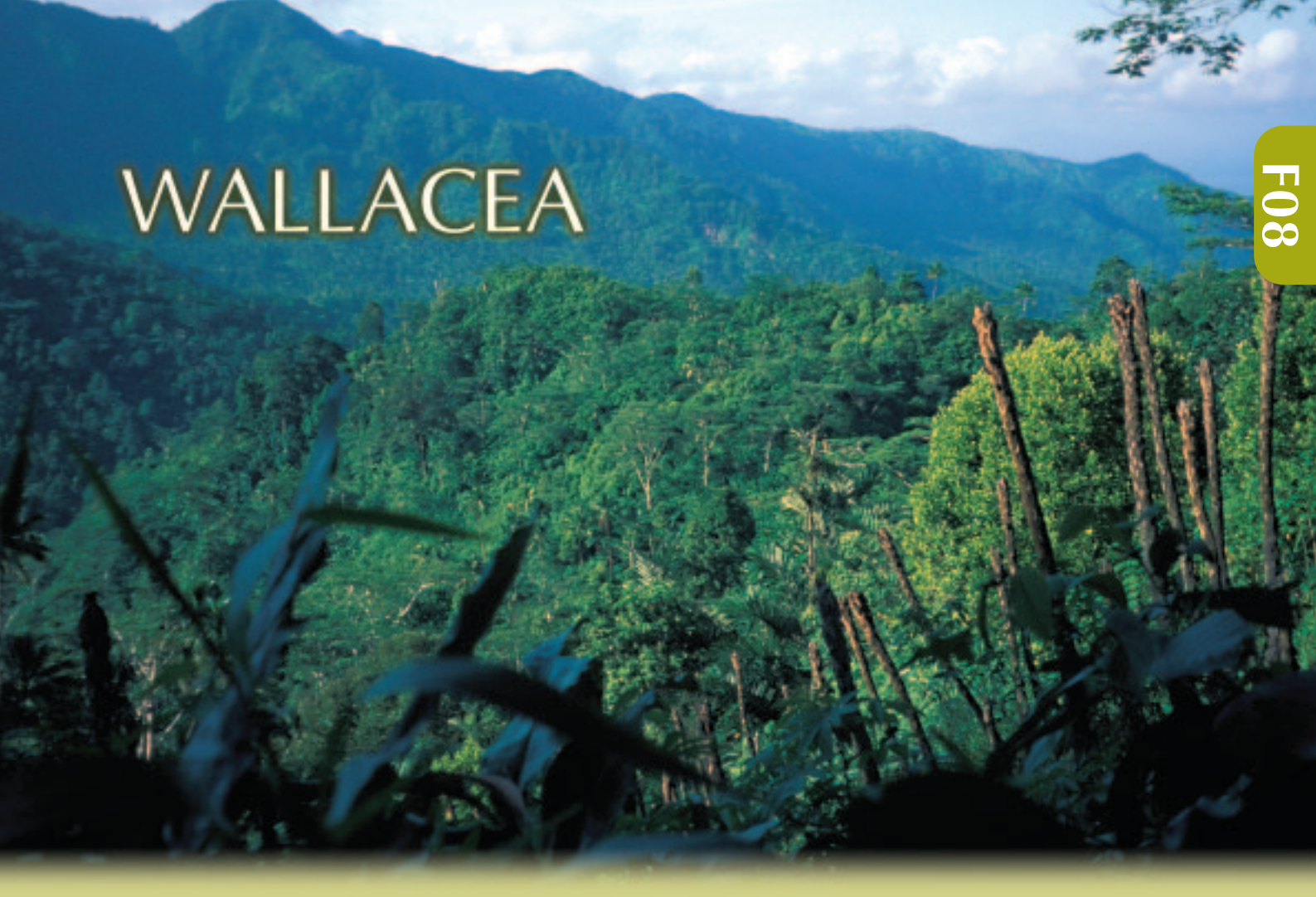
WALLACEA



WALLACEA includes the Indonesian regions of Nusa Tenggara (almost equivalent to the Lesser Sundas), Sulawesi and Maluku (almost equivalent to the Moluccas). The entire region is remarkable for the high degree of localised endemism, and has been subdivided into 10 Endemic Bird Areas (four in Nusa Tenggara, three in Sulawesi and three in Maluku) and one Secondary Area (in Sulawesi). In several of these EBAs (e.g. Timor and Wetar; Sulawesi; Buru) the threatened species include both lowland and montane forest specialists, and some threatened species are highly localised (e.g. Black-chinned Monarch is confined to the tiny island of Boano); conservation measures are therefore required to protect both lowland and montane forests in these EBAs, and in the areas which support highly localised species. The remarkable total of 27 highly threatened species mainly comprises birds affected by habitat loss within their small ranges, but also several species under pressure from exploitation for the wild bird trade (e.g. Chattering Lory and Yellow-crested Cockatoo) or for their eggs (e.g. Maleo).

- **Key habitats** Tropical lowland and montane rainforest, moist and dry deciduous forest, mangrove forest and sago swamps, and associated grassland scrub and cultivation.
- **Altitude** 0–3,000 m.
- **Countries and territories** **Indonesia** (Nusa Tenggara, Sulawesi, Maluku); **Timor-Leste (East Timor)**.

	Threatened species			
	CR	EN	VU	Total
breeds only in this region	7	20	22	49
also breeds in other region(s)	—	—	1	1
non-breeding visitor from another region	—	1	—	1
Total	7	21	23	51

Key: breeds only in this forest region. = also breeds in other region(s). = non-breeding visitor from another region.

