
REGIONAL INTRODUCTIONS

THE WORLD has been divided up regionally for presentation of the EBA data. The limits of the chosen regions (see Figure 1) largely reflect biogeography, but some compromises have had to be made; thus the Palearctic and Oriental faunal regions are both split between two of the regions used here.

This chapter presents introductory information region by region. For each there is provided a map displaying all the EBAs which fall within the region, a box of key facts and a table of summary EBA data.

The text presents sections on:

- *Restricted-range species*, with information on where they occur, the types of habitats which they favour, the key sources of information and some of the taxonomic problems encountered in the EBA analysis.
- *Endemic Bird Areas*, with a description of patterns of endemism, some of the characteristics of the EBAs and levels of knowledge.
- *Threats and conservation*, with an indication of habitat loss, other threats to EBAs and their birds, and selected important conservation initiatives.

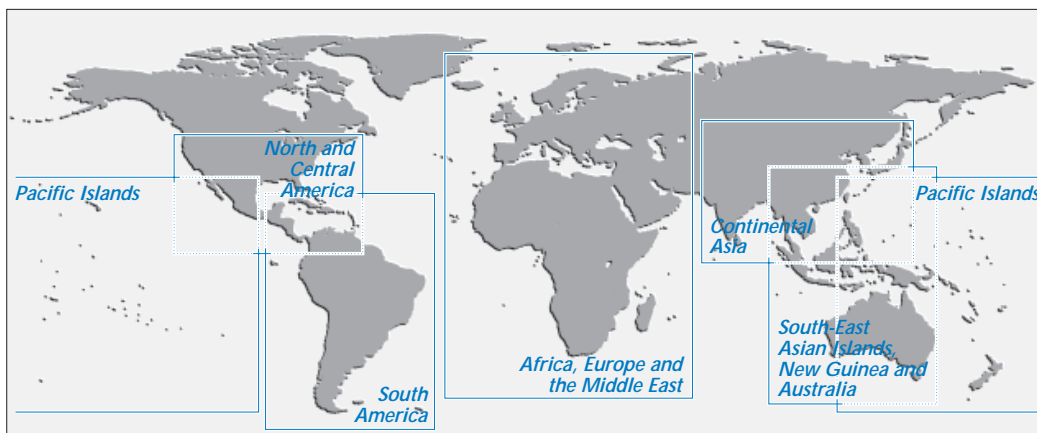


Figure 1. Regional division of the world used in this book. The areas shown correspond to those covered by the regional maps (Figures 2–7).

NORTH AND CENTRAL AMERICA

THIS REGION includes North and Central America through to the Darién lowlands of eastern Panama and north-west Colombia. The Greater and Lesser Antillean islands of the Caribbean are also covered here, as are other islands in the Caribbean Sea such as Cozumel, Providence and San Andrés. On the Pacific side, the islands of Guadalupe,

Socorro and Cocos are included (see Box 1 for key facts).

Restricted-range species

Of the c.200 restricted-range species in the mainland part of this region, only a few are found in North America, the vast majority being associated with

Box 1. Key facts for North and Central America.

Numbers of:

- 324 Restricted-range species
- 69 Threatened restricted-range species
- 30 EBAs
- 17 Secondary Areas
- 29 Countries with EBAs

EBAs with high numbers of restricted-range species

- Costa Rica and Panama highlands (EBA 020), 52 species
- Jamaica (EBA 027), 35 species
- Hispaniola (EBA 028), 34 species

EBAs which are especially distinct at the generic level

- Costa Rica and Panama highlands (EBA 020), 8 endemic genera
- Lesser Antilles (EBA 030), 7 endemic genera
- Hispaniola (EBA 028), 6 endemic genera

EBAs with high numbers of threatened restricted-range species

- Lesser Antilles (EBA 030), 9 species
- Hispaniola (EBA 028), 7 species

EBAs with high numbers of Critical and Endangered endemic species

- Lesser Antilles (EBA 030), 4 species

Examples of EBAs critically in need of conservation action

- Sierra Madre Occidental and trans-Mexican range (EBA 006)
- Sierra Madre del Sur (EBA 009)
- Cuba (EBA 025)

Countries with particularly high numbers of restricted-range species

- Panama, 91 species
- Mexico, 83 species
- Costa Rica, 77 species

Countries with high numbers of threatened restricted-range species

- Mexico, 23 species

forests in the mountain ranges of Central America. In the Caribbean, which has over 130 restricted-range species, nearly every island supports at least one restricted-range species, such species having a variety of habitat and altitudinal preferences.

There are no families endemic to the mainland, as Central America forms a land-bridge between North and South America, and thus has avifaunal affinities with both continents. However, very few of the restricted-range species extend out of Central America south into South America. The Greater Antilles have avifaunal similarities with North and Central America, and the Lesser Antilles with South America, but speciation has resulted in an endemic Caribbean avifauna which is quite distinct from that of mainland

America (Lack 1976), and just four restricted-range bird species are shared between the islands and the continental landmass. The most highly differentiated species include Palmchat *Dulus dominicus*, which is endemic to Hispaniola and is the only member of its family, and several todies (Todidae), an endemic Caribbean family.

Knowledge of birds in this region is, for the most part, good, with a number of excellent regional and national publications documenting in some detail their ecology, distribution and status (e.g. Slud 1964, Monroe 1968, AOU 1983, Bond 1985, Ridgely and Gwynne 1989, Stiles and Skutch 1989, Collar *et al.* 1992, Howell and Webb 1995a, Stotz *et al.* 1996), each benefiting from work by several large, active museums in both North and Central America. However, the region is still in need of major field surveys, with a number of areas in the Greater Antilles and Central America being un- or under-explored ornithologically.

Although only one species from the region has been described as new to science in the last five years (White-fronted Swift *Cypseloides storeri*), species limits have been redefined for many taxa, resulting in numerous new species-level taxa. This is due to the unparalleled attention given to the New World avifauna by taxonomists and field biologists within the region—although it should be noted that this attention has not focused to the same extent on the Caribbean avifauna. As an example of how fluid the taxonomy is within this region, almost 30 species have been added to the North American list since 1995 due to the taxonomic splitting of species (AOU 1995a, 1997). Similarly, Howell and Webb (1995a) considered that, for 15% of the 1,070 species in Mexico and northern Central America, there still remains considerable debate about their taxonomic status.

Endemic Bird Areas

There are only two EBAs in North America: California (EBA 001), which is largely in the USA but extends into northern Baja California, Mexico; and the Northern Sierra Madre Oriental (EBA 010), which is largely in northern Mexico but just overlaps southern Texas, USA. The majority (19) of the EBAs lie solely in (the mainland of) Central America, with a further six covering the Caribbean islands. Three Pacific Ocean islands of the region form three separate EBAs. A total of 17 Secondary Areas, including several on small Caribbean islands, complete the analysis (see Figure 2 for location of EBAs and Secondary Areas, and Table 1 for EBA summary data).

An important feature of the region is the series of mountain chains which effectively separate the Pacific

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lowlands from the Gulf/Caribbean lowlands. EBAs occur in the lowlands on both of these slopes, e.g. the North Central American Pacific slope (EBA 017) and the South Central American Pacific slope (EBA 021) on the western side and the Central American Caribbean slope (EBA 019) on the east. There are also EBAs in the higher isolated mountainous areas such as the Costa Rica and Panama highlands (EBA 020) and Darién highlands (EBA 024). The Costa Rica and Panama highlands EBA, although only 23,000 km² in size, has 52 restricted-range species confined to it, one of the highest numbers of any of the EBAs identified by the project.

In a few cases a number of smaller islands have been grouped together to form single EBAs, notably the Lesser Antilles (EBA 030), which encompasses the arc of islands from Anguilla south to Grenada and incorporates 12 geopolitical units. Several of these islands support their own single-island endemics; indeed St Lucia (616 km²) has four species unique to it, but many more restricted-range species are shared between nearby islands, thus making the whole of the Lesser Antilles one EBA.

The topography of mainland Central America is complex, especially in the central Mexican highlands, where it has been difficult to delineate the boundaries of the EBAs precisely. In other highland areas, and on the Caribbean and Pacific slopes in Costa Rica and Panama in particular, poor knowledge of the altitudinal ranges for restricted-range species means that the boundaries of the EBAs involved (e.g. EBAs 020, 021) can only be approximately defined; this problem is exacerbated by the loss of habitat which radically affects species distributions and altitudinal preferences. Similarly, the distributions of birds in the northern portion of the Central American Caribbean slope (EBA 019) are very poorly known, and consequently the EBA is poorly defined in this area.

Threats and conservation

Profound changes during the twentieth century have left this region's natural habitats fragmented and disturbed. Most EBAs have suffered at least moderate habitat loss, with limited loss noted only for the unpopulated and isolated Darién highlands (EBA 024) and Cocos Island (EBA 022).

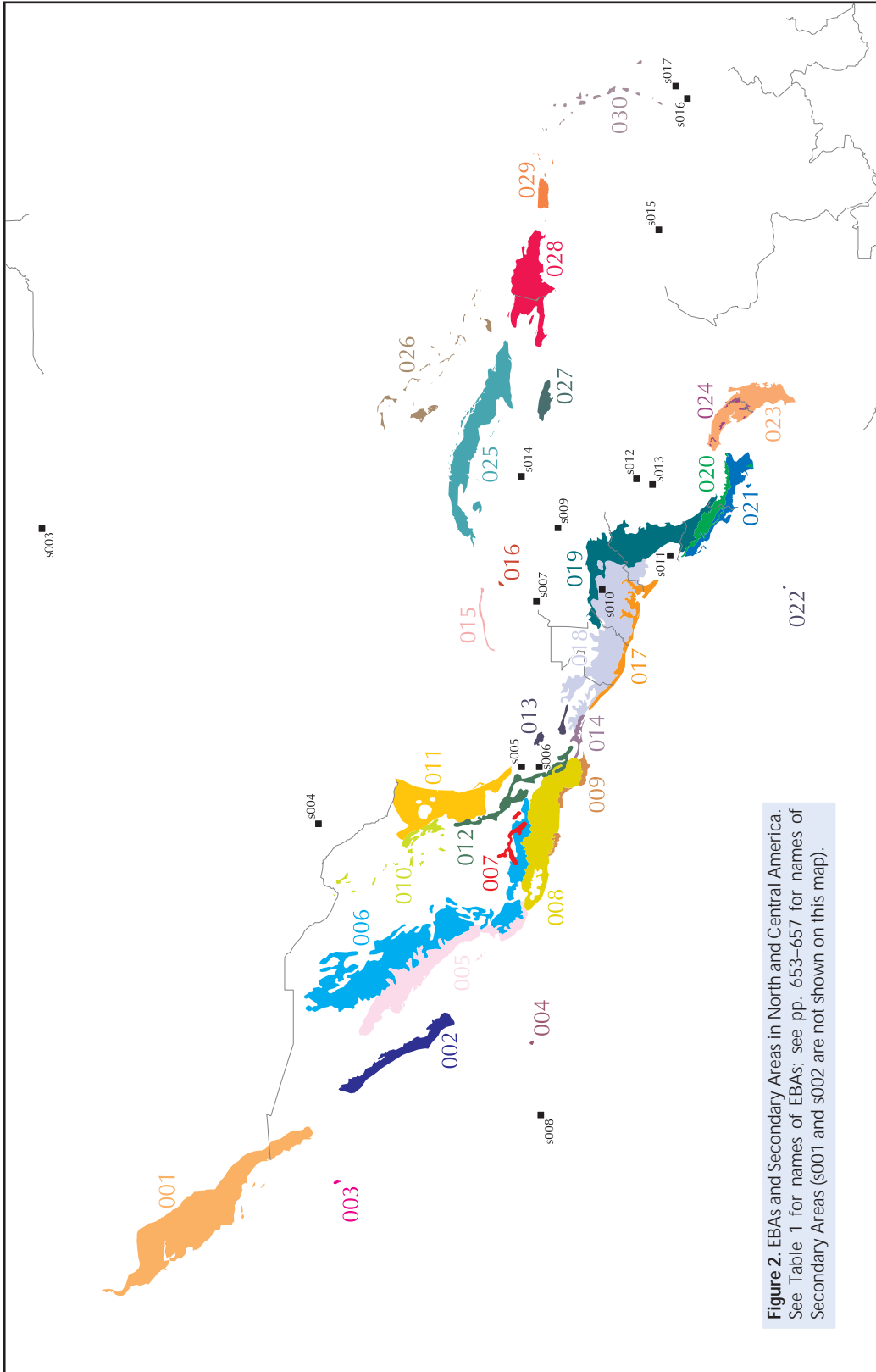
All the main habitat types have suffered. For example, wetlands have been drained and polluted in the Central Mexican marshes (EBA 007) and Baja California (EBA 002), and forests (tropical dry, humid lowland and humid montane) have been variously altered in the majority of EBAs. Those EBAs whose main habitat is lowland tropical dry forest—such as the North-west Mexican Pacific slope (EBA 005), Balsas region and interior Oaxaca

(EBA 008), North-east Mexican Gulf slope (EBA 011), and North Central American Pacific slope (EBA 017)—are especially vulnerable to habitat loss, being located along the coastal plains of Central America where the human population is at its most dense. Long-standing land use for agriculture has intensified over the past 25 years in this area, especially for cattle-ranching and cash crops (e.g. citrus fruit). Likewise, the predominantly coniferous forest EBAs of the Sierra Madre Occidental and trans-Mexican range (EBA 006) and Northern Sierra Madre Oriental (EBA 010) have lost most of their old-growth forest from logging over the past 50 years, and a similar fate has hit the mainly lowland humid forest EBAs of Los Tuxtlas and Uxpanapa (EBA 013), Central American Caribbean slope (EBA 019) and South Central American Pacific slope (EBA 021).

There are still extensive areas of montane evergreen forest left in some EBAs—the Sierra Madre del Sur (EBA 009), Southern Sierra Madre Oriental (EBA 012), North Central American highlands (EBA 018), Costa Rica and Panama highlands (EBA 020) and Darién highlands (EBA 024)—but even these have been affected by agriculture, especially for coffee and subsistence farming, and logging is increasingly having a severe impact, e.g. in the Southern Sierra Madre Oriental.

The Caribbean EBAs—notably Cuba (EBA 025) and Hispaniola (EBA 028)—have also suffered widespread habitat modification due to cultivation (e.g. of coffee, sugar-cane or bananas) and development for the tourist industry, with introduced predators (e.g. rats, mongooses and cats) being a particular problem for some birds. The Pacific Ocean EBAs of Guadalupe (EBA 003) and Socorro (EBA 004) have suffered from introduced herbivores—goats and sheep—which have caused severe degradation of their natural habitats.

Despite such habitat losses, many of the EBAs have low numbers of threatened species and, overall, only 21% of the region's restricted-range birds are classified as threatened (compared to 31% for all restricted-range bird species). According to the literature, the species in question are almost all numerically strong (N. J. Collar verbally 1997). For example, in the most species-rich mainland EBAs just two of the 20 restricted-range species are threatened in the North Central American highlands (EBA 018), and three of the 53 species in the Costa Rica and Panama highlands (EBA 020). One reason for this is that many of the species have adapted to the extensive habitat degradation, and/or are able to utilize secondary growth and other altered areas. This appears to be the case particularly in those EBAs in which dry forest is the predominant habitat. There are some



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M. Lammertink

Thick-billed Parrot *Rhynchopsitta pachyrhyncha*, a threatened restricted-range species, breeds in the pine forests of the northern half of the Sierra Madre Occidental (EBA 006), Mexico, though it may have once bred in south-east Arizona, USA, where it has been recently reintroduced. Extensive deforestation has occurred throughout its range affecting not only its foraging options but also, through the selective clearance of old trees, nest-site availability.

EBAs that do, however, have a high proportion of threatened species. For example, the Sierra Madre del Sur (EBA 009) has four of its five restricted-range

species listed as threatened, and the Sierra Madre Occidental and trans-Mexican range (EBA 006) has three of its seven species so classified. The Lesser Antilles (EBA 030) has the highest total number of threatened restricted-range species in the region (nine), all of them having tiny ranges, being confined to just one or two islands.



BirdLife International

This bus—the Jacquot Express—tours local schools on St Lucia in the Lesser Antilles (EBA 030), promoting conservation issues to children, and drawing attention to the St Lucia Amazon (or Jacquot) *Amazona versicolor*. This species has suffered through habitat loss, hurricanes, hunting and trade, but recent action by government and non-government agencies—which has become a model for other Caribbean countries—has reversed the situation, and the nation is now sensitized to the importance of its endemic parrot.

There are quite extensive protected-area networks within the countries of mainland Central America, with Costa Rica for example having over 8% of its land area covered by national parks or reserves. However, several EBAs, especially in Mexico, are inadequately protected, and action is urgently required to protect the habitats of their restricted-range birds; this applies particularly to the Sierra Madre Occidental part of the Sierra Madre Occidental and trans-Mexican range (EBA 006) and the Sierra Madre del Sur (EBA 009). There are also many protected areas in the Caribbean EBAs, but some of these are too small and/or do not afford protection sufficiently strict to preserve effectively the wildlife they contain, e.g. in Cuba (EBA 025). Some species, however, e.g. the *Amazona* parrots (see Lesser Antilles, EBA 030), have been the focus of considerable conservation efforts by governments and non-government agencies, and consequently their status has improved.

Endemic Bird Areas of the World

Table 1. EBAs of North and Central America: summary data.

