

The conservation status of forest birds on Flores and Sumbawa, Indonesia

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Summary

Forest birds were surveyed on the islands of Flores and Sumbawa, Indonesia, in July–September 1993. Assessments were made of the conservation status and habitat requirements of the restricted-range, threatened, and near-threatened species. Semi-evergreen rainforest was found to be more important than moist deciduous monsoon forest for the conservation of these species, but such habitat is being rapidly degraded at mid-altitudes and in the lowlands. Moist deciduous monsoon forest is still widespread in the lowlands but it is also being degraded by human activities. Only one significant protected area exists in the region: Taman Nasional Komodo. This harbours an important population of Yellow-crested Cockatoo *Cacatua sulphurea* but it is too dry to support any semi-evergreen rainforest. Ten of the 24 restricted-range species found on these islands are of particular conservation importance mainly because of combinations of intolerance of degraded habitat, dependence on semi-evergreen rainforest, restriction to the lowlands, and low population densities. The highest priority species are Flores Monarch *Monarcha sacerdotum* and Wallace's Hanging-parrot *Loriculus flosculus*, which were only found in semi-evergreen rainforest at about 450–950 m at one site in the Tanjung Kerita Mese proposed protected area in south-west Flores. Effective protection of this site is urgently required in order to help secure the future of these species. Recommendations are presented for the protection of further areas on Flores and Sumbawa.

Introduction

ICBP (1992) identified north Nusa Tenggara (Flores, Sumbawa and the associated smaller islands from Lombok to Alor) as a centre of endemism, termed an Endemic Bird Area (EBA E15). Twenty-five restricted-range bird species are found on Flores and Sumbawa, of which 17 are endemic to the EBA, including the monotypic genus *Caridonax* (Stattersfield *et al.* in prep.; Sujatnika *et al.* 1995). These restricted-range species include three listed as threatened and five listed as near-threatened in Collar *et al.* (1994). In addition, one threatened and four near-threatened more widespread species are found on Flores and Sumbawa. Given such high numbers of restricted-range birds, and the threats which they are facing on these islands, this EBA was given the highest listing ("critical") for conservation priority (ICBP 1992).

Of particular conservation importance are the three threatened species (as categorized in Collar *et al.* 1994) which are restricted to forest on the island of

Flores: Wallace's Hanging-parrot *Loriculus flosculus* (Vulnerable), Flores Monarch *Monarcha sacerdotum* (Endangered), and Flores Crow *Corvus florensis* (Vulnerable).

The provinces of Nusa Tenggara have been extensively deforested. The natural vegetation is predominantly moist deciduous monsoon forest with semi-evergreen rainforest in the wetter areas (Whitmore 1984). However, forest clearance and the burning of forests in the dry season have had a major impact on the vegetation (FAO 1982). The most recent data available (from a government survey of land-use carried out in 1985–1989; RePPPProt 1990) indicate that semi-evergreen rainforest covered only 18% of west Nusa Tenggara (Lombok to Sumbawa) and 3.7% of east Nusa Tenggara (Flores to Timor).

The Cambridge Flores/Sumbawa Conservation Project 1993, a student expedition, surveyed forest at six sites on Flores and four sites on Sumbawa in July–September 1993. We assessed the conservation status and habitat requirements of “restricted-range” bird species (defined as those with global ranges estimated to cover <50,000 km² by ICBP 1992 and Stattersfield *et al.* in prep.) and those considered threatened and near-threatened (Collar *et al.* 1994), and summarize the results here.

Ornithological fieldwork on Flores and Sumbawa

The birds of these islands, particularly Flores, were fairly extensively collected in the nineteenth century and the early part of the twentieth century. White and Bruce (1986) list eleven collections made between 1821 and 1896 (with important contributions being made by Wallace in 1856–1863, Doherty in 1887–1898, and Everett in 1895–1896). A further six collections are listed for the period up to 1930, and one by Pfeffer in 1956.

Two missionaries made anecdotal bird observations on Flores during the latter half of this century: Verheijen from 1946 and Schmutz from 1968, both of whom left in the early 1980s. In the 1980s and 1990s, a number of ornithologists visited the islands, but most visited only a limited number of well-known sites, and comprehensive searches for the endemic species were not made prior to our observations in 1993 (Butchart *et al.* 1993). Table 1 gives the sites, habitats (following Whitmore 1984), and altitudes at which we carried out fieldwork, the effort at each site and the dates of fieldwork. The locations of the sites are shown in Figure 1.

Methods

General field observations were used as the primary bird survey method at each study site. Quantitative surveys were carried out using the variable circular-plot technique (Reynolds *et al.* 1980) at sites S1a and F1a in order to calculate bird population densities, and results were discussed in Butchart (1993). For nocturnal observations Petzl headlamps and a Nitech X-cell spotlight were used. All records were logged systematically, and species were categorized as abundant (recorded regularly in large numbers), common (recorded regularly in moderate numbers), frequent (recorded regularly in small numbers), uncommon (recorded occasionally in small numbers) or rare (recorded on very

Table 1. Summary of fieldwork at study sites

Site	Dates	Habitat ^a	Altitude (m)	Field-hours ^b	Mist-net hours ^c	
S1	Selah Legium					
S1a	Batu Hijau	28 Jul–9 Aug	1	200–700	286	888
S1b	RF2	3 Aug–6 Aug	1,2	200–350	48	–
S1c	Babar	6 Aug–8 Aug	2,5	20–100	37	–
S2	Gunung Olet Sangenges					
S2a	Lowland forest	11 Aug–19 Aug	1	50–550	47	479
S2b	Lower montane forest	11 Aug–19 Aug	3	550–1,000	51	–
S2c	Upper montane forest	11 Aug–19 Aug	4	1,000–1,850	36	–
F1	Tanjung Kerita Mese					
F1a	Mata Wae Ndeo	23 Aug–2 Sep	1	350–1,100	245	495
F1b	Kampung Langka	30 Aug–2 Sep	6,2	300–350	38	45
F2	Taman Nasional Komodo	4 Sep–5 Sep	2	0–100	11	–
F3	Gunung Repok	7 Sep–11 Sep	4	1,100–1,700	81	545
F4	Poco Ranaka	21 Aug–22 Aug + 12 Sep–13 Sep	4,6	1,180–2,140	32	–
F5	Nanga Rawa	14 Sep–17 Sep	2,5,1	0–500	103	–
F6	Pulau Besar	19 Sep	2,5,6	0–800	25	–

^a1, Lowland semi-evergreen rainforest; 2, moist deciduous monsoon forest; 3, lower montane forest; 4, upper montane forest; 5, dry thorn scrub; 6, secondary scrub.

^bOne field-hour is defined as one hour of field observations carried out by a single person, or group of people operating together.

^cOne mist-net hour is defined as the operation of a single 18-m four-panel mist-net for one hour.

few occasions). While these are subjective and relative terms, they provide some indication of the frequency with which species were recorded during fieldwork at different sites. Sound recordings were made of 42 species using a Sony Professional Walkman and a Sennheiser ME340 directional microphone, and these have been deposited in the Wildlife Section, British Library National Sound Archive. Mist-netting was conducted at five sites using 180 m of four-panel nets, and standard biometrics (age, sex, weight, wing, tarsus and bill), detailed descriptions and photographs were taken of all birds before release.

Altitudes were measured using a Thommen Classic pocket altimeter. Basic vegetative descriptions were recorded by estimating percentage cover for the canopy, mid-storey and herb-layer, canopy height, average and maximum diameter at breast height, and gradient. The abundance of identifiable species, genera and plant types were estimated as abundant, common, frequent, uncommon or rare. Forest types (e.g. semi-evergreen rainforest, moist deciduous monsoon forest etc.) were identified with reference to Whitmore (1984). The term semi-evergreen rainforest is used to encompass montane forest, unless prefixed by ‘lowland’.

Description of sites

Sumbawa

Sumbawa is a mountainous island, about 270 km by 90 km, located between Lombok and Flores in Nusa Tenggara (Figure 1). The two major upland areas

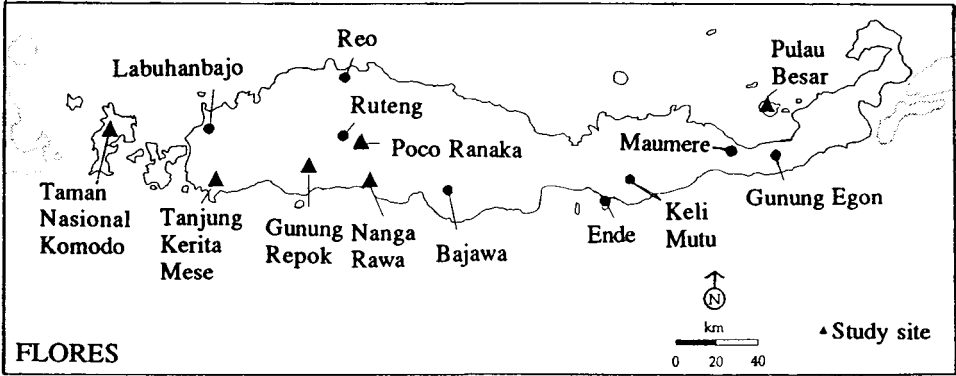
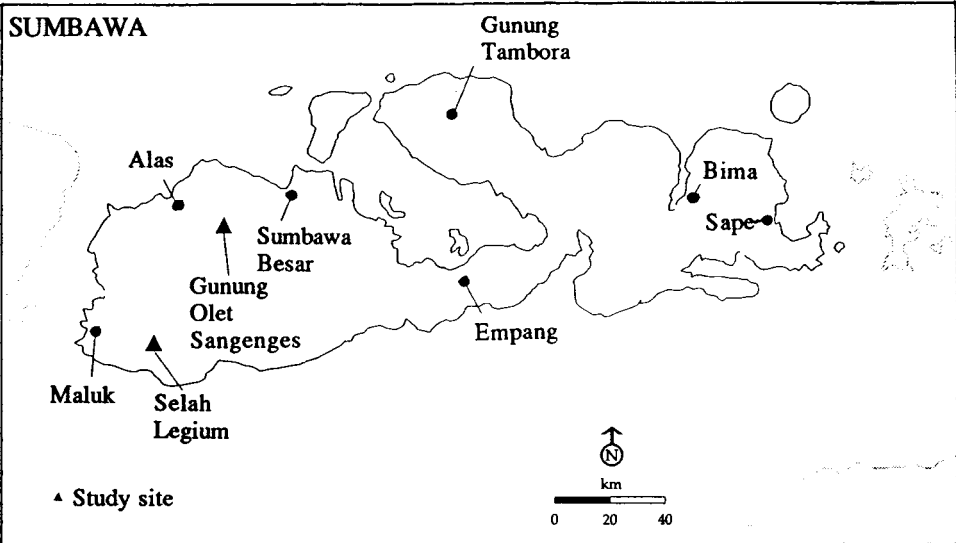
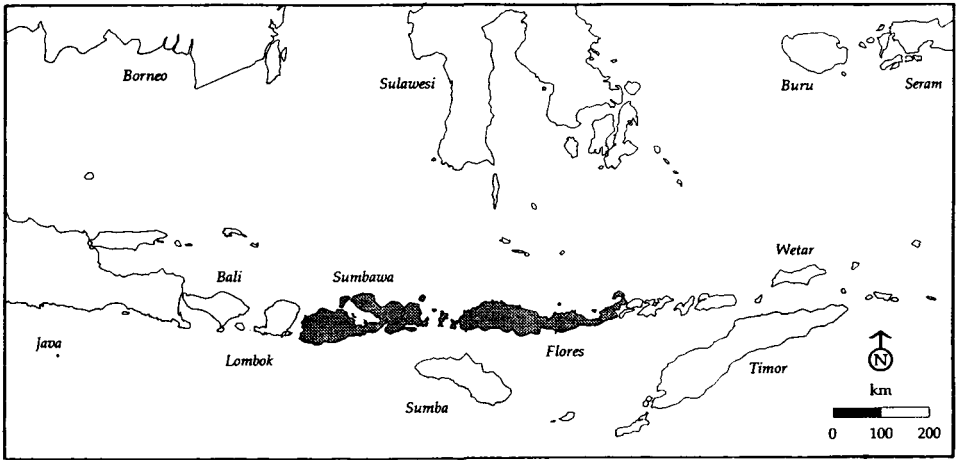


Figure 1. Maps of Sumbawa and Flores showing location of study sites.

are the Gunung Tambora massif in north-central Sumbawa (which erupted in 1815 destroying most of the vegetation on the island; FAO 1981) and the Gunung Olet Sangenges range in the north-west of the island.

