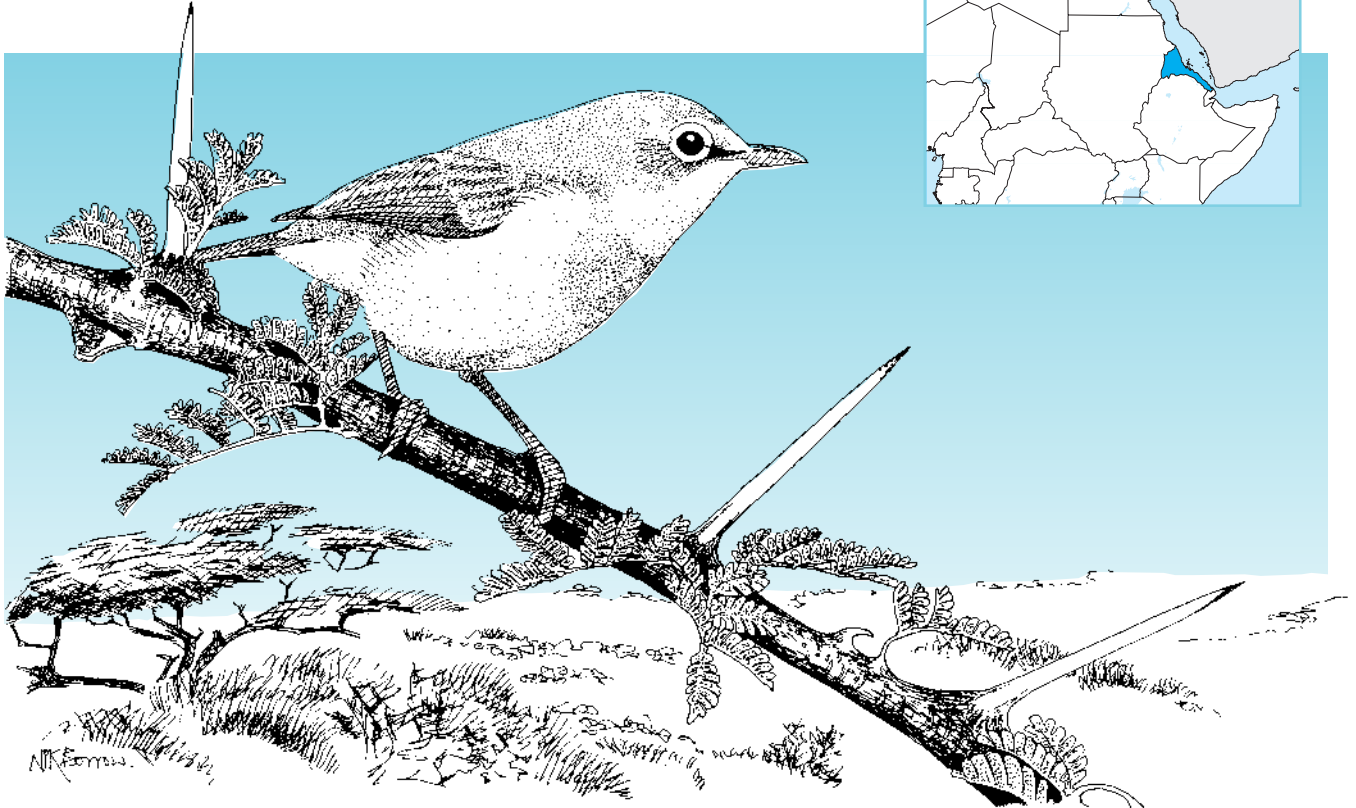


ERITREA

N. D. COULTHARD



Abyssinian White-eye *Zosterops abyssinicus*. (ILLUSTRATION: NIK BORROW)

GENERAL INTRODUCTION

Eritrea forms an approximately triangle shape, adjacent to the southern half of the Red Sea, with a long extension to the south-east reaching nearly to the straits of Bab-el-Mandeb between Djibouti and Yemen. It lies between 12°N and 18°N and between 36°E and 44°E. It covers an area of 125,000 km², and is bordered to the north and west by Sudan and to the south by Ethiopia and Djibouti. To the east, the Red Sea forms the entire border of the country, with a coastline extending over 1,200 km (with the 380 or so offshore islands in the Eritrean Red Sea adding a further 1,300 km of coastline).

The country has suffered hugely from a war of independence fought with Ethiopia over 30 years and is one of the poorest countries in the world. Independence was achieved in 1993. However, massive problems remain as a result of the destruction of the country's agricultural and industrial infrastructure and there are an estimated 500,000 Eritrean refugees in the Sudan (Paice 1996). Ongoing border disputes exist between Eritrea and Ethiopia, with serious eruptions of violence in 1998 and 1999.

The latest official census gives a population (in 1997) of just over 3.8 million (Microsoft Encarta 1999). However, this includes refugees in the Sudan and Eritreans living in other countries. A more likely figure for those actually resident in Eritrea is 2.5 million, which gives an overall population density of 16.2 people/km² (Paice 1996). About 50% of people live in the lowlands and 50% above 1,000 m (30% between 1,000 and 2,000 m and 20% on the high plateaux). Growth-rate is estimated at 3.3% and life expectancy at 46.

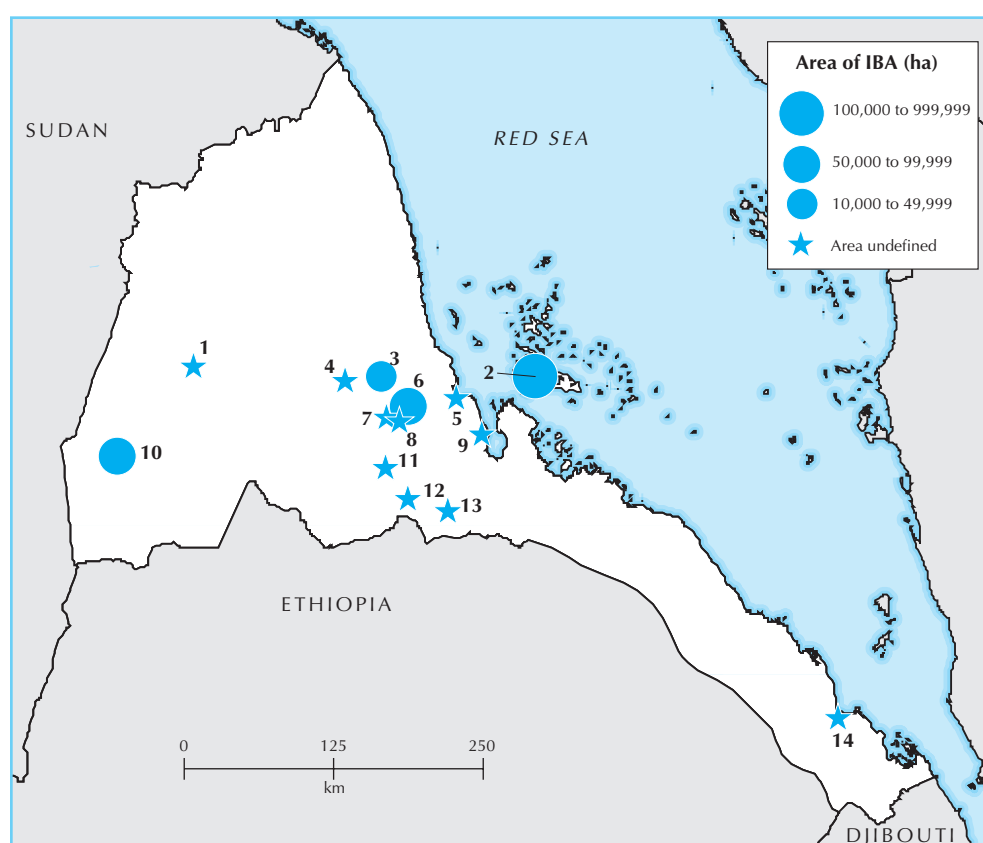
Eritrea is still in the process of building a democratic government and reconstructing its economy and infrastructure. There are nine ethnic groups in the country (the Tigrinya being numerically the most dominant) and an equal number of languages. The main working languages are Arabic and Tigrinya, but Italian is also still widely spoken (as a result of many years of Italian colonial rule) and English is taught in many schools. There are six administrative

zones, known as 'Zobas', namely: Central Zoba (capital city, Asmara); Southern Zoba (Adi Ugri); Gash Barka (Barentu); Anseba (Keren); Northern Red Sea (Massawa); Southern Red Sea (Asseb). The national capital, Asmara, has a population of 400,000 and the two main Red Sea ports are Massawa (just east of Asmara) and Asseb, in the south, towards the Djibouti border.

The country is made up of four major geographical zones that can be further subdivided according to climate and vegetation. These are the Central Highland Plateau (including its eastern and western escarpments, the Northern Hills and the southern slopes); the Western Lowlands (or Western Plain) stretching towards Sudan; the Eastern Lowlands (including the Eastern Plain and the southern Danakil region); and the Coast and Offshore Islands. Current government documents divide the Western Lowlands into south-western and north-western sectors and include the coast, islands and Danakil region as part of the Eastern Coastal Plain. However, the zones used in this chapter reflect the way the country was divided up in terms of bird habitats and distributions by early investigators, notably Smith.

