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Source: Bulletin of the British Ornithologists' Club, 141(2) : 216-239

Published By: British Ornithologists' Club

URL: https://doi.org/10.25226/bboc.v141i2.2021.a12

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Received 2 March 2021; revised 30 March 2021; published 15 June 2021

http://zoobank.org/urn:lsid:zoobank.org:pub:9A63390-C716-47F7-B647-64723201EF43

Summary.—We present the results of a bird survey undertaken in the Aiope (Sarime) River basin in the Kunua District of north-west Bougainville, Papua New Guinea, during October–November 2019. Birds were surveyed across an elevational gradient of nearly 1,800 m, from the coast at the mouth of the Aiope River to the catchment headwaters in the north-west Emperor Range. Seventy-nine bird species were recorded, including three-quarters of Bougainville's resident land and freshwater avifauna (76/102 species) and a high proportion of its island-endemic and Solomons-endemic taxa (genera, species and subspecies). Resident avifauna include three species listed as threatened on the IUCN Red List—Sanford's Sea Eagle *Haliaeetus sanfordi*, Fearful Owl *Nesasio solomonensis* and (provisionally) Yellow-legged Pigeon *Columba pallidiceps*—nine Near Threatened species and two species that are protected under Papua New Guinean law. Forest supports 84% of the recorded resident bird species, most of which are forest-dependent, including all island-endemic taxa and all species of conservation concern apart from the Near Threatened Woodford's Rail *Nesoclopeus woodfordi*. Forest extent and condition improved with increasing elevation along the surveyed route; upper hill zone forest provides a narrow band of suitable habitat for a suite of lowland and hill forest species that were locally formerly more common across a broader altitudinal range. Elevational range extensions are reported for six species, and the vocalisations of Solomons Frogmouth *Rigidipenna inexpectata* are described from Bougainville for the first time.

Bougainville Island lies *c*.600 km east of New Guinea at the northern end of the Solomon archipelago, in the Northern Melanesian region of the south-west Pacific Ocean (Mayr & Diamond 2001). The largest island in the Solomon group, it is 210 km long and covers approximately 8,800 km^2 (excluding Buka). Its central chain of mountains is dominated by a series of Pleistocene and recent volcanoes (Speight & Scott 1967) and is divided into the Emperor Range in the north-west and the Crown Prince Range in the south-east.

Bougainville's avifauna includes 102 resident land and freshwater species plus 31 migrants that regularly visit the island (excluding vagrants, seabirds and resident species confined to offshore islets; distributional data from Hadden 2004). Avian community structure is strongly affiliated with that of other large islands in the Solomon archipelago, particularly Choiseul and Santa Isabel, with which Bougainville was periodically connected during Pleistocene glacial periods (Mayr & Diamond 2001).

The Solomons avifauna includes exceptionally high rates of endemism—the 'Solomon group Endemic Bird Area' (EBA) has the largest number of restricted-range bird species of any of the world's 218 EBAs (Stattersfield *et al*. 1998). Of 79 extant bird species that are endemic to the Solomons, nearly half occur on Bougainville (36 species), including one genus (*Stresemannia*), four species and ten subspecies that are confined to the island. A

ISSN-2513-9894 (Online)

further two species and six subspecies occur only on Bougainville and smaller satellite islands (Buka, Fauro and the Shortland Islands).

Biodiversity across the Solomons is under sustained threat from forest clearance, habitat degradation and the establishment and spread of invasive species (Filardi *et al*. 2007, Aalbersberg *et al*. 2012, Katovai *et al*. 2015). As a result, 18% of Bougainville's resident avifauna (18/102) is currently classified as threatened or Near Threatened with extinction (IUCN 2020), 83% of which (15/18) is endemic to the Solomons.

Despite the high conservation value of Bougainville's avifauna, relatively little ornithological work has been conducted on the island. Recent data are especially scarce owing to the decade-long secessionist conflict that commenced in the late 1980s, and several of the island's rarer species have not been seen for more than 80 years. Historically, most effort has focused on the east and south, and north-west Bougainville is particularly poorly covered.

At the invitation of the Rapoisi community, and on behalf of the Critical Ecosystems Partnership Fund (CEPF), in October–November 2019 a bird survey was undertaken in the Aiope River basin, in the Kunua District of north-west Bougainville. The Aiope basin lies immediately north of the Kunua Plains and Mount Balbi Key Biodiversity Area (KBA) (Fig. 1). Surveys were conducted at multiple sites along an elevational gradient from sea level to *c*.1,800 m on the western slopes of the Emperor Range.

Previous data

Surveys of western Bougainville began in 1928 with the Whitney South Sea Expedition. From Cape Moltke, *c*.32 km south of the then-established Kunua coconut plantation, H. Hamlin led a group into the southern Emperor Range and was the first outsider to reach the Mt. Balbi crater (Hamlin 1929). Birds were collected en route, as well as at coastal localities near Amun ('Hamon') *c*.15 km south of Kunua. The specimens are held at the American

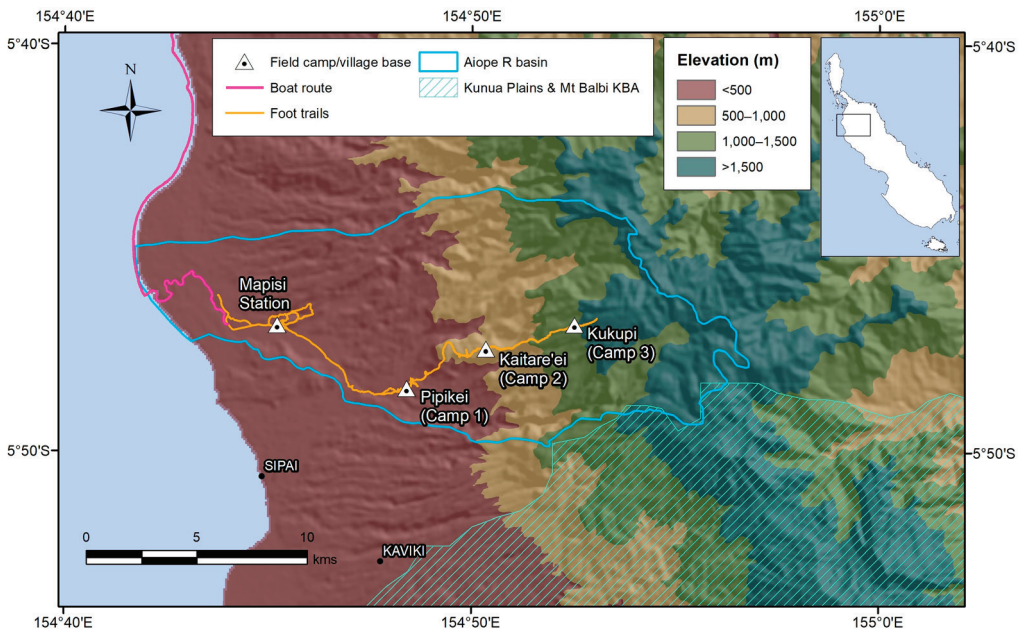

Figure 1. Study area and survey route.

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Museum of Natural History, New York (AMNH). These are the only data collected from the western drainage of the Kunua Plains and Mount Balbi KBA.

Subsequent data from western Bougainville largely comprise historical records from the coastal lowlands near Torokina and Empress Augusta Bay (Beecher 1945, Virtue 1947, Baker 1948, Filewood 1969). More recently, T. Mark observed birds from the coast near Atsinima inland to the upper hill zone (below 1,000 m) in the southern Emperor Range (sound recordings at www.xeno-canto.org). These sites lie *c*.40–90 km south-east of Kunua.

Other ornithologists have approached Mt. Balbi from the east, following roads from the coastal towns of Wakunai and Asitavi Mission. J. Diamond surveyed birds up to 1,950 m in 1972 (Diamond 1975; J. M. Diamond *in litt*. 2020), D. Hadden to at least 2,000 m in 2002 (Hadden 2004), and T. Mark to 2,200 m in 2014 (sound recordings at www.xeno-canto.org).

This is the sum of publicly available ornithological data from the Emperor Range and the hills and lowlands of north-west Bougainville. We are aware of no prior data from Kunua district or from those parts of the Emperor Range north of Mt. Balbi and Rotokas territory.

Study area and Methods

Aiope River basin.—Birds were surveyed in the Aiope (Sarime) River basin, a *c*.197 km^2 catchment reaching more than 2,050 m elevation in the north-west Emperor Range (Fig. 1). Steep terrain characterises the volcanic landform above *c*.250 m, below which low-to-moderate relief foothills flank broad alluvial plains lining the major watercourses (Scott *et al*. 1967). Permanent swamps lie within 2.5 km of the coast, which is lined with a narrow band of beach ridges. The climate is wet tropical, with annual rainfall averaging more than 2,600 mm near the coast (McAlpine 1967, Bryan & Shearman 2008). Rainfall increases with elevation and is mildly seasonal, with slightly lower monthly totals during the south-east 'trade winds' season (April–October: McAlpine 1967).

The study area is located in the Teua Constituency of Kunua District on traditional lands of the Rapoisi (Kunua) people. Kunua is also the name of the district administrative centre, comprising multiple villages located along *c*.10 km of the lower Aiope River valley. The area is sparsely populated outside the Kunua centre (Bourke *et al*. 2002).