Sumbawa has only three formally gazetted protected areas: Pulau Moyo (an island off north Sumbawa which is designated as a hunting reserve), Tambora Selatan (a hunting reserve in north Sumbawa), and Tanah Pedauh (a turtle-nesting beach in south-west Sumbawa which is threatened by a road project). As hunting reserves are not managed for nature conservation, there are no areas with effective forest protection in Sumbawa (Jepson and Monk 1993). The National Conservation Plan (FAO 1982) proposed four reserves with areas greater than 15,000 ha: Gunung Olet Sangenges (which was regarded as the highest priority area in west Nusa Tenggara; 35,000 ha, 200–1,930 m), Selah Legium (c. 50,000 ha, 0–1,200 m), Gunung Tambora (80,000 ha, 1,000–2,821 m), and Pulau Sangiang (an island of 16,000 ha, 0–1,900 m). We surveyed four areas within the first two proposed protected areas; the locations of these sites are shown in Figure 1.

Site S1: Selah Legium (= Selalu Legini) Status: Proposed suaka margasatwa (wildlife reserve), presently hutan lindung (protection forest).

We surveyed three sites in this area of extensive lowland semi-evergreen rainforest and moist deciduous monsoon forest in south-west Sumbawa: Batu Hijau (S1a; 9°00'S 116°55'E), RF2 (S1b; 8°55'S 117°00'E) and Babar (9°03'S 117°05'E). Batu Hijau is located in an area of heavily dissected terrain with ridge-tops at about 600–850 m and lies 15 km from the west coast of Sumbawa and 10 km from the south coast. The area has a high rainfall, and supports semi-evergreen rainforest with a low percentage of deciduous trees. Fairly flat streamside forest has a canopy height of 30–35 m and 20–30% herb-layer cover. Slope forest appears to have a lower plant species diversity, and a denser understorey (40–50% herb-layer cover). Ridge-tops support more stunted forest (canopy height 20 m) with even denser understorey (60% herb-layer cover). Observations from a helicopter showed a large area of intact forest to the south and east of Batu Hijau.

The mining company PT Newmont has been granted a mining exploration licence for the area, and have set up a base camp (Air Merah) in a river valley about 1.5 km north-west of Batu Hijau, at 200 m altitude. Batu Hijau is a satellite camp situated at 600 m on a ridge-top. There are numerous trails, helipads, and drill-clearings in the area, and a large open-cast mine is proposed at Batu Hijau. This, and the associated reservoir complex which is currently being considered, would destroy much of the forest in the area and further downstream.

RF2 is a meteorological station with a helipad located at 200–350 m in an area of steeply ridged terrain. At the higher altitudes the forest is semi-evergreen with a canopy at 20 m, emergents to 40 m, a dense understorey, and rattan, bamboo, and palms are common. Seasonally flooded gallery forest occurring at the confluence of two valleys is characterized by a high proportion (75%) of deciduous trees, a low canopy (15 m), and an open understorey. An area of riverine forest, dominated by *Duabanga moluccensis*, with a canopy height of 40 m and a dense understorey, lies further downstream. It appears that little disturbance or hunting occurs.

Site S1c, located to the south-east of Batu Hijau, is a fairly flat area of moist deciduous monsoon forest, degraded forest, dry thorn-scrub and grassland inland of Babar village on the south coast of Sumbawa at an altitude of 20–100 m. The forest is mainly deciduous, with a canopy height of 12–15 m, emergent evergreen trees including many figs, and a dense mid-storey and understorey. Riverine forest extending about 20 m either side of the river is less deciduous and has a higher canopy (35 m). There are large areas of thorny thickets indicating extensive abandoned cultivation.

Site S2: Gunung Olet Sangenges (= Puncak Ngenges) Status: Proposed suaka margasatwa (wildlife reserve), presently hutan lindung (protection forest).

This mountain range in western Sumbawa has the highest altitudes on the island apart from the Gunung Tambora massif. The peak of Puncak Ngenges (1,850 m) is located at 8°32'S 117°07'E and was accessed from the village of Marente at an altitude of 50 m, 3 km from the town of Alas. Most of the fieldwork was conducted on Aipok ridge from an altitude of 550 m, about 5 km from Marente.

Gunung Olet Sangenges is an area of steep, rocky ridges with narrow ridge-tops, dissected by several rivers which are flanked by areas of gentler gradients. Three distinct habitat types are found in this area: lowland forest below 550 m (S2a), lower montane forest at 550–1,000 m (S2b) and upper montane forest above 1,000 m (S2c). Much of the lowland forest has been logged (the area was under logging concession until 1990), but some tall trees (40 m high) still exist in the flat valleys. Where logged, there is an extensive understorey of rattan and bamboo. Below 100 m and around Marente the forest has been completely cleared or logged, leaving secondary scrub with some stands of tall trees. Logging has extended to 900 m in parts of the lower montane forest, but this has been restricted to the gentler slopes. Secondary growth occurs on streamsides, tree-fall areas and old logging tracks. Upper montane forest is entirely primary; it has a lower diversity of tree species, and supports some *Casuarina* sp. trees. Occasional flatter areas have much taller trees and a forest composition similar to that characterized as lower montane forest.

Gunung Olet Sangenges is an important water catchment area for agriculture at lower altitudes; it is classified as *hutan lindung* mainly for hydrological reasons. Local villagers collect firewood, timber and rattan up to 1,400 m, and hunt animals such as deer and snakes.

Flores

Flores is a rugged mountainous island about 350 km by 75 km, located east of Sumbawa and north-west of Timor in Nusa Tenggara (Figure 1). There is an extensive mountain range around the town of Ruteng in west Flores, and isolated volcanic peaks occur further east. Forest ranges from semi-evergreen rainforest to deciduous monsoon forest, though little semi-evergreen rainforest remains below 1,000 m.

Nusa Tenggara's only national park, Komodo, lies off western Flores. However, no areas of significance for the conservation of the endemic avifauna of Flores have been adequately protected yet. FAO (1982) listed three sites on

Flores with areas greater than 15,000 ha as proposed protected areas: Egon-Iliwuli (c. 15,000 ha, 500–1,700 m, east Flores), Ruteng (c. 30,000 ha, 900–2,400 m, west Flores), and Tanjung Kerita Mese (c. 15,000 ha, 0–1,000 m, south-west Flores). We visited sites in these last two proposed protected areas, two islands off Flores (Komodo and Pulau Besar), and two other sites on the island (Figure 1).

Site F1: Tanjung Kerita Mese Status: Proposed *suaka margasatwa* (wildlife reserve) of c. 15,000 ha at 0–1,000 m. Presently classified as *hutan lindung* (protection forest).

Mata Wae Ndeo (F1a) is an area of mid-elevation forest adjacent to Paku, west Flores (8°40'S 119°55'E). Paku is 13 km from the larger village of Werang. We carried out fieldwork at 350–1,100 m (mostly at 700–900 m) on a ridge running inland from the south coast of Flores, which peaked at 1,300 m.

The forest is semi-evergreen with a few deciduous emergents, but becomes increasingly deciduous along the ridge to the east and on flatter land off the main ridge. Canopy height is 35–40 m, with the tallest trees including many fig trees. The forest floor is rocky, with a 20–30% herb-layer cover. Collection of *garu*, an aromatic wood (possibly *Dysoxylum* sp., K. Monk *in litt.* 1993) is a major source of income for villagers in the area. *Garu* trees occur most commonly in lowland and lower montane forest, where most of the larger and more valuable trees have already been extracted. There is also a significant level of other timber removal, and villagers hunt animals such as deer and pigeons.

The small village of Kampung Langka (F1b) is one of seven which comprise Dusun Paku in south-west Flores. It is on the cleared plain at the base of the forested Mata Wae Ndeo ridge at an altitude of 350 m, and can only be accessed by foot over steep mountain ridges. Agricultural land and secondary scrub surround the village, and were surveyed from 300 m to 350 m. Secondary scrub gives way to less degraded forest a short way up the adjacent ridge. South to the village of Sesok, forest is more degraded and more deciduous, with only small areas of primary forest remaining on the tops of ridges. To the south-west of the study area a cultivated plain surrounds the other villages comprising Dusun Paku.

Site F2: Taman Nasional Komodo Status: *Taman Nasional* (national park).

Taman Nasional Komodo (8°35'S 119°30'E) consists of Komodo and adjacent islands located between Flores and Sumbawa. It covers a land area of 55,600 ha and an altitudinal range of 0–735 m. Kampung Komodo, south of the park headquarters at Loh Liang on the east side of Komodo, is the only village on the island. We carried out fieldwork at an altitude of 0–100 m around Loh Liang. The topography is rugged and volcanic, with a chain of peaks (averaging 500–600 m) running along the north-south axis of the island, though the coastal region which was surveyed is relatively flat. The island is predominantly grassy with moist deciduous monsoon forest in gullies and valleys. A *suaka margasatwa* (wildlife reserve) since 1965, the area was gazetted as a national park in 1980, primarily to protect the Komodo dragon *Varanus komodoensis*, which numbers about 3,000 in the park. The area of the national park headquarters is visited by large numbers of tourists and appears to be well-protected. Park guards

reported that the rest of the park suffers from trapping of Yellow-crested Cockatoos *Cacatua sulphurea*.

Site F3: Gunung Repok Status: *Hutan lindung* (protection forest).

Gunung Repok (8°44'S 120°21'E) is a mountain peaking at 1,912 m located near Ruteng, west Flores, which can be accessed from Kampung Repok at 1,050 m. We carried out fieldwork at 1,150–1,700 m, although mainly below 1,300 m. The slopes of Gunung Repok are extremely steep, and natural landslides are a common feature on the mountain. Montane forest with some tall trees reaching 35 m occurs at lower altitudes, and gives way to stunted upper montane forest with a lower canopy height and denser understorey at about 1,500 m. Forest has largely been cleared up to 1,200–1,500 m on Gunung Repok and adjacent peaks. Below these altitudes forest only remains in small patches in steep river valleys. Most trails are overgrown and probably used infrequently, but villagers take firewood and timber from the forest.

Site F4: Poco Ranaka Status: *Cagar alam* (nature reserve) since 1979. This site is in the process of being redesignated as a *taman wisata* (recreation park).

Poco Ranaka (8°38'S 120°33'E) is an active volcano, and at 2,140 m it is the second highest peak on Flores. It erupted in 1987, adding a new, barren volcanic peak, and destroying some forest below. There is a transmitter station at the peak, abandoned in 1992, and a surfaced road leads 9 km down to the main road at Kampung Robo, at 1,180 m. We carried out fieldwork along the road from 1,180 m to 2,140 m. Montane forest on the lower slopes has been heavily degraded to grassland and scrub. Some *Casuarina* sp. trees occur at 1,600–1,800 m, and above 2,000 m the forest becomes more stunted. Villagers from Kampung Robo collect timber for construction and firewood from the lower slopes, and also hunt pigeons. There is a limited amount of recreational use, with tourists visiting the mountain for the impressive views.