The Wallacea region corresponds to Conservation International's Wallacea Hotspot (see pp.20–21).

The Gunung Sahendaruman IBA on Sangihe supports five highly threatened bird species, three of which are unique to this site. PHOTO: PHIL BENSTEAD

Table 1. Outstanding Important Bird Areas in Wallacea.

	IBA name	Status	Island	Threatened species and habitats
1	**Komodo NP**	PA [BR, WH]	Komodo	Important population of Yellow-crested Cockatoo
2	**Mbeliling**	—	Flores	Several Northern Nusa Tenggara EBA species, notably Flores Monarch and Flores Hanging-parrot
3	**Ruteng NRP**	PA	Flores	Several Northern Nusa Tenggara EBA species, notably Flores Scops-owl
4	**Wolo Tadho NR**	(PA)	Flores	Extensive forests with several Northern Nusa Tenggara EBA species
5	**Manupeu-Tanadaru**	PA	Sumba	Large protected area, with populations of all of Sumba's threatened forest birds
6	**Laiwangi-Wanggameti NP**	PA	Sumba	Large protected area, with populations of all of Sumba's threatened forest birds
7	**Gunung Mutis**	PA	Timor	Populations of several Timor and Wetar EBA species, notably Timor Imperial-pigeon
8	**Paitchau-Iralalora**	—	Timor-Leste	Large area of forest, with populations of several Timor and Wetar EBA species
9	**Arnau**	—	Wetar	Populations of several Timor and Wetar EBA species
10	**Pulau Damar**	—	Damar	The only site for Damar Flycatcher
11	**Karakelang HR**	PA	Talaud	Populations of Talaud Rail, Grey Imperial-pigeon and Red-and-blue Lory
12	**Gunung Sahendaruman**	—	Sangihe	The only site for Sangihe Shrike-thrush, Cerulean Paradise-flycatcher and Sangihe White-eye, also Sangihe Hanging-parrot and Elegant Sunbird
13	**Pulau Siau**	—	Siau	The only site for Siau Scops-owl
14	**Bogani Nani Wartabone NP**	PA	Sulawesi	Extensive forests supporting several Sulawesi EBA species, notably Cinnabar Hawk-owl, Matinan Flycatcher and Maleo nesting grounds
15	**Lore Lindu NP**	PA [BR]	Sulawesi	Extensive forests supporting several Sulawesi EBA species, notably Sulawesi Eared-nightjar and Maleo nesting grounds
16	**Lompobatang PF**	PA	Sulawesi	The only site for Lompobatang Flycatcher
17	**Tanahjampea**	—	Tanahjampea	The only site for White-tipped Monarch
18	**Taliabu PNR**	—	Taliabu	The only site for Taliabu Masked-owl
19	**Wayabula**	—	Morotai	Supports several North Maluku EBA species, notably Dusky Friarbird
20	**Lalobata**	—	Halmahera	Extensive forests supporting several North Maluku EBA species
21	**Pulau Obi**	—	Obi	Moluccan Woodcock on the main peak and Carunculated Fruit-dove in the lowlands
22	**Kapalat Mada**	—	Buru	The only site known for Black-lored Parrot and Rufous-throated White-eye, probably also Blue-fronted Lorikeet
23	**Waibula**	—	Seram	Extensive forests supporting several Seram EBA species
24	**Manusela NP**	PA	Seram	Extensive forests supporting several Seram EBA species
25	**Pulau Boano**	—	Boano	The only site for Black-chinned Monarch

Note that more IBAs in this region will be included in the *Important Bird Areas in Asia*, due to be published in early 2004.

Key *IBA name*: HR = Hunting Reserve; NP = National Park; NR = Nature Reserve; NRP = Nature Recreation Park; PF = Protection Forest; PNR = proposed nature reserve.
Status: PA = IBA is a protected area; (PA) = IBA partially protected areas; — = unprotected; BR = IBA is wholly or partially a Biosphere Reserve (see pp.34–35); WH = IBA is wholly or partially a World Heritage Site (see p.34).

Table 2. Threatened birds of Wallacea.

Species			Distribution and habitat
			NORTHERN NUSA TENGGARA (EBA 162)
Flores Green-pigeon *Treron floris*		VU	Throughout EBA in lowland forest
Yellow-crested Cockatoo *Cacatua sulphurea*	s	CR	Occurs sparsely throughout EBA in lowland forest
Flores Hanging-parrot *Loriculus flosculus*		EN	Endemic to Flores, where very local in mid-elevation semi-evergreen rainforest
Flores Scops-owl *Otus alfredi*		EN	Endemic to Flores, known from two localities in montane forest above 1,000 m
Flores Monarch *Monarcha sacerdotum*		EN	Endemic to Flores, where very local in mid-elevation semi-evergreen rainforest
Flores Crow *Corvus florensis*		EN	Endemic to Flores, inhabits lowland forest below 950 m
			SUMBA (EBA 163)
Sumba Buttonquail *Turnix everetti*		VU	Sparse dry grassland with patches of bushes in the lowlands
Red-naped Fruit-dove *Ptilinopus dohertyi*		VU	Mostly confined to montane forest
Yellow-crested Cockatoo *Cacatua sulphurea*	s	CR	Depends on closed-canopy primary lowland forest with tall trees
Sumba Hornbill *Aceros everetti*		VU	Mostly confined to large patches of undisturbed lowland forest
			TIMOR AND WETAR (EBA 164)
Slaty Cuckoo-dove *Turacoena modesta*		VU	Primary and tall secondary lowland and hill forests on Timor and Wetar
Wetar Ground-dove *Gallicolumba hoedtii*		EN	Lowland and hill forests on Timor and Wetar
Timor Green-pigeon *Treron psittacea*		EN	Primary or tall secondary forest on Timor, chiefly in the extreme lowlands
Timor Imperial-pigeon *Ducula cineracea*		EN	Forest at 500–2,200 m in the mountains of Timor and Wetar
Yellow-crested Cockatoo *Cacatua sulphurea*	s	CR	Lowland and hill forests on Timor
Timor Sparrow *Padda fuscata*		VU	Savanna, scrub and cultivation in the lowlands of Timor
			BANDA SEA ISLANDS (EBA 165)
Damar Flycatcher *Ficedula henrici*		VU	Common in forest on the tiny island of Damar
The Data Deficient Lesser Masked-owl *Tyto sororcula* has been recorded in forest on two islands of the Tanimbar group			

