demographic data to weather and habitat; (4) identify proximate and ultimate causes of population change; (5) use monitoring data to inform management; and (6) assess the success of managements actions in an adaptive management framework.

Here we provide a summary of captures, indices of population size (capture rates), and productivity for eight TMAPS stations operated on Tutuila during the period August 2012 through August 2013, summarize seasonality patterns for molting strategies and age-determination criteria, and provide a justification for a future 5-month season of November to March based on peak breeding seasons and capture rates encountered during the first year of station operation.

In August 2012 through August 2013 we established and operated eight TMAPS stations in typical habitats utilized by landbirds on Tutuila, American Samoa; two stations needed to be replaced by two others for logistical reasons. We banded 638 birds, we recorded 153 recaptures, and an additional 46 birds were captured and released unbanded, for a total of 837 captures of twelve species overall. The seven most commonly captured species were Wattled Honeyeater, Cardinal Honeyeater, Collared Kingfisher, Samoan Starling, Polynesian Starling, Jungle Myna, and Purple-capped Fruit-Dove. Capture rates for most or all of these seven species are adequate to estimate vital rates, with precision increasing with more years of data.

Among the six long-running stations, the highest adult capture rate during the breeding season during November-March was recorded at the Aolau station, followed by Malota, Loto'asi, Mount Alava, Amalau, and Malaeloa. Reproductive index was highest at Aolau, followed by, Malaeloa, Loto'asi, Malota, Mount Alava and Amalau. This indicates that the best quality habitats for breeding birds on Tutuila are those located at Aolau and Loto'asi; habitats found at Malota and Mount Alava appear to support healthy breeding populations but poor reproductive success, perhaps indicating sink habitats; the habitat at Malaeloa supports low breeding densities but high reproductive success; and only at Amalau does the habitat appear to support neither high breeding populations nor reproductive success.

Capture rates of adults were higher in November-April and lower in May-October and capture rates of juveniles were higher in December through March, indicating a peak breeding season during the austral summer, as expected at the latitude of American Samoa. Based on these data along with data on reproductive condition and molt, we will limit future TMAPS banding during the winters of 2013-2014 through 2016-2017 to the months of November to March, to capture the peak breeding and fledging seasons.

Extensive data on molt, plumage, breeding condition, skull pneumaticization, and morphometrics has been summarized in a comprehensive manual on molt, age and sex determination criteria for the resident birds of American Samoa; this information will be submitted for publication in the scientific literature during 2014. We have determined that the preformative molt is absent in one target species (Collared Kingfisher), partial in three species (Wattled Honeyeater and the two starlings), and incomplete or complete in three species (Purple-capped Fruit-Dove, Cardinal Honeyeater, and Jungle Myna). The prebasic molt peaks in January-April in most species, following the peak breeding season. Specific age-determination criteria and seasonality were also determined for the target indigenous species.

Continuation of the current sampling protocol will yield critical data on the survival, recruitment, and population growth rates for these target species. Our goal is to continue to operate six stations on Tutuila during November-March during the coming four breeding seasons, and to also add six stations on Ta'u Island beginning in the 2013-2014 season. We anticipate that the stations on Ta'u will not only increase capture rates of most of the species currently targeted, but we hope will add two new species, Blue-crowned Lory and Fiji Shrikebill to our list of species with adequate capture rates to assess their demographics.

Continued monitoring at the TMAPS stations and the realization of TMAPS goals will aid identification of conservation needs and formulation of management approaches for Samoan landbirds. The need for such approaches is pressing given the many potential threats to the persistence of Pacific insular populations such as habitat loss, avian disease, and exotic predators such as brown treesnake, which has reduced or eliminated many landbirds on Guam in the Marianas Islands. We look forward to continuing this important work in the coming years.

INTRODUCTION

Birds are sensitive indicators of environmental quality and ecosystem health (Morrison 1986, Hutto 1998), and they are the focus of many regional and continental scale monitoring efforts (Gregory et al. 2005, Sauer et al. 2008). Most broad-scale bird monitoring has involved counts of birds to index abundance and estimate trends (Bart 2005), but monitoring of demographic rates (productivity, recruitment, survival) is needed to infer actual causes of population changes (DeSante et al. 2005). Because demographic rates are directly affected by environmental stressors or management actions, they can more accurately reflect short-term and local environmental changes (Temple and Wiens 1989, DeSante and George 1994). Demographic data can also be used to identify stages of the life cycle that are most important for limiting bird populations (Green 1999; Peach et al. 1999; DeSante et al. 2001; Holmes 2007; Saracco et al. 2008, 2009) and can be modeled as functions of predictive population analyses to assess the viability of populations (Noon and Sauer 1992; Saracco et al. 2010a, 2010b).