Site F5: Nanga Rawa Status: Unprotected. Forest on nearby Poco Ndeki is classified as *hutan lindung* (protection forest).

Nanga Rawa (8°50'S 120°40'E) is a coastal village of about 900 people in an area of rolling hills in south Flores. It is 12 km from Kisol, a village on the main trans-Flores road. The area has a number of unsurfaced tracks. Poco Ndeki is the highest mountain in the area at 872 m, and is located about 2 km from Kisol. The natural vegetation in the area is moist deciduous monsoon forest. This has been extensively cleared for grazing and cultivation, and degraded to dry thorn-scrub. Many recently cleared areas were observed. There are areas of semi-evergreen forest along watercourses, and a small area of mangroves on the coast. Most grassland is found below 200 m and is maintained by grazing and burning. There are coconut plantations and areas of large fruiting trees, including figs, around the village. Villagers hunt pigs and deer, and birds are hunted with snares and catapults.

Site F6: Pulau Besar Status: The island is designated as *taman wisata* (tourist park), primarily for diving on the island's coral reefs. Conservation of forest is

not seen as a priority, other than to prevent erosion and thus silting of the reefs.

Pulau Besar (8°27'S 122°23'E) is an island of about 5,000 ha off the north-east coast of Flores, about 25 km from Maumere. There are six villages on the island, with additional houses scattered around the coast. The highest point on the island is a peak at 939 m. A major earthquake in December 1992 caused landslides on the mountain peaks, and severely damaged coastal settlements. The island retains forest on most of the interior and steep slopes, with cultivation and secondary growth around much of the coast. There are areas of degraded mangroves on the coast and small patches of beach forest, with deciduous monsoon forest inland becoming more moist in gullies and above about 300 m. Although predominantly deciduous, the forest contains a few evergreen fruiting trees, such as *Tamarindus indica* and fig trees. The main industry on the island is fishing (for fish and lobsters) and collection of sea-grass for export.

Results and discussion

We recorded a total of 179 species on Sumbawa and Flores. We found twenty-five restricted-range species (including three threatened and four near-threatened species), one widespread threatened species, and four widespread near-threatened species. On Sumbawa we recorded 121 species including 20 restricted-range, one threatened and eight near-threatened species (Johnstone *et al.* in prep.). On Flores we recorded 162 species including 25 restricted-range, four threatened and eight near-threatened species.

Nomenclature is based on Collar *et al.* (1994) and Andrew (1992); taxonomy and distribution follow White and Bruce (1986). International Union for Conservation of Nature and Natural Resources (IUCN) threatened category codes are defined in Collar *et al.* (1994). Habitat preferences are based on Stattersfield *et al.* (in prep.) and our own observations. Sites are numbered as in Table 1.

Threatened species

Yellow-crested Cockatoo *Cacatua sulphurea*

Status, distribution and habitat Endangered (IUCN threatened category codes: A1b; A1c; A2b, A2c). Endemic to Wallacea; known from Sulawesi, Lombok, Sumbawa, Komodo, Rinca, Flores, Timor, Sumba and a number of smaller islands. Moist deciduous monsoon forest, mainly lowland; 0–1,200 m.

Taxonomy There are three subspecies, with *C. s. parvula* endemic to Lombok, Sumbawa, Komodo, Flores, Alor and adjacent smaller islands.

Project records S1b: Rare (250 m), F2: Frequent (0–100 m), F5: Rare (10 m). This extremely rare parrot was found at three sites at 0–250 m, but in healthy numbers only on Komodo (F2). A single pair was observed at S1b on 5 August, calling loudly (a deep, raucous squawking) as they went to roost in a stand of tall riverine forest dominated by *Duabanga moluccensis* located in an area of

semi-evergreen rainforest at 250 m. A single silent bird was briefly observed the next morning. The species was found to be still fairly common in coastal deciduous forest and thorn-scrub in Taman Nasional Komodo (F2), because of the protection afforded by the park. Flocks of up to 20 birds were recorded in the late afternoon of 4 September and early the following morning. The single record on Flores was of three birds in degraded moist deciduous monsoon forest at Nanga Rawa village (F5) at 10 m.

Birds were locally reported at S2a (until about 10 years ago), F1b (as a seasonal visitor which raided maize fields in December and January), F5 and F6 (until recently), but numbers at these sites were said to have declined over the last few years.

Discussion On Flores, this species has recently been recorded at F5 (Buck 1988; S. Smith *in litt.* 1993; B. F. King verbally 1993). On Sumbawa, Gibbs (1990) recorded one at Empang. This cockatoo has suffered a dramatic population crash in the last few decades through a combination of persecution for the cage-bird trade and habitat destruction (Collar *et al.* 1994). Once common throughout Nusa Tenggara and Sulawesi, it is now a very scarce bird. It may already be beyond recovery in Sulawesi (Andrew and Holmes 1990), and must be close to extinction on Flores and Sumbawa.

Conservation status Although the Komodo population seems relatively safe, it is small and its long-term viability is questionable. In addition, park guards reported trapping of this species in remote parts of the national park away from the well-guarded headquarters area. Effective prevention of all trapping on Komodo and elsewhere is essential for the conservation for this species.

Wallace's Hanging-parrot *Loriculus flosculus*

Status, distribution and habitat Vulnerable (IUCN threatened category codes: B1; B2c; C1; C2a). Endemic to Flores. Very local in primary semi-evergreen rainforest with fig trees; 450–1,000 m, but rare below 850 m.

Project records F1a: Common (450–980 m, rare below 850 m). This poorly known Flores endemic was recorded from 450–980 m in primary semi-evergreen rainforest at one site (F1a). The majority of records were in a narrow altitudinal band from 850–980 m, particularly around a number of large fig trees at this altitude. The species appeared to be rare below 850 m.

Flocks of up to 20 birds (usually 2–10) were observed feeding in fruiting fig trees (locally named *kawol*). Birds were less often noted feeding in other tree species, on sprigs of berries, flowers and buds. Birds were always observed in the canopy and subcanopy to a minimum height of about 10 m, or flying above the canopy.

The plumage was as described by Forshaw (1989) except that red staining of the tail tips was not noted (these tips appeared pale yellow rather than pale green), and sexual dimorphism in iris colour was not seen. The source of this information on differences in iris colour is given as "Wallace" by Forshaw (1989), but only one specimen is known to have been collected (Wallace 1863).

The juvenile plumage is undescribed: one bird seen on 26 August had a small red throat patch, a duller bill and much duller legs than the adult feeding it. Other birds had red throat patches of variable size, sometimes with no visible red, as described for females by Forshaw (1989). However, the source of this information is not given, and the variability might also be an age-related feature.

Calls have not previously been described. Birds were noted calling continuously in flight and whilst feeding. The flight call, a sharp, screeching "strrt strrt" was louder and lower pitched than the call given when perched, which was more reminiscent of a flowerpecker *Dicaeum* sp. One observation was made of a bird giving a display flight, weaving in and out of the canopy giving a slightly hoarse "chi-chi-chi-chi-chi" call. Birds were regularly seen drooping and flicking wings, or wing-shivering, highlighting the red rump and uppertail coverts.

Using the variable circular-plot method, the population density at F1a was estimated to be 9.9 ± 1.6 birds per hectare (see Butchart 1993 for discussion).

Discussion This species was described by Forshaw (1989) as "a mysterious bird about which almost nothing seems to be known". It is known only from the type specimen (collected by Wallace's assistant, Allen, and described in 1863), a sighting by Schmutz in "cloudforest" (= semi-evergreen rainforest) at Paku (F1) at 1,035 m in May 1978 (Schmutz 1978) and at lower elevations elsewhere (Forshaw 1989), and by Verhoeve (undated) in "tall undisturbed forest" rich in columbids and parrots at 1,000 m on Gunung Egon in east Flores in June 1987. A number of collectors and recent observers have failed to find the bird or reports of its existence, and Verheijen (*in litt.* to Forshaw 1989) stated that it was not known by locals, suggesting that it is very localised and/or rare. Subsequent to our records, a small flock numbering at least six birds of this species was found on 4 November 1994 at about 600 m in a narrow corridor of semi-evergreen rainforest 29 km east of Labuhanbajo along the road to Ruteng in west Flores (F. R. Lambert verbally 1994).

All our records were of birds in the canopy or subcanopy, but Schmutz's sighting at Paku was of a bird perched just 2.5 m above the ground suggesting that they may rarely feed in the mid-storey. At F1 the distribution of this species appeared to be closely related to the distribution of fruiting fig trees, even allowing for increased detectability of concentrations of hanging-parrots at such trees. Such an apparent dependence on a single tree type is unusual and is not suspected for congeners. The *Treron* green-pigeons of Wallacea and the Orient have a marked dependence on *Ficus* fig trees, but this is less restrictive, with utilization of more species and variable degrees of nomadism. While Wallace's Hanging-parrot may also be able to utilize other food sources or be nomadic, the fast declining population status of the Large Green-pigeon *Treron capellei*, a *Ficus* specialist with a wide Sundaic distribution (Lambert 1989), is an example of the vulnerability of such a dependence. Wallace's Hanging-parrot may be naturally very localized, as appears to be the case for the allospecific Green Hanging-parrot *L. exilis* of Sulawesi (Andrew and Holmes 1990).

Conservation status This species is known from just two areas in Flores (although the 1994 records extend the area of the known range in west Flores),

both with primary semi-evergreen rainforest at or below 1,000 m. Even here it is rare, apparently with a severe habitat constraint. Considering the status of this habitat on Flores the species is correctly treated as Vulnerable, with Endangered being a likely classification if conservation measures are not implemented soon. Further searches should be conducted to assess the distribution and status of this species in east Flores, and should focus on semi-evergreen rainforest on Gunung Egon as a priority. The cage-bird trade should be closely monitored both internationally and within Indonesia to detect if this is a threat to the species, as it is for some congeners (e.g. Philippine Hanging-parrot *L. philippensis*, Brooks and Dutson 1994). Effective protection of remaining semi-evergreen rainforest in the Tanjung Kerita Mese proposed protected area is the highest priority for the conservation of this species.

Flores Monarch *Monarcha sacerdotum*

Status, distribution and habitat Endangered (IUCN threatened category codes: B1; B2c; C1; C2b). Endemic to Flores. Extremely local in primary semi-evergreen rainforest; 350–1,000 m.

Taxonomy Part of the pied *Monarcha* species group (including Spectacled Monarch *M. trivirgatus*) found from Wallacea to the Solomon Islands. Moeliker and Heij (1995) regarded this species as intermediate between the *M. trivirgatus* superspecies and the *M. manadensis* superspecies. Monotypic. See below.

Project records F1a: Uncommon (350–970 m). This extremely rare and virtually unknown Flores endemic was recorded in primary semi-evergreen rainforest between 350 m and 970 m at one site (F1a). Most birds were recorded between 700 m and 900 m, suggesting an intolerance of moist deciduous monsoon forest (at the lower altitudinal range) and lower montane forest.

Many individuals were recorded calling (typically, an upwardly inflected whistle repeated three or more times) and the species seemed to be territorial but birds were often recorded in mixed-species flocks, with up to five individuals in a single flock. One adult and one immature were mist-netted together on 28 August, and the first known photographs of the species were taken (see *Bull. Oriental Bird Club* (1993) 18: 42). In-hand descriptions of these birds are given here as the species is so poorly known.