= breeds only in this forest region; = also breeds in other region(s); = non-breeding visitor from another region; s = also occurs in other EBA(s) and/or SA(s) in Wallacea

... continued

Flores Green-pigeon is widespread but localised in the fragmented lowland forests of northern Nusa Tenggara.

PHOTO: COLIN TRAINOR/BIRDLIFE

Yellow-crested Cockatoo has declined rapidly in many parts of Wallacea because of capture for the wild bird trade.

PHOTO: BIRDLIFE

Table 2 continued. Threatened birds of Wallacea.

Species		Distribution and habitat
		SULAWESI (EBA 166)
Japanese Night-heron *Gorsachius goisagi*	EN	Several non-breeding records from Sulawesi
Maleo *Macrocephalon maleo*	EN	Widespread in lowland and mid-elevation forests, nests colonially in warm sand or soil
Snoring Rail *Aramidopsis plateni*	VU	Widespread in lowland and mid-elevation forests
Blue-faced Rail *Gymnocrex rosenbergii*	VU	Widespread in lowland and mid-elevation forests
Yellow-crested Cockatoo *Cacatua sulphurea*	CR	Widespread but extremely scarce in lowland and mid-elevation forests and open habitats
Sulawesi Golden Owl *Tyto inexspectata*	VU	Recorded from northern and central Sulawesi in lowland and mid-elevation forests
Cinnabar Hawk-owl *Ninox ios*	VU	Known only from montane forest on the Minahassa peninsula
Sulawesi Eared-nightjar *Eurostopodus diabolicus*	VU	Recorded from northern and central Sulawesi in lowland and montane forests
Lompobatang Flycatcher *Ficedula bonthaina*	EN	Confined to montane forest on Gunung Lompobatang in South Sulawesi
Matinan Flycatcher *Cyornis sanfordi*	EN	Known only from montane forest on the Minahassa peninsula
		SANGIHE AND TALAUD (EBA 167)
Talaud Rail *Gymnocrex talaudensis*	EN	Known only from Karakelang in the Talaud islands, in grassland and rank vegetation near forest
Grey Imperial-pigeon *Ducula pickeringii*	VU	Small island specialist that occurs on the Talaud islands
Red-and-blue Lory *Eos histrio*	EN	Extinct on Sangihe and declining rapidly on Talaud, in forest and plantations
Sangihe Hanging-parrot *Loriculus catamene*	EN	Endemic to Sangihe, where widespread in forest, coconut plantations and scrub
Siau Scops-owl *Otus siaoensis*	CR	Known by a single specimen collected on the tiny island of Siau in 1866
Caerulean Paradise-flycatcher *Eutrichomyias rowleyi*	CR	Endemic to Sangihe, confined to mid-altitude forest on Gunung Sahendaruman
Sangihe Shrike-thrush *Colluricincla sanghirensis*	CR	Endemic to Sangihe, confined to mid-altitude forest on Gunung Sahendaruman
Elegant Sunbird *Aethopyga duyvenbodei*	EN	Possibly now confined to Sangihe, where widespread in forest, coconut plantations and scrub
Sangihe White-eye *Zosterops nehrkorni*	CR	Endemic to Sangihe, confined to mid-altitude forest on Gunung Sahendaruman
		BANGGAI AND SULA ISLANDS (EBA 168)
Blue-faced Rail *Gymnocrex rosenbergii*	VU	In this EBA, known by a single record on Peleng in the 1930s
Taliabu Masked-owl *Tyto nigrobrunnea*	EN	Known only by two records on Taliabu, in lowland forest
Banggai Crow *Corvus unicolor*	EN	Known by two specimens from the Banggai group in the 1880s, possibly seen in mossy forest on Peleng in 1991
		TANAHJAMPEA (SA 110)
Yellow-crested Cockatoo *Cacatua sulphurea*	CR	Recorded, but now almost extirpated
White-tipped Monarch *Monarcha everetti*	EN	Fairly common in evergreen forest, scrub and mangroves
		BURU (EBA 169)
Moluccan Megapode *Eulipoa wallacei*	VU	Breeds colonially on Buru's beaches and occurs in montane forest
Blue-fronted Lorikeet *Charmosyna toxopei*	CR	Historically found in mid-altitude forest, but no confirmed records for many years
Black-lored Parrot *Tanygnathus gramineus*	VU	Inhabits montane forest, seldom recorded and thought to be nocturnal
Rufous-throated White-eye *Madanga ruficollis*	EN	Known from montane forest in western Buru
The Data Deficient Lesser Masked-owl *Tyto sororcula* is historically known from the lowlands of Buru, but there are no recent records		
		SERAM (EBA 170)
Moluccan Megapode *Eulipoa wallacei*	VU	Nesting colonies on Boano, Seram, Ambon and Haruku, and occurs in montane forest
Purple-naped Lory *Lorius domicella*	VU	Inhabits mid-elevation evergreen forests on Seram, records on other islands possibly involved escaped birds
Salmon-crested Cockatoo *Cacatua moluccensis*	VU	Inhabits lowland evergreen forest on Seram, records on other islands possibly involved escaped birds
Black-chinned Monarch *Monarcha boanensis*	CR	Endemic to the tiny island of Boano, in semi-evergreen forest in the foothills
		NORTHERN MALUKU (EBA 171)
Japanese Night-heron *Gorsachius goisagi*	EN	Two non-breeding records from Halmahera
Moluccan Megapode *Eulipoa wallacei*	VU	Nesting colonies on Halmahera, and occurs in montane forest
Invisible Rail *Habroptila wallacii*	VU	Flightless rail known only from Halmahera, in lowland sago swamps
Moluccan Woodcock *Scolopax rochussenii*	EN	Known only from Obi and Bacan, believed to inhabit montane forest
Carunculated Fruit-dove *Ptilinopus granulifrons*	VU	Endemic to Obi, in lowland forest and wooded cultivation
Chattering Lory *Lorius garrulus*	EN	Widespread in the EBA, in lowland and montane forests
White Cockatoo *Cacatua alba*	VU	Found in lowland forest on Halmahera, Bacan and associated smaller islands
Sombre Kingfisher *Todiramphus funebris*	VU	Known only from Halmahera, in forest, sago swamps and mangroves
Purple Dollarbird *Eurystomus azureus*	VU	Found in lowland forest on Halmahera, Bacan and associated smaller islands
Dusky Friarbird *Philemon fuscicapillus*	VU	Recorded from Morotai, Bacan and Halmahera, in forest and plantations