Survey sites and timing.—Surveys were conducted from 11 October to 4 November 2019. Coverage spanned an elevational gradient of nearly 1,800 m, from the coast at the mouth of the Aiope River to the Porua River headwaters *c*.19 km north-west of Mt. Balbi (Fig. 1). The main survey programme was based on sampling over multiple days (range: 4–11 days) at each of four sites provided with resident household or field-based accommodation. Transfer between sites was made on foot with the assistance of Rapoisi residents. Travel between Buka Island and the Kunua survey base was by boat.

Table 1 lists the location, timing and elevations covered at each survey site. A brief description of each site and the habitats surveyed for birds is given below. Vegetation descriptions follow the PNG Forest Inventory Mapping System (FIMS) (Hammermaster & Saunders 1995). Place names are those used by local Rapoisi residents.

Mapisi Station.—Located in the Kunua centre along the lower Aiope River. Village and agricultural land covers much of the high-lying alluvial plain and flanking foothills for more than 10 km along the valley. Birds were surveyed on foot within 4 km of Mapisi Station in village and garden environments, agroforestry areas (including cocoa and coconut plantations), along the Aiope River, in flood-prone riverine grasslands, and in remnant and secondary forest environments (riverine seral and hill forest). No trapping or automated recording was undertaken at this site.

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TABLE 1
Accommodation/camp base locations, elevations covered and sampling effort.

	Mapisi	Pipikei	Kaitare'ei	Kukupi	Lower Aiope R.
Camp/base coordinates	05°46.9'S, 154°45.2'E	05°48.5'S, 154°48.4'E	05°47.5'S, 154°50.4'E	05°46.9'S, 154°52.5'E	
Camp/base elevation (m)	35	240	730	1,480	
Elevations covered (m)	15–160	160–360	590–900	(1,000–)1,400–1,765	
Dates present	11–16 Oct; 2–4 Nov	16–21 Oct	21–29 Oct; 1–2 Nov	29 Oct–1 Nov	11 Oct; 4 Nov
Search hours*	21.5	18.5	30.75	15.5	2
MacKinnon lists	24	20	30	10	
No. of mist-nets		9	7	7	
Mist-net hours		57	35	50	
No. camera traps		7	7		
Camera trap hours		483.5	517		
No. BAR positions		1	3	3	
BAR hours		51.5	114.5	133	

* Excluding opportunistic survey periods such as time around camp, deploying camera traps and mist-nets.

Pipikei (Camp 1).—This hamlet is in the foothills at the base of the former volcano slope (Scott *et al*. 1967), above the Porua River *c*.900 m east of its confluence with the Aiope River. The terrain east of camp is steep with ridges high above deeply incised valleys. Below and west of Pipikei, gentler terrain occurs as shallowly dissected volcano alluvial fans and alluvial plains. Natural vegetation is mapped as hill forest with riverine seral forest on alluvial plains; however, forest across much of the surveyed area had been cleared or is otherwise heavily disturbed. Surveys were conducted within 2 km of camp in a mosaic of secondary forest, bamboo, gardens and agroforestry with remnant patches of natural forest and isolated trees.

Kaitare'ei (Camp 2).—Located in the upper hill zone *c*.4 km east-northeast of Pipikei. Terrain is steep and of very high relief, with the hamlet perched *c*.250 m above the Porua Valley floor. Most former village sites at this elevation were abandoned some decades prior (residents relocating to the foothills) and the Kaitere'ei hamlet itself is not permanently occupied. Natural forest predominates, with areas of bamboo and secondary forest, including old-growth agroforestry species, present around the hamlet and at former village sites. Surveys were conducted within 2 km of camp, predominantly along the main ridge.

Kukupi (Camp 3).—This camp was established in the lower montane zone (above 1,000 m) on a ridge near the headwaters of the Porua River valley. The slope is steeper here than at lower sites, although the stream valleys are more shallowly incised. There are no permanent structures or prior settlements at this site. The lower montane forest is largely undisturbed with Myrtaceae, palms (*Hydriostele*) and multi-crowned pandans (*Pandanus*) among the canopy dominants. Understorey is dense with moss-covered woody surfaces and heavy epiphyte loads. Below camp, at *c*.850–1,350 m the route between Kaitare'ei and Kukupi passes through extensive areas of bamboo/tree fern (*Bambusa*/*Cyathea*) scrub. This zone covers the transition from hill to lower montane forest. Most survey effort was conducted over two mornings due to a delay in departure from Kaitare'ei and the onset of persistent heavy rain each afternoon. Surveys were conducted along the main ridge within

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2 km of camp. Additional records collected from above 1,000 m en route from Kaitare'ei are included in the Kukupi list.

Lower Aiope River.—In addition to the main survey programme, opportunistic boat-based records were made along the lower 7 km of the Aiope River during transit between Mapisi Station and the coast. Riverine successional growth (grassland–scrub–forest) occurs on aggrading banks throughout the course. Behind this, and along erosional banks, permanent swamps near the coast (*c*.4.5 km of river) support mixed swamp forest, while most forest upstream on the high-lying alluvial plain has been converted to agriculture. A narrow band of sand ridges supports littoral *Casuarina* forest along the coast, and tidal beaches and mudflats flank the river mouth.

Field techniques and survey effort.—A variety of sampling methods was employed to maximise completeness of the bird species inventory in the time available. Trapping and automated recording methods were limited to non-populous areas at Pipikei, Kaitare'ei and Kukupi. Table 1 lists the effort summaries at each site.

Active searches.—These were conducted on foot along pre-existing walking trails, through forest and along watercourses, and by boat along the lower Aiope River. Effort was weighted to peak periods of bird activity in the early morning and late afternoon, and included time before dawn and after dusk. Records at each of the four main survey sites were collated into a series of ten-species 'MacKinnon lists' (MacKinnon & Phillipps 1999, MacLeod *et al*. 2011); during each search period, sequential lists of ten species were generated with allowance for the same species to occur on multiple lists. To avoid double-counting, lists were not generated during the return journey along linear (non-loop) survey trails.

Mist-nets.—Up to nine mist-nets (9/12 m, 31/38 mm mesh) were deployed at Pipikei, Kaitare'ei and Kukupi in areas of primary forest, secondary forest and bamboo scrub. Trapped birds were measured (bill, head, tarsus, wing), photographed, blood sampled (70% ethanol; deposited at Museums Victoria, Melbourne) and released with the terminal end of three outer rectrices clipped to permit subsequent identification.

Camera traps.—Seven white-flash digital camera traps (Reconyx HC550/PC850) were deployed in forest near Pipikei and Kaitare'ei, close to the ground along animal trails and at apparent feeding stations. Survey time at Kukupi was insufficient to deploy cameras during the present field work. Additional data were collected from 30 camera traps (Reconyx HF) deployed by JN prior to the survey across an altitudinal gradient of 370–1,850 m. These cameras operated variably for 3–6 months, with most positioned to record mammals at the entrance of burrows and rock shelters, or in trees.

Sound-recording and playback.—Automated bioacoustic recorders (BARs, Frontier Labs) were deployed in forest at Pipikei, Kaitare'ei and Kukupi. During active searches, bird calls were opportunistically recorded on a Sony PCM-D50 Linear PCM Recorder. Selected sounds were played aloud using a portable speaker. A selection of bird sounds recorded during the survey (131 files, 50 species) has been uploaded to the Xeno-canto website (www.xeno-canto.org). Website catalogue numbers accompany specific recordings mentioned in the text (e.g. 'XC 543612').

Information from local residents.—Direct observations were supplemented with data gathered during conversations with Rapoisi residents. Discussions focused on the distribution and status of recognisable species of conservation significance and on the local language (*'tok ples'—Rapoisi*) names of distinctive and commonly encountered bird species. Rapoisi is one of the easternmost Papuan non-Austronesian languages (J. M. Diamond *in litt*. 2021). Identifications were considered most reliable when based on two or more of the following reference points: (1) images shown in a field guide (Dutson 2011); (2) sounds

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played aloud from an audio library; (3) birds photographed, seen or heard together in the field for which the local informant could provide an accurate description; (4) distinct local language names consistently provided by multiple informants.

Conventions.—Taxonomy and nomenclature (English and scientific names) follow the IOC world bird list (version 11.1) (Gill *et al*. 2021). Species in square brackets were only provisionally identified to species level; though not definitively identified, they likely represent taxa not confusable with previously recorded species and are included in site totals. Species of conservation concern include those listed in the IUCN Red List of threatened species (IUCN 2020) as globally threatened, Near Threatened or Data Deficient, and those listed as Protected under the PNG Fauna (Protection & Control) Act 1966.

To distinguish between potentially confusing political and geographical terms: (1) the term 'Solomon Islands' refers to the sovereign state of the Solomon Islands; (2) the Solomon island group, including parts of the sovereign states of Papua New Guinea (PNG) and the Solomon Islands, is referred to as the 'Solomon archipelago' and abbreviated as the 'Solomons'.