Adult: light grey bill, dark grey legs, dark iris; black chin, throat, lores, forehead, ear coverts, and above and behind the eye, blending in to dark grey crown and nape; bluish-black mantle, back, rump, and wing-coverts, all of which had a bluish gloss in sunlight; browner tinge to remiges; underparts white; white outer rectrices only visible from above when tail fanned; white undertail with dark central wedge and tips.

Immature: black bill, dark grey legs, pinkish soles, dark grey iris; blue-grey forehead, crown, nape, mantle, scapulars, rump, uppertail coverts, lesser coverts, median coverts and innermost greater coverts, rest of wing feathers dark grey, ear coverts darker grey, faint paler area behind eye; white lores, chin,

malar area and throat, peachy suffusion to lower throat, upper breast and upper breast sides, rest of underparts white.

Most birds observed were adults with clean plumage as described above. A number of immature birds resembling the netted individual were also observed. The orange tinge to the breast of these birds varied in intensity.

On 26 August an adult was observed feeding a recently fledged chick. The chick had a prominent gape, was still tiny, downy, tail-less and only just able to fly. Food passed to the fledgling included insects resembling a caterpillar, a lacewing and a cricket. The adult was very active and called frequently, a harsh scolding "sjay-sjay" and a quiet warbling chatter interspersed with 3–4 distinctive upwardly inflected whistles ("wheee" or "pswee"). The fledgling replied with a quiet "cheep" and a descending seven-note chatter.

The population density of this species at F1a was estimated to be 2.3 birds per hectare (± 0.8), but there are strong biases in the techniques used (Butchart 1993).

A repeated upwardly inflected whistle similar to the call given most frequently by this species was heard at 350 m in semi-evergreen rainforest on Gunung Ndeki (F5), but the bird was not seen. This was likely to be either Flores Monarch or the closely related Spectacled Monarch *M. trivirgatus* which has previously been reported from this site (Verhoeve undated).

Discussion This species was first described by Mees (1973) based on a specimen provided by Schmutz, collected in September 1971 in "the lower stages of primary forest" at 1,000 m at Sesok. Previous to our records it was only known from Schmutz's observations in the Tanjung Kerita Mese area (F1), near Sesok, Cerang and Paku (Schmutz 1977). Subsequent to our records, Verbelen (*in litt.* 1994) saw a probable Flores Monarch in August 1993 along the Labuhanbajo-Ruteng road near Paku. The species was found again on 5 November 1994 in semi-evergreen rainforest 33 km east of Labuhanbajo along the same road (F. R. Lambert verbally 1994). On the latter date three birds were heard calling and one adult was seen when it responded to playback of its own calls; all were in damp areas within old secondary forest.

The pied *Monarcha* species group comprises similarly plumaged forms which have been split as full allospecies. Flores Monarch is similar to Spectacled Monarch in plumage, behaviour and vocalisations, differing in the white underparts of the adult and more extensive white in the outer rectrices. In Flores Monarch the outer web of the outer rectrix is white to the base, and the inner web is white distally over a length of 38 mm. In Spectacled Monarch the white on the inner web varies from 24 mm to 33 mm in length, and on the outer web it is only a few mm longer. The second and third pairs of rectrices have decreasing amounts of white, with more in Flores Monarch than Spectacled Monarch (Mees 1973). The species is also markedly smaller than Spectacled Monarch in bill dimensions, tarsus length and tail length, and it averages shorter winged (Moeliker and Heij 1995). Spectacled Monarch varies in the extent of rufous on the underparts, and some birds on Halmahera (*M. t. diadematus* and *M. t. bimaculatus*) may have virtually pure white underparts (D. Gibbs verbally 1994, Moeliker and Heij 1995). However, the consistent differences between Flores

Monarch and Spectacled Monarch in other characters, especially the tail pattern, support the former's specific status.

The only evidence of sympatry between these two species are three specimens of Spectacled Monarch (an adult female and two immature birds) collected by Everett in 1896 on Flores. However, Mees (1973) examined these skins and regarded them as well-placed in the nominate race of *M. trivirgatus*. Mees (1973) considered the possibility that *sacerdotum* represents the male of a Flores population of Spectacled Monarch, but regarded this as unlikely. In addition, our observations and those of Schmutz, plus the collection of a *sacerdotum*-type female in July 1975 (Schmutz 1977) preclude this possibility.

Mees (1973) also noted a possible ecological difference between the two taxa. Our data support his observation that Flores Monarch is a "mountain-forest" (i.e. semi-evergreen rainforest) specialist, but further searches are required to show that Spectacled Monarch is a lowland inhabitant of coastal forest and mangrove habitat. The fact that Spectacled Monarch occurs sympatrically with pied congeners on Damar (Black-bibbed Monarch *M. mundus*) and Kofiau (Kofiau Monarch *M. julianae*; Mayr and Vuilleumier 1983) provides support for the suggestion that Flores and Spectacled Monarchs co-occur on Flores.

Schmutz (1977) described a juvenile Flores Monarch taken at 610 m in "rain-forest" at Cerang as "paler in plumage, but obviously the same species". This presumably refers to a bird of the same type as the immature described above. In addition, Verbelen's description indicates that his sighting probably referred to an immature bird too (F. Verbelen *in litt.* 1994). Variation in underpart colouration of immatures has also been noted in Black-chinned Monarchs *M. boano* (Moeliker and Heij 1995).

Conservation status The Flores Monarch was not observed in degraded or moist deciduous monsoon forest, and its known range is restricted to semi-evergreen rainforest in a small part of western Flores. Considering the high pressure on primary semi-evergreen rainforest in this region, the species is appropriately classified as Endangered. Effective protection of suitable habitat in the Mata Wae Ndeo part of the Tanjung Kerita Mese proposed protected area is an urgent priority if this species is not to go extinct. Further searches should be conducted in the area, and the precise extent of remaining habitat supporting the species should be ascertained.

Flores Crow *Corvus florensis*

Status, distribution and habitat Vulnerable (IUCN threatened category codes: B1; B2c; C1; C2a). Endemic to Flores. Semi-evergreen rainforest and moist deciduous monsoon forest and forest-edge; 0–950 m.

Project records F1a: Uncommon (350–950 m), F1b: Uncommon (350 m), F5: Uncommon (0–300 m). This rare Flores endemic was found in semi-evergreen rainforest and moist deciduous monsoon forest up to 950 m. It was not recorded in montane forest (F3 and F4), nor offshore islands (F2 and F6). The species was found in semi-evergreen rainforest on fairly steep slopes at F1a, in forest-edge at

F1b, and in degraded moist deciduous monsoon forest, especially along water-courses at F1b and F5.

Most records were of single birds or pairs, but groups of up to five were noted. Individuals frequently called: a loud, far-carrying, nasal "waak" or "waa-waak", occasionally extended to "waah-waak-waak". The tail was often distinctively pumped down with each note. A strange bubbling and popping call lasting up to five seconds, and a quiet hoarse wheezing contact call were also occasionally heard. Birds were generally shy, and most were seen in the subcanopy or canopy. A pair was seen mating on 29 August.

Discussion This species was also recorded at Nanga Rawa and Poco Ndeki (F5) by Buck (1988), Gibbs (1990), and in 1991 (S. Smith *in litt.* 1993). Buck (1988) recorded up to 15 on Poco Ndeki, so a real decline may have occurred. Holmes (1993) found it in "dry, lightly wooded terrain" at Mbai on the north coast of Flores. It is reliably known only from the west of Flores, and has not recently been reported east of Mbai. This may represent a real distributional restriction (as hypothesized by Verhoeve undated), or may just reflect the limited amounts of fieldwork that have been carried out in the east of the island.

Everett (*in litt.* to Hartert 1898) also noted the distinctiveness of this species' call, and described it as "a peculiar loud squalling [*sic*] whine". Observers searching for this species should be aware of the ease of identification and location of birds by their call. Ottow and Verheijen (1969) reported that Flores Crow is an important host for both Channel-billed Cuckoo *Scythrops novaehollandiae* and Asian Koel *Eudynamys scolopacea*; this should be investigated further to assess whether any threat to the crow exists.

Large-billed Crow *C. macrorhynchos* seems to be well separated from Flores Crow by habitat preference; the latter species is much more forest-dependent, and therefore more susceptible to habitat degradation.

Conservation status Flores Crow appears to be more tolerant of both forest degradation and dry forest than the other bird species endemic to Flores (Wallace's Hanging-parrot and Flores Monarch). However, it is a large, low population-density species and is dependent on forest cover in the lowlands and hills. It is thus correctly considered Vulnerable. The establishment of a large lowland protected area in the west of Flores which includes semi-evergreen rainforest and moist deciduous monsoon forest would significantly improve the conservation status of this single-island endemic species.

Other restricted-range species and near-threatened forest species

Flores Green-pigeon *Treron floris*

Status, distribution and habitat Near-threatened. Lombok, Sumbawa, Flores, Solor, Lomblen, Pantar and Alor; possibly also Flores Sea islands (Dutson 1995). Lowland moist deciduous monsoon forest and forest-edge, rarely semi-evergreen forest; 0–800 m.

Project records S1a: Rare (550 m), F5: Uncommon (0–100 m), F6: Frequent (100–350 m). This species was recorded at three sites at 0–550 m, mostly in moist deciduous monsoon forest. A single individual at S1a was observed foraging in the canopy of primary lowland semi-evergreen rainforest at 550 m. At F5, a flock of up to 10 birds was observed in fruiting fig trees alongside a river at the edge of patchy deciduous forest. One was observed in a narrow coastal strip of moist deciduous monsoon forest, and three in patchy stands of moist deciduous monsoon forest in open grassland. At F6, six flocks of 2–7 birds were observed feeding in fruiting fig trees in deciduous and moist deciduous monsoon forest.

Discussion The one other recent record of this species on Sumbawa is at Empang (Andrews 1988). Other recent records on Flores are from Nanga Rawa (F5) by Buck (1988), Gibbs (1990) and subsequently (B. F. King verbally 1993), Keli Mutu (Andrews 1988) and Bajawa (Holmes 1993). Schmutz (1977) recorded the species rarely and reported that local people had no name for it and saw it infrequently. Verhoeve (undated) described this species as generally uncommon on Flores, but temporarily common near fruiting trees.

The species appears to be rare in closed-canopy semi-evergreen rainforest, occurring more commonly in open drier forest. Its absence from Komodo (and, presumably, the other islands between Sumbawa and Flores) is notable, considering its occurrence on Pulau Besar (F6) and the occurrence of this superspecies on most other islands in Nusa Tenggara. Komodo may be too dry, for although Pulau Besar is many times smaller, it has a larger area of moist deciduous monsoon forest and even semi-evergreen rainforest at higher altitudes. Furthermore, unlike Komodo, it supports a population of Black-backed Fruit-Dove *Ptilinopus cinctus*. It is possible that Flores Green-pigeon is nomadic and occurs infrequently on Komodo.

Moist deciduous monsoon forest was surveyed at S1c and F1b, but these sites did not support fig trees or large numbers of other columbids. This species may thus be dependent on certain fig trees. It appears to be patchily distributed and is likely to have declined as a result of ongoing deforestation in the lowlands. Numbers of Flores Green-pigeons at F5 have declined significantly in the last few years (B. F. King verbally 1993).

Conservation status This species is clearly uncommon and local, and deserves further research. Its ecology is probably similar to that of Timor Green-pigeon *T. psittacea* which is treated as Vulnerable in Collar *et al.* (1994). Although the range of Flores Green-pigeon is greater than that of Timor Green-pigeon or Sumba Green-pigeon *T. teysmannii* (Near-threatened), it should perhaps be considered Vulnerable (IUCN threatened category codes: B1; B2c; C1) rather than Near-threatened. Effective protection of suitable lowland habitat containing a mixture of moist deciduous monsoon forest and semi-evergreen riverine forest would help the conservation of this species, particularly if hunting was prevented in such a protected area.