= breeds only in this forest region; = also breeds in other region(s); = non-breeding visitor from another region; s = also occurs in other EBA(s) and/or SA(s) in Wallacea

The Cerulean Paradise-flycatcher was feared extinct, but was rediscovered during recent surveys of the few forest remnants on Sangihe.

PHOTO: JON RILEY

OUTSTANDING IBAs FOR THREATENED BIRDS (see Table 1)

Twenty-five IBAs have been selected in Wallacea, which represent all EBAs and SAs and together support populations of almost all threatened forest birds of this region. Several sites are unique, as they support the only (or by far the largest) known populations of one or more threatened species, notably Gunung Sahendaruman which is the only site for the Critically Endangered Sangihe Shrike-thrush, Cerulean Paradise-flycatcher and Sangihe White-eye. The other sites include some of the largest and richest forests remaining in this region; however, many other forest sites with significant populations of threatened forest birds will be documented during BirdLife's ongoing IBA Programme.

CURRENT STATUS OF HABITATS AND THREATENED SPECIES

This region is made up of many thousands of islands. The extent of habitat loss on these islands varies widely, and is related to their accessibility and history of human occupation, climate and soil fertility, and whether their forests have been exploited. Some small islands remain pristine, but many other islands have been largely converted to coconut and other plantations. On the larger islands, the coastal lowlands are typically cleared and cultivated, with forest remaining in the interior, although on many of them cultivation and pastureland extend well inland. Commercially valuable forests are mainly found in the lowlands, and most are covered by logging concessions (except for Nusa Tenggara, where the forests are largely protected from commercial forestry); large areas on some islands have already been commercially logged. In comparison to western Indonesia, only small areas have been converted for plantations, but this is likely to become an increasing pressure. Some extensive areas of forest have been cleared for mining, for example on Halmahera.

Nusa Tenggara: This part of Indonesia has a relatively dry, seasonal climate, and the natural forest types are dry deciduous 'monsoon' forest, with semi-evergreen forests in the moister areas, mostly on mountain slopes. The drier forests are relatively easy to clear, because they can be burned, and large areas have been converted to pasture. The semi-evergreen and montane forests, which are naturally more restricted in extent, are often relatively intact but have been affected by cutting for timber and fuelwood and conversion for agriculture. On Flores, the lowlands have been extensively deforested, with only relatively small patches of intact habitat remaining; at higher altitudes habitat is more extensive but suffers continuous erosion at its lower fringes. Sumbawa has a lower population density and more extensive forests, including the best monsoon

The monsoon forests of Nusa Tenggara are relatively easy to clear, because they can be burned, and large areas on Sumba and other islands have been converted to pastureland.

PHOTO: PHIL BENSTEAD

forests remaining in Indonesia. On Sumba, around 60% of the island's forest cover was cleared between 1927 and 1990, leaving 34 fragments varying in size from 0.16 to 425 km² (15.5% of the total land area). Tropical monsoon forest now occupies less than 4% of West Timor, and is distributed among seven or so remnant and isolated patches (none protected), the largest being only 90 km². In Timor-Leste (East Timor) forest cover declined from 37% in the early 1980s to 15% in the mid-1990s, although forests there are still much more extensive than those in West Timor.