Endemism is a useful measure of habitat conservation value (Stattersfield *et al*. 1998, Waltert *et al*. 2011), especially in the Melanesian island context (Mayr & Diamond 2001, Davies *et al*. 2015). Three degrees of endemism are distinguished herein: (1) taxa confined to Bougainville ('island endemic'); (2) taxa found only on Bougainville and smaller satellite islands (Buka, Fauro and the Shortland Islands); and (3) taxa confined to the Solomons ('Solomons endemic').

Two hierarchical categories of forest use are distinguished: (1) 'forest species' include all birds regularly found in natural forest environments, many of which also utilise open and converted habitats; (2) 'forest-dependent' species comprise the subset of forest species reliant on forest environments, including birds that permanently reside in forest (including mature secondary forest) and those that may also be found in anthropogenic environments but are either rarely encountered in such habitats or rely on mature forest elements for some part of their life cycle (e.g. large trees with suitable nest hollows). Data on habitat use in Bougainville were taken from Coates (1985, 1990) and Hadden (2004).

Results

Appendix 1 lists the species recorded at each site, their conservation status, encounter rate, degree of endemism, major habitat associations, and Rapoisi names where known. A total of 77 bird species was recorded directly during the surveys. Two additional species are included based on information provided by local residents—Woodford's Rail *Nesoclopeus woodfordi* and, provisionally, Yellow-legged Pigeon *Columba pallidiceps*. Forty-four birds of 17 species were mist-netted (26 individuals, eight species) or photographed by camera trap (18 birds, 11 species) (Appendix 1). The diversity recorded at each of the main survey sites ranged from 34 to 49 species, with the highest tallies recorded at Kaitare'ei (49 species) and Mapisi Station (42 species). The avifauna includes 76 (96.2%) resident breeders. Three migratory species breed in the Northern Hemisphere and visit the region during the austral summer: Eurasian Whimbrel *Numenius phaeopus*, Common Sandpiper *Actitis hypoleucos* and Common Tern *Sterna hirundo*.

Fig. 2 shows the number of endemic taxa recorded at each of the four main survey sites. Rates of endemism increased with elevation. Taxa confined to Bougainville were recorded only in lower montane forest at Kukupi; they include three island-endemic species—Bougainville Honeyeater *Stresemannia bougainvillea*, Bougainville Whistler *Pachycephala richardsi* (Fig. 4D) and Bougainville Bush Warbler *Horornis haddeni*—and six subspecies (Appendix 1).

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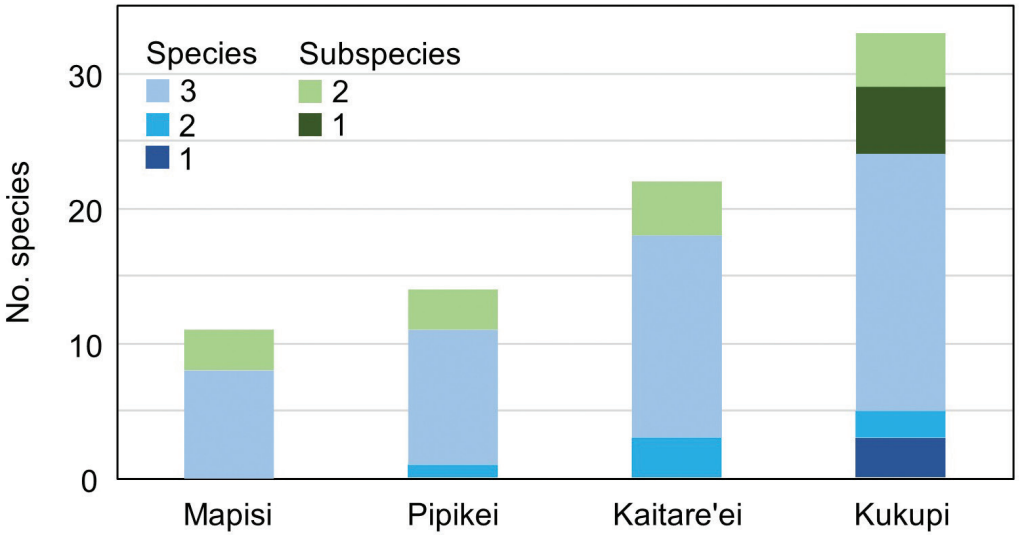

Figure 2. The number of regional and island-endemic species and subspecies recorded at each survey site. Endemism codes: 1—endemic to Bougainville; 2—endemic to Bougainville and small offshore islands (Buka, Shortland and Fauro); 3—endemic to the Solomons (displayed only at the species level).

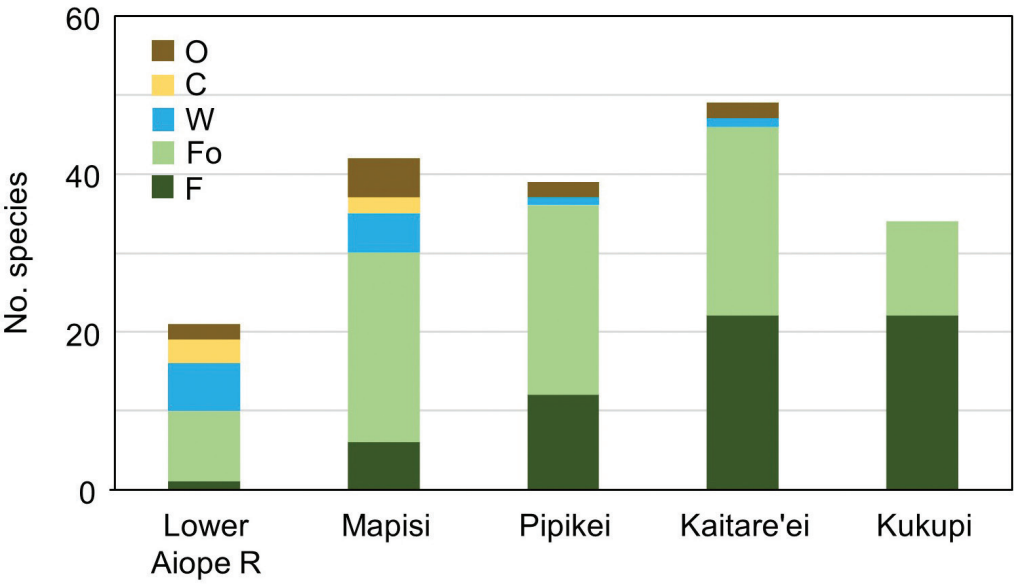

Figure 3. The number of species at each site and their major habitat associations. Habitat association codes: F—forest-dependent; Fo—forest, edge and converted land; W—rivers and wetlands; C—coastal; O—anthropogenic converted land. Data from Coates (1985, 1990) and Hadden (2004).

Fig. 3 shows the number of species recorded at each site and their major habitat associations. Both the proportion of forest species and number of forest-dependent species at each site increased with elevation. Most wetland species, and all predominantly coastal species, were recorded along the lower Aiope River and at Mapisi Station. Species requiring open and disturbed habitats were most diverse in the densely settled areas near Mapisi Station.

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Figure 4 (a) Red-knobbed Imperial Pigeon *Ducula rubricera* (Iain Woxvold); (b) Fearful Owl *Nesasio solomonensis* (Junior Novera); (c) male Red-capped Myzomela *Myzomela lafargei* (Iain Woxvold); (d) male Bougainville Whistler *Pachycephala richardsi* (Iain Woxvold); (e) female Steel-blue Flycatcher *Myiagra ferrocyanea* (Iain Woxvold); (f) Grey-throated White-eye *Zosterops rendovae* (Iain Woxvold)

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TABLE 2
Species of conservation concern recorded at each survey site. Conservation status is shown in brackets for species listed by the IUCN as Vulnerable (VU) or Near Threatened (NT) and species protected (P) under PNG law. Record codes: X—recorded directly by the authors; L—presence inferred from landowner testimony. Provisional records appear in square brackets.

Species (conservation status)	Mapisi	Pipikei	Kaitare'ei	Kukupi
Solomons Frogmouth *Rigidipenna inexpectata* (NT)		X		
Yellow-legged Pigeon *Columba pallidiceps* (VU)			[L]	
Crested Cuckoo-Dove *Reinwardtoena crassirostris* (NT)				X
Red-knobbed Imperial Pigeon *Ducula rubricera* (NT, P)		X	X	
Woodford's Rail *Nesoclopeus woodfordi* (NT)	L			
Sanford's Sea Eagle *Haliaeetus sanfordi* (VU)			X	
Fearful Owl *Nesasio solomonensis* (VU)				X
Blyth's Hornbill *Rhyticeros plicatus* (P)	X	X	X	X
Meek's Lorikeet *Charmosyna meeki* (NT)			X	X
Duchess Lorikeet *Charmosyna margarethae* (NT)			X	X
Solomons Cuckooshrike *Edolisoma holopolium* (NT)	X	X	X	
Solomons Monarch *Symposiachrus barbatus* (NT)			X	
Bougainville Bush Warbler *Horornis haddeni* (NT)				X

Thirteen species of conservation concern were recorded, including 12 listed by the IUCN as Vulnerable (Sanford's Sea Eagle *Haliaeetus sanfordi*, *Columba pallidiceps*, Fearful Owl *Nesasio solomonensis*) or Near Threatened, and two species protected under PNG law (Table 2). The highest numbers of species of conservation concern were recorded in relatively undisturbed forest environments at higher elevation sites—in the upper hill zone at Kaitare'ei (eight species) and in lower montane forest at Kukupi (six species).