Pink-headed Imperial-pigeon *Ducula rosacea*

Distribution and habitat Small islands from the Java Sea east to Tanimbar, Kai and Halmahera, occurring locally or sporadically on larger islands, with inland

records frequent only from Timor and possibly Tanimbar amongst the larger islands. Known from Satonda island off Sumbawa, coastal Flores and islands east of Flores. Moist deciduous monsoon forest, semi-evergreen rainforest, agricultural land and scrub; 0–600 m.

Project records F6: Uncommon (0–150 m). This species was recorded at only one site, the offshore island Pulau Besar (F6). A single individual was observed roosting in an isolated large tree on the edge of a village. Two other records of a single bird and a pair perched in tree-tops were in moist deciduous monsoon forest at 100–150 m. Additionally, calls probably given by this species were heard at about 200 m. Large pigeons *Ducula* spp. were reported to congregate in fruiting trees around the villages at dawn and dusk, and hunting of pigeons on the island was reported.

Discussion The congeneric Green Imperial-pigeon *D. aenea* was also observed uncommonly at F6, at 0–300 m. Pink-headed has a similar wing length to Green Imperial-pigeon (White and Bruce 1986) but appears much slighter. The ranges of the two species overlap only on Flores, Pantar and Alor. Pink-headed often occurs sympatrically with Blue-tailed Imperial-pigeon *D. concinna* (White and Bruce 1986; Dutson 1995) which is considerably larger and bulkier than both other species. Although these two species can co-exist, Pink-headed Imperial-pigeon may compete to a certain extent with Green Imperial-pigeon, explaining the limited overlap in range and its apparent scarcity on Flores.

Conservation status Although this species appears to be local and potentially threatened by hunting in Sumbawa and Flores, it has been recorded frequently on the islands in the Moluccan and eastern Lesser Sundaic parts of its range. It is therefore probably secure, but given its restricted range, its conservation status should continue to be monitored.

Dark-backed Imperial-pigeon *Ducula lacernulata*

Distribution and habitat Java, Bali, Lombok and Flores; recorded for the first time on Sumbawa (Butchart *et al.* 1993). Primary semi-evergreen rainforest, mainly montane; 400–1700 m.

Project records S2b: Uncommon (850–1,000 m), S2c: Frequent (1,000–1,700 m), F1a: Common (550–1,100 m), F3: Rare (1,200 m), F4: Rare (1,400 m).

This species was present at all montane sites surveyed, at 550–1,700 m, but scarce below 850 m. It is likely to occur at even higher altitudes where suitable habitat occurs: 1,730 m was the highest point reached on Sumbawa (where the highest peak, Gunung Tambora, is 2,851 m), and forest above this altitude was highly degraded at F3 and F4. The species's rarity at F3 and F4 (compared to its frequency at S2 and F1) was judged to have been caused by a combination of widespread logging of the largest trees, and much greater human disturbance. It was locally reported to be hunted at F4, and presumably also at F3.

There was a slight altitudinal overlap between this species and Green Imperial-pigeon below 850 m. The habitat preferences of Dark-backed Imperial-pigeon

were notably similar to those of Black-backed Fruit-dove at the sites where both species occurred, although the latter was also found in lowland moist deciduous monsoon forest at F6. No *Casuarina*-dominated forest was observed at any of our study sites. Such habitat occurs on Gunung Tambora on Sumbawa (FAO 1982), and on Keli Mutu in east Flores (Verhoeye undated), and is listed by White and Bruce (1986) under the habitat preferences for Dark-backed Imperial-pigeon and a number of other species. We are unable to comment on these preferences, but our observations indicate that such species are not restricted to this habitat, and no strong association with *Casuarina* sp. trees in the forests surveyed was noted for any species.

Discussion Schmutz (1977) recorded the species in closed-canopy forest down to 435 m at Rana Kulan in Flores. Gibbs (1990) failed to record this species at F4 and Keli Mutu, where it had been seen previously by McKean (1987) and Andrews (1988) respectively, suggesting either a decline in numbers or nomadism. MacKinnon and Phillipps (1993) describe this species as the commonest large pigeon of montane forests on Java and Bali. The observations at S2 were the first records of this species for Sumbawa, the only sizeable island in the range of the superspecies without previous records.

Compared to the nominate form, the subspecies *D. l. sasakensis* of Lombok, Flores and Sumbawa has more restricted grey on the head, pink ear coverts and head sides, paler and pinker breast, more brownish-pink on the lower belly and undertail coverts, and darker greenish-blue mantle and wings (Goodwin 1983). The western subspecies have a distinctly di- or tri-syllabic call (J. A. Tobias verbally 1994), whereas birds on Flores and Sumbawa give a more slurred double note which is almost monosyllabic. The taxonomy of these forms should be investigated further and perhaps specific status should be considered for *sasakensis*.

Conservation status The species appears to be still common where suitable undisturbed habitat remains. However, it is dependent on large trees in closed-canopy forest within a restricted range, and is potentially threatened by hunting. These facts, combined with possible nomadism, indicate that it is perhaps best considered Near-threatened rather than secure, but more information is required on the status of this species on Java and Bali where a significant population may occur. Prevention of hunting in an effectively protected area of montane forest would support the conservation of this species.

Nicobar Pigeon *Caloenas nicobarica*

Status, distribution and habitat Near-threatened. Widespread: Bay of Bengal to north Melanesia. Primarily found on small wooded islands, but also visits semi-evergreen rainforest on adjacent large islands and coastal mainland, up to at least 700 m.

Project records S1a Rare (450 m), F1a Rare (700 m). The records at S1a were of single birds flushed up from the ground in the same area of semi-evergreen rainforest at 450 m. These records (a single bird twice on 28 July and one on 8

August) may have referred to the same bird. On 28 August at F1a one was flushed from the ground at 700 m in semi-evergreen rainforest. This record is the first for the island.

Discussion This species was traditionally considered to be a small island specialist (e.g. White and Bruce 1986). However, our records on Flores and Sumbawa support those of Beehler *et al.* (1986) on New Guinea, Bowler and Taylor (1989) on Seram, and Lambert (1993) on Halmahera, suggesting that the species occasionally visits semi-evergreen rainforest on larger islands, and is not so specialized in its habitat requirements.

Conservation status With increased knowledge about its status and habitat requirements, this species is now considered to be under less threat than previously thought (it was treated as threatened in Collar and Andrew 1988). White and Bruce (1986) noted that this species is very local in Wallacea, being absent from many small islands because of their aridity, human disturbance, or lack of forest. This, in addition to its nomadic habits, suggest that Near-threatened is a suitable categorization, and that populations should be monitored.

Wallace's Scops-owl *Otus silvicola*

Status, distribution and habitat Near-threatened. Sumbawa and Flores. Semi-evergreen rainforest and forest-edge, rarely moist deciduous monsoon forest and agricultural land; 350–1,600 m.

Project records S1a: Rare (500–550 m), S2a: Rare (450 m), S2c: Rare (1,350 m), F1a: Frequent (750–850 m), F1b: Rare (350 m), F3: Frequent (1,100–1,450 m).

This nocturnal species is liable to have been under-recorded. It was found at all sites with semi-evergreen rainforest (except F4, where the only night of fieldwork was hampered by inclement weather), at 400–1,450 m. The majority of birds were in primary semi-evergreen rainforest, although one was recorded at F1b in moist deciduous monsoon forest, and many of the records at F3 were in forest-edge. Two call types were heard, a gruff "rrow" repeated at long irregular intervals and a deep "hwomph" repeated 9–18 (generally 10) times. Calls seemed to be given infrequently and sporadically throughout the night, with a peak between 22h00 and 23h00. No individuals responded to playback of recordings of this species made in Flores by S. Smith, but one at F1a responded to playback of its own call.

Discussion This species is very unobtrusive except when calling, so the number of calling birds is the only indication of the species's abundance. Calls were heard infrequently, except at site F3, suggesting either that it occurs at low population densities or that few individuals were calling at this time of year. Birds have previously been recorded at Poco Ranaka (F4) by McKean (1989), at Poco Ndeki (F5) by Buck (1988) and in 1991 (S. Smith *in litt.* 1993), and recently at Bajawa, south Flores (Holmes 1993).

Conservation status Although several birds were heard in forest-edge at F3, this was the only site where the species was recorded in degraded habitat. It is probable that the species exists within a wide range of habitats and altitudes, but it seems to be most common in semi-evergreen rainforest below 1,450 m. The increasing scarcity of this habitat within the species's restricted range supports its classification as Near-threatened.

White-rumped Kingfisher *Caridonax fulgidus*

Distribution and habitat Lombok, Sumbawa and Flores. All forest habitats and scrub with scattered trees; 0–1,500 m.

Project records S1a: Frequent (200–700 m), S1b: Rare (200 m), S1c: Frequent (20–100 m), S2a: Frequent (50–550 m), S2b: Common (550–1,000 m), S2c: Uncommon (1,000–1,460 m), F1a: Common (350–1,100 m), F1b: Frequent (300–350 m), F3: Frequent (1,100–1,500 m), F5: Frequent (0–500), F6: Rare (600–700 m).

This species was recorded at 0–1,500 m, at all sites except F2 where there is no semi-evergreen rainforest, and F4 where only highly degraded forest remains within the species's altitudinal range. Birds were commonest in primary semi-evergreen rainforest, but were also recorded in moist deciduous monsoon forest, degraded forest-edge, and village scrub with tall trees.

Discussion McKean (1989) recorded this species to 1,700 m in Flores in 1987, but did not specify where this record came from. Our records do not support Schmutz's (1977) observations that this is purely a forest bird.

Conservation status This species appears to prefer semi-evergreen rainforest to an upper altitude of about 1,500 m. However, it can apparently also tolerate drier forest and degraded habitat, provided scattered trees remain, and is thus unlikely to be under any significant threat of extinction.

Sumba Cicadabird *Coracina dohertyi*

Status, distribution and habitat Near-threatened. Flores and Sumba; recorded for the first time on Sumbawa (Butchart *et al.* 1993). Semi-evergreen rainforest and forest-edge, rarely moist deciduous monsoon forest; 200–1,400 m.

Project records S1b: Rare (250 m), S2b: Frequent (800–930 m), F1a: Rare (450–750 m), F3: Uncommon (1,100–1,300), F4: Rare (1,350 m), F5: Rare (200–400 m).

This species was recorded in small numbers between 250 m and 1,350 m, most commonly at 800–1,100 m, at all sites with semi-evergreen rainforest except for S1a, S2a and S2c. Also, two were recorded in moist deciduous monsoon forest at 200–400 m on Gunung Ndeki (F5). The species appeared to be moderately tolerant of degraded forest, but favoured semi-evergreen rainforest rather than drier forest types. It was found to be considerably rarer on Sumbawa. This was possibly because the mountains surveyed were at lower altitudes than those on Flores, and thus supported less forest within the species's

favoured altitudinal range. These are the first records of the species from Sumbawa.

Males on Flores appeared darker than those on Sumbawa, with narrower tertial fringes, less contrastingly pale wings, and a less well-defined throat patch, suggesting that perhaps the newly discovered Sumbawan birds might represent an undescribed subspecies.

Discussion Schmutz (1977) found this species at 400–800 m on Flores. This accords well with our findings, as do observations on Sumba where this species prefers closed-canopy primary or mature secondary forest (Jones *et al.* 1995). This species has also recently been recorded on Flores by McKean (1987) at Poco Ndeki (F5), Buck (1988) at Golo Lusang (near Ruteng), and Gibbs (1990) at Poco Ranaka (F4).