Sulawesi: The lowlands of Sulawesi have recently suffered rapid forest loss. Around 1975, the island retained from its original cover 53% of wet, 26% moist, 24% dry lowland forest on alluvium, 4%, 33% and 7% respectively on limestone, and 6%, 10% and 3% respectively on volcanic soils. During the subsequent two decades it lost over 67% of remaining wet lowland forest to timber production and agriculture. Extensive forests remain in the mountains, but large areas have been cleared or degraded by encroachment for agriculture. North of Sulawesi, the island of Sangihe has lost almost all of its original forest, with the only remnant on the Gunung Sahendaruman massif, which retains around 8 km² of habitat, of which the largest continuous tract of primary forest is only 2.25–3.40 km² in size. The three Critically Endangered species confined to this IBA all have specialised habitat requirements and occupy only part of the forest. Clearance of forest on the tiny island of Siau has been near-total, with as little as 0.5 km² of logged woodland remaining. The Talaud islands retain extensive forest cover, but this is now under great pressure from logging and agriculture. East of Sulawesi, the Banggai and Sula Islands have suffered extensive forest loss and degradation, particularly in the lowlands; on Taliabu, the largest of the Sula islands, most forest below 800 m has been commercially logged, and on Banggai the last areas of intact rainforest were being selectively logged in the 1990s and primary habitat was restricted to montane areas. South of Sulawesi, up to half of Tanahjampea remained under forest in 1993, but much of it had been selectively logged.

Maluku: The forests in the coastal lowlands of most larger islands in Maluku have been converted for agriculture, but the interior forests are relatively intact; however, most remaining lowland forests are covered by logging concessions, and large-scale commercial logging operations are now underway on several islands. In the mid-1990s nearly 75% of Buru retained some forest cover (totalling 6,250 km²), but no fewer than 3,866 km²—62%, almost two-thirds—have been designated for conversion to other land uses such as agriculture. On Seram, huge areas of forest remain in the mountainous interior, but the coastal fringe is largely cleared or degraded. Logging concessions cover 48% of Seram's forests, leaving less than 5,096 km² of lowland forest outside concessions, and logging became increasingly intense during the 1990s, even occurring inside Manusela National Park. In northern Maluku, 88.5% of the total area of Morotai, Halmahera and Bacan was reported to remain forested in the early 1990s, but these islands are rich in economically valuable timber and intensive commercial logging is now underway in the lowlands. In southern Maluku, the remote island of Damar remains heavily forested other than the coastal fringe, and in the Tanimbar Islands natural habitat on Larat has long been seriously degraded, but Yamdena retains extensive forest cover. The relatively remote and unpopulated island of Wetar retained over 90% forest cover in the mid-1980s, but logging of the larger, more valuable timber trees has commenced.

Most of the remaining lowland forests in Maluku are covered by logging concessions, and large-scale commercial operations are now underway on several islands.

PHOTO: P. JEPSON/BIRDLIFE

CONSERVATION ISSUES AND STRATEGIC SOLUTIONS (summarised in Table 3)

Forest loss and degradation

FORESTRY AND ILLEGAL LOGGING

The forestry sector has an important (although declining) role in the Indonesian economy. In many areas most commercially valuable forest has already been logged, and timber extraction is no longer the major threat, although illegal or small-scale logging operations often continue to degrade the remaining forests. Major commercial logging enterprises are now focused on islands in Maluku, especially Halmahera and Seram, where most remaining forest is covered by concessions. In Nusa Tenggara, large-scale logging is really only an issue in Sumbawa, there being no production forests in Flores, Sumba and Timor; but small-scale extraction, usually illegal, is a widespread threat to remaining forest areas in these islands.

Selective logging is the primary extractive technique, but cutting plans and regulations are rarely followed, and so forests are badly damaged by extraction techniques, and areas that should be left uncut (e.g. along watercourses and on hill slopes) are frequently logged. Selective logging also targets mature trees with a (probably) disproportionate impact on parrots, hornbills, owls and other hole-nesters as fewer nest sites remain. Moreover, commercial logging necessitates networks of roads, which can lead to secondary problems such as increased hunting and clearance for

agriculture and settlements. In several areas, logging has recently occurred inside protected areas, for example Bogani Nani Wartabone National Park on Sulawesi and Manusela National Park on Seram. Once selective logging has been concluded there are frequently pressures to change the landuse from production forestry to agriculture or plantations.

The Indonesian government is committed to sustainable forest management, and has commendable laws and regulations in place. However, these laws are frequently flouted, in part due to widespread corruption in the forest sector. Given that extensive commercially valuable forests remain, sustainable forest management is a major priority. Certification schemes need to be rapidly advanced, based on best practices in forest management and independent monitoring. Concessions should not be granted inside gazetted or proposed protected areas, i.e. on land officially allocated or designated for nature conservation (with the national conservation plan of 1981 remaining the principal reference). Concessions should be cancelled, and concessionaires penalised, whenever logging operations encroach on protected areas.

EXPLOITATION OF FOREST PRODUCTS

In some areas, such as the remaining lowland forests on Flores, habitat is being heavily degraded by exploitation for firewood and building material. In some moist forest areas throughout the region, timber and rattan collection is intense, especially near settlements and wherever habitat has been fragmented into small patches. On Sulawesi, some villages are so close to Maleo nesting grounds that opportunistic felling of trees and collection of rattan by villagers is likely to deter breeding birds. Protected areas need to be zoned, with ample buffers to absorb human pressures, and core areas free of exploitative activities. Greater community participation in forest management and conservation should be developed, respecting traditional lifestyles; this should be promoted through conservation awareness work (stressing the ecological services that forests provide, including maintenance of water supplies), particularly around nature reserves and IBAs, to help reduce damage and disturbance in the most important areas of habitat for threatened birds.

