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Avifauna of the Van Rees Mountains, New Guinea

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Summary.—We describe results of the first ornithological exploration of the uplands of the Van Rees Mts., the lowest of New Guinea's ten outlying mountain ranges. The narrow Mamberamo River gorge separates them from the higher and more species-rich Foja Mts. The known avifauna of Van Rees comprises 223 species, of which 17 are winter visitors from Australia or the Palearctic (occurring overwhelmingly in open non-forest habitats), and 37 are upland species. Whilst most of the Van Rees upland species occur in the Foja Mts., conversely most Foja upland species are unrecorded from Van Rees. Of course, upland species whose Foja elevational floors lie above the Van Rees summit are predictably absent from the latter. However, there are also many 'flagrant absentees' from Van Rees—i.e., conspicuous or abundant Foja species that could or 'should' occur in Van Rees because their Foja floors lie well below the Van Rees summit. The percentage of Foja upland species occurring in Van Rees increases with decreasing Foja floor elevation. That is, availability of elevationally suitable habitat does not provide an all-or-nothing explanation, but only increases the probability, of upland species success in colonising Van Rees. Our Van Rees records of non-forest species at natural clearings in forest—landslides, mud volcanoes, streams and lakes—illustrate how the region's endemic non-forest bird species may have evolved, despite forest being the climax vegetation over most of New Guinea. The lake Danau Bira and its surrounding marsh, created by a mud volcano damming a stream, support at least 23 water and marsh species. An appendix summarises records and elevational ranges of all 223 species recorded in the Van Rees Mts.

This paper presents the results of the first ornithological exploration of the uplands of New Guinea's Van Rees Mountains. The mountains of New Guinea consist of the Central Range rising to almost 5,000 m, plus ten lower outlying ranges along New Guinea's north and north-west coast (Fig. 1). Of the ten outliers, the Van Rees Mts. are the lowest, the last to be explored ornithologically, and (as we found) home to the smallest number of upland bird species (37 species). They are close to the richer outlying Foja Mts. to the east, and to the Central Range to the west and south, with which they share all of their bird species. Conversely, only a fraction of the upland species of the Foja Mts. and Central Range occurs in the Van Rees Mts.; most are absent. The absentees consist not only of high-elevation species whose absence in the low Van Rees Mts. is unsurprising, but also some conspicuous species that are common in the Foja Mts. and Central Range at elevations considerably below the Van Rees summits, and hence might be expected in the Van Rees Mts.

Why are those species absent in the Van Rees Mts. despite the availability of much apparently suitable habitat? This question exemplifies a general problem of biogeography: to understand why different patches of similar habitat in the same faunal region support different subsets of that fauna. The Van Rees Mts. offer a good opportunity to study variation in upland species richness among mountain ranges differing in elevation, area and connectivity. They also prove to be a suitable location for studying other phenomena,

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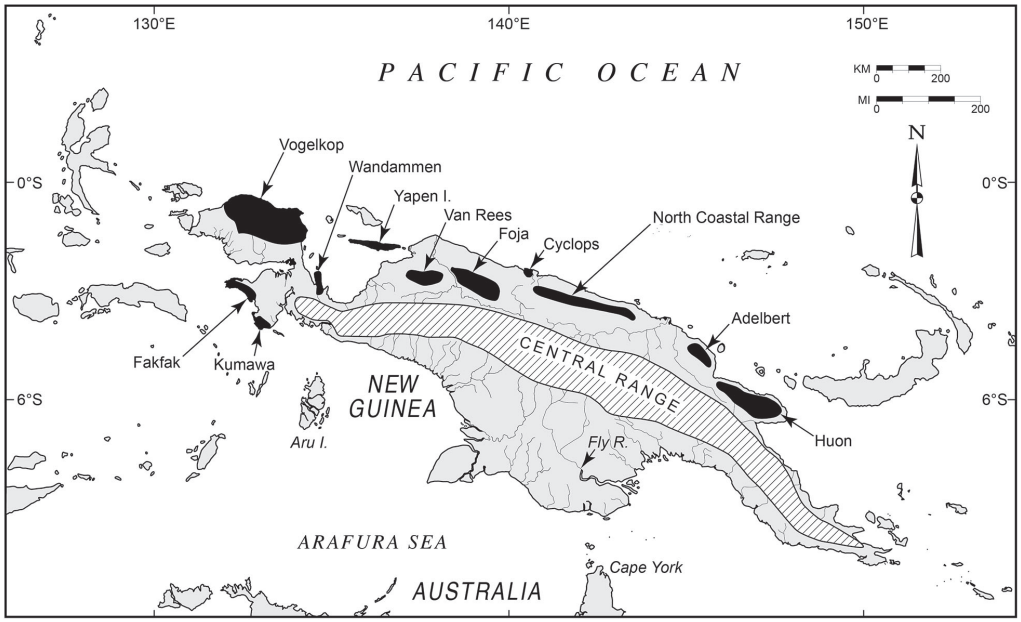

Figure 1. Mountains of New Guinea. The Central Range is cross-hatched. In solid black and named are ten outlying mountain ranges detached from the Central Range, and rising from the lowlands along New Guinea's north and north-west coasts. Also solid black and named are the mountains of Yapen, which today is an island separated by a shallow strait, but which at Pleistocene times of low sea level was part of the New Guinea mainland. This paper compares the Van Rees outlier with the nearby Foja outlier.

including bird distributions in a large area uninhabited and apparently not hunted by humans; and the origin of non-forest species in a forested environment. A companion paper (Diamond & Bishop submitted) will examine how avian elevational ranges differ between the Van Rees Mts., Foja Mts., and other New Guinea sites.

Background

Physical environment.—Lowland north-west New Guinea's interior is dominated by the Lakes Plains (Dutch name: Meervlakte), a nearly flat mountain-ringed basin at an elevation below 100 m and approximately 10,000 km^2 in area. The western and eastern halves of the Lakes Plains consist of the basins of the Rouffaer River (Indonesian name: Tariku) and Idenburg River (Taritatu), respectively, which join to form the Mamberamo River, western New Guinea's largest river, draining to the north coast. The mountain walls of the Lakes Plains consist of the Central Range on the south side, the Van Rees Mts. on the north-west side, and the Foja Mts. on the north-east side. At the west end of the Lakes Plains, the Van Rees Mts. and the Central Range are joined by a saddle *c.*350 m high (Fig. 2; I. Woxvold pers. comm.). The Van Rees Mts. and Foja Mts. are separated by the Mamberamo River gorge. Because the gorge is narrow and steep-walled for much of its length, the Van Rees Mts. and Foja Mts. are separated by as little as 1.3 or 3.0 km at the 300-m or 500-m contours, respectively (I. Woxvold pers. comm.).

We conducted 22 aerial surveys of the Van Rees Mts. by helicopter and small fixed-wing aircraft. Thirteen surveys were incidental to flights en route to and from the airfield at Danau Bira in the Van Rees Mts. (see below). The other nine were dedicated surveys over the mountains; six of the nine involved close scrutiny of the highest peaks, whose locations we confirmed using Google Earth. We thereby found that the highest Van Rees peak lies

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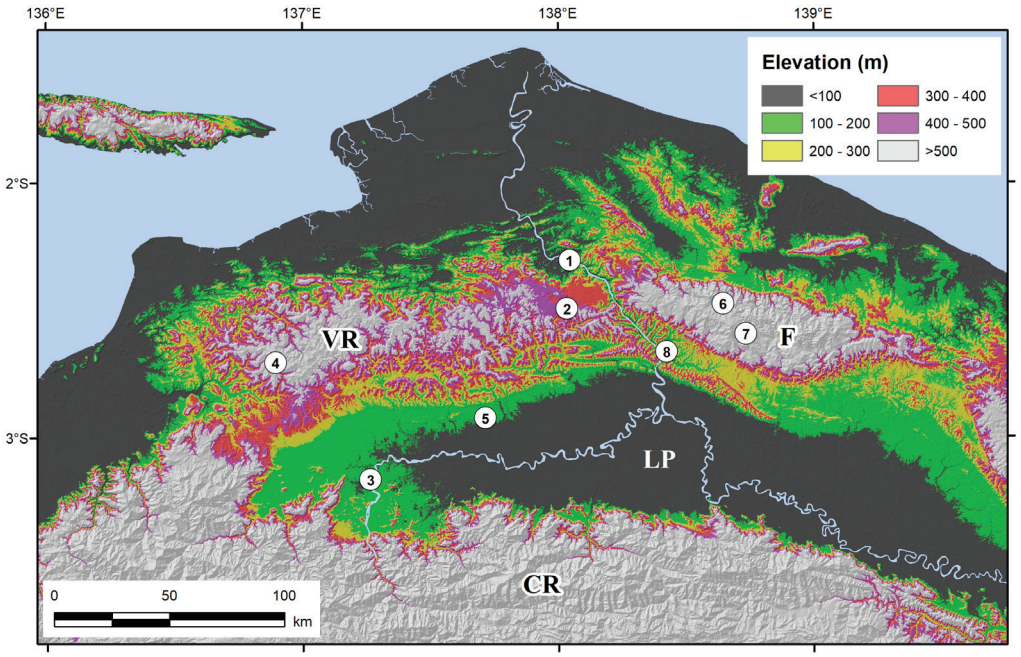

Figure 2. Elevational terrain of north-west New Guinea, kindly provided by Iain Woxvold; the Van Rees Mts. are separated from the Foja Mts. to the east by the narrow Mamberamo River gorge, whose bottom is at an elevation of <100 m. The west end of the Van Rees Mts. is joined to the Central Range by a saddle lying at *c*.350 m. VR = Van Rees Mts., F = Foja Mts., CR = Central Range, LP = Lakes Plains. Field sites: 1 = Pionierbivak on the Mamberamo River; 2 = Danau Bira; 3 = Doufo; 4 = our Van Rees mountain camp; 5 = Biri; 6 = JD's 1979 Foja camp at the base of his Foja coastal transect; 7 = JD's camp on his 1981 Foja inland-facing transect; 8 = the Kwerba transect of Beehler *et al*. (2012), rising from the lowlands of the Foja inland watershed.

at *c*.02°63′S, 137°19′E, with an elevation of *c*.1,262 m. The elevation of 1,430 m shown on current maps is inaccurate and too high. The Van Rees Mts. are thus much lower than the Foja Mts. (summit 2,218 m).

Climate.—We are aware of rainfall data for just one location in the Van Rees Mts.; Kasonaweja (near the former Dutch Pionierbivak), at an elevation of 40 m on the Mamberamo River in the mountains' north-east corner. Mean annual rainfall there is 3.3 m distributed rather evenly or irregularly through the year, with no month receiving <21 cm mean rainfall (Brookfield & Hart 1966). The nearest other rainfall records are for seven stations on the coast west and north-west of the mountains, 30–130 km away, where annual rainfall is 2.7–3.8 m, distributed rather evenly year-round or with a modest peak in December–March and a minimum in May–October. All of these records are for lowland stations; rainfall in the Van Rees Mts. presumably increases with elevation, as elsewhere in New Guinea.