EBA number and name	Countries	Continental/ island	Area (km ²)	Altitude (m)	Habitat
001 California	Mexico, USA	C	180,000	0–2,000 ^{L,M}	Scrub (F,W)
002 Baja California	Mexico	C	43,000	0–1,500 ^{L,M}	Scrub (F,W)
003 Guadalupe Island	Mexico	OI	280	0–1,000 ^L	Forest ⁵ (S)
004 Socorro Island	Mexico	OI	150	0–1,000 ^L	Forest ^{4,5} (S)
005 North-west Mexican Pacific slope	Mexico	C	93,000	0–1,200 ^L	Forest ^{3,4} (S)
006 Sierra Madre Occidental and trans-Mexican range	Mexico	C	230,000	1,200–3,600 ^M	Forest ^{2,5} (G)
007 Central Mexican marshes	Mexico	C	10,000	1,700–2,500 ^M	Wetland
008 Balsas region and interior Oaxaca	Mexico	C	110,000	0–2,500 ^{L,M}	Forest ³ (S,D)
009 Sierra Madre del Sur	Mexico	C	12,000	900–3,500 ^M	Forest ²
010 Northern Sierra Madre Oriental	Mexico, USA	C	15,000	1,500–3,500 ^M	Forest ⁵ (S)
011 North-east Mexican Gulf slope	Mexico	C	100,000	0–1,200 ^L	Forest ³ (W)
012 Southern Sierra Madre Oriental	Mexico	C	31,000	900–3,500 ^M	Forest ^{2,5}
013 Los Tuxtlas and Uxpanapa	Mexico	C	14,000	0–1,500 ^{L,M}	Forest ^{1,2}
014 Isthmus of Tehuantepec	Mexico	C	6,700	0–1,000 ^L	Forest ³ (S)
015 Yucatán peninsula coastal scrub	Mexico	C	3,400	0–300 ^L	Scrub
016 Cozumel Island	Mexico	CI	490	0–100 ^L	Forest ^{3,6}
017 North Central American Pacific slope	El Salvador, Guatemala, Honduras, Mexico, Nicaragua	C	30,000	0–1,000 ^L	Forest ³ (S)
018 North Central American highlands	El Salvador, Guatemala, Honduras, Mexico, Nicaragua	C	150,000	500–3,500 ^M	Forest ^{2,5} (S)
019 Central American Caribbean slope	Costa Rica, Guatemala, Honduras, Nicaragua, Panama	C	120,000	0–1,400 ^L	Forest ¹
020 Costa Rica and Panama highlands	Costa Rica, Panama	C	23,000	1,000–3,800 ^M	Forest ^{2,5} (G)
021 South Central American Pacific slope	Costa Rica, Panama	C	38,000	0–1,800 ^L	Forest ^{1,3,6}
022 Cocos Island	Costa Rica	OI	47	0–700 ^L	Forest ¹
023 Darién lowlands	Colombia, Panama	C	61,000	0–1,000 ^L	Forest ^{1,6}
024 Darién highlands	Colombia, Panama	C	3,000	700–2,300 ^M	Forest ^{2,5}
025 Cuba	Cuba	OI	110,000	0–1,500 ^L	Forest ³ (S,W)
026 Bahamas	Bahamas, Turks and Caicos Islands (to UK)	OI	14,000	0–60 ^L	Scrub (F)
027 Jamaica	Jamaica	OI	11,000	0–2,000 ^{L,M}	Forest ^{1,2,3}
028 Hispaniola	Dominican Republic, Haiti	OI	76,000	0–3,000 ^{L,M}	Forest ^{1,2,3}
029 Puerto Rico and the Virgin Islands	Puerto Rico (to USA), Virgin Is. (to USA), Virgin Is. (to UK)	OI	9,400	0–1,200 ^{L,M}	Forest ^{1,2,3,5,6}
030 Lesser Antilles	Caribbean *	OI	6,300	0–1,500 ^{L,M}	Forest ^{1,2,3,5}

KEY

Habitat
This column names the key habitat of the EBA, followed by any other habitats which are also used by the restricted-range birds (single-letter codes, as below, within parentheses).

Forest (F) Includes both forested areas (generally with a closed canopy) and wooded areas (canopy more open). Primary and secondary forest habitats and forest-edge are all included. Further subdivided as follows.

¹ **Tropical lowland moist forest.** Typically humid forest in the tropics, generally below 1,000 m (varying with geography and topography). Includes types described as lowland and hill evergreen rain forest, moist deciduous forest and wet forest.

² **Tropical montane moist forest.** Typically humid forest in the tropics, often above 1,000 m. Includes types described as lower and upper montane evergreen rain forest, mountain forest, montane coniferous forest, cloud forest and mossy forest.

³ **Tropical dry forest.** Typically dry forest in the tropics at all altitudes. Includes types described as dry deciduous forest, makatea forest, atoll/beach forest, palm forest, thorn or spiny forest and *Acacia* woodland.

⁴ **Subtropical forest.** Typically forest in the subtropics or at higher altitudes in tropics.

⁵ **Temperate and subalpine zone forest.** Typically forest at higher latitudes, or at higher altitudes at lower latitudes. Includes types described as coniferous and broadleaf forest, *Polylepis* woodland, eucalypt forest, elfin forest and dwarf forest.

⁶ **Mangrove and flooded forest.** Typically coastal mangrove forest, swamp forest and flooded forest (including varzea and igapo).

Scrub (S) Any vegetation dominated by shrubs including heathland, moorland, tundra, typical Mediterranean scrub (maquis, fynbos and chaparral) and alpine vegetation. Drier scrub formations are thorn scrub (caatinga), lomas (fog-fed desert formations), arid and cactus scrub, and spinifex associations. Also included are bamboo, fern and sage thickets.

Savanna (V) Extensive tropical vegetation dominated by grasses with a variable amount of tall bushes and/or trees in open formation.

Grassland (G) Includes tussock-grassland, alpine meadows, páramo, steppe and pasture, with limited tree cover.

Wetlands (W) Includes marshes, flooded grassland (wet meadows), reed-beds, bogs, swamps, floodplains and estuaries; also incorporates freshwater bodies and courses of all sizes, and their shores and margins, as well as brackish lakes and lagoons.

Deserts (D) Includes areas where there is an absence of well-developed vegetation.

Rocky areas (R) All rocky terrain such as rocky gorges, rock scree, caves, cliffs, rocky shorelines and beaches.

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Habitat loss	Knowledge	Numbers of restricted-range species						Biological importance	Current threat level	Priority	EBA no.
		Confined to the EBA		Present also in other EBAs, SAs		Total					
		Threatened	Total	Threatened	Total	Threatened	Total				
Major	Good	0	6	0	0	0	6	●●●	●●●	High	001
Moderate	Incomplete	1	2	0	0	1	2	●●●	●●●	High	002
Severe	Good	1	1	0	0	1	1	●●●	●●●	Critical	003
Major	Good	2	3	0	0	2	3	●●●	●●●	Critical	004
Moderate	Incomplete	1	6	0	1	1	7	●●●	●●●	High	005
Major	Incomplete	3	5	0	2	3	7	●●●	●●●	Critical	006
Severe	Good	1	1	0	0	1	1	●●●	●●●	Urgent	007
Moderate	Good	0	9	0	1	0	10	●●●	●●●	High	008
Major	Incomplete	4	4	0	1	4	5	●●●	●●●	Critical	009
Moderate	Good	1	2	0	0	1	2	●●●	●●●	High	010
Major	Good	1	4	0	0	1	4	●●●	●●●	Urgent	011
Major	Incomplete	2	3	0	1	2	4	●●●	●●●	Critical	012
Major	Incomplete	2	3	0	0	2	3	●●●	●●●	Critical	013
Moderate	Incomplete	0	2	0	1	0	3	●●●	●●●	High	014
Major	Good	0	1	0	1	0	2	●●●	●●●	High	015
Moderate	Good	0	3	0	1	0	4	●●●	●●●	Urgent	016
Major	Incomplete	0	3	0	1	0	4	●●●	●●●	High	017
Moderate	Incomplete	2	20	0	0	2	20	●●●	●●●	Urgent	018
Moderate	Incomplete	0	7	0	5	0	12	●●●	●●●	High	019
Moderate	Good	3	49	0	3	3	52	●●●	●●●	Urgent	020
Major	Good	4	13	0	2	4	15	●●●	●●●	High	021
Limited	Good	3	3	0	0	3	3	●●●	●●●	Urgent	022
Moderate	Incomplete	3	4	0	9	3	13	●●●	●●●	Critical	023
Limited	Incomplete	0	11	0	5	0	16	●●●	●●●	High	024
Major	Good	3	6	0	4	3	10	●●●	●●●	Critical	025
Major	Good	0	3	0	4	0	7	●●●	●●●	High	026
Major	Incomplete	3	28	0	7	3	35	●●●	●●●	Critical	027
Severe	Incomplete	6	23	1	11	7	34	●●●	●●●	Urgent	028
Major	Good	3	14	1	10	4	24	●●●	●●●	Urgent	029
Major	Incomplete	9	24	0	9	9	33	●●●	●●●	Critical	030

KEY (cont.)

* Antigua and Barbuda, Anguilla (to UK), Netherlands Antilles (to Netherlands), Barbados, Dominica, Grenada, Guadeloupe (to France), St Kitts and Nevis, St Lucia, Martinique (to France), Montserrat (to UK), St Vincent.

Continental/island

C Continent.

CI Continental island (once part of a continent; such islands generally lie on a continental shelf less than 200 m below sea-level).

OI Oceanic island (has never been connected to a continental area by a land-bridge; such islands are generally volcanic in origin).

Altitude

L EBA classified as 'lowland' (generally below c.1,000 m)

M EBA classified as 'montane' (generally above c.1,000 m)

Biological importance See p. 39.

Current threat level See p. 40.

Priority See p. 41.

Habitat loss

Severe Estimated that >90% of the key habitats (for restricted-range bird species) has been lost (i.e. cleared or severely degraded).

Major >50% to 90%

Moderate >10% to 50%

Limited 0-10%

Unquantified Some of the key habitats known to have been lost, but not possible to quantify as above.

Possible Some of the key habitats suspected to have been lost.

Knowledge

Good

- Most parts of the EBA have been sampled by ornithologists.
- Habitat requirements and altitudinal ranges of most restricted-range birds generally well understood.
- EBA boundaries usually well-defined.

Incomplete

- Some parts of the EBA have been sampled, but some important gaps in knowledge of restricted-range bird distributions.
- Habitat requirements and altitudinal ranges of some restricted-range birds are well understood, but significant gaps in knowledge for others.
- EBA boundaries approximate, at least in part.

Poor

- EBA seldom visited by ornithologists, or fieldwork concentrated at a few sites or on a few species. Major gaps in knowledge of restricted-range bird distribution.
- Habitat requirements and altitudinal ranges of restricted-range birds generally poorly understood.
- EBA boundaries may be difficult to define.

SOUTH AMERICA

SOUTH AMERICA can be divided into three broad continental regions, namely the Andes (a mountain chain which runs the entire length of the western part of the continent and extends across northern Venezuela as far as the Paria peninsula), the interior and Atlantic lowlands, and the ancient massifs of the Guyana and Brazilian shields and their Atlantic margins. The Pacific Ocean island groups of Galápagos and Juan Fernández, and the Atlantic Ocean islands of Fernando de Noronha, the Falklands and South Georgia are also included in this region (see Box 2 for key facts).

Restricted-range species

The ancient origins of South America, its complex climatic patterns and topography (especially in the Andes), have led to the development of a mosaic of different habitat types, providing conditions for both the radiation and isolation of species. Thus it has by far the largest continental avifauna in the world, with over 3,200 species (roughly a third of the world's total), despite comprising less than 12% of the world's land area. Not surprisingly, it has the highest number of restricted-range species (658) of all the regions in this study.

Restricted-range species can be found at all altitudes and within most habitats, although there are greater concentrations of species within forested habitats and within the upper tropical and subtropical zones (c.1,000–2,500 m). However, they are not distributed evenly through the region. The Andes form a major barrier to the dispersal of lowland and submontane animals and plants, and the mountain ranges themselves are divided by dispersal barriers such as the Marañón, Cauca and Magdalena rivers, and the Táchira depression. Consequently, the Andes

and their isolated Pacific and Caribbean slopes are the main centre of speciation, and support the largest concentration of restricted-range birds. In addition, the Atlantic margins of the continent are isolated from the rain forests of the Amazon basin by a relatively arid zone, and, although some species are shared with the Amazon forests, there is a very high level of endemism here, with concentrations of restricted-range birds. In contrast to these areas, there are few restricted-range bird species within the vast expanses of the Amazon basin, other than at the western fringes close to the Andes, where there is a zone of exceptionally high rainfall and one of the highest avian diversity levels of any region of the world. There are also few restricted-range species in interior South America (e.g. the Orinoco basin, Parana–Paraguay lowlands and the Gran Chaco) where most species are more widely distributed than the 50,000-km² range-size criterion used in this study.

Knowledge of birds in South America is relatively good, with a number of excellent regional and national publications documenting in some detail their ecology, distribution and status (e.g. Meyer de Schauensee and Phelps 1978, Meyer de Schauensee 1982, Hilty and Brown 1986, Ridgely and Tudor 1989, Fjeldså and Krabbe 1990, Collar *et al.* 1992, Ridgely and Tudor 1994, Stotz *et al.* 1996). However, the continent is still in need of major field surveys, and this is demonstrated by the fact that more than 20 species have been described as new to science from the region (especially Brazil and Colombia) during the past five years (see, e.g., *Cotinga* 1994–1997, 1–7).

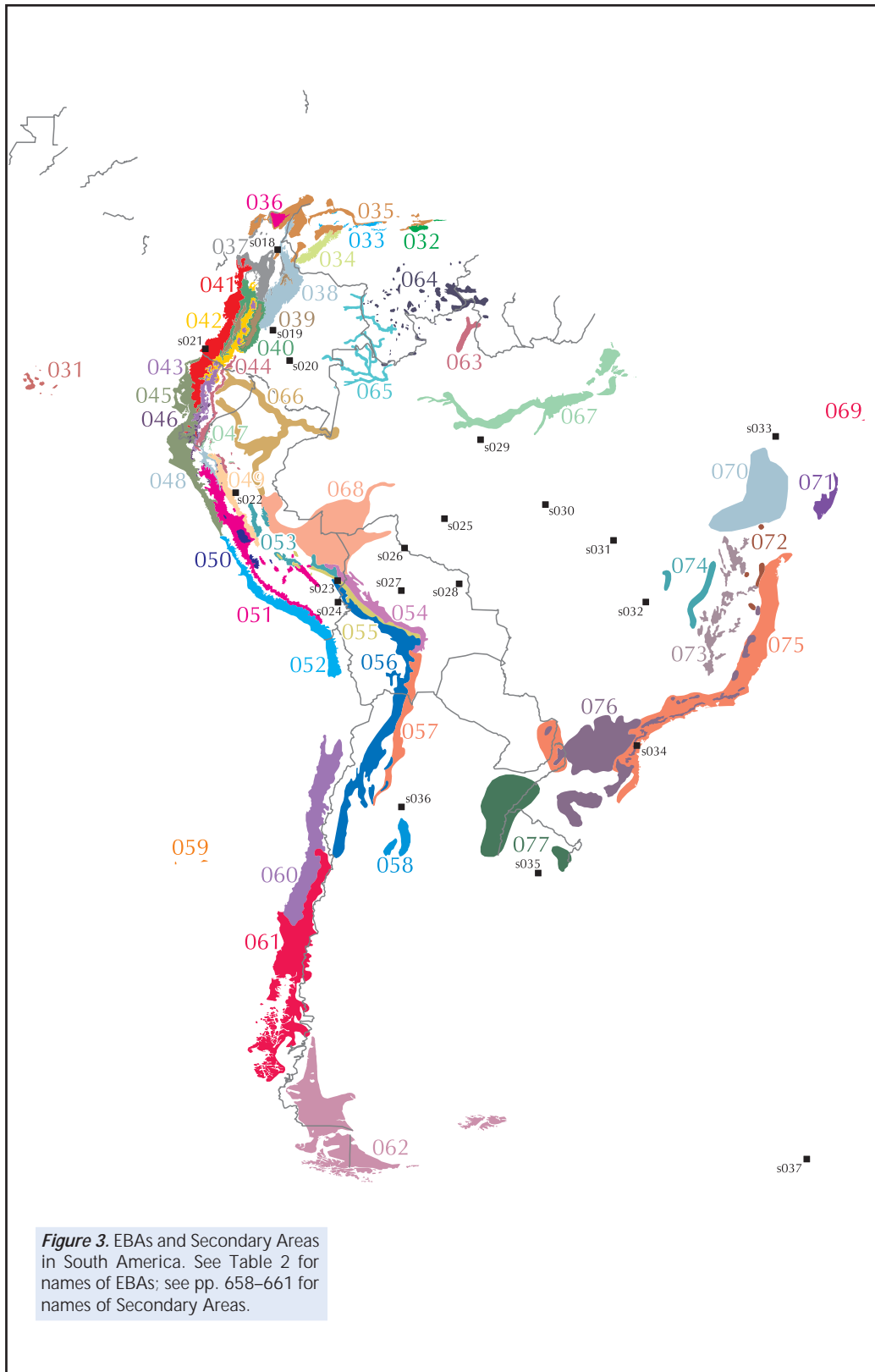
The taxonomy of the South American avifauna (indeed that of the whole of the New World) has

Toucan Barbet *Semnornis ramphastinus* is endemic to the wet forests of the Chocó (EBA 041) in Colombia and Ecuador. This area has the highest number of restricted-range bird species (62) of all mainland EBAs, with exceptional diversity and endemism in a wide range of other taxa including plants, reptiles, amphibians and butterflies.

P. Salaman/Proyecto Falcon



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Endemic Bird Areas of the World

Table 2. EBAs of South America: summary data.

EBA number and name	Countries	Continental/ Island	Area (km ²)	Altitude (m)	Habitat
031 Galápagos Islands	Ecuador	OI	8,000	0–1,700 ^{L,M}	Scrub (F)
032 Caripe–Paria region	Venezuela	C	6,000	400–2,500 ^M	Forest ²
033 Cordillera de la Costa Central	Venezuela	C	6,200	600–2,500 ^M	Forest ² (W)
034 Cordillera de Mérida	Venezuela	C	23,000	300–4,000 ^{L,M}	Forest ^{1,2,5} (G)
035 Caribbean Colombia and Venezuela	Colombia, Venezuela	C	89,000	0–1,000 ^L	Forest ^{3,6} (S,D)
036 Santa Marta mountains	Colombia	C	11,000	600–5,200 ^{L,M}	Forest ^{1,2,5} (S,G)
037 Nechí lowlands	Colombia	C	58,000	0–1,500 ^L	Forest ¹
038 Colombian East Andes	Colombia, Venezuela	C	85,000	1,000–4,000 ^M	Forest ^{1,2,5} (G,W)
039 Colombian inter-Andean valleys	Colombia	C	31,000	200–1,700 ^L	Forest ^{1,3} (S)
040 Colombian inter-Andean slopes	Colombia	C	48,000	1,000–2,500 ^M	Forest ²
041 Chocó	Colombia, Ecuador	C	100,000	0–3,800 ^{L,M}	Forest ^{1,2,5} (G)
042 Northern Central Andes	Colombia, Ecuador	C	36,000	1,500–3,700 ^M	Forest ^{2,5}
043 Central Andean páramo	Colombia, Ecuador, Peru	C	32,000	2,000–5,000 ^M	Grassland (F,S)
044 Ecuador–Peru East Andes	Colombia, Ecuador, Peru	C	28,000	800–2,200 ^{L,M}	Forest ^{1,2}
045 Tumbesian region	Ecuador, Peru	C	130,000	0–3,000 ^{L,M}	Forest ^{1,2,3} (S)
046 Southern Central Andes	Ecuador, Peru	C	10,000	1,500–3,500 ^M	Forest ^{2,5}
047 Andean ridge-top forests	Ecuador, Peru	C	3,800	600–2,500 ^M	Forest ^{2,5}
048 Marañón valley	Peru	C	11,000	200–3,200 ^{L,M}	Forest ^{1,3} (S)
049 North-east Peruvian cordilleras	Peru	C	37,000	1,700–3,800 ^M	Forest ^{2,5} (S,G)
050 Junín puna	Peru	C	11,000	3,500–5,000 ^M	Grassland (S,W)
051 Peruvian high Andes	Peru	C	100,000	1,500–4,600 ^M	Scrub (F,G)
052 Peru–Chile Pacific slope	Chile, Peru	C	95,000	0–4,000 ^{L,M}	Desert (F,S)
053 Peruvian East Andean foothills	Peru	C	32,000	600–2,200 ^{L,M}	Forest ^{1,2}
054 Bolivian and Peruvian lower yungas	Bolivia, Peru	C	58,000	400–2,000 ^{L,M}	Forest ^{1,2}
055 Bolivian and Peruvian upper yungas	Bolivia, Peru	C	35,000	1,800–3,700 ^M	Forest ² (S)
056 High Andes of Bolivia and Argentina	Argentina, Bolivia, Peru	C	200,000	1,100–4,600 ^M	Forest ⁵ (S,G,R)
057 Argentine and south Bolivian yungas	Argentina, Bolivia	C	60,000	800–3,100 ^M	Forest ²
058 Sierras Centrales of Argentina	Argentina	C	22,000	1,500–2,800 ^M	Grassland (F)
059 Juan Fernández Islands	Chile	OI	180	0–1,300 ^{L,M}	Forest ⁵ (S)
060 Central Chile	Chile	C	160,000	0–2,400 ^{L,M}	Scrub (F)
061 Chilean temperate forests	Argentina, Chile	C	230,000	0–1,500 ^{L,M}	Forest ⁵
062 Southern Patagonia	Argentina, Chile, Falkland Islands (to UK)	C	170,000	0–1,200 ^L	Grassland (S,W,F)
063 Rio Branco gallery forests	Brazil, Guyana	C	94,000	0–100 ^L	Forest ¹
064 Tepuis	Brazil, Guyana, Venezuela	C	57,000	600–2,800 ^M	Forest ^{2,5} (S,V)
065 Orinoco–Negro white-sand forests	Brazil, Colombia, Venezuela	C	62,000	0–500 ^L	Forest ^{1,6} (S,V)
066 Upper Amazon–Napo lowlands	Brazil, Colombia, Ecuador, Peru	C	130,000	0–600 ^L	Forest ^{1,6} (S)
067 Amazon flooded forests	Brazil	C	140,000	0–200 ^L	Forest ^{1,6}
068 South-east Peruvian lowlands	Bolivia, Brazil, Peru	C	260,000	0–800 ^L	Forest ^{1,6}
069 Fernando de Noronha	Brazil	OI	18	0–60 ^L	Forest ³ (S)
070 North-east Brazilian caatinga	Brazil	C	200,000	0–1,000 ^L	Forest ³ (S)
071 Atlantic slope of Alagoas and Pernambuco	Brazil	C	23,000	0–1,000 ^L	Forest ¹
072 Deciduous forests of Bahia	Brazil	C	10,000	600–1,000 ^L	Forest ³
073 Central Brazilian hills and tablelands	Brazil	C	67,000	700–2,000 ^M	Savanna (S)
074 Deciduous forests of Minas Gerais and Goiás	Brazil	C	33,000	0–500 ^L	Forest ³
075 Atlantic forest lowlands	Argentina, Brazil, Paraguay	C	290,000	0–1,700 ^L	Forest ¹
076 Atlantic forest mountains	Argentina, Brazil	C	260,000	500–2,800 ^M	Forest ²
077 Argentine Mesopotamian grasslands	Argentina, Brazil, Uruguay	C	160,000	0–1,100 ^L	Grassland (W)

