

## Survey of the Non-Migratory Birds of the Rock Islands Southern Lagoon World Heritage Site in Palau<sup>1</sup>

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**Abstract**— Our field survey of the 10 island groups in the Rock Islands Southern Lagoon UNESCO World Heritage Site in Palau found a cumulative total of 37 species of non-migratory wild birds including 13 endemic to Palau and 5 endemic to Micronesia. Previous surveys of Palau’s avifauna reported a cumulative total of 29 non-migratory wild bird species for the site. We also observed 5 migratory bird species, 2 non-migratory species of bats, nesting activity by 9 non-migratory bird species and a larger range than previously known for the endemic Giant White-eye, *Megazosterops palauensis*.

### Introduction

Located in the Republic of Palau, the Rock Islands Southern Lagoon (RISL) Conservation Area was nominated as a UNESCO World Heritage Site in 2011 and inscribed on the World Heritage List in 2012 (Document 2012). The nomination cited forest habitats for endemic birds in the criteria for selecting the conservation area to be a World Heritage Site, but basic knowledge of the bird diversity of the site is incomplete. Because the World Heritage Site is remote, previous bird surveys (Engbring 1992, VanderWerf 2007, Wiles & Conry 1990) have provided only partial geographic coverage of the site while the descriptions of geographic ranges in field guides and other compendia of Palau’s birds (Baker 1951, Engbring 1988, Marshall 1949, Owen 1977, Pratt & Etpison 2008, Pratt et al. 1987, Pyle & Engbring 1985, Wiles 2005) are mostly too general to pinpoint whether a species occurs inside or outside the boundaries of the World Heritage Site. To increase available information on the bird diversity of this internationally important conservation area, we conducted this first thorough, site-specific survey of the bird species richness that it hosts.

### Materials and Methods

Our study area is the RISL World Heritage Site, a conservation area that includes approximately 445 small (< 100 ha – 1800 ha) forested, raised limestone “rock” islands scattered within 100,200 ha of marine lagoon waters protected by a barrier reef. The rock islands inside the boundaries of the RISL World Heritage Site are geographically arranged into 10 groups (Figure 1) that are uninhabited and accessible only by boat. Previous surveys in the study area were limited to 4 of the 10 island groups (Ulebsechel, Ngeruktabel, Mecherechar and Ngerukuid) and most of them relied heavily on bird counts from boats, a practice that may have biased the counts against species that are not easily detected from offshore (VanderWerf 2007). Instead, we made inland counts of bird species richness by landing and walking into the forest as far as possible at various times of day or night. Landing points were  $\geq 150$  m apart to avoid overlapping counts and we visited each point only once. During each count, we documented every species seen or heard during a timed 15-

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minute interval at our farthest point of penetration into the forest plus any other species seen or heard while en route from the shore and back. Depending on terrain, our farthest point of penetration into the forest ranged from 25 m to >500 m inland from the high tide line at the landing point. We only conducted counts in fair weather at wind intensity  $\leq 3$  on the Beaufort scale.

Our survey began on 12 September 2011, when we accompanied an IUCN field team during their evaluation of the World Heritage nomination and ended on 11 October 2015. We took a total of 140 separate counts of bird species richness evenly spread over the four-year survey period. The number of counts per island group ranged from 2 to 27 as follows: Babelomekang (27 counts), Kmekumer (2 counts), Mecherechar (27 counts), Ngeanges (8 counts), Ngemelis (13 counts), Ngerechong (3 counts), Ngerukuid (3 counts), Ngeruktabel (26 counts), Ulebsechel (9 counts) and Ulong (22 counts). Scientific and English names follow Gill & Donsker (2016).

## Results and Discussion

We detected a total of 37 species of non-migratory wild birds on counts, including 13 species that are endemic to Palau and 5 other species that are endemic to the Micronesia region. Table 1 lists the 37 species in descending order of the number of counts on which they were detected. By comparison, previous studies listed a cumulative total of 29 non-migratory wild bird species for the island groups in the World Heritage Site (Engbring 1992, Pratt et al. 1980, VanderWerf 2007, Wiles & Conry 1990). We detected all 29 of those species during our survey.