Habitats.—On our overflights, we saw that almost the entire area of the Van Rees Mts. is covered by forest. Anthropogenic non-forest habitats are very limited, because the human population is so sparse and subsists mainly by hunting and gathering (see next section). We observed five types of natural non-forest environments, whose importance for the presence and evolution of non-forest New Guinea birds we will discuss: rivers, landslides, lakes, mud volcanoes, and bare cliff faces.

Rivers range from the Mamberamo, its western arm the Rouffaer, and their small tributaries, down to mountain streams. As habitats for birds, these rivers provide the water itself, riverbanks and bars, and riparian vegetation.

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Figure 3. A mud volcano near Danau Bira, photographed from the air. It was formed by mud extruded from a hydrothermal vent. The grey area of bare mud is surrounded by concentric rings of progressively taller regenerating vegetation (© Bruce Beehler, reproduced with permission from *New Guinea: nature and culture of Earth's grandest island*; Beehler 2020)

Numerous landslides, probably provoked by earthquakes or by heavy rains, are recognisable in overflights as areas either of bare mud, dead trees, or non-forest successional vegetation. One large landslide clearing with an estimated area of 1.5 km^2 lay 2.8 km from our mountain camp. We chose our camp's location because of its proximity to a small landslide of bare ground that permitted our helicopter to land near the highest Van Rees peak, in an otherwise-forested environment where a helicopter could not land.

The largest lake in the Van Rees Mts., Lake Holmes (Danau Bira), was created by a mudslide that dammed a river valley *c*.100 years ago (D. Price pers. comm.). Many dead trees that formerly grew in the valley before its inundation are still standing in the shallow lake. From the air we saw two ponds at the base of the large landslide 2.8 km from our camp, also presumably created by mud dams.

Mud volcanoes, a characteristic feature of the north-west New Guinea lowlands, are circles of bare mud surrounded by concentric rings of progressively taller regenerating vegetation. They are created by extrusion of mud from a central vent. For a photograph of one of these striking structures 3 km from Danau Bira, see Fig. 3. In 1979 JD walked through forest to that mud volcano and found it dry and safe to walk on.

Finally, from our overflights we observed several vertical white cliffs, presumably limestone, at the highest Van Rees elevations, including at the summit of the tallest peak above our camp.

People.—The human population of the Van Rees Mts. is just *c*.4,000, divided among speakers of ten languages belonging to two Papuan language families (the Lakes Plains family and East Geelvink Bay family) (Lewis 2009). Most numerous, and occupying the largest fraction of the Van Rees Mts., are speakers of the Bauzi language, who we

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encountered at our Danau Bira field site. The other language group that we encountered was Biritai at Biri village. Subsistence is by hunting and gathering, fishing, sago harvesting, and recently some agriculture. First contacts of some groups by missionaries were still occurring during our field work in 1979 and 1982.

People in the Van Rees Mts. live in a few scattered villages and groups of huts at low elevations. In our overflights we saw no signs of human presence above 500 m. We also saw no such signs in the 20 days that we spent at our mountain camp at an elevation of 799 m (Diamond *et al*. 1999). Around our camp the presence and tameness of tree kangaroos (possibly Grizzled Tree Kangaroo *Dendrolagus inustus*), prized by hunters as New Guinea's largest native land mammal, testified to the absence of human hunters and visitors. The nearest village to our camp that we detected in our overflights was 41 km distant.

Other bird surveys.—To our knowledge, prior to our work there had been only two previous studies of birds in the immediate environs of the Van Rees Mts. Both were at the Dutch base of Pionierbivak at an elevation of 40 m on the Mamberamo's west bank in the north-east corner of the Van Rees Mts., opposite the present-day Indonesian settlement of Kasonaweja (02°28'S, 138°03'E). The first of those studies was by W. C. van Heurn, who collected several hundred specimens of 95 bird species between 15 June and 26 August 1920 and 10 December 1920 to 9 January 1921 (Hartert 1932). The second was by J. P. K. van Eechoud, who collected 250 specimens of 87 species in July–November 1939 (van Bemmel 1947). The collections combined comprise 127 species, of which 55 species were obtained by both collectors. Of the 127 species, we observed all but 12 (mostly cryptic or rare species, plus two confined to the Mamberamo River and its riverine forest that we did not visit). Both collectors evidently remained in or near the Mamberamo floodplain and did not ascend the mountains, because their collections include only three species of the lower slopes: Pheasant Pigeon *Otidiphaps nobilis*, New Guinea Vulturine Parrot *Psittrichas fulgidus* and Torrent Flycatcher *Monachella muelleriana*.

Other studies at sites more distant but still relevant to the Van Rees Mts. are the following: Van Balen *et al*. (undated) surveyed birds in 2007 at five lowland sites just north of the Van Rees Mts., and at three sites on or near the coast at the mouth of the Mamberamo River.

Surveys were conducted by us in the western Lakes Plains at Doufo near the Rouffaer River (03°14'S, 137°25'E; 136 m elevation); at Kordesi on the Rouffaer River (*c*.03°04'S, 137°94'E; 101 m); and at Weri south of the Van Daalen River, a south-west tributary of the Rouffaer River (*c*.03°36'S, 137°95'E; 112 m). Surveys were conducted in the eastern Lakes Plains near the Idenburg River by W. C. van Heurn at Prauwenbivak (Hartert 1932), by A. L. Rand (1942) at Bernhard Camp, and by van Balen *et al*. (2002) at Dabra near Prauwenbivak.

Surveys in the Foja Mts. by JD and by Bruce Beehler and his colleagues were summarised by Beehler *et al*. (2012). We (Diamond & Bishop 2020) summarised studies in the mountains of Yapen Island by us and by others.

The most complete survey of a nearby section of the western Central Range was by G. Stein (Hartert *et al*. 1936). Mack & Alonso (2000) reported surveys of three sites near or south of the Wapoga River drainage that separates the Central Range from the Van Rees Mts.

We (Diamond *et al*. 2019) surveyed lowland birds at the head of Geelvink Bay and on the isthmus south of Geelvink Bay, west of the Van Rees Mts. Finally, various other authors have made smaller collections or studies on New Guinea's north coast north of the Van Rees Mts. between Geelvink Bay and Sarmi.

Our surveys.—We observed birds at three sites in the Van Rees Mts. One site is Danau Bira, the former aviation base (now closed) of the Summer Institute of Linguistics, in gently undulating terrain on Bauzi tribal land (02.47°S, 138.02°E) at 366 m in the north-east part

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of the Van Rees Mts. The base's habitats, besides open water, fringing marsh, and inflow and outflow streams, were fragmented forest with many tall trees still standing, second growth, the open airfield, and open land around the buildings, surrounded by intact forest. We accessed the forest by following an inlet stream in a canoe, and by a trail connecting the base to the nearby mud volcano.

We made six visits to Danau Bira in four different years and five different months of the year: JD on 4–6 and 18–22 October 1979, and 23–29 January and 13–17 February 1981; and JD & KDB on 4–6 July 1990 and 19 April 1993. At Danau Bira we observed 152 species ourselves, ranging from 91 to 125 species on each of our longer visits. An additional 13 species (denoted by [a] in column 3 of the Appendix) were convincingly identified and described to us by D. Price, a biologist and linguist resident at Danau Bira.

Our second site was Biri village at *c*.02°82'S, 137°83'E (143 m elevation), visited on 6–10 October 1979 by JD. Biri lies on a small northern tributary of the Rouffaer River where gentle hills drop into the Rouffaer's flatter floodplain. Near the village are primary forest up to 50 m tall, forest on the floodplain with some standing water, an old oxbow now filled with marsh 1 m tall, and successional forests on former gardens.

Our remaining site, which was our principal locality for surveying upland birds, was a camp that we made at 02°68'S, 136°88'E; 799 m elevation. We chose this site because it was a small landslide with steep mud walls upslope but with a small flat area at which our helicopter could land; in the otherwise forest-covered terrain, this was the closest possible landing site to the highest Van Rees peak for our helicopter. Whilst the landslide itself was bare mud and evidently recent, a small section of the ridge immediately upslope supported grass, second growth and low trees as evidence of an older landslide in the area. We previously described how a dozen species of parrots, pigeons and other frugivores visited the landslide daily to consume soil ('geophagy') with high concentrations of minerals that bind poisonous or bitter secondary compounds contained in ingested fruits (Diamond *et al*. 1999).

We occupied our camp from 15 September to 4 October 1994. From there we cleared a system of trails whose highest point was 1,206 m on the summit ridge. From that highest accessible location on the ridge rose a bare vertical-walled rock tower that was impossible or imprudent, and probably ornithologically unrewarding, to climb. Its top, measured as 1,262 m using Google Earth and aircraft overflights, is the highest point in Van Rees. One of our trails descended until it reached 534 m at a river, which we followed by wading down to 494 m. Thus, the elevational range of our observations was 1,206 to 494 m. To listen for nightbirds, and to hear the dawn chorus at different elevations, we also established two further camps at 1,049 m and 1,022 m, where each of us overnighted for two nights and spent parts of three days.

All of the terrain accessible and visible from our mountain camp was sloping, with no extensive flat areas. We estimated the canopy as reaching a max. height of 45 m. There were many treefalls and areas of somewhat open forest, some of them possible results of former landslides. Only at our highest elevations just below the summit ridge did we encounter modest amounts of moss and epiphytic growth; there was no heavily mossed forest, as is common at higher elevations elsewhere in New Guinea. Recognised tall trees included casuarinas and oaks. The largest animals that we saw were tree kangaroos, and varanid lizards up to *c*.1.8 m in length. We detected no signs of human presence.

Methods.—Our methods of observation were similar to those described for our studies elsewhere in New Guinea (Diamond & Bishop 2015, 2020, 2021, Diamond *et al*. 2019). Briefly, because there were no motor roads or motor vehicles at any of our four study sites, our observations were made on foot trails, plus from canoes on Danau Bira and by

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wading in streams at Danau Bira and our mountain camp. We devoted much effort to recording vocalisations with Sony TCM 5000 EV tape-recorders, playing back unidentified vocalisations in the field to attract and identify singers, and re-listening to recordings in camp each day because our directional microphones often captured vocalisations that we had not noticed in the field. We paused at fruiting and flowering trees where birds gathered. We began observing by 05.00 h to detect nocturnal birds. Elevations of all significant observations were measured using Thommen altimeters or a Garmin GPS. We did no collecting.

