

Birds of the Araucaria Pine Plantations and Natural Forests near Bulolo, Papua New Guinea

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A comparison of birds found in natural and plantation *Araucaria* (Hoop and Klinkii Pine) forests in the Bulolo area of Papua New Guinea led to the conclusion that, within the plantations, certain major groups of birds were missing. This may be due to a lack of specialised niches for these birds. Maturation of the plantations may result in these niches becoming available.

In Australia, several studies have been made recently of birds in pine plantations, often in comparison with the birds found in nearby native forests (Davidson, 1976; Disney & Stokes, 1976; Gepp, 1976; Driscoll, 1977). In Papua New Guinea very few studies have been made in the various monoculture plantings throughout the country. Bell (1979) reported the effects of an exotic, Teak *Tectona grandis*, on birds of lowland rainforest near Port Moresby, Papua New Guinea. From April to December 1977 I carried out avian surveys in the *Araucaria* forests around Bulolo, Morobe Province, Papua New Guinea. These forests consist of Hoop Pine *Araucaria cunninghamii* and Klinkii Pine *A. hunsteinii*, occurring as natural and plantation forests. This paper reports the findings of surveys in both the natural and plantation forests, and discusses their implications.

Methods

Seven sites, including two in natural forest and five in plantations, were surveyed in the vicinity of Bulolo in the Morobe Province of Papua New Guinea. Although other natural forests of *Araucaria*, which might have been studied, exist in Papua New Guinea, Bulolo is the only area with extensive plantations. As well, it was possible, in the Bulolo area, to locate all study sites at an altitude of approximately 900 metres above sea level to avoid the species variation found at different elevations.

The area receives approximately 1 615 mm of rain annually (Table 1) and has an average temperature of 24.3°C with an average maximum and minimum of 30.0°C and 18.6°C respectively (Table 2).

TABLE 1

Rainfall (in mm.) for the Bulolo area (17 year period) recorded at Bulolo Forestry.

J	F	M	A	M	J	J	A	S	O	N	D	Year Total
134	144	156	150	123	81	97	97	123	139	162	198	1 615 mm

(McAlpine *et al.*, 1975)

TABLE 2

Temperature for the Bulolo area (5 year period) recorded at Forestry School

	J	F	M	A	M	J	J	A	S	O	N	D	Year Average
Mean Max. °C.	30.7	30.6	30.7	30.7	29.7	29.1	28.4	28.9	29.7	29.1	31.1	30.6	30.0°C
Mean Temp. °C.	24.8	24.8	24.9	24.5	24.3	23.8	23.4	23.4	24.1	24.4	24.8	25.0	24.3°C
Mean Min. °C.	18.8	18.9	19.1	18.2	18.8	18.4	18.3	17.9	18.4	18.8	18.4	19.4	18.6°C

(McAlpine *et al.* 1975)

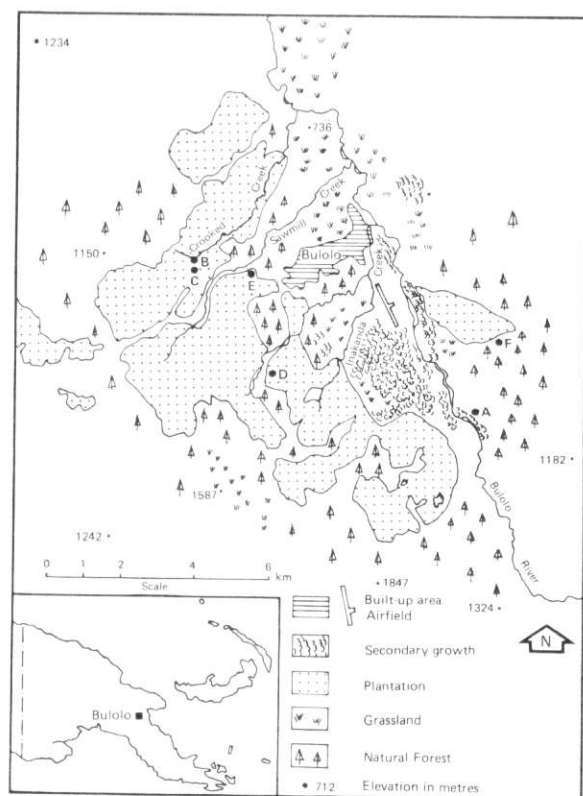
One of the natural forest sites (Site F, see Figure 1) was located in the Head's Hump Logging Area which is in the foothills to the west of Mount Misim. Webb *et al.* (1976) described the area variously as a "mixed mesophyll-notophyll vine forest" and "araucarian notophyll vine forest" containing, besides, *Araucaria* such genera as *Elaeocarpus*, *Elmerillia*, *Eugenia*,