Species accounts

Species accounts follow (in taxonomic order) for taxa of conservation concern, rarely recorded birds, and wherever records extend a species' known geographical or elevational range. Local Rapoisi names are shown where known. Dates without a year refer to the 2019 survey.

SOLOMONS FROGMOUTH *Rigidipenna inexpectata* (NT); 'kororori'
Endemic to the northern Solomons (Bougainville, Buka, Choiseul, Santa Isabel and San Jorge) where it is uncommon in forest and second growth from the lowlands to at least 700 m (BirdLife International 2020). It was familiar to local residents who stated that it occurs locally in forested hills.

Vocalisations from Bougainville are undescribed (Hadden 2004) and elsewhere are poorly known (Dutson 2011). Examples from Santa Isabel (at www.xeno-canto.org) include single high-pitched whistles repeated at long intervals, and a lower pitched, descending series of 3–5 whistles given 1–2 seconds apart (Fig. 6 *in* Cleere *et al*. 2007; G. Dutson *in litt*. 2020). Variants of both vocalisations were recorded on a BAR unit at Pipikei (XC 543626–629), on a ridge with secondary forest and tall bamboo at 250 m. The commonest sound was the descending series (19 detected over two nights, all at 0.8–2.0 kHz). This may be the species' 'song'. The full sequence consists of 3–4 (occasionally 1–2) upslurred whistles followed by 2–6 (normally three) trills. The sequence descends in pitch, and each note

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becomes progressively shorter, quieter and lower in amplitude (difference between max. and minimum pitch). Truncated sequences were sometimes given, consisting only of terminal trills or, less commonly, initial whistles. The higher pitched whistle call (1.8–2.7 kHz) was given singly as short (0.7–1.0-second), upslurred, mono- or disyllabic calls. These vocalisations are drastically different from those given by other *Podargus* species in Australia and New Guinea.

YELLOW-LEGGED PIGEON *Columba pallidiceps* (VU); 'rerebe'e'

This large pigeon is rare across most of its range in the Solomon and Bismarck archipelagos. At least partially terrestrial, it feeds and nests on the ground making the species susceptible to hunting and predation by cats and dogs (Mittermeier *et al*. 2018, BirdLife International 2020). Although most records are from hill forest, it has also been found in the lowlands, including in coconut plantation regrowth (Read 2013), and in lower montane forest at *c*.1,065–1,675 m on Bougainville (Hamlin 1928) and 1,300 m on Guadalcanal (Buckingham *et al*. 1990). There have been no records from Bougainville since 1928, when Hamlin collected one near Kupei in the Crown Prince Range (Hamlin 1928).

On 22 October, while listening to the calls of an imperial pigeon (*Ducula* sp.) at *c*.700 m near Kaitare'ei camp, a Rapoisi field assistant stated that the sounds belonged to a bird called 'rerebe'e'. The name is different to that applied to other locally occurring columbids, including Red-knobbed Imperial Pigeon *Ducula rubricera* ('beta'u basi') and Island Imperial Pigeon *D. pistrinaria* ('bo uru'uru') (Appendix 1). When questioned about the bird's appearance, he described it as a 'green *balus* [= pigeon] with white head and yellow legs' and iridescent plumage 'shiny like a mirror', features collectively unique to *C. pallidiceps*. Local *Ducula* species have a variety of calls; the deep, smooth-toned *wooOOo* sounds heard are somewhat similar to the call of *C. pallidiceps* (example from Makira Island available at www.xeno-canto.org). Later the same day, another man considered to be an experienced hunter by his Rapoisi colleagues confidently identified 'rerebe'e' as *C. pallidiceps* from among the columbids in the Dutson (2011) field guide, stating that he had last caught one in the area *c*.2013. Based on these statements, it seems likely that *C. pallidiceps* occurs in hill forest near Kaitare'ei. The record is here treated as provisional; if confirmed, it would be the first record from northern Bougainville and the first from anywhere on the island in more than 90 years.

CRESTED CUCKOO-DOVE *Reinwardtoena crassirostris* (NT)

This Solomons endemic is generally uncommon on Bougainville where it is most frequently encountered in primary forest in the upper hills and mountains (Hamlin 1928, Hadden 2004; *cf*. Schodde 1977). Recorded previously from the Emperor Range during the Whitney South Sea Expedition (Mt. Balbi: Hamlin 1928) and by T. Mark (at 1,100 m near Sisivi). In 2019, its distinctive song was recorded on the mornings of 31 October and 1 November on a steep forested slope below Kukupi camp at 1,200 m (XC 543612). Local residents stated that it does not occur in the populous lowlands.

RED-KNOBBED IMPERIAL PIGEON *Ducula rubricera* (NT, P); 'beta'u basi'

Endemic to the Solomon and Bismarck archipelagos where it occupies forest, less commonly degraded habitats, from the lowlands to upper hills and mountains, to at least 800 m on Bougainville (Hadden 2004) and 1,200 m on Guadalcanal (BirdLife International 2020). At Kaitare'ei this species was encountered daily in forest, including tall secondary forest, up to *c*.850 m (Fig. 4A). It was recorded there with certainty on more than one-third of MacKinnon lists. Probable additional encounters (up to 60% of lists: Appendix 1) are

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conservatively considered provisional due to the difficulty in distinguishing some call types from those of *Ducula pistrinaria* (Hadden 2004; pers. obs.). Although predominantly a bird of the lowlands, a *D. pistrinaria* seen at Kaitare'ei (at 730 m) matches the highest elevation reported for that species (Hadden 2004). At Pipikei, one *D. rubricera* observed after rain atop a remnant tall tree on 19 October was the only other record.

WOODFORD'S RAIL *Nesoclopeus woodfordi* (NT); 'siki'i'
A large, flightless rail endemic to the Solomons. The endemic Bougainvillean subspecies *N. w. tertius* is recognised by the IUCN as a separate species (Bougainville Rail *Hypotaenidia tertia*; del Hoyo & Collar 2014). Formerly considered extinct on Bougainville (Diamond 1987), the population appears to have increased greatly with the expansion of suitable regrowth habitat during the 1990s secessionist conflict (Hadden 2002). Although not recorded directly during the survey, *N. woodfordi* was familiar to local residents (as 'siki'i') who readily distinguished it from the sympatric Australasian Swamphen *Porphyrio melanotus* ('kosa') and Pale-vented Bush-hen *Amaurornis moluccana* ('keobau'). It was said to be fairly common in areas with tall grass and scrub in the populous region along the lower Aiope River, including in flood-prone riparian sites and along roadsides. They are sometimes hunted with dogs, particularly when flooding drives the birds out of cover.

SANFORD'S SEA EAGLE *Haliaeetus sanfordi* (VU); 'kerakera'
Endemic to the Solomons where it is the region's largest native terrestrial predator. It is widespread but sparsely distributed from the coast to the mountains. *H. sanfordi* is an important totem in many Bougainvillean cultures (Oliver 1968, Nash & Ogan 1990, Hage 2004). Rapoisi society is divided into matrilineal moieties represented by the sea eagle ('kerakera') and Blyth's Hornbill *Rhyticeros plicatus* ('bohuhu'), within which multiple subclans are identified by other bird totems. Bird-clan membership governs patterns of marriage, sexual relations, customary land ownership and local leadership structures (ensuring balanced representation in ward and village assemblies), and it is forbidden for people to hunt or eat their own totem. Local residents are consequently very familiar with these species, and indicated that it is not uncommon to see one or two 'kerakera' soaring overhead anywhere in the district. On 21 October, during transfer from Pipikei to Kaitare'ei, JN and several Rapoisi assistants observed a single *H. sanfordi* circling low over forest at *c*.600 m.

FEARFUL OWL *Nesasio solomonensis* (VU); 'itu'uko'
This large owl is endemic to the northern Solomons (Bougainville, Choiseul and Santa Isabel) where it is widespread but sparsely distributed in forest from the lowlands to at least 2,000 m. Local residents are familiar with this species and readily distinguished it from Solomons Boobook *Ninox jacquinoti* ('kuro'i') by its appearance, call and habit of hunting Northern Common Cuscus *Phalanger orientalis*. The Rapoisi name given during the survey ('itu'uko') is different to that reported by Hadden (2004) ('tuubaa'). Prior to the main survey, on the morning of 18 April (11.14 h) one *N. solomonensis* was camera-trapped above Kukupi camp at 1,600 m (Fig. 4B). During the main survey, calls of this species were recorded on 31 October (23.04 h) on a BAR unit deployed along a ridge in lower montane forest near Kukupi camp at 1,440 m (XC 543582). The species' voice is poorly known (Olsen & Marks 2020). Three calls were given over a period of 56 seconds, each consisting of a single, disyllabic note (*HOoWOoo*) lasting *c*.1.3 seconds and falling slightly in pitch.

