A RAPID FIELD ASSESSMENT OF THE RUFOUS NIGHT-HERON POPULATION OF PALAU, MICRONESIA

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A medium-sized (58 cm) cinnamon-brown heron with a black crown and nape, *Nycticorax caledonicus pelewensis* is a nonmigratory subspecies of the Rufous Night-Heron that occurs only in the Palau and Chuuk islands of Micronesia (Pratt et al. 1987, Wiles 2005, Pratt and Etpison 2008). Its natural habitat is coastal wetland with mangroves for roosting and tidal flats for feeding grounds (Engbring 1988). The Rufous Night-Heron was selected as the flagship coastal species for Palau's National Program for Monitoring Forest and Coastal Birds because it is a prominent feature of Palau's coastal avifauna and, as a conspicuous territorial predator with a varied diet, it has practical value as an indicator of the biological richness of Palau's coastal wetlands (Olsen and Eberdong 2012). In order to fully incorporate the Rufous Night-Heron into the national monitoring program, we needed a baseline population estimate for the Palau subpopulation. When we reviewed the reports of previous surveys of Micronesia's birds (Engbring et al. 1990, Engbring 1992, VanderWerf 2007) we found that the reports mentioned sightings of Rufous Night-Herons but did not provide a population estimate. *Waterbird Population Estimates* (Wetlands International 2014) hazarded a "best guess" population estimate of "1–10,000" for the subspecies. The chief obstacles to establishing a more precise population estimate for the subspecies are the lack of a well-defined breeding season and the lack of centralized roosting or nesting colonies where the birds can be conveniently counted. Although Rufous Night-Herons are generally considered to be crepuscular or nocturnal creatures (Hancock 1999, Brazil 2009), we observed that, in Palau, they are routinely attracted to their coastal feeding grounds during daytime low tides. So we took the approach of a rapid field assessment of Palau's Rufous Night-Heron population by counting the birds at low tide on their daytime feeding grounds as they stand on the tidal flats waiting for prey.

Taking advantage of a four-day sequence of exceptionally low (–6 cm to –21 cm) afternoon tides from 4 through 7 June 2012, we counted Rufous Night-Herons on their feeding grounds in a study area that encompasses the coastal wetlands of Babeldaob Island and of the smaller islands of Koror, Ngerkebesang, and Malakal (known collectively as the Koror Complex) immediately south of Babeldaob. Together, the four islands account for 80% (376 km^2) of Palau's land mass and 92% (4200 ha) of Palau's mangroves (Colin 2009). The remaining 8% of Palau's mangroves is scattered among small, remote islands in the lagoon south of the study area. In order to complete the assessment during the four-day tide sequence, we selected four representative assessment localities within the study area, using the extent of mangroves to express our coverage of Rufous Night-Heron habitat in the study area. The four assessment localities and their estimated coverage by mangrove in hectares are in eastern Babeldaob (500 ha), western Babeldaob (600 ha), northern Babeldaob (500 ha), and southern Babeldaob/Koror Island Complex (500 ha). The greater extent of mangrove represented at western Babeldaob resulted from the inclusion of Ngermeduu Bay, an estuary that is lined with mangrove forest. In combination, the four localities encompass 2100 ha of mangroves, representing half of the Rufous Night-Heron habitat in the study area. En route to or from each assessment locality, we visited inland sites where Rufous Night-Herons are known to congregate to see how many remained at these sites at low tide.

Over the four-day period, we completed 46 counts of Rufous Night-Herons from

separate vantage points at the coastal assessment localities and at inland sites where Rufous Night-Herons reportedly congregate. For each count, we recorded the number of Rufous Night-Herons, time of day, geographic coordinates, temperature, cloud cover, and wind condition. We conducted our coastal counts from vantage points that offered neighboring panoramic views of the tidal flats and mangroves, using landmarks to avoid overlapping counts and following the daily progressions of low tide from north to south. We conducted 22 coastal counts from separate shoreline vantage points (beach, bluff, bridge, causeway, or pier) as follows: eastern Babeldaob (4 June 2012, 8 counts), northern Babeldaob (6 June 2012, 6 counts), southern Babeldaob/Koror Island Complex (7 June 2012, 8 counts). The number of shoreline counts per assessment locality depended on the distribution of suitable vantage points and landmarks. We made 18 coastal counts from a boat traveling along the remote coast of the western Babeldaob assessment locality (5 June 2012), which is not accessible by a land route. These offshore counts required many tightly spaced offshore vantage points to avoid overlap from drift each time we stopped the boat to count birds. The six inland sites that we assessed en route to or from the coastal counts included a fish farm in western Babeldaob, a landfill in eastern Babeldaob, and two landfills, a fish farm and a sewage-treatment plant in the southern Babeldaob/Koror Complex. Figure 1 maps the approximate locations of the vantage points in each assessment locality. In three instances, pairs of vantage points for adjacent sites (e.g., a pier and a landfill) were too close together to register as separate points on the scale of the map.

