New bird records for Alabat Island, Quezon Province, Philippines

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The Philippines has 576 bird species, 74 (12.8%) of which are threatened with global extinction. As many as 59 (30.7%) of the 192 endemic Philippine species are globally threatened and a further 40 endemic species are near-threatened (BirdLife International 2001). The Philippine archipelago was originally almost entirely forested, but large areas have been cleared for agriculture in the past century. Estimates of current forest cover vary considerably, but it is clear that forests have been drastically reduced in almost every region of the country. Satellite data from the late 1980s indicate that Mindoro has retained 8.5% forest cover, Luzon 24%, Mindanao 29% and Palawan 54% (BirdLife International 2003). Since estimates were made, further forest loss and degradation has taken place as a result of increases in farmland and pasture, and harvesting of timber and non-timber products.

Alabat Island (Fig. 1) in Quezon province has an estimated land area of 210 km^2 and lies approximately 1 km off the coast of eastern Luzon. Few extensive avian surveys have been conducted on the island in recent history; Kennedy *et al.* (2000) listed only nine bird species from the island. We report on a six-day faunistic survey of Alabat Island, estimate the island's forest understorey avian diversity, and discuss the conservation value of the island's remaining forest.

METHODS

From 27 April to 2 May 2007, twelve four-shelf, 30 mm mesh 12×2.6 m mistnets (Avinet, Inc., Dryden, NY) were erected in the understorey of primary and adjacent secondary forest sites around Mt Camagong, Alabat Island (14°8.17′N 122°1.24′E; Fig. 1), at elevations ranging from *c.*50 to 150 m. Mount Camagong is centrally located on the island and has a single path over its *c.*300 m peak, allowing access to forests along an elevational gradient. Nets were positioned along ridges, paths and streams, and two nets were located along a forest edge abutting a clearing. Nets were opened at approximately 05h00 and were checked at half-hour intervals until approximately 17h00, for a total of approximately 864 mist-netting hours.

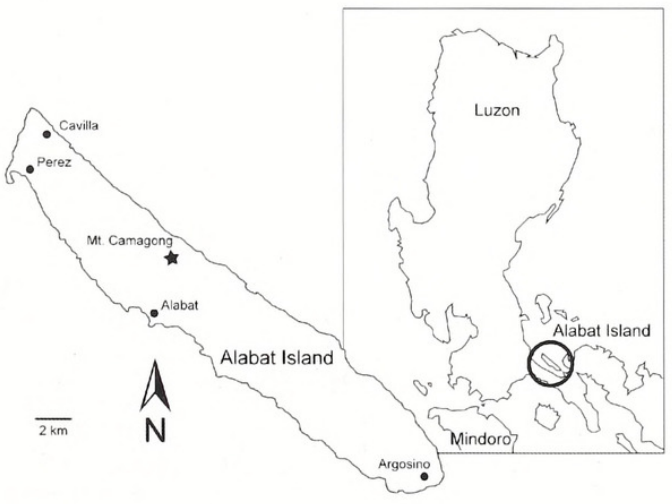

Figure 1. Location of focal sampling location on Mt. Camagong, Alabat Island, Quezon Province, Philippines (maps not to scale).

We took photographs of each trapped bird and collected a blood sample from the brachial vein of each bird as photographic and genetic vouchers. Extracted DNA from these birds was subsequently used for several genetic investigations, including the development of new COI barcoding primers for passerine birds. The total body length from tip of the bill to tip of the longest tail feather was measured while the living bird was flattened against a ruler. Right wing chord length was measured while the wing was flattened against a ruler, and tail length was measured from the vent to the tip of the longest tail feather using a ruler. The head length, bill length, and tarsus length were recorded using a digital Vernier caliper. Head length was measured from base of skull to bill-tip; bill length was measured as the total length of the unfeathered portion of the upper mandible. The body mass of each bird was also recorded using a set of Pesola spring scales. Twenty-one birds were collected, prepared as museum skins, and deposited in the National Museum of the Philippines (PNM) as voucher specimens (Table 1), and the rest were banded and released. Liver and muscle tissues were preserved from all birds collected. Residency status is gleaned from Kennedy *et al.* (2000).