The range of the endemic Giant White-eye is widely reported to be restricted to Ngeruktabel in the study area and Peleliu Island outside the study area (Engbring 1988, Engbring 1992, Holm et al. 2008, Marshall 1949, Pratt & Etpison 2008, Pratt et al. 1980, Pratt et al. 1987, Sherley 2001), the species being “strangely absent from the other rock islands” (VanderWerf 2007). We saw Giant White-eyes in 4 island groups, confirming the occurrence of the species at Ngeruktabel and adding Mecherechar, Ngerechong and Ulong. We frequently observed the species feeding on the flowers and fruit of wax apple trees, *Eugenia javanica*, suggesting that Giant White-eyes may be drawn to any island group with wax apple trees in bloom or bearing fruit.

We found active nesting mounds of the Micronesian Megapode (widespread) as well as active nests of the Palau Fantail (Ngeanges, Ulong), Eclectus Parrot (Ulong), White-tailed Tropicbird (Ulong), Nicobar Pigeon (Ngeruktabel) and Giant White-eye (Ngeruktabel). We saw pairs of Black-naped Terns and Bridled Terns at Ngerukuid on rocky cliffs suitable for nesting and we watched Black Noddies gathering seaweed for nesting material at Ngemelis.

We detected 5 migratory species during our counts: Common Sandpiper, *Actitis hypoleucos* (Ngerukuid, Ulong); Ruddy Turnstone, *Arenaria interpres* (Ngerechong, Ulong); Gray-tailed Tattler, *Tringa brevipes* (Ngemelis); Eastern Cattle Egret, *Bubulcus coromandus* (Ngeruktabel); and Eastern Yellow Wagtail, *Motacilla tschutschensis* (Ulong). The Common Sandpiper has been previously reported from Ngerukuid in the study area (Wiles & Conry 1990). Tame Red Junglefowl, *Gallus gallus*, were observed at several picnic facilities in the study area. Following precedent (cf. Wiles 2005, p. 144), we excluded junglefowl from our final counts to avoid inflating our counts of wild birds with “liberated” semi-feral chickens. We also detected the Palau Flying Fox, *Pteropus pelewensis*, during 34 counts spread throughout the study area and found a roosting cave of the Pacific Sheath-tailed Bat, *Emballonura semicaudata*, during a count at Ulong.

Palau’s avifauna is the richest in Micronesia (Pratt & Etpison 2008, VanderWerf 2007, Wiles 2005) and the diversity of the non-migratory birds of the RISL World Heritage Site is the richest that we have encountered in 10 years of field work in Palau. The results of this survey reinforce the UNESCO emphasis on the importance of the site as a refuge for endemic birds. Seven of the 13 Palau endemics detected during the survey are fairly common in the World Heritage Site, having been detected on  $\geq 50\%$  of the counts that we conducted during our survey. Three of the 5 Micronesia regional endemics which occur in the site are fairly common there, including the

endangered Micronesian Megapode (Olsen et al. 2016). We hope that this inventory of birds in the World Heritage Site will provide useful guidance for developing programs and strategies to protect its biodiversity with particular care for safeguarding endemics and species heading towards extinction (cf. Francis 2015, p.12).