Conservation status Many *Coracina* species occur naturally at low population densities. This plus the clearance of most of the semi-evergreen rainforest in the species's altitudinal range on Flores, and the increasing threat to it on Sumbawa, support the classification of Sumba Cicadabird as Near-threatened.

Little Minivet *Pericrocotus lansbergei*

Distribution and habitat Sumbawa and Flores. Most forest habitats, particularly open and riverine forest; 0–1,820 m.

Project records S1a: Rare (450–960 m), S1b: Rare (200–350 m), S1c: Rare (20–50 m), S2a: Frequent (200–550 m), S2b: Uncommon (550–1,150 m), F1a: Uncommon (700–950 m), F1b: Frequent (350 m), F4: Rare (1,400–1,820 m), F5: Frequent (0–400 m).

This species was found in small numbers at most sites, between 0 m and 1,820 m. Birds were present in semi-evergreen rainforest, moist deciduous monsoon forest and riverine forest, and were commonest in areas of open forest with some large trees and a sparse understorey. A flock was seen just east of Sumbawa Besar in a few large evergreen trees along a watercourse in otherwise dry coastal scrub.

Conservation status This is another species which seems to occur naturally at low population densities. Little Minivet seems to tolerate all but the driest forest types and is common in degraded forest provided some large trees remain (for instance, along watercourses). It is commonest below 500 m but also occurs in forest to upper montane levels. Its tolerance of degraded forest suggests that it is under little threat.

Chestnut-backed Thrush *Zoothera dohertyi*

Distribution and habitat Lombok, Sumbawa, Flores, Sumba and Timor. Primary semi-evergreen rainforest; 400–1,700 m.

Project records S1a: Rare (400–530 m), S2a: Rare (500 m), S2b: Common (550–1,000 m), S2c: Common (1,000–1,700 m), F1a: Common (600–950 m), F1b: Rare (350 m), F3: Rare (1,100–1,550 m).

This species was recorded from 350 m to 1,550 m at all sites with closed-canopy semi-evergreen rainforest within this altitudinal range, but was rarely encountered in degraded habitats (although one was netted in village scrub adjacent to semi-evergreen rainforest at F1b).

Discussion Sympatry with the very similar Chestnut-capped Thrush *Z. interpres* is notable. Both species were often encountered in the same areas, and even feeding in the same fruiting trees. Biometric data from mist-netted individuals show that there are no significant differences in weight, wing length or tarsus length. However, there was a significant difference in bill length, with Chestnut-backed Thrush averaging longer billed: 20.6 ± 0.5 mm versus 19.5 ± 0.8 mm ($df = 6$, $t = 4.38$, $P = 0.0047$). Such morphological differences may underlie differences in feeding ecology which allow the two species to coexist, though it was not clear what such ecological differences were. As on Flores and Sumbawa, Chestnut-backed Thrush shows a strong preference for primary forest on Sumba (Jones et al. 1995).

Conservation status This species is most common in closed-canopy semi-evergreen rainforest with fruiting trees between 750 m and 950 m, rendering it vulnerable to deforestation. However the species's tolerance of considerably higher altitudes is probably sufficient for it to be presently in little danger of extinction.

Russet-capped Tesia *Tesia everetti*

Distribution and habitat Sumbawa and Flores. Primary and degraded semi-evergreen rainforest, scarce in monsoon forest and agricultural land; 0–2,140 m.

Project records S1a: Common (200–700 m), S1b: Common (200–300 m), S2a: Common (200–550 m), S2b: Common (550–1,000 m), S2c: Frequent (1,000–1,700 m), F1a: Common (350–1,100 m), F1b: Common (300–350 m), F3: Common (1,100–1,600 m), F4: Common (1,180–2,140 m), F5: Rare (200–300).

Russet-capped Tesia was recorded from 200 m to 2,140 m and was found to be common in all semi-evergreen rainforest with an extensive understorey. It was considerably scarcer in moist deciduous monsoon forest (F1b and F5) and riverine forest (S1b, F1b and F5). The species seemed to be tolerant of forest degradation, provided that a shady understorey remained intact.

Conservation status This species's wide altitudinal range and broad habitat tolerance render it unlikely to be under any threat of extinction.

Timor Leaf-warbler *Phylloscopus presbytes*

Distribution and habitat Timor and Flores. Primary and degraded montane forest; 1,000–2,140 m.

Project records F3: Common (1,100–1,700 m), F4: Common (1,400–2,140). This montane species was recorded over the entire altitudinal range of forest at both high-altitude sites covered on Flores (F3 and F4), from 1,100 m to 2,140 m. Forest reaching 1,100 m was surveyed at F1a, but was not montane in character.

Conservation status This species was tolerant of degraded forest at both sites, and much forest remains intact within its altitudinal range. Therefore it is unlikely to be under any significant threat of extinction.

Russet-backed Jungle-flycatcher *Rhinomyias oscillans*

Status, distribution and habitat Near-threatened. Flores and Sumba; recorded for the first time on Sumbawa (Butchart *et al.* 1993). Primary semi-evergreen rainforest; 370–1,500 m.

Project records S1a: Rare (500–650), F1a: Frequent (370–1,000), F3: Uncommon (1,100–1,500 m). This species was only recorded at sites with primary semi-evergreen rainforest, from 370 m to 1,500 m. The records from S1a are the first records for Sumbawa. Birds were occasionally observed eating berries and fruit, but usually foraged by flycatching, usually in the understory and mid-storey. The song was not recognized until late August at F1a, possibly explaining why fewer birds were recorded on Sumbawa.

Discussion Birds on Sumba (*R. (o.) stresemanni*) have been proposed to be a separate species (Sibley and Monroe 1990) partly because of differences in diet, with greater preference on Sumba for fruit and seeds than insects (White and Bruce 1986). Our observations of Sumbawan birds feeding on berries question the validity of this difference, but a detailed behavioural study of birds on all three islands is required to clarify the matter. The differences in habitat preference do seem to be valid, with birds on Flores and Sumbawa favouring primary semi-evergreen rainforest, and birds on Sumba being found in secondary woodland with small trees and bushes (White and Bruce 1986) and fairly mature secondary forest and forest-edge (Jones *et al.* 1995).

Verhoeve (undated) also found this species to be rare in severely degraded forest on Flores. In addition, it has recently been recorded on Flores by McKean (1987) at Golo Lusang near Ruteng, by Gibbs (1990) at Keli Mutu in east Flores, and by Holmes (1993) at 1,100 m near Ruteng.

Conservation status The Russet-backed Jungle-flycatcher is difficult to observe and may naturally occur at low population densities. It was only recorded in intact semi-evergreen rainforest but it occurs up to the montane zone and is therefore under little immediate threat. Its apparent intolerance of degraded forest probably justifies its Near-threatened status.

Brown-capped Fantail *Rhipidura diluta*

Distribution and habitat Sumbawa, Flores and Lomblen. All forest habitats except dry thorn-scrub; 0–2,140 m.

Project records S1a: Common (200–700 m), S1b: Common (200–350 m), S1c: Common (20–100 m), S2a: Common (50–550 m), S2b: Common (550–1,000 m), S2c: Frequent (1,000–1,700 m), F1a: Common (350–1,100 m), F1b: Frequent (350 m), F3: Common (1,100–1,700 m), F4: Common (1,180–2,140 m), F5: Frequent (0–500 m).

This species was recorded commonly from 0 to 2,140 m, at all sites with semi-evergreen rainforest or moist deciduous monsoon forest, both primary or heavily degraded, with the exception of the two island sites (F2 and F6). It was most common in forest with an extensive understorey, along streams and in small clearings with dead vegetation lying on the ground.

Discussion This species's apparent intolerance of small islands is notable, as it was widespread even in coastal areas on Flores and Sumbawa. It may be outcompeted by the more generalist congeneric Rufous Fantail *R. rufifrons*, which was recorded on Pulau Besar (but not Komodo).

Conservation status This species is unlikely to be under any threat of extinction, given the range of habitats tolerated and the wide altitudinal zone within which it occurs.

Bare-throated Whistler *Pachycephala nudigula*

Distribution and habitat Sumbawa and Flores. Semi-evergreen rainforest; 200–2,400 m.

Project records S1a: Common (200–700 m), S1b: Common (200–350 m), S2a: Common (450–500 m), S2b: Common (550–1,000 m), S2c: Abundant (1,000–1,700 m), F1a: Common (400–1,100 m), F3: Common (1,100–1,700), F4: Common (1,300–2,140 m).

This species was found to be common between 200 m and 2,000 m in all semi-evergreen rainforest visited, and was especially common along rivers and in montane forest. It was not present in moist deciduous monsoon forest, and was tolerant of degraded forest only where it retained a closed canopy.

Discussion Schmutz (1977) noted that this species seems to have a patchy distribution, being absent from some areas of apparently suitable montane habitat. Holmes (1993; *in litt.* 1994) made brief observations in the Ruteng area, and recorded this species from isolated tree stands and forest margins, suggesting that it may be more tolerant of habitat degradation than our observations suggested.

Conservation status Although mainly restricted to closed-canopy semi-evergreen rainforest, this species is sufficiently common at high altitude to be considered under no present threat of extinction.

Golden-rumped Flowerpecker *Dicaeum annae*

Distribution and habitat Sumbawa and Flores. Primary semi-evergreen rainforest, rarely degraded and drier forest; 0–1,800 m.

Project records S1a: Abundant (200–700 m), S1b: Uncommon (200–350 m), S1c: Rare (40–100 m), S2a: Abundant (50–550 m), S2b: Abundant (550–1,000 m), S2c: Frequent (1,000–1,530), F1a: Abundant (350–1,100 m), F1b: Rare (350 m), F3: Common (1,100–1,600 m), F4: Common (1,180–1,800 m), F5: Rare (0–100 m).

This species was found to be common at 0–1,800 m in all closed-canopy semi-evergreen rainforest studied, but rare at sites with only moist deciduous monsoon forest or degraded forest. It was not seen outside closed-canopy forest, except in scattered trees at 1,180–1,570 m on the cleared lower slopes of Poco Ranaka (F4), in small numbers in patchy degraded forest at F5, and in forest-edge at F1b. It seemed to be less often encountered on ridge-tops than Black-fronted Flowerpecker *D. igniferum*, probably because of the more broken habitat found in such situations.

Conservation status Although rare in dry and degraded forests, this species was sufficiently common over a wide altitudinal range to be considered under no present threat of extinction.

Black-fronted Flowerpecker *Dicaeum igniferum*

Distribution and habitat Sumbawa, Komodo, Flores, Pantar and Alor. All forest habitats and scrub with scattered trees; 0–1,730 m.

Project records S1a: Common (200–700 m), S1b: Uncommon (200–350 m), S1c: Rare (50–100 m), S2a: Common (50–550 m), S2b: Common (550–1,000 m), S2c: Uncommon (1,000–1,730 m), F1a: Frequent (350–1,100 m), F1b: Common (300–350 m), F2: Common (0–100 m), F3: Rare (1,100–1,500 m), F5: Frequent (0–250 m), F6: Uncommon (500 m).

This species was recorded from 0 to 1,730 m, at all sites except Poco Ranaka (F4). It was commonest outside closed-canopy forest, either in large clearings or in heavily degraded forest. The species was less common in deciduous and moist deciduous monsoon forest, and was rare above 1,200 m. The absence of this species from F4 may have been because of competition with the montane Blood-breasted Flowerpecker *D. sanguinolentum*.