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BLYTH'S HORNBILL *Rhyticeros plicatus* (P); 'bohuhu'
An important totem in Rapoisi society (see *Haliaeetus sanfordi*). Encountered daily at each of the four main survey sites and in a variety of habitats wherever tall trees were present, including forest, plantations, open areas and village gardens. Encounter rates were highest at Kaitare'ei where it was recorded on nearly 50% of MacKinnon lists (Appendix 1). As a mobile and easily detected species, multiple records at the same site may involve repeat encounters with the same individuals.

MELANESIAN KINGFISHER *Todiramphus tristrami*
Common in open and disturbed habitats across the Bismarck and most of the Solomon archipelagos. A duo calling below Kukupi camp at 1,420 m is the highest reported elevation on Bougainville (previously up to 700 m; reported to 1,500 m on New Britain: Dutson 2011).

MEEK'S LORIKEET *Charmosyna meeki* (NT)
A blossom nomad endemic to the Solomons. On most islands, it is normally found above 900–1,000 m (Collar & Boesman 2020). Previously on Bougainville, Hamlin (1928) encountered it above 900 m in flocks of up to more than 100 birds; Diamond (1975) observed *C. meeki* on Mt. Balbi where it was 'confined to the mountains' (Diamond 1975: 15); and Schodde (1977) reported the species at 300–1,500 m, usually in flocks of 10–15. In 2019, at Kaitare'ei a group of at least 12 *C. meeki* was seen together with Duchess Lorikeet *C. margarethae* in a flowering *Syzygium* at 650 m. At Kukupi, flocks of 3–8+ were encountered daily above 1,450 m.

DUCHESS LORIKEET *Charmosyna margarethae* (NT); 're'rai'
Endemic to the Solomons where the species is reportedly scarce and local across most of its range (BirdLife International 2020) though 'common' on Bougainville (Hadden 2004). On Bougainville it has been recorded in primary forest, tall secondary forest, plantations and gardens, predominantly in the hills (100–750 m) and more widely from the coastal lowlands to 1,350 m (Diamond 1975, Schodde 1977, Hadden 2004). In 2019, at least eight were seen at Kaitare'ei in company with *C. meeki* in a flowering *Syzygium* at 650 m. At Kukupi campsite (1,480 m), singles and small groups of 2–4 were observed daily feeding on epiphytic *Schefflera* fruits. This is the highest reported elevation for the species.

WHITE-BELLIED CUCKOOSHRIKE *Coracina papuensis*; 'kusiau'
Occurs widely in open and disturbed habitats across the Australo-Papuan region, predominantly in the lowlands and hills, occasionally at lower montane elevations up to 1,650 m on New Guinea and 1,400 m on New Britain (Coates 1990). On Bougainville, the endemic north Solomons subspecies *C. p. perpallida* has been reported as high as 1,100 m (Diamond 1975). At Kukupi the species was recorded twice in forest on a narrow ridge at 1,440 m and 1,460 m.

SOLOMONS CUCKOOSHRIKE *Edolisoma holopolium* (NT)
This Solomons endemic is scarce on some islands (Choiseul, Santa Isabel) but at least fairly common on Bougainville where it occupies forest including second growth from the lowlands to at least 800 m (Hadden 2004, Dutson 2011, Taylor *et al*. 2020). Singles and duos were encountered daily at Kaitare'ei in forest up to 800 m, less frequently in remnant forest at Pipikei, and once (a duo) in scattered trees along the Aiope River near Mapisi Station.

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GREY-CAPPED CICADABIRD *Edolisoma remotum*
Fairly common in forest, second growth and gardens, to 1,400 m on New Ireland and to at least 1,000 m on Bougainville (Coates 1990, Hadden 2004). Records from lower montane forest around Kukupi at 1,200 m, 1,360 m and 1,440 m are the highest reported elevations for the species on Bougainville.

COCKERELL'S FANTAIL *Rhipidura cockerelli*
Endemic to the Solomons where it inhabits the interior of closed forest, including primary and tall secondary forest, in the lowlands and hills (Schodde 1977, Hadden 2004). It has been recorded to *c.*1,000 m on Bougainville, and elsewhere to 1,150 m (Hadden 2004, Dutson 2011). A recording of the species' distinctive song (XC 543617), made on a steep forested slope below Kukupi camp at 1,200 m, is from the highest reported elevation.

SOLOMONS MONARCH *Symposiachrus barbatus* (NT)
Endemic to the Solomons where largely confined to the interior of primary and tall secondary hill forest (Schodde 1977, Coates 1990, Hadden 2004, Dutson 2011). It was unobtrusive but fairly common at Kaitare'ei with singles or duos encountered on most days, usually in the forest interior but occasionally in hamlet gardens near the forest edge where it was accompanied by Bougainville Monarch *Monarcha erythrostictus*. In hill forest the species was observed in a feeding flock with *M. erythrostictus*, *Rhipidura cockerelli*, Steel-blue Flycatcher *Myiagra ferrocyanea* (Fig. 4E) and Finsch's Pygmy Parrot *Micropsitta finschii*. It was not found in more heavily disturbed foothill forests at Pipikei where *M. erythrostictus* persisted.

BOUGAINVILLE MONARCH *Monarcha erythrostictus*; 'sose'e'
Endemic to Bougainville and surrounding smaller islands (Buka, Shortland and Fauro). It is treated by the IUCN as a subspecies of the Solomons endemic Chestnut-bellied Monarch *M. castaneiventris erythrostictus* (del Hoyo & Collar 2016). Sightings at 1,525 m at Kukupi are the highest reported elevation for the species (previously up to 1,200 m: Hadden 2004).

BOUGAINVILLE BUSH WARBLER *Horornis haddeni* (NT); 'kopaki'
This island endemic occupies steep forested slopes at 700–1,500 m (Hadden 2004). It was recorded only at Kukupi where its distinctive song was heard or recorded daily at 1,200–1,450 m (e.g. XC 543567). Prior to our bird survey, one was camera-trapped near Kukupi camp at 1,500 m on 2 August.

BLUE-FACED PARROTFINCH *Erythrura trichroa*
Rarely reported on Bougainville (Hadden 2004), on 29 October this species' distinctive call was heard twice at *c.*1,050 m during transfer to Kukupi, near a forested stream amid extensive grass and bamboo.

Discussion

The 2019 survey results include the first avifaunal data to be collected in Kunua district and one of the few recent datasets from north-west Bougainville. Our records include three-quarters of Bougainville's resident land and freshwater bird species (76/102), three of Bougainville's four island-endemic species, 60% (6/10) of its endemic subspecies and 80% (29/36) of Solomons endemic species that occur on Bougainville.

Appendix 2 lists the 26 Bougainvillean resident (at least historically) land and freshwater bird species that were not recorded during the survey, along with their conservation status,

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degree of endemism and major habitat associations. An additional 27 migratory species (not tabulated) may also visit the study area (excluding vagrants and those with fewer than five records: Hadden 2004), most of which (23 species) occupy rivers, wetlands and coastal sites. Avian community composition, conservation value and the potential for additional species of conservation significance to occur in each of the study area's major natural environments are discussed below.

Forest environments.—Of the 76 resident species recorded, 64 (84%) occur in forest, most of which are forest-dependent (Appendix 1). All island-endemic taxa (genera, species and subspecies), most Solomons endemic species (21/29) and almost all species of conservation concern (except *Nesoclopeus woodfordi*) recorded in the study area are dependent on forest environments (Appendix 1).

The extent and condition of forest environments improved with increasing elevation along the surveyed route—from remnant fragments at Mapisi Station, through secondary and disturbed forest prevalent at Pipikei, to predominantly intact forest at Kaitare'ei and Kukupi. Consequently, the proportion of forest species, the number of forest-dependent species, and the number of Solomons and island-endemic taxa at each site increased with forest availability along an altitudinal gradient (Figs. 2–3), and the most intact forest bird communities were recorded at the higher elevation sites at Kaitare'ei and Kukupi.

Lowland plains and hill forest.—Bird species richness was highest in the upper hill zone at Kaitare'ei. Almost all of the species recorded there (46/49) occupy forest environments, nearly half of which are forest-dependent (22/46) (Appendix 1). Eight species of conservation concern were recorded at Kaitare'ei, the most at any survey site (Table 2), including three species not found at other sites—*Haliaeetus sanfordi*, *Symposiachrus barbatus* and the rare *Columba pallidiceps*; although the latter species is listed as provisional, the testimonies of two informants strongly suggest that it is still present around Kaitare'ei, albeit probably in small numbers.

The majority of species recorded at Kaitare'ei also occupy lowland plains and foothill forest (*cf*. Red-breasted Pygmy Parrot *Micropsitta bruijnii*, *Charmosyna meeki* and Oriole Whistler *Pachycephala orioloides*). However, many of these were not recorded in more degraded habitats at suitable elevations around Mapisi or Pipikei, e.g., Superb Fruit Dove *Ptilinopus superbus*, *Micropsitta finschii*, *Charmosyna margarethae*, Red-capped Myzomela *Myzomela lafargei* (Fig. 4C), *Rhipidura cockerelli*, Rufous Fantail *R. rufifrons* and *Symposiachrus barbatus*. Among those forest species recorded in the foothills at Pipikei, many were encountered more frequently at Kaitare'ei—Claret-breasted Fruit Dove *Ptilinopus viridis*, *Ducula rubricera*, *Edolisoma holopolium*, *E. remotum* and *Myiagra ferrocyanea*. By contrast, species encountered more often at Pipikei than at Kaitare'ei were typically birds of forest edge or of open and disturbed habitats, e.g., *Ducula pistrinaria*, Brush Cuckoo *Cacomantis variolosus*, Cardinal Lory *Pseudeos cardinalis*, *Coracina papuensis* and Olive-backed Sunbird *Cinnyris jugularis*.