KEY See Table 1 (pp. 62–63).

received more attention than has that of any other region, and consequently there have been many recent taxonomic revisions of species and species-groups. However, on the basis of extensive field experience, numerous further species redefinitions and taxonomic splits are suggested in Ridgely and Tudor (1994).

Endemic Bird Areas

A series of 28 EBAs has been identified in the Andes running from east to west along the Caribbean slope (including the Santa Marta mountains: EBA 036), from north to south down the Pacific lowlands, and along their entire length at different altitudes and along various slopes. Thus there are EBAs through-

Regional Introductions

Habitat loss		Knowledge		Numbers of restricted-range species						Biological importance	Current threat level	Priority	EBA no.
				Confined to the EBA		Present also in other EBAs, SAs		Total					
				Threatened	Total	Threatened	Total	Threatened	Total				
	Moderate	Good	3	22	0	0	3	22	••	••	Urgent	031	
	Major	Good	5	5	1	7	6	12	••	•••	Critical	032	
	Moderate	Incomplete	1	5	1	12	2	17	••	•	High	033	
(V)	Moderate	Good	2	10	2	15	4	25	••	••	Urgent	034	
(G)	Moderate	Good	2	11	1	1	3	12	••	••	Urgent	035	
(S,D)	Major	Good	2	15	1	7	3	22	•••	•	Urgent	036	
(S,G)	Major	Incomplete	2	3	3	9	5	12	••	•••	Critical	037	
(G,W)	Major	Good	8	14	6	20	14	34	•••	••	Critical	038	
(S)	Major	Good	1	4	0	0	1	4	•	•	High	039	
	Major	Incomplete	4	5	5	12	9	17	••	•••	Critical	040	
(G)	Major	Incomplete	12	51	5	11	17	62	••	••	Urgent	041	
	Major	Incomplete	3	4	2	5	5	9	•	•••	Critical	042	
(F,S)	Moderate	Good	5	10	0	1	5	11	••	••	Urgent	043	
	Moderate	Good	2	11	1	6	3	17	••	•	High	044	
(S)	Severe	Good	14	45	1	10	15	55	•••	••	Critical	045	
	Major	Good	2	5	1	3	3	8	•	••	Urgent	046	
	Moderate	Poor	3	6	0	1	3	7	••	••	Urgent	047	
(S)	Major	Incomplete	3	11	2	11	5	22	•••	•	Urgent	048	
(S,G)	Moderate	Incomplete	2	19	0	5	2	24	•••	•	Urgent	049	
(S,W)	Moderate	Good	3	5	0	1	3	6	•	•••	Critical	050	
(G)	Moderate	Incomplete	8	20	3	9	11	29	•••	•••	Critical	051	
(S)	Moderate	Good	3	6	0	3	3	9	••	•	High	052	
	Moderate	Incomplete	0	6	1	8	1	14	••	•	High	053	
	Major	Incomplete	3	7	1	8	4	15	••	••	Urgent	054	
	Moderate	Incomplete	0	15	0	5	0	20	•••	•	Urgent	055	
(G,R)	Major	Incomplete	7	16	2	5	9	21	•••	••	Critical	056	
	Moderate	Incomplete	1	8	0	1	1	9	•••	•	Urgent	057	
(F)	Moderate	Good	0	2	0	0	0	2	•	•	High	058	
	Severe	Good	2	3	0	0	2	3	•	•••	Critical	059	
	Major	Incomplete	0	7	0	1	0	8	•••	•	Urgent	060	
	Major	Incomplete	0	4	0	1	0	5	••	•	High	061	
(S,W,F)	Moderate	Incomplete	1	10	0	0	1	10	•••	•	Urgent	062	
	Moderate	Incomplete	2	2	0	0	2	2	•	••	Urgent	063	
(S,V)	Limited	Incomplete	2	36	0	2	2	38	•••	•	Urgent	064	
(S,V)	Limited	Incomplete	1	11	0	1	1	12	••	•	High	065	
(S)	Moderate	Incomplete	1	10	0	0	1	10	••	•	High	066	
	Moderate	Poor	0	4	0	0	0	4	•	•	High	067	
	Moderate	Incomplete	2	12	0	0	2	12	•••	•	Urgent	068	
	Major	Good	1	2	0	0	1	2	•	•	High	069	
	Major	Incomplete	3	5	1	1	4	6	••	•••	Critical	070	
	Severe	Good	7	7	5	5	12	12	••	•••	Critical	071	
	Severe	Incomplete	2	2	0	0	2	2	•	•••	Critical	072	
(S)	Moderate	Incomplete	1	4	1	3	2	7	•	••	Urgent	073	
	Severe	Incomplete	1	2	0	0	1	2	•	•••	Critical	074	
	Severe	Incomplete	28	52	3	3	31	55	•••	•••	Critical	075	
	Moderate	Good	3	21	0	2	3	23	•••	•	Urgent	076	
(W)	Severe	Good	2	3	0	0	2	3	•	•••	Critical	077	

out the central spine of the Andes, in some of the larger Andean intermontane valleys, and on mountain ranges which run parallel to, but separate from, the main range. This makes the Andean region (including their lowland Pacific and Caribbean margins) of utmost importance for conservation. An important concentration of eight EBAs (070–077) is

located in the humid and semi-humid tropical Atlantic forests (at the eastern edge of the Brazilian shield) that stretch the length of eastern Brazil (from Alagoas to Rio Grande do Sul), and also extend into eastern Paraguay and Misiones in north-east Argentina. Only five EBAs can be described as Amazonian, two of these being located at the western fringes close to the

Box 2. Key facts for South America.

Numbers of:

- 658 Restricted-range species
- 195 Threatened restricted-range species
- 47 EBAs
- 20 Secondary Areas
- 12 Countries with EBAs

EBAs with high numbers of restricted-range species

- Chocó (EBA 041), 62 species
- Tumbesian region (EBA 045), 55 species
- Atlantic forest lowlands (EBA 075), 55 species

EBAs which are especially distinct at the generic level

- Atlantic forest lowlands (EBA 075), 11 endemic genera

EBAs with high numbers of threatened restricted-range species

- Atlantic forest lowlands (EBA 075), 31 species
- Chocó (EBA 041), 17 species
- Tumbesian region (EBA 045), 15 species

EBAs with high numbers of Critical and Endangered endemic species

- Atlantic forest lowlands (EBA 075), 18 species
- Tumbesian region (EBA 045), 6 species
- Atlantic slope of Alagoas and Pernambuco (EBA 071), 6 species

Examples of EBAs critically in need of conservation action

- Tumbesian region (EBA 045)
- Atlantic slope of Alagoas and Pernambuco (EBA 071)
- Atlantic forest lowlands (EBA 075)

Countries with high numbers of restricted-range species

- Peru, 211 species
- Colombia, 192 species (some of these species are covered under the North and Central American region)
- Brazil, 164 species

Countries with high numbers of threatened restricted-range species

- Brazil, 59 species
- Colombia, 54 species (some of these species are covered under the North and Central American region)
- Peru, 48 species

Andes (EBAs 066, 068). The Sierras Centrales of Argentina (EBA 058), Southern Patagonia (EBA 062 in part) and Tepuis (EBA 064) complete the mainland EBAs in South America. Island EBAs cover the Galápagos Islands (EBA 031), Juan Fernández Islands (EBA 059), Fernando de Noronha (EBA 069, the smallest EBA in the region at only 18 km²) and the Falkland Islands (EBA 062 in part). A total of 20 Secondary Areas, many covering the isolated ranges

of Amazonian birds, complete the analysis (see Figure 3 for location of EBAs and Secondary Areas, and Table 2 for EBA summary data).

The continental EBAs range in size from relatively small areas such as the Andean ridge-top forests (EBA 047, 3,800 km²) and the Caripe–Paria region (EBA 032, 6,000 km²), to the vast Atlantic forest areas (EBA 075, 290,000 km², and EBA 076, 260,000 km²) and the South-east Peruvian lowlands (EBA 086, 260,000 km²). They are distributed relatively evenly between lowland and montane elevations (16 EBAs are primarily lowland, 18 primarily montane, and 13 cover both lowland and montane zones).

It is unsurprising that the predominant habitat-type of South America's EBAs is humid forest, which ranges from the wet, pluvial forests of the Chocó (EBA 041), the Upper Amazon–Napo lowlands (EBA 066) and the South-east Peruvian lowlands (068), to the relatively stunted and species-poor white-sand forests of the upper Orinoco–Negro (EBA 065) and the semi-tropical forests that characterize the southern and western extension of the Atlantic lowland forests (EBA 075) in eastern Paraguay and northern Brazil.

Dry deciduous forest can be found in Caribbean Colombia and Venezuela (EBA 035), but also in the Tumbesian region (EBA 045), the Marañón valley (EBA 048), Bahia (EBA 072) and Minas Gerais and Goiás (EBA 074). With even less rainfall, the dry forest of north-west Peru grades into the desert vegetation of the Peru–Chile Pacific slope (EBA 052). Subtropical or temperate forest, characterized by 'southern pine' *Araucaria* and *Nothofagus* forest, can be found in southern Chile (EBA 061). Semi-open and open lowland habitats are well represented in Southern Patagonia (EBA 062), Mediterranean matorral scrub in Central Chile (EBA 060), caatinga in North-east Brazil (EBA 070), and wet grassland or monte in the Argentine Mesopotamian grasslands (EBA 077).

Montane habitats are extremely important in some EBAs, such as in the Santa Marta mountains (EBA 036) which in fact cover all life-zones including tropical to temperate forest. Stunted ridge-top forest is important for some Andean birds (e.g. in EBA 047), and treeline elfin forest and (above the treeline) páramo (comprising tussocky grassland, scrub, open rocky areas, etc.) defines the Central Andes (EBA 043). Particularly important for some restricted-range and threatened birds are the semi-humid, isolated forest patches comprising *Polylepis*, *Gynoxys*, *Escallonia* and *Weinmannia* trees/bushes (e.g. in the Peruvian high Andes, EBA 051). Where páramo defines the vegetation above the treeline in the northern Andes, puna defines it in the southern

Regional Introductions

Andes, and is especially important in the Junín EBA (050) in southern Peru. In some parts of the Andes, for example in Peru and Bolivia, local conditions have led to the development of a particularly complex mosaic of different habitat types. In such areas, some EBAs overlap geographically, but as their species have completely different habitat requirements (such as wet subtropical or temperate forest, puna, páramo, cloud forest and *Polylepis* woodland) the EBAs can be divided on the basis of these preferences. For example, the north-east Peruvian cordilleras (EBA 049) primarily comprise humid montane forest, whereas the adjacent Peruvian high Andes (EBA 051) are characterized by arid and semi-arid vegetation. The Junín puna (EBA 050) is surrounded by the Peruvian high Andes, but differs due to the presence of puna grassland, scrub, marshland and open water.

Knowledge of EBAs is incomplete in many areas because of complex biogeography, the inaccessibility of some areas, and the complicating factor of widespread habitat destruction. For example, in the Chocó (EBA 041) it has not been possible to divide the EBA further into lowland and montane areas owing to an incomplete knowledge of the precise altitudinal ranges of the species involved. Similarly, the distributions of Amazonian birds are generally incompletely or poorly known, so the boundaries and areas of the EBAs can only be approximately defined. Two EBAs are particularly poorly known, namely the Andean ridge-top forests in Ecuador and Peru (EBA 047), and the Amazon flooded forests in Brazil (EBA 067), and further information would help to refine the EBA analysis.

Threats and conservation

A long history of human colonization and its associated economic, social and political factors, especially in the twentieth century, has brought about serious changes to the South American environment. The forests are being felled, the grasslands cultivated, wetlands drained and pristine habitats increasingly fragmented and disturbed. Throughout the Americas the primary threat to birds (and thus EBAs) is this destruction and disturbance (or alteration) of the habitats on which their existence depends. In the Andean region, eight of the 28 EBAs are considered of critical importance for conservation action, with the Tumbesian region (EBA 045) standing out in particular. Some of the original great forests, such as those of eastern Brazil, are functionally gone. Being one of the first parts of the continent to be colonized by Europeans, these Atlantic forests have been reduced to an estimated 2–5% of their original forest cover (Oliver and Santos 1991), and mass species

extinctions are likely unless urgent action is taken. Six of the eight EBAs in this region are considered of critical importance for conservation action. The Atlantic forest lowlands (EBA 075) is possibly the most important EBA in South America: it has especially high numbers of restricted-range species (59), endemic genera (11), and threatened restricted-range species (32, of which 18 are considered Critical or Endangered). The Atlantic slope of Alagoas and Pernambuco (EBA 071) also has a particularly high number of species (7) classified as Critical or Endangered.

Although the Amazon basin is not rich in restricted-range species, extensive deforestation there could disrupt climatic patterns over the continent and threaten the integrity of many Andean EBAs. Even within this vast region, there is a criss-cross of highways, and steadily the cleared margins of these roads swell to meet one another, isolating a growing number of forest fragments between them. Currently more devastating has been the conversion of the complex of open-country habitats in central South America (e.g. Sierras Centrales of Argentina, EBA 058; southern Patagonia, EBA 062; central Brazilian hills and tablelands, EBA 073; Argentine Mesopotamian grasslands, EBA 077) into planted pines, soya beans and sugar-cane, interspersed with citrus groves, overgrazed pasture and other crops (Stotz *et al.* 1996).

South America has a well-developed protected-area network covering approximately 4.8% of terrestrial habitats (e.g. IUCN 1992b, Harcourt and Sayer 1996), although this network does not adequately embrace all areas of high biodiversity conservation value. Specific sites within South American EBAs and elsewhere have been identified as part of an analysis which has documented the 499 most important sites ('Key Areas') currently known for threatened species in the continent (Wege and Long 1995). If adequately protected, these Key Areas would help ensure the conservation of almost all of the region's threatened species and are perhaps the most efficient areas currently known in which to target conservation initiatives, whether these be direct protection or field surveys. However, only some 44% of Key Areas currently have any form of protected status, and just 22% are national parks, strict nature reserves or biosphere reserves (IUCN categories I, II and IX). In addition, many of these protected areas remain under threat and, in many, habitat degradation, uncontrolled hunting, etc., continue unchecked, suggesting that effective management of activities undertaken within them is still required if their effectiveness for biodiversity conservation is to be ensured.

AFRICA, EUROPE AND THE MIDDLE EAST

THIS REGION covers all of continental Africa plus Europe and the Middle East. Islands in the Atlantic Ocean are included, west as far as the Azores and south to Tristan da Cunha, as well as islands in the Indian Ocean east as far as the Mascarenes and south to Kerguelen and the Crozet Islands. Most of these islands are in small, isolated archipelagos, with the notable exception of the large continental island of Madagascar (see Box 3 for key facts).

Restricted-range species

Like the world's other tropical and subtropical regions, sub-Saharan Africa has a high bird-species diversity, although total numbers are lower than in the Neotropics or tropical Asia. This relatively high diversity is reflected in the number of restricted-range species (408), the third (equal) highest of all of the regions (note that few of these species are from Europe or the Middle East). A little more than half of the restricted-range species (59%) occur in continental regions, with somewhat fewer (41%) on islands. Of the continental species, the majority occur in montane, largely forest, habitats (66%), as opposed to lowland ones (34%). Some restricted-range species are associated with grassland, scrub and open, rocky areas.

Hall and Moreau (1970) and Snow (1978) published detailed point-locality maps for the resident species of the Afrotropical region. More up-to-date atlases have been produced for several African countries, for example Kenya (Lewis and Pomeroy 1989) and several provinces of South Africa (e.g. Tarboton *et al.* 1987; see also Harrison *et al.* 1997, which appeared too late to be used in this project). Information for the Palearctic region is generally good (e.g. Cramp *et al.* 1977–1994), as is that for the island distribution of birds, e.g. Cape Verdes (Hazevoet 1995), Madagascar (Langrand 1990) and the Mascarenes (Diamond 1987). It was therefore relatively straightforward to select candidate species for this region and to judge which have restricted ranges. For islands, these included all endemics apart from those on Madagascar, where about half (c.50 species) were excluded from the project because their historical ranges were estimated to be larger than 50,000 km² (notably those which formerly occurred throughout the eastern coastal rain forests).

There are major gaps in knowledge of the avifaunas of some countries, for example Angola, Mozambique, Ethiopia, Somalia and Zaïre. The limited recent ornithological work in these poorly known countries has led to the description of several new species, such as Bulb Burti Bush-shrike *Laniarius liberatus* from Somalia (Smith *et al.* 1991b) and Itombwe Nightjar

Box 3. Key facts for Africa, Europe and the Middle East.