Conservation status This species is not likely to be under any threat of extinction, given its preference for degraded habitats and its wide altitudinal range.

Flame-breasted Sunbird *Nectarinia solaris*

Distribution and habitat Sumbawa, Flores, Lomblen, Alor, Semau, Roti, Timor and Wetar. All forest habitats and scrub with scattered trees; 0–1,100 m.

Project records S1a: Uncommon (200–700 m), S1b: Frequent (200–350 m), S1c: Frequent (20–100 m), S2a: Frequent (50–550 m), S2b: Uncommon (550–850 m), F1a: Uncommon (350–900 m), F1b: Common (330–350 m), F2: Frequent (0–100 m), F5: Abundant (0–400 m), F6: Rare (400 m).

The Flame-breasted Sunbird was recorded commonly at 0–900 m and found at all sites within this altitudinal range. The species was tolerant both of very

dry forest and of highly degraded habitat, even occurring in coastal scrub. It was recorded uncommonly in closed-canopy semi-evergreen rainforest, and its distribution and habitat preferences seem to be very similar to those of Black-fronted Flowerpecker. However, Flame-breasted Sunbird may be more dependent on the presence of flowering trees in broken or open areas.

Conservation status The broad range of habitats in which this species occurs indicate that it is likely to be under little threat of extinction.

Yellow-spectacled White-eye *Zosterops wallacei*

Distribution and habitat Sumbawa, Komodo, Rinca, Flores, Lomblen and Sumba. Forest-edge, degraded forest, and scrub; 0–800 m.

Project records S1a: Rare (500–700 m), S1b: Rare (300 m), S1c: Rare (20–50 m), S2a: Frequent (50–550 m), S2b: Rare (550–800 m), F1b: Common (300–350 m), F2: Common (0–100 m), F5: Abundant (0–400 m), F6: Abundant (0–500 m).

This species was present at all lowland sites except F1a, from 0 m to 1,050 m (at Kampung Repok below F3). It was commonest in low bushes and scrub, forest-edge and heavily degraded forest, and was also tolerant of very dry habitat.

Conservation status This species is almost certainly not under any threat of extinction, because of its preference for forest edge, dry forest and degraded habitat.

Yellow-browed White-eye *Lophozosterops superciliaris*

Distribution and habitat Sumbawa and Flores. Primary and degraded montane forest; 1,000–2,140 m.

Project records S2c: Common (1,400–1,700 m), F3: Common (1,100–1,700 m), F4: Common (1,200–2,140 m). This species was common at all three montane sites, at 1,100–2,140 m, and was tolerant of logged and degraded forest.

Conservation status This species is not likely to be under any threat of extinction, given its tolerance of degraded forest, and the extent of forest remaining within its altitudinal range.

Crested White-eye *Lophozosterops dohertyi*

Status, distribution and habitat Near-threatened, Sumbawa and Flores. Primary semi-evergreen rainforest; 200–1,400 m.

Project records S1a: Common (200–700 m), S1b: Uncommon (300–350 m), S2a: Common (450–550 m), S2b: Common (550–1,000 m), S2c: Common (1,000–1,400 m), F1a: Common (450–1,000 m), F4: Rare (1,300 m), F5: Rare (300 m).

The Crested White-eye was found to be common at all sites with closed-canopy semi-evergreen rainforest, between 300 m and 1,400 m. It appeared to be replaced by the congeneric Yellow-browed White-eye above about 1,200 m, hence its rarity at S2c, F3 and F4. It was not recorded in moist deciduous monsoon forest and was only found in degraded forest where a closed canopy and extensive understorey remained, apart from a single record of a pair in scrub at F4.

Discussion Surprisingly, Schmutz (1977) recorded this species "in large numbers" in secondary forest. This does not agree with our observations, nor with those of Verhoeve (undated) who found it to be rare in wooded cultivation and scrub but common in forest.

Conservation status Although a common bird in mid-altitude primary semi-evergreen rainforest, Crested White-eye does not appear to be able to tolerate degraded, moist deciduous monsoon forest, or montane forest. The speed with which mid-altitude semi-evergreen rainforest is being lost on Flores and Sumbawa supports the Near-threatened status of this species.

Thick-billed White-eye *Heleia crassirostris*

Distribution and habitat Sumbawa and Flores. Primary and degraded semi-evergreen rainforest and moist deciduous monsoon forest; 50–1,800 m.

Project records S1a: Uncommon (200–700 m), S1b: Rare (300 m), S1c: Frequent (100 m), S2a: Frequent (50–550 m), S2b: Common (550–1,000 m), S2c: Rare (1,000–1,200 m), F1a: Uncommon (350–1,100 m), F1b: Uncommon (350 m), F3: Uncommon (1,100–1,300 m), F4: Rare (1,200–1,400 m) F5: Rare (50–450 m).

This species was recorded between 100 m and 1,400 m at all sites with semi-evergreen rainforest or moist deciduous monsoon forest. Although never occurring at high population densities, it was commonest in primary semi-evergreen rainforest, but was also tolerant of degraded forest-edge habitat and dry forest.

Conservation status Although Thick-billed White-eye occurs at low population densities, its tolerance of degraded and dry forest indicate that it is presently under little threat of extinction.

Scaly-crowned Honeyeater *Lichmera lombokia*

Distribution and habitat Lombok, Sumbawa and Flores. Primary and degraded montane forest; 800–2,140 m. On Lombok, it reaches the lowlands and occurs in areas of cultivation.

Project records S2b: Uncommon (800–1,000 m), S2c: Common (1,000–1,700 m), F1a: Rare (950–1,000 m), F3: Frequent (1,150–1,600 m), F4: Abundant (1,400–2,140 m). This species was common at all montane sites visited, with records from 850 m to 2,140 m, and generally commoner with increasing altitude. The species was tolerant of degraded forest.

Discussion White and Bruce (1986) note that this species occurs mostly below 1,000 m in fruit trees on Lombok, and generally above this altitude in montane forest on Sumbawa and Flores. This interesting ecological difference warrants further study, and combined with the paler underparts also described for Lombok birds, suggests that these birds might be better treated as a subspecies.

Conservation status This species is not likely to be presently under any threat of extinction, given the extent of forest remaining within its altitudinal range.

Other significant records

Oriental Honey-buzzard *Pernis ptilorhynchus* Two records represent the first records of this species for Sumbawa: one at S1c at 50 m on 8 August, and a pair at S2b at 800 m on 16 August. This species has also recently been reported from Flores (J. Verhoeve *in litt.* 1994). The Palearctic race *P. p. orientalis* is a scarce winter visitor to the Greater Sundas (MacKinnon and Phillipps 1993), and a winter vagrant to Wallacea (only two very old records are listed by White and Bruce 1986), so perhaps the recent Flores and Sumbawa records represent one of the resident Sundaic races *P. p. torquatus* or *P. p. ptilorhynchus*.

Rufous-bellied Eagle *Hieraaetus kienerii* This species was described by White and Bruce (1986) as a scarce and local forest species. Three records at S1a on 31 July, 3 August and 8 August, and one record at S2b on 15 August represent the first records of this species from Sumbawa. Two records at F1a and one record at F3 are additional to recent records by J. Verhoeve (*in litt.* 1994), and Verhoeve and King (1990). Thus the species may be less scarce than was previously thought.

Changeable Hawk-eagle *Spizaetus cirrhatus* The well-defined subspecies *S. c. floris* is known only from Flores and Sumbawa. The few specimens collected (four listed in White and Bruce 1986), the paucity of recent records (excepting one seen near Golo Lusang in November 1994; F. R. Lambert verbally 1994), and our sole record of an individual on 15 August at S2b, indicate the scarcity of this taxon, and give cause for concern.

Black-backed Fruit-dove *Ptilinopus cinctus* This species reaches Bali but is otherwise restricted to Nusa Tenggara. It was recorded in reasonable numbers at most sites holding moist forest, from 100 m (F6) to 1500 m (S2c, F3, and F4), although it was considerably more common at higher altitudes. The fairly small range and attractiveness to hunters of this species mean that it is potentially at threat, and populations should be monitored.

Pied Imperial-pigeon *Ducula bicolor* This is a small-island specialist which is found from the Bay of Bengal to north Australia. It has a rather irregular distribution in Wallacea, with only a single record from Tanimbar in Nusa Tenggara. Our records from Komodo (seven on 4 September and three on 5 September) are the first confirmed records for the island.

Rainbow Lorikeet *Trichoglossus haematodus* Although common on Flores, even around villages, this species seems to be scarce on Sumbawa and was recorded uncommonly at S1b and rarely at S1c, which may indicate a heavy trapping pressure on the island. Birds on Flores (*T. h. weberi*), Timor (*T. h. capistratus*), Wetar and Romang (*T. h. flavotectus*) and Sumba (*T. h. fortis*) lack red in the plumage, in marked contrast to the races of Lombok, Sumbawa, the Flores Sea Islands, the Moluccas and Australia. Smith (1975) proposed specific status for *weberi*. If valid, then this taxon should be monitored closely, as its restricted range would make it vulnerable to intensive trapping.

Great-billed Parrot *Tanygnathus megalorynchos* Birds on Flores are of the nominate race which also occurs north through the Flores Sea Islands to Sulawesi and the Moluccas, in contrast to the endemic subspecies of Sumba in southern Nusa Tenggara. Three were recorded on two consecutive days in an area of cultivation, scrub, and degraded semi-evergreen and moist deciduous forest at 200 m at Dhalong near F1. One was recorded in moist deciduous monsoon forest at 50 m at F5. The species has declined markedly on Flores (B. F. King verbally 1993), a direct result of trapping for the cage-bird trade.

Elegant Pitta *Pitta elegans* This species has been considered restricted-range in the past (e.g. Sujatnika *et al.* 1995) but new information on its distribution has led to its deletion from Stattersfield *et al.* (in prep). It was recorded at all sites except F4 (which was above the species's altitudinal range) and, surprisingly, F2. It appeared to be able to tolerate a wide range of forested habitats up to 1,400 m, and seemed to be commoner in logged forest than in primary forest. Thus it seems to be under little threat, and with its relatively large range does not merit a particularly high conservation priority.

Subspecific endemism on Sumbawa and Flores

The conservation of biodiversity is mainly focused on the species level. However, subspecies also contribute significantly to biodiversity, and the importance of conservation in Nusa Tenggara is highlighted by consideration of bird endemism at the subspecific level. Sixty-two subspecies endemic to Nusa Tenggara are resident on Flores and Sumbawa; of these, 39 are endemic to EBA E15, and 25 are endemic to Flores and Sumbawa only.

Fifteen subspecies are restricted to Flores (preliminary assessments of the status of each subspecies based on our observations are given): Besra *Accipiter virgatus quinquefasciatus* (unrecorded), Lewin's Rail *Rallus pectoralis exsul* (unrecorded), Buff-banded Rail *Gallirallus philippensis wilkinsoni* (frequent), Rainbow Lorikeet *Trichoglossus haematodus weberi* (common), Pygmy Wren-babbler *Pnoepyga pusilla everetti* (uncommon), White-browed Shortwing *Brachypteryx montana floris* (uncommon), Russet-capped Tesia *Tesia everetti everetti* (common), Timor Leaf-warbler *Phylloscopus presbytes floris* (common), Mountain Tailorbird *Orthotomus cuculatus everetti* (frequent), Yellow-breasted Warbler *Seicercus montis floris* (frequent), Grey-headed Flycatcher *Culicicapa ceylonensis sejuncta* (uncommon), Bare-throated Whistler *Pachycephala nudigula nudigula* (common), Blood-breasted Flowerpecker *Dicaeum sanguinolentum wilhelminae* (frequent),

Yellow-browed White-eye *Lophozosterops superciliaris superciliaris* (common), Crested White-eye *Lophozosterops dohertyi subcristatus* (frequent).