CONVERSION TO AGRICULTURE AND PLANTATIONS

Large areas of forest continue to be converted for agriculture and plantations, especially in Maluku. Near the coast, forest has been replaced with coconut, banana, cacao and oil palm plantations. Inland, forest on rich alluvial soil is liable to be converted to agricultural fields, e.g. at Ruteng on Flores. Many important protected areas are threatened by agricultural encroachment, including Karakelang Hunting Reserve on Talaud and Gunung Sibela Strict Nature Reserve on Bacan. This threat is twofold because it leads to influxes of people and puts greater pressure on forest resources, so the impact on a reserve extends well beyond the area encroached upon. For example, the southern boundary of Bogani Nani Wartabone National Park on Sulawesi is almost entirely degraded by coconut plantations and other cultivation, and people venture within the park for a variety of extractive purposes, including timber, rattan and Maleo eggs. Sago swamp on Halmahera (apparently vital to Invisible Rail) has been extensively cleared, and the threat to the remaining tracts is high, involving commercial sago extraction, irrigation schemes, conversion for wet rice and, potentially, fishpond development. Grassland on Sumba is being burnt, overgrazed and converted to agriculture, all to the likely detriment of Sumba Buttonquail, which appears to avoid man-made grasslands. The lower edges of the vital last patches of forest on Sangihe are gradually being cleared for shifting cultivation.

The development of more efficient agriculture (through improved and appropriate techniques) to help alleviate

Table 3. Conservation issues and strategic solutions for birds of Wallacea.

Conservation issues	Strategic solutions
Forest loss and degradation	
■ FORESTRY AND ILLEGAL LOGGING ■ EXPLOITATION OF FOREST PRODUCTS ■ CONVERSION TO AGRICULTURE AND PLANTATIONS ■ LIVESTOCK GRAZING AND FIRE ■ TRANSMIGRATION ■ DEVELOPMENT (URBAN, INDUSTRIAL, ETC.) ■ PESTICIDES	➤ Manage forests sustainably, with certification schemes based on best practices in forest management and independent monitoring ➤ Cancel logging concessions within gazetted and proposed protected areas ➤ Develop greater community participation in forest management and conservation ➤ Promote the development of more efficient agriculture, to help reduce the pressure on the remaining areas of natural habitat ➤ Maintain forest patches on Sangihe, and restore the forest at Gunung Sahendaruman ➤ Introduce fire management programmes, and measures to reduce grazing in forests, in Nusa Tenggara ➤ Develop new transmigration schemes, roads and mines following the existing legal process, including environmental impact assessment, to integrate biodiversity conservation with regional development ➤ Eliminate use of illegal insecticides on plantations
Protected areas coverage and management	
■ GAPS IN PROTECTED AREAS SYSTEM ■ WEAKNESSES IN RESERVE MANAGEMENT	➤ Establish new protected areas to fill gaps in coverage of threatened birds and their habitats ➤ Strengthen the PKA through training, improved terms and conditions, and equipment for staff ➤ Improve reserve management through more intensive patrolling, boundary demarcation and stricter law enforcement
Exploitation of birds	
■ HUNTING AND TRAPPING ■ EGG-COLLECTION ■ WILD BIRD TRADE	➤ Improve enforcement of existing hunting laws, especially in protected areas ➤ Promote sustainable community management of Maleo and Moluccan Megapode nesting grounds ➤ Implement the Yellow-crested Cockatoo Recovery Plan, and adapt it for other threatened parrots
Gaps in knowledge	
■ INADEQUATE DATA ON THREATENED BIRDS	➤ Survey poorly known threatened species, islands and sites, including proposed protected areas ➤ Monitor populations of species that are exploited by man, including megapodes and parrots

poverty is part of the Indonesian government's long-term planning strategy, and if carefully implemented has the potential to reduce the pressure on the remaining areas of natural habitat. These improvements should be promoted away from protected areas (and particularly away from their core areas) and IBAs, and efforts should be made to prevent further encroachment into existing and proposed reserves. Special conservation awareness efforts should be made in the most critical areas (stressing the uniqueness, rarity and endangerment of the birds and their habitats), for example on Sangihe local people should be encouraged not to clear remnant forest patches and native trees, and to plant native tree species in agricultural areas: at Gunung Sahendaruman, the forest should be restored, to increase the area of habitat available to the three Critically Endangered species unique to the site.

LIVESTOCK GRAZING AND FIRE

Intensive livestock grazing is a problem in some areas, for example on Timor where excessive grazing pressure has severely inhibited regeneration in most lowland and mid-altitude forest. In areas with a relatively dry climate and seasonal rainfall, mainly in Nusa Tenggara, dry-season fires are used to clear land and to encourage new growth. These often burn out of control and damage or destroy forests, especially where these are already fragmented. Although periodic fires are a natural phenomenon, they now occur so frequently that vegetation has little chance to recover. Fire management programmes, and measures to reduce grazing pressure in forested areas, are now urgently needed.

TRANSMIGRATION

It has long been policy in Indonesia to re-settle people mainly from Java to develop the less populated regions of the country, with Sulawesi and Maluku being major destinations. Whilst the scale of transmigration has been reduced over the past decade, the recent unrest in Maluku and East Timor has led to large-scale movement of people. In some areas transmigration schemes have had serious negative effects on the environment, involving forest clearance for agriculture, hunting and unsustainable slash-and-burn farming. A planned transmigration project could damage the 60 km^2 Kao sago swamp on Halmahera (a potential site for Invisible Rail), and on Sulawesi the arrival of transmigrants in the Dumoga valley may result in the loss of lowland forests and important montane areas within Bogani Nani Wartabone National Park. Transmigration has also led to the breakdown of traditionally controlled egg-collecting systems at nesting grounds of Maleo and Moluccan Megapode, causing local extinctions. New resettlement schemes need to be carefully developed, following the existing legal process including environmental impact assessment. In general, schemes should be sited away from protected areas and IBAs, and not on islands with high biodiversity value. Awareness programmesshould be instituted in transmigration areas to educate people about the ecology and traditions of their new home, in particular the ecological services provided by forests.

