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Distribution of Palawan Peacock Pheasant *Polyplectron napoleonis* morphs

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Introduction

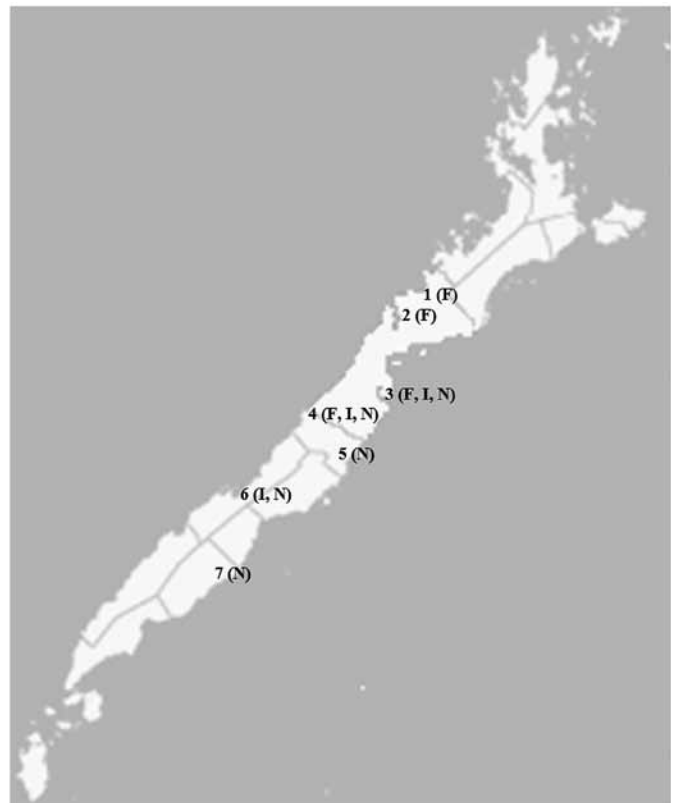
The Palawan island group is politically affiliated with the Philippines and lies at the edge of the continental shelf in South-East Asia (Figure 1). Palawan's fauna has traditionally been treated as most similar to that of Borneo (Huxley 1868, Holloway 1982). However, some investigators have found similar, if not greater, faunal affinity to the oceanic Philippines (McGuire & Alcala 2000, McGuire & Kiew 2001, Brown & Guttman 2002).

The Palawan Peacock Pheasant *Polyplectron napoleonis* is endemic to Palawan and is considered Vulnerable due to deforestation and hunting (BirdLife International 2015). It is one of the smaller species of pheasant with weights averaging 436 and 322 g for males and females respectively (Dunning 2008). It prefers pristine forest and can attain densities as high as 34 males/km² in prime habitat (Caleda 1993). The species has several different vocalisations, including the female *peeping* to alert chicks to food, the male hissing during an intense lateral courtship display, and the long call which is the most frequent vocalisation throughout the year (DMB unpubl. data). It is strictly monogamous, and the typical clutch size is two eggs with an incubation period of 19–20 days (Jeggo 1975).

Despite there being adequate knowledge of the conservation and ecology of Palawan Peacock Pheasant relatively little is known about its evolutionary history. Kimball *et al.* (2001) suggested that *P. napoleonis* is positioned basally to its congeners. Johnsgard (1999) noted that it is the most isolated member of the genus, separated from its closest relative Bornean Peacock Pheasant *P. schleiermacheri* on Borneo by approximately 150 km. It appears to occur in two morphs, which differ in the presence or absence of a distinctive white supercilium on the male. This was noted by Delacour (1957), but the geographic pattern of the character has not been studied, particularly in wild birds on Palawan. We investigated the spatial pattern of the two morphs and mapped their distribution. Blasius (1891) described the form with the white supercilium as *P. nehrkornae*, but today the species is considered monotypic (e.g., Beebe 1936, Madge & McGowan 2002). While examining images of study skins to determine whether supercilium

variability characterised two distinct forms, we found hybridisation in the central part of the species's range. Our objective herein is to report our findings regarding possible divergence and secondary contact in this species.

Figure 1. Island of Palawan showing locations of specimens
Key: 1 = St. Paul's, 2 = Sabang, 3 = Puerto Princesa, 4 = Iwahig, 5 = Kabigaah, 6 = Quezon, 7 = Taguso. F = full supercilium, I = intergrade, N = no supercilium



Methods

Email requests were sent to ornithological staff at museums around the world holding avian specimens from the Philippines. The request explained the background to the enquiry, asked for images that would capture the extent (if any) of the superciliary of the Palawan Peacock Pheasant, and included three examples depicting variation (Figure 2).



Figure 2. Superciliary variation in Palawan Peacock Pheasant *Polyplectron napoleonis* (left to right): full and joined at the back, partial (intergrade) and completely lacking.

The following institutions provided images of the heads of adult male specimens: Academy of Natural Sciences, Philadelphia (ANSP), American Museum of Natural History (AMNH), Delaware Museum of Natural History (DMNH), Field Museum (FMNH), Museum of Comparative Zoology (MCZ), Museum of Natural History, Paris (MNHN), National Museums Liverpool (NML), National Museum of Natural History, Washington (NMNH), Natural History Museum, Tring (BMNH), Natural History Museum of Milan (MSNM), State Natural History Collections, Dresden (SNSD) and Zoology Museum Hamburg (ZMH).

Images of live birds were also examined on the Oriental Bird Club image database (orientalbirdimages.org) and the Internet Bird Collection (ibc.lynxeds.com). The specimen images returned were examined and associated data were entered into a spreadsheet. However, most images could not be used because they were of captive birds, did not include a locality, or were duplicates of the same individual at a given site.