Numbers of:

- 408 Restricted-range species
- 180 Threatened restricted-range species
- 45 EBAs
- 33 Secondary Areas
- 48 Countries with EBAs

EBAs with high numbers of restricted-range species

- Tanzania–Malawi mountains (EBA 105), 37 species
- Albertine Rift mountains (EBA 106), 37 species
- Cameroon mountains (EBA 086), 29 species

EBAs which are especially distinct at the generic level

- East Malagasy wet forests (EBA 094), 9 endemic genera

EBAs with high numbers of threatened restricted-range species

- Tanzania–Malawi mountains (EBA 105), 20 species
- East Malagasy wet forests (EBA 094), 14 species
- Cameroon mountains (EBA 086), 12 species

EBAs with high numbers of Critical and Endangered endemic species

- Tanzania–Malawi mountains (EBA 105), 6 species
- Western Angola (EBA 087), 5 species
- Comoro Islands (EBA 098), 5 species
- Mauritius (EBA 102), 5 species

Examples of EBAs critically in need of conservation action

- Western Angola (EBA 087)
- Comoro Islands (EBA 098)
- South Ethiopian highlands (EBA 114)

Countries with high numbers of restricted-range species

- Tanzania, 52 species
- Madagascar, 49 species
- Zaïre, 47 species

Countries with high numbers of threatened restricted-range species

- Madagascar, 27 species
- Tanzania, 22 species
- Zaïre, 18 species

Caprimulgus prigoginei from Zaïre (Louette 1990). New species continue to be described even from some of the better known countries, such as Kilombero Weaver *Ploceus burnieri* from Tanzania (Baker and Baker 1990) and Long-tailed Pipit *Anthus longicaudatus* from South Africa (Liversidge 1996).

Regional Introductions

As in other regions of the world, Sibley and Monroe (1990, 1993) has been followed as the standard taxonomic work. However, Collar *et al.* (1994) diverged from this list for a number of African taxa, generally following Dowsett and Dowsett-Lemaire (1993), Dowsett and Forbes-Watson (1993) and the advice of regional experts; these taxonomic amendments have been followed in this analysis.

Endemic Bird Areas

Africa is generally less complex biogeographically than the tropical Americas or the Oriental region, and most EBAs are discrete, having few shared restricted-range species. However, there are several immediately adjacent pairs of EBAs, usually one montane and one lowland, e.g. the Cameroon mountains (EBA 086) and the Cameroon and Gabon lowlands (EBA 085). Not surprisingly, many of the region's EBAs (21) are in sub-Saharan Africa, only six falling within Europe and the Middle East. Levels of endemism are high on almost all of the African islands especially in relation to their size, and most are included within 13 island EBAs. A further five EBAs cover much of Madagascar, and 33 Secondary Areas complete the analysis (see Figure 4 for location of EBAs and Secondary Areas, and Table 3 for EBA summary data).

The wide range of tropical and subtropical vegetation types found in Africa were documented and mapped in detail by White (1983). Many of these vegetation types, and their characteristic flora and fauna, are well represented within the African EBAs and Secondary Areas. For example, almost all of the disjunct mountain ranges included in White's Afromontane regional centre of endemism are coincident with the Cameroon mountains (EBA 086), Lesotho highlands (EBA 090), South African grasslands (EBA 091), Eastern Zimbabwe mountains (EBA 104), Tanzania–Malawi mountains (EBA 105), Albertine Rift mountains (EBA 106), Kenyan mountains (EBA 109), South Ethiopian highlands (EBA 114), Central Ethiopian highlands (EBA 115), North Somali mountains (EBA 116) and Mount Kulal (Secondary Area s062). Several of the restricted-range species of Western Angola (EBA 087) and one from the Upper Guinea forest (EBA 084) occur in Afromontane habitats, and those of the South African forests (EBA 089) occur in both Afromontane and White's Tongaland–Pondoland regional mosaic habitats. The Afromontane EBAs include those with the highest totals of restricted-range species in the region.

It should be noted that a compromise has been made to the EBA analysis in the case of the Taita hills and Mt Kasigau in southern Kenya. The three taxa which are endemic to these mountains are here treated as species following Collar *et al.* (1994), although Sibley and Monroe (1990, 1993), Dowsett

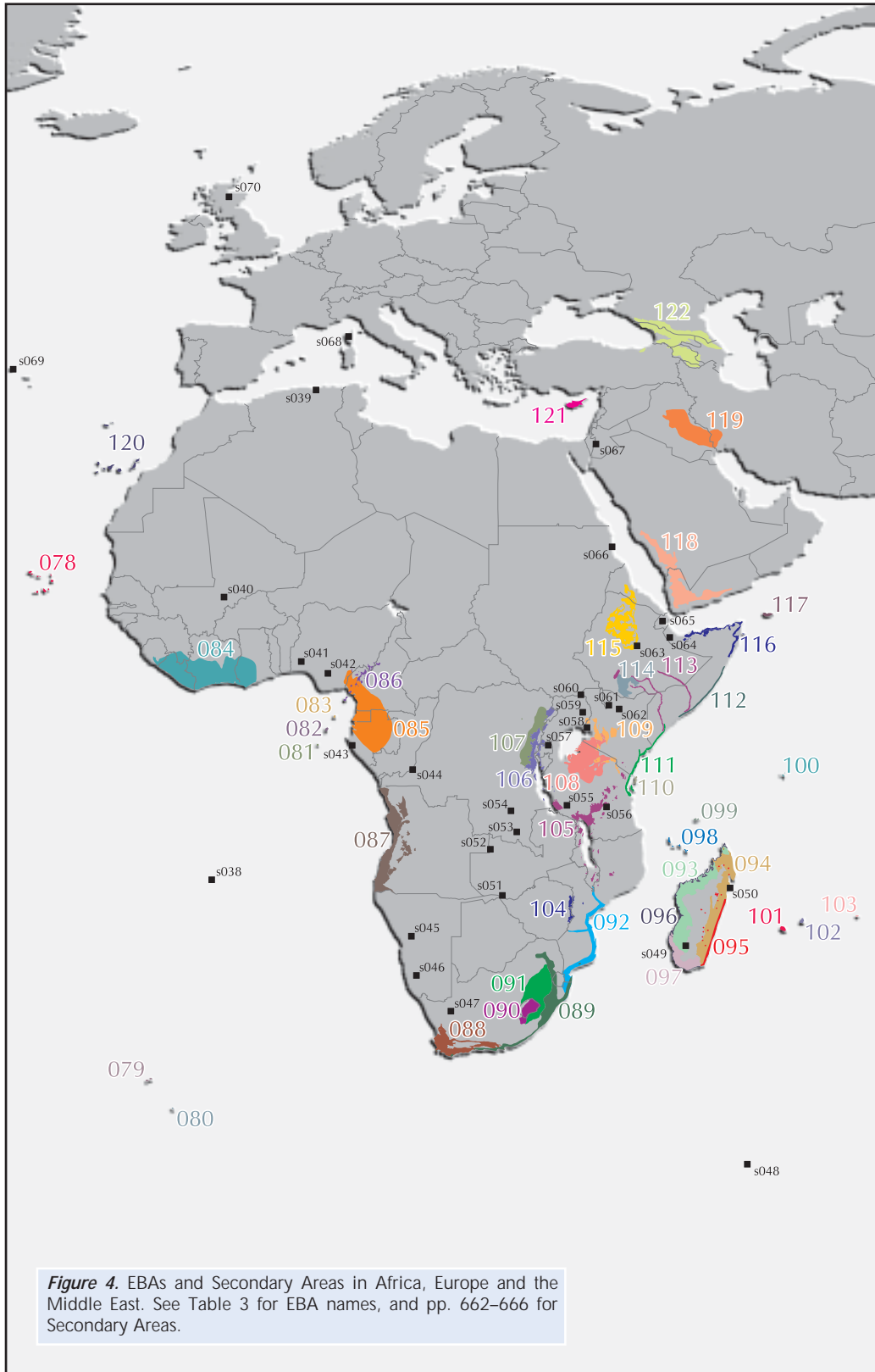
and Forbes-Watson (1993) and Zimmerman *et al.* (1996) consider them to be forms of more widespread species. Because of the disputed taxonomic status of these forms, these mountains are treated as part of the Tanzania–Malawi mountains (EBA 105) rather than as a separate EBA in their own right.

The characteristic fauna and flora of the lowland rain forests of White's Guineo-Congolian regional centre of endemism are well represented by the Upper Guinea forests (EBA 084), Cameroon–Gabon lowlands (EBA 085) and Eastern Zaïre lowlands (EBA 107). The northern and southern sections of White's Zanzibar–Inhambane regional mosaic are included in the East African coastal forests (EBA 111) and South-east African coast (EBA 092) respectively; the restricted-range species in the former are mainly confined to forest, but in the latter they occur in non-forest habitats. The Serengeti plains (EBA 108), the Central Somali coast (EBA 112), the Jubba and Shabeele valleys (EBA 113) and several Secondary Areas—North-east Uganda (s060), North Kenyan short-grass plains (s061), Northern Ethiopia (s063) and North-west Somalia (s064)—lie within White's Somalia–Masai regional centre of endemism, where the restricted-range species occur in a variety of semi-arid non-forest habitats. The Cape regional centre of endemism is also an EBA—the Cape fynbos (EBA 088)—but is far less important for endemic birds (and other animals) than it is for endemic plants.

There are several important vegetation zones defined by White which do not include any EBAs, although most contain one or more Secondary Areas. These cover the Lake Victoria regional mosaic which includes the Dry woodlands west of Lake Victoria (Secondary Area s057), and the Sahara and Sahel regional transition zones, as well as the following regional centres of endemism: the Zambesian which includes Southern Zambia (Secondary Area s051) and North-west Zambia (s052); the Sudanian which includes the Upper Niger valley (s040); and the Karoo–Namib which includes the Namibian escarpment (s045), Namib desert (s046) and Karoo (s047).

Like the Cape regional centre of endemism, the Mediterranean region of southern Europe, North Africa and the Middle East is exceptionally rich in narrowly endemic plants, but is only covered by EBAs and Secondary Areas in Cyprus (EBA 121), the North Algerian mountains (Secondary Area s039), Corsican mountains (s068), and the Levantine mountains of Syria, Lebanon, Israel and Jordan (s067). Other European EBAs cover Madeira and the Canary Islands (EBA 120), and the subalpine and alpine zones of the Caucasus mountains (EBA 122). Middle Eastern EBAs cover the island of Socotra (EBA 117), which lies off the horn of Africa, the South-west

Endemic Bird Areas of the World



Regional Introductions



R. Mittermeier

Verreaux's sifaka *Propithecus verreauxi* is found in the West Malagasy dry forests (EBA 093) and the South Malagasy spiny forests (EBA 097).

Arabian mountains (EBA 118) and the Mesopotamian marshes of Iraq and Iran (EBA 119).

Knowledge of many of the EBAs is still judged to be incomplete. For example, São Tomé (EBA 082) had been little studied ornithologically until recently when four endemic bird species were rediscovered after 50 years without records (Atkinson *et al.* 1991), while information for the tiny island of Annobón (EBA 081), also in the Gulf of Guinea, comes from a brief visit in 1989, the first by an ornithologist in 30 years (Harrison 1990). Ornithological exploration remains incomplete in Madagascar, where a new species (and genus) of passerine, Cryptic Warbler *Cryptosylvicola randrianasoloi*, was discovered only in 1992, and subsequently revealed to have a relatively broad distribution in the East Malagasy wet forests (EBA 094) (Goodman *et al.* 1996).

Threats and conservation

Many countries in Africa are experiencing rapid human population growth, with associated pressures on natural habitats. In some EBAs a high proportion of the key habitats for the restricted-range species has already been lost, for example in the Upper Guinea forests (EBA 084), the East African coastal forests (EBA 111) and several of the Indian Ocean island EBAs such as the Comoros (EBA 098), Mauritius (EBA 102) and Rodrigues (EBA 103). In some EBAs habitat loss is localized: in the Albertine Rift mountains (EBA 106), for example, much of the forest has been lost from the densely populated countries of Rwanda and Burundi, but in eastern Zaïre large areas

of montane forest remain intact, although the lower-altitude transitional forests are being rapidly cleared.

The EBAs with highest numbers of threatened restricted-range species are the Afromontane Tanzania–Malawi mountains (EBA 105) and Cameroon mountains (EBA 086), and the East Malagasy wet forests (EBA 094), which all have high overall totals of restricted-range species. The threatened species in these EBAs are usually the forest birds with particularly small ranges, which are therefore the most vulnerable to any habitat loss.

Introduced species are a serious problem on many of the island EBAs, for example on Aldabra (EBA 099) where it is thought that predation by rats was the main cause of the (presumed) extinction of Aldabra Warbler *Nesillas aldabrana*, and in the Granitic Seychelles (EBA 100) where many populations of restricted-range birds have become extinct from at least one island in the group.

The protected areas of Africa are documented in IUCN (1992c), which is used as the standard reference for this region. However, IUCN (1992c) only lists a small proportion of the forest reserves in most African countries. Although these reserves were designated to protect natural resources, rather than specifically for wildlife conservation, they are vitally important for the protection of the key habitats in many EBAs. Collar and Stuart (1988) documented key forests for the conservation of threatened birds in Africa, many of which are mentioned in the relevant EBA and Secondary Area accounts. The current



A. F. A. Hawkins

One of the most characteristic plants of the South Malagasy spiny forests (EBA 097) are the Diديهaceae (an endemic family).

Endemic Bird Areas of the World

Table 3. EBAs of Africa, Europe and the Middle East: summary data.

EBA number and name	Countries	Continental/ Island	Area (km ²)	Altitude (m)	Habitat
078 Cape Verde Islands	Cape Verde	OI	4,000	0–2,800 ^L	Scrub (R)
079 Tristan Islands	St Helena (to UK)	OI	110	0–2,000 ^L	Grassland (S,R)
080 Gough Island	St Helena (to UK)	OI	65	0–900 ^L	Grassland (S)
081 Annobón	Equatorial Guinea	OI	17	0–600 ^L	Forest ¹
082 São Tomé	São Tomé e Príncipe	OI	860	0–2,000 ^{LM}	Forest ^{1,2}
083 Príncipe	São Tomé e Príncipe	OI	140	0–900 ^L	Forest ¹
084 Upper Guinea forests	Ghana, Guinea, Ivory Coast, Liberia, Sierra Leone	C	340,000	0–1,000 ^L	Forest ¹
085 Cameroon and Gabon lowlands	Cameroon, Equatorial Guinea, Gabon, Nigeria	C	280,000	0–1,000 ^L	Forest ¹
086 Cameroon mountains	Cameroon, Equatorial Guinea, Nigeria	C	14,000	800–3,000 ^M	Forest ² (S)
087 Western Angola	Angola, Namibia	C	150,000	0–2,000 ^{LM}	Forest ^{1,2} (S,G)
088 Cape fynbos	South Africa	C	110,000	0–1,500 ^{LM}	Scrub (R)
089 South African forests	Mozambique, South Africa, Swaziland	C	91,000	0–1,900 ^{LM}	Forest ⁴ (S)
090 Lesotho highlands	Lesotho, South Africa	C	30,000	1,000–3,000 ^M	Grassland (S,R)
091 Southern African grasslands	Lesotho, South Africa	C	110,000	1,700–2,400 ^M	Grassland
092 South-east African coast	Malawi, Mozambique, South Africa, Swaziland, Zimbabwe	C	87,000	0–200 ^L	Forest ³ (S)
093 West Malagasy dry forests	Madagascar	CI	150,000	0–800 ^L	Forest ³
094 East Malagasy wet forests	Madagascar	CI	160,000	0–2,000 ^{LM}	Forest ^{1,2}
095 East Malagasy wetlands	Madagascar	CI	17,000	0–2,700 ^{LM}	Wetland (R)
096 West Malagasy wetlands	Madagascar	CI	26,000	0–1,500 ^L	Wetland (F,R)
097 South Malagasy spiny forests	Madagascar	CI	46,000	0–500 ^L	Forest ³ (S)
098 Comoro Islands	Comoros, Mayotte (to France)	OI	2,200	0–2,600 ^{LM}	Forest ^{1,2} (S)
099 Aldabra	Seychelles	OI	160	0–20 ^L	Scrub (F)
100 Granitic Seychelles	Seychelles	OI	240	0–900 ^L	Forest ^{1,3}
101 Réunion	Réunion (to France)	OI	2,500	0–3,000 ^{LM}	Forest ^{1,2} (S)
102 Mauritius	Mauritius	OI	1,900	0–800 ^L	Forest ^{1,5}
103 Rodrigues	Mauritius	OI	110	0–300 ^L	Forest ¹
104 Eastern Zimbabwe mountains	Mozambique, Zimbabwe	C	12,000	800–2,400 ^M	Forest ²
105 Tanzania–Malawi mountains	Kenya, Malawi, Mozambique, Tanzania, Zambia	C	72,000	200–3,000 ^{LM}	Forest ^{1,2} (S,G)
106 Albertine Rift mountains	Burundi, Rwanda, Tanzania, Uganda, Zaire	C	56,000	1,000–4,300 ^M	Forest ² (S)
107 Eastern Zaire lowlands	Uganda, Zaire	C	75,000	700–1,800 ^{LM}	Forest ^{1,2}
108 Serengeti plains	Kenya, Tanzania	C	160,000	1,000–2,200 ^{LM}	Scrub (V,G)
109 Kenyan mountains	Kenya, Tanzania, Uganda	C	48,000	900–4,400 ^M	Forest ² (S,G)
110 Pemba	Tanzania	OI	1,000	0–100 ^L	Forest ¹
111 East African coastal forests	Kenya, Somalia, Tanzania	C	25,000	0–500 ^L	Forest ^{1,3} (S)
112 Central Somali coast	Somalia	C	15,000	0–60 ^L	Grassland
113 Jubba and Shabeelle valleys	Ethiopia, Kenya, Somalia	C	35,000	0–800 ^L	Forest ³ (S,W)
114 South Ethiopian highlands	Ethiopia	C	37,000	1,000–2,000 ^M	Savanna (F,S,G)
115 Central Ethiopian highlands	Eritrea, Ethiopia	C	120,000	1,300–3,300 ^M	Scrub (R)
116 North Somali mountains	Somalia	C	32,000	300–2,100 ^{LM}	Forest ⁴ (S,R)
117 Socotra	Yemen	OI	3,500	0–1,500 ^L	Scrub (R,D)
118 South-west Arabian mountains	Sauda Arabia, Yemen	C	150,000	1,200–3,600 ^M	Forest ⁴ (S,R)
119 Mesopotamian marshes	Iran, Iraq	C	130,000	0–100 ^L	Wetland
120 Madeira and the Canary Islands	Portugal, Spain	OI	8,000	0–3,700 ^{LM}	Forest ⁴ (S,R)
121 Cyprus	Cyprus	CI	9,300	0–1,800 ^{LM}	Forest ⁵ (S)
122 Caucasus	Armenia, Azerbaijan, Georgia, Iran, Turkey, Russia	C	170,000	1,200–4,000 ^M	Grassland (F,S)

KEY See Table 1 (pp. 62–63).