At Biri JD was constantly accompanied by villagers, who pointed out and identified birds that we and they saw or heard together. They told us about their experience of each species, and described others that lived in the area of their village but which they did not encounter with us. These conversations were carried out in Indonesian (Bahasa Indonesia), and bird names used were in the local Biritai language—names that JD went to much effort to identify and learn. In our list of species for Biri we include three distinctive and vocal large non-passerines (denoted by [b] in column 3 of the Appendix) that Biri villagers described to JD, and that can be expected at Biri, but JD did not observe himself. At our mountain camp we were constantly accompanied by three Ketengban-speaking men who had worked with us in the previous year at their village of Okbap in New Guinea's Star Mts., and whom we brought with us to the Van Rees Mts.: Robert Uropka, Peter Kaliala and Benni Kediman. We already published the list of Ketengban-language names for 169 bird species that we learned from them (Diamond & Bishop 1999).

Our nomenclature follows that of Beehler & Pratt (2016).

Species totals

The Appendix lists all bird species recorded for the Van Rees Mts. by us at our three sites, and by van Heurn or van Eechoud at Pionierbivak at the mountains' base. A concluding section of species accounts provides significant observations for species of particular interest.

A total of 223 species has now been recorded for the Van Rees Mts. (including Pionierbivak). Table 1 summarises for each site the number of species recorded, the number of specimens collected (if any), and the number of days of observation or collecting. The number of species per site reflects mainly the circumstances of field work, rather than intrinsic differences between sites. The lowest number (119 species) is for Biri, at which JD spent only five days. At each of our three sites we observed more species in 5–24 days than van Heurn or van Eechoud collected in three or six months respectively at Pionierbivak, because we devoted almost all of our time to observations and had the advantage of tape-recorders, whereas van Heurn and van Eechoud's records were based only on specimens they collected; they did not report observations. Our high species total for Danau Bira may be real: its habitats included not only forest but also the lake, marshes, and a large area of anthropogenic clearing lacking at other sites.

Non-breeding winter visitors

Table 2 lists the 17 winter visitors recorded: nine from Australia, eight from the Palearctic. At least two and probably five species are represented by both Australian winter visitors and a resident New Guinea population. In New Guinea, Oriental Dollarbird *Eurystomus orientalis* is represented by the paler duller Australian winter visitor *E. o. pacificus* and by the darker brightly coloured resident *E. o. waigiouensis*, which we easily distinguished in the field under good light conditions and close views. In the case of Brush Cuckoo

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TABLE 1

Species totals for Van Rees sites. Numbers of species recorded at the site (column 3), and (column 5) numbers of upland species as defined in the text, taken from the Appendix. Number of winter visitor species recorded (column 4) from Table 2. The four sites are listed in order of elevation. Differences in species totals among sites partly reflect differences in survey effort (lowest for Biri), but also differences in site habitat diversity (highest at Danau Bira).

Site	Elevation (m)	No. of species	No. of species of winter visitors	No. of upland species	Observation time spent	Specimens collected
Pionierbivak	40	127	8	3	9 months	*c*.550
Biri	143	119	4	7	5 days	0
Danau Bira	366	165	13	14	24 days	0
Mountain camp	494–1,206	147	3	35	20 days	0
All sites		223	17	37		

TABLE 2

Non-breeding winter visitors from Australia (Au) or the Palearctic (Pal) recorded in the Van Rees Mts. at the sites coded in the right-hand column (see Appendix for codes). Fourth column: √ = breeds locally or infrequently in New Guinea, but most New Guinea observations are believed to involve non-breeding visitors; subsp = Van Rees record of an identifiably distinct migrant subspecies at the site or sites coded in the right-hand column, and also of a distinctive New Guinea resident breeding population at other Van Rees sites (see Species Accounts for details).

Species		Geogr. source	Also breeds NG?	Van Rees sites
Intermediate Egret	*Ardea intermedia*	Au	✓	ba
Pied Heron	*Egretta picata*	Au	✓	e [a]
Channel-billed Cuckoo	*Scythrops novaehollandiae*	Au		e, m
Brush Cuckoo	*Cacomantis variolosus dumetorum* (= *C. v. variolosus*)	Au	subsp	h
Oriental Cuckoo	*Cuculus optatus*	Pal		am
White-throated Needletail	*Hirundapus caudacutus*	Pal		[a]m
Pacific Golden Plover	*Pluvialis fulva*	Pal		b
Wood Sandpiper	*Tringa glareola*	Pal		b
Common Sandpiper	*Actitis hypoleucos*	Pal		heb[a]
Curlew Sandpiper	*Calidris ferruginea*	Pal		[a]
Whiskered Tern	*Chlidonias hybrida*	Au		a
Rainbow Bee-eater	*Merops ornatus*	Au	✓	ha
Oriental Dollarbird	*Eurystomus orientalis pacificus*	Au	subsp	ha
Sacred Kingfisher	*Todiramphus sanctus*	Au		hea
Barn Swallow	*Hirundo rustica*	Pal		a
Tree Martin	*Petrochelidon nigricans*	Au		ha
Grey-streaked Flycatcher	*Muscicapa griseisticta*	Pal		a

Cacomantis variolosus, during the Australian winter months of June–July van Heurn collected specimens at Pionierbivak that Hartert (1932) identified as Australian *C. v. dumetorum* (now synonymised with *C. v. variolosus*). We found this cuckoo species common and singing at all three of our sites during the Australian spring months of September–October, when one would expect Australian winter visitors to be back in Australia, so we assume that our observations were of north-west New Guinea resident *C. v. infaustus*. Two herons at Danau Bira, Intermediate Egret *Ardea intermedia* and Pied Heron *Egretta picata*, plus Rainbow

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Bee-eater *Merops ornatus*, are widespread in New Guinea as visitors from Australia but also breed in southern New Guinea (Beehler & Pratt 2016); their status at Danau Bira is unknown. The other four Australian species and the eight Palearctic species in Table 2 occur in New Guinea solely or overwhelmingly as winter visitors, not as breeders.

As elsewhere in New Guinea, we found the winter visitors overwhelmingly in open non-forest habitats. Our sole observations of winter visitors in forested areas were of Oriental Cuckoo *Cuculus optatus*, Channel-billed Cuckoo *Scythrops novaehollandiae* and White-throated Needletail *Hirundapus caudacutus*, of which we had respectively three, two and one sightings of individuals flying over (but not perched in) forest at our mountain camp. We also saw *Cuculus optatus* repeatedly in open habitats at Danau Bira, our site with the most extensive open habitat, and correspondingly with the greatest variety of winter visitors (11 species). Other than the 17 winter visitors, all other species listed in Table 1 as recorded for the Van Rees Mts. are New Guinea residents.

Upland species

Upland species number.—As in our other recent papers (Diamond & Bishop 2015, 2020, 2021), we define 'upland species' as those largely confined to sloping elevated terrain, and absent from the flat lowlands at or near sea level. That definition proves to be more useful and less arbitrary than defining 'montane species' as those largely confined to elevations above an arbitrary figure, such as 1,000 m or 1,700 m. We have discussed in more detail elsewhere (Diamond & Bishop 2015, 2020) the advantages of this definition, and the ambiguities and practical issues in applying it. By this definition, we recognise 37 Van Rees species as upland species (= S_{up}), denoted by an asterisk in the Appendix.

To place this number of 37 in context, Table 3 compares it with S_{up} values for New Guinea's nine other outlying mountain ranges. It is apparent that S_{up} increases with outlier-range elevation, but the correlation is not perfect. (Especially the S_{up} value of only 44 species for Cyclops is lower than expected for its elevation of 2,160 m, probably due at least in part to the Cyclops' small area.) Van Rees, as the lowest outlier (1,262 m), has the smallest S_{up} value.

TABLE 3
Upland avifaunas of Van Rees Mts. and the other outliers. Column 1: NCR = North Coastal Range. Column 3: the number of upland species on that outlier. Values for outliers other than Van Rees are taken from Table 1 of Diamond & Bishop (2021).

Outlier	Elevation (m)	S_{up} (species)
Van Rees	1,262	37
Fakfak	1,400	65
Kumawa	1,654	72
Adelbert	1,675	71
NCR	1,886	78
Wandammen	2,075	77
Cyclops	2,160	44
Foja	2,218	95
Vogelkop	2,954	129
Huon	4,121	127

Is that value of 37 upland species likely to be an underestimate? Yes, undoubtedly, but by how much? We surveyed three Van Rees sites, and van Heurn and van Eechoud a fourth. As apparent from Table 1, column 5, which lists the number of upland species recorded at each site, that number increases with elevation. Of our 37 upland species, we recorded 17 species at two or three sites, and 20 species at just one site (in all but one case, our highest-elevation site, the mountain camp). Of the 20 species recorded at only one site, 16 were recorded repeatedly or were common, but four were recorded just once or twice: Wallace's Owlet-nightjar *Aegotheles wallacii*, Blue-collared Parrot *Geoffroyus simplex*, Spotted Honeyeater *Xanthotis polygrammus* and Yellow-legged Flycatcher *Kempiella griseoceps*. That is, there were four species that we were 'lucky' to observe, whilst it was unlikely that we would overlook the other 33 species

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because we found them at multiple sites (17 species) or observed them repeatedly at a single site (16 species). These results suggest that we observed most of the upland species actually present at our sites, but that there were some species we were 'unlucky' not to see, along with the four species to which we must attribute our mere one or two observations to good luck. Of course, as we discuss under Outlook, additional high-elevation Van Rees sites should be surveyed; they are likely to yield additional upland species.

Comparison with Foja.—The outlier to which the Van Rees Mts. are nearest is Foja, separated from Van Rees by the narrow Mamberamo River gorge. Because Foja is much higher than Van Rees (2,218 vs. 1,262 m), it supports many more upland species: 95 vs. 37 (Table 3). Unsurprisingly, of the 37 upland species of Van Rees, all except three or four have been recorded in Foja: *Aegotheles wallacii*, Red-fronted Lorikeet *Charmosyna rubronotata* and *Kempiella griseoceps*, and perhaps Barred Cuckooshrike *Coracina lineata* for which there is a single uncertain Foja record (Beehler *et al*. 2012: 101). Several or all of these species are likely to be present but overlooked in Foja, because *Kempiella griseoceps* and *Charmosyna rubronotata* are otherwise known from seven and eight outliers, respectively, and all four are variously cryptic and / or difficult to identify and / or uncommon.

While at least most Van Rees species occur in Foja, conversely most Foja species (58 of 95) are unrecorded from Van Rees. Especially 'flagrant' Van Rees absences are those of Foja species common or abundant on other outliers at elevations well below the Van Rees summit, which are noisy or behaviourally conspicuous, and occur on all nine other outliers (Fairy Lorikeet *Charmosyna pulchella*, Red-breasted Pygmy Parrot *Micropsitta bruijnii*, Black-bellied Cicadabird *Edolisoma montanum*, Island Leaf Warbler *Seicercus poliocephalus*, Black Fantail *Rhipidura atra*, White-faced Robin *Tregellasia leucops*), or on eight of the nine (Red Myzomela *Myzomela cruentata*, Black-winged Monarch *Monarcha frater*).

