

# New and noteworthy bird records from the Mt. Wilhelm elevational gradient, Papua New Guinea

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**SUMMARY.**—The elevational gradient of Mt. Wilhelm, the highest peak in Papua New Guinea, represents one of the best-surveyed elevational gradients in the Indo-Pacific region. Based on field work undertaken in 2013 and 2015, we report range extensions, new elevational records and add 24 species to the list of bird species recorded along this gradient. This includes information on poorly known species such as Long-billed Cuckoo *Chrysococcyx megarhynchus*, Leaden Honeyeater *Ptiloprora plumbea*, Yellow-breasted Satinbird *Loboparadisaea sericea* and Sooty Shrikethrush *Colluricincla tenebrosa*.

New Guinea is the largest tropical island (>750,000 km<sup>2</sup>) and well known for its exceptional avian diversity, characterised by a large number of endemic lineages (Pratt & Beehler 2014, Beehler & Pratt 2016). During the last 200 years, the island has been the subject of a multitude of expeditions and surveys that have aimed to document the distribution and diversity of its avifauna (summarised in Pratt & Beehler 2014). New Guinea and neighbouring archipelagos have also served as a natural laboratory that has aided in the development of modern biological theories and syntheses pertaining to speciation, community assemblies, and the effects of climate change on biodiversity and biogeography, often using birds as model organisms (e.g. Diamond 1973, Deiner *et al.* 2011, Jønsson *et al.* 2011, Freeman & Class Freeman 2014a, Irestedt *et al.* 2015). Despite these efforts, knowledge of New Guinean avifauna remains incomplete, largely due to the region's enormous topographic complexity and lack of infrastructure, which has made some areas near-impossible to access for the purposes of biological surveys. Consequently, detailed information concerning both complete geographic and elevational distributions, in addition to life-history traits are currently lacking for a considerable number of species.

At 4,509 m, Mt Wilhelm, the highest peak in Papua New Guinea, is located in the Bismarck Range, which forms part of New Guinea's extensive Central Range. Despite being historically under-surveyed (although see, e.g. Mayr & Gilliard 1954), recent field work in 2010 and 2012 considerably improved knowledge of the local avifauna (Sam & Koane 2014). Here we report new and noteworthy records from the elevational gradient on the north-east slope of Mt. Wilhelm. Our new records are based on field observations by the authors along this elevational gradient in 2013 and 2015.

## Study area and Methods

Study sites (Table 1) and survey methods generally follow those outlined in Sam & Koane (2014), with some exceptions noted here. First, as of 2015 the study site at 1,700 m was moved to a new location, named Degenumbu (05°45'45"S, 145°11'54"E). Second, records made during the current field trips did not follow fully standardised approaches, but were gathered opportunistically using a combination of point counts, mist-netting and field observations. Finally, the 3,700 m study site at Lake Piunde was incorrectly labelled as Lake Aunde in Sam & Koane (2014), a mistake corrected herein. Field work took place on 15

TABLE 1  
Locations along the Mt. Wilhelm elevational gradient surveyed during 2013 and 2015.

Site name	Elevation (m)	Latitude	Longitude
Kausi	200	05°44'33"S	145°20'01"E
Numba	700	05°44'14"S	145°16'12"E
Memeku	1,200	05°43'18"S	145°16'17"E
Degenumbu	1,700	05°45'45"S	145°11'54"E
Sinopass	2,100	05°45'34"S	145°10'49"E
Bruno Sawmill	2,700	05°48'57"S	145°09'02"E
Kombuno Mambuno	3,200	05°48'18"S	145°04'20"E
Lake Piunde	3,700	05°47'10"S	145°03'32"E

June–20 August 2013 (KS, BK, two days of mist-netting, three days of point counts, and field observations) and 23 September–21 October 2015 (PZM, JBK, JDK, KAJ, BK, 27 days of mist-netting, 29 days of field observations) and 27 October–28 November 2015 (KS, two days of mist-netting, three days of point counts, and field observations; see Sam & Koane 2014).