Application of standardized constant-effort mist netting and modern capture-recapture analytical techniques is an effective means of monitoring demographic rates of many landbird species (DeSante et al. 2005). A long-term landbird mark-recapture effort was initiated in North America by The Institute for Bird Populations (IBP), with the establishment of the Monitoring Avian Productivity and Survivorship (MAPS) program in 1989 (DeSante 1992). The MAPS program is a cooperative network consisting of hundreds of constant-effort mist-netting stations operated across North America each summer (nearly 1,200 stations overall) that has provided demographic data for > 180 landbird species (DeSante and Kaschube 2007, Saracco et al. 2010b). Similar programs exist in Europe, where they are central components of national and international bird-monitoring efforts (e.g., Peach et al. 2004). The MAPS program has been utilized to monitor bird demography by many U.S. federal agencies, including the National Park Service, Department of Defense, USDA Forest Service, and USDI Fish and Wildlife Service.

IBP has also established a "Tropical MAPS" (TMAPS) program to collect similar data on avian vital rates in tropical areas, where breeding may occur year-round. The first TMAPS project was established on Saipan, Commonwealth of the Northern Marianas Islands, in 2008 and has provided important new information on population abundance and trends, breeding and molting seasonality, vital rates, age-determination criteria, morphology, and ecology of the resident landbirds on this island (Radley et al. 2011, Junda et al. 2012, Pyle et al. 2012a)

IBP, in collaboration with the Department of Marine and Wildlife Resources in American Samoa, established TMAPS stations on the island of Tutuila in August 2012 to initiate a five-year TMAPS program there. This effort aims to provide baseline data on landbird populations of American Samoa and a foundation for informing conservation strategies for this insular avifauna. Long-term goals are to: (1) provide annual indices of adult population size and post-fledging productivity (from constant-effort capture data); (2) provide annual estimates and trends of adult population size, adult survival rates, proportions of residents, and recruitment into the adult population (from capture-recapture data); (3) relate avian demographic data to seasonal weather patterns and habitat; (4) identify proximate and ultimate causes of population change; (5) use monitoring data to inform management; and (6) assess the success of any management actions in

an adaptive management framework. In order to estimate productivity and recruitment, accurate criteria for determination of each captured bird's age is needed, which in turn relies on knowledge of molting seasons and strategies.

The initial establishment of TMAPS stations on Tutuila and a preliminary summary of capture data from seven TMAPS stations were described by Pyle et al. (2012b), and molting patterns and age-determination criteria for Samoan landbirds based on museum specimens and captures on Tutuila is detailed by Pyle et al. (2013). Here we provide a more comprehensive summary of captures, indices of population size (capture rates), and productivity for eight TMAPS stations operated on Tutuila during the period August 2012 through August 2013. We also summarize seasonality patterns for molting strategies and age-determination criteria, and provide a justification for a future 5-month season for the TMAPS Program in American Samoa, November to March, based on peak breeding seasons and capture rates encountered during the first year of station operation.

STUDY AREAS AND METHODS

In July-August 2012 we established six TMAPS stations in typical habitats utilized by landbirds on Tutuila, American Samoa (Table 1; Fig. 1). All six stations were operated on three consecutive days (representing a "pulse"), once per month, during August-October 2012. In October the Fagatele Bay station was discontinued due to access problems and low capture rates, and a seventh station, Mount Alava, was established in November 2012 to replace the Fagatele Bay station. In November 2012 the Olovalu Crater station needed to be discontinued for similar reasons, and was replaced by an eighth station, Malota, in December 2012. The resulting six stations were operated continuously through August 2013. Locations, descriptions and a summary of effort for these eight stations are provided in Figure 1 and Table 1.