Table 4 (column 4) lists, for each Van Rees upland species, the number of outliers occupied by that species. The average number of outliers occupied, out of a total of ten outliers, is eight. Nine Van Rees upland species occupy all ten; 11 or six species occupy nine or eight outliers, respectively; and just four occur on fewer than six. Conversely, 35 of New Guinea's 193 upland species are absent from every outlier and confined to the Central Range, and 28 species occupy only a single outlier plus the Central Range (Diamond & Bishop 2021). Evidently, some upland species are good colonists and succeed in occupying most or all outliers, whilst others are poor colonists and fail to occupy most or all outliers.

How can these species differences be explained? Why do the Van Rees Mts. conform to these trends in some cases and violate them in others, by respectively supporting or not supporting populations of many species that exist on most or all other outliers?

Availability of habitat at elevations compatible with a species' requirements is a major factor explaining why a given upland species is or is not present on a given outlier (Diamond & Bishop 2020, 2021). The 35 Central Range species absent from all outliers are mostly species that live at high elevations on the Central Range, and for which all outliers are too low to provide suitable habitat. The 28 Central Range species present on a single outlier are confined to one of the two highest outliers, Vogelkop and Huon. Let's examine presence or absence of Foja species in the Van Rees Mts. from this perspective. Van Rees' summit is 1,262 m; Foja's summit is 2,218 m; many Foja populations have elevational floors higher than the Van Rees summit; and 15 Foja populations have floors between 1,600 and 1,637 m, much higher than the Van Rees summit. Do Foja elevational floors help to explain presence or absence of Foja species in the Van Rees Mts.?

Beehler *et al*. (2012) tabulated elevational distributions of Foja populations as measured by JD in 1979 and 1981, and by Beehler and his colleagues in 2005, 2007 and 2008. We divided the 95 Foja upland species into 13 sets differing by 50 or 100 m in elevational floor.

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TABLE 4

Van Rees upland species on other outliers. The first and second columns list all upland species in the Van Rees Mts. The third column checks those Van Rees species recorded from the Foja Mts. (from Beehler *et al*. 2012). The last column informs on how many of New Guinea's ten outlying ranges (including Van Rees) the species has been recorded (from Diamond & Bishop 2020). Note that most Van Rees upland species have also been recorded from all or nearly all of the other outliers.

Species		**In Foja?**	**No. of outliers**
Dwarf Cassowary	*Casuarius bennetti*	✓	7
Wattled Brushturkey	*Aepypodius arfakianus*	✓	9
Black-billed Cuckoo-Dove	*Macropygia nigrirostris*	✓	10
Pheasant Pigeon	*Otidiphaps nobilis*	✓	9
Mountain Fruit Dove	*Ptilinopus bellus*	✓	10
Claret-breasted Fruit Dove	*Ptilinopus viridis*	✓	8
Papuan Mountain Pigeon	*Gymnophaps albertisii*	✓	10
White-eared Bronze Cuckoo	*Chalcites meyerii*	✓	10
Wallace's Owlet-nightjar	*Aegotheles wallacii*	--	3
Pygmy Eagle	*Hieraaetus weiskei*	✓	6
New Guinea Vulturine Parrot	*Psittrichas fulgidus*	✓	7
Red-fronted Lorikeet	*Charmosyna rubronotata*	--	5
Blue-collared Parrot	*Geoffroyus simplex*	✓	9
Black-eared Catbird	*Ailuroedus melanotis*	✓	9
Spotted Honeyeater	*Xanthotis polygrammus*	✓	9
Mountain Meliphaga	*Meliphaga orientalis*	✓	9
White-eared Meliphaga	*Meliphaga montana*	✓	9
Obscure Honeyeater	*Caligavis obscura*	✓	4
Tropical Scrubwren	*Sericornis beccarii*	✓	8
Chestnut-backed Jewel-babbler	*Ptilorrhoa castanonota*	✓	9
Mountain Peltops	*Peltops montanus*	✓	9
Stout-billed Cuckooshrike	*Coracina caeruleogrisea*	✓	10
Barred Cuckooshrike	*Coracina lineata*	?	8
Papuan Cicadabird	*Edolisoma incertum*	✓	10
Piping Bellbird	*Ornorectes cristatus*	✓	8
Rusty Whistler	*Pachycephala hyperythra*	✓	8
Hooded Pitohui	*Pitohui dichrous*	✓	10
Drongo Fantail	*Chaetorhynchus papuensis*	✓	9
Trumpet Manucode	*Phonygammus keraudrenii*	✓	8
Magnificent Bird of Paradise	*Diphyllodes magnificus*	✓	10
Fantailed Monarch	*Symposiachrus axillaris*	✓	9
Green-backed Robin	*Pachycephalopsis hattamensis*	✓	7
Yellow-legged Flycatcher	*Kempiella griseoceps*	--	7
Torrent Flycatcher	*Monachella muelleriana*	✓	6
Papuan Scrub-Robin	*Drymodes beccarii*	✓	7
White-rumped Robin	*Peneothello bimaculata*	✓	5
Green-fronted White-eye	*Zosterops minor*	✓	10

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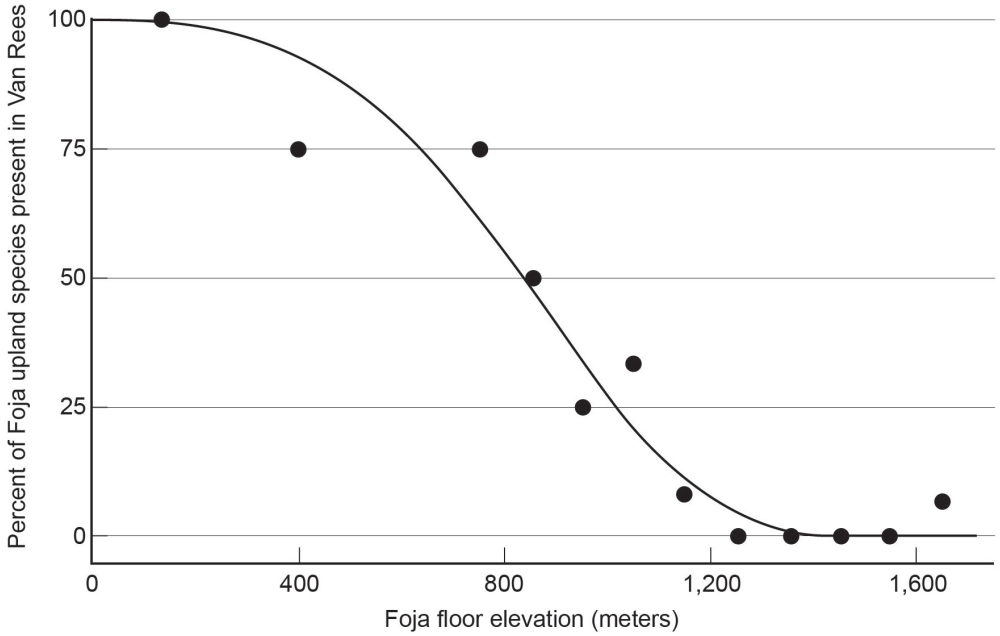

Figure 4. Upland species recorded in the Foja Mts. divided into sets based on their Foja elevational floors (abscissa, in metres). For each set, the ordinate gives the percentage of the Foja upland species in that set that has also been recorded in the Van Rees Mts. For example, the point at an ordinate value of 50%, abscissa value of 850 m means that three of the six upland species with a Foja floor at 800–899 m were also recorded in Van Rees. Foja floors from Beehler *et al*. (2012).

For each set, we calculated the percentage of its species that do occur in Van Rees. Fig. 4 plots that percentage as a function of the set's mean elevational floor in Foja.

Fig. 4 shows that, with one apparent exception, all Foja species whose floors exceed 1,250 m are absent from Van Rees[1]. The Van Rees species with the next highest Foja floor was Hooded Pitohui *Pitohui dichrous* (Foja floor 1,158 m). Thereafter, with decreasing Foja floor elevation, the percentage of Foja species present in Van Rees increases until all of the lowest-elevation Foja upland species, with Foja floors averaging 132 m, do occur in Van Rees.

In light of Fig. 4, how can one explain the finding that some noisy, widespread species common on Foja and other outliers at elevations well below the Van Rees summit are nevertheless absent from Van Rees? The answer is that the relationship depicted in Fig. 4 is not a step function. It is not the case that the probability of presence in Van Rees increases in a step function from zero, for species with Foja floors above the Van Rees summit of 1,262 m, to 100% for species with floors of 1,261 m (or even of 1,000 m!). Such species with Foja floors 1 m, or even 262 m, below the Van Rees summit are not thereby guaranteed to occur in Van Rees. Instead, probability of occurring in Van Rees increases gradually with decreasing Foja floor elevation, to reach 100% only for the lowest Foja floors studied. Evidently, some additional factors besides elevational floor influence colonising success by upland populations. They will require further studies; possible factors include dispersal ability, abundance, reproductive output, and sociality.

[1] The one exception is the mound-builder Wattled Brushturkey *Aepypodius arfakianus*, whose apparent Foja floor was 1,677 m but was nevertheless observed from 610 m upwards in Van Rees. But this species and its mounds often escape detection, and its actual Foja floor may be much lower.

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Non-forest species in forested environments

Except for lowland savannas and marshes in low-rainfall areas, and high-elevation alpine grassland above the timberline, the climax vegetation over most of New Guinea is forest. In airplane flights over parts of New Guinea with sparse or no human population, we have often had the impression of uninterrupted forest stretching horizon to horizon. As a result, most New Guinea bird species are forest-dwellers. But in areas with dense populations of farmers, such as mid-montane grassland in the Wahgi and Baliem Valleys, there are large expanses of anthropogenic grassland supporting grassland birds, some of them endemic subspecies and species presumably of some antiquity. Those extensive anthropogenic grasslands could not have existed before the origins of New Guinea agriculture only within the last 10,000 years. Where did those species of anthropogenic non-forested habitats evolve before agricultural land clearance?

Rand (1941, Archbold & Rand 1935, Rand & Brass 1940) noted that, even in forested areas without human population, there are small open non-forest patches created by natural disturbances such as landslides and treefalls, where non-forest species could have evolved. With the post-Pleistocene development of agriculture and of anthropogenic grasslands, habitat and populations of those non-forest species expanded enormously.