## Results

As of 2012, 260 species had been recorded along the north-east elevational gradient on Mt. Wilhelm (Sam & Koane 2014). We present significant observations and 24 additions made to the local avifauna during our 2013 and 2015 field trips, which also include extensions to the geographic range and elevational distributions for several taxa. Species not previously recorded by Sam & Koane (2014) are indicated by an asterisk. Taxonomy and nomenclature follow those of the IOC world bird list version 6.1 (Gill & Donsker 2016).

### GREY-HEADED GOSHAWK *Accipiter poliocephalus*\*

Several observations were made in 2013 along the road at 200–700 m. In addition, singles were observed and mist-netted at 200 m in October 2015, and one was mist-netted at 700 m in November 2015. An uncommon and easily overlooked species of lowland and hill forests.

### BROWN GOSHAWK *Accipiter fasciatus*\*

An active nest was observed at 2,700 m and a single individual at 2,200 m in November 2015. These observations represent an extension to the previously reported upper elevational range of 1,950 m (Coates 1985, Beehler & Pratt 2016).

### COMMON SANDPIPER *Actitis hypoleucos*\*

One was seen along the Imbrum River on 21 October 2015, at the 200 m study site. A common Palearctic migrant to New Guinea, usually found along interior rivers and the coast.

### COLLARED IMPERIAL PIGEON *Ducula mullerii*\*

Three observed in a village clearing on 21 October 2015 at 200 m. Thereafter, KS, BK, M. Kigl and B. Iova observed one for several minutes along the river at 1,600 m on 8 November 2015. It was seen well by all four observers, who observed several key features characteristic of the species including the distinctive black collar and bright maroon upper mantle. The latter observation represents an extreme elevational range extension from the previously reported upper limit of 200 m (Beehler & Pratt 2016). Our records presumably refer to the

smaller and paler, northern subspecies *aurantia*, although Beehler & Pratt (2016) suggested that the species is best treated as monotypic.

**LONG-BILLED CUCKOO** *Chrysococcyx megarhynchus*\*

An immature (Fig. 1) mist-netted in forest on 20 October 2015 at 200 m is the first record for the survey area. A rare and poorly known species. Whereas Sorenson & Payne (2005) suggested that it should be removed to the genus *Chrysococcyx*, Erritzøe *et al.* (2012) and Beehler & Pratt (2016) chose to retain it within a monospecific *Rhamphomantis* given its distinctive appearance. Interestingly, this species, especially in juvenile plumage, bears a striking resemblance to Tawny-breasted Honeyeater *Xanthotis flaviventer* (Coates 1985), a potential host species. PZM also observed an adult male *C. megarhynchus* in close association with *X. flaviventer* at Kau Wildlife Area (c.05°08'43"S, 145°46'19"E), near Madang town, on 24 October 2015.

**MOUNTAIN OWLET-NIGHTJAR** *Aegotheles albertisi*

Previously reported to 3,700 m on the Huon Peninsula, and mostly at 1,200–2,900 m over the rest of its range (Beehler & Pratt 2016). However, we mist-netted two in cloud forest, at 3,700 m (Fig. 2) and 3,200 m, on 26 and 27 September 2015, respectively. Although no definite records exist for the Eastern Ranges, Archbold's Owlet-Nightjar *A. archboldi* might be expected at such elevations. However, the individuals recorded possessed characters consistent with *A. albertisi*, appearing finely patterned on the back and underparts, and lacking prominent white speckles. Nonetheless, pending further research, Beehler & Pratt (2016) have recently suggested that the two forms are best treated as a single, highly variable, species.

**BLYTH'S HORNBILL** *Rhyticeros plicatus*

A nest found at 1,700 m in November 2015 is very high for the species, which previously had only rarely been recorded to 1,800 m (Coates & Peckover 2001, Beehler & Pratt 2016).