DEVELOPMENT (URBAN, INDUSTRIAL, ETC.)

Improvement of the transportation infrastructure is an essential part of regional development, but new roads can cause serious environmental problems, notably uncontrolled forest clearance by impoverished slash-and-burn farmers. Roads on mountainous islands tend to follow the coast, and often lead to loss and degradation of lowland habitats. Mining and prospecting is degrading forest and polluting watercourses in some areas, including important areas such as Karakelang Hunting Reserve on Talaud, Gunung Sahendaruman on Sangihe and Gunung Sibela Strict Nature Reserve on Bacan. Much forest has been cleared for mining in Halmahera and Wetar. Halmahera has deposits of nickel and gold, and further mining projects are proposed in Central Halmahera. Previous proposals for a large cement factory, with quarry and dam, close to Manusela NP, Seram appear to have been abandoned. Exploitation of sand for local road construction has affected some Moluccan Megapode nesting grounds on Seram. New roads and mines need to be carefully developed, following the existing legal process including environmental impact assessment, with the aim of integrating biodiversity conservation with regional development. They should be sited away from protected areas and IBAs.

PESTICIDES

The use of pesticides has increased since the 1980s, and poisons have been applied to reduce pig numbers. The current (at least occasional) use of technically illegal insecticides (azodrin and other 'monokrotofos' pest-control chemicals) to eliminate locusts (*Sexava*) from coconut plantations reportedly causes deaths in lories a few days after application, and could be affecting other threatened parrots. Existing regulations should be enforced to prevent the use of these chemicals in plantations.

Protected areas coverage and management

GAPS IN PROTECTED AREAS SYSTEM

There are some important gaps in the protected areas system in Wallacea, particularly in Maluku where Manusela

The small area of forest remaining at Gunung Sahendaruman on Sangihe is the most important site for bird conservation in Asia.

PHOTO: JIM WARDILL

National Park is the only reserve large enough to ensure biodiversity conservation. Several important new protected areas are planned, awaiting full gazettement, and others are needed to fill the remaining gaps. The following sites and habitats need official protection or alternative measures to ensure that their habitat and biodiversity are conserved: (1) Mbeliling (Kerita Mese) on Flores, to protect semi-evergreen forest below 1,000 m; (2) natural grassland on Sumba, for Sumba Buttonquail; (3) a protected area enclosing Gunung Timau and Gunung Mutis on Timor; (4) Gunung Arnau proposed nature reserve on Wetar; (5) Yamdena proposed nature reserve in the Tanimbar islands; (6) forest on the island of Damar; (7) selected Maleo nesting grounds on Sulawesi; (8) Gunung Lompobatang proposed nature reserve in South Sulawesi; (9) locate and protect an area on Sulawesi that combines mangrove, beach forest, swamp forest and lowland forest connecting to hill forest (e.g. the north-west corner of the Minahassa peninsula); (10) Gunung Sahendaruman proposed wildlife sanctuary on Sangihe; (11) Taliabu proposed nature reserve in the Sula islands; (12) Gunung Kapalatmada proposed wildlife sanctuary on Buru; (13) eastern Seram, ideally in the Wae Fufa and adjacent catchments; (14) Lalobata and Ake Tajawe proposed national parks on Halmahera; (15) Wayabula proposed wildlife sanctuary on Morotai; (16) Pulau Obi proposed nature reserve.

In Timor-Leste, 15 Protected Wild Areas were listed during a brief period of administration by the United Nations (UNTEAT) in 2000, but these reserves have no management arrangements on the ground. The government is in need of support to establish these areas, including the designation of the Monte Paitchau–Iralalora area as the country's first national park.

WEAKNESSES IN RESERVE MANAGEMENT

Responsibility for reserve management in Indonesia lies with the Directorate General of Forest Protection and Nature Conservation (PKA), but effective management is constrained by shortage of staff, expertise and budget, compounded by the vastness and remoteness of the areas which need to be protected. The situation was made worse by the recent civil unrest, which forced the cut-back of conservation programmes managed from Ambon and Ternate. Some protected areas are virtually unsupervised, allowing local communities to hunt and clear forest, and logging or mining corporations to ignore protected area legislation. Land disputes have caused problems in some reserves, for example at Ruteng Nature Recreation Park on Flores, where local communities dispute the current boundaries, and in 1998 it was reported that a land-ownership dispute on Sulawesi had led to occupation of the southern section of Rawa Aopa Watumohai National Park. On Sulawesi, in almost all cases protected status has failed to deter exploitation of Maleo eggs.

It is necessary to strengthen the PKA in the region through better training, pay and equipment for reserve staff, and to improve reserve management through (a) more intensive patrolling to intercept hunters and loggers; (b) clear demarcation of reserve boundaries; and (c) stricter enforcement of environmental laws. Close collaboration between conservation NGOs and the forest department, and effective management of forest officers, would also help. Community management of resources may be the most successful strategy for Maleo (and Moluccan Megapode) nesting grounds, but a deep regard for local politics is needed if it is to succeed (see below).