For the most part, changes in forest condition thus explain changes in bird community composition. In a notable exception, Bougainville Crow *Corvus meeki* was present at Kaitare'ei and Kukupi but absent from Mapisi Station and Pipikei. This easily detected species is reportedly common in forest, edge and open habitats, including village gardens and coconut plantations, from the lowlands to 1,600 m (Coates 1990, Hadden 2004). Multiple Rapoisi residents stated that it was once common in settled areas near Mapisi Station, but that it had not been observed there for some time. The reason for its recent decline at lower elevations is unknown.

The forest at Kaitare'ei provides a narrow band of suitable habitat for a suite of forest species that, at least along the survey route, were formerly more common across a broader

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elevational range. On mountainous Melanesian islands, many forest species are more or less confined to distinct altitudinal zones (Diamond 1975, Coates 1985). Diversity is generally highest in the lowlands and hills (Diamond & Mayr 1976), and on Bougainville many hill forest species naturally drop out between *c*.750 and 1,200 m (Hadden 2004). In the Aiope basin, extensive areas of bamboo/tree-fern scrub at *c*.800–1,300 m limit the availability of forest at the upper bound of this range (FIMS data; pers. obs.). Below Kaitare'ei, as demonstrated, the fragmented and degraded forests below *c*.500–600 m support a depauperate forest bird community.

Better-quality foothill forest may occur elsewhere in the Aiope basin. The present survey route followed a frequently used track into the mountains that provided access to multiple settlement sites, both current and former, around which anthropogenic disturbance is concentrated. Elsewhere, both the FIMS mapping anthropogenic disturbance codes (based on 1970s aerial imagery) and Landsat imagery from 2014 (Google Earth Pro V 7.3.2.5776) suggest that well-structured foothill forest still occurs patchily in a well-integrated network between *c*.50 and 500 m elevation across much of the northern catchment. Surveys of this area may reveal more intact lowland forest bird communities.

Lower montane forest.—The primary forest prevalent at Kukupi supports an intact lower montane bird community. Despite the low survey effort—limited to the rain-free hours of three days—almost all species known to occur above 1,250 m and previously reported from northern Bougainville were found; *Haliaeetus sanfordi* and Uniform Swiftlet *Aerodramus vanikorensis* being the exceptions, both of which probably also utilise the Kukupi forest. In addition to regular montane residents, five species were reported at record high elevations at Kukupi—*Todiramphus tristrami*, *Coracina papuensis*, *Edolisoma remotum*, *Rhipidura cockerelli* and *Monarcha erythrostictus*. *Charmosyna margarethae* and *Pseudeos cardinalis* normally occur at lower elevations but occasionally visit montane sites in response to seasonal food availability (Hadden 2004); both were seen feeding on epiphytic *Schefflera* fruits at Kukupi camp.

Narrow-range endemism among Melanesia's avifauna is highest in montane habitats (Mayr & Diamond 2001, Danielsen *et al*. 2010). Despite having the lowest species tally of the main survey sites (due to naturally lower diversity at montane elevations), Kukupi's avian community includes the largest number of Solomons endemic taxa and the only island-endemic species and subspecies recorded during the survey (Appendix 1; Fig. 2). Of Bougainville's four island-endemic bird species, three were confirmed at Kukupi—*Stresemannia bougainvillea*, *Pachycephala richardsi* and *Horornis haddeni*. Bougainville Thicketbird *Cincloramphus llaneae*, yet to be recorded on the Emperor Range, was the only island endemic not found at Kukupi.

Potential additional forest species.—Appendix 2 includes 14 resident Bougainvillean forest bird species not recorded during the survey. Most are cryptic, rare or uncommon, and four are yet to be recorded in northern Bougainville. Nevertheless, most are expected to occur in the Aiope basin and may be found with additional survey effort in suitable habitat. Among the rarer species, North Melanesian Cuckooshrike *Coracina welchmani* and White-eyed Starling *Aplonis brunneicapillus* (Vulnerable) were recently recorded in north Bougainville by T. Mark (Xeno-canto records).

A targeted effort was made to locate two of Bougainville's rarest and most enigmatic birds: Moustached Kingfisher *Actenoides bougainvillei* (Endangered) and Black-faced Pitta *Pitta anerythra* (Vulnerable).

The island-endemic subspecies of Moustached Kingfisher *A. b. bougainvillei* (treated as a separate species by the IUCN; del Hoyo & Collar 2014) is known only from southern Bougainville, although this may reflect the greater survey effort expended there. There are

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a handful of recent records (within the last 40 years) from upper hill / lower montane forest in the northern Crown Prince Range and a potential aural record from lowland swamp forest near Arawa (Bishop 1987, Hadden 2004, BirdLife International 2020). One or two local residents claimed to recognise the species from the field guide, stating that it occurs locally in upper hill and lower montane forest. When viewing illustrations there is much potential for confusion with other kingfishers. Although the reported elevations are encouraging, no informants were clearly familiar with the song (Guadalcanal data), and there was no response to playback in potentially suitable habitat. It may persist locally in small numbers, but further work is required to confirm or deny its presence.

The island-endemic subspecies of Black-faced Pitta *P. a. pallida* has not been seen since 1938 (Hadden 2004, BirdLife International 2020). It was not recognised by local residents and its preferred plains and foothill habitat (to at least 700 m: Hamlin 1928) has been heavily fragmented and degraded, and supports a suite of invasive species including rats (Black Rat *Rattus rattus*, Pacific Rat *R. exulans*), feral pigs (*Sus scrofa*), cats (*Felis catus*), dogs (*Canis familiaris*) and Cane Toad (*Rhinella marina*), which potentially threaten adults and nests or compete for invertebrate food resources. Its presence in the study area is considered doubtful.

Among montane birds, three unrecorded species are known only from the Crown Prince Range—the rare Metallic Pigeon *Columba vitiensis* (not seen on Bougainville for more than 50 years; Hadden 2004), *Cincloramphus llaneae* and Black-backed Thrush *Zoothera talaseae*. The Emperor Range is less well surveyed than its southern counterpart, and the presence of these (or closely reated) taxa in northern Bougainville is not unexpected; in all cases, the same or closely related species occur on nearby mountainous islands, notably New Britain, which is closer to the Emperor Range than it is to the Crown Prince Range. The hills linking the Emperor and Crown Prince Ranges lie below 750 m at their lowest point. If *Cincloramphus* or *Zoothera* do occur on the Emperor Range, given that there are no confirmed records of *C. llaneae* or *Z. talaseae* fom below 1,500 m, it will be interesting to determine if the same taxa are present in both areas. *C. llaneae* and *Z. talaseae* are predominantly terrestrial, and *Columba vitiensis* occasionally feeds on the ground (Baptista *et al*. 2020). Camera traps are an effective tool for detecting elusive birds (O'Brien & Kinnaird 2008, Murphy *et al*. 2017, Woxvold & Legra 2017, 2019) and their use in future searches is recommended.

Freshwater and coastal environments.—Watercourses, other waterbodies and coastal sites provide habitat for a variety of freshwater wetland and coastal specialist birds. Resident wetland species, such as Pacific Black Duck *Anas superciliosa*, *Porphyrio melanotus*, Nankeen Night Heron *Nycticorax caledonicus*, Striated Heron *Butorides striata* and the colonial nesting Little Pied Cormorant *Microcarbo melanoleucos*, may breed locally in backwater swamps and well-vegetated former river channels within *c*.2 km of the coast. At least some of these wetlands are considered sacred sites and are visited only by local landowners.

The Aiope River basin is unlikely to provide important habitat for any freshwater or coastal marine bird species of conservation significance. Regional residents include two rare coastal species, neither of which is likely to occur locally—Solomons Nightjar *Eurostopodus nigripennis* (Vulnerable) has not been recorded on Bougainville for almost 100 years and Beach Stone-curlew *Esacus magnirostris* (Near Threatened) is largely restricted to undisturbed beaches and offshore islets (Hadden 2004, BirdLife International 2020). In terms of migrants, most Palearctic shorebirds visit Bougainville in small numbers (Hadden 2004) and local shores do not include the extensive tidal mudflats required to support large wader aggregations.

Introduced species.—No non-native bird species were recorded. Among the most likely introductions: (1) we did not observe Common Myna *Acridotheres tristis*, which was at least

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formerly present at Arawa on Bougainville's east coast (Hadden 2004), and; (2) as yet, there are no pubished reports of Eurasian Tree Sparrow *Passer montanus* from the island, although it is well established and rapidly expanding in similar environments on mainland PNG (Beehler & Pratt 2016).