Each station consisted of a sampling area of about 20 ha. Within the central 8 ha of each station, 10 12-m long, 30-mm mesh, 4-tier nylon mist nets were erected at fixed net sites. Stations were operated according to the standardized protocol established by The Institute for Bird Populations for use in the MAPS Program (DeSante et al. 2012). Mist-netting effort data (i.e., the number and timing of net-hours on each day of operation) were collected in a standardized manner by recording net-opening, net-checking, and net-closing times to the nearest 10 minutes. We aimed to operate nets for six morning hours per day beginning at local sunrise. Inclement weather (especially heavy rain) sometimes truncated operation on a particular day, resulting in variable overall effort among stations (Table 1). Station operation was carried out by biologist interns and assistants, including Tranquillo, Nell, and Jeffreys (see Acknowledgements), who were trained in TMAPS protocols by IBP staff biologist Taylor and supervised by Dauphine and, remotely, by Rowan and Pyle.

With few exceptions, all birds captured were identified to species, age, and sex based on criteria outlined by Pyle (2013), and, if unbanded, were banded with USGS/BRD numbered aluminum leg bands. Birds were released immediately upon capture and before being banded or processed if situations arose where bird safety would be compromised. The following data were taken on all birds captured, including recaptures, according to MAPS guidelines (DeSante et al. 2012):

- capture code (newly banded, recaptured, band changed, unbanded)
- band number
- species
- age, how aged, and molt-plumage code (see below)
- sex (if possible to determine) and how sexed (if applicable)
- extent of skull pneumaticization
- breeding condition of adults (i.e., extent of cloacal protuberance or brood patch)
- extent of juvenal plumage in young birds
- extent of body and flight-feather molt
- extent of primary-feather wear
- presence of molt limits and plumage characteristics
- wing chord
- fat class and body mass
- date and time of capture (net-run time)
- station and net site where captured
- any pertinent notes.

Detailed molt data and images were obtained for most captures, to establish molt strategies and ageing and sexing criteria for American Samoan landbirds (Pyle 2013). These data and images were examined by Pyle to assess accuracy of age determinations and to develop seasonal criteria for acceptable age coding. Because breeding can occur year-round in American Samoa and the peak breeding season spans the calendar year (December/January), the calendar-year-based ageing system used for MAPS (DeSante et al. 2012) could not be used for this program. Instead, we used the same coding used in MAPS except young vs. adult was scored according to our estimation of whether or not a bird was greater or less than six months old (based on skull and feather wear data), as opposed to which calendar year it was hatched. In addition, each capture was given a molt-plumage (WRP) code following Wolfe et al. (2010) and Johnson et al. (2011). A final determination of age for productivity analyses, young or adult, was determined through a combination of the age and WRP codes.

Breeding (summer residency) status (confirmed breeder, likely breeder, non-breeder) of each species seen, heard, or captured at each TMAPS station on each day of operation was recorded using techniques similar to those employed for breeding bird atlas projects. We used these data to classify each species at each station according to three residency categories: breeder, migrant, or transient. Habitat data were collected for each station following Nott et al. (2003), and using the vegetation classification system of Viereck et al. (1992). John W. Shipman of Zoological Data Processing, Socorro, NM, entered all banding data.

We verified the banding data by running all records through a series of specialized computer programs to (1) check the validity of all codes entered and the ranges of all numerical data to compare station, date, and net fields from the banding data with those from the effort and breeding status data, (2) cross-check species, age, and sex determinations against data such as skull pneumatization and breeding characters indicative of age and sex, and (3) detect unusual or duplicate band numbers, unusual band sizes, or recaptures indicating inconsistent species, age, or sex determinations. Discrepancies or suspicious data identified by these programs were corrected

by hand, if necessary. We used wing chord, body mass, fat content, date and station of capture, and pertinent plumage criteria as supplementary information for the correct determination of species, age, and sex (Pyle 2013). As mentioned above, all photographs were examined to verify age and sex determinations.

For each species and for all species pooled, we calculated (1) numbers of newly banded birds, recaptured birds, and birds released unbanded, (2) numbers and capture rates (per 600 net-hours) of individual birds at each station, and (3) capture rates for adult and young birds and the ratio of young to adult birds representing a reproductive index (Peach et al. 1996). Once four or more years of data are collected, we will use sophisticated mark-recapture techniques (e.g., Hines et al. 2003) to estimate survivorship of target species.

RESULTS

An overall summary of captures of each species during the four TMAPS pulses from August 2012 through August 2013, at all eight stations combined, is provided in Table 2, a summary of captures (newly banded, recaptured, and released unbanded) at each station is provided in Table 3, and a summary of captures by age (adult and young) along with productivity indices for each station is provided in Table 4. We banded 638 birds, we recorded 153 recaptures, and an additional 46 birds were captured and released unbanded, for a total of 837 captures (Table 2). Twelve species were captured overall.