The Central Plateau runs from north to south throughout the country and separates the lowlands to west and east. The plateau reaches altitudes of over 2,500 m and falls sharply, particularly on the eastern escarpment running down to the coastal plain and the Red Sea. Some inland parts of the Danakil region lie below sea-level. Apart from hill streams and springs in lava-fields near Danakil there is only one perennial river, the Setit (or Taccaze) which rises near Lake Tana in Ethiopia and forms the border between Ethiopia and south-west Eritrea before flowing into the Atbara river in the Sudan.

Most of the country, including the plateau, the upper escarpment slopes and the Western Lowlands, has two rainy seasons, although Paice (1996) reports that rainfall is highly variable and the rains failed in most years between 1986 and 1996. The light and variable 'short rains' fall between March and May (80–150 mm on the plateau, 25 mm in the west). The main rains last from about mid-June to mid-September (rarely extending into November) and bring



Map 1. Location and size of Important Bird Areas in Eritrea.

Table 1. Summary of Important Bird Areas in Eritrea. 14 IBAs; four cover c.4,690 km², while the areas of the remainder are undefined

IBA code	Site name	Administrative region	Criteria (see p. 11; for A3 codes, see Table 2)							
			A1	A2	A02	A03	A04	A07	A08	A4i
ER001	Western Plain: Barka river	Gash Barka, Anseba		115		✓	✓			
ER002	Dehalak Archipelago and offshore islands	Northern Red Sea Zone, Southern Red Sea Zone	✓		✓					✓
ER003	Semenawi Bahri	Northern Red Sea Zone	✓					✓	✓	
ER004	Central Plateau: Keren	Anseba				✓		✓		
ER005	Massawa coast	Northern Red Sea Zone	✓		✓	✓				✓
ER006	Ghinda	Northern Red Sea Zone								✓
ER007	Asmara escarpment	Northern Red Sea Zone, Central	✓	✓				✓	✓	
ER008	Arboroba escarpment	Central						✓		
ER009	Gulf of Zula	Northern Red Sea Zone								✓
ER010	Western Plain: Gash-Setit	Gash Barka				✓	✓			
ER011	Southern Plateau: Furrus	Southern						✓		
ER012	Mareb escarpment	Southern					✓		✓	
ER013	Senafe	Southern		✓				✓		
ER014	Danakil lowlands	Southern Red Sea Zone			✓					✓
Total number of IBAs qualifying:			4	2	3	4	3	6	6	2

between 510–760 mm to these same areas. Rainfall during both these periods lessens towards the north and usually stops at the upper slopes of the eastern escarpment, but occasionally it may overshoot, bringing rain to the usually arid Eastern Lowlands. Eastern areas, including the lower escarpment slopes, the coast and the Dehalak islands receive ‘winter’ rains of up to 250 mm between November and May. These levels decline progressively southwards, and the southern Danakil region has very little rain (less than 40 mm annually at Asseb, on the coast); rainfall also tends to be lower on the offshore islands. One atypical region of the eastern escarpment north of Ghinda receives both the main ‘summer’ and the ‘winter’ rainfall, with an annual total in excess of 1,000 mm and rain falling in every month except June and September. This creates a relatively wet zone of richer vegetation.

One of the main features of weather in the Red Sea area is the lack of variability (compared with more northerly latitudes). The whole Red Sea region has very little low cloud, usually good visibility and few gales, and the only real change throughout the

year is in the wind direction in the south. Winds over the northern Red Sea are predominantly north-westerly throughout the year, whereas those in the southern Red Sea are affected by monsoons in the Arabian Sea and veer from north-west between May and September to south-east from October to May.

On the plateau, the hottest month is usually May, with maximum temperatures of c.30°C; in ‘winter’ (December to February) night-time temperatures can be close to freezing. In the Western lowlands, the hottest months are from April to June, when daily maxima can reach 50°C; the coldest month (December) can see minima of 15°C. On the coast and islands, the temperature can range from 40° to 50°C during June to September (and even higher in the southern Danakil region). In ‘winter’ the daily variation is between 21° and 35°C. The very high night-time levels result in exceptionally high average temperatures for these eastern areas.

The following general descriptions of the different zones of the country and their habitats are derived largely from older references, particularly Smith (1957) and Hemming (1961). While these

probably give a fairly accurate picture of the semi-natural vegetation zones that existed in the 1940s and 1950s, they should be treated with some caution. Present-day habitats are greatly modified and degraded or fragmented; in particular, most of the previously extensive forests have been removed and some of the areas of upland wetland and marsh described by Smith appear to have disappeared or occur only after heavy rains. Areas where there is permanent water at or near the surface are frequently dammed to allow for cattle-grazing, irrigation or human domestic use. It is estimated that 30% of Eritrea was covered by forest in the early 1900s; for 1950 the estimate is around 10% and by 1995 this was reduced to less than 1% (EAE 1995).

The Central Highland Plateau (Zobas: Anseba; Central; Northern Red Sea Zone; Southern) lies mostly at an elevation of between 1,800–2,500 m, with the real upland areas lying at over 2,100 m and some peaks reaching nearly 3,000 m. It is at its widest in the south, between the towns of Asmara and Adi Ugri and tapers to the north, where the Northern Hills form a narrow spur between the Western and Eastern Lowlands. The area consists of rough, stony moorland, rocky hillsides and peaks, scrubby tussock-grassland (containing *Rumex nervosa* and *Argemone mexicana*) and *Juniperus procera* woodland with planted *Eucalyptus* and shrubby undergrowth. There are some wetter patches of woodland in the very south, from Senafe and Guna Guna north to Adi Caieh at altitudes between 2,100–2,500 m. These include very tall deciduous trees mingled with *Ficus* and *Juniperus* spp. as well as exotic *Eucalyptus* sp., with ferns among the undergrowth. The upland areas are frequently in cloud and there are profuse lichens in some areas. Barley and teff (*Eragrostis tef*) are the main crops cultivated in the poor soils and *Eucalyptus* trees are widely grown in parks and gardens in the main towns (e.g. Asmara, Adi Ugri and Adi Caieh). Close to Asmara and most of the larger villages there are small dams and reservoirs (some with *Rumex* sp. swamps at the margins). During the rainy season a few other small, temporary lakes and marshes are formed. Numerous deep valleys incise the mountains up to high altitudes and narrow belts of riparian growth, including willows, flank the streams in these valleys. In the north, the mountains are more rugged with deciduous cover; the lower, more arid plains are covered with *Aloe abyssinica* and *Sansevieria* sp. and the wadis are fringed with *Zizyphus* sp.

Escarpment slopes (Zobas: Anseba; Central; Northern Red Sea Zone; Southern): on the eastern escarpment (c.300–1,800 m), the hills fall away steeply, in some areas dropping more than 2,000 m in 30 km to the Eastern Plains. The plains extend to a maximum of about 50 km width before meeting the Red Sea. The plateau slopes run parallel to the sea from Ras Kasar in the north to the Gulf of Zula, just south of Massawa. The upper slopes fall irregularly with sheer drops of 600 m and more, rock precipices, spurs and deep valleys creating superb scenery. The vegetation on the upper slopes is montane scrub (*Olea*, *Euphorbia*, *Dodonaea*, *Opuntia*, *Rosa* and occasional *Acacia* spp.), which gives way, at around 1,400 m, to *Combretum* forest, with *Terminalia* and *Anogeissus* spp., which continues down to c. 300 m at the edge of the Eastern Plain. Riparian woodland along watercourses in the valleys includes *Acacia*, *Ficus*, *Rhus*, *Acokanthera*, *Ricinus*, *Gymnosporia* and *Buddleia* spp., with dense mats of the herb *Flaveria australasiatica* adjacent to rivers at intermediate altitudes after rain. Coffee was cultivated extensively on terraces in these regions by the Italians and citrus fruits and bananas are grown in the valleys, especially around Ghinda and Keren. Just north of Ghinda lies an area of about 78,000 ha of wet woodland between 900–1,700 m. This results from rain falling in this region in every month of the year except June and September and leads to a richer flora. In addition to *Combretum*, dominant trees and bushes in this region are *Capparis tomentosa*, *Cordia abyssinica*, *Rhus abyssinica* and *Ficus* sp. Dense undergrowth includes ferns, *Adiantum* spp.

The upper slopes of the western escarpment (c.900–1,800 m) are similar to those in the east though the area is far more rugged, with frequent cliffs and deep river valleys. East of the town of Keren is an almost sheer mountain wall, north of which lies the Anseba valley which separates eastern and western parts of the plateau. The slopes below Keren are boulder-strewn and scrub-covered, contrasting with the forested slopes of the eastern escarpment at the same altitude. The land falls irregularly, with very deep river valleys, to about 900 m, after which it flattens out into the Western Plain.

The upper slopes are rocky and barren. Montane scrub and sparse grassland extend down to about 1,500 m. On the lower slopes, the land becomes quite fertile, and scrub gives way to mixed *Acacia* woodland and rocky hillsides covered with pure stands of *Euphorbia candelabra*. The well-watered valleys are cultivated with cereals, fruit and sisal. Several major rivers flow west and north out of the escarpment, including the headwaters of the Gash, the Barka and the Anseba. Riparian woodland is similar to that on the eastern slopes, but becomes more extensive at lower altitudes in the Western Lowlands.