The total species richness of forest understorey birds in the sampling area was estimated using the Chao2 and first-order jackknife non-parametric diversity estimators calculated with EstimateS 8.0 (Colwell 2006). These indices apply different analytical methods to the numbers of shared and unique species in sequential samples to estimate the number of unsampled species in the community (Colwell and Coddington 1994, Colwell *et al.* 2004, Chao *et al.* 2005). Walther and Morand (1998) found that, of the ten or more methods for biodiversity estimation, the Chao2 and first-order jackknife indices gave the most reliable estimates when all methods were compared with a variety of real and simulated datasets. Further details of each method are provided with the online documentation to EstimateS 8.0 (Colwell 2006).

RESULTS

A total of 85 individuals from 24 understorey species were recorded during the six-day survey (Table 1), including 11 Philippine endemics and near-endemics, four migratory species, and one globally threatened species (Table 1). This survey adds 21 bird species to the nine already known from Alabat Island (Kennedy *et al.* 2000); these new records are marked with an asterisk (*) in Table 1. Philippine Bulbul was the most common species, with

Table 1. Status, morphometry and species information on birds mistnetted on Alabat Island from 27 April to 2 May 2007. Species marked with an asterisk (*) were recorded from Alabat Island for the first time. Catalogue numbers refer to specimens vouchered in the National Museum of the Philippines (PNM), and GenBank accession refers to *cytochrome c oxidase* subunit I (COI) DNA barcode sequences (http://www.ncbi.nlm.nih.gov/) for select specimens. Numbers in parentheses are standard deviations; n = total number of individuals captured; E = Philippine endemic, NE = Philippine near endemic, R = resident, M = migrant; † = IUCN status Vulnerable (all other species = Least Concern).