We tallied a four-day cumulative total of 552 Rufous Night-Herons: 514 (93.1%) adult birds and 38 (6.9%) immature birds, with an average of 12 birds per count (range 0–50 birds per count). The time of day ranged from 12:45 to 16:00; temperature from 26.2°C to 35.5°C; cloud cover from 5% to 100%; wind calm to gentle breeze (Beaufort Scale 0 to 3); visibility unlimited. Table 1 summarizes our cumulative counts for each coastal assessment locality and for the inland sites. All of the Rufous Night-Herons that we encountered during the assessment were on exposed meadows of sea grass except for three adults at the Koror municipal landfill, an inland site that reportedly attracts up to 50 Rufous Night-Herons at high tide (Pratt et al. 1980). Rufous Night-Herons were absent from the other five inland sites. No Rufous Night-Herons were seen in the mangrove areas of the assessment localities, and none were seen on the tidal flats of Ngermeduu Bay, which is rich in mangroves but devoid of sea-grass meadows because of sedimentation from the three rivers that empty into the bay. Our results are consistent with previous anecdotal reports that Palau's Rufous Night-Herons normally roost in coastal mangroves until low tide, when they fly to their feeding grounds on nearby tidal flats (Marshall 1949, Baker 1951, Pratt et al. 1980, Pratt and Etpison 2008, Olsen and Eberdong 2009).

On the basis of the results of our rapid field assessment of half of the study area and several inland sites, we conclude that the Rufous Night-Herons that we encountered during the low-tide sequence of the four-day assessment period represent half of the

Table 1 Cumulative Counts of the Rufous Night-Heron in Palau, 4–7 June 2012

Assessment Locality	No. Adults	No. Immatures	Total
Eastern Babeldaob	109	6	115
Western Babeldaob	174	0	174
Northern Babeldaob	162	13	175
Southern Babeldaob/Koror Complex	66	19	85
Inland sites	3	0	3

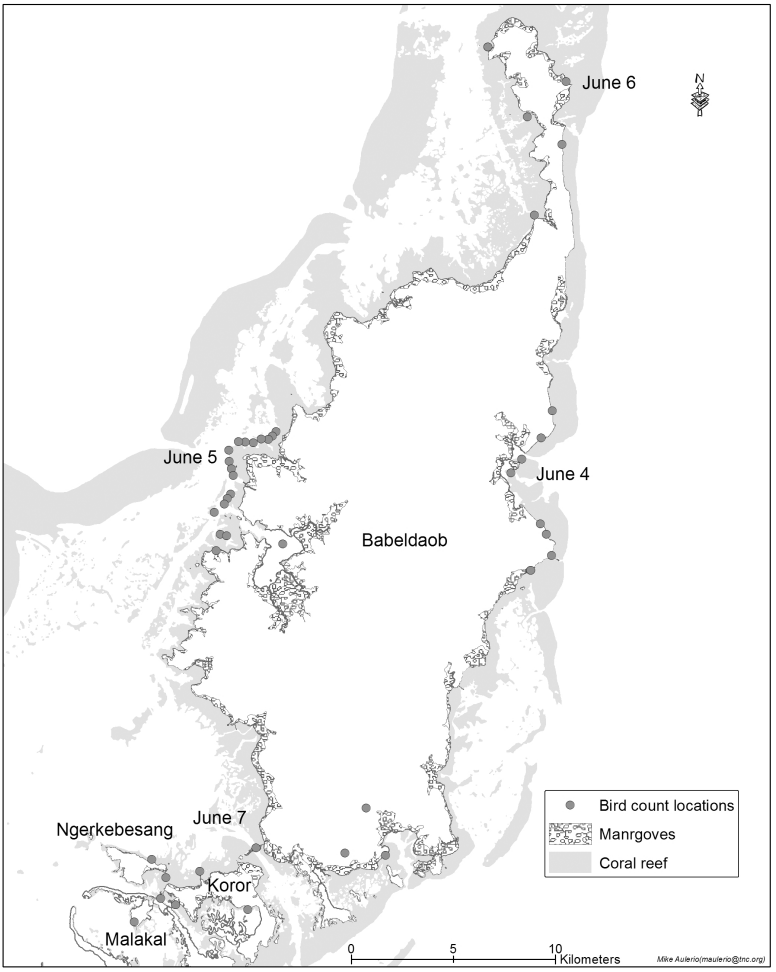

Figure 1. Locations of vantage points for counts of the Rufous Night-Heron in Palau, 4–7 June 2012.