Exploitation of birds

HUNTING AND TRAPPING

Shooting of wildlife with shotguns, air-rifles and slingshots is widespread, affecting many threatened birds. For example, pigeons are commonly shot on Timor, while hunting, even of small passerines, is intensive on Sangihe. Villagers on Sumba trap the Sumba Buttonquail for food during the dry season, especially at the maize harvest. Trapping with snares threatens forest rails and ground-doves, and it also occurs at or adjacent to some Maleo nesting grounds, adding to the pressures of habitat loss and egg-collection. Protected areas need to be more intensively patrolled to intercept hunters and clear snares, with conservation awareness campaigns to make hunters more aware of the plight of threatened species, and of existing hunting laws.

EGG-COLLECTION

The region's two threatened megapodes, Maleo and Moluccan Megapode, nest colonially and lay large, commercially valuable eggs. The eggs sell for several times the price of a chicken egg, and even the remotest nesting grounds are exploited. Of the 120 Maleo nesting grounds whose present conservation status is known, 42 (35%) have already been abandoned largely owing to over-collection of eggs and habitat destruction. At many colonies current levels of exploitation are so unsustainable that total protection has become necessary. This is by no means straightforward, however, as guardposts, fences and hatcheries installed at protected nesting grounds have been repeatedly destroyed. Eggs are also collected from the nests of parrots, hornbills and other large species, which are raised for food or as pets for trade.

The following general management programme has been proposed for Maleo: (1) build up populations by policing all

Maleos lay large, commercially valuable eggs, and even the most remote nesting grounds are known to local people and exploited.

PHOTO: STUART BUTCHART/BIRDLIFE

nesting grounds, and enforcing a temporary ban on egg-collecting (with appropriate incentives); (2) once populations have reached an acceptable size, strictly supervise exploitation of eggs, ensuring a certain percentage is transferred to hatcheries so that the harvest is sustainable and provides a continuous income to the harvesters and protecting authorities; (3) encourage tourist interest in viewing Maleo grounds through these practices, adding to the economic incentives to implement them; (4) improve nesting ground suitability by clearing, burning or trimming vegetation (particularly the vigorous invasive *Lantana camara*) to increase insolation, and by raking sand over burrows to make detection of eggs by poachers more difficult. Similar measures are required at Moluccan Megapode nesting grounds, perhaps with 10% of each colony sealed off as no-go areas.

WILD BIRD TRADE

Cage birds play an important role in Indonesian culture. Parrots are particularly popular, and the massive demand for cockatoos and lories, both domestically and internationally, fuels a vigorous trade. Capture for trade is the most important factor in the decline of several threatened parrots in this region, notably Yellow-crested Cockatoo: even after trade was banned, hundreds of birds were traded openly in Jakarta and thousands were annually smuggled abroad. White and Salmon-crested Cockatoos are also declining for the same reason. At least 10,000 Salmon-crested Cockatoos were being trapped annually in the 1980s and the number probably still exceeds 4,000 per annum. As cockatoos tend to raid plantations and agricultural fields, they are persecuted as crop pests wherever they cause damage, with farmers using lime to capture the birds, and then selling them as pets. Three species of lory are also under serious threat from trapping. The Red-and-blue Lory is now confined to the Talaud Islands, where as many as 1,000–2,000 birds still leave Karakelang annually, 80% to the Philippines. In North Maluku, trappers apparently remove around 10% of the world population of Chattering Lory annually, while in Seram large numbers of Purple-naped Lories are trapped to meet domestic demand.

A recovery plan for Yellow-crested Cockatoo should be implemented, and adapted for other threatened parrots, with the aim of reducing trapping of all species to sustainable levels. National legislation needs to be strengthened, followed by collaboration with wildlife traders' associations, national carriers, airport authorities, CITES management authorities, local NGOs and Asian NGOs, in order to impose the law and monitor the situation. The measures required include awareness campaigning, improved protection for key habitats and sites, dockside control in relevant ports, and fair but firm deterrents imposed on offenders, from local trappers (light fines) to middlemen and exporters (heavy fines). In North Maluku, zero quotas should remain in place for all threatened parrots at least until a reliable system of trade management is in place. Population monitoring is required to detect trends.

Parrots are particularly popular cagebirds, and the massive demand for attractive species such as Red-and-blue Lory fuels a vigorous trade.

PHOTO: A. COMPOST/BIRDLIFE

Gaps in knowledge

INADEQUATE DATA ON THREATENED BIRDS

The vast number of islands in this region, many of which are remote and inaccessible, means that much basic biological survey and inventory work is still required, together with investigations of the ecology of the threatened birds. Studies are needed of the most poorly known threatened species, to clarify their distribution and habitats, notably: Sumba Buttonquail (grasslands on Sumba); Lesser Masked-owl, Taliabu Masked-owl, Sulawesi Golden-owl, Flores Scops-owl, Siau Scops-owl and Cinnabar Hawk-owl (using tape-recording, spotlighting and interviews with local people); Banggai Crow (Banggai and Sula islands); Blue-fronted Lorikeet and Black-lored Parrot (Buru); and Invisible Rail, Moluccan Woodcock and Dusky Friarbird (northern Maluku).

Threatened birds and their habitats need to be surveyed in poorly known islands and sites, including: all proposed protected areas listed above; unsurveyed lowland forests on Flores, notably in the east; Timor-Leste and Wetar, to help develop a comprehensive conservation strategy; Gunung Sahendaruman on Sangihe. The populations of species that are exploited by man need to be monitored, to determine the impact of this threat and the effects of ongoing conservation measures, including: numbers and breeding success at Maleo and Moluccan Megapode nesting grounds; and wild populations of threatened parrots and numbers captured for trade. The threat posed by introduced predators (e.g. cats) to ground-dwelling birds, especially to flightless species such as Invisible Rail, needs study.