Birds	n	Residency status	Total length (mm)	Wing chord (mm)	Tail (mm)	Total head (mm)	Bill length (mm)	Tarsus length (mm)	Weight (g)	Catalogue number(s)	GenBank accession
PHILIPPINE TROGON *Harpactes ardens**	1	E	288	133	169	44.52	19.29	18.99	77	19905	
SPOTTED WOOD-KINGFISHER *Actenoides lindsayi**	1	E	251.00	109.00	88.00	77.43	42.98	22.64	101.00		
INDIGO-BANDED KINGFISHER *Alcedo cyanopecta**	1	E	138.00	57.00	25.00	58.93	32.58	15.44	16.50		
PHILIPPINE DWARF-KINGFISHER *Ceyx melanurus*†	9	E	125.11 (4.86)	53.11 (2.26)	22.89 (2.42)	53.79 (1.66)	31.19 (1.08)	13.02 (1.45)	16.44 (1.31)	19898	
RUDDY KINGFISHER *Halcyon coromanda**	1	M	269	119	74	85.64	50.16	23.21	78.5	19895	EU54 1466
WHITE-THROATED KINGFISHER *Halcyon smyrnensis*	1	R	264	113	77	90.36	56.1	19.66	67.5		
ORIENTAL CUCKOO *Cuculus saturates**	1	M	294	175	160	51.41	20.97	22.98	79	19903	
COMMON EMERALD-DOVE *Chalcophaps indica*	3	R	227.00 (11.31)	136.50 (0.71)	93.89 (3.01)	43.36 (1.68)	17.79 (1.51)	30.54 (1.87)	122.83 (3.33)		EU54 1467
WHITE-BROWED SHAMA *Copsychus luzoniensis**	2	E	174.50 (7.78)	76.50 (0.71)	80.00	38.26 (0.82)	14.43 (0.18)	30.09 (0.94)	24.00 (2.83)		EU54 1451
ORIENTAL MAGPIE-ROBIN *Copsychus saularis**	3	R	195.67 (5.51)	91.74 (3.91)	87.83 (0.72)	43.00 (0.72)	16.97 (0.51)	32.16 (1.60)	32.67 (4.16)	19891, 19896	
MANGROVE BLUE FLYCATCHER *Cyornis rufigastra**	4	R	149.33 (6.35)	72.33 (2.08)	60.08 (1.26)	35.48 (1.13)	12.67 (2.13)	20.36 (0.70)	17.00 (0.82)	19902, 19888	EU54 1452
RED-STRIPED FLOWERPECKER *Dicaeum australe**	3	E	85.67 (7.23)	50.00 (2.0)	25.67 (2.08)	25.89 (1.20)	9.84 (0.21)	16.26 (0.82)	7.33 (1.15)	19904, 19906	
BLACK-NAPED MONARCH *Hypothymis azurea**	4	R	154.00 (9.83)	65.77 (2.27)	69.01 (3.13)	32.93 (0.52)	12.10 (0.45)	20.77 (2.33)	11.00 (1.47)	19892, 19893	
PHILIPPINE BULBUL *Ixos philippinus**	16	E	200.14 (8.55)	93.43 (5.35)	89.13 (6.60)	44.59 (1.52)	21.23 (2.66)	22.30 (1.59)	37.00 (2.11)		
BROWN SHRIKE *Lanius cristatus**	6	M	188.17 (7.73)	87.33 (4.41)	89.50 (5.21)	39.21 (1.57)	15.48 (0.55)	30.84 (7.79)	28.08 (2.42)	19908	
GREY WAGTAIL *Motacilla cinerea**	1	M	176	78	85	33.44	13.47	21	15		EU54 1458
PURPLE-THROATED SUNBIRD *Nectarinia sperata**	1	R	96	48	34	29.24	13.38	15.72	6.5		EU54 1459
YELLOW-BELLIED WHISTLER *Pachycephala philippinensis**	13	E	168.15 (4.47)	85.23 (4.46)	70.68 (3.00)	40.35 (2.74)	15.39 (1.08)	24.14 (1.15)	23.31 (1.58)	19907	
LEMON-THROATED LEAF-WARBLER *Phylloscopus cebuensis**	1	E	118	62	43	29.3	9.34	22.27	28		EU54 1460
RED-BELLIED PITTA *Pitta erythrogaster**	2	R	154.00	93.50 (0.71)	35.99 (2.81)	42.10 (0.12)	19.04 (4.05)	39.30 (0.12)	53.75 (1.06)	19889	EU54 1462
YELLOW-VENTED BULBUL *Pycnonotus goiavier**	2	R	180.50 (0.71)	77.50 (3.54)	84.50 (3.54)	35.55 (0.26)	14.19 (0.01)	22.57 (0.25)	29.00 (2.83)	19900, 19901	
YELLOW-WATTLED BULBUL *Pycnonotus urostictus**	2	E	179.50 (4.95)	85.50 (2.12)	86.28 (9.51)	33.98 (0.40)	14.78 (0.65)	23.35 (2.32)	25.25 (3.18)	19890	EU54 1463
PIED FANTAIL *Rhipidura javanica**	2	R	191.50 (6.36)	85.00 (1.41)	104.50 (0.71)	34.13 (1.10)	11.94 (0.42)	24.67 (0.70)	16.50 (0.71)	19897, 19899	
RUFOUS PARADISE-FLYCATCHER *Terpsiphone cinnamomea**	5	NE	230.20 (38.45)	89.80 (4.15)	129.40 (36.44)	42.55 (0.80)	16.93 (0.85)	19.70 (1.33)	20.60 (2.27)	19894	

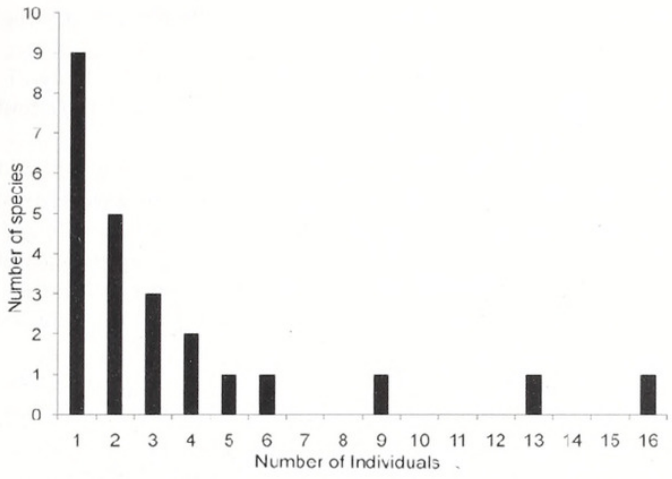

Figure 2. Species-abundance plot of birds mistnetted during six days of sampling, showing a characteristic log-normal distribution.