**ORIENTAL HOBBY** *Falco severus*\*

A single perched in a dead tree near a village clearing at 200 m on 17 October 2015.

**BROWN FALCON** *Falco berigora*\*

A single seen soaring at Keglsugl village at 2,500 m (05°49'53"S, 145°5'54"E); the species occurs primarily in open country.

**MODEST TIGER-PARROT** *Psittacella modesta*\*

Single male observed near our camp at 2,700 m on 29 September 2015; identified by yellow collar on the hindneck and lack of yellow spotting on the head that distinguishes it from the very similar male of Madarasz's Tiger-Parrot *P. madaraszii*. Our record represents an eastward range extension, as the species was thought to be absent east of the Mt. Hagen area (c.100 km to the west). To date, *P. madaraszii* is unrecorded from the gradient, although it might be expected to occur.

**JOSEPHINE'S LORIKEET** *Charmosyna josefinae*\*

We observed two near our 1,700 m camp on 10 October 2015 and several foraging individuals were recorded at 2,200 m in November 2015. An uncommon and possibly overlooked species, whose identification is complicated by its close similarity to the commoner Papuan

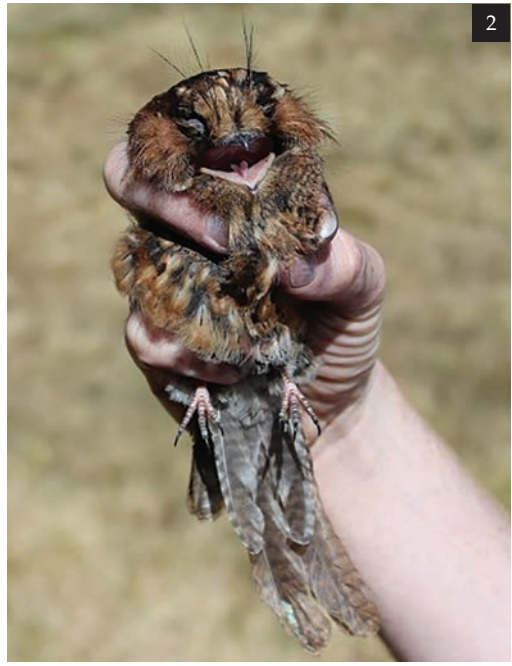


Figure 1. Immature Long-billed Cuckoo *Chrysococcyx megarhynchus*, Mt. Wilhelm, Papua New Guinea, 20 October 2015 (P. Z. Marki)

Figure 2. Mountain Owlet-Nightjar *Aegotheles albertisi*, Mt. Wilhelm, Papua New Guinea, 26 September 2015 (P. Z. Marki)

Figure 3. Leaden Honeyeater *Ptiloprora plumbea*, Mt. Wilhelm, Papua New Guinea, 9 October 2015 (P. Z. Marki)

Figure 4. Male Yellow-breasted Satinbird *Loboparadisaea sericea*, Mt. Wilhelm, Papua New Guinea, 6 October 2015 (P. Z. Marki)

Figure 5. Female (left) and male (right) Spotted Berrypecker *Rhamphocharis crassirostris*, Mt. Wilhelm, Papua New Guinea, 6 October 2015 (P. Z. Marki)

Figure 6. Sooty Shrikethrush *Colluricincla tenebrosa*, Mt. Wilhelm, Papua New Guinea, 4 October 2015 (P. Z. Marki)



Lorikeet *C. papou*. The Bismarck Mountains lie at the north-east edge of the species' known range (Beehler & Pratt 2016).

**RUBY-THROATED MYZOMELA** *Myzomela eques*\*

A single of this generally uncommon species was mist-netted in forest at 200 m on 17 October 2015.