Xanthophyllum, *Gnetum*, *Firmiana*, *Actinodaphne*, *Celtis*, *Flindersia*, *Hydriastele*, *Schuurmansia*, *Grevillea* and *Alphitonia*. The other natural forest site (Site G, Figure 1) was in McAdam National Park. The vegetation was essentially the same as found in the Head's Hump site. Although both species of *Araucaria* occur on these sites, *A. hunsteinii* is more abundant.

The plantation sites, on the other hand, contained only one pine species, *A. cunninghamii* (the one exception being the Stoney Creek site which had both species). The plantation sites varied in age from about one year old to 24 years old and included Stoney Creek Logging Area Compartment 1 (Site A), Crooked Creek Logging Area Compartments 12 and 9 (Sites B and C respectively), Inakanda Creek Logging Area Compartment 6 (Site D), and Sawmill Creek Logging area Compartment 1 (Site E) (See Table 4 for compartment ages; see Figure 1 for site locations).

All plantation sites had understorey vegetation, of varying diversity and density, within them. As estimated visually, the diversity of the understorey vegetation was usually related to the age of the compartment, there being greater diversity as the plantations matured. The density of the vegetation was more dependent on the spacing and closure of the stands, with greater density in the more open stands. The composition of this vegetation is summarised by plantation site, in Table 4.

The sites had had varying management practices applied to them. Stoney Creek and Crooked Creek 12 had been neither pruned nor thinned, Crooked Creek 9 and Inakanda Creek had been pruned but not thinned, while Sawmill Creek had been both pruned and thinned. I was unable to survey a fully mature, harvest-



● Figure 1: Map showing location of study area.

able plantation as none existed at the time. To the end of 1977, 6 148 hectares of *Araucaria* plantation had been established.

All sites were surveyed using mist nets. These were placed in fixed locations and run from approximately 06:00 hours to 18:00 hours each day for a four- or five-day period. The actual mist net-days (number of mist nets times the number of days run) in each site varied from 135 in natural forests to 40 at the Stoney Creek site. This variation was a combined result of time pressures and varying site complexities. Visual surveys, conducted by random walks through the sites, were carried out for all sites. In addition, A. Kairo of the Papua New Guinea Forestry College shot and collected specimens from the natural forests and most of the plantation sites. These specimens have been lodged at the Papua New Guinea Forestry College.

Aside from the birds actually caught in mist nets, birds were recorded (or shot) only if they were perching or feeding within the study sites. In other words, birds in flight were not recorded.

TABLE 3

Survey methods used during study

	Net days*	Other methods used	
		Sighting	Shooting
Natural <i>Araucaria</i>			
Heads Hump	88	✓	✓
McAdam National Park	36	—	—
Stoney Creek 1	40	—	—
Crooked Creek 12	80	—	✓
Crooked Creek 9	65	—	✓
Inakanda Creek 6	92	—	✓
Sawmill Creek 1	50	—	—

* A net-day refers to one net being run for one day. Five nets run for five days would give 25 net-days. Nets in all cases were run from sunrise to sunset. Most of the netting involved running from six to ten nets for a period of four to five consecutive days. During these times I also surveyed using binoculars at random spots in the survey area.

In "Other Methods Used", "Sighting" refers to times when I was not running mist nets. "Shooting" refers to times when a shooter went into these areas. His task was to try to bring back species which had not been otherwise identified in the survey area.