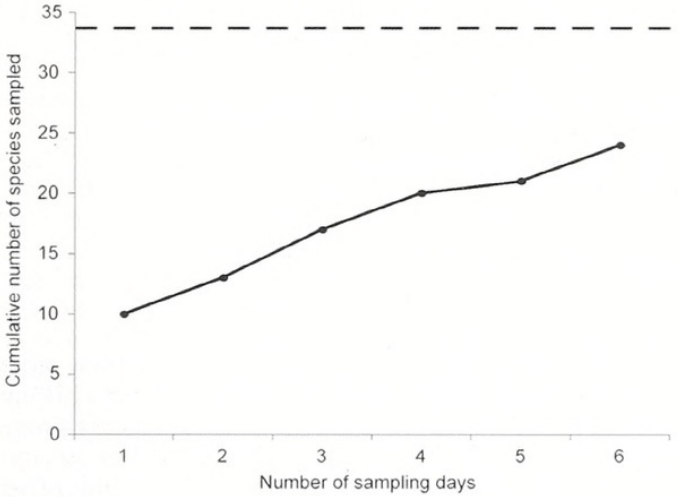

Figure 3. Species accumulation curve of forest understorey birds over six days of sampling. Dashed line indicates total number of species estimated with the first-order jackknife method.

16 individuals, followed by Yellow-bellied Whistler with 13 and Philippine Dwarf Kingfisher with nine. Six of the nine species reported from Alabat Island by Kennedy *et al.* (2000) were not found during our survey: Common Kingfisher *Alcedo atthis*, White-collared Kingfisher *Halcyon chloris*, Amethyst Brown Dove *Phapitreron amethystina*, White-eared Brown Dove *Phapitreron leucotis*, Island-collared Dove *Streptopelia bitorquata* and Pompadour Green Pigeon *Treron pompadora*. These previous records combined with our new records indicate that nearly 40% of kingfisher species found in the Philippines can be found on Alabat Island.

A species abundance histogram (as estimated by capture rate) of the total dataset shows a typical log-normal distribution (Fig. 2), indicating that our sampling effort was sufficient to apply species richness estimation methods to extrapolate total community diversity. The number of captured individuals per species is listed in Table 1, along with the mean and standard deviation of all morphological measurements taken, and the conservation and endemic status of each species based on the status given by Kennedy *et al.* (2000).

The Chao2 method estimated the total mean number of forest understorey bird species to be 34, with a standard deviation of 8, while the first-order jackknife estimated alpha diversity to be 33 species (SD = 3). These estimates suggest that we sampled 70–72% of the total species diversity of forest understorey birds at our site (Fig. 3).

DISCUSSION

Our estimates of species richness indicate that the total number of forest understorey bird species on Alabat is less than 40, but the island's total avian diversity would include additional species of forest canopy birds, shorebirds, predatory birds and human commensals, none of which we sampled or surveyed. On one occasion, one of us (RVS) heard hornbill calls, but the species could not be discerned. Our failure to record six of the species previously reported for the island is perhaps attributable to their restriction to part of the island we did not sample, to local extinction, or to chance.

Interestingly, the only species we captured listed by IUCN (2007) as Vulnerable, Philippine Dwarf Kingfisher, was the third most commonly sampled species. The population on Alabat appears to be large and thriving. In the experience of one of us (RVS), many of the species recorded on Alabat, including Philippine Dwarf Kingfisher, Himalayan Cuckoo, Philippine Trogon, Red-bellied Pitta and Rufous Paradise-flycatcher, are typically found only in relatively undisturbed primary forest. This indicates that the forests of Alabat Island remain suitable for these habitat specialists, and are likely to harbour substantial diversity in other taxa of vertebrates and invertebrates.