Final remarks.—Forest loss and degradation present the greatest threat to Melanesian bird communities (Filardi *et al*. 2007). Solomon Islands' forests have been excessively and unsustainably logged over the last 25 years (Katovai *et al*. 2015, Minter *et al*. 2018). Locally, more than 40% of Bougainville's lowland forest has been lost or degraded over the last half century (Allison & Tallowin 2015), and while no forest was commercially logged during 2002–14 (Bryan *et al*. 2015), this situation is expected to change as the island re-opens to development after an extended period of secessionist conflict.

Invasive alien species further threaten the Solomons avifauna, particularly those species that forage or nest on the ground (Filardi *et al*. 2007, Mittermeier *et al*. 2018). In this study, feral pigs were camera-trapped in forest at Kaitare'ei, feral cats were camera-trapped in forest on at least six cameras spanning elevations of 560–1,820 m, dogs (usually accompanied by men) were camera-trapped on multiple occasions in forest at Pipikei and Kaitare'ei, and introduced rats were the most commonly camera-trapped rodent, with records from all sampled elevations (JN unpubl.). Cane Toads were common in the lowlands and foothills at Mapisi Station and Pipikei, but were not observed in more intact forest at Kaitare'ei and Kukupi. Hunting represents an additional threat to large-bodied terrestrial species, including the rare *Columba pallidiceps*, especially when dogs are used (e.g. Mittermeier *et al*. 2018). A variety of birds is consumed by local residents, including large pigeons and Melanesian Megapode *Megapodius eremita*.

Despite these issues, bird communities in the natural forest prevalent at higher elevations were largely intact. The lower montane avifauna at Kukupi appears essentially unaltered, whilst the upper hill zone community at Kaitare'ei included the majority of species missing or otherwise under-represented in more degraded foothill forest. Beyond the survey route, recent satellite imagery indicates that better examples of foothill forest persist at the north-west rim of the Aiope River basin.

Bougainville has the richest avifauna of any Pacific island east of New Guinea. Published data are few, however, and almost no detailed surveys have been conducted since the civil war started in the late 1980s. Much remains to be learned concerning the distribution, status and ecology of many of Bougainville's birds. There is a pressing need for further studies as the island re-opens to development.

Acknowledgements

This research was supported by the Critical Ecosystem Partnership Fund (CEPF). Special thanks to Zola Sangga (CEPF) and Diana Fisher (Univ. of Queensland) for helping to facilitate funding and logistical support. This work would have been impossible without the support and kindness of the Rapoisi people; we gratefully acknowledge the chiefs and communities for permission to work on their traditional lands and for their generous hospitality throughout the survey. We are extremely grateful to the many Rapoisi people who carried equipment, prepared meals and assisted with camp logistics and field work, often under difficult conditions. Special thanks to Joe & Mary Novera for their hospitality at Mapisi Station, and to Albert Abiriosi (Pipikei), Dominic Porebirere (aka 'Blue Mountain'—Kaitare'ei and Kukupi) and their families and associated clans for providing accommodation and support at our field camps. Thanks also to Joseph Rahia and Joseph Kawas (Tohei village chiefs) for their assistance with community support, to Blaise Sibetei (field coordinator), to John Boiabisi for managing camps at Pipikei, Kaitare'ei and Kukupi, and to David Masirio and family for providing accommodation at Kepui village (near Mapisi). We are particularly grateful to the men and women of Tohei village who performed the traditional welcoming ceremony, and to Robin Raraboi and Andrew Rasio for their expert knowledge and assistance in the field. Guy Dutson and Jared Diamond provided valuable comments on the submitted manuscript. This work is offered in memory of Thomas Bakebiri of Tohei, in the hope that his wish that Kunua's forests are preserved will be realised.

ISSN-2513-9894 (Online)

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ISSN-2513-9894 (Online)

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Appendix 1

Birds recorded in the Aiope River basin in 2019. Migratory species are indicated by an asterisk (*) after the scientific name. Conservation status is shown in parentheses after the scientific name for species listed by the IUCN as Vulnerable (VU) or Near Threatened (NT) and species protected (P) under Papua New Guinean law. Site-based record codes: numerics (e.g., 0.125) indicate the proportion of MacKinnon lists that each species was recorded on during active search periods (see Active searches); X—recorded outside active search periods (e.g., via trapping or automated recording methods); L—deduced present based on local resident information. Square brackets indicate provisional records. 'Captures' indicate the number of birds camera-trapped (c) and mist-netted (n). 'Endemism' codes (species/subspecies): 1—endemic to Bougainville; 2—endemic to Bougainville and small offshore islands (Buka, Shortland and Fauro); 3—endemic to the Solomons. The subspecific epithet is provided for subspecies with an endemism rank of 1 or 2. 'Habitat' association codes: F—forest-dependent; Fo—forest, edge and converted lands; W—rivers and wetlands; C—coastal; O—anthropogenic converted land; data from Coates (1985, 1990) and Hadden (2004). Most Rapoisi names are similar to those provided by Hadden (2004). Exceptions include species for which: †—no Rapoisi name was provided by Hadden; ‡—the Rapoisi name is markedly different to that provided by Hadden; ‡‡—the names given to different sexes are the reverse of those provided by Hadden.

Species (conservation status)	Mapisi	Pipikei	Kaitare'ei	Kukupi	Lower Aiope R.	Captures	Endemism	Habitat	Rapoisi name
Melanesian Megapode *Megapodius eremita*	0.125	X	0.033			c2		F	'pa'e'o'
Pacific Black Duck *Anas superciliosa*	0.042				X			W	
Solomons Frogmouth *Rigidipenna inexpectata* (NT)		X					3/–	F	'kororori'
Moustached Treeswift *Hemiprocne mystacea*	0.083	0.050	0.033				–/3	Fo	'boisikura'
Glossy Swiftlet *Collocalia esculenta lagonoleucos*		0.050	0.067	0.400		n4	–/2	Fo	'tegeri'
White-rumped Swiftlet *Aerodramus spodiopygius*	0.167	X	X	0.100	X	n2	–/3	Fo	'tegeri'
Aerodramus sp.		0.050	0.067						
Pacific Koel *Eudynamys orientalis*		0.050					–/3	Fo	†'suki suki', 'koa'
Brush Cuckoo *Cacomantis variolosus*	0.333	0.650	0.200	0.600			–/3	Fo	'boipirupiru'
Yellow-legged Pigeon *Columba pallidiceps* (VU)			[L]					F	†'rerebe'e'
MacKinlay's Cuckoo-Dove *Macropygia mackinlayi*	0.083	0.100	0.167	0.100				F	‡'to'upe'e'
Crested Cuckoo-Dove *Reinwardtoena crassirostris* (NT)				X			3/–	F	
Stephan's Emerald Dove *Chalcophaps stephani*		0.050	X			c1	–/3	F	†'ka'aburio'
Superb Fruit Dove *Ptilinopus superbus*			0.167			n2		F	†'bisio'u'
Yellow-bibbed Fruit Dove *Ptilinopus solomonensis bistictus*				0.700			–/2	F	
Claret-breasted Fruit Dove *Ptilinopus viridis*	0.042	0.250	0.667		[X]			F	†'bisio'u', 'na'uru'o'
Red-knobbed Imperial Pigeon *Ducula rubricera* (NT, P)		0.050	0.367 [0.600]				–/3	F	'beta'u basi'
Island Imperial Pigeon *Ducula pistrinaria*	0.667	0.200 [0.550]	0.033 [0.066]		X			Fo	'bo uru'uru'

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Species (conservation status)	Mapisi	Pipikei	Kaitare'ei	Kukupi	Lower Aiope R.	Captures	Endemism	Habitat	Rapoisi name
Pale Mountain Pigeon *Gymnophaps solomonensis*				0.500			3/–	F	
Woodford's Rail *Nesoclopeus woodfordi tertia* (NT)	L						3/2	O	'siki'i'
Pale-vented Bush-hen *Amaurornis moluccana*	X							O	†'keobau'
Australasian Swamphen *Porphyrio melanotus*	0.042				X			W	'kosa, ‡'akaure'
Eurasian Whimbrel *Numenius phaeopus**					X			C	
Common Sandpiper *Actitis hypoleucos**		X			X			W	
Common Tern *Sterna hirundo**	X				X			C	
Little Pied Cormorant *Microcarbo melanoleucos*	0.167				X			W	'morogoi tutu'
Nankeen Night Heron *Nycticorax caledonicus*	0.042		X		X	c1		W	‡'ku'ita'
Striated Heron *Butorides striata*					X			W	
Pacific Reef Heron *Egretta sacra*	X				X			C	
Pacific Baza *Aviceda subcristata*	0.208	0.100					–/3	Fo	'ki'itou'
Variable Goshawk *Accipiter hiogaster bougainvillei*	0.042		0.133				–/2	Fo	'ru'ete'
Pied Goshawk *Accipiter albogularis*	[0.042]		0.033				–/3	Fo	'ru'ete'
Brahminy Kite *Haliastur indus*	0.208	0.100	0.067		X		–/3	Fo	'bakawa'/'makawa'a'
Sanford's Sea Eagle *Haliaeetus sanfordi* (VU)			X				3/–	F	'kerakera'
Solomons Boobook *Ninox jacquinoti*		X	0.067	X			3/3	F	'kuro'i'
Fearful Owl *Nesasio solomonensis* (VU)				X		c1	3/–	F	‡'itu'uko'
Blyth's Hornbill *Rhyticeros plicatus* (P)	0.250	0.350	0.433	0.200				F	'bohuhu'
Oriental Dollarbird *Eurystomus orientalis*	0.042	X	0.067					Fo	†'bokikiora'o'
Ultramarine Kingfisher *Todiramphus leucopygius*	0.125	0.150	0.167				3/–	Fo	'toreikirakira'
Melanesian Kingfisher *Todiramphus tristrami*	0.375	0.550	0.367	0.300	X		–/3	Fo	†'tokorokoro'
Common Kingfisher *Alcedo atthis*	0.083						–/3	W	'si'iriko'
North Solomons Dwarf Kingfisher *Ceyx meeki pallidus*		[X]					3/2	F	
Solomons Cockatoo *Cacatua ducorpsii*	0.583	0.550	0.533	0.700	X		3/–	Fo	'kakare'e'
Finsch's Pygmy Parrot *Micropsitta finschii*			0.100				–/3	F	
Red-breasted Pygmy Parrot *Micropsitta bruijnii*			0.033	0.200		c2	–/3	F	†'sisipu'
Eclectus Parrot *Eclectus roratus*	0.417	0.600	0.167		X			Fo	‡‡'kiroko' (female), 'boka'a' (male)
Song Parrot *Geoffroyus heteroclitus*	0.083	0.100	0.033					Fo	'kira'iko'
Meek's Lorikeet *Charmosyna meeki* (NT)			0.033 [0.066]	0.500			3/–	F	
Duchess Lorikeet *Charmosyna margarethae* (NT)			0.100	0.300			3/–	F	†'re'rai'