The Van Rees Mts. illustrate this postulated origin of some of New Guinea's non-forest bird species. Despite the forest cover and lack of humans in most of Van Rees, we encountered natural clearings in the middle of forest, originating in four ways: landslides, mud volcanoes, streams, and lakes and marshes created by mud flows damming streams. In three of these four types of clearings we observed non-forest species absent from Van Rees forest but present in the anthropogenic clearings at Biri village and Danau Bira airfield. The details are as follows.

Our forest camp at 799 m was next to a small, treeless, evidently very recent landslide of bare mud, downslope from a small area of second growth evidently grown over an earlier landslide. In the second growth we observed daily a party of up to six White-shouldered Fairywrens *Malurus alboscapulatus*, a species of grassland and second growth; we also saw and repeatedly heard singing a pair of White-bellied Thicket Fantail *Rhipidura leucothorax*, a species characteristic of forest edge and second growth. An individual of the forest-edge Papuan Nightjar *Eurostopodus papuensis* sallied over the landslide clearing each evening. We encountered these three species nowhere else at our forest camp, which was otherwise surrounded by forest.

Danau Bira was a mission base at an airfield on a recently formed lake (see below), and surrounded by forest. From the mission base, on 19 October 1979 JD walked through 3 km of forest to a mud volcano, a circle of bare mud surrounded by rings of low young trees increasing in height with distance from its centre (Fig. 3). It was striking to emerge from the forest into the mud clearing, and suddenly to encounter two species of forest edge and second growth, Large-billed Gerygone *Gerygone magnirostris* and the cuckoo *Cacomantis variolosus*. Both were absent (*Gerygone*) or sparse (*Cacomantis*) in the surrounding forest. Of these five forest-edge, grassland, and second-growth species encountered at our camp's landslide and / or at the mud volcano, four—*Cacomantis*, *Malurus*, *Gerygone* and *Rhipidura*—were abundant in the large anthropogenic clearings of Danau Bira and Biri village.

While based at our mountain camp, we reached only one stream broad enough to lie under clear sky, not overhung by trees. On the two days on which we visited that stream, we encountered a party of three Torrent Flycatchers *Monachella muelleriana*, an obligate specialist of fast-flowing forest-lined mountain streams, but absent in forest.

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TABLE 5
Lake-associated species at Danau Bira. Non-forest species dependent on the natural creation of Danau Bira. Right-hand column: how that species uses the lake. Includes species listed in Table 1 of Diamond *et al*. (2019), plus additional records.

Species		**Use of water**
Spotted Whistling Duck	*Dendrocygna guttata*	swim
Raja Shelduck	*Tadorna radjah*	swim
Pacific Black Duck	*Anas superciliosa*	swim
Tricoloured Grebe	*Tachybaptus tricolor*	swim
Australasian Grebe	*Tachybaptus novaehollandiae*	swim
Black Bittern	*Ixobrychus flavicollis*	wade
Nankeen Night Heron	*Nycticorax caledonicus*	wade
Striated Heron	*Butorides striata*	wade
Great-billed Heron	*Ardea sumatrana*	wade
Great Egret	*Ardea alba*	wade
Intermediate Egret	*Ardea intermedia*	wade
Little Pied Cormorant	*Microcarbo melanoleucos*	swim
Little Black Cormorant	*Phalacrocorax sulcirostris*	swim
Australasian Darter	*Anhinga novaehollandiae*	swim
White-browed Crake	*Porzana cinerea*	edge
Comb-crested Jacana	*Irediparra gallinacea*	floating vegetation
Common Sandpiper	*Actitis hypoleucos*	edge
Curlew Sandpiper	*Calidris ferruginea*	edge
Whiskered Tern	*Chlidonias hybrida*	plunge
Osprey	*Pandion haliaetus*	plunge
White-bellied Sea Eagle	*Haliaeetus leucogaster*	plunge
Azure Kingfisher	*Ceyx azureus*	plunge
Australian Reed Warbler	*Acrocephalus australis*	edge

Our remaining natural non-forest site was the lake Danau Bira itself and its surrounding marsh, created by a mudslide that had dammed a stream. Table 5 lists the 23 bird species whose presence can probably be attributed to the lake's creation, although two may have been present on the pre-existing stream. Of the 23, eight (three ducks, two grebes, two cormorants, and an anhinga) swim on the lake; six herons wade in it; four (two hawks, a tern and a kingfisher) plunge into the lake to catch fish; four (a rail, two sandpipers and a warbler) live at its edges; and one (a jacana) walks on lily pads on the lake. Similar but smaller ponds created by mudslides and damming may be common: we saw two from the air at the base of the large landslide a few km from our camp. The avian colonists of Danau Bira are of course waterbirds of New Guinea's extensive lowland marshes and rivers such as the Fly, Sepik and Mamberamo, rather than landbirds of the forest edge, landslide clearings and mud volcanoes discussed above.

Outlook

Our studies provide only a first survey of the Van Rees Mts. They leave much still to be done. We suggest some priorities for further studies.

We surveyed only one transect above 494 m, although that did lie under what appears to be the highest Van Rees peak. There are several other peaks that should be surveyed. Even on our one transect, there were four upland species that we recorded only once or twice. Hence there are surely additional Van Rees upland species beyond the 37 that we

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observed. Candidates include Mountain Swiftlet *Aerodramus hirundinaceus*, *Charmosyna pulchella*, *Micropsitta bruijnii*, Masked Bowerbird *Sericulus aureus*, *Myzomela cruentata*, Mid-mountain Berrypecker *Melanocharis longicauda*, Great Woodswallow *Artamus maximus*, Torrentlark *Grallina bruijnii*, *Monarcha frater*, White-faced Robin *Tregellasia leucops* and Russet-tailed Thrush *Zoothera heinei*.

Because our focus was on upland species, we spent only brief periods at low elevation in the hills (at Biri at 143 m), and no time in the floodplain of the Mamberamo or Rouffaer (= Tariku) Rivers. Van Heurn and van Eechoud collected 127 species in the Mamberamo floodplain, but they recorded no field observations. As a result, the current list of lowland Van Rees species lacks some uncommon or local species likely to be present (e.g., Lesser Black Coucal *Centropus bernsteini*, Long-billed Cuckoo *Rhamphomantis megarhynchus*, Papuan Hawk-Owl *Uroglaux dimorpha*, Orange-breasted Fig Parrot *Cyclopsitta gulielmitertii*, Hooded Pitta *Pitta sordida* and Yellow-gaped Meliphaga *Meliphaga flavirictus*). On the Mamberamo's eastern branch, the Idenburg (= Taritatu) River, the Third Archbold Expedition sampled extensively the avifauna of marshes and swamp forests at their Bernhard Camp (Rand 1942). No such sample is available for the Van Rees Mts. lying on the Mamberamo's western branch, the Rouffaer (= Tariku) River.

A longer stay at Danau Bira, and at different seasons, will undoubtedly produce more lake-associated species than the 23 that we recorded. Indonesian New Guinea's largest lake, Lake Rombebai, on the Mamberamo's eastern bank north of the Van Rees Mts. remains completely unsurveyed ornithologically.

Why are some upland species much more successful colonists of mountains than others? Fig. 4 shows that the match between species' elevational ranges and a mountain's elevation provides much of the explanation, but only a part. Why, of those upland species much of whose elevational range falls within our Van Rees transect, are some but not others present? How can one explain 'flagrant' Van Rees absentees such as *Edolisoma montanum*, *Seicercus poliocephalus* and *Rhipidura atra*? This is a major unanswered question whose resolution awaits analysis of all of New Guinea's outlying ranges, not just the Van Rees Mts.

Selected species accounts

We now provide brief details of significant observations of particular species.

CORONETED FRUIT DOVE *Ptilinopus coronulatus* / **BEAUTIFUL FRUIT DOVE** *P. pulchellus*

These two species, of the same size and probably closely related, differ on average in habitat throughout New Guinea but with some overlap. *P. coronulatus* prefers drier forests and lower elevations, *P. pulchellus* wetter forests and higher elevations. Van Rees records illustrate this. Both species were collected at Pionierbivak (elevation 40 m), *P. coronulatus* by van Heurn, *P. pulchellus* by van Eechoud. At Biri (143 m) JD observed *P. pulchellus* just once but heard and saw *P. coronulatus* several times daily. At Danau Bira (366 m) we found only *P. pulchellus*, which was common. Both were common on our mountain transect (494–1,206 m), *P. pulchellus* to somewhat higher elevations (1,000 m) than *P. coronulatus* (915 m). Both species give two types of calls at medium-high pitch, similar between them but usually distinguishable. One call is a series of *hoo* notes; in *P. coronulatus* it starts very slowly before accelerating dramatically, whilst that of *P. pulchellus* proceeds at a more constant rate and accelerates only slightly. The other call, the 'seesaw', consists of either two or three identical pairs of slurs, the two slurs of each pair differing slightly in pitch. *P. pulchellus*, but not *P. coronulatus*, often inserts a third faint note, inaudible at a distance, between the two

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slurs of each pair. The third note is diagnostic of *P. pulchellus*, but a 'seesaw' without (or apparently without) the third note could be either species.

MOUNTAIN FRUIT DOVE *Ptilinopus bellus*
This was the species with the highest elevational floor on our transect, where it descended to only 976 m from our highest elevation of 1,206 m. To judge from our encounters with calling individuals, the 'population' atop the highest peak of the Van Rees Mts. consisted of only a few birds, which suggests that the 'population' is not self-sustaining but is subsidised by dispersing colonists from other ranges.

PAPUAN NIGHTJAR *Eurostopodus papuensis*
Every evening at our mountain camp (799 m), between 18.04 and 18.11 h, a pair of this nightjar appeared over the landslide clearing, banking as high as 30 m above ground, then disappeared. Their eyes reflected yellow in the light of our torches. No markings were visible on the underparts, wings or tail. The pair was always silent.

WALLACE'S OWLET-NIGHTJAR *Aegotheles wallacii*
At DB's mountain camp at 1,049 m elevation, at 20.00 h on 22 September, he recorded aegothelid-like calls identical to those we had recorded from an *A. wallacii* observed closely at 700 m on 16 July 1990 on the north slope of the Central Range at 137°70'E. The Van Rees call was a series of short, high-pitched, nasal, downslurred notes with a forced quality, all on approximately the same pitch: nine notes in 22 seconds, at slightly irregular intervals, followed by another series of eight notes in 17 seconds, similar except that each note was trilled, like the trilled bark of Rufous-bellied Kookaburra *Dacelo gaudichaud*. The calls differed from those of other New Guinea aegothelids with which we are familiar (Barred Owlet-nightjar *A. bennettii*, Mountain Owlet-nightjar *A. albertisi* and Feline Owlet-nightjar *A. insignis*: Diamond & Bishop 2021).