TABLE 4
Site Descriptions

- Stoney Creek 1:** 1-2 years old. 29.6 hectares.
Araucaria cunninghamii and *hunsteinii* are planted here. Other vegetation were mainly grasses and some *Leuceana* spp.
- Crooked Creek 12:** 10 years old. 123.9 hectares.
A. cunninghamii only planted here. Regrowth in this site included gingers and some Leguminosae species (T. Sapan, pers. comm.).
- Crooked Creek 9:** 14 years old. 42.4 hectares.
A. cunninghamii only planted here. Basically the same species as Crooked Creek 12 but of greater density and size (T. Sapan, pers. comm.).
- Inakanda Creek 6:** 19 years old. 54.3 hectares.
A. cunninghamii only planted here. Denser regrowth, than in the previous three compartments, consisting of vines, gingers *Dendrocnide* spp., *Euodia* spp., *Macaranga* spp., and *Eupometia* spp. (T. Sapan, pers. comm.).
- Sawmill Creek 1:** 24 years old. 66.8 hectares.
A. cunninghamii only planted here. Ginger regrowth is very abundant while creepers and grasses are abundant and bracken is plentiful in clearings beside the road. *Musa* spp., *Papaya* spp., *Piper* spp., *Myristica* spp., *Euphorbia* spp., *Pipturus* spp., and *Rhus titeensis* are relatively common. There was also some *Leuceana* spp., *Ficus* spp., and *Palmae* spp. (W. Nangi, pers. comm.).

Compartment sizes and ages are taken from Department of Forests' file number 101-1-9 (Compartment Histories, Policy, Instruction — Bulolo area).

Results

As a result of the surveys, a total of 50 species of birds were identified. In the natural forests, 40 different species were seen. From the entire range of plantation sites, 24 different species were identified. Of all the plantation sites, the 19 year old Inakanda Creek site had the greatest number of species (18). Fourteen species were common to the natural forests and one of more plantation sites.

TABLE 5. Bird species by site.

BIRDS	STUDY SITES					
	Stoney Creek 1 1-2 yrs	Crooked Creek 12 10 yrs	Crooked Creek 9 14 yrs.	Inakanda Creek 6 19 years	Sawmill Creek 1 24 yrs.	Natural <i>Araucaria</i>
Superb Fruit Dove (Purple-crowned Pigeon) <i>Ptilinopus superbus</i>						•
Ornate Fruit Dove <i>Ptilinopus ornatus</i>						•
Pink Spotted Fruit Dove <i>Ptilinopus perlatus</i>						•
Magnificent Fruit Dove (Wompoo Pigeon) <i>Megaloprepia magnifica</i>						•
Zoe Imperial Pigeon <i>Ducula zoeae</i>						•
Amboina Cuckoo-dove (Brown Pigeon) <i>Macropygia amboinensis</i>						•
Magnificent Ground Pigeon <i>Otidiphaps nobilis</i>						•
Rainbow Lory (Rainbow Lorikeet) <i>Trichoglossus haematodus</i>				•	•	•
Papuan King Parrot <i>Alisterus chloropterus</i>				•		•
Grey-breasted Brush Cuckoo <i>Cacomantis variolosus</i>				•	•	•
Chestnut-breasted Brush Cuckoo <i>C. castaneiventris</i>					•	•
Common Coucal (Pheasant Coucal) <i>Centropus phasianinus</i>	•					•
Sooty Owl <i>Tyto tenebricosa</i>						•
Dwarf Kingfisher <i>Ceyx lepidus</i>				•		•
Hook-billed Kingfisher <i>Melidora macrorrhina</i>				•		•
Shovel-billed Kingfisher <i>Clytoceyx rex</i>				•		•
Rainbow Bee-eater <i>Merops ornatus</i>				•		•
Broad-billed Roller (Dollarbird) <i>Eurystomus orientalis</i>			•			•
Stout-billed Greybird <i>Coracina caeruleogrisea</i>				•		•
Papuan Greybird (White-bellied Cuckoo-Shrike) <i>Coracina papuensis</i>				•		•
Lesser New Guinea Thrush <i>Amalocichla incerta</i>						•
Pale-billed Sericornis <i>Sericornis spilodera</i>						•
Lowland Mouse-babbler <i>Crateroscelis murina</i>						•
Mountain Peltops Flycatcher <i>Peltops montanus</i>						•
Chestnut-bellied Fantail <i>Rhipidura hyperythra</i>						•
White-throated Fantail (Northern Fantail) <i>Rhipidura rufiventris</i>				•		•
Black & White Monarch Flycatcher <i>Monarcha manadensis</i>						•
Spot-wing Monarch Flycatcher <i>M. guttula</i>						•
Friiled Monarch Flycatcher <i>Arses telescopthalmus</i>		•				•
Yellow-footed Microeca Flycatcher <i>Microeca griseiceps</i>						•
Olive Microeca Flycatcher <i>Microeca flavovirescens</i>						•
Black & White Flycatcher <i>Poecilodryas hypoleuca</i>						•
White-rumped Thicket-flycatcher <i>Peneothello bimaculatus</i>						•
Grey-headed Whistler <i>Pachycephala griseiceps</i>						•
Brown Shrike-flycatcher (Rufous Shrike-thrush) <i>Myiolestes megarhynchus</i>		•		•		•
Black-headed Pitohui <i>Pitohui dichrous</i>				•		•
Brown Oriole <i>Oriolus szalayi</i>		•		•		•
Black-headed Butcherbird <i>Cracticus cassicus</i>		•		•		•
Spangled Drongo <i>Dicrurus hottentottus</i>				•	•	•
Raggiana Bird of Paradise <i>Paradisaea raggiana</i>	•			•	•	•
White-eared Catbird <i>Ailuroedus buccoides</i>				•		•
Yellow-bellied Sunbird <i>Nectarinia jugularis</i>	•				•	•
Grey-bellied Longbill <i>Toxorhamphus iliolophus</i>					•	•
Slaty-chinned Longbill <i>T. poliopterus</i>						•
Long-billed Honeyeater <i>Melilestes megarhynchus</i>					•	•
Brown Xanthotis (Tawny-breasted Honeyeater) <i>Xanthotis chrysotis</i>				•		•
Puff-backed Meliphaga <i>Meliphaga aruensis</i>				•		•
White-eared Mountain Meliphaga <i>M. montana</i>				•	•	•
Berrypecker <i>Melanochoris sp.</i>				•		•
Streak-headed Mannikin <i>Lonchura tristissima</i>						•