The most commonly captured species by far was Wattled Honeyeater (473 captures), followed in descending order by Cardinal Honeyeater (105), Collared Kingfisher (94), Samoan Starling (59), Polynesian Starling (32), Jungle Myna (28), Purple-capped Fruit-Dove (19), Red-vented Bulbul (18), White-rumped Swiftlet (11), Common Myna (6), Buff-banded Rail (1), and Purple Swamphen (1). Several recaptures were of birds previously banded on Tutuila as part of other projects and these were treated as newly banded birds in our data set. Three other landbird species on Tutuila, Many-colored Fruit-Dove (*Ptilinopus perousii*), Pacific Pigeon (*Ducula pacifica*), and Long-tailed Cuckoo (*Eudynamis taitensis*), have not yet been captured at the TMAPS stations.

The 837 captures of individual birds, during 10,433.50 net-hours (Table 1), results in a capture rate of 48.13 individual birds per 600 net-hours, a standard index to compare across locations and stations. Among species that were banded, this index ranged from 0.2 for Common Myna to 13.0 for Wattled Honeyeater (Table 2). This overall capture rate is slightly lower than found at most MAPS stations but is adequate to estimate vital rates for all species pooled, for the four target species with a capture rate of 1.5 or more, Purple-capped Fruit Dove, Collared Kingfisher, Wattled Honeyeater, and Cardinal Honeyeater, and marginally so for species with a capture rate of 1.0-1.5, Samoan Starling, Polynesian Starling, and Jungle Myna.

Among stations (Table 3), the highest number of captures occurred at Aolau (264 captures) followed by Loto'asi (143), Mount Alava and Amalau (121 each), Malota (87), Malaeloa (56), Fagatele Bay (30), and Olovalu Crater (15). Species richness was greatest at Loto'asi and Aolau with 8 species each, followed by three stations with 6 species, two with 5 species, and Olovalu

Crater with 3 species (Table 3).

Because of variation in the number of net-hours, especially regarding the four stations not operated for the full period (Table 1), it is best to compare overall population densities in terms of individual adults captured per 600 net-hours (Table 4). Using this metric for the five-month period November 2012 to March 2013 (the peak breeding season; see below), the highest adult capture rate was recorded at Aolau (41.8 adults per 600 net-hours), followed by Malota (32.7), Loto'asi (28.4), Mount Alava (25.5), Amalau (13.1), and Malaeloa (11.0). Capture rates at Fagatele Bay and Olovalu Crater (Pyle et al. 2012b) were similar to or lower than those of the replacement stations Malota and Malaeloa, indicating successful recruitment of the new stations.

Captures of young of all species pooled during November 2012 through March 2013 (Table 4) showed a somewhat different order to captures of adults, being highest at Aolau (36.5 young birds per 600 net-hours), followed by Loto'asi (20.1), Malota (12.2), Malaeloa (9.0), Mount Alava (7.6), and Amalau (1.8). This resulted in substantial variation in reproductive index, which was highest at Aolau (0.87 young per adults), followed by Malaeloa (0.82), Loto'asi (0.71), Malota (0.38), Mount Alava (0.30), and Amalau (0.13).

Capture rates of all birds and juveniles, of all species pooled per month, are shown in Figure 2. Capture rates of adults were higher in November-April and lower in May-October, with peaks in December and March-April. Capture rates of juveniles were higher in December through March. Based on these data along with data on reproductive condition and molt, it seems clear that peak breeding in most species in American Samoa is during the austral summer, as expected. This pattern appears generally to be followed by all target species except Cardinal Honeyeater, which shows evidence of a double breeding season, juveniles fledging in December and then again in May, partially explaining the higher capture rates in March-April (Fig. 2).

DISCUSSION

The first 13 months of the Tropical Monitoring Avian Productivity and Survivorship (TMAPS) program in American Samoa was an unqualified success. Eight monitoring stations, representing a range of terrestrial habitats typical of Tutuila Island, were established across the length of the island; goals for mist-netting effort were met despite two stations needing to be replaced; and 837 captures of 12 species were recorded.