We suggest that the remaining primary forest of Alabat Island be protected. Aerial photographs (accessible using Google Earth; http://earth.google.com) indicate that most (>80%) of this hilly island is forested, and the presence of large timber trees suggests that our study site has not been extensively logged. It is likely that the steep terrain over much of this island has prevented conversion of the forest for agricultural purposes, although the large families of local human inhabitants suggest that a population explosion could create new pressures for agricultural land and timber. Further surveys of other animal and plant taxa would provide a fuller basis for conservation measures on Alabat Island.

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Additional altitudinal records from Seram, South Maluku, Indonesia

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Further to the welcome set of new island records and new altitudinal records from South Maluku (Rheindt and Hutchison 2007a), I present some additional records from Seram (2–3°S 127–130°E). These records were obtained during ornithological research conducted on Seram in July–September 1987 as part of an Operation Raleigh expedition and all altitudinal data pertain to areas within the Manusela National Park in the centre of this island. Rheindt and Hutchinson (2007a) generally refer to the altitudinal data given in Coates and Bishop (1997), which in turn were frequently sourced from Bowler and Taylor (1989, 1993). Baseline altitudinal data for all species on Seram are given by White and Bruce (1986).

Altitudinal data in 1987 were mostly obtained from work conducted on the northern face of the Merkele Ridge between the villages of Roho (300 m), Kanikeh (700 m) and the summit ridge of Gunung Binaia at 2,850 m, between 25 July–14 August 1987, and from the separate ridge of Gunung Kobipoto (1,470m) on 15–24 August 1987. Averages of the readings of three altimeters were taken for each observation. Most of these data have appeared elsewhere, e.g. Bowler and Taylor (1989, 1993), but I present some previously unpublished information here, gleaned from my field notebooks, as well as referring to the results where relevant of the 1996 Cambridge University expedition to north-east Seram (Isherwood *et al.* 1997).

The island of Seram remains comparatively little visited and further fieldwork will undoubtedly add to our current knowledge of the altitudinal range of bird species on this island.

RED-BREASTED PYGMY PARROT *Micropsitta bruijnii pileata*

Up to six tiny parrots were observed and heard in the upper canopy of intact lower montane forest above Kanikeh at 1,500 m on 4 August 1987, which were assumed to be this species. Although, not specifically identified at the time, subsequent observations of a single bird of this species on Gunung Kobipoto (Bowler and Taylor 1989), plus frequent observations of the only other small parrot species on the island, the Red-flanked Lorikeet *Charmosyna placentis*, a lowland forest species, leave the identification as this species most likely. This record suggests that the upper altitudinal limit of Red-breasted Pygmy Parrot on Seram may be well above the 900 m given in Coates and Bishop (1997), as indeed it is on Buru (1,200 m in Coates and Bishop 1997).

ISLAND LEAF-WARBLER *Phyllopscopus poliocephalus ceramensis*

The lower altitudinal limit of this species on Seram was given erroneously as 700 m in Bowler and Taylor (1989). The authors overlooked two of their own records of this species in bird parties in lowland forest near Roho at an altitude of 350 m on 25–26 July 1987, whilst Isherwood *et al.* (1997) recorded this species at 300 m near Wae Fufa, north-east Seram, in 1996. The altitudinal limits of this species clearly extend to much lower elevations on Seram than either on Buru, where *P. p. everetti* was not recorded in areas visited up to 1,200 m by Jepson (1993), although Coates and Bishop (1997) list this race as occurring down to 700 m, or on Bacan, where *P. p. waterstradti* is recorded as occurring between 1,500 and 2,100 m (Coates and Bishop 1997). The situation on Seram appears to be more like that on Halmahera, where Lambert and Yong (1989) recorded *P. p. henrietta* down to 550 m, and Coates and Bishop (1997) report it down to 300 m. These differences in altitudinal tolerance, together with reported variation in both plumage and song between the island populations (see Rheindt and