Important Bird Areas (IBA) Programme of BirdLife International's African Partnership is preparing inventories of sites for threatened, restricted-range, biome-restricted and congregatory bird species (already complete in Ethiopia: EWNHS 1996), and will

work for the conservation of this network of sites. There are already several very important conservation initiatives within African EBAs; examples of these are described in the EBA accounts for the Cameroon mountains (EBA 086), the East Usambara

Regional Introductions

		Numbers of restricted-range species								Priority	EBA no.	
		Confined to the EBA		Present also in other EBAs, SAs		Total		Biological importance	Current threat level			
Habitat loss	Knowledge	Threatened	Total	Threatened	Total	Threatened	Total					
	Severe	Incomplete	2	4	0	0	2	4	•	••	Urgent	078
	Moderate	Good	3	4	0	0	3	4	••	••	Urgent	079
	Possible	Good	2	2	0	0	2	2	•	••	Urgent	080
	Limited	Poor	2	2	0	1	2	3	•	••	Urgent	081
	Limited	Incomplete	7	16	1	5	8	21	•••	••	Critical	082
	Moderate	Incomplete	1	6	1	5	2	11	••	•	High	083
	Major	Incomplete	11	15	0	0	11	15	•••	•••	Critical	084
	Moderate	Poor	1	5	1	1	2	6	•	•	High	085
	Major	Incomplete	10	27	2	2	12	29	•••	••	Critical	086
	Unquantified	Poor	7	13	1	1	8	14	••	•••	Critical	087
	Moderate	Good	0	6	0	0	0	6	•	•	High	088
	Possible	Good	0	7	0	0	0	7	•	•	High	089
	Moderate	Incomplete	0	3	0	0	0	3	•	•	High	090
	Major	Good	3	3	0	0	3	3	•	•••	Critical	091
	Unquantified	Incomplete	0	4	0	0	0	4	•	•	High	092
	Major	Incomplete	3	3	1	5	4	8	•	•	High	093
	Major	Incomplete	13	20	1	3	14	23	•••	••	Critical	094
	Major	Incomplete	3	6	0	2	3	8	•	•••	Critical	095
	Moderate	Incomplete	5	5	0	2	5	7	•	•••	Critical	096
	Moderate	Incomplete	2	8	0	2	2	10	•••	•	Urgent	097
	Major	Incomplete	6	16	0	2	6	18	••	•••	Critical	098
	Limited	Good	0	1	0	2	0	3	•	•	High	099
	Major	Good	8	11	0	0	8	11	••	•••	Critical	100
	Moderate	Incomplete	1	4	0	3	1	7	•	••	Urgent	101
	Severe	Good	7	7	0	3	7	10	•	•••	Critical	102
	Severe	Incomplete	2	2	0	0	2	2	••	•••	Critical	103
	Moderate	Incomplete	0	2	1	1	1	3	•	•	High	104
	Moderate	Incomplete	16	31	4	6	20	37	•••	••	Critical	105
	Moderate	Incomplete	10	36	1	1	11	37	•••	•	Urgent	106
	Moderate	Poor	3	6	0	0	3	6	•	•	High	107
	Moderate	Incomplete	1	5	1	1	2	6	••	•	High	108
	Moderate	Good	3	8	0	1	3	9	••	••	Urgent	109
	Major	Incomplete	0	4	0	0	0	4	•	•	High	110
	Major	Incomplete	2	3	3	4	5	7	•	••	Urgent	111
	Possible	Poor	1	2	0	0	1	2	•	•••	Critical	112
	Unquantified	Poor	2	4	0	0	2	4	•	•••	Critical	113
	Unquantified	Poor	4	5	0	0	4	5	••	•••	Critical	114
	Unquantified	Poor	3	4	0	0	3	4	•	•••	Critical	115
	Unquantified	Poor	3	3	0	0	3	3	•	•••	Critical	116
	Major	Incomplete	3	6	0	0	3	6	•	•	High	117
	Moderate	Incomplete	2	7	0	0	2	7	••	•	High	118
	Major	Incomplete	0	2	0	0	0	2	•	•	High	119
	Major	Good	2	8	0	1	2	9	•	•	High	120
	Major	Good	0	2	0	0	0	2	•	•	High	121
	Major	Incomplete	0	3	0	0	0	3	•	•	High	122

Mountains in Tanzania (EBA 105) and the East African coastal forests (EBA 111).

An IBA inventory is also available for the Middle East (Evans 1994), and information and action are further advanced in Europe: an IBA inventory has

already been published (Grimmett and Jones 1989) and is being updated (Heath *et al.* in prep.), the status of all birds has been reviewed (Tucker and Heath 1994), and detailed action plans for threatened species are available (Heredia *et al.* 1996).

CONTINENTAL ASIA

THIS REGION covers the eastern Palearctic and much of the Oriental region (but not Peninsular Malaysia, the Philippines and Indonesia, which are included with New Guinea and Australia in a separate region, see p. 81). Continental Asia is characterized by numerous mountains, most notably the Himalayas and other ranges around the margins of the high-altitude Qinghai–Tibetan plateau, which include the highest mountain peaks in the world (see Box 4 for key facts).

Restricted-range species

This is one of the richer regions of the world in overall bird species diversity, but the total number of restricted-range species (203) is relatively low. However, this may underestimate the importance of localized endemism in Asia for two reasons. The first is that there appear to be many species which have relatively small ranges but which narrowly fail to meet the 50,000-km² range-size criterion, notably in the Himalayas and mountains of south-west China. Secondly, much of the work on species taxonomy in this region took place during a period when the trend was to treat morphologically distinct allopatric and parapatric taxa as subspecies of relatively widespread species, an approach which is followed in most of the major avifaunal works which cover the region (e.g. King *et al.* 1975, Ripley 1982, Smythies 1986, Ali and Ripley 1987, Cheng Tso-hsin 1987, Boonsong and Round 1991, Inskipp and Inskipp 1991, Roberts 1991). There are, for example, c.46 subspecies of bird endemic to Hainan according to Cheng Tso-hsin (1987) and Howard and Moore (1991), several of which are very distinct and may be better treated as full species (Olsson *et al.* 1993). Many of the restricted-range species are associated with the montane forests and other habitats of the



Edwards's Pheasant *Lophura edwardsi* is endemic to the Annamese lowlands (EBA 143) in Vietnam where it was feared extinct in the wild until recently refound.

Box 4. Key facts for continental Asia.

Numbers of:

- 203 Restricted-range species
- 88 Threatened restricted-range species
- 27 EBAs
- 23 Secondary Areas
- 13 Countries with EBAs

EBAs with high numbers of restricted-range species

- Sri Lanka (EBA 124), 23 species
- Eastern Himalayas (EBA 130), 22 species
- Taiwan (EBA 149), 15 species

EBAs with high numbers of threatened restricted-range species

- Eastern Himalayas (EBA 130), 11 species
- Annamese lowlands (EBA 143), 7 species
- Sri Lanka (EBA 124), 6 species

EBAs with high numbers of Critical and Endangered endemic species

- Annamese lowlands (EBA 143), 4 species

Examples of EBAs critically in need of conservation action

- Chinese subtropical forests (EBA 140)
- Annamese lowlands (EBA 143)
- Nansei Shoto (EBA 148)

Countries with high numbers of restricted-range species

- India, 74 species
- China, 56 species

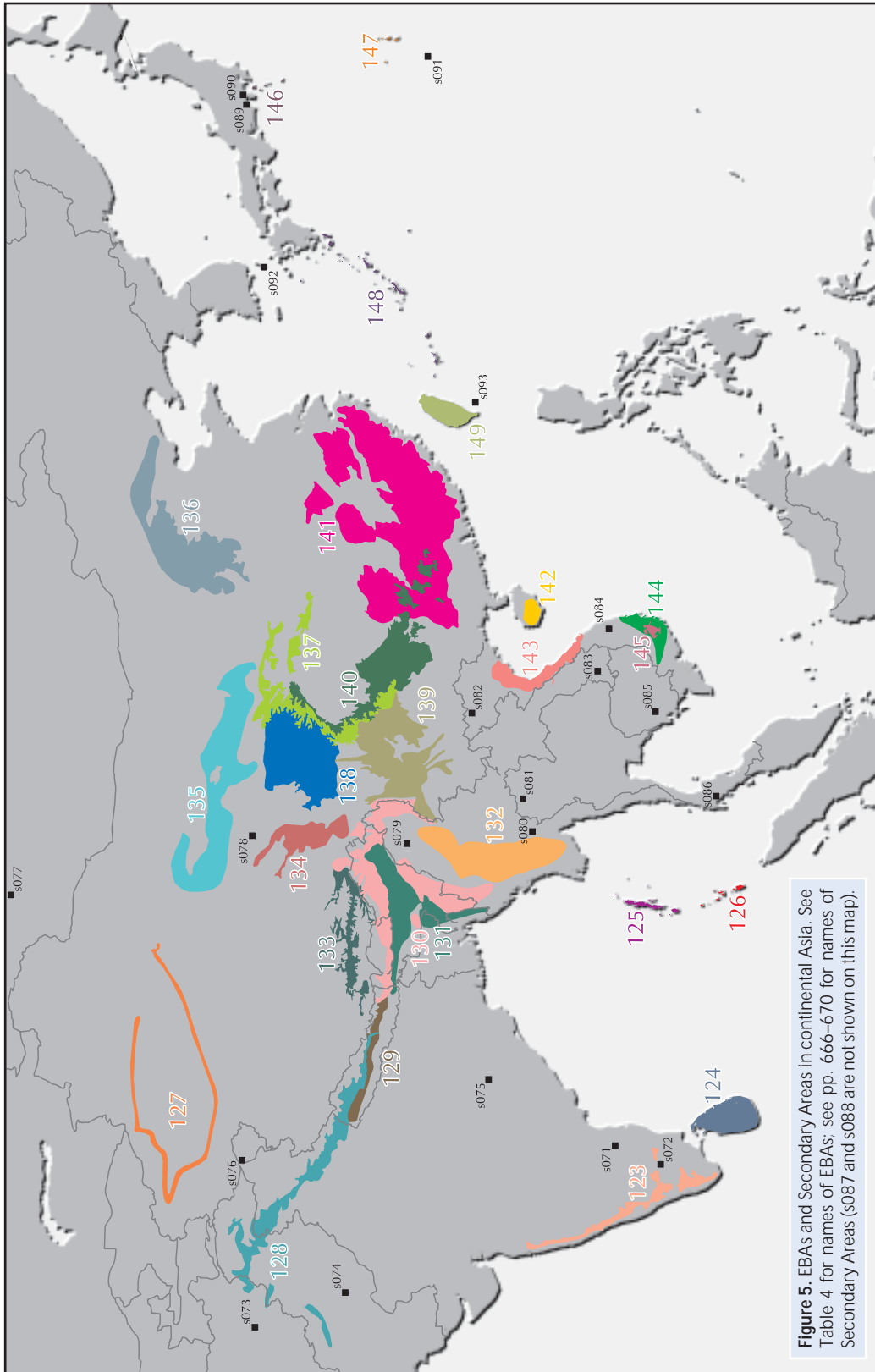
Countries with high numbers of threatened restricted-range species

- China, 33 species
- India, 23 species
- Vietnam, 14 species

Himalayas and south-west China, but there are also significant numbers in tropical and subtropical forests in southern and south-east Asia. Very few occur in the temperate, boreal and arctic habitats in northern Asia.

Parts of the continent have historically been inaccessible, for political as well as for logistical reasons, and as a consequence the region's avifauna is relatively poorly known. Many of the restricted-range species are known by a handful of records, and their habitat requirements are not fully understood—notably Vaurie's Nightjar *Caprimulgus centralasicus* (from China) and Rusty-throated Wren-babbler *Spelaeornis badeigularis* (India), both known only by the type specimens, and Himalayan Quail *Ophrysia superciliosa* (India; not recorded during the twentieth century). Several restricted-range species have only been described in the past 20 years, including Okinawa Rail *Gallirallus okinawae* (from Nansei

Regional Introductions



Endemic Bird Areas of the World

Table 4. EBAs of continental Asia: summary data.

EBA number and name	Countries	Continental/ Island	Area (km ²)	Altitude (m)	Habitat
123 Western Ghats	India	C	61,000	0–2,600 ^{L,M}	Forest ^{1,2} (G)
124 Sri Lanka	Sri Lanka	CI	66,000	0–2,400 ^{L,M}	Forest ^{1,2,3}
125 Andaman Islands	India, Myanmar	OI	8,200	0–700 ^L	Forest ^{1,6}
126 Nicobar Islands	India	OI	1,800	0–600 ^L	Forest ¹
127 Taklimakan Desert	China	C	60,000	900–1,300 ^L	Desert (S)
128 Western Himalayas	Afghanistan, India, Nepal, Pakistan	C	130,000	1,500–3,600 ^M	Forest ⁵ (G)
129 Central Himalayas	Nepal	C	56,000	1,500–3,300 ^M	Forest ⁵ (S)
130 Eastern Himalayas	Bangladesh, Bhutan, China, India, Myanmar, Nepal	C	220,000	300–4,000 ^M	Forest ^{4,5}
131 Assam plains	Bangladesh, India, Nepal	C	126,000	0–1,000 ^L	Grassland (S,W)
132 Irrawaddy plains	Myanmar	C	160,000	0–1,000 ^L	Forest ³ (S)
133 Southern Tibet	China, India	C	63,000	2,700–5,000 ^M	Forest ⁵ (S,G)
134 Eastern Tibet	China	C	65,000	3,600–4,600 ^M	Forest ⁵ (S,R)
135 Qinghai mountains	China	C	230,000	1,800–3,500 ^M	Scrub (G,R)
136 Shanxi mountains	China	C	180,000	1,300–2,800 ^M	Forest ⁵
137 Central Sichuan mountains	China	C	140,000	1,500–3,700 ^M	Forest ⁵ (S)
138 West Sichuan mountains	China	C	180,000	2,700–4,900 ^M	Forest ⁵ (S,G,R)
139 Yunnan mountains	China, Myanmar	C	190,000	1,500–4,000 ^M	Forest ⁵ (S)
140 Chinese subtropical forests	China	C	160,000	300–2,200 ^{L,M}	Forest ⁴
141 South-east Chinese mountains	China	C	610,000	300–1,900 ^{L,M}	Forest ⁴
142 Hainan	China	CI	13,000	600–1,800 ^{L,M}	Forest ^{1,2}
143 Annamese lowlands	Laos, Vietnam	C	51,000	0–1,000 ^L	Forest ¹
144 South Vietnamese lowlands	Vietnam	C	30,000	0–1,000 ^L	Forest ¹
145 Da Lat plateau	Vietnam	C	6,000	800–2,400 ^M	Forest ^{2,4}
146 Izu Islands	Japan	OI	300	0–800 ^L	Forest ⁴
147 Ogasawara Islands	Japan	OI	73	0–400 ^L	Forest ⁴
148 Nansei Shoto	Japan	OI	4,500	0–1,900 ^{L,M}	Forest ^{4,5}
149 Taiwan	Taiwan	CI	36,000	0–3,900 ^{L,M}	Forest ^{4,5}

KEY See Table 1 (pp. 62–63).

Shoto in Japan), Nepal Wren-babbler *Pnoepyga immaculata* and (from China) Emei Leaf-warbler *Phylloscopus emeiensis*, Hainan Leaf-warbler *P. hainanus* and Sillem's Mountain-finch *Leucosticte sillemi*. Several have recently been rediscovered after several decades without any records, including Orange-necked Partridge *Arborophila davidi* (Vietnam), Jerdon's Courser *Rhinoptilus bitorquatus* (India), Gurney's Pitta *Pitta gurneyi* (Thailand), Grey-crowned Crocias *Crocias langbianis* (Vietnam), Tibetan Babax *Babax koslowi* and Tibetan Bunting *Emberiza koslowi* (China) and White-browed Nuthatch *Sitta victoriae* (Myanmar).

Endemic Bird Areas

The distribution of EBAs in continental Asia is related to the region's complex topography and climatic patterns. Six EBAs are located in the Indian subcontinent and Myanmar, 10 in China and three in south-east Asia; the remaining eight cover islands. There are also 23 Secondary Areas completing the analysis (see Figure 5 for location of EBAs and Secondary Areas, and Table 4 for EBA summary data).

Several EBAs lie around the margins of the Qinghai–Tibetan plateau, including the Western Himalayas (EBA 128), Central Himalayas (EBA 129), Eastern Himalayas (EBA 130), Yunnan mountains (EBA 139) and Central Sichuan mountains (EBA 137). Temperate-zone forest is the most important habitat for the restricted-range species in all of these EBAs, although some of the species of the Eastern Himalayas breed in the subtropical zone. Other EBAs in this region include the West Sichuan mountains (EBA 138), where the restricted-range birds occur in subalpine forests and alpine habitats above the treeline, and Eastern Tibet (EBA 134), Southern Tibet (EBA 133) and the Qinghai mountains (EBA 135), which lie in relatively arid regions on the edge of the Qinghai–Tibetan plateau. Many of the restricted-range species on the mountainous island of Taiwan (EBA 149) have affinities with Himalayan species and are found in temperate-zone forest.

The natural vegetation of much of south-east China is subtropical forest, and this region has been subdivided into two EBAs, the Chinese subtropical forests (EBA 140) and the South-east Chinese mountains (EBA 141). However, habitats in this part of

Regional Introductions

Habitat loss	Knowledge	Numbers of restricted-range species						Biological importance	Current threat level	Priority	EBA no.	
		Confined to the EBA		Present also in other EBAs, SAs		Total						
		Threatened	Total	Threatened	Total	Threatened	Total					
	Major	Good	0	16	1	1	1	17	••	•	High	123
	Major	Good	6	23	0	0	6	23	•	••	Urgent	124
	Moderate	Incomplete	2	8	0	4	2	12	•	•	High	125
	Moderate	Incomplete	2	5	0	4	2	9	•	•	High	126
	Unquantified	Poor	2	2	0	0	2	2	•	••	Urgent	127
	Moderate	Good	4	11	0	0	4	11	•••	••	Critical	128
	Moderate	Good	0	2	0	1	0	3	•	•	High	129
	Moderate	Incomplete	10	19	1	3	11	22	•••	•	Urgent	130
	Major	Incomplete	3	3	0	0	3	3	•	••	Urgent	131
	Major	Incomplete	1	2	0	0	1	2	•	•	High	132
	Unquantified	Incomplete	1	2	0	0	1	2	•	•	High	133
	Unquantified	Poor	0	2	0	0	0	2	•	•	High	134
	Unquantified	Incomplete	0	2	0	0	0	2	•	•	High	135
	Severe	Incomplete	2	2	0	0	2	2	•	••	Urgent	136
	Major	Incomplete	5	10	0	1	5	11	••	•	High	137
	Major	Incomplete	3	3	0	0	3	3	•	••	Urgent	138
	Major	Incomplete	2	3	0	0	2	3	•	••	Urgent	139
	Severe	Poor	4	5	0	0	4	5	•	•••	Critical	140
	Severe	Incomplete	4	4	1	1	5	5	•	•••	Critical	141
	Severe	Incomplete	2	2	2	2	4	4	•	•••	Critical	142
	Severe	Incomplete	5	5	2	4	7	9	•	•••	Critical	143
	Major	Poor	2	2	0	1	2	3	•	•••	Critical	144
	Moderate	Incomplete	3	4	3	4	6	8	•	••	Urgent	145
	Major	Good	2	2	0	1	2	3	•	••	Urgent	146
	Major	Good	1	1	0	0	1	1	•••	••	Critical	147
	Major	Good	5	7	0	3	5	10	•	•••	Critical	148
	Major	Good	0	14	0	1	0	15	•	•	High	149

China were greatly affected by human activity in the past, and there are important gaps in ornithological knowledge here, so it has only been possible to define approximate boundaries to both EBAs. As a result, both the mapped extent and estimated areas of these EBAs almost certainly represent substantial overestimates of their true sizes. For similar reasons, the areas of several other EBAs in this region have probably also been overestimated, notably the Eastern Himalayas (EBA 130), Irrawaddy plains, (EBA 132), Eastern Tibet (EBA 134), Qinghai mountains (EBA 135), West Sichuan mountains (EBA 138) and Yunnan mountains (EBA 139).