The southern slopes of the plateau form the north bank of the massive Mareb valley. The Mareb river rises on the plateau near Asmara, flows south down the escarpment slopes and then west to form the border with Ethiopia over a length of 130 km, eventually becoming the Gash river on the Western Plains. In some places (e.g. just south of Adi Quala), the drop from the top of the escarpment down to the bottom of the Mareb valley is almost sheer for 600 m, but in other areas the slope is gentler than on the eastern and western escarpments. At higher altitudes the vegetation is similar to that of the other slopes, with cliffs and scrub-covered hills, but there are also more fertile areas: water-meadows and wide plains, cultivated for cereals. Lower down, the slopes are covered in thick bush, contrasting with the forested slopes of the eastern escarpment. The flat lands, adjacent to the Mareb river where it flows west out into the plain, lie at around 1,500 m and the vegetation here shows more affinities with that of the Western Plain at lower altitudes, with extensive riparian woodland along the Mareb.

The Western Lowlands (Zobas: Anseba; Gash-Barka), or Western Plain, form a rough triangle between the Central Plateau to the east, the Sudan border to the west and the Ethiopian border to the south. After following the Mareb river out of the southern escarpment, the border with Ethiopia diverts south-west at Tolle Wells and then west to follow the Tacazze river (which becomes the Setit river at the border). The Setit flows west to the Sudan border at Om Hager where it joins the Atbara. The Setit is the only perennial river in Eritrea and is mainly deep and fast-flowing, with steep banks. The other rivers crossing the Western Plain dry out and cease to flow except during the rainy season.

The Western Lowlands lie largely between 550–1,100 m, although in the south there are hills rising 100 m or so above this, especially to the north of the Mareb valley where the northern flanks extend into the plain. There are also stony hills in the north and west, rising to 300 m. This area towards the Sudan border is drier than more southerly parts of the Lowlands, with stony steppes and *Acacia* sp. thorn-bush. The Barka river flows north through this area and is joined just before the border with Sudan by the Anseba. The sandy valley of the Barka is the lowest part of the Plain, at less than 300 m. The area resembles semi-desert apart from the riparian woodland along the rivers which can be several hundred metres wide and includes taxa such as *Hyphaene*, *Tamarindus*, *Tamarix*, *Adansonia*, *Ficus*, *Acacia*, *Zizyphus*, *Salvadora*, *Leptadenia*, *Calotropis* and, occasionally, *Kigelia* spp. During the summer rains there are also belts of cultivation along the rivers and extensive rank grass and scrub.

Further south, especially from just north of the Gash river, south to the Setit river, the area is much more fertile, with *Acacia* sp. savanna and woodland, grassland and agricultural land (especially on the so-called 'cotton soils' in the river valleys). Woodland includes *Adansonia*, *Balanites* and *Capparis* spp. and, in the very south, hillsides covered with pure stands of *Boswellia* sp. The riparian vegetation is similar to that along the Barka and Anseba, but generally wetter and there are extensive stands of doum palm *Hyphaene thebaica*, especially along the Gash river. When the rains are heavy, these areas form temporary swamps. An artificial marsh has been created alongside the Gash river for irrigated agriculture (especially millet) in the region of Tessenei, known as Ali Ghider marshes. This area is unique in Eritrea because of the size and near-permanence of the marshes (all other areas of marsh and swamp in the country are seasonal and dependent on annual rains). There is a distinctive but narrow belt of tall *Andropogon* and *Cymbopogon* spp. grassland, mainly devoid of trees, lying along the Sudan border between Sabderat and Om Hager.

The Eastern (maritime) Plain (Zoba: Northern Red Sea Zone) stretches from the base of the eastern escarpment at about 300 m to 400 m, to the Red Sea coast and from Ras Kasar in the north to

the southern end of the Buri peninsula (65 km south of Massawa) in the south. It is about 320 km long and an average of 30 km wide, narrowing in the south. The vegetation tends to occur in narrow parallel belts, reflecting the decline in rainfall from the escarpment to the coast.

At the base of the escarpment, the land is sandy and relatively fertile. In some years this area receives direct rainfall when the winter rains overshoot the Central Plateau, but most of the Eastern Plain is crossed only by temporary wadis which flood rarely, only after heavy rains on the plateau. In the lava belts south of Massawa there are a few permanent springs. In places, the floodwaters flowing out from the plateau and the escarpment gorges are trapped for irrigation purposes on the plains (maize, some millet, *Sorghum durra* and *Pennisetum typhoideum*). There are also extensive grasslands with associated herbs (e.g. *Aerva*, *Commelina*, *Indigofera* and *Heliotropium* spp. and dense mats of *Cenchrus* and *Eragrostis* spp. following rains in the cultivated areas). Woodland is mainly *Acacia* (e.g. *A. spirocarpa* and *A. mellifera*), with *Balanites aegyptiaca*, *Capparis decidua* and *Cadaba* sp. The dry wadis support only narrow strips of woodland along their banks (*Acacia*, *Zizyphus*, *Tamarix*, *Leptadenia* and *Calotropis* spp. and *Salvadora persica*). This riparian woodland is similar to that on the Western Plain, but is sparser and there are no baobabs, *Adansonia* sp.

Further to the east, the Plain becomes more arid and hilly; the hills are mostly stony and barren with little vegetation and no trees and the dominant vegetation is tussock-grassland (*Panicum turgidum*) with occasional stands of *Acacia* sp. trees. The *Panicum* steppe does not extend south of Massawa. The coastal regions are arid and sandy; *Acacia* sp. thorn-bush reaches right to the dunes in many parts and there are also belts of *Suaeda* sp. behind the dunes. Dry streambeds also reach the coast, but very rarely have any water flow. An isolated range of mountains, the Ghedem range, lies in the Plain just south of Massawa. The mountains run parallel to the coast for a length of 24 km and reach a height of 900 m. Above 300 m the slopes are covered with *Combretum* sp. woodland, together with *Terminalia* and *Anogeissus* spp. and underlying scrub, similar to the woodland found on the eastern slopes of the plateau escarpment. There are many wadis on the slopes, with *Zizyphus* and *Acacia* spp. along their banks and dense undergrowth.

The volcanic region of Danakil (Zoba: Southern Red Sea Zone) is the most southerly region of the country and also the hottest and most arid. It stretches from south of the Buri peninsula to the southern border of Eritrea with Djibouti and lies just north and east of the actively-volcanic Danakil Desert in Ethiopia. It is a long narrow strip, mainly stony desert and mountains, never more than 80 km wide. Unlike the Eastern Plain, which receives some effect of the plateau and escarpment rains, Danakil receives no direct effect from rainfall inland on the Central Ethiopian Highlands, although there are some small permanent springs and streams in depressions in the lava-flows to the south (which provide drinking water for the town of Asseb on the coast) and wells in other areas. The mountain ranges are barren volcanic rock, the highest peak (Mount Ramlu) reaching 2,100 m. At lower levels, there are black lava-flows, flat sand- and shell-plains, rocky low hills, flat-topped jebels and dry salt-lakes (some lying below sea-level). Vegetation is sparse with scattered *Acacia* sp. (up to about 600 m) and sparse grassland, and occasional reedbeds around perennial springs in the south.

Coast (Zobas: Northern Red Sea Zone; Southern Red Sea Zone): the northern coast, from Ras Kasar near the Sudan border, to the port of Massawa, is fairly uniform, consisting of a sandy coastline with small rocky promontories, grading inland to dunes and then *Acacia* sp. woodland, thorn scrub, and grassland with *Suaeda* sp. thickets, *Zygophyllum simplex* and *Dipterygium glaucum*. There are belts of the succulent *Suaeda* on marshy areas sometimes inundated by high tides, immediately behind the dunes. Underlying the dunes are ancient raised coral reefs which form a low 1.5 m cliff along the beach in some places and may also appear as an underwater shelf. The presence of coral gives rise to very white dunes consisting of tiny coral fragments. There are also live offshore coral reefs in some places, partly blocking small bays, which leads to an accumulation of saline mud covered in mangroves of several species. Numerous wadis run down from the Eastern plain to form small, tidal inlets. No permanent running freshwater reaches the coast and the wadis are usually dry for most or all of the year. During the 'winter' rains,

some of the coastal areas can become marshy, and seasonal vegetation (sedges and *Statice* sp.) grows on the dunes. There is a brackish lake (Lake Mandalum), with associated mangrove swamps, in the extreme north, which lies below sea-level in the Hasmet Plain. North of the port of Massawa the shore is sandy, with occasional low cliffs. The port itself is constructed partly on the mainland and partly on the two islands of Taulud and Batsii, which are connected to the mainland by causeways. Very large areas of sand- and mudflats are exposed in and around the port at low tide, attracting large congregations of waders. There are palm groves (*Hyphaene* sp.), together with *Acacia* and *Zizyphus* sp. in some gardens in Massawa. The extensive Dehalak Archipelago lies offshore.