Rufous Night-Herons in the study area. We estimate that Palau harbors a population of no more than 1200 Rufous Night-Herons—roughly twice the four-day cumulative total from our field assessment plus an 8% adjustment to account for the birds in the southern lagoon, which was not included in the study area. It is noteworthy that the Rufous Night-Herons on the exposed tidal flats were attracted to sea-grass meadows exclusively (Figure 2). Palau's sea-grass meadows face continuing threats from sedimentation due to economic development and from rising sea level and other effects of climate change (Colin 2009). The Rufous Night-Heron should prove useful as an indicator species for managers of coastal ecosystems where sea-grass meadows occur. We recommend a companion assessment of the Rufous Night-Heron subpopulation

Figure 2. Adult Rufous Night-Heron, *Nycticorax caledonicus pelewensis*, capturing prey on an exposed meadow of sea grass during an afternoon low tide, eastern coast of Babeldaob Island, Palau, 19 May 2010.

Photo by Alan R. Olsen

in the Chuuk islands to combine with our results as a starting point for future population studies of the subspecies.

We gratefully acknowledge the support we received from the Belau National Museum and the National Program for Monitoring Forest and Coastal Birds, as well as the Palau Conservation Society and the Marisla Foundation through the Global Greengrants Fund. Hon. Wilson Ongos, governor of the state of Ngaremlengui, arranged boat transportation for the offshore counts. We thank Mark O'Brien of BirdLife International for guidance, reviewers Kimball L. Garrett and Daniel D. Gibson for their valuable comments, Mike Aulerio of The Nature Conservancy for the map of the study area, and our student birdwatchers: Angelica Olsen, Aurora Olsen, and Murako Belibei.

LITERATURE CITED

Baker, R. H. 1951. The avifauna of Micronesia, its origins, evolution, and distribution. Univ. Kansas Publ. Nat. Hist. Mus. 3:1–359.

Brazil, M. 2009. Birds of East Asia. Princeton Univ. Press, Princeton, NJ.

Colin, P. L. 2009. Marine Environments of Palau. Indo-Pacific Press. San Diego.

Engbring, J. 1988. Field Guide to the Birds of Palau. Conservation Office [now Ministry of Natural Resources, Environment and Tourism], P. O. Box 100, Ngerulmud, PW 96949.

Engbring, J. 1992. A 1991 survey of the forest birds of the Republic of Palau. U.S. Fish and Wildlife Service, 300 Ala Moana Blvd., Rm. 3-122, P. O. Box 50088, Honolulu, HI 96850.

Engbring, J., Ramsay, F. L., and Wildman, V. J. 1990. Micronesian forest bird surveys, the Federated States: Pohnpei, Kosrae, Chuuk and Yap. U.S. Fish and Wildlife Service, 300 Ala Moana Blvd., Rm. 3-122, P. O. Box 50088, Honolulu, HI 96850.

Hancock, J. 1999. Herons and Egrets of the World. Academic Press, London.

Marshall, J. T., Jr. 1949. The endemic avifauna of Saipan, Tinian, Guam and Palau. Condor 51:200–221.

Olsen, A. R., and Eberdong, M. 2009. Species richness and other noteworthy observations at an important bird area in Palau. Micronesica 41:59–69.

Olsen, A. R., and Eberdong, M. 2012. State of Palau's Birds 2011: Second Annual Report of the National Program for Monitoring Forest and Coastal Birds. Belau National Museum, P. O. Box 666, Koror, PW 96940.

Pratt, H. D., and Etpison, M. T. 2008. Birds and Bats of Palau. Mutual Publ., Honolulu.

Pratt, H. D., Bruner P. L., and Berrett, D. G. 1987. A Field Guide to the Birds of Hawaii and the Pacific. Princeton Univ. Press, Princeton, NJ.

Pratt, H. D., Engbring, J., Bruner, P. L., and Berrett, D. G. 1980. Notes on the taxonomy, natural history, and status of the resident birds of Palau. Condor 82:117–131.

VanderWerf, E. A. 2007. 2005 bird surveys in the Republic of Palau. U.S. Fish and Wildlife Service, 300 Ala Moana Blvd., Rm. 3-122, P. O. Box 50088, Honolulu, HI 96850.

Wetlands International. 2014. Waterbird population estimates, 5th ed.; http://wpe.wetlands.org (25 April 2014).

Wiles, G. J. 2005. A checklist of the birds and mammals of Micronesia. Micronesica 38:142–189.

Accepted 1 July 2014