In south-east Asia, there are two lowland rain forest EBAs—the Annamese lowlands (EBA 143) and the South Vietnamese lowlands (EBA 144)—and two in isolated areas of tropical montane forest—the island of Hainan (EBA 142) and Vietnam's Da Lat plateau (EBA 145). The Western Ghats (EBA 123) and Sri Lanka (EBA 124) represent areas of moist habitat isolated by relatively dry regions in the rest of the Indian peninsula; they both include tropical rain forest in the lowlands, and subtropical hill forest, temperate-zone forest and montane grassland

at higher altitudes. Two EBAs are in the floodplains of major rivers, the Assam plains (EBA 131) and the Irrawaddy plains (EBA 132), and one in the Taklimakan desert (EBA 127) in western China.

The remaining island EBAs are the Andaman Islands (EBA 125) and Nicobar Islands (EBA 126), where the native vegetation is largely tropical rain forest, and the Japanese islands of Izu (EBA 146), where temperate forest is the key habitat, and the Ogasawara Islands (EBA 147) and Nansei Shoto (EBA 148), where subtropical forest is important.

A particular feature of the EBAs in this region is the relatively small numbers of restricted-range species which they hold; only eight EBAs support ten or more, and the highest total is just 23 (Sri Lanka, EBA 124). It is interesting to speculate about the effects that the splitting of morphologically distinct allopatric and parapatric taxa into full species would have on the EBA analysis for this region (see above). Many of the 'new' species resulting from such taxonomic reassessments would have restricted ranges, but a high proportion of these taxa are known to occur in existing EBAs, so this would simply increase the species totals for these EBAs. In a few cases, how-

ever, new Secondary Areas would result or existing Secondary Areas would be upgraded into EBAs. An example is the Indus plains (Secondary Area s074), which would qualify as an EBA if Rufous-vented Prinia *Prinia burnesii* were split into two species following Morony *et al.* (1975)—who unfortunately did not publish justification for this taxonomic treatment. It is also possible that some EBAs would be subdivided into two or more EBAs. For example, the mountain ranges south of the Brahmaputra river have an avifauna distinct from the rest of the Eastern Himalayas (EBA 130), and a small number of taxonomic revisions (such as the separation of the two forms of Wedge-billed Wren-babbler *Sphenocichla humei* proposed by P. Rasmussen verbally to N. J. Collar 1997) could justify their treatment as a separate EBA.

Some of the EBAs have been well studied—e.g. the Western Ghats (EBA 123) and Sri Lanka (EBA 124)—but most have not been fully explored ornithologically, although the recent activities of travelling birdwatchers have added significantly to knowledge of some of these areas (see, e.g., Olsson 1995).

Threats and conservation

China and India have by far the largest human populations of any nations in the world, and many of the other countries in the region are currently experiencing a period of rapid growth in both their human populations and their economies. The consequent demands for land and resources are putting increasing pressure on remaining areas of natural habitat. Forest is particularly under pressure from unsustainable commercial logging, clearance for agricultural land or development projects, felling for fuelwood and animal fodder, overgrazing, burning and conversion to plantations (Smil 1984, 1993, Collins *et al.* 1991). As forest is by far the most important habitat for restricted-range species, it is unsurprising that the principal threat to these birds is forest loss and fragmentation.

China, India and Vietnam have the most threatened restricted-range species, and the Annamese lowlands (EBA 143) is notable both for its total number of threatened species and for the high number of Critical and Endangered species unique to it. Some EBAs support important populations of more widespread threatened species, notably the Assam plains (EBA 131) and South Vietnamese lowlands (EBA 144).

Some poorly known areas have recently been targeted for survey work by BirdLife International and others, for example the Vietnamese EBAs (143–145) (see Robson *et al.* 1991, 1993a,b, Eames *et al.* 1992, 1994, 1995a, Eames and Nguyen Cu 1994,

Lambert *et al.* 1994, Eames 1995) and the Nicobar Islands (Sankaran 1993a,b, 1995). The results of surveys completed in 1997 in the Annamitic mountains of Vietnam and Laos (Robson 1997) could significantly modify the EBA analysis. Two new taxa discovered on Ngoc Linh, the highest peak of the Kontum plateau (Secondary Area s084) are both likely to be described as new species (J. C. Eames verbally 1997), and the Black-hooded Laughingthrush *Garrulax milleti*, previously known only from the Da Lat plateau (EBA 145), has been found across the border in Laos—the net effect of which will probably be to create a new EBA (incorporating Secondary Area s084). Further field surveys are required in many EBAs, to determine the distributions and habitat requirements of the restricted-range birds and other wildlife, and to identify the pressures they face and hence the most appropriate actions required for their conservation.



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The location and extent of the Central Sichuan mountains (EBA 137) closely matches the current distribution of giant panda *Ailuropoda melanoleuca*, for which Wolong is a reserve. Like the EBA's 10 restricted-range bird species, giant panda occurs in temperate-zone forest with a bamboo understorey.

There are protected areas in most, if not all, of the EBAs in this region. Some EBAs, such as the Western Ghats (EBA 123) and Central Sichuan mountains (EBA 137), have networks of reserves which include extensive areas of the key habitats for the restricted-range species. In a few, such as Eastern Tibet (EBA 134), the area of habitat covered by protected areas is very small. However, in many EBAs the information available on the habitat types represented within the protected areas, and the occurrence of restricted-range species in these areas, is too limited to allow a full evaluation of the adequacy of the existing networks. Surveys of these and potential protected areas are required to establish the basis for future planning for the conservation of these EBAs and their unique plant and animal life.

SOUTH-EAST ASIAN ISLANDS, NEW GUINEA AND AUSTRALIA

THIS REGION embraces the Philippines, Peninsular Malaysia and the Greater Sunda islands of Sumatra, Borneo, Java and Bali, the Lesser Sundas, the Moluccas, Sulawesi (which are all part of the Oriental region; see also p. 76), New Guinea (but note that Papua New Guinean islands are covered under the Pacific Islands region, p. 87), Christmas Island and Australia.

There is a notable discontinuity between the flora and fauna of the Oriental and Australasian faunal regions, as they originated from different continental shelves (the Sunda and Sahul shelves respectively). Two imaginary lines divide up this region on the basis of biogeography: Wallace's (or Weber's) Line follows the eastern edge of the Sunda Shelf, which lies between Bali and the Lesser Sunda island of Lombok and between Borneo and Sulawesi; Lydekker's Line follows the edge of the Sahul Shelf, which lies between New Guinea and Australia and the oceanic islands of the Moluccas and Lesser Sundas to the west (and represents the eastern boundary of the Oriental faunal region). The area between the Sunda and Sahul shelves is known as Wallacea, and is a zone of transition between the Oriental and Australasian faunas (see Beehler *et al.* 1986, White and Bruce 1986).

Many of the islands of this region are mountainous and rugged as a result of volcanic activity and the uplifting of sedimentary deposits, and Sumatra, Java, the Lesser Sundas and Papua New Guinea include some of the most actively volcanic areas in the world (see Box 5 for key facts).

Restricted-range species

The predominantly insular character and mountainous terrain of this region have resulted in much localized speciation, and hence there are many restricted-range species: 636, the second highest total, after South America, of all the regions. There are a number of distinctive families (largely) endemic to the region, such as the megapodes (Megapodiidae) and birds-of-paradise (Paradisaeidae), and these include many restricted-range species.

Most of the restricted-range species are forest birds occurring in a variety of different types, including tropical lowland and montane evergreen and semi-evergreen rain forest in Malaysia, Indonesia, the Philippines and Papua New Guinea, deciduous monsoon forest in parts of Indonesia, particularly the Lesser Sundas, where the Australian rain-shadow results in seasonal rainfall (see Whitmore 1984, WWF/IUCN 1994–1995), and tropical, subtropical and temperate forest in Australia.

Box 5. Key facts for the south-East Asian Islands, New Guinea and Australia.

Numbers of:

- 636 Restricted-range species
- 160 Threatened restricted-range species
- 39 EBAs
- 28 Secondary Areas
- 7 Countries with EBAs

EBAs with high numbers of restricted-range species

- Sulawesi (EBA 166), 54 species
- Central Papuan mountains (EBA 178), 53 species
- Mindanao and the Eastern Visayas (EBA 154), 51 species

EBAs which are especially distinct at the generic level

- Sulawesi (EBA 166), 12 endemic genera
- Central Papuan mountains (EBA 178), 9 endemic genera

EBAs with high numbers of threatened restricted-range species

- Mindanao and the Eastern Visayas (EBA 154), 22 species
- Luzon (EBA 151), 18 species
- Negros and Panay (EBA 152), 14 species

EBAs with high numbers of Critical and Endangered endemic species

- Negros and Panay (EBA 152), 8 species
- Mindoro (EBA 150), 4 species
- Luzon (EBA 151), 4 species
- Mindanao and the Eastern Visayas (EBA 154), 4 species
- Palawan (EBA 156), 4 species

Examples of EBAs critically in need of conservation action

- Mindoro (EBA 150)
- Negros and Panay (EBA 152)
- Sulu archipelago (EBA 155)
- Sangihe and Talaud (EBA 167)

Countries with high numbers of restricted-range species

- Indonesia, 403 species
- Papua New Guinea, 167 (some of these species are covered under the Pacific Islands region)
- Philippines, 126

Countries with high numbers of threatened restricted-range species

- Indonesia, 66 species
- Papua New Guinea, 21 species (some of these species are covered under the Pacific Islands region)
- Australia, 20 species

Within the region, knowledge of the distribution and ecology of birds varies from relatively comprehensive in Australia, where data are available from an atlas project (Blakers *et al.* 1984), to highly incomplete in parts of Indonesia, New Guinea and the Philippines, although there are several good reviews of the available information (e.g. Medway and Wells 1976, Smythies 1981, Coates 1985, 1990, Beehler *et al.* 1986, White and Bruce 1986, van Marle and Voous 1988, Dickinson *et al.* 1991, Andrews 1992, MacKinnon and Phillipps 1993; see also Coates and Bishop 1997 which was published too late to be used in this project).

In some of the region's least-known parts, notably New Guinea, it is difficult to determine whether some species truly have restricted ranges. Thus many appear to be very scarce and/or to have disjunct distributions, but this may reflect incomplete knowledge rather than genuine distributional patterns. For example, Papuan Hawk-owl *Uroglaux dimorpha* (excluded from the analysis) is so far known by just a handful of scattered records in the West and North Papuan lowlands, Yapen and the south-east, but probably occurs all through these areas (Coates

1985). On the other hand, Obscure Berrypecker *Melanocharis arfakiana* (included) is known from only two specimens, over 1,000 km apart but with several additional (unconfirmed) sightings, and may occupy a narrow altitudinal belt due to competition with congeners (Coates 1990).

The species taxonomy used deviates from Sibley and Monroe (1990, 1993) for Indonesia (following Andrew 1992) and Australia (Christidis and Boles 1994), because these alternative works are the standard within those countries. Particularly on the numerous islands of Indonesia and the Philippines, the region generally has many distinctive allopatric taxa which are currently treated as subspecies but which are potential candidates for species status in the light of current trends in taxonomy (see, e.g., Haffer 1992).

Endemic Bird Areas

Virtually the whole of the Philippines (seven EBAs), Indonesia (23 EBAs; one shared with Peninsular Malaysia, one with Brunei and East Malaysia, and seven with Papua New Guinea) and mainland Papua New Guinea (eight EBAs; seven shared with Indonesia) are included in EBAs. A further seven EBAs are located in Australia and one on Christmas Island. A total of 28 Secondary Areas completes the analysis (see Figure 6 for location of EBAs and Secondary Areas, and Table 5 for EBA summary data).

In the Greater Sunda islands and the Malayan Peninsula, there are characteristic avifaunas in both the lowland and montane forests (Wells 1985), but most of the Sundaic lowland endemics are too widespread to be considered as restricted-range species and there are therefore no lowland EBAs (although lowland forest in this area is of cardinal conservation importance because of its rapid and extensive clearance, leading to some of its characteristic species being listed as globally threatened). However, the Sundaic montane endemics include many species which are confined to relatively small areas of forest on just one or two of the major islands and therefore have restricted ranges; three Sundaic montane EBAs—the Bornean mountains (EBA 157), Sumatra and Peninsular Malaysia (EBA 158) and the Java and Bali forests (EBA 160)—cover the entire Sundaic montane region.

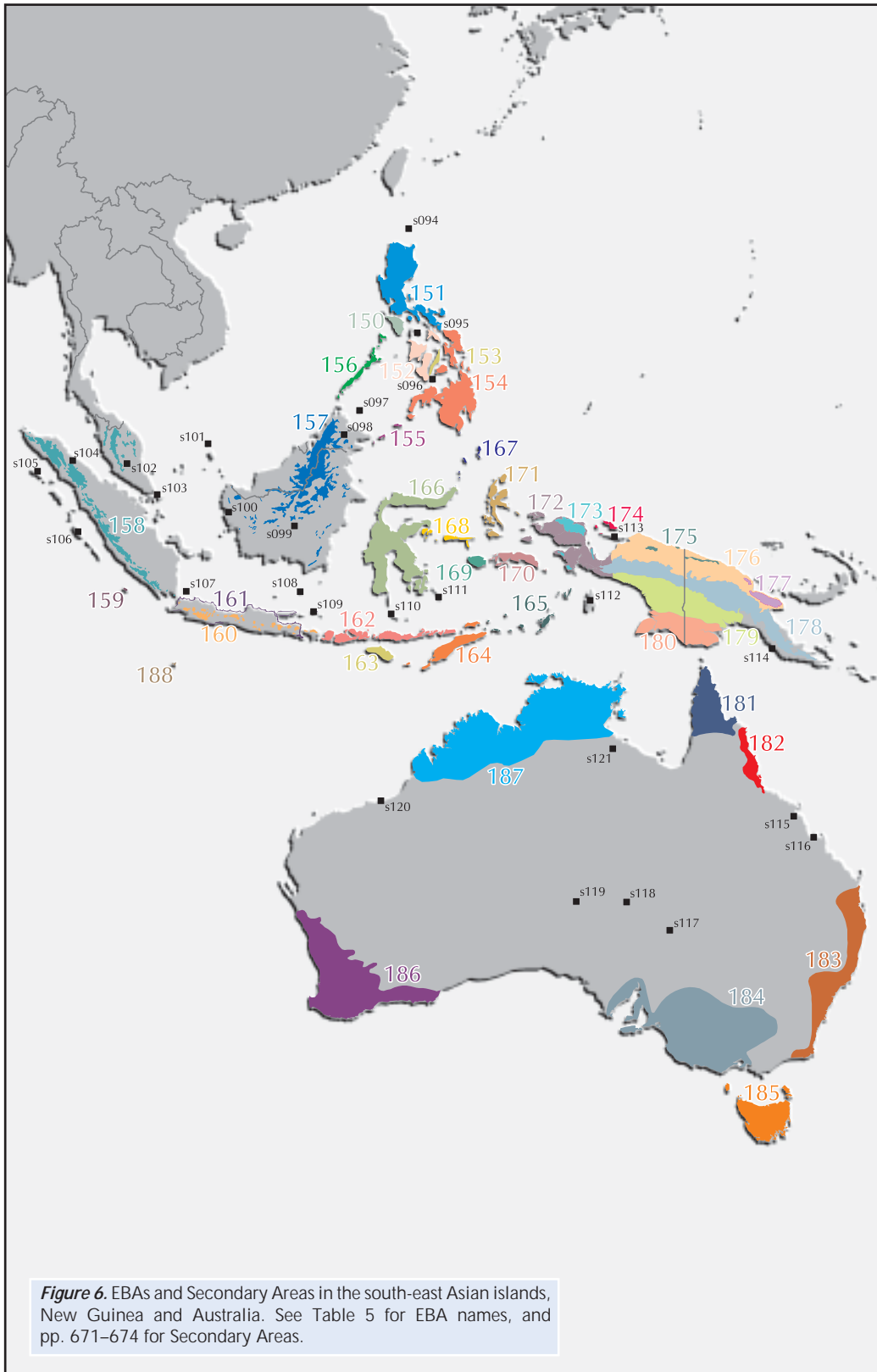
In Australia there are avifaunas characteristic of both forest and drier habitats (see Keast 1961, Cracraft 1986), but the endemic desert-adapted species are generally widely distributed (although a few qualify as having restricted ranges which are covered by Secondary Areas). The Australian EBAs are situated in the isolated areas of wetter forest, woodland or scrubland around the periphery of the continent. Most of these EBAs are large, e.g. South-east Australia (EBA 184) at 380,000 km², but the restricted-



Giant 'Klinkii pines' *Araucaria hunsteinii* in the Central Papuan mountains (EBA 178). This EBA's particularly distinct avifauna includes four genera of birds-of-paradise.

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Endemic Bird Areas of the World

Table 5. EBAs of South-east Asian islands, New Guinea and Australia: summary data.