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Species (conservation status)	Mapisi	Pipikei	Kaitare'ei	Kukupi	Lower Aiope R.	Captures	Endemism	Habitat	Rapoisi name
Cardinal Lory *Pseudeos cardinalis*	0.667	0.300	0.100	X	X			Fo	'bosirihe', 'bosiri'e'
Coconut Lorikeet *Trichoglossus haematodus*	0.292	0.350	0.333	[X]				Fo	'bokurusu'
Bougainville Honeyeater *Stresemannia bougainvillei*				0.100		c2	1/–	F	
Red-capped Myzomela *Myzomela lafargei*			0.067	0.100		n4	3/–	F	
Barred Cuckooshrike *Coracina lineata*	0.042	0.100	0.167				–/3	Fo	
White-bellied Cuckooshrike *Coracina papuensis*	0.458	0.500	0.167	0.100			–/3	Fo	'kusiau'
Solomons Cuckooshrike *Edolisoma holopolium* (NT)	0.083	0.100	0.267				3/3	F	
Grey-capped Cicadabird *Edolisoma remotum*	0.042	0.050	0.200	0.200			–/3	F	
Oriole Whistler *Pachycephala orioloides bougainvillei*			0.200				3/2	F	
Bougainville Whistler *Pachycephala richardsi*				0.600		n3,c4	1/–	F	
Willie Wagtail *Rhipidura leucophrys*	0.208				X			O	
Cockerell's Fantail *Rhipidura cockerelli septentrionalis*			0.133	X			3/2	F	
Brown Fantail *Rhipidura drownei drownei*				0.700		n1,c1	3/1	F	†'siroreipa'
Rufous Fantail *Rhipidura rufifrons*			0.267				–/3	F	†'sitoberi', 'sirubirubi'
Solomons Monarch *Symposiachrus barbatus* (NT)			0.200				3/3	F	
Bougainville Monarch *Monarcha erythrostictus*		0.300	0.367	0.400			2/–	F	‡'sose'e'
Steel-blue Flycatcher *Myiagra ferrocyanea cinerea*	0.458	0.200	0.633	0.200			3/2	Fo	
Bougainville Crow *Corvus meeki*			0.233	0.600			2/–	Fo	'ao'ao'
Solomons Robin *Petroica polymorpha septentrionalis*				0.400		c1	3/1	F	
Bougainville Bush Warbler *Horornis haddeni* (NT)				0.200		c1	1/–	F	†'kopaki
Island Leaf Warbler *Phylloscopus poliocephalus bougainvillei*				0.500			–/1	F	
Yellow-throated White-eye *Zosterops metcalfii*	0.583	0.850	0.833				3/3	f	'sioruka'
Grey-throated White-eye *Zosterops rendovae hamlini*				0.500		n1	3/1	F	
Metallic Starling *Aplonis metallica*	0.208	0.200						Fo	'sirio'o'
Singing Starling *Aplonis cantoroides*	0.208	0.300	0.033					O	
Brown-winged Starling *Aplonis grandis*	0.298	0.150	0.267				3/3	Fo	
Long-tailed Myna *Mino kreffti*	0.792	0.750	0.467		X			Fo	'sikiro'
Island Thrush *Turdus poliocephalus bougainvillei*				X		c2	–/1	F	
Midget Flowerpecker *Dicaeum aeneum*	0.833	0.700	0.567	0.800	X	n9	3/3	Fo	†'takapa'i'

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Species (conservation status)	Mapisi	Pipikei	Kaitare'ei	Kukupi	Lower Aiope R.	Captures	Endemism	Habitat	Rapoisi name
Olive-backed Sunbird *Cinnyris jugularis*	0.583	0.250	0.067		X			O	
Blue-faced Parrotfinch *Erythrura trichroa*				X			–/3	Fo	

Appendix 2

Resident Bougainvillean land and freshwater bird species not recorded in 2019. Conservation status is shown in parentheses after the scientific name for species listed by the IUCN as Endangered (EN), Vulnerable (VU) or Near Threatened (NT) and species protected (P) under Papua New Guinean law. 'Endemism' codes (species/subspecies): 1—endemic to Bougainville; 2—endemic to Bougainville and small offshore islands (Buka, Shortland and Fauro); 3—endemic to the Solomons. The subspecific epithet is provided for subspecies with an endemism rank of 1 or 2. 'Habitat' association codes: F—forest-dependent; Fo—forest, edge and converted land; W—rivers and wetlands; C—coastal; O—anthropogenic converted land; data from Coates (1985, 1990) and Hadden (2004).

Species (conservation status)	Endemism	Habitat	Distribution/status notes
Solomons Nightjar *Eurostopodus nigripennis* (VU)	3/–	C	Not recorded on Bougainville since the 1930s.
Uniform Swiftlet *Aerodramus vanikorensis*	–/3	Fo	Common, possibly overlooked or present among unidentified *Aerodramus* (Appendix 1).
Metallic Pigeon *Columba vitiensis*		F	Hills and mountains. Rare, last confirmed record 1964.
Nicobar Pigeon *Caloenas nicobarica*		C	
Bronze Ground Dove *Pampusana beccarii*	–/3	F	Hills and mountains to 1,250 m. Rare, few recent records.
White-browed Crake *Porzana cinerea*		W	
Tricoloured Grebe *Tachybaptus tricolor*		W	
Beach Stone-curlew *Esacus magnirostris* (NT)		C	Potentially restricted to offshore atolls.
Yellow Bittern *Ixobrychus sinensis*		W	
Black Bittern *Dupetor flavicollis*		W	
Eastern Osprey *Pandion cristatus* (P)		C	
Imitator Goshawk *Accipiter imitator* (VU)	3/–	F	Lowlands and hills to at least 750 m. Rare and cryptic, few records.
Eastern Barn Owl *Tyto javanica*		O	
Moustached Kingfisher *Actenoides bougainvillei bougainvillei* (EN)	3/1	F	Lowlands and hills (mountains on Guadalcanal). Rare; <5 records since the Whitney South Sea Expedition, no records from northern Bougainville.
Beach Kingfisher *Todiramphus saurophagus*		C	
Little Kingfisher *Ceyx pusillus*	–/3	F	Mangroves and lowland forest near streams. Not uncommon but cryptic.
Oriental Hobby *Falco severus*		Fo	
Peregrine Falcon *Falco peregrinus*		Fo	Rare; <5 records.
Red-flanked Lorikeet *Charmosyna placentis*		Fo	Lowlands. Possibly locally fairly common.

ISSN-2513-9894 (Online)

Black-faced Pitta *Pitta anerythra pallida* (VU)	3/1	F	Lowlands and foothills. No Bougainville records since 1938; possibly extinct.
North Melanesian Cuckooshrike *Coracina welchmani bougainvillei*	3/1	F	Lowlands and hills. Rare.
Pacific Swallow *Hirundo tahitica*		O	
Australian Reed Warbler *Acrocephalus australis*		W	
Bougainville Thicketbird *Cincloramphus llaneae*	1/–	F	Only recorded from Crown Prince Range, above 1,200 m.
White-eyed Starling *Aplonis brunneicapillus* (VU)	3/–	Fo	Lowlands and hills to at least 900 m. Rare. Recently recorded in southern Emperor Range <4 km south of the Kunua Plains and Mount Balbi KBA.
Black-backed Thrush *Zoothera talaseae atrigena*	–/1	F	Only recorded from Crown Prince Range, *c*.1,500 m.

ISSN-2513-9894 (Online)