**LEADEN HONEYEATER** *Ptiloprora plumbea*\*

One mist-netted at 1,700 m on 9 October 2015 (Fig. 3) and a second mist-netted on 20 November 2015. We also observed the species in the surrounding area on a few occasions, usually in pairs foraging inconspicuously in the subcanopy, with tails frequently cocked. A rare and patchily distributed species of mid-mountain forest, with records scattered throughout the Central Range, but previously unrecorded on the Mt. Wilhelm gradient (Sam & Koane 2014, Beehler & Pratt 2016).

**RUFOUS-BACKED HONEYEATER** *Ptiloprora guisei*

One of the most frequently mist-netted species at 2,700 m, despite Grey-streaked Honeyeaters *P. perstriata* also being present at the same site albeit in smaller numbers. Beehler & Pratt (2016) reported that *P. guisei* only reaches 2,400 m in the presence of *P. perstriata*. Our observations support those of Sam & Koane (2014), who also reported that the elevational ranges of these two species overlap broadly and that they are locally sympatric. This contradicts Diamond's (1973) suggestion that the two species exhibit significant elevational segregation due to strong interspecific competition. The two species differ markedly in size and thus potentially also in their ecological niches.

**SPOTTED HONEYEATER** *Xanthotis polygrammus*\*

A generally uncommon species primarily found in hill and lower montane forest (Beehler & Pratt 2016). We mist-netted the species twice and observed it once at our 1,200 m camp. We recorded the call of one individual at 680 m in November 2015, and observed two at c.800 m in 2013.

**ORNATE MELIDECTES** *Melidectes torquatus*\*

We observed one in a forest gap along the track (at c.1,000 m) between our camps at 700 m and 1,200 m, in July 2013, representing a new record for the area. Local villagers reported that they are familiar with the species, but that it is rarely encountered and only in some years. Often associated with second growth and disturbed habitats, and can be expected to increase in response to potentially greater human activities along the gradient (Higgins *et al.* 2008).

**YELLOW-BREASTED SATINBIRD** *Loboparadisaea sericea*

Another rare and little-known denizen of mid-mountain forest, with a patchy distribution in the Central Ranges. We observed it at 2,200 m in July 2013 and at 2,700 m in November 2015, which is significantly higher than the species' previously reported upper elevational range (625–2,000 m: Coates 1990, Beehler & Pratt 2016). In addition, we mist-netted two males (Fig. 4) and a female at 1,700 m, and observed the species frequently in the environs in October 2015. At the same site, a male and a juvenile were observed feeding on fruits of the tree *Trema orientalis*, where they were joined by several Common Smoky Honeyeaters *Melipotes fumigatus* and a female Superb Bird-of-Paradise *Lophorina superba*. Although the nominate subspecies is believed to occur in the Eastern Ranges, including the Bismarcks,

both mist-netted males exhibited characters consistent with the south-east subspecies *L. s. aurora*, including a pale blue bill-wattle and an olive wash to the crown. However, as the two subspecies are weakly differentiated, possibly representing clinal variation from east to west, more study is needed to assess their validity (Beehler & Pratt 2016).

**SPOTTED BERRYPECKER** *Rhamphocharis crassirostris*\*

We mist-netted three and observed a fourth individual near our camp at 1,700 m (Fig. 5). A generally rare species not recorded by Sam & Koane (2014), although it has been reported to be locally common elsewhere, such as on the Huon Peninsula (Freeman *et al.* 2013). One of the mist-netted birds was an adult male that appeared quite different to existing descriptions of male plumage (e.g. Pratt & Beehler 2014), with a distinct blue-black gloss to the upperparts, including the head, scapulars and tail, reminiscent of an immature male Fan-tailed Berrypecker *Melanocharis versteri*. It is possible that this represents an age-related feature. Beehler & Pratt (2016) treated the eastern subspecies *R. c. piperata* as specifically distinct from the western nominate.