Four target native species Purple-capped Fruit Dove, Collared Kingfisher, Wattled Honeyeater, and Cardinal Honeyeater, were captured in sufficient numbers to calculate productivity and survivorship, and it is probable that, with collection of more data, that we may also be able to calculate these rates for Samoan Starling, Polynesian Starling, and Jungle Myna. Given the dearth of data on the demographics of Samoan landbirds, establishment of the TMAPS program on Tutuila represents a significant advance in improving our understanding of this insular avifauna.

Among the six long-running stations, the highest adult capture rates during the breeding season

(November-March) was recorded at Aolau, Malota, Loto'asi, and Mount Alava, with lower rates at Amalau, and Malaeloa. Reproductive index was high at Aolau, Malaeloa, and Loto'asi, and lower at Malota, Mount Alava, and Amalau. This indicates that the best quality habitats (see Table 1), hosting relatively dense populations and high reproductive success for birds on Tutuila, are those located at Aolau and Loto'asi. Habitats found at Malota and Mount Alava appear to support healthy breeding populations but poor reproductive success, perhaps indicating sink habitats. On the other hand, the habitat at Malaeloa, despite showing low breeding densities, appears to have quite high reproductive success. More years of data will be needed to confirm these patterns or to investigate whether or not juvenile dispersal patterns may be affecting these reproductive indices. Only one of the six stations, Amalau, appears to support neither high breeding populations nor high reproductive success.

Capture rates of all birds and especially of juveniles throughout the first year of operation were higher during the months November through March, indicating that peak breeding in most species in American Samoa is during the austral summer, as expected. Based on this seasonal capture-rate information we will limit future TMAPS banding effort, during the winters of 2013-2014 through 2016-2017, to the months of November to March, to capture the breeding season for most adults and fledging period of most juveniles in American Samoa.

Continuation of the current sampling protocol will yield critical data on the survival, recruitment, and population growth rates for these target species. Our goal is to continue to operate six stations on Tutuila during November-March during the coming four breeding seasons, and to also add six stations on Ta'u Island beginning in the 2013-2014 season. We anticipate that the stations on Ta'u will not only increase capture rates of most of the species currently targeted, but we hope will add two new species, Blue-crowned Lory (*Vini australis*) and Fiji Shrikebill (*Clytorhynchus vitiensis*) to our list of species with adequate capture rates to assess their demographics.

Extensive data on molt, plumage, breeding condition, skull pneumaticization, and morphometrics were collected on eight of the 12 species, and have been coupled with preliminary data from museum specimens to provide a comprehensive manual on molt, age and sex determination criteria for the resident birds of American Samoa (Pyle 2013). The information compiled for this manual will be submitted for publication in the scientific literature (cf. Radley et al. 2011) during 2014. We have determined that the preformative molt is absent in one target species (Collared Kingfisher), partial in three species (Wattled Honeyeater and the two starlings), and incomplete or complete in three species (Purple-capped Fruit-Dove, Cardinal Honeyeater, and Jungle Myna). The prebasic molt peaks in January-April in most species, following peak breeding season.

Specific age-determination criteria and seasonality for target species were also determined for the target indigenous species (Pyle 2013). For Purple-capped Fruit-Dove, young birds can be identified by a blunter-tipped juvenal outer primary than are found in adults, and for Collared Kingfisher young are greener, have white scalloping to the wings, and narrower flight feathers than adults. Sexing for both of these species can be accomplished by plumage, males being brighter than females, once age is determined. All of these criteria sets are similar to those found in these genera in the Northern Marianas Islands (Radley et al. 2011). For Wattled Honeyeater and the two starlings, young are best identified by molt limits in the wing, resulting from the

partial preformative molts, and by the narrower rectrices than are found in adults. Males and females appear similar in plumage among these three species, but can be differentiated by measurements and, to some extent, amount of gloss in the two starlings, age for age. Most Cardinal Honeyeaters undergo an incomplete preformative molt and can be aged by browner inner primary coverts. Once age has been determined, sexes of this species can be separated by the amount of red in the plumage, primarily the back.

Continued monitoring at the TMAPS stations and the realization of TMAPS goals will aid identification of conservation needs and formulation of management approaches for Samoan landbirds. The need for such approaches is pressing given the many potential threats to the persistence of Pacific insular populations such as habitat loss, avian disease, and exotic predators such as brown treesnake (*Boiga irregularis*), which has reduced or eliminated many landbirds on Guam in the Marianas Islands (Frits and Rhodda 1998). We look forward to continuing this important work in the coming years.