EBA number and name	Countries	Continental/ Island	Area (km ²)	Altitude (m)	Habitat
150 Mindoro	Philippines	CI	9,800	0–2,000 ^{L,M}	Forest ^{1,2}
151 Luzon	Philippines	CI	110,000	0–2,700 ^{L,M}	Forest ^{1,2}
152 Negros and Panay	Philippines	CI	29,000	0–2,000 ^{L,M}	Forest ^{1,2}
153 Cebu	Philippines	CI	4,500	0–1,000 ^L	Forest ¹ (S)
154 Mindanao and the Eastern Visayas	Philippines	CI	120,000	0–2,700 ^{L,M}	Forest ^{1,2}
155 Sulu archipelago	Philippines	CI	1,500	0–700 ^L	Forest ¹
156 Palawan	Philippines	CI	14,000	0–2,000 ^{L,M}	Forest ^{1,2}
157 Bornean mountains	Brunei, Indonesia, Malaysia	CI	130,000	500–3,700 ^{L,M}	Forest ^{1,2}
158 Sumatra and Peninsular Malaysia	Indonesia, Malaysia	CI	89,000	500–3,500 ^{L,M}	Forest ^{1,2}
159 Enggano	Indonesia	OI	450	0–300 ^L	Forest ¹
160 Java and Bali forests	Indonesia	CI	18,000	0–3,000 ^{L,M}	Forest ^{1,2,3}
161 Javan coastal zone	Indonesia	CI	11,000	0–0 ^L	Wetland (F,S,G)
162 Northern Nusa Tenggara	Indonesia	OI	39,000	0–2,400 ^{L,M}	Forest ^{1,2,3}
163 Sumba	Indonesia	OI	11,000	0–1,200 ^{L,M}	Forest ^{1,2,3} (G)
164 Timor and Wetar	Indonesia	OI	34,000	0–2,600 ^{L,M}	Forest ^{1,2,3} (S)
165 Banda Sea Islands	Indonesia	OI	7,100	0–850 ^L	Forest ^{1,3,6} (S)
166 Sulawesi	Indonesia	OI	190,000	0–3,400 ^{L,M}	Forest ^{1,2} (S)
167 Sangihe and Talaud	Indonesia	OI	1,700	0–1,700 ^{L,M}	Forest ^{1,2}
168 Banggai and Sula Islands	Indonesia	OI	7,200	0–1,600 ^{L,M}	Forest ^{1,2}
169 Buru	Indonesia	OI	8,300	0–2,000 ^{L,M}	Forest ^{1,2,3}
170 Seram	Indonesia	OI	19,000	0–3,000 ^{L,M}	Forest ^{1,2}
171 Northern Maluku	Indonesia	OI	27,000	0–2,000 ^{L,M}	Forest ^{1,2,6}
172 West Papuan lowlands	Indonesia	CI	110,000	0–1,000 ^L	Forest ^{1,6}
173 West Papuan highlands	Indonesia	CI	17,000	1,000–3,000 ^M	Forest ² (G)
174 Geelvink Islands	Indonesia	OI	3,000	0–1,000 ^L	Forest ^{1,6}
175 North Papuan mountains	Indonesia, Papua New Guinea	CI	4,700	1,000–2,200 ^M	Forest ²
176 North Papuan lowlands	Indonesia, Papua New Guinea	CI	180,000	0–1,000 ^L	Forest ^{1,6}
177 Adelbert and Huon ranges	Papua New Guinea	CI	14,000	1,000–4,100 ^M	Forest ^{2,5} (G)
178 Central Papuan mountains	Indonesia, Papua New Guinea	CI	190,000	1,000–4,600 ^M	Forest ^{2,5} (G)
179 South Papuan lowlands	Indonesia, Papua New Guinea	CI	160,000	0–1,000 ^L	Forest ^{1,6}
180 Trans-Fly	Indonesia, Papua New Guinea	CI	94,000	0–90 ^L	Wetland (F,V)
181 Cape York	Australia	C	99,000	0–500 ^L	Forest ^{1,3,6}
182 Queensland wet tropics	Australia	C	32,000	0–1,600 ^{L,M}	Forest ^{1,2}
183 Eastern Australia	Australia	C	160,000	0–1,200 ^{L,M}	Forest ^{4,5} (S)
184 South-east Australia	Australia	C	380,000	0–1000 ^L	Forest ⁵
185 Tasmania	Australia	CI	68,000	0–1,600 ^L	Forest ⁵ (S)
186 South-west Australia	Australia	C	280,000	0–400 ^L	Forest ⁵ (S)
187 North-west Australia	Australia	C	560,000	0–1,000 ^L	Forest ^{1,3,6} (S,V)
188 Christmas Island	Christmas Island (to Australia)	OI	140	0–300 ^L	Forest ¹

KEY See Table 1 (pp. 62–63).

range species are confined to smaller areas of specialized habitat within these areas—such as the four south-east Australian restricted-range species which favour mallee (a particularly distinct, semi-arid woodland of multi-stemmed eucalypts).

There is much sharing of species between EBAs in this region, especially between the smaller islands in the Moluccas and Lesser Sundas. This has caused some difficulties in the analysis, notably in the Banda Sea islands (EBA 165) where several different interpretations are possible. In this case, it has been considered most appropriate to include the widely scattered islands and island groups within a single EBA, and to highlight in the relevant EBA account the fact that the Tanimbar and Kai island groups each have several of their own endemic species.

Some of the larger islands in the region support groups of both lowland and montane restricted-range species, so Luzon (EBA 151), Mindanao and the Eastern Visayas (EBA 154) and Sulawesi (EBA 166) were formerly divided into separate lowland and montane EBAs (ICBP 1992). Because there are restricted-range species on all of these islands which occur in both lowland and montane habitats or at intermediate altitudes, with some species too poorly known to be confidently allocated to either a lowland or montane EBA, they are all here treated as single EBAs (see Appendices 3 and 4, pp. 779 and 781).

Several of the EBAs in this region are notable for their taxonomic uniqueness, especially Sulawesi (EBA 166) with 12 endemic genera, the Central Papuan mountains (EBA 178) with nine, and the

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		Numbers of restricted-range species						Biological importance	Current threat level	Priority	EBA no.	
		Confined to the EBA		Present also in other EBAs, SAs		Total						
Habitat loss	Knowledge	Threatened	Total	Threatened	Total	Threatened	Total					
	Severe	Incomplete	5	5	3	5	8	10	•	•••	Critical	150
	Major	Incomplete	11	24	7	16	18	40	•••	••	Critical	151
	Severe	Incomplete	10	10	4	7	14	17	•	•••	Critical	152
	Severe	Incomplete	2	2	0	0	2	2	••	•••	Critical	153
	Major	Incomplete	19	39	3	12	22	51	•••	••	Critical	154
	Major	Incomplete	3	4	2	5	5	9	•••	•••	Critical	155
	Moderate	Incomplete	7	17	1	3	8	20	••	••	Urgent	156
	Limited	Incomplete	0	24	0	5	0	29	•••	•	Urgent	157
	Moderate	Incomplete	6	20	1	18	7	38	•••	•	Urgent	158
	Limited	Incomplete	0	2	0	0	0	2	•	••	High	159
	Severe	Good	6	20	0	14	6	34	•••	••	Critical	160
(F,S,G)	Severe	Incomplete	1	1	0	2	1	3	•	•	High	161
	Major	Incomplete	3	17	0	12	3	29	•	•	High	162
(G)	Major	Incomplete	4	7	0	5	4	12	•	•	High	163
(S)	Major	Poor	5	23	0	12	5	35	••	•	High	164
(S)	Unquantified	Poor	1	18	0	23	1	41	••	•	High	165
(S)	Moderate	Incomplete	5	42	1	12	6	54	••	•	High	166
	Major	Poor	4	5	1	5	5	10	•	•••	Critical	167
	Moderate	Incomplete	2	8	1	8	3	16	•	•	High	168
	Limited	Incomplete	5	10	1	18	6	28	••	•	High	169
	Limited	Incomplete	4	14	1	16	5	30	•	•	High	170
	Limited	Incomplete	5	26	1	17	6	43	••	•	High	171
	Moderate	Poor	2	9	0	10	2	19	•	•	High	172
(G)	Limited	Poor	1	9	0	11	1	20	••	•	High	173
	Major	Poor	3	10	0	4	3	14	•	•	High	174
	Possible	Poor	0	3	0	3	0	6	•	•	High	175
	Limited	Poor	1	5	0	4	1	9	•	•	High	176
(G)	Unquantified	Poor	2	6	0	5	2	11	•	•	High	177
(G)	Moderate	Poor	5	39	0	14	5	53	•••	•	Urgent	178
	Limited	Poor	0	3	0	3	0	6	•	•	High	179
(F,V)	Moderate	Poor	1	3	0	3	1	6	•	•	High	180
	Moderate	Incomplete	2	3	0	2	2	5	••	•••	Critical	181
	Moderate	Good	0	13	0	3	0	16	•••	•	Urgent	182
(S)	Moderate	Good	3	9	0	1	3	10	•••	••	Critical	183
	Major	Good	3	6	1	1	4	7	•••	••	Critical	184
	Moderate	Good	3	14	0	0	3	14	••	••	Urgent	185
	Major	Good	3	7	1	1	4	8	•••	••	Critical	186
(S,V)	Moderate	Incomplete	1	12	0	1	1	13	•••	•	Urgent	187
	Moderate	Good	1	2	0	0	1	2	•	•	High	188

Bornean mountains (EBA 157) and Northern Maluku (EBA 171), both with four.

Most of the larger islands in the Moluccas and Lesser Sundas in Indonesia have only ever been visited a few times by ornithologists, and the avifaunas of many of the small islands remain virtually unknown (White and Bruce 1986). For example, the island of Wetar (part of EBA 164) has three single-island endemic species but has apparently only been visited once by ornithologists since 1910, and then only for a few hours (Robson 1990).

Threats and conservation

Since the early 1970s the forests of this region have been the world's primary source for tropical timber. The impact of logging varies according to the tech-

niques used and levels of harvesting, but, in addition to the direct loss and degradation of habitat, increased access to once-remote areas leads to colonization and shifting cultivation and further detrimental effects. As the human population grows, traditional sustainable agricultural practices are often replaced by more destructive slash-and-burn ones, resulting in vast areas of land becoming degraded in some parts of the region. For example, grassland, bamboo and other types of scrub, and weed-infested landscapes have replaced much of the original forest cover in southern and central Borneo, in the New Guinea uplands, the Philippines and in the Lesser Sunda islands. In the Philippines, it is feared that virtually all primary forest outside protected areas will be lost by the end of the twentieth century, mainly as a result of com-

mercial logging followed by conversion to oil-palm plantations and other crops. If the current rates of deforestation continue, little primary lowland forest is expected to remain in 20 years time in some parts of Malaysia and Indonesia (apart from Kalimantan and Irian Jaya) (Collins *et al.* 1991, WWF/IUCN 1994–1995).

The main threat to the EBAs of this region is therefore habitat loss. Several EBAs in the Philippines and Indonesia have already suffered extensive forest loss. An extreme example is Cebu (EBA 153), more than 99% of which is deforested: half the forest bird species formerly resident on the island have gone (39 species lost altogether, including four restricted-range species and a further five endemic subspecies (Brooks *et al.* 1995b; see also Dutton *et al.* 1993). Examples of other EBAs which have lost much of their original forest cover are Negros and Panay (EBA 152), Mindoro (EBA 150) and the Sulu archipelago (EBA 155) in the Philippines, and Sangihe and Talaud (EBA 167) in Indonesia.

Indonesia has the world's largest programme of voluntary assisted migration (transmigration). Since the early 1900s at least 2.5 million people have been moved from the crowded and environmentally degraded islands of Java, Madura, Bali and Lombok to new settlements in the less densely populated islands of Sumatra, Kalimantan, Sulawesi, Maluku and Irian Jaya. Although the actual deforested area arising from these programmes is small relative to the total forest estate, associated road developments open up formerly undisturbed areas, and requirements for fuelwood and building materials place additional pressure on surrounding areas of forest (WWF/IUCN 1994–1995; see also Whitten *et al.* 1987a). Another threat to biodiversity from transmigration is the possibility of introduced species outcompeting native ones, as the regions of Maluku and Irian Jaya have quite different species assemblages from those of Java. For example, macaques *Macaca* could cause an ecological disaster if they became established on New Guinea, potentially outcompeting fruit-eating birds which have evolved in the absence of primates.

There is considerable variation in the protected-area coverage of EBAs in this region. Apart from in Australia, management of protected areas is often constrained by insufficient trained personnel and an absence of clearly and accurately defined boundaries, and many of the legally designated protected areas are not, in practice, under complete protection. Local people can often play a vital role in managing the areas they utilize, and on which they may depend for survival, and thus management is increasingly concerned with improving the welfare of local inhabitants and developing buffer zones around reserves (WWF/IUCN 1994–1995).

In Indonesia, large sections of some EBAs are included in protected areas, for example Sumatra and Peninsular Malaysia (EBA 158), while others have very limited (or no) official protection, notably several of the EBAs in the Moluccas (see MacKinnon *in press*). Recognizing the importance of Indonesia for both restricted-range and globally threatened birds, BirdLife International established a country programme there in 1992, in collaboration with the Directorate General of Forest Protection and Nature Conservation. This programme has focused particularly on the EBAs in the Moluccas and Lesser Sundas. Ornithological surveys have been completed in several EBAs, including Sumba (EBA 163), Tanimbar (in EBA 165), Buru (EBA 169) and Halmahera (in EBA 171), and detailed recommendations have been made regarding the gazetting of proposed protected areas.

In the Philippines, the government has recently passed its National Integrated Protected Areas System (NIPAS) legislation, which is designed to completely redevelop the protected-area system of the country. The Haribon Foundation (the BirdLife Partner organization in the Philippines) is working in collaboration with the Department of Environment and Natural Resources on a project (funded by the Darwin Initiative of the UK Department of the Environment) to identify key sites for threatened and restricted-range species within the country's seven EBAs. Through this project, the Haribon–BirdLife programme is helping to ensure that the most appropriate sites within the EBAs are selected as reserves, as well as providing some of the background material needed for designating them under the NIPAS Act.

In Papua New Guinea, 97% of all land is owned according to customary tenure, and only a very small proportion is therefore contained within reserves on state property. Rather, Papua New Guinea has attempted to develop protected areas on customary land through Wildlife Management Areas, with landowners being responsible for deciding boundaries, the rules and their development. There has been a recent study to identify areas worthy of conservation through the compilation of current biological knowledge (including data on restricted-range birds from this project) and an attempt to map areas of high biodiversity and endemism, areas of scant knowledge and areas of significant habitat-types (Beehler 1993, Osborne 1995).

In Australia, where there is already an extensive protected-area network, a framework for setting priorities in the national reserves system is being developed through the Interim Biogeographic Regionalisation of Australia (IBRA) and Conservation Planning Attributes (CPA) (Thackway and Cresswell 1995). Altogether 80 IBRAs are currently

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recognized, of which 28 correspond with or are included within the seven Australian EBAs. The major attributes used to delineate IBRA boundaries include climate, geology, landform, vegetation, flora and fauna and land-use, while the identification of deficiencies in the current reserve system and priorities for action are derived from four CPAs, including

the existing reservation of each IBRA, the level of bias within protected areas (i.e. how comprehensively the existing protected areas sample the known environmental heterogeneity), constraints and limitations, and opportunities for alternative conservation management measures. This approach will help to identify important gaps in the system.

PACIFIC ISLANDS

THE PACIFIC ISLANDS as defined here comprise Micronesia, the Bismarck archipelago, the east Papuan islands, Melanesia, central and eastern Polynesia, Lord Howe and Norfolk Islands, New Zealand and associated islands, and the Hawaiian Islands.

Most of the islands are oceanic in origin, never having been connected to a continental area by land. Many are tiny and extremely low-lying—such as the coral atolls (motus) of the Tuamotu archipelago (less than 10 km² in size on average and mostly below 7 m in altitude), where the volcanic remnants of former high islands are now completely submerged—but some are of considerable size and altitude, e.g. Hawai'i (more than 10,000 km²), which is a relatively young volcanic island, little eroded and rising to over 4,000 m. Others are raised islands (sometimes called makatea islands) characterized by rocky coralline (limestone) substrates, e.g. the Rock Islands of Palau, Rennell in the Solomon Islands, Makatea in the Tuamotu archipelago, and Henderson in the Pitcairns, and a few are (at least in part) continental in origin, often containing a complex of volcanic and limestone substrates, such as the ancient island of New Caledonia (see Box 6 for key facts).

Restricted-range species

Overall, the Pacific islands have a relatively depauperate land avifauna, chiefly as a result of their small size and great isolation resulting in poorer prospects for continental birds reaching them (but also because of the numerous extinctions which they have suffered: see 'Threats', below). Nevertheless, a high proportion of the total Pacific land avifauna is included in this analysis, resulting in the third (equal) highest number of restricted-range species in total—408—of all the regions.

Restricted-range species are found on nearly all island groups. The majority occur in forest although many utilize other habitats including gardens and secondary vegetation, possibly as a result of being adapted to a cyclone-prone environment, although a

Box 6. Key facts for the Pacific Islands.

Numbers of:

- 408 Restricted-range species
- 127 Threatened restricted-range species
- 30 EBAs
- 17 Secondary Areas
- 15 Countries with EBAs

EBAs with high numbers of restricted-range species

- Solomon group (EBA 198), 79 species
- New Britain and New Ireland (EBA 195), 54 species
- Fiji (EBA 202), 36 species

EBAs which are especially distinct at the generic level

- Central Hawaiian Islands (EBA 217), 5 endemic genera
- Hawai'i (EBA 218), 5 endemic genera

EBAs with high numbers of threatened restricted-range species

- Central Hawaiian islands (EBA 217), 18 species
- Solomon group (EBA 198), 14 species
- Hawai'i (EBA 218), 9 species

EBAs with high numbers of Critical and Endangered endemic species

- Central Hawaiian islands (EBA 217), 10 species
- Solomon group (EBA 198), 6 species
- Marquesas (EBA 212), 5 species

Examples of EBAs critically in need of conservation action

- East Caroline Islands (EBA 192)
- Solomon group (EBA 198)
- Marquesas Islands (EBA 212)

Countries with high numbers of restricted-range species

- Solomon Islands, 92 species
- Fiji, 36 species

Countries with high numbers of threatened restricted-range species

- French Polynesia, 18 species
- Solomon Islands, 15 species
- New Zealand, 12 species

Endemic Bird Areas of the World

Table 6. EBAs of Pacific islands: summary data.

EBA number and name	Countries	Continental/ Island	Area (km ²)	Altitude (m)	Habitat
189 Mariana Islands	Guam (to USA), Northern Mariana Islands (to USA)	OI	1,000	0–900 ^L	Forest ¹
190 Palau	Palau	OI	460	0–200 ^L	Forest ^{1,6}
191 Yap Islands	Micronesia	OI	120	0–100 ^L	Forest ^{1,6}
192 East Caroline Islands	Micronesia	OI	580	0–700 ^L	Forest ^{1,2,6}
193 Admiralty Islands	Papua New Guinea	OI	2,000	0–700 ^L	Forest ¹
194 St Matthias Islands	Papua New Guinea	OI	460	0–1,000 ^L	Forest ¹
195 New Britain and New Ireland	Papua New Guinea	OI	48,000	0–2,200 ^{L,M}	Forest ^{1,2}
196 D'Entrecasteaux and Trobriand Islands	Papua New Guinea	CI	3,400	0–2,200 ^{L,M}	Forest ^{1,2}
197 Louisiade archipelago	Papua New Guinea	CI	1,600	0–1,000 ^L	Forest ¹
198 Solomon group	Papua New Guinea, Solomon Is.	OI	34,000	0–2,000 ^{L,M}	Forest ^{1,2}
199 Rennell and Bellona	Solomon Islands	OI	850	0–100 ^L	Forest ¹
200 Vanuatu and Temotu	Solomon Islands, Vanuatu	OI	13,000	0–1,800 ^{L,M}	Forest ^{1,2}
201 New Caledonia	New Caledonia (to France)	OI	19,000	0–1,600 ^{L,M}	Forest ^{1,2,3} (S,V)
202 Fiji	Fiji	OI	18,000	0–1,300 ^{L,M}	Forest ^{1,2}
203 Samoan Islands	American Samoa (to USA), Western Samoa	OI	3,000	0–1,800 ^{L,M}	Forest ^{1,2}
204 Lord Howe Island	Australia	OI	17	0–800 ^L	Forest ¹
205 Norfolk Island	Norfolk Island (to Australia)	OI	35	0–300 ^{L,M}	Forest ¹
206 North Island of New Zealand	New Zealand	OI	120,000	0–2,000 ^{L,M}	Forest ⁵ (W)
207 South Island of New Zealand	New Zealand	OI	110,000	0–2,500 ^{L,M}	Forest ⁵ (S,W)
208 Auckland Islands	New Zealand	OI	610	0–600 ^L	Forest ⁵ (S,G)
209 Chatham Islands	New Zealand	OI	970	0–200 ^L	Forest ⁵ (S,G,R)
210 Southern Cook Islands	Cook Islands (to New Zealand)	OI	190	0–600 ^L	Forest ^{1,2,3}
211 Rimatara	French Polynesia (to France)	OI	8	0–80 ^L	Forest ³
212 Marquesas Islands	French Polynesia (to France)	OI	1,000	0–1,200 ^{L,M}	Forest ^{2,3}
213 Society Islands	French Polynesia (to France)	OI	1,400	0–2,200 ^{L,M}	Forest ^{2,3}
214 Tuamotu archipelago	French Polynesia (to France)	OI	690	0–100 ^L	Forest ³ (S)
215 Henderson Island	Pitcairn Islands (to UK)	OI	31	0–30 ^L	Forest ³ (S)
216 Laysan Island	USA	OI	4	0–10 ^L	Scrub (G,W)
217 Central Hawaiian Islands	USA	OI	6,300	0–3,000 ^{L,M}	Forest ^{2,3} (W)
218 Hawai'i	USA	OI	10,000	0–3,100 ^{L,M}	Forest ^{2,3}

KEY See Table 1 (pp. 62–63).

wide range of habitat tolerance is a general phenomenon exhibited by many (of the surviving) oceanic-island landbirds.