RED-FRONTED LORIKEET *Charmosyna rubronotata* / **RED-FLANKED LORIKEET** *C. placentis*
These two closely related species of the same size overlapped in elevation on our transect, but *C. rubronotata* extended higher (to 1,119 m vs. 799 m for *C. placentis*), whilst elsewhere in New Guinea *C. placentis* is encountered more regularly at sea level than *C. rubronotata*. Their calls are a similar dry staccato note *ks*, but can be distinguished with practice. That of *C. placentis* is weaker, shorter, thinner and less distinctive, whereas in *C. rubronotata* it is louder, longer, fuller, more metallic, and reminiscent of the even louder calls of *Cyclopsitta* and *Psittaculirostris* fig parrots.

ORIENTAL DOLLARBIRD *Eurystomus orientalis*
Two subspecies occur in New Guinea: resident *E. o. waigiouensis*, and (mainly in March–November) the Australian winter visitor *E. o. pacificus*. In good views they can be readily distinguished: *waigiouensis* is darker and richer blue and green, *pacificus* paler and browner (Diamond 1972). We identified only *pacificus* (in abundance) at Danau Bira; van Heurn collected *pacificus* alone at Pionierbivak; our sightings at Biri were unidentified to subspecies, but at our mountain camp we identified only *waigiouensis*, although we occupied the camp in September–October when *pacificus* occurs in New Guinea and we found it at Danau Bira. These results suggest that resident *waigiouensis* prefers forests (as at our mountain camp), and migrant *pacificus* prefers open country (as at Danau Bira and Pionierbivak).

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TAWNY STRAIGHTBILL *Timeliopsis griseigula*
As usual for this rare honeyeater, our two sightings were in mixed flocks of other brown birds, especially Papuan Babbler *Garritornis isidorei* and Rusty Pitohui *Pseudorectes ferrugineus*, both of which (especially the babbler) the honeyeater mimics in its uniformly brown plumage (Diamond 1987). In addition, it mimics the pitohui in its pale eye.

MOUNTAIN MELIPHAGA *Meliphaga orientalis* and **MIMIC MELIPHAGA** *M. analoga*
These two very similar species both occurred on our mountain transect, *M. orientalis* at higher elevation (799 m upwards), *M. analoga* lower (732 m downwards). Only *M. analoga* occurred at our lower elevation site of Danau Bira, and at Pionierbivak. Both have a small yellow ear patch and long slender bill, and a staccato call *tp*. Only in exceptional views can the Van Rees population of *M. orientalis* be distinguished visually by its slightly uneven and slightly mottled underparts. The best means of separating them is vocally by their disyllabic call (either upslurred or downslurred): in *M. orientalis* distinctively snapped, short, and less loud, whilst that of *M. analoga* is 'bright', big and not snapped. We noted the same distinctions between *M. orientalis* and *M. analoga* populations in the Adelbert Mts., Fakfak Mts., Kumawa Mts., and on Yapen Island (Diamond & Bishop 2015, 2020, 2021). The other two meliphagas present on our transect, Puff-backed Meliphaga *M. aruensis* and White-eared Meliphaga *M. montana*, are more distinctive visually, and *M. montana* is also more distinctive vocally in its upslurred *wheep* call.

TROPICAL SCRUBWREN *Sericornis beccarii*
Common at 366–1,168 m, mainly in the understorey up to 2 m, foraging nuthatch-like up trunks and around vines, often with Pale-billed Scrubwren *S. spilodera*. In the Foja Mts., Kumawa Mts., Vogelkop, and north slopes of much of the Central Range, *S. beccarii* co-exists by altitudinal exclusion with the high-elevation Large Scrubwren *S. nouhuysi*, which is absent in the Van Rees Mts. and some other outliers. The Van Rees population may be sexually dimorphic: when we saw a pair, usually one individual was strongly patterned with a broken white eye-ring, white lores, and white-spotted dark wing-coverts, whilst the other was unpatterned. The fast songs based on a repeated pattern include some that are very similar to those of Green-backed Gerygone *Gerygone chloronota* (a rapid up-and-down 'sine wave', or a rapid alternation between two notes on slightly different pitches), and other songs consisting of a rapidly repeated descending series of three notes.

BARRED CUCKOOSHRIKE *Coracina lineata*
Heard frequently, and seen once in a fig tree, on our mountain transect. The call is a medium to high-pitched downslur initially confusable with the downslur of Meyer's Friarbird *Philemon meyeri*, whose call is shorter and has a sharp 'attack'. The cuckooshrike's call is prolonged, lacks the sharp 'attack', and adds an ingratiating sweet quality. Even more than the bowerbird superspecies *Sericulus* [*aureus*] (Diamond & Bishop 2021), *C. lineata* is an upland species mainly found on the mountain outliers: it occurs on at least eight and possibly nine of the ten outliers, but it is unrecorded over most of the Central Range.

PALE-BILLED SICKLEBILL *Drepanornis bruijnii*
Our only record was of a single seen in a brown-and-black mixed-species flock at Biri (Diamond 1981). Van Heurn and van Eechoud both collected this species at Pionierbivak.

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RUFOUS MONARCH *Symposiachrus rubiensis*
Our only record of this monarch, which is uncommon to rare throughout its range, was of a pair foraging at 12–25 m in a mixed-species flock in forest at Danau Bira. Van Heurn collected it at Pionierbivak.

FANTAILED MONARCH *Symposiachrus axillaris*
Our only record was of a single calling male encountered on four different days in the same area of our mountain transect at 921–1,012 m. This 'population' of one individual suggests either a recent colonist or a population on the verge of extinction.

RAND'S SUNBIRD *Cinnyris idenburgi*
We mention here a significant observation for Doufo (136 m), which strictly speaking is not in the Van Rees Mts., but lies near the Rouffaer River only 14 km west of the westernmost river draining the Van Rees southern watershed into the Rouffaer. At Doufo several times we heard calls like that of the widespread Olive-backed Sunbird *C. jugularis*, but our single sighting was of a male *C. idenburgi* with black underparts. To our knowledge, this is only the second record in the Mamberamo Basin, and the first from its western half (Rouffaer = Tariku River). The other Mamberamo record is from the basin's eastern half (Idenburg = Taritatu River), where this taxon was discovered by Rand (1942) at Bernhard Camp. There are a few records of the same or a similar taxon in the Sepik Basin and nearby on the Ramu River. For the benefit of ornithologists visiting Doufo seeking this sunbird with the help of local guides, we mention the species' names in the local languages spoken at Doufo: soi-sána, in the Edopi language, kwe-núsu in the Kirikiri language.

Mixd-species flocks.—As elsewhere in New Guinea (Diamond 1985), on our transect we encountered two types of mixed-species flocks: small insectivores, and medium-sized brown and / or black omnivores. Occasionally these two groups joined in a larger and more diverse flock, but more often they were separate. A third 'flock' peculiar to our Van Rees transect was a frequent close association between *Sericornis beccarii* and *S. spilodera*.

The most constant and noisiest member of the Van Rees small insectivore flock was Yellow-bellied Gerygone *Gerygone chrysogaster*. Other regulars were Fairy Gerygone *G. palpebrosa*; *Sericornis beccarii* and *S. spilodera*; Chestnut-bellied Fantail *Rhipidura hyperythra*, Rufous-backed Fantail *R. rufidorsa* and Northern Fantail *R. rufiventris*; Ochre-collared Monarch *Arses insularis*, Golden Monarch *Carterornis chrysomela*, Spot-winged Monarch *Symposiachrus guttula* and Hooded Monarch *S. manadensis*; plus Grey Whistler *Pachycephala griseiceps* and Drongo Fantail *Chaetorhynchus papuensis*. Occasional members were Yellow-breasted Boatbill *Machaerirhynchus flaviventer*, Yellow-bellied Longbill *Toxorhamphus novaeguineae* and Black Berrypecker *Melanocharis nigra*.

The brown-and-black flocks were clearly led by *Garritornis isidorei* and *Pseudorectes ferrugineus*, followed by Northern Variable Pitohui *Pitohui kirhocephalus*. Black Cicadabird *Edolisoma melas* (male black, female brown) was a regular member. Frequent members were the birds of paradise Magnificent Bird of Paradise *Diphyllodes magnificus*, Lesser Bird of Paradise *Paradisaea minor* and Crinkle-collared Manucode *Manucodia chalybatus*; as well as Spangled Drongo *Dicrurus bracteatus*, Little Shrikethrush *Colluricincla megarhyncha* and Tawny-breasted Honeyeater *Xanthotis flaviventer*. Occasional members were the birds of paradise Magnificent Riflebird *Ptiloris magnificus* and Twelve-wired Bird of Paradise *Seleucidis melanoleucus*, and *Timeliopsis griseigula*. Hooded Pitohui *Pitohui dichrous*, which leads mid-montane brown-and-black flocks at some New Guinea locations (Diamond & Bishop 2015, 2020), was only an occasional member of Van Rees brown-and-black flocks,

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probably because it was commonest above 1,000 m, i.e. above the range of most other flock members.

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References:

Archbold, R. & Rand, A. L. 1935. Results of the Archbold Expeditions. No. 7. Summary of the 1933–1934 Papuan expedition. *Bull. Amer. Mus. Nat. Hist*. 68: 527–579.

van Balen, B., Irham, M. & Kalo, D. undated. Birds of the northwestern Mamberamo. Unpubl. MS.

van Balen, S., Suryadi, S. & Kalo, D. 2002. Birds of the Dabra area, Mamberamo Basin, Papua, Indonesia. Pp. 172–178 *in* Richards, S. J. & Suryadi, S. (eds.) A biodiversity assessment of Yongsu-Cyclops Mountains and the southern Mamberamo basin, Papua, Indonesia. *RAP Bull. Biol. Assess*. 25. Conservation International, Washington DC.

Beehler, B. M. 2020. *New Guinea: nature and culture of Earth's grandest island*. Princeton Univ. Press.

Beehler, B. M. & Pratt, T. K. 2016. *Birds of New Guinea: distribution, taxonomy, and systematics*. Princeton Univ. Press.

Beehler, B. M., Diamond, J. M., Kemps, N., Scholes, E., Milensky, C. & Laman, T. G. 2012. Avifauna of the Foja Mountains of western New Guinea. *Bull. Brit. Orn. Cl*. 132: 84–101.

van Bemmel, A. C. V. 1947. Two small collections of New Guinea birds. *Treubia* 19: 1–45.

Brookfield, H. C. & Hart, D. 1966. *Rainfall in the tropical southwest Pacific*. Australian National Univ., Canberra.

Diamond, J. 1972. *Avifauna of the Eastern Highlands of New Guinea*. Nuttall. Orn. Cl., Cambridge, MA.

Diamond, J. 1981. *Epimachus bruijnii*, the lowland sickle-billed bird-of-paradise. *Emu* 81: 82–86.

Diamond, J. 1987. Flocks of brown and black New Guinean birds: a bicoloured mixed-species foraging association. *Emu* 87: 201–211.