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Table 1. Summary of the TMAPS program on the island of Tutuila, American Samoa (AMSA), August 2012 through August 2013. The original six stations were first operated in August 2012; two of these (Fagatele Bay and Olovalu Crater) were replaced during the year by two other stations (Mount Alava and Malota) due to access and logistical considerations.

Station					August 2012-August 2013 operation		
Name	Code	Major Habitat Type	Latitude-longitude	Avg Elev. (m)	Total number of net-hours	No. of pulses	Inclusive dates
Fagatele Bay	FABA	Old-growth moderate-slope, lowland tropical evergreen forest	14°21'51"S, 170°45'27"W	79	478.33	3	08/10/12 – 10/11/12
Loto'asi	LOTO	Secondary, lowland, tropical forest and open-field edge	14°21'42"S, 170°46'27"W	12	1673.83	13	08/07/12 – 08/05/13
Olovalu Crater	OLOV	Mixed old-growth tropical forest and encroaching banana plantation	14°20'41"S, 170°45'29"W	70	555.17	4	08/03/12 – 11/03/12
Malaeloa	MALA	Old-growth moderate-slope, lowland tropical evergreen forest; ephemeral wetlands	14°19'50"S, 170°46'26"W	43	1508.17	13	08/15/12 – 08/13/13
Aoloau	AOLO	Ridge-spine, secondary, tropical forest	14°19'03"S, 170°46'01"W	451	1735.67	13	08/27/12 – 08/22/13
Mount Alava	MTAL	Old-growth steep-slope, tropical forest; some secondary forest and plantation	14°17'05"S, 170°42'46"W	215	1458.33	10	11/12/12 – 08/08/13
Amalau	AMAL	Mixed, old-growth and secondary lowland tropical forest; some plantation	14°15'19"S, 170°39'32"W	35	1780.67	13	08/21/12 - 8/15/13
Malota	MALO	Ridge-spine, natural tropical forest	14°18'17"S, 170°49'11"W	144	1243.33	8	12/27/12 – 08/20/13
ALL STATIONS					10433.50	13	08/03/12 – 08/20/13

Table 2. Summary of combined results for all eight American Samoan TMAPS stations operated in August 2012 through August 2013.

Species (Common and Scientific Names)	Birds captured			Birds/600 net-hours		
	Newly banded	Un-banded	Recap-tured	Adults	Young	Prop. Young
Buff-banded Rail, *Gallirallus philippensis*		1				
Purple Swamphen, *Porphyrio porphyria*		1				
White-rumped Swiftlet, *Aerodramus spodiopygia*	3	8				
Purple-capped Fruit-Dove, *Ptilinopus porphyraceus*	18		1	1.5	0.2	0.10
Collared Kingfisher, *Todiramphus chloris*	63		31	3.8	2.3	0.60
Red-vented Bulbul, *Pycnonotus cafer*	16	1	1	0.8	0.5	0.60
Wattled Honeyeater, *Foulehaio carunculata*	343	21	99	13.0	5.0	0.38
Cardinal Honeyeater, *Myzomela cardinalis*	90	3	12	2.9	3.9	1.37
Polynesian Starling, *Aplonis tabuensis*	27	1	4	1.1	0.9	0.86
Samoan Starling, *Aplonis atrifusca*	47	7	5	1.2	1.1	0.88
Common Myna, *Acridotheres tristis*	6			0.2	0.2	1.00
Jungle Myna, *Acridotheres fuscus*	25	3		1.2	0.8	0.63
ALL SPECIES POOLED	638	46	153	25.5	14.6	0.57
Total Number of Captures		837				
Total Number of Species		12			9	

Table 3. Capture summary for the eight individual TMAPS stations operated on the island of Tutuila, American Samoa (AMSA), in August 2012 through August 2013. N = Newly banded, U = Unbanded, R = Recaptures of banded birds.