South of Massawa, the coastline becomes more complex, with large bays and headlands, rocky pools, long sand- and shingle-beaches and many offshore reefs and islands. The inshore waters are shallow and some of the coral reefs may be exposed by low spring tides. The cliffs of the Buri peninsula above Zula Bay reach 50 m in height. There are tidal sand- and mudflats similar to those at Massawa in all the larger bays (Herghigo, Gulf of Zula, Mersa Fatmah and Asseb). Zula and Asseb Bays also contain tidal saltmarsh and there are mangroves fringing many of the muddy bays and inlets. Behind the coast there are dunes, *Hyphaene* sp. palms, *Acacia* spp. thorn scrub and tidal lagoons. The port of Asseb lies at the very southern end of the coast of Eritrea and previously formed the main trade port for towns in the Ethiopian Highlands, to the west of the Danakil Desert.

Islands (Zobas: Northern Red Sea Zone; Southern Red Sea Zone): of the many islands lying off the coast, the Dehalak Archipelago is by far the largest group, but there are other significant groups further south in Mersa Fatmah Bay and Asseb Bay, in addition to many individual offshore islands along the length of the Eritrean coast. Most of the Dehalak Archipelago is composed of salt 'diapir' (uplifted salt deposits and dead corals); islands further to the south are a mixture of salt diapir and some of continental and volcanic origin. The islands in the Dehalak Archipelago and Asseb Bay are sandy, with sparse scrub vegetation similar to that on the coastal mainland (mangroves, especially *Avicennia* sp., and *Acacia*, *Panicum* and *Suaeda* spp.). Sandy and pebble flats and some rocky cliffs are also present on some islands (two of those in the Mersa Fatmah Bay group reach heights over 200 m).

The majority of the islands are uninhabited, but a few have resident populations of fishermen and people keeping goats. The commercial sardine and anchovy fisheries of earlier years stopped almost entirely during the war of independence with Ethiopia, although there are now government plans to rehabilitate these. There is some very low-key tourism on the Dehalak islands, based largely on the diving opportunities and the coral reefs, and some collection of shells and coral occurs. The islands were used as an Ethiopian military base against Eritrean rebels during the war.

For a relatively small country, Eritrea has a large diversity of habitats and extremes of altitude and climate, which are reflected in the species diversity. In particular, because the central highlands of Eritrea (and Ethiopia) acted as species refuges during periodic glaciations, there is a unique assemblage of montane species, including many endemics (Zinner *et al.* 1999). The country is also acknowledged as one of the world centres of agricultural crop diversity. There are very few detailed studies of any group other than birds and very few recent good data for any group. This arises for two main reasons: many past studies did not recognize Eritrea as a separate state from Ethiopia so it is impossible to separate some records and statements about distribution for the two countries; secondly, 30 years of war have severely restricted any survey work by national or expatriate scientists.

For Ethiopia and Eritrea combined, the total (provisional) list of mammals numbers 11 marine species and 277 terrestrial (of which 47.2% are classified as savanna forms and 16.2% as desert forms). A total of 29 species are endemic to the two countries and almost all of these are montane grassland or moorland residents confined to the central highland plateaux, with very few forest species (Yalden *et al.* 1996). A provisional list of mammals 'likely to have been present' in Eritrea at some time in the nineteenth century numbers 126 taxa, including nine marine mammals known from Eritrean territorial waters. Of this total, 17 are on the IUCN *Red List of threatened species* (DOE 1999).

Mammals of conservation concern known to occur in significant numbers in Eritrea include *Dugong dugon* along the coast, as well as ‘dolphins, porpoises and whales’, including *Physeter macrocephalus* (FAO 1997, Smith 1953). *Panthera pardus*, *Tragelaphus strepsiceros*, *T. scriptus*, *Papio hamadryas* and *Oreotragus oreotragus* are all said to occur on the forested slopes of the Central Plateau and populations of *Loxodonta africana* (probably only about 30 remaining), *T. strepsiceros*, *Gazella dorcas*, *G. rufifrons*, and possibly *Taurotragus oryx* and *Alcelaphus buselaphus tora*, on the Western Plain. Gazelles are reported from the islands of Dehalak Kebir and Nocra (including a dwarf *Gazella soemmerringii* of uncertain taxonomic status). On the arid areas of the Buri peninsula and south into the Danakil there is a breeding population of around 100 *Equus africanus somaliensis*, which is probably the last viable population of the subspecies. There are also migratory *Gazella dorcas* and *G. soemmerringii* in this area and south of Asseb towards the Djibouti border.

Among other groups there are breeding sea-turtles *Chelonia mydas* and *Eretmochelys imbricata* in the Dehalak archipelago and three other species of sea-turtle are said to occur in Eritrean waters. The waters off the coastline and around the archipelago also support several hundred (probably thousands) of fish and shellfish species, many of which breed in and around the coral reefs and form the food-supply for breeding seabirds, ospreys and others. The level of endemism for all Red Sea fish is estimated at around 18%, but is higher than 50% for some fish groups (EAE 1995). There is also a wide variety of different forms and species of coral. Preliminary inventories of terrestrial reptiles and amphibians suggest that the diversity among these groups is low, probably at least in part due to the very large impact of man’s activities, especially in the uplands of both Eritrea and Ethiopia (FAO 1997).

The upland areas of the country have been extensively degraded over time by thousands of years of man’s agricultural influence, including intensive cultivation and domestic livestock-grazing. Much of the original highland forest has also been removed for fuelwood—it is estimated that the proportion of land covered in natural forest fell from 30% to 1% of the country during the course of the twentieth century (EAE 1995)—and there are severe problems of erosion in places. It was estimated in 1984 that 2.4 million ha of the uplands (19% of the country’s land surface) had been degraded through water erosion (DOE 2000). There has been a major reforestation effort in more recent years, with a reported 45 million trees planted by Eritreans in attempts to combat erosion and desertification (Microsoft Encarta 1999). More recent human impacts include the years of war which have had an as yet unknown effect on wildlife populations, although the evidence of spent shells, bunkers and old rusty armaments is clearly visible on the landscape (Butynski 1995, Hillman pers. comm.) and some antelope populations are believed to have been shot for food by the Ethiopian army. However, at least for mammals the situation is considered ‘not irredeemable’, if protected areas can be reinstated or newly developed, and providing that peace and prosperity return to the region (Yalden *et al.* 1996).

Smith reported in the 1950s that there was some collection of seabird eggs on the Dehalak Archipelago and some snaring and netting of gamebirds such as guinea fowl and francolin and shooting of ducks which appeared to cause disturbance on dams around Asmara (Smith 1951b). In general, exploitation of birds or other wildlife does not appear to have been a large or particularly damaging influence in Eritrea, where there is no tradition of hunting bush-meat except in times of great adversity (FAO 1997). Thus, exploitation appears to have been limited to the years of war when soldiers and others had to live off the land; encouragingly, the current Ministry of Agriculture ban on hunting appears to be being observed (Butynski 1995). An increasing problem may arise from conflict between primates such as *Papio anubis* and humans in areas where populations of baboons and humans are high and baboons are chased and killed as agricultural pests (Zinner *et al.* 1999). Killing of turtles and collection of coral, shells and tropical fish for export or the local tourist market are also potential threats (Berhanu 1976, FAO 1997), but none of these activities is likely to have developed to any large extent due to the intervening years of conflict.

The introduction of exotic plant species, especially prickly pear *Opuntia vulgaris* and *Eucalyptus* sp. in the uplands may be a threat to native habitats in certain areas such as the Semenawi Bahri. Other

introduced trees such as *Azadirachta indica* and *Prosopis chilensis* are also spreading out along roads and watercourses in the Western Lowlands.

As in many other African countries, one of the greatest barriers to effective future conservation of biodiversity is a lack of resources and capacity (trained personnel, systems and infrastructure) and lack of information about the country’s natural resources and biodiversity. It will be essential to the success of national conservation efforts that adequate support, finance and training are offered to Eritrean government authorities and NGOs as the job of surveying the country’s biodiversity and rebuilding a conservation infrastructure and protected-area system, following the years of war, begins.

ORNITHOLOGICAL IMPORTANCE

The checklist for the birds of Eritrea lists a total of 537 species for the country, of which 306 are resident (50% or 153 with proof of breeding) and 208 are regular seasonal migrants (160 of which are Palearctic) (Dowsett and Dowsett-Lemaire 1993). A further two species may need to be added to this list; there is a record of *Caprimulgus poliocephalus* in the Semenawi Bahri in 1995 (see site ER003) and possible records of *Streptopelia capicola* on the southern plateau in 1998. Bird species diversity reflects the diversity of habitats, altitudes and climates, including desert, arid and semi-arid, Afro-montane, wet and dry woodland, grassland, inland and coastal wetlands and islands. The Eritrea Biodiversity Stocktaking Report (DOE 1999) lists 577 bird species for Eritrea, but stresses that this is not a definitive checklist as it includes all species which might reasonably have been identified in the country in the past 100 years (for only c.50% of these are there reliable records from the last 50 years). Bird records for the country are very incomplete; due to the years of war many areas have not been surveyed or visited for 50 years or more, some areas have never been investigated and many recent records are from relatively accessible areas, along or close to main roads, towns and villages.