Diamond, J. 2021. The charisma of tree kangaroos. Pp. xxvii–xxxi *in* Dabek, L. (ed.) *Tree kangaroos: science and conservation*. Elsevier, Cambridge, UK.

Diamond, J. M. & Bishop, K. D. 1999. Ethno-ornithology of the Ketengban people, Indonesian New Guinea. Pp. 17–45 *in* Atran, S. & Medin, D. (eds.) *Folk biology*. MIT Press, Cambridge, MA.

Diamond, J. & Bishop, K. D. 2015. Avifauna of the Kumawa and Fakfak Mountains, Indonesian New Guinea. *Bull. Brit. Orn. Cl*. 135: 292–331.

Diamond, J. & Bishop, K. D. 2020. Origins of the upland avifauna of Yapen Island, New Guinea region. *Bull. Brit. Orn. Cl*. 140: 423–448.

Diamond, J. & Bishop, K. D. submitted. Why may the same species have different elevational ranges at different sites in New Guinea? *Bull. Brit. Orn Cl*.

Diamond, J., Bishop, K. D. & Gilardi, J. 1999. Geophagy in New Guinea birds. *Ibis* 141: 181–193.

Diamond, J., Bishop, K. D. & Sneider, R. 2019. An avifaunal double suture zone at the Bird's Neck Isthmus of Indonesian New Guinea. *Wilson J. Orn*. 131: 435–458.

Hartert, E. 1932. Liste der Vögel aus Neuguinea im Buitenzorger Museum in Java. *Nova Guinea* 15: 435–484.

Hartert, E., Paludan, W., Rothschild, W. & Stresemann, E. 1936. Ornithologische Ergebnisse der Expedition Stein 1931–1932. Die Vögel des Weyland-Gebirges und seines Vorlandes. *Mitt. Zool. Mus. Berlin* 21: 165–240.

Lewis, M. P. (ed.) 2009. *Ethnologue: languages of the world*. SIL International, Dallas, TX.

Mack, A. L. & Alonso, L. E. 2000. A biological assessment of the Wapoga River area of northwestern Irian Jaya. *RAP Bull. Biol. Assess*. 14: 1–129. Conservation International, Washington DC.

Rand, A. L. 1941. Results of the Archbold Expeditions. No. 33. A new race of quail from New Guinea; with notes on the origin of the grassland avifauna. *Amer. Mus. Novit*. 33: 1–2.

Rand, A. L. 1942. Results of the Archbold Expeditions. No. 43. Birds of the 1938–1939 New Guinea expedition. *Bull. Amer. Mus. Nat. Hist*. 79: 425–516.

Rand, A. L. & Brass, L. J. 1940. Results of the Archbold Expeditions. No. 29. Summary of the 1936–1937 New Guinea expedition. *Bull. Amer. Mus. Nat. Hist*. 77: 341–380.

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Appendix: Birds of the Van Rees Mts

In the first column, an asterisk denotes birds considered upland species as defined in the text. In the third column, our three sites of bird observations and collections in the Van Rees Mts. are coded thus: b = Biri (143 m), a = Danau Bira (366 m), and m = our mountain transect (494–1,206 m). Square brackets denote a record of a species reliably reported to us at that site by another observer. In the same column, van Heurn's and van Eechoud's collections at Pionierbivak (40 m) are coded h and e, respectively. The fourth column gives each species' elevation range in the Van Rees Mts., based on records at all those sites listed in the third column.

Species		**Sites**	**Elevation (m)**
Dwarf Cassowary *	*Casuarius bennetti*	/m	549–1,146
Northern Cassowary	*Casuarius unappendiculatus*	/ba	143–366
Wattled Brushturkey *	*Aepypodius arfakianus*	/m	610–1,189
Red-legged Brushturkey	*Talegalla jobiensis*	e/bam	40–799
New Guinea Scrubfowl	*Megapodius decollatus*	he/[b][a]m	40–799
Spotted Whistling Duck	*Dendrocygna guttata*	/a	366
Raja Shelduck	*Tadorna radjah*	/a	366
Pacific Black Duck	*Anas superciliosa*	/[a]	366
Tricoloured Grebe	*Tachybaptus tricolor*	/a	366
Australasian Grebe	*Tachybaptus novaehollandiae*	/[a]	366
Great Cuckoo-Dove	*Reinwardtoena reinwardti*	e/am	40–835
Brown Cuckoo-Dove	*Macropygia amboinensis*	e/bam	40–1,159
Black-billed Cuckoo-Dove *	*Macropygia nigrirostris*	/[a]m	366–1,119
New Guinea Bronzewing	*Henicophaps albifrons*	he/m	40–799
Cinnamon Ground Dove	*Gallicolumba rufigula*	h/m	40–1,072
Thick-billed Ground Pigeon	*Trugon terrestris*	he/	40
Pheasant Pigeon *	*Otidiphaps nobilis*	h/bam	40–1,079
Victoria Crowned Pigeon	*Goura victoria*	he/bm	40–726
Stephan's Emerald Dove	*Chalcophaps stephani*	h/b	40–143
Wompoo Fruit Dove	*Megaloprepia magnifica*	he/bam	40–1,049
Dwarf Fruit Dove	*Ptilinopus nainus*	/bam	143–1,024
Superb Fruit Dove	*Ptilinopus superbus*	e/bam	40–1,073
Mountain Fruit Dove *	*Ptilinopus bellus*	/m	976–1,206
Pink-spotted Fruit Dove	*Ptilinopus perlatus*	he/bam	40–921
Orange-bellied Fruit Dove	*Ptilinopus iozonus*	he/ba	40–366
Claret-breasted Fruit Dove *	*Ptilinopus viridis*	/m	561–1,079
Beautiful Fruit Dove	*Ptilinopus pulchellus*	e/bam	40–1,000
Coroneted Fruit Dove	*Ptilinopus coronulatus*	h/bm	40–915
Purple-tailed Imperial Pigeon	*Ducula rufigaster*	e/bam	40–1,152
Pinon's Imperial Pigeon	*Ducula pinon*	he/bam	40–1,049
Collared Imperial Pigeon	*Ducula mullerii*	he/	40
Zoe's Imperial Pigeon	*Ducula zoeae*	he/bam	40–1,159
Papuan Mountain Pigeon *	*Gymnophaps albertisii*	/bm	143–1,067
Australian White Ibis	*Threskiornis moluccus*	e/	40
Forest Bittern	*Zonerodius heliosylus*	h/	40
Black Bittern	*Ixobrychus flavicollis*	h/[a]	40–366
Nankeen Night Heron	*Nycticorax caledonicus*	/a	366
Striated Heron	*Butorides striata*	/a	366
Great-billed Heron	*Ardea sumatrana*	h/a	40–366

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Species		Sites	Elevation (m)
Great Egret	*Ardea alba*	/a	366
Intermediate Egret	*Ardea intermedia*	/ba	143–366
Pied Heron	*Egretta picata*	e/[a]	40–366
Little Pied Cormorant	*Microcarbo melanoleucos*	/a	366
Little Black Cormorant	*Phalacrocorax sulcirostris*	/a	366
Australasian Darter	*Anhinga novaehollandiae*	/a	366
Red-necked Crake	*Rallina tricolor*	h/	40
White-browed Crake	*Porzana cinerea*	/a	366
Rufous-tailed Bush-hen	*Amaurornis moluccana*	h/ba	40–366
Greater Black Coucal	*Centropus menbeki*	he/bam	40–945
Dwarf Koel	*Microdynamis parva*	/bm	143–924
Eastern Koel	*Eudynamys orientalis*	h/ba	40–366
Channel-billed Cuckoo	*Scythrops novaehollandiae*	e/m	40–799
White-eared Bronze Cuckoo *	*Chalcites meyerii*	/m	543–1,034
Little Bronze Cuckoo	*Chalcites minutillus*	/bam	143–640
White-crowned Cuckoo	*Caliechthrus leucolophus*	/bam	143–848
Chestnut-breasted Cuckoo	*Cacomantis castaneiventris*	/am	366–1,067
Brush Cuckoo	*Cacomantis variolosus*	h/bam	40–595
Oriental Cuckoo	*Cuculus optatus*	/am	366–1,104
Marbled Frogmouth	*Podargus ocellatus*	/[a]m	366–1,049
Papuan Frogmouth	*Podargus papuensis*	he/[b]am	40–1,049
Papuan Nightjar	*Eurostopodus papuensis*	/m	799
Large-tailed Nightjar	*Caprimulgus macrurus*	/b	143
Wallace's Owlet-nightjar *	*Aegotheles wallacii*	/m	1,049
Moustached Treeswift	*Hemiprocne mystacea*	he/am	40–799
Glossy Swiftlet	*Collocalia esculenta*	/am	366–1,206
Uniform Swiftlet	*Aerodramus vanikorensis*	/ba	143–366
Papuan Spinetailed Swift	*Mearnsia novaeguineae*	/ba	143–366
White-throated Needletail	*Hirundapus caudacutus*	/[a]m	366–799
Pacific Golden Plover	*Pluvialis fulva*	/b	143
Comb-crested Jacana	*Irediparra gallinacea*	/[a]	366
Wood Sandpiper	*Tringa glareola*	/b	143
Common Sandpiper	*Actitis hypoleucos*	he/b[a]	40–366
Curlew Sandpiper	*Calidris ferruginea*	/[a]	366
Little Tern	*Sternula albifrons*	h/	40
Whiskered Tern	*Chlidonias hybrida*	/a	366
Osprey	*Pandion haliaetus*	/a	366
Pacific Baza	*Aviceda subcristata*	he/am	40–799
Long-tailed Buzzard	*Henicopernis longicauda*	e/am	40–918
New Guinea Harpy Eagle	*Harpyopsis novaeguineae*	/[b]am	143–921
Pygmy Eagle *	*Hieraaetus weiskei*	/m	799
Whistling Kite	*Haliastur sphenurus*	/a	366
Brahminy Kite	*Haliastur indus*	/ba	143–366
White-bellied Sea Eagle	*Haliaeetus leucogaster*	/a	366
Doria's Hawk	*Megatriorchis doriae*	h/	40
Variable Goshawk	*Accipiter hiogaster*	/bam	143–799
Grey-headed Goshawk	*Accipiter poliocephalus*	e/	40
Papuan Boobook	*Ninox theomacha*	/am	366–1,049
Blyth's Hornbill	*Rhyticeros plicatus*	e/bam	40–1,055
Rainbow Bee-eater	*Merops ornatus*	h/a	40–366