	Fagatele Bay			Loto'asi			Olovalu Crater			Malaeloa			Aoloau			Mount Alava			Amalu			Malota		
Species[1]	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R	N	U	R
Buff-banded Rail																				1				
Purple Swamphen																				1				
White-rumped Swiftlet										3	2						6							
Purple-collared Fruit-Dove				1									1		1	8						8		
Collared Kingfisher	3		1	11		13	3		1	11		4	4		1	15		2	10		7	6		2
Red-vented Bulbul	1			15		1								1										
Wattled Honeyeater	19		3	48	5	12	9			27		5	96	6	41	56	3	11	54	1	21	34	6	6
Cardinal Honeyeater				1									87	3	12							2		
Polynesian Starling										1			7		1	7	1	1	3			9		2
Samoan Starling	2			4			1	1		3				2		9		2	17	3	3	11	1	
Common Myna	1			5																				
Jungle Myna				25	2									1										
All Species Pooled	26		4	110	7	26	13	1	1	45	2	9	195	13	56	95	10	16	84	6	31	70	7	10
Total Number of Captures		30			143			15			56			264			121			121			87	
Number of Species	5		2	8	2	3	3	1	1	5	1	2	5	5	5	5	3	4	4	4	3	6	2	3
Total Number of Species		5			8			3			5			8			6			6			6	

[1] Scientific names given in Table 2.

Table 4. Numbers of aged individual birds captured per 600 net-hours and proportion of young in the catch at the six individual MAPS stations operated on the island of Tutuila, American Samoa (AMSA), in November 2012 – March 2013.

	Loto'asi			Malaeloa			Aoloau			Mount Alava			Amalau			Malota		
Species[1]	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.	Ad.	Yg.	Prop. Yg.
Purple-collared Fruit-Dove	0.0	0.8	und.[2]				0.9	0.0	0.00	3.4	0.0	0.00				5.1	0.0	0.00
Collared Kingfisher	5.0	3.3	0.67	3.0	6.0	2.00	0.9	0.9	1.00	4.2	3.4	0.80	5.3	0.0	0.00	4.1	0.0	0.00
Red-vented Bulbul	4.2	2.5	0.60															
Wattled Honeyeater	10.9	6.7	0.62	8.0	2.0	0.25	23.1	10.7	0.46	16.1	3.4	0.21	5.3	0.9	0.17	14.3	6.1	0.43
Cardinal Honeyeater	0.0	0.0	0.00				15.1	23.1	1.53							2.0	0.0	0.00
Polynesian Starling							1.8	1.8	1.00	0.8	0.8	1.00				4.1	3.1	0.75
Samoan Starling	0.8	1.7	2.00	0.0	1.0	und.[2]				0.8	0.0	0.00	2.6	0.9	0.33	3.1	3.1	1.00
Common Myna	0.8	0.8	1.00															
Jungle Myna	6.7	4.2	0.63															
All Species Pooled	28.4	20.1	0.71	11.0	9.0	0.82	41.8	36.5	0.87	25.5	7.6	0.30	13.1	1.8	0.13	32.7	12.2	0.38
Number of Species	6	7		2	3		5	4		5	3		3	2		6	3	
Total Number of Species		7			3			5			5			3			6	

[1] Scientific names given in Table 2.
[2] Reproductive index (young/adult) is undefined because no adults of this species were captured at this station in this year.