**SOOTY SHRIKETHRUSH** *Colluricincla tenebrosa*\*

A male was mist-netted in primary cloud forest on 4 October 2015 at 2,700 m (Fig. 6). The bird was caught at ground level in dense bamboo undergrowth also inhabited by Forbes's Forest Rail *Rallidula forbesi* and Lesser Melampitta *Melampitta lugubris*. Our record represents a significant range and elevational extension, as the species had previously been recorded east only to the western Schrader Range and only to 2,150 m (Pratt & Beehler 2014, Beehler & Pratt 2016). A shy and poorly known species with few recent records. We did not identify the individual to subspecies, as the two currently recognised taxa were described from atypical specimens of a highly variable species perhaps best treated as monotypic (Beehler & Pratt 2016).

**LONG-TAILED SHRIKE** *Lanius schach*\*

Unrecorded by Sam & Koane (2014), we observed one at 2,500 m in Keglsugl village on 28 September 2015.

**BLACK-HEADED WHISTLER** *Pachycephala monacha*\*

We observed at least three between 600 m and 700 m in November 2015. An active nest was reported by villagers at c.850 m during our stay. The species appears to swiftly utilise newly opened areas, in this instance those cleared in late 2014 in close proximity to our camp.

**WILLIE WAGTAIL** *Rhipidura leucophrys*\*

Common and widespread throughout most of Australia and Melanesia. Several were observed around Keglsugl village at 2,500 m in September 2015.

**CHESTNUT-BELLIED FANTAIL** *Rhipidura hyperythra*\*

Moderately common in hill and lower montane forest throughout New Guinea. We observed a single at 1,200 m on 14 October 2015, and three at 700 m in November 2015.

**GLOSSY-MANTLED MANUCODE** *Manucodia ater*\*

We observed one at 700 m in August 2013, and two at the same elevation in November 2015, which were identified by their distinctive call. Crinkle-collared Manucode *M. chalybatus* and *M. ater* were both observed during the November 2015 survey, foraging at the forest edge close to the 700 m camp.

**SHORT-TAILED PARADIGALLA** *Paradigalla brevicauda*\*

One was observed in forest at c.2,800 m on 20 June 2013, and a single was seen foraging in roadside forest on 4 October 2015 at c.2,500 m.

**KING-OF-SAXONY BIRD-OF-PARADISE** *Pteridophora alberti*\*

We observed a single female and heard three calling males on several occasions on 4 October 2015, along the road between the 2,700 m and 3,200 m study sites. Not previously recorded in the proximity of the study sites, suggesting that its occurrence in the area might be highly local.

**GOLDEN MYNA** *Mino anais*\*

Several recorded at 200 m and 700 m in August 2013 and November 2015. Unrecorded by Sam & Koane (2014), but expected to occur in the region. The species is apparently uncommon and our record from 700 m is slightly higher than its previously reported elevational range (0–570 m: Coates 1990, Beehler & Pratt 2016).

**PAPUAN GRASSBIRD** *Megalurus macrurus*\*

A highly variable species found at all elevations throughout New Guinea (Beehler & Pratt 2016). We observed several at 1,700 m in November 2015.

**BLUE-FACED PARROTFINCH** *Erythrura trichroa*

A male was mist-netted in cloud forest on 24 September 2015 at 3,700 m, and one was observed at 3,200 m in November 2015. In addition, we recorded the species on several occasions along the road between 2,700 m and 3,200 m in June 2013. Previously reported only to 3,000 m (Beehler & Pratt 2016), but it is a highly nomadic species that could potentially appear anywhere in New Guinea.

## Discussion

Our recent surveys confirm that, despite being one of the best-surveyed areas in New Guinea, there is still undocumented avian diversity on the Mt. Wilhelm elevational gradient. As well as documenting additions to the regional avifauna, we present new data on species habits and elevational ranges. Our results will potentially aid further study of tropical mountain gradients, including work on speciation, community assemblies and species responses to climate change.