There are 12 species of global conservation concern recorded from Eritrea. The most recent record of *Geronticus eremita* (CR) is of five birds seen on the coast near Massawa in 1997 (Dewhurst pers. comm.) and there are earlier records from the plateau and Asmara/Massawa regions. *Phoenicopiterus minor* (NT) occurs irregularly along the coast in winter, often accompanied by *P. ruber*. *Aythya nyroca* (VU) was said to winter in numbers up to 40 birds on the plateau dams (especially Lake Delia, c.24 km north of Asmara) although there are no recent records. *Circus macrourus* (NT) is also reported wintering over the moors of the plateau and on the Dehalak islands. *Aquila clanga* (VU) was observed near Asmara in 2000 (one individual in a flock of several *A. nipalensis*) and *Falco naumanni* (VU) is said to be abundant wintering and on passage in certain areas on the plateau and escarpment slopes and also occurs on the Dehalak Archipelago. *Rougetius rougetii* (NT) breeds in swampy ground (e.g. Lake Mandrezen, c.15 km north-west of Asmara) on the Central Plateau over 1,800 m. The Palearctic migrant *Vanellus gregarius* (VU) is found on the plateau and also at much lower altitudes on the Western Plain and in coastal saltmarsh (though there are no recent records). *Larus leucophthalmus* (VU) breeds on most of the Dehalak islands visited to date (e.g. 200 adults on one island in 2000). *Emberiza cineracea* (NT) is recorded wintering in a number of locations on the plateau, including the areas of Keren and Asmara (Acria dam) and also on the islands of the Dehalak Archipelago. *Aquila heliaca* (VU) is reported as ‘probably quite common wintering’ and *Crex crex* (VU) as a rare migrant by Smith (1957, 1960), but there are no recent records (Dowsett and Dowsett-Lemaire 1993 treats both species as vagrants).

The only restricted-range species recorded in Eritrea is *Myrmecocichla melaena*, which is found only in the Central Ethiopian highlands Endemic Bird Area (EBA 115), where it extends into Eritrea. It is recorded from the southern end of the Eritrean Central Plateau near the border with Ethiopia, and also from around Asmara.

Five biomes are represented in Eritrea, each holding an assemblage of bird species found only in that biome: nine of the 22 characteristic bird species of the Sahara–Sindian biome (A02)

Table 3. The occurrence of biome-restricted species at Important Bird Areas in Eritrea. Sites that meet the A3 criterion are highlighted in **bold**. Species of global conservation concern are highlighted in **bold blue**. Any other species with a restricted range are highlighted in blue.

A02 – Sahara–Sindian biome (nine species in Eritrea; three sites meet the A3 criterion)												
IBA code:	001	002	005	006	009	010	014					
<i>Falco concolor</i>		✓		✓								
<i>Pterocles senegallus</i>		✓	✓		✓							
<i>Pterocles lichtensteinii</i>	✓		✓		✓	✓	✓					
<i>Ammomanes deserti</i>			✓		✓							
<i>Alaemon alaudipes</i>		✓	✓									
<i>Hirundo obsoleta</i>			(✓ ¹)									
<i>Oenanthe leucopyga</i>												✓
<i>Cercomela melanura</i>		✓	✓		✓							✓
<i>Turdoides fulvus</i>			✓		✓							
Number of species recorded:	1	4	6	1	5	1	5					
1. Record from Wadi Lebka, 70 km north of Massawa.												
A03 – Sahel biome (eight species in Eritrea; four sites meet the A3 criterion)												
IBA code:	001	002	003	004	005	006	007	009	010	011	012	014
<i>Ardeotis arabs</i>	✓	✓	✓		✓			✓	✓			
<i>Streptopelia roseogrisea</i>		(✓ ²)						(✓ ²)		(✓ ²)		
<i>Trachyphonus margaritatus</i>	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Cercotrichas podobe</i>	✓	✓		✓	✓	✓		✓	✓		✓	✓
<i>Spiloptila clamans</i>	✓			✓					✓			
<i>Anthoscopus punctifrons</i>	✓								✓			
<i>Passer luteus</i>					✓							
<i>Lamprotornis pulcher</i>	✓		✓	✓		✓			✓	✓	✓	
Number of species recorded:	6	2	3	4	4	3	1	3	6	2	3	2
2. All <i>Streptopelia roseogrisea</i> records are subject to confirmation (the record from 002 is not accepted by Ash; the records from 011 and near to 009 (Abdur, 50 km east of the IBA) may have been <i>S. capicola</i> (Zinner pers. comm.))												
A04 – Sudan–Guinea Savanna biome (eight species in Eritrea; three sites meet the A3 criterion)												
IBA code:	001	002	004	009	010	011	012					
<i>Falco alopex</i>	✓	(✓ ³)	(✓ ⁴)		✓							✓
<i>Myrmecocichla albifrons</i>							✓				✓	✓
<i>Turdoides leucocephalus</i>					✓				✓			
<i>Cisticola ruficeps</i>					✓				✓			
<i>Eremomela pusilla</i>					✓				✓			✓
<i>Estrilda troglodytes</i>									✓			✓
<i>Petronia dentata</i>					✓			✓	✓			✓
<i>Plocepasser superciliosus</i>					✓			✓	✓	✓	✓	✓
Number of species recorded:	6				2	7	2	6				
3. Presumed vagrant.												
4. Record from Melzanei, 25 km from the IBA.												
A07 – Afrotropical Highlands biome (31 species in Eritrea; six sites meet the A3 criterion)												
IBA code:	003	004	005	006	007	008	009	011	012	013		
<i>Bostrychia carunculata</i>					✓							✓
<i>Francolinus erckelii</i>		✓			✓	✓		✓				✓
<i>Rougetius rougetii</i>		✓			✓							
<i>Columba albitorques</i>												✓
<i>Streptopelia lugens</i>		✓			✓	✓	✓	✓				
<i>Agapornis taranta</i>		✓	(✓ ⁵)		✓							
<i>Tauraco leucotis</i>		✓	✓		✓			✓				✓
<i>Caprimulgus poliocephalus</i>		✓										
<i>Apus niansae</i>			✓									✓
<i>Lybius undatus</i>			✓		✓							✓
<i>Dendropicos abyssinicus</i>		✓	✓		✓			(✓ ⁶)	✓			✓
<i>Monticola rufocinereus</i>		✓		✓			✓	✓				✓
<i>Cossypha semirufa</i>					✓	✓		✓				
<i>Myrmecocichla melaena</i>					✓							✓
<i>Thamnolaea semirufa</i>												✓
<i>Phylloscopus umbrovirens</i>		✓										✓
<i>Dioptornis chocolatinus</i>												✓
<i>Parus leuconotus</i>												✓
<i>Nectarinia tacazze</i>		✓			✓							✓
<i>Zosterops poliogaster</i>		✓	✓		✓	✓		(✓ ⁶)				
<i>Serinus citrinelloides</i>					✓							✓
<i>Serinus xanthopygius</i>					✓							
<i>Serinus tristriatus</i>		✓			✓	✓						✓

Table 3 ... continued. The occurrence of biome-restricted species at Important Bird Areas in Eritrea. Sites that meet the A3 criterion are highlighted in **bold**. Species of global conservation concern are highlighted in **bold blue**. Any other species with a restricted range are highlighted in blue.

A07 – Afrotropical Highlands biome ... continued (31 species in Eritrea; six sites meet the A3 criterion)														
IBA code:	003	004	005	006	007	008	009	011	012	013				
<i>Serinus striolatus</i>	✓	✓			✓	✓				✓	✓			
<i>Estrilda melanotis</i>	✓			✓	(✓ ⁵)					✓				
<i>Passer swainsonii</i>	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
<i>Ploceus baglafecht</i>	✓	✓			✓	✓							✓	
<i>Onychognathus tenuirostris</i>	✓												✓	
<i>Onychognathus albirostris</i>													✓	
<i>Oriolus monacha</i>	✓	✓		✓									✓	
<i>Corvus crassirostris</i>													✓	
Number of species recorded:	18	9	2	4	17	9	2	6	4	23				
5. Record from Melezanej, 25 km south of the site.														
6. Record from Segheneyti, c.40 km south-east of the site.														
7. Record from Lake Delia, c.30 km north-west of the site.														
A08 – Somali–Masai biome (14 species in Eritrea; six sites meet the A3 criterion)														
IBA code:	001	002	003	004	005	006	007	008	009	010	011	012	013	014
<i>Francolinus leucoscepus</i>									✓					✓
<i>Caprimulgus fraenatus</i>							✓							
<i>Phoeniculus somaliensis</i>	✓		✓							✓	✓	✓		
<i>Tockus flavirostris</i>					✓	✓			✓					✓
<i>Tockus hemprichii</i>			✓	✓			✓	✓			✓	✓		
<i>Tricholaema melanocephala</i>	✓				✓	✓			✓	✓				
<i>Rhodophoneus cruentus</i>	(✓ ⁸)				✓				✓					✓
<i>Cercomela scotocerca</i>												✓		
<i>Turdoides leucopygius</i>	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓
<i>Cisticola bodessa</i>			✓					✓						
<i>Nectarinia habessinica</i>	✓		✓		✓	✓			✓	✓				✓
<i>Zosterops abyssinicus</i>	✓		✓			✓	✓		✓	✓				
<i>Ploceus galbula</i>	✓	✓		✓	✓	✓	✓		✓	✓				
<i>Onychognathus blythii</i>			✓	✓		✓	✓	✓			✓	✓	✓	✓
Number of species recorded:	6	1	7	3	6	7	6	4	8	6	4	4	2	6
8. Record from Karkabat, c.60 km north of the site.														

occur in the country, as do seven of the 16 species of the Sahel biome (A03), eight of the 54 species of the Sudan–Guinea Savanna biome (A04), 31 of the 226 species of the Afrotropical Highlands (A07) and 14 of the 129 species of the Somali–Masai biome (A08), reflecting the diversity of climates and habitats in the country. Thirteen species are regarded as ‘regional endemics’, shared only with Ethiopia, and all of these are upland species of the Afrotropical Highlands biome. All were recorded in the past from the Senafe area of the southern Central Plateau, but only a few have recent reliable records. They are *Bostrychia carunculata*, *Rougetius rougetii*, *Columba albitorques*, *Agapornis taranta*, *Lybius undatus*, *Dendropicus abyssinicus*, *Myrmecocichla melaena*, *Thamnolaea semirufa*, *Dioptrornis chocolatinus*, *Parus leuconotus*, *Onychognathus albirostris*, *Oriolus monacha* and *Corvus crassirostris*.