The great remoteness of many Pacific islands has led to the evolution of a large number of highly distinctive species, notably the Hawaiian honeycreepers (an endemic Hawaiian family) and the Kagu *Rhynchotus jubatus* (a monospecific family endemic to New Caledonia). Other species which are of similarly obscure origin, representing a very early colonization, include Silktail *Lamprolia victoria* from Fiji and Tooth-billed Pigeon *Didunculus strigirostris* from Western Samoa. Some genera are particularly well represented in the region, e.g. white-eyes *Zosterops*, and *Acrocephalus* warblers, both being classic small-island colonizers.

The most substantial contribution to the ornithology of Micronesia, Melanesia and Polynesia has been several expeditions—collectively called the Whitney South Seas Expedition—carried out over nearly 20 years from 1920. A high proportion of the islands in the region were visited and a large series of

bird skins was deposited in the American Museum of Natural History, forming the basis our knowledge of bird distribution today. The results of this extended work were published in *American Museum Novitates*, chiefly by Mayr and Amadon, and summarized in Mayr (1945). This book and Pratt *et al.* (1987) are the most comprehensive bird guides to many parts of this region.

The taxonomy of the majority of Pacific island birds has not received the same attention as some other areas of the world and, as a consequence, many allopatric island subspecies may well come to be treated as full species if modern taxonomic trends are extended to the region. On the other hand some species which are recognized by Sibley and Monroe (1990, 1993) show introgression and are regarded as conspecific with other species by some experts. For example, Polynesian Imperial-pigeon *Ducula auro-rae* (from the Society Islands and Tuamotu archipelago) approaches populations of the widespread Pacific Pigeon *D. pacifica* in morphological characteristics, and is thus included in the latter by Holyoak

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Habitat loss	Knowledge	Numbers of restricted-range species						Biological importance	Current threat level	Priority	EBA no.
		Confined to the EBA		Present also in other EBAs, SAs		Total					
		Threatened	Total	Threatened	Total	Threatened	Total				
Moderate	Good	5	7	1	5	6	12	●●	●●	Urgent	189
Moderate	Incomplete	0	10	1	6	1	16	●●	●	High	190
Major	Incomplete	1	3	0	4	1	7	●	●	High	191
Moderate	Incomplete	4	11	0	7	4	18	●●●	●●	Critical	192
Limited	Poor	3	6	0	7	3	13	●●	●	High	193
Possible	Poor	0	2	0	6	0	8	●	●	High	194
Moderate	Poor	2	35	1	19	3	54	●●	●	High	195
Unquantified	Poor	1	2	0	0	1	2	●	●	High	196
Moderate	Poor	0	5	0	2	0	7	●●●	●	Urgent	197
Moderate	Poor	13	61	1	17	14	78	●●●	●●	Critical	198
Limited	Poor	0	5	0	7	0	12	●	●	High	199
Moderate	Poor	6	15	0	15	6	30	●	●	High	200
Major	Poor	8	22	0	9	8	31	●●	●●	Urgent	201
Major	Incomplete	5	24	0	11	5	35	●●	●	High	202
Major	Incomplete	5	11	0	9	5	20	●●	●●	Urgent	203
Limited	Good	2	2	0	0	2	2	●●	●●●	Critical	204
Major	Good	3	3	0	0	3	3	●●	●●●	Critical	205
Major	Good	2	3	0	0	2	3	●	●●●	Critical	206
Moderate	Good	4	6	0	0	4	6	●	●●	Urgent	207
Moderate	Good	1	1	0	1	1	2	●	●	High	208
Moderate	Good	4	5	0	0	4	5	●●	●●●	Critical	209
Moderate	Incomplete	4	6	0	1	4	7	●	●●	Urgent	210
Major	Incomplete	1	2	0	0	1	2	●	●●●	Critical	211
Major	Incomplete	7	10	0	0	7	10	●	●●●	Critical	212
Major	Incomplete	3	5	2	3	5	8	●	●●	Urgent	213
Moderate	Poor	4	6	2	2	6	8	●	●●●	Critical	214
Limited	Good	3	4	0	0	3	4	●	●●	Urgent	215
Possible	Good	2	2	0	0	2	2	●●●	●●	Critical	216
Major	Good	14	15	4	8	18	23	●●●	●●●	Critical	217
Major	Good	5	7	4	8	9	15	●●●	●●●	Critical	218

and Thibault (in prep.). Likewise, the *Acrocephalus* warblers of the Marquesas, Society and Tuamotu Islands are treated as three separate species by Sibley and Monroe (1990, 1993), but show intermediate characteristics that imply gene-flow between archipelagos.

Endemic Bird Areas

The vast majority of the islands of this region are included in 30 EBAs, including four in Micronesia, nine in the Bismarck archipelago and Melanesia, eight in central and eastern Polynesia, one each on Lord Howe and Norfolk Islands, four in New Zealand, and three in the Hawaiian islands. A further 17 Secondary Areas cover additional islands (see Figure 7 for location of EBAs and Secondary Areas, and Table 6 for EBA summary data).

The patterns of endemism shown by the EBA analysis are not necessarily ‘natural’; rather they reflect fragmented surviving avifaunas, the result of man’s influence over several thousand years (see ‘Threats’, below). In most cases the EBA analysis

reflects well-known patterns of endemism. An exception to this is New Zealand, which has a mainland area of over 250,000 km², and many of its endemic birds have (or historically had) ranges of more than 50,000 km² thus failing to qualify as having restricted ranges for this project. The EBA analysis therefore results in a rather artificial division of mainland New Zealand into two EBAs (EBAs 206, 207), based on North and South Islands, which together constitute a larger and better-known centre of endemism.

There are several other larger areas of endemism in the region, especially in Micronesia, Melanesia and central Polynesia, and a few restricted-range species are shared within these larger groupings. Conversely, some species have tiny ranges and are confined to single islands within EBAs. Thus smaller nested areas of endemism are also a common feature, e.g. the main islands of the East Caroline Islands (EBA 192) each have (or had) their own endemics (three on Truk, five on Pohnpei and two on Kosrae), and New Georgia in the Solomon group (EBA 198) has 10 endemic species, some of them occurring on

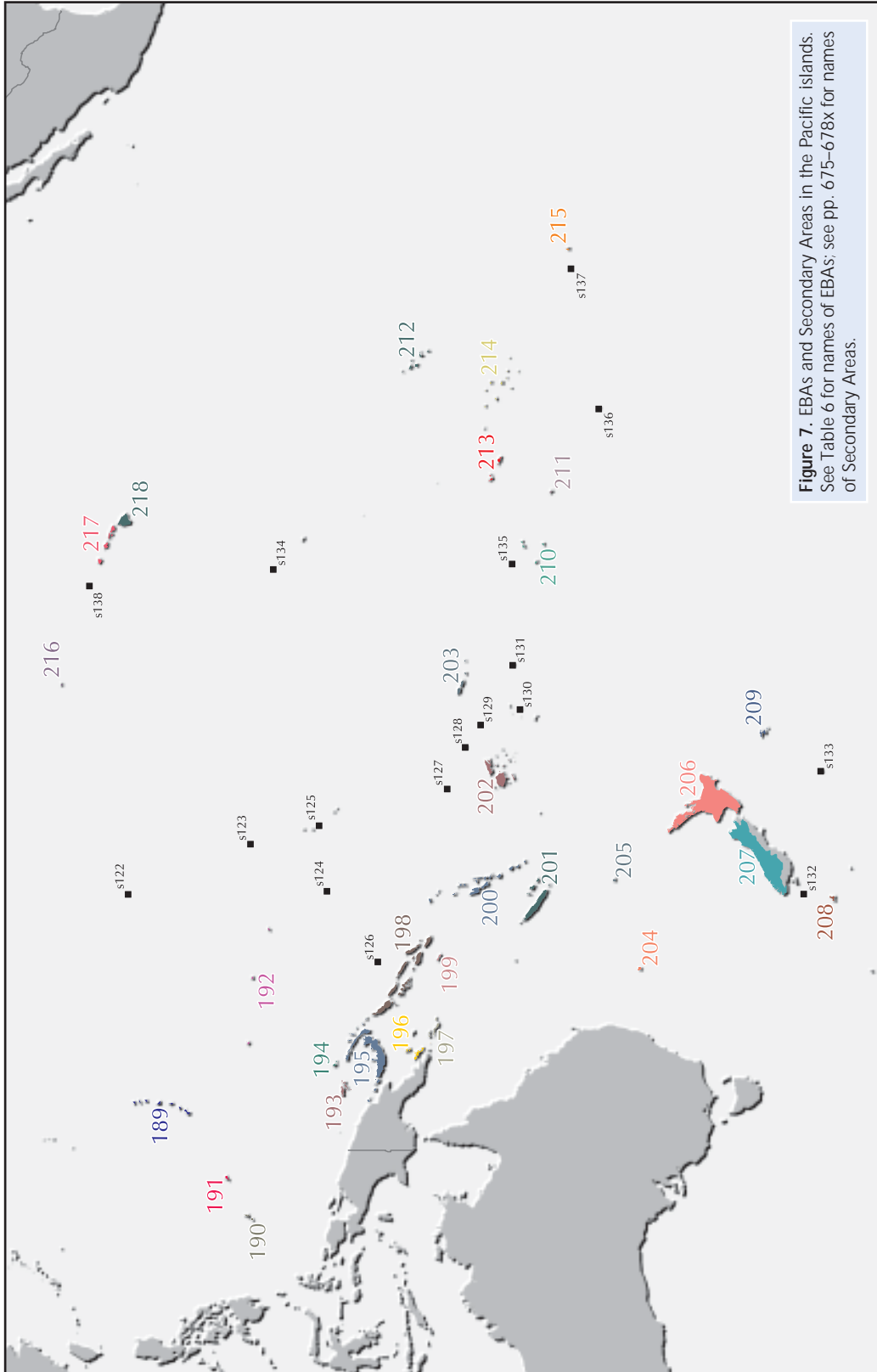


Figure 7. EBAs and Secondary Areas in the Pacific islands. See Table 6 for names of EBAs; see pp. 675–678x for names of Secondary Areas.

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The Rock Islands of Palau (EBA 190). The forests here are particularly important as a haven for several restricted-range bird species, and beaches provide safe nesting sites for the threatened Micronesian Scrubfowl *Megapodius laperouse*, although tourism is causing increasing disturbance.

single islands within the group. Overall, the Solomon group (EBA 198), centred on the political Solomon Islands (but including Bougainville, and excluding Rennell and Temotu), has the greatest number of restricted-range species (79) of all the world's EBAs; New Britain and New Ireland (EBA 195) with 54 species and Fiji (EBA 202) with 36 species also rank highly in global terms.

There are many small-island Secondary Areas, perhaps because highly disjunct ranges are commoner (or easier to distinguish) in an island—rather than in a continental—region. Several islands have single-island endemics, e.g. Nauru (Secondary Area s124) and Rapa (s136), and some islands share restricted-range species with two EBAs, with no clear affinity with one of these EBAs over the other, e.g. Wallis and Futuna (s128) and Niue (s131).

Several of the world's smallest EBAs lie in the Pacific region, including the islands of Laysan (EBA 261, 4 km²) and Rimatara (EBA 211, 8 km²). As most restricted-range species are forest-dependent, forest is the key habitat in nearly all EBAs, mostly tropical lowland and montane forest, but also tropical dry forest and mangroves and, in the New Zealand EBAs, temperate forest. There is some habitat specialization and altitudinal zonation of birds on the higher Pacific islands, but this is not sufficient to warrant the splitting of EBAs into lowland and montane groups as has been done on some larger islands in other regions and continental areas. In the Hawaiian EBAs (EBAs 217, 218) many of the restricted-range birds are found above 500 m, although originally they are likely to have occurred in the lowlands too.

Several EBAs are poorly known ornithologically, e.g. the Bismarck archipelago, consisting of the Admiralty Islands (EBA 193), St Matthias Islands (EBA 194) and New Britain and New Ireland (EBA 195); the east Papuan islands, consisting of D'Entrecasteaux and Trobriand Islands (EBA 196),

and the Louisiade archipelago (EBA 197); Melanesia, consisting of the Solomon group (EBA 198), Rennell and Bellona (EBA 199), Vanuatu and Temotu (EBA 200) and New Caledonia (EBA 201); and the Tuamotu archipelago (EBA 214) in French Polynesia.

Threats and conservation

Many Pacific bird species (especially flightless ones) have been locally extirpated from islands or have even become globally extinct since colonization by Polynesians, owing not only to habitat loss and hunting but also to the effects of introduced mammalian predators (Pacific rat *Rattus exulans*, dogs and pigs). These losses are relatively well documented historically and paleontologically in New Zealand, the Hawaiian Islands and eastern Polynesia (e.g. Steadman 1989, Johnson and Stattersfield 1990, Bell 1991, Milberg and Tyrberg 1993, Pratt 1994), but are likely to be region-wide. On islands where the prehistoric fauna has been investigated, the richest



K. D. Bishop

Kagu *Rhynochetos jubatus*, endemic to New Caledonia (EBA 201), is an exceptional bird, being the sole representative of its family. Its eggs are eaten by introduced wild pigs, chicks are killed by dogs, cats and rats, and adults are hunted.

examples have been found to have held three to four times more landbird species than are present today. For example, most or all islands in Polynesia supported one to four endemic species of flightless rail of different size, virtually all now extinct; there are known survivors on Guam in the Mariana Islands (EBA 189), on the New Georgia group in the Solomon group (EBA 198) and on Henderson (EBA 215), a poor remnant of an amazingly diverse group of birds, which once may have had some 2,000 members in the region (Steadman 1995).

Further declines followed European contact, less than 300 years ago, with the concomitant spread of brown rat *Rattus norvegicus*, black rat *R. rattus* (the most pernicious threat to birds: Atkinson 1985; see also Moors *et al.* 1992) and cats to many islands, as well as mustelids to New Zealand (EBAs 206, 207), mongoose *Herpestes auro-punctatus* to Fiji and Hawai'i (EBAs 202, 217, 218) and brown tree snake *Boiga irregularis* to Guam (EBA 189 in part). Other introduced species which have had a significant effect, either directly or indirectly, are browsing and grazing animals (e.g. goats, cattle, sheep), competitors (e.g. Common Myna *Acridotheres tristis* in the Cook Islands, EBA 210), avian diseases (e.g. avian malaria and pox carried by *Culex* mosquitoes in Hawai'i, EBAs 217, 218) and aggressive weedy plants (e.g. the Neotropical tree *Miconia calvescens* on Tahiti, EBA 213). Since 1800, nine species have become extinct on Hawai'i (EBA 218) and four on Lord Howe (EBA 204), largely as a result of these introductions. Since the 1980s, two species have become extinct from Guam (EBA 189 in part) and a further seven have become locally extinct, as a result of predation by the introduced brown tree snake.

In addition to the legacy of introduced species, a major current threat to the EBAs and to their surviving birds is forest loss: beach and atoll forest is cleared and replaced with plantations (where coconut and breadfruit are usually dominant) and tourist developments; lowland forest is logged or cleared and replaced with exotic trees (e.g. pine and eucalyptus) and agriculture; and fire destroys large areas of native forest leading to the spread of impoverished man-made grassland, fernland and scrub, which is usually unsuitable for native birds (e.g. on the leeward sides of the Hawaiian Islands, EBAs 217, 218, on Viti Levu and Vanua Levu in Fiji, EBA 202, in southern Guam, EBA 189, and in the Marquesas, EBA 212). Forest damage through hurricanes (e.g. in Western Samoa, EBA 203, in 1990–1991, and in the

central Hawaiian Islands, EBA 217, in 1992) can also be extensive and especially serious in areas which are already fragmented and degraded. Even where habitats remain relatively intact (e.g. on Rennell, EBA 199, and Henderson, EBA 215) or have been restored (e.g. Laysan, EBA 216), species are classified as threatened because of their tiny ranges and populations, which render them permanently vulnerable to chance events such as introductions and hurricanes.

Overall, a high proportion of the Pacific region's avifauna (c.14%) is currently considered threatened with extinction (Stattersfield in press) and yet terrestrial conservation programmes are absent or weakly advanced in many EBAs. The Central Hawaiian islands (EBA 217) stand out for having the highest number of threatened restricted-range species (18), including 10 Critical and Endangered endemics. The majority of the other EBAs, many of them tiny, also have threatened restricted-range species.

Most Pacific EBAs are very poorly protected by state-owned reserves (less than 5% of their land area: ICBP 1992) with the exception of Lord Howe and Norfolk Islands (EBAs 204, 205), New Zealand (EBAs 206–209), Hawai'i (EBAs 216–218) and Henderson (EBA 215). Most land elsewhere in the Pacific is communally owned by indigenous groups who are (or were) highly dependent on subsistence agriculture. On many islands, cultural traditions attach particular significance to some species and sites, and have thereby played an important role in protecting certain natural resources (although these traditions are commonly now being lost or replaced). Conservation efforts, if they are to succeed, must operate within this framework of customary land ownership and traditional practice, and pay particular attention to the needs of local people, encouraging local community participation in all facets of conservation and management (see, e.g., Gilman 1997). Encouraging examples of such initiatives can be found in the Solomon group (EBA 198), Vanuatu (EBA 200) and Fiji (EBA 202), but many EBAs are critically in need of (more) conservation action.

There have been some major conservation programmes in the region targeted at individual species, and many have involved intensive rat control, notably in New Zealand (EBAs 206, 207) but also in the Cook Islands (EBA 210) and Society Islands (EBA 213). These may serve as models of management that can be applied to other critically threatened bird species, where introduced species are the key factor in their demise.