Six subspecies are restricted to Sumbawa: Rainbow Lorikeet *Trichoglossus haematodus forsteni* (rare), Russet-capped Tesia *Tesia everetti sumbawana* (common), Brown-capped Fantail *Rhipidura diluta sumbawensis* (common), Bare-throated Whistler *Pachycephala nudigula ilsa* (common), Yellow-browed White-eye *Lophozosterops superciliaris hartertianus* (common), Crested White-eye *Lophozosterops dohertyi dohertyi* (frequent).

Four subspecies are restricted to Flores and Sumbawa: Changeable Hawk-eagle *Spizaetus cirrhatus floris* (rare), Wallacean Cuckoo-shrike *Coracina personata floris* (frequent), Russet-backed Jungle-flycatcher *Rhinomyias oscillans oscillans* (uncommon; recorded for the first time on Sumbawa), Oriental White-eye *Zosterops palpebrosus unicus* (common).

The apparent status of many of the endemic subspecies leaves some room for optimism over the conservation of the region's subspecific biodiversity. Only one endemic subspecies restricted to forested habitats, the Besra *Accipiter virgatus quinquefasciatus*, was not recorded, but this species is generally uncommon and difficult to observe. Lewin's Rail *Rallus pectoralis exsul* was also not recorded but it is known from four specimens only and is likely to be rare. Three further subspecies must also be considered to be under some threat: Changeable Hawk-eagle *Spizaetus cirrhatus floris*, Rainbow Lorikeet *Trichoglossus haematodus forsteni* and Hill Myna *Gracula religiosa venerata* (endemic to the EBA), with the latter two taxa probably declining through trapping for the cage-bird trade. Although not yet rare, Russet-backed Jungle-flycatcher *Rhinomyias oscillans oscillans*, the two races of Crested White-eye *Lophozosterops dohertyi dohertyi* and *L. d. subcristatus*, and two EBA endemics (Dark-backed Imperial-pigeon *Ducula lacernulata sasakensis* and Elegant Pitta *Pitta elegans concinna*) must also be considered in some danger because of their dependence on forest within such small ranges. Of the subspecies endemic to Nusa Tenggara which occur on Flores and/or Sumbawa, the only one of these which seems to be under significant threat is Yellow-crested Cockatoo *Cacatua sulphurea parvula*, although Metallic Pigeon *Columba vitiensis metallica* and Little Cuckoo-dove *Macropygia ruficeps orientalis* may also be declining.

Unrecorded forest species

Fieldwork focused on forest species, so we failed to record a number of non-forest species. Migrants and dry or coastal forest species are not discussed here, but the lack of records of several moist forest species may give cause for conservation concern.

A number of montane forest specialists were not seen on Sumbawa. These were: Little Cuckoo-dove *Macropygia ruficeps*, Lesser Shortwing *Brachypteryx leucophris*, Mountain Leaf-warbler *Phylloscopus trivirgatus*, Snowy-browed Flycatcher *Ficedula hyperythra*, Little Pied Flycatcher *Ficedula westermanni*, and Tawny-breasted Parrot-finch *Erythura hyperythra*. All of these species are presumably known on Sumbawa from Gunung Tambora only, and are possibly rare or absent from S2c because of its lower altitude.

We did not record Flores Scops-owl *Otus (magicus) alfredi* (treated as threatened in Collar and Andrew 1988, but not listed in Collar *et al.* 1994 because of taxonomic revisions made by Sibley and Monroe 1993). It was until recently known only from three specimens, collected by Everett in 1896 in montane forest on Gunung Repok "and other hills" over 1,000 m (Hartert 1897). Several other ornithologists have recently attempted to find the species in the mountains around Ruteng without success (B. F. King verbally 1993). However, on 21 May 1994 a specimen of a small rufous owl was collected by Wahyu Widodo at c. 1,400 m in dense montane forest on Poco Mandasawu near Ruteng at 8°36'S 120°32'E. This may prove to be a new specimen of *O. alfredi*, although it is significantly smaller than Everett's specimens (J. Cox *in litt.* 1996).

Sibley and Monroe (1993) suggest that *O. alfredi* is the red phase of Moluccan Scops-owl *O. (magicus) albiventris*. However, Moluccan Scops-owl appears to be a species of deciduous, usually coastal, forest in Flores, and there have been no records of this owl in montane forest around Ruteng. In addition, the type description of Flores Scops-owl includes differences in tarsal feathering, bill colour and scapular pattern between the two taxa (Hartert 1897). There has been a recent trend for splitting scops-owls *Otus* spp. into many more species than has been traditionally recognized, usually based on vocalizations (e.g. Marshall 1978). However, the calls of Flores Scops-owl are unknown. If Flores Scops-owl is a valid species, it may well be silent during the dry season when all recent attempts to locate it have been made. A similar situation exists on Java where the montane and almost silent Javan Scops-owl *O. angelinae* is very rarely recorded (Andrew and Milton 1988, but see Becking 1995). Efforts to locate Flores Scops-owl have all been fairly limited in extent and would not have been expected to record a silent *Otus* species. Further surveys should concentrate on extensive nocturnal fieldwork, including mist-netting, on mountains in the Ruteng massif. Until the taxonomic status of Flores Scops-owl becomes clearer, we suggest that it should be considered Data Deficient in the Red Data Book. If further work reveals that it does deserve specific status, it should be treated as Endangered (IUCN threatened category codes: B1; B2c; C2a; C2b).

Two other montane forest species which were not recorded on Flores despite coverage of this habitat at F1a, F3 and F4 were Besra (only known on Flores from one specimen) and Changeable Hawk-eagle, both of which may be genuinely rare on Flores. Similarly, Oriental Honey-buzzard has recently been reported from the island by J. Verhoeye (*in litt.* 1994), but was not recorded by us (see discussion of Sumbawa records above). Channel-billed Cuckoo is known to be very rare in western Flores (Ottow and Verheijen 1969), explaining the lack of our records. Little Cuckoo-dove was the only forest species previously recorded on Komodo which we did not record. It is found in montane forest, but occurs nomadically elsewhere in its range, and so may occur on Komodo as an occasional non-breeding visitor.

Conclusions and recommendations

In 1993 we carried out preliminary surveys of the birds of Sumbawa and Flores with the aim of promoting their conservation through a greater understanding

of their ecological needs and the threats to their survival. Although our estimates of abundance are subjective, we believe that sufficient information was obtained from a wide enough variety of sites, altitudes and habitats to justify our comments on the status of forest birds on these islands.

Forest Our results show that semi-evergreen rainforest is the most important habitat for the birds of conservation interest on these islands. Whilst significant areas of this habitat still remain in the montane zone, such forest is being rapidly degraded at mid-altitudes and in the lowlands. Moist deciduous monsoon forest is more widespread than semi-evergreen rainforest in the lowlands but is also being degraded by human activities.

Birds We recorded all 24 restricted-range bird species listed by Stattersfield *et al.* (in prep.) for Flores and Sumbawa. Fifteen are not under immediate threat because of their tolerance of degraded habitat or montane forest. Five species are listed by Collar *et al.* (1994) as Near-threatened and three as threatened, mainly because of combinations of intolerance of degraded habitat, dependence on semi-evergreen rainforest, restriction to the lowlands, and low population densities. We recommend that Flores Green-pigeon (Near-threatened) should be considered for upgrading to threatened (Vulnerable) status because of its apparently patchy distribution and preference for lowland forest which is being increasingly degraded. We also suggest that the status of Dark-backed Imperial-pigeon should be reconsidered for classification as Near-threatened because of threats from hunting, dependence on semi-evergreen rainforest, and intolerance of forest degradation.

The three threatened species, which are all found only on Flores, were previously very poorly known. Our records provide the first opportunity to give preliminary assessments of their ecological requirements and conservation status. Wallace's Hanging-parrot (Vulnerable) was found to be very local in semi-evergreen rainforest in a narrow altitudinal range, and seems to show some degree of dependence on fig trees. It was only found at one site, and has only been recorded from one other site on the island. Flores Monarch (Endangered) was also very local in primary semi-evergreen rainforest at just one site, and is known only from one area in west Flores. Flores Crow (Vulnerable) is more widespread on the island, and is more tolerant of degraded habitat and drier forest, but occurs at low population densities.

We also recorded two species which are more widespread, but still of conservation importance: Nicobar Pigeon (Near-threatened) and Yellow-crested Cockatoo (Endangered). The cockatoo is close to extinction on these islands as a result of heavy trapping for the cage-bird trade. A significant population remains on Komodo, but requires better protection from trappers.

Protected areas Despite the high conservation priority of this region it only has one significant protected area, Taman Nasional Komodo. Although this supports an important population of Yellow-crested Cockatoo, it does not hold any semi-evergreen rainforest, the habitat upon which many of the species of conservation importance depend. There are no areas which adequately protect

forest supporting the bird species of highest conservation importance on Sumbawa or Flores.

However, both of the two highest priority species (Wallace's Hanging-parrot and Flores Monarch) were found at the same site within a proposed protected area (Tanjung Kerita Mese). A major step forward for the conservation of this region's biodiversity could be effected in one move by swiftly gazetiting this protected area and by ensuring effective protection of the remaining forest.

Of secondary, but also high, priority is the creation of several other protected areas on Flores and Sumbawa including:

1. An area in lowland Flores which would protect moist deciduous monsoon forest mixed with riverine forest, supporting good populations of Flores Crow and Flores Green-pigeon. The Nanga Rawa area in south Flores contains such habitat, but needs urgent protection to prevent further habitat degradation. Such protection should also focus on the prevention of hunting and trapping. Searches should be made for other areas of undegraded suitable habitat elsewhere on Flores and Sumbawa, in particular in northern Ende, central Flores where such habitat is apparently still quite extensive (D. A. Holmes *in litt.* 1994).
2. An area of montane forest and mid-altitude semi-evergreen rainforest on Flores which would protect high altitude specialists such as Yellow-browed White-eye and Scaly-crowned Honeyeater, and species dependent on semi-evergreen rainforest such as Dark-backed Imperial-pigeon and the near-threatened Wallace's Scops-owl, Sumba Cicadabird, Russet-backed Jungle-flycatcher, and Crested White-eye. Such a protected area could be located in the region of Ruteng on Flores, and would therefore additionally protect habitat which might support Flores Scops-owl.
3. Areas on Sumbawa which protect lowland, mid-altitude and montane semi-evergreen rainforest. Areas within the Selah Legium and Gunung Olet Sangenges proposed protected areas would be suitable, provided that further forest degradation can be prevented. Gunung Tambora may also be an important site for protecting such forest. These areas would not only protect populations of most of the species found on Flores, but would also provide protection for the many endemic Sumbawan subspecies.

Further work Further fieldwork needs to be carried out on these islands, not only to build on our findings at the sites we visited, but also to target additional areas. These should include the Gunung Tambora area on Sumbawa, Gunung Egon in east Flores, northern Ende in central Flores, and any other areas of lowland semi-evergreen rainforest. Further information is required on the distribution and status of Flores Monarch and Wallace's Hanging-parrot, and the latter species's apparent dependence on fig trees should be investigated further. Specific searches should be made for Flores Scops-owl on the peaks around Ruteng in order to determine the status of this form.

We conclude that one of the highest priorities for conservation on these islands is urgently to provide effective protection for the semi-evergreen rainforest remaining in the Tanjung Kerita Mese proposed protected area. This will help to safeguard the future of the most threatened endemic species: Wallace's Hanging-parrot and Flores Monarch.

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