Of particular significance are the large congregations of breeding and wintering seabirds on the Dehalak Archipelago, other offshore islands and along the coast and sea channels in between. These famous seabird colonies were first recorded by Heuglin in the nineteenth century (Smith 1957). There are large populations of breeding gulls, including *Larus leucophthalmus* (VU) and *L. hemprichii* and breeding *Phaethon aethereus* and *Sula leucogaster*. There are also significant numbers of wintering and breeding waders, including breeding colonies of *Dromas ardeola*. The islands are also a stronghold for breeding *Pandion haliaetus*. Various (mainly artificial) wetlands on the Central Plateau around Asmara provide habitat for wintering waterfowl, including *Aythya nyroca* (VU), *A. fuligula*, *Anas acuta* and *A. crecca* (Smith 1951b). *Phoenicopterus ruber* occurs along the coast in winter and there is also a record of possible breeding at Lake Mandalum on the extreme north coast in 1949 (Smith 1951b), but this has not been re-confirmed.

Eritrea is also very important, because of its geography and habitats, as a migration route and stop-over location for many other species of Palearctic migrants (notably warblers and raptors as well as waterbirds). Breeding *Falco concolor* on the Dehalak Archipelago

are said to feed almost entirely on Palearctic migrant passerines (Clapham 1964). There are almost no counts for any species, but many references to the movement of migrants along the eastern escarpment slopes of the Central Plateau and along the coast, offshore islands and the sea channel between, e.g. for *Hirundo rustica*, ‘passage in huge numbers... seen flying north out of sight of land and over Dahlak [= Dehalak] Island.’; for *Riparia riparia*, ‘abundant on passage’; and for *Motacilla flava*, ‘very large numbers’ (Smith 1957, 1960). There are also frequent references in the literature to large congregations of migrants stopping-over, for example on the forested slopes around Ghinda (see site ER006) which are said to be ‘outstanding’ for Palearctic migrants, including *Anthus cervinus*, *Monticola saxatilis*, *Acrocephalus arundinaceus* and *Emberiza hortulana* (Murdoch 1998) and for *Phoenicurus phoenicurus* (Smith 1951b).

The lower foothills of the eastern escarpment slopes and the plateau itself also appear to be an important migration route for raptors and storks (probably influenced in some years by the movement of locust swarms), including *Aquila pomarina* *clanga*, *Milvus migrans* (‘thousands, layer upon layer’), *Ciconia ciconia*, *C. nigra* (Smith 1951b, 1960) and *Falco naumanni* (Zinner in press). Due to their location the islands, in addition to providing a north–south link between Africa and Europe, may also provide a stepping-stone between Africa and Asia, via the Arabian peninsula (Hillman pers. comm.).

CONSERVATION INFRASTRUCTURE AND PROTECTED-AREA SYSTEM

Eritrea is in the process of developing an entirely new conservation infrastructure and system of protected areas, independent of the remnants of those previously inherited from Ethiopia. However, ongoing conflict in the region means that progress is very slow and

other activities take precedence over conservation. There is some support from the international community to processes including development of a National Environmental Management Plan (NEMP-E) and a National Biodiversity Strategy and Action Plan (Duthie pers. comm., FAO 1997).

Responsibility for wildlife conservation rests with the Ministry of Agriculture (within which the Forestry and Wildlife Division deals with the management of forestry and wildlife), the Ministry of Fisheries and the Ministry of Land, Water and Environment (MLWE). The MLWE was established in 1997 and contains several departments involved in conservation, including the Department of Environment (initially involved with policy, but which may have an implementing role in the future) and the Department of Land (previously the Eritrean Land Commission). The government of Eritrea no longer recognizes the formerly designated protected areas established under the Italian colonial administration (the game reserves of Gash–Setit, Yob and Nacfa). The NEMP-E was produced in 1995, following wide consultation. It outlines threats to the fauna and flora and a strategy for the conservation of biodiversity, which includes the creation of a protected-area system, formulation of conservation legislation, and the requirements for education, awareness, training and local participation. A National Biodiversity Strategy and Action Plan (NBSAP) was produced in 2000 and the Department of the Environment has the coordinating role for biodiversity-related activities in Eritrea. The goal of the NBSAP is: ‘the overall biodiversity of Eritrea restored, conserved and managed so that it provides environmental services and natural resources that contribute to sustainable and socially-fair national economic development’. Policy and legislative frameworks are still being developed and this is seen as an opportunity for Eritrea to integrate biodiversity conservation and sustainable development fully with economic development of the independent state (DOE 2000).

It is unclear which government ministry or agency will take the lead in the future designation of protected areas. There are proposals for new National Parks (additional to the Dehalak Archipelago Marine National Park) in at least four areas: Semenawi Bahri, Buri peninsula/Danakil, Gash–Setit in the Western Plain and Yob in the north-west (this last site for Nubian ibex, *Capra ibex nubiana*). It is also anticipated that future nationwide surveys will identify other areas for new conservation initiatives (FAO 1997). The National Biodiversity Stocktaking Report (DOE 1999) also lists riverine habitat along the Gash and Barka rivers as a national priority for the establishment of protected areas and says that in total 27 locations have been identified as potential protected areas under one of three categories (DOE 1999): Strict Nature Reserves, to be managed for strict protection of natural areas and for scientific research; National Parks, to be managed for ecosystem conservation and tourism; and Biodiversity Conservation Areas, to provide for the conservation of biodiversity by ensuring that the human use of natural resources, including water, timber, wildlife (including fish), pasture or marine products is carried out in a sustainable manner.

The system of smaller ‘forest closures’, instituted in 1989, appears to be producing successful results in some areas, with wildlife populations, including *Panthera pardus*, *Tragelaphus strepsiceros*, *T. scriptus*, *Papio hamadryas* and *Oreotragus oreotragus* returning to areas from which they had previously disappeared (FAO 1997). Under this system, which is under the control of local village councils or ‘baitos’, degraded areas of wooded hillsides and juniper forest are closed to access for tree-cutting, grazing or agriculture for up to 10 years to allow natural regeneration and some tree-planting to take place. In total about 1,000 km² have been closed in Semenawi and Debubawi Bahri regions (Butynski 1995). The total area of permanent enclosures throughout the country in 1998 was 110,338 ha, with a further 14,504 ha under temporary closure and 82,460 ha earmarked for potential closure (DOE 1999).

The Marine Environment Protection Conference (MEPC) held in Massawa in 1994 endorsed the concept of Integrated Coastal Zone Management (ICZM) for Eritrea, incorporating pollution control, habitat and biodiversity protection (including the need for comprehensive surveys and for environmental impact statements relating to any proposed developments). A draft ‘ICZM Proclamation’ was produced, which now requires the drafting of suitable legislation to underpin it. There is an ongoing GEF-funded

‘Conservation of Eritrea’s Coastal, Marine and Island (CMI) Biodiversity Project’, implemented by the Ministry of Fisheries.

The country is still undergoing a major programme of government restructuring and decentralization into regional ‘zones’ known as ‘Zobas’, each of which will have its own assembly and government. Conservation and wildlife legislation will have to be drafted from scratch (currently only draft ‘proclamations’ exist) and there is a huge requirement for appropriate training and capacity building. The shortage of staff is said to be ‘the most critical constraint to the development of the wildlife sector in Eritrea’ (FAO 1997).

INTERNATIONAL MEASURES RELEVANT TO THE CONSERVATION OF SITES

Eritrea has ratified the Convention on Biological Diversity, CITES, the Convention on Climate Change and the Convention to Combat Desertification.

OVERVIEW OF THE INVENTORY

A total of 14 Important Bird Areas (IBAs) have been identified for Eritrea (Map 1, Table 1). For 10 of these, it has not been possible to provide an estimate of area because data are insufficient to be able to define site boundaries. Instead, general areas of particular habitat and altitude have been selected and described and further ornithological and other survey work will be required to define boundaries within these areas. The remaining four sites cover c.4,690 km², equivalent to 3.7% of the land-surface area of the country. At present there are no formally protected areas within Eritrea as the legislation and potential sites for protection are all currently under review.