We recorded six extensions to upper elevational range limits reported in the literature, but none to lower limits. This corroborates previous studies, which have documented many upslope shifts among New Guinea birds (Sam & Koane 2014, Freeman & Class Freeman 2014a,b), a trend that has been postulated to represent responses to global warming (Freeman & Class Freeman 2014a, but see Rehm 2014). However, as stressed by Sam & Koane (2014), the absence of historical records along the Mt. Wilhelm gradient means that the significance of our elevational records should be treated cautiously in respect of their cause. Furthermore, during the latter half of 2015, Papua New Guinea experienced some of the most severe droughts in decades, associated with a strong El Niño event. The decrease in precipitation, especially at lower elevations, might have influenced local bird distribution and abundance, including shifts in elevation, with some species potentially moving upslope where conditions were less severe. Notably, several species that are usually common at lowland sites appeared to be less abundant or absent. Finally, breeding activity also appeared to be limited at lower elevation sites, suggesting that some species might have abandoned or postponed nesting attempts given the conditions. Significant effects of El

Niño Southern Oscillation events on the timing of breeding and reproductive output have been documented elsewhere in the world (e.g. [Sillett \*et al.\* 2000](#), [Wilson & Arcese 2003](#)), but to our knowledge not from New Guinea.

Despite considerable survey effort, a number of species that might be expected to occur in the local area have to date not been recorded, including several widespread upper hill forest / montane species such as Madarasz's Tiger-Parrot *Psittacella madaraszi*, Fairy Lorikeet *Charmosyna pulchella*, Mountain Myzomela *Myzomela adolphinae*, Red Myzomela *M. cruentata*, Papuan Black Myzomela *M. nigrita*, Marbled Honeyeater *Pycnopygius cinereus* and Varied Sittella *Daphoenositta chrysoptera*. We predict that further surveys along the gradient may reveal their presence. Given that several of these are primarily canopy-dwelling species, they might simply have been overlooked. Furthermore, a number of widespread species primarily associated with lowland forest are unrecorded to date. This might in part reflect the limited extent and fragmented nature of lowland forest at the base of the gradient ([Sam & Koane 2014](#)). Finally, another noteworthy group of species that appears to be absent from the area are birds-of-paradise of the genus *Parotia*. Despite the high cultural value of birds-of-paradise in most regions of New Guinea, local villagers along the gradient are not familiar with parotias. This, coupled with intensive surveys that have failed to detect the presence of this normally conspicuous group of birds, suggests that their absence may be real. However, the reasons for this are unclear and therefore require explanation.

Our records signify that knowledge of the distribution of New Guinean birds is still incomplete, even for well-surveyed areas. We encourage more detailed avifaunal surveys be undertaken in New Guinea, both in well-surveyed areas and regions that to date have been surveyed to a limited degree, such as the many outlying ranges (e.g. North Coastal Range, Cyclops and Foja Mountains). In particular, we recommend further data collection concerning abundance, dispersal and life-history traits of the island's birds. The New Guinea avifauna represents an excellent study system for investigating a series of long-standing ecological and evolutionary questions that would benefit from more and detailed data.

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#### References:

- Beehler, B. M. & Pratt, T. K. 2016. *Birds of New Guinea: distribution, taxonomy, and systematics*. Princeton Univ. Press.
- Boles, W. E. 2007. Family Petroicidae (Australasian robins). Pp. 438–489 in del Hoyo, J., Elliott, A. & Christie, D. A. (eds.) *Handbook of the birds of the world*, vol. 12. Lynx Edicions, Barcelona.
- Coates, B. J. 1985. *The birds of Papua New Guinea*, vol. 1. Dove Publications, Alderley, Queensland.
- Coates, B. J. 1990. *The birds of Papua New Guinea*, vol. 2. Dove Publications, Alderley, Queensland.
- Coates, B. J. & Peckover, W. S. 2001. *Birds of New Guinea and the Bismarck archipelago*. Dove Publications, Alderley, Queensland.
- Deiner, K., Lemmon, A. R., Mack, A. L., Fleisher, R. C. & Dumbacher, J. P. 2011. A passerine bird's evolution corroborates the geological history of the island of New Guinea. *PLoS ONE* 6: e19479.
- Diamond, J. M. 1973. Distributional ecology of New Guinea birds: recent ecological and biogeographical theories can be tested on the bird communities of New Guinea. *Science* 179: 759–769.
- Erritzøe, J., Mann, C. F., Brammer, F. & Fuller, R. A. 2012. *Cuckoos of the world*. Christopher Helm, London.
- Freeman, B. G., Class, A., Mandeville, J., Tomassi, S. & Beehler, B. M. 2013. Ornithological survey of the mountains of the Huon Peninsula, Papua New Guinea. *Bull. Brit. Orn. Cl.* 133: 4–18.



- Freeman, B. G. & Class Freeman, A. M. 2014a. Rapid upslope shifts in New Guinean birds illustrate strong distributional responses of tropical montane species to global warming. *Proc. Natl. Acad. Sci. USA* 111: 4490–4494.
- Freeman, B. G. & Class Freeman, A. M. 2014b. The avifauna of Mt. Karimui, Chimbu Province, Papua New Guinea, including evidence for long-term population dynamics in undisturbed tropical forest. *Bull. Brit. Orn. Cl.* 134: 30–51.
- Gill, F. & Donsker, D. (eds.) 2016. IOC world bird list (version 6.1). [www.worldbirdnames.org](http://www.worldbirdnames.org).
- Higgins, P. J., Christidis, L. & Ford, H. A. (2008). Family Meliphagidae (honeyeaters). Pp. 498–691 in del Hoyo, J., Elliott, A. & Christie, D.A. (eds.) *Handbook of the birds of the world*, vol. 13. Lynx Edicions, Barcelona.
- Irestedt, M., Batalha-Filho, H., Roselaar, C. S., Christidis, L. & Ericson, P. G. P. 2015. Contrasting phylogeographic signatures in two Australo-Papuan bowerbird species complexes (Aves: *Ailuroedus*). *Zool. Scripta* 45: 365–379.
- Jønsson, K. A., Fabre, P.-H., Ricklefs, R. E. & Fjeldså, J. 2011. Major global radiation of corvid birds originated in the proto-Papuan archipelago. *Proc. Natl. Acad. Sci. USA* 108: 2328–2333.
- Mayr, E. & Gilliard, E. T. 1964. Birds of central New Guinea: results of the American Museum of Natural History expeditions to New Guinea in 1950 and 1952. *Bull. Amer. Mus. Nat. Hist.* 103: 311–374.
- Pratt, T. K. & Beehler, B. M. 2014. *Birds of New Guinea*. Second edn. Princeton Univ. Press.
- Rehm, E. M. 2014. Rates of upslope shifts for tropical species depend on life history and dispersal mode. *Proc. Natl. Acad. Sci. USA* 111: E1676.
- Sam, K. & Koane, B. 2014. New avian records along the elevational gradient of Mt. Wilhelm, Papua New Guinea. *Bull. Brit. Orn. Cl.* 134: 116–133.
- Sillett, T. S., Holmes, R. T. & Sherry, T. W. 2000. Impacts of a global climate cycle on population dynamics of a migratory songbird. *Science* 288: 2040–2042.
- Sorenson, M. D. & Payne, R. B. 2005. A molecular genetic analysis of cuckoo phylogeny. Pp. 68–94 in Payne, R. B. *The cuckoos*. Oxford Univ. Press.
- Wilson, S. & Arcese, P. 2003. El Niño drives timing of breeding but not population growth in the song sparrow (*Melospiza melodia*). *Proc. Natl. Acad. Sci. USA* 100: 11139–11142.

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