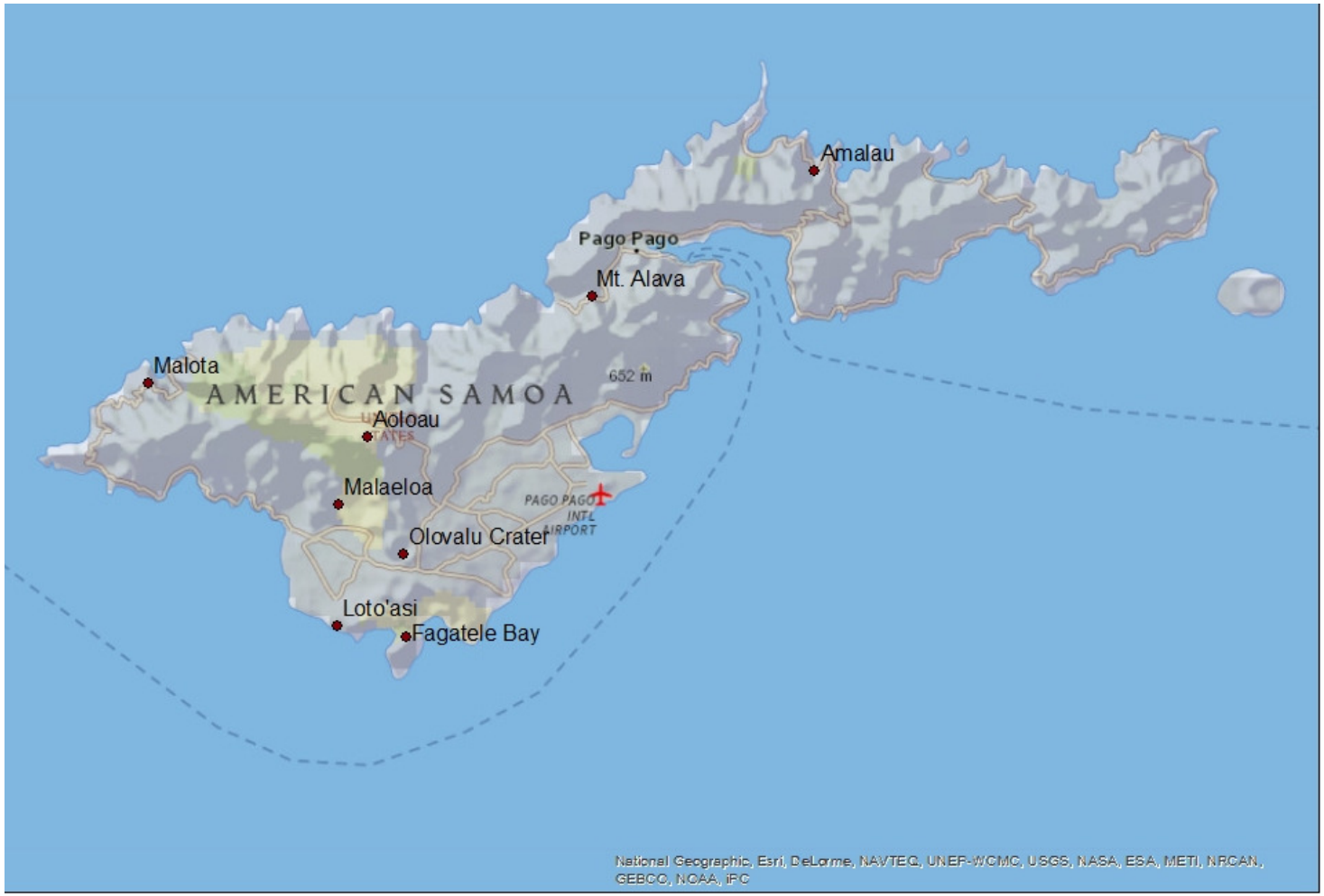

Figure 1. Locations of the eight Tropical Monitoring Avian Productivity and Survivorship (TMAPS) stations operated during , August 2012 through August 2013 on Tutuila Island, American Samoa.

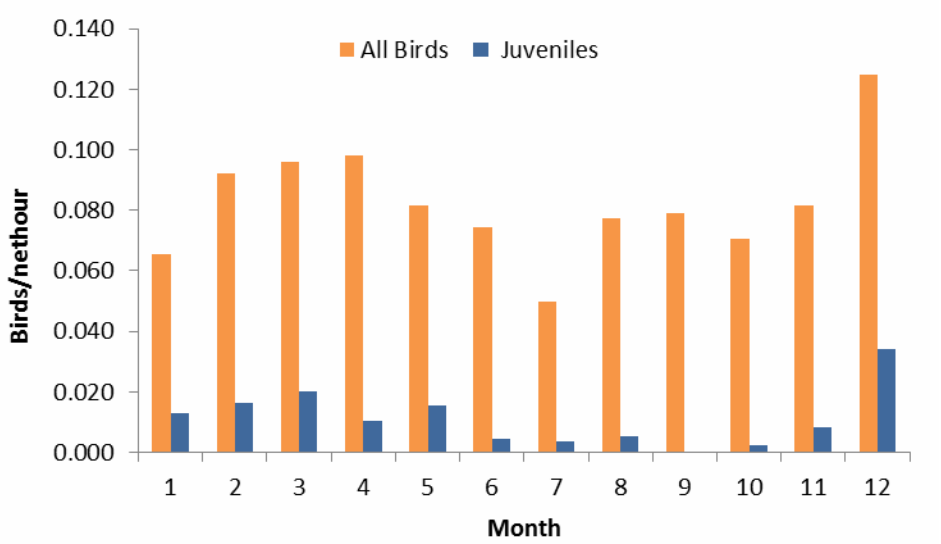

Figure 2. Capture rates per 600 net-hours of all birds and of juveniles at eight American Samoan TMAPS stations by month, in January (1) through December (12). Data were collected during August 2012 - August 2013; both years were combined to calculate the values for August (8).