Three sites qualify under the A3 criterion for the Sahara–Sindian biome, between them holding all nine of the biome-restricted species known from Eritrea (Table 2). Similarly, four sites qualify for the Sahel biome, holding all seven confirmed species, three do so for the Sudan–Guinea Savanna biome (holding all eight species), six for the Afrotropical Highlands biome (all 31 species), and six for the Somali–Masai biome, holding all 14 species in the country (Tables 1 and 3).

The IBAs cover most of the important habitat-types and are distributed quite widely across the country. The majority of sites (eight) are on the upland Central Plateau (between 900–2,500 m). This reflects the importance of the upland habitats (including small temporary wetlands and reservoirs), but almost certainly reflects observer effort as well. The majority of the larger towns and villages are on the Central Plateau and the roads between provide much better access for either formal or casual survey and observation than is available in other areas such as the lowlands in the west and north of the country. A further four sites are coastal or island areas (where there are also concentrations of human habitation), including coastal wetlands, and two are on the Western Plain (both associated with river valleys and seasonal wetlands). The IBAs listed therefore are probably not the best examples of each habitat-type and future survey work may well identify more suitable sites further away from human habitation and roads.

In general, bird records for the country are very poor and large areas remain completely unsurveyed. Many other areas only have records from the 1940s and 1950s and have not been visited since then by ornithologists. There are also problems of interpretation of some older records, which do not distinguish Ethiopian from Eritrean records. Much of the information on birds and habitats included in the site-accounts is taken from older references (those of Smith and Hemming in particular). In some cases, because this is the only information available, it has been extrapolated rather widely and this may lead to inaccuracies in the site-accounts. For the vegetation and habitat information, it has been assumed that descriptions in the general area and at the correct altitude will be valid for the proposed IBA, but it is important to note that all habitats have been degraded since the surveys by Smith and Hemmings and some may now be in very much poorer condition than the site-accounts suggest. The effects of the years of conflict on habitats and species (especially in the southern border areas with Ethiopia) are unknown.

For species' status, Smith's records have also been interpreted quite broadly. For example, where he lists a species as 'widespread and common throughout the Western Plain', it has been included in the records for both Western Plain sites (see sites ER001 and ER010) and similarly, all records which suggest that a species occurs in a particular habitat at a certain altitude on the plateau and its slopes have been included in each relevant IBA list. Due to the absence of other data, it was necessary to do this in order to be able to identify any biome-restricted IBAs in Eritrea. In the few cases where proposed IBAs have been visited more recently, the more recent records confirm the majority of records extrapolated in this way from Smith, suggesting that this approach is valid. However, it means that future work on IBAs in Eritrea will need to start new biome-restricted species lists for sites and not assume that all records used in the tables in this account are absolute occurrence records for each site.

A few areas of the country are particularly poorly known and it is certain that new IBAs will be identified (particularly sites for biome-restricted species under the A3 criterion). These sites include the northern coastal area towards the border with Sudan and the dry, stony north-western plains through which the Barka and Anseba rivers flow north towards Sudan. The Eritrean Ministry of Agriculture also suggests several sites of potential importance for birds which require further investigation, these include an artificial wetland near Gurgusum beach, Massawa (see site ER005); the *Acacia nilotica* forest in the Gash river near Ali Ghider (see site ER010); Kerkeb in Zoba Anseba; a site near Shambuko on the Mareb river; and two sites of importance for *Ardeotis arabs*: Wongobo, 20 km south of Irafayle, and the plain south of the island of Harene (Bein 2001).

The list of IBAs in this account does not include a site for the globally threatened *Vanellus gregarius*, and there are a number of species of the Afrotropical Highlands biome that are said to occur in Eritrea, but which have not been recorded from any of the sites listed. No sites qualify for significant congregations of birds under the A4ii or A4iii criteria, but the 'Dehalak Archipelago and offshore islands' IBA (site ER002) is almost certain to qualify under both of these categories if more comprehensive surveys of the whole area are undertaken. This site is also likely to be subdivided into a larger number of more discrete IBAs with better survey information.

No migration bottleneck site (qualifying under the A4iv criterion) has been identified for Eritrea but, again, with better information it is anticipated that one or several sites will be identified. Likely candidates are sites on the eastern escarpment slopes and foothills of the Central Plateau (e.g. Semanawi Bahri [ER003] and Ghinda [ER006]), the islands (especially Dehalak Archipelago) and the sea channels between the various island groups and the mainland. There are several records from these areas indicating that there are large movements and concentrations of migrants, especially raptors such as *Milvus migrans* (numbers in thousands), *Aquila nipalensis* and *Falco naumanni*, together with other congregatory species such as *Merops apiaster* and *Hirundo rustica*. Further work is required to determine the importance of these migration routes, the numbers of different species and individuals using them and the best location for any IBAs to help protect the relevant species.

COMMENTS ON THE INVENTORY

- Place names used in the inventory are taken from various literature sources and maps (Microsoft Encarta 1999; International Travel Map 731: Eritrea) and corrected following comments on the draft from individuals with knowledge of the sites. Tigrinya names on maps are highly variable (for example Archico, Hirghigo, Hargigo are all the same place). It is likely that some readers will disagree with some spellings used, but the place names should all be recognizable and distinguishable. Geographical coordinates are taken in the main from Microsoft Encarta (1999), checked and modified where possible against the few coordinates given in the literature or by reference to field reports (e.g. Zinner).
- The difficulties of defining boundaries for most sites, due to the lack of data, are discussed under 'Overview of the inventory'. The Dehalak Archipelago and offshore islands (site ER002) is

a particular case. The area proposed here as an IBA is very large, covering several separate offshore island groups and the sea channel between them and the mainland. It is almost certain, with better survey data, that this area will be divisible into a number of smaller, discrete IBAs. There are also plans for a marine National Park including the islands of the Dehalak Archipelago (or several discrete protected areas in the different island groups), but estimates of the likely size of this vary. Once plans for these protected areas are clearer it will be possible to define a more precise area and boundaries for the IBA(s).

- Three sites on the eastern escarpment, Ghinda (ER006), Asmara escarpment (ER007) and Arboroba escarpment (ER008) are geographically quite close and have similar, linked habitat (probably part of a continuum with Semenawi Bahri [ER003], the so-called Eritrean 'Green Belt'). They have been divided into four separate accounts because bird records existed for them as separate sites, but better survey information may well suggest different divisions and locations for individual IBAs. It is likely that at least parts of all four areas will be included in the proposed National Park for the Semenawi Bahri (Zinner pers. comm.).
- Mount Ramlu in the Danakil region was considered as an IBA for the records of two regional endemics (*Columba albitorques* and *Corvus crassirostris*), otherwise known only from one other site (Senafe, site ER013) on the Central Plateau. However, the records of these species on Mount Ramlu are historical, with no recent confirmation and there is no other bird information. Mount Ramlu remains a priority for future survey as a potential IBA.
- Information on species other than birds is taken from Butynski (1995), DOE (1999), FAO (1997), Smith (1953), Yalden *et al.* (1996) and Zinner *et al.* (1999), supplemented by comments (pers. comm.) from T. Butynski, C. Hillman, D. Duthie and D. Zinner.

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GLOSSARY

diapir uplifted salt deposits and dead corals.
DOE Department of the Environment.
EAE Eritrean Agency for the Environment.
FAO Food and Agriculture Organization.
GEF Global Environment Facility.
ICZM Integrated coastal zone management.
MLWE Ministry of Land, Water and Environment.
MOF Ministry of Fisheries.
NBSAP National Biodiversity Strategy and Action Plan.
NEMP-E National Environmental Management Plan.
wadi seasonal (often dry) riverbed.
Zoba administrative region.

SITE ACCOUNTS

Western Plain: Barka river

Admin region Gash Barka, Anseba

Coordinates 15°45'N 37°27'E

Area Not defined Altitude 300–600 m

ER001

A3 (A03, A04)

Unprotected

Site description

The site lies some 20 km north-east of Keru, in the valley of the Barka river which flows west and north out of the Central Plateau. It is not possible using existing information to locate an exact site, but the combination of records from 'North-east of Keru' and the 'Barka river valley', at the correct altitude and in the kinds of habitats described for this region by Smith, indicate that a site within this area will qualify as an IBA. The whole river valley area, especially north towards the Sudan border, is drier than more southerly parts of the Western Plain, with stony steppes and *Acacia* sp. thorn-bush. The Barka river flows north and is joined just before the border with Sudan by the Anseba. The sandy valley of the Barka drops to less than 300 m, forming the lowest part of the Western Plain. The area is semi-desert apart from the riparian woodland along the rivers which can be several hundred metres wide and includes taxa such as *Hyphaene*, *Tamarindus*, *Tamarix*, *Adansonia*, *Ficus*, *Acacia*, *Zizyphus*, *Salvadora*, *Leptadenia*, *Calotropis* and occasionally, *Kigelia* spp. During the summer rains there are also belts of cultivation along the rivers and extensive rank grass and scrub.

Birds

See Box and Table 2 for key species. For both this site and the other 'Western Plain' site (Gash-Setit, ER010), many of the records are inferred (i.e. the species are reported generally from 'the Western Plain' or 'the Barka river valley' in habitats and at altitudes known to occur within the site) rather than any more specific mention of a particular location. This site, together with Western Plain: Gash-Setit (ER010) are the only two known sites in the country for the Sahel biome species *Anthoscopus punctifrons* and the Sudan-Guinea Savanna biome species *Turdoides leucocephalus*. There are also records of a single Sahara-Sindian (A02) species and seven Somali-Masai (A08) species, including *Rhodophoneus cruentus* recorded specifically from the Barka river valley (although at Karkabat, to the north of the area of the proposed IBA); see Table 2.