Results

Forty-three images of heads were obtained from 12 museums in the USA and Europe, as well as three images of live birds on Palawan. Only six of the specimens had full superciliaries that were joined at the back of the head, 23 completely lacked a superciliary, and 14 were intergrades with partial superciliaries (Table 1).

Eighteen of the specimens were excluded from analyses because they were from 'Palawan (province)', which was too ambiguous to map. Seventeen specimens were from the sites Iwahig and Quezon. Iwahig and Puerto Princesa were the only sites with all three forms, and Quezon contained both intergrades and specimens lacking a superciliary but none with a full superciliary. None of the sites held only intergrade specimens without any other form. Only Sabang and St. Paul's Subterranean River National Park had specimens

Table 1. Specimens examined. (Holotype denoted *)

No superciliary (n = 23):

AMNH 468107; 544036-8; 782995; BMNH 1896.1.1.773; 1896.1.1.775; 1911.11.16.3-4; DMNH 1105; 4551; 4554; 4556; 10751; FMNH 426082; MSNM 150; 15279; NML: 10.10.99.13; MNHN 233658; 314673-4; SNSD MTD.C13406; ZMH 64.40

Intergrades (n = 14):

AMNH 544035; ANSP 12732*; 170672; BMNH 1889.5.13.477; 1911.11.16.1; 1911.11.16.5; DMNH 4552-3; 10748-9; FMNH 416817-8; MNHN 3921; NMNH 314672

Full superciliary (n = 6):

BMNH no number; FMNH 96646; MCZ 57573; IBC Puerto Princesa photo; OBC Sabang photo; St. Paul's Subterranean River National Park photo

solely with a full superciliary, and Kabigaah and Taguso exclusively contained only specimens without a superciliary; however, none of these sites had intergrades (Figure 1).

The two northernmost sites held only specimens with full superciliaries and the two most south-eastern sites contained only specimens without a superciliary. Intergrades were found at three sites in the central part of the island (Figure 1). The locality data suggest that the full superciliary form is found in the north of the island, and the form without a superciliary is found in south-east Palawan.

Discussion

Despite the limited sample size, there appears to be polymorphism in Palawan Peacock Pheasant with the northern population showing full white superciliary, and the south-eastern population lacking the superciliary. It is not known whether vicariant events occurred that separated the population in the past.

It is possible that dispersal occurred as parts of modern Palawan emerged over time during the Pleistocene. While this is speculative, it is known that Palawan in its present configuration has a unique geological history. The northern part of contemporary Palawan emerged much earlier during the Pleistocene about 20–26 mya. The 'North Palawan' block then pushed further south and came in contact with Borneo and southern Palawan was uplifted around 10 mya (Encarnacion & Mukasa 1997, Hall 2002, Yumul *et al.* 2009). To test this hypothesis, extensive field surveys and genetic studies are needed to determine whether the observed phenotypic variation reflects polymorphism, with the intermediate forms representing the hybrid zone.

Acknowledgements

Kind thanks go to Beverly Garland for providing the drawings for Figure 2. We are very grateful to the following museum ornithology staff members for taking or facilitating photography of specimen heads at their respective institutions (full museum names provided in Methods section above): Matt Shanley and Paul Sweet (AMNH), Nate Rice (ANSP), Robert Prys-Jones and Hein van Grouw (BMNH), Jean Woods (DMNH), Peter Lowther and Dave Willard (FMNH), Jeremiah Trimble (MCZ), Eric Pasquet (MNHN), Girogio Chiozzi (MSNM), Tony Parker (NML), Brian Schmidt (NMNH), Martin Päckert (SNSD) and Cordula Bracker (ZMH). Roger Wilkinson and Pam Rasmussen kindly helped to obtain images of live birds. We are indebted to Todd Mark and Paul Sweet for helping to track down some of the obscure localities.

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Erratum

Collar, N. J. & Marsden, S. J. (2014) The subspecies of Yellow-crested Cockatoo *Cacatua sulphurea*. *Forktail* 30: 23–27.

Table 2 in the above paper inadvertently omitted the line for the form *citrinocristata*. We reproduce the correct version below, with apologies.

Table 2. Means and standard deviations of five mensural variables in male *Cacatua sulphurea* described taxa. ¹ = sample size reduced by 1; ² = sample size reduced by 2. Note *djampeana* proves to be composed of two taxa (see Discussion).

taxon	n	bill	crest	ear-patch	wing	tail
<i>sulphurea</i>	21	38.3 ± 1.81 ²	101 ± 4.07 ¹	29.8 ± 3.01 ¹	225 ± 6.43 ¹	113 ± 2.38
<i>abbotti</i>	6	35.1 ± 1.21	123 ± 4.8 ¹	20.5 ± 4.14 ²	263 ± 5.82	138 ± 6.62
<i>occidentalis</i>	15	36.9 ± 0.76 ²	94.3 ± 5.42	23.7 ± 3.05	220 ± 5.13	110 ± 5.13 ¹
<i>parvula</i>	4	33.5 ± 1.94	101 ± 6.61	20.1 ± 0.63	223 ± 5.5	121 ± 5.03
<i>djampeana</i>	6	34.1 ± 1.3	92.5 ± 3.77 ¹	26.6 ± 2.38 ¹	220 ± 7.34	111 ± 4.4
<i>citrinocristata</i>	11	37.2 ± 1.55 ¹	116 ± 6.67 ¹	25.6 ± 5.22 ²	246.2 ± 6.16 ¹	135.4 ± 3.64