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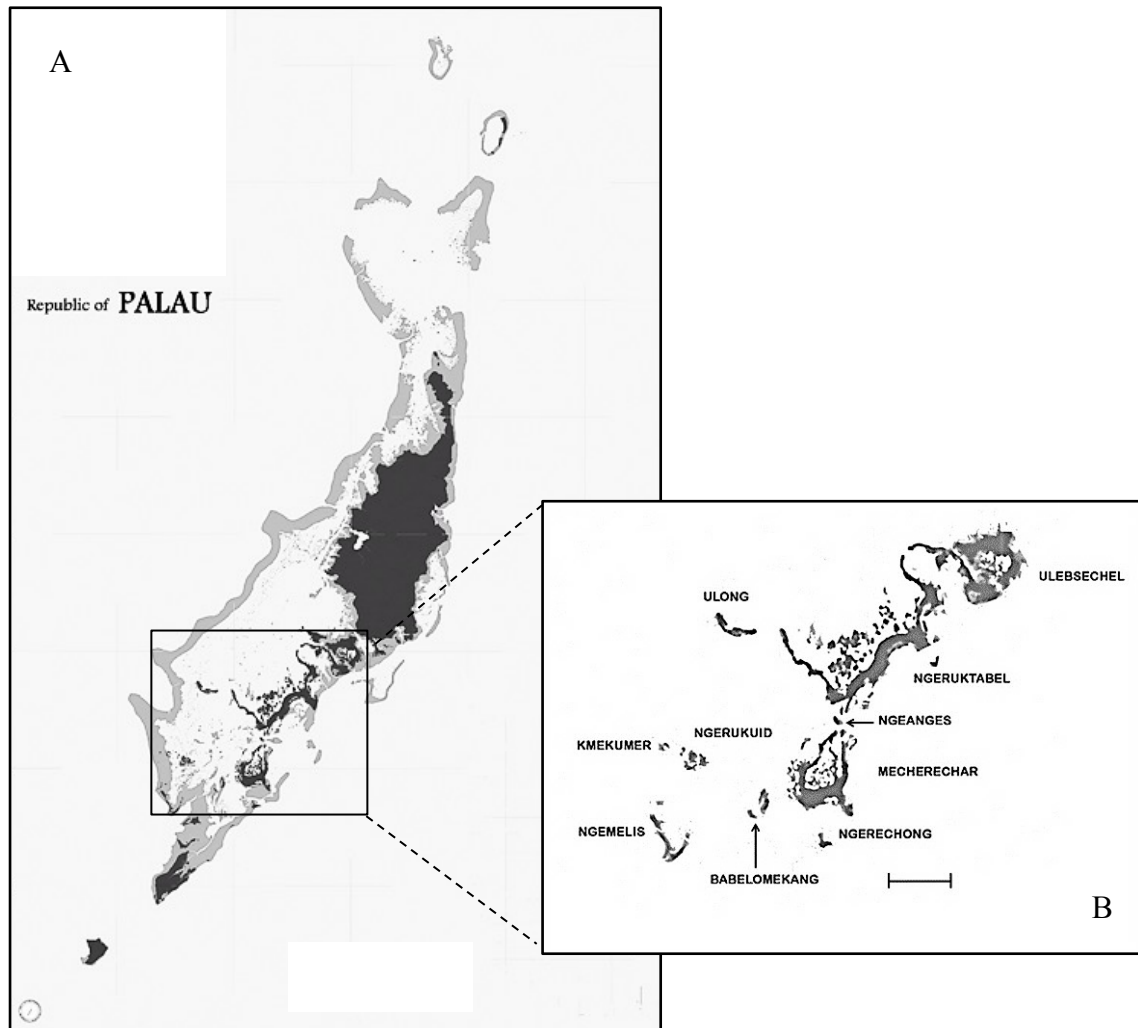


Figure 1. A. Map of Palau. B. Map of the island groups of the Rock Islands Southern Lagoon World Heritage Site study area (inset). Our survey included all 10 island groups. Scale marker = 5 km..

Table 1. List of the non-migratory wild birds detected during the survey of the Rock Islands Southern Lagoon World Heritage Site. \* = Palau endemic species. † = Micronesia regional endemic species. ‡ = Introduced species. [EN] = Endangered species. Frequency values indicate the number of counts during which a species was detected. Shaded areas in the columns to the right indicate detection of a species at an island group: Column a=Ngeruktabel, b=Ulong, c=Mecherechar, d=Ngerechong, e=Ngemelis, f=Babelchomekang, g=Ulebsechel, h=Ngerukuid, i=Ngeanges, j=Kmekumer.