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Species		Sites	Elevation (m)
Oriental Dollarbird	*Eurystomus orientalis*	h/bam	40–799
Common Paradise Kingfisher	*Tanysiptera galatea*	he/b	40–143
Hook-billed Kingfisher	*Melidora macrorrhina*	he/bam	40–799
Shovel-billed Kookaburra	*Clytoceyx rex*	e/	40
Rufous-bellied Kookaburra	*Dacelo gaudichaud*	he/bam	40–884
Sacred Kingfisher	*Todiramphus sanctus*	he/a	40–366
Yellow-billed Kingfisher	*Syma torotoro*	he/bam	40–1,183
Papuan Dwarf Kingfisher	*Ceyx solitarius*	he/bam	40–1,098
Azure Kingfisher	*Ceyx azureus*	h/a	40–366
Brown Falcon	*Falco berigora*	h/	40
Palm Cockatoo	*Probosciger aterrimus*	he/bam	40–1,049
Sulphur-crested Cockatoo	*Cacatua galerita*	he/bam	40–1,098
New Guinea Vulturine Parrot *	*Psittrichas fulgidus*	e/bam	40–1,049
Red-fronted Lorikeet *	*Charmosyna rubronotata*	/bm	143–1,119
Red-flanked Lorikeet	*Charmosyna placentis*	/m	549–799
Black-capped Lory	*Lorius lory*	he/bam	40–1,067
Rainbow Lorikeet	*Trichoglossus haematodus*	he/bam	40–1,049
Dusky Lory	*Pseudeos fuscata*	/am	366–1,022
Brown Lory	*Chalcopsitta duivenbodei*	he/ba	40–366
Salvadori's Fig Parrot	*Psittaculirostris salvadorii*	/bam	143–671
Double-eyed Fig Parrot	*Cyclopsitta diophthalma*	/bam	143–835
Orange-fronted Hanging Parrot	*Loriculus aurantiifrons*	/a	366
Papuan King Parrot	*Alisterus chloropterus*	e/bm	40–915
Eclectus Parrot	*Eclectus roratus*	he/bam	40–1,104
Red-cheeked Parrot	*Geoffroyus geoffroyi*	e/bam	40–951
Blue-collared Parrot *	*Geoffroyus simplex*	/b	143
Buff-faced Pygmy Parrot	*Micropsitta pusio*	he/bam	40–945
Red-bellied Pitta	*Erythropitta erythrogaster*	he/bam	40–902
White-eared Catbird	*Ailuroedus buccoides*	he/m	40–729
Black-eared Catbird *	*Ailuroedus melanotis*	/m	686–1,146
Wallace's Fairywren	*Sipodotus wallacii*	/m	732–1,022
Broad-billed Fairywren	*Chenorhamphus grayi*	h/am	40–689
Emperor Fairywren	*Malurus cyanocephalus*	/[a]	366
White-shouldered Fairywren	*Malurus alboscapulatus*	he/b[a]m	40–799
Ruby-throated Myzomela	*Myzomela eques*	/ba	143–366
Papuan Black Myzomela	*Myzomela nigrita*	/m	811–1,189
Tawny-breasted Honeyeater	*Xanthotis flaviventer*	he/bam	40–1,076
Spotted Honeyeater *	*Xanthotis polygrammus*	/m	787–799
Meyer's Friarbird	*Philemon meyeri*	h/bam	40–1,206
Helmeted Friarbird	*Philemon buceroides*	h/bam	40–902
Green-backed Honeyeater	*Glycichaera fallax*	/am	366–799
Plain Honeyeater	*Pycnopygius ixoides*	he/am	40–799
Streak-headed Honeyeater	*Pycnopygius stictocephalus*	h/ba	40–366
Long-billed Honeyeater	*Melilestes megarhynchus*	he/bam	40–1,174
Tawny Straightbill	*Timeliopsis griseigula*	/m	610–765
Puff-backed Meliphaga	*Meliphaga aruensis*	h/bam	40–1,006
Mimic Meliphaga	*Meliphaga analoga*	he/am	40–732
Mountain Meliphaga *	*Meliphaga orientalis*	/m	799–1,049
White-eared Meliphaga *	*Meliphaga montana*	/am	366–1,206
Obscure Honeyeater *	*Caligavis obscura*	/bam	143–1,003

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Species		Sites	Elevation (m)
Rusty Mouse-Warbler	*Crateroscelis murina*	he/bam	40–1,206
Pale-billed Scrubwren	*Sericornis spilodera*	/bm	143–1,061
Tropical Scrubwren *	*Sericornis beccarii*	/am	366–1,168
Yellow-bellied Gerygone	*Gerygone chrysogaster*	h/bam	40–817
Green-backed Gerygone	*Gerygone chloronota*	/bam	143–799
Fairy Gerygone	*Gerygone palpebrosa*	e/am	40–1,189
Large-billed Gerygone	*Gerygone magnirostris*	h/ba	40–366
Papuan Babbler	*Garritornis isidorei*	h/bam	40–756
Black Berrypecker	*Melanocharis nigra*	he/bam	40–1,052
Spectacled Longbill	*Oedistoma iliolophus*	/bm	143–1,003
Pygmy Longbill	*Oedistoma pygmaeum*	/b	143
Yellow-bellied Longbill	*Toxorhamphus novaeguineae*	he/bam	40–1,206
Blue Jewel-babbler	*Ptilorrhoa caerulescens*	e/bam	40–671
Chestnut-backed Jewel-babbler *	*Ptilorrhoa castanonota*	/m	701–1,159
Yellow-breasted Boatbill	*Machaerirhynchus flaviventer*	/bam	143–1,073
Lowland Peltops	*Peltops blainvillii*	he/ba	40–366
Mountain Peltops *	*Peltops montanus*	/m	570–1,206
Black Butcherbird	*Cracticus quoyi*	/am	366–854
Hooded Butcherbird	*Cracticus cassicus*	he/bam	40–945
White-breasted Woodswallow	*Artamus leucorhynchus*	he/ba	40–366
Stout-billed Cuckooshrike *	*Coracina caeruleogrisea*	/am	366–1,098
Barred Cuckooshrike *	*Coracina lineata*	/m	686–1,018
Boyer's Cuckooshrike	*Coracina boyeri*	/am	366–863
White-bellied Cuckooshrike	*Coracina papuensis*	h/b	40–143
Golden Cuckooshrike	*Campochaera sloetii*	/bam	143–744
Black-browed Triller	*Lalage atrovirens*	h/bam	40–860
Papuan Cicadabird *	*Edolisoma incertum*	/m	570–1,206
Grey-headed Cicadabird	*Edolisoma schisticeps*	h/bam	40–1,076
Black Cicadabird	*Edolisoma melas*	h/bam	40–817
Piping Bellbird *	*Ornorectes cristatus*	/am	366–1,127
Little Shrikethrush	*Colluricincla megarhyncha*	h/bam	40–1,174
Rusty Shrikethrush	*Pseudorectes ferrugineus*	he/bam	40–1,024
Rusty Whistler *	*Pachycephala hyperythra*	/am	366–1,128
Grey Whistler	*Pachycephala simplex*	he/bam	40–1,073
Northern Variable Pitohui	*Pitohui kirhocephalus*	h/bam	40–1,119
Hooded Pitohui *	*Pitohui dichrous*	/am	366–1,206
Brown Oriole	*Oriolus szalayi*	h/bam	40–854
Drongo Fantail *	*Chaetorhynchus papuensis*	/m	720–1,073
Willie Wagtail	*Rhipidura leucophrys*	he/ba	40–366
White-bellied Thicket Fantail	*Rhipidura leucothorax*	h/bam	40–799
Sooty Thicket Fantail	*Rhipidura threnothorax*	/bam	143–915
Rufous-backed Fantail	*Rhipidura rufidorsa*	/bam	143–976
Chestnut-bellied Fantail	*Rhipidura hyperythra*	e/bam	40–707
Northern Fantail	*Rhipidura rufiventris*	he/bam	40–845
Spangled Drongo	*Dicrurus bracteatus*	he/bam	40–878
Trumpet Manucode *	*Phonygammus keraudrenii*	/ba	143–366
Crinkle-collared Manucode	*Manucodia chalybatus*	/m	543–1,171
Jobi Manucode	*Manucodia jobiensis*	e/	40
Glossy Manucode	*Manucodia ater*	he/	40
Twelve-wired Bird of Paradise	*Seleucidis melanoleucus*	e/am	40–610

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Species		Sites	Elevation (m)
Magnificent Riflebird	*Ptiloris magnificus*	e/bam	40–1,037
Pale-billed Sicklebill	*Drepanornis bruijnii*	he/b	40–143
King Bird of Paradise	*Cicinnurus regius*	he/bam	40–619
Magnificent Bird of Paradise *	*Diphyllodes magnificus*	/am	366–1,168
Lesser Bird of Paradise	*Paradisaea minor*	he/bam	40–1,049
Ochre-collared Monarch	*Arses insularis*	he/bam	40–966
Shining Flycatcher	*Myiagra alecto*	he/ba	40–366
Fantailed Monarch *	*Symposiachrus axillaris*	/m	921–1,012
Rufous Monarch	*Symposiachrus rubiensis*	h/a	40–366
Hooded Monarch	*Symposiachrus manadensis*	e/bam	40–732
Spot-winged Monarch	*Symposiachrus guttula*	he/bam	40–787
Golden Monarch	*Carterornis chrysomela*	he/bam	40–1,128
Grey Crow	*Corvus tristis*	e/bam	40–1,061
Green-backed Robin *	*Pachycephalopsis hattamensis*	/m	762–1,070
Yellow-legged Flyrobin *	*Kempiella griseoceps*	/m	884
Olive Flyrobin	*Kempiella flavovirescens*	e/ba	40–366
Torrent Flycatcher *	*Monachella muelleriana*	e/m	40–549
Papuan Scrub Robin *	*Drymodes beccarii*	/m	610–1,067
Black-chinned Robin	*Heteromyias brachyurus*	e/m	40–691
Black-sided Robin	*Poecilodryas hypoleuca*	he/bam	40–799
White-rumped Robin *	*Peneothello bimaculata*	/am	366–884
Barn Swallow	*Hirundo rustica*	/a	366
Pacific Swallow	*Hirundo tahitica*	h/ba	40–366
Tree Martin	*Petrochelidon nigricans*	h/a	40–366
Green-fronted White-eye *	*Zosterops minor*	/am	366–1,206
Australian Reed Warbler	*Acrocephalus australis*	/a	366
Metallic Starling	*Aplonis metallica*	he/ba	40–366
Singing Starling	*Aplonis cantoroides*	e/a	40–366
Yellow-faced Myna	*Mino dumontii*	he/bam	40–1,037
Golden Myna	*Mino anais*	e/ba	40–366
Grey-streaked Flycatcher	*Muscicapa griseisticta*	/a	366
Red-capped Flowerpecker	*Dicaeum geelvinkianum*	e/bam	40–1,128
Black Sunbird	*Leptocoma aspasia*	h/bam	40–799
Streak-headed Mannikin	*Lonchura tristissima*	h/ba	40–366

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