Names follow Rand and Gilliard with Australian names in parentheses.

Table 5 summarizes the finding of the survey by listing all birds seen and indicating the site in which they were located.

Discussion

As with other studies (Davidson, 1976; Disney and Stokes, 1976; Gepp, 1976; Driscoll, 1977; Bell, 1979), this study showed a certain depauperization of bird species in the plantation sites, even when these were taken as a whole and with the realization that many species in the natural forests had not been recorded.

The major groups completely or almost completely missing from the plantations were the pigeons and flycatchers. It seemed entirely feasible that the pigeons should be missing as the plantations were not rich in the fruit required by these birds. However, the absence of flycatchers was not so easily explained, especially as an analysis of stomach contents of birds taken from plantation habitats showed the birds to be almost exclusively insectivorous. (Lamothe, 1979). In his study of Teak plantations, Bell (1979) felt that the absence of an understorey and subcanopy explained the loss of small insectivores. This may also be the case for the Bulolo *Araucaria* plantations. If it is, one would expect to find at least some of these small insectivores in the plantations at near harvesting age when the undergrowth should be abundant and the existing other vegetation much taller. It must be remembered that *Araucaria* is native to this country and this particular area.

The apparent anomaly of the Sawmill Creek site (24 years old) having fewer bird species than the Inakanda Creek site (19 years old) may be explained by the fact that Inakanda was surveyed more intensively than Sawmill (Table 3), and was also covered by the shooter whereas Sawmill was not.

In order to explain the apparent anomaly of Sawmill Creek, to test the expected colonization of mature plantations by small insectivores, and to complete the list of birds found in the forests, the studies need to be continued. These must be carried out at periodic intervals in order to assess the effect of vegetation diversity and maturity in the plantation. Also, the bird populations should be quantified to expand the comparison between natural and plantation *Araucaria* forests.

Acknowledgements

This study was undertaken while I was on staff at the Papua New Guinea Forestry College, Bulolo, Papua New Guinea. Without the encouragement and friendship of Harry Bell the paper would not have been written.

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