Key species

A3 (A03) Sahel biome: Six of the eight species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

A3 (A04) Sudan-Guinea Savanna biome: Six of the eight species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

Other threatened/endemic wildlife

The mammal *Gazella dorcas* (VU) were observed (10–60 km east of Keru) and 'hartebeest' reported (c.15 km north of Keru) during a brief visit by Butynski in 1995, between Halcota, Keru and Agordat.

Conservation issues

Although there are quite high human and livestock densities in the area, according to Butynski, the area between Halcota and Keru did not look too degraded during a brief visit in 1995. There are proposals for riverine forest near Kerkeb to be protected as a Biodiversity Conservation Area.

Further reading

Butynski (1995), Smith (1951b, 1957).

Dehalak Archipelago and offshore islands

Admin region Northern Red Sea Zone, Southern Red Sea Zone

Coordinates 15°40'N 40°03'E

Area Not defined (>300,000 ha) Altitude 0–200 m

ER002

A1, A3 (A02), A4i

Unprotected

Site description

The Dehalak Archipelago consists of a group of about 220 islands, ranging from minute to very large, lying in the Red Sea east of

Massawa, from about 20 km to more than 100 km offshore. The islands vary from sandbars to complex ecosystems comparable to those on the nearby mainland, with complexity increasing with size and proximity to the shore. Most of the islands are composed of salt diapir, which consists of salt deposits 3 km deep, formed when the Red Sea almost totally dried out many aeons ago. These are now expanding as they get wet, and rising upwards; where they reach the photic zone (50 m below the sea surface) corals start to develop. As the deposits continue to rise into shallower waters, the corals die off and islands are formed as the deposits rise into the air or are forced up by periodic tectonic movements. The largest island, Dehalak Kebir, covers 64,500 ha and is the most complex ecologically, with three different levels of uplifted corals. Other islands are composed of Pleistocene limestones and marine sand deposits.

To the south there are other smaller groups of islands that are also included within the proposed IBA, although there are few specific bird records from these other groups. These are the continental islands just offshore and south of the Buri peninsula in Mersa Fatmah Bay, and a few offshore at Asseb, one of which, Senahor, is volcanic in origin. The areas of sea between the islands within these groups and between the main groups and the mainland (particularly the Massawa channel between the Dehalak Archipelago and Massawa) should probably also be included, although there are few specific bird records from these inter-island areas. Records from the immediate offshore islands, including Batsii (Massawa), Taulud and Sheik Said (Green) Islands are included in the Massawa Coast account (see ER005). More survey work will be required to determine the boundaries of one or more IBAs covering the areas of most importance to bird populations using the various groups of islands and the surrounding seas.

The majority of the islands consist of bare sand, some with exposed uplifted coral and very sparse scrub and grassland vegetation similar to that on the adjacent mainland (e.g. *Acacia*, *Panicum*, *Sargassum* and *Euphorbia* spp., with *Suaeda*, *Statice*, *Atriplex* and *Zygophyllum* spp. on low areas of saline sand). Some of the islands have areas of rocky cliffs, some have sand, pebble or mudflats and there are also large mangrove swamps (principally *Avicennia marina*, with some *Rhizophora* and *Ceriops* spp.) on some islands in the Dehalak and Asseb Bay groups. There is a tidal range of between 50–120 cm. Both day and night-time temperatures are high (40–50°C) and there is very high humidity, but only about six islands, all in the Dehalak archipelago, have surface fresh water. Almost all the 180–250 mm of rainfall falls between October and May.

Dehalak Kebir island was used as an Ethiopian military base against Eritrean rebels during the war. Apart from this, fishermen and people keeping goats inhabit a few islands. There is also some very low-key tourism (administered by the Ministries of Tourism and Fisheries) on Dehalak Kebir, based largely on the attractions of diving in the Red Sea and around the coral reefs.

Birds

See Box and Table 2 for key species. Most rocky islands with some cliff edges in the Dehalak Archipelago have several pairs of *Falco naumanni*. *Larus leucophthalmus* was said to be a 'very common colonial breeding bird', with maximum reported numbers of 1,393 adults, eight immatures and 227 young on 10 islands in 1962, and more recent observations which confirm this level of abundance (e.g. 200 adults on Harat Island in 2000) (Kahsai pers. comm.). *Emberiza cineracea* was 'seen often on the [Dehalak] islands, provided they were rocky and had some vegetation, even far offshore' in the 1990s (C. Hillman pers. comm.). *Circus macrourus* is also said to occur. The Sahara-Sindian (A02) biome species *Falco concolor* is recorded from only one other site in Eritrea and the Dehalak Archipelago is a stronghold for this species (the most recent records are from Harat Island). It breeds on several islands (more than 170 pairs have been recorded) and is said to feed almost entirely on Palearctic migrants. Three Sahel (A03) biome species are also recorded, including breeding *Ardeotis arabs* and *Streptopelia roseogrisea* (although this latter record is rejected by some authors; Hillman pers. comm.). One Sudan-Guinea Savanna (A04) biome species, *Falco alopex*, has been recorded from the Dehalak Archipelago, but was presumed to be a vagrant from the mainland. One Somali-Masai (A08) species, *Ploceus galbula*, also occurs on the Dehalak islands; see Table 2.

The Archipelago is famed for its seabird colonies: ‘the great colonies of breeding seabirds in summer’ recorded by Heuglin in the nineteenth century and commented on by Smith nearly 100 years later. The islands are also directly on the flyway for Palearctic migrant waterbirds and terrestrial species, which use them for feeding, rest and shelter in very large numbers (Hillman pers. comm.). There are very few data on numbers or movements, but it seems likely that, in addition to acting as staging-post for north–south migrations, the islands’ location, between Africa and the Arabian peninsula, makes them significant as an east–west stepping-stone between Africa and Asia. Most of the count data are from surveys in the 1960s. There is no reason to suppose that numbers should have declined since then and these counts will in most cases have been considerable underestimates of total population sizes since only a few (and generally the most accessible) islands were visited in each case. Most of the seabirds are reported as breeding in the hotter ‘summer’ months (from May to October), but other species (colonial waterbirds, raptors, passerines) have been found breeding in ‘winter’ (December to May) after or during the winter rains.

There are very large numbers of breeding and wintering gulls and terns. Both *Larus leucophthalmus* and *L. hemprichii* are recorded breeding on most of the Dehalak islands visited to date. Numbers of *L. hemprichii* probably exceed the IBA threshold for this species: in 1962, c.90 adults were counted on one island and the species was ‘common’ on other islands visited. In 2000, up to 300 adults were recorded on Harat island (Kahsai pers. comm.). *Sterna bengalensis* breeds in thousands, with ‘several thousand pulli’ reported in 1962 and a large colony of over 1,000 adults on Harat Island in 2000 (Kahsai pers. comm.). *S. repressa* is also ‘common’ breeding and *S. anaethetus* is reported almost certainly breeding in the Asseb islands as well as in the Dehalak group (a total of 950 birds recorded on the Dehalak islands in 1962). *S. bergii* was recorded breeding by Heuglin in the 1850s. *Larus ridibundus* overwinters and there are reports of ‘abundant’ *Larus fuscus* and ‘common’ *Sterna caspia* (both in March).

Other species recorded breeding on the Dehalak islands in significant numbers (which may well exceed IBA thresholds with further survey work) include *Phaethon aethereus* (breeding and ‘fairly common offshore (post-breeding)’), *Pelecanus rufescens*, *Sula leucogaster* (breeding ‘in their hundreds on several taller coral ‘islands’ (including Harat, 50 adults) in late ‘summer’”) and *Dromas ardeola* (‘flocks of 20–30 on shorelines of all islands visited’ and ‘frequent on the shores of the islands’, with two known breeding colonies on two far offshore islands: Hillman pers. comm., Kahsai pers. comm.).

A variety of other waterbirds occur, in limited numbers, where there is suitable habitat. These include *Egretta gularis*, *Ardea goliath*, *A. purpurea*, *Butorides striatus*, *Threskiornis aethiopicus* (breeding), *Platalea leucorodia* and *P. alba*. *Rynchops flavirostris* occurs, as do a variety of *Charadrius* spp., *Tringa* spp. and other waders.

The islands also support very significant numbers of breeding *Pandion haliaetus*, with an estimated potential breeding population of more than 300 pairs (Fisher pers. comm.), and possibly into the thousands (Hillman pers. comm.). Other raptors recorded include ‘abundant’ wintering *Milvus migrans* (recorded both from the Dehalak islands and from the Massawa sea channel), *Neophron percnopterus* (on Nocra and Dehalak island groups), *Circus aeruginosus*, *C. pygargus* and (breeding) *Falco peregrinus*. Migrant passerines include *Riparia riparia*, *Hirundo rustica* and *Motacilla flava*.

Key species

A1	<i>Falco naumanni</i>	<i>Emberiza cineracea</i>
	<i>Larus leucophthalmus</i>	
A3 (A02)	Sahara–Sindian biome: Four of the nine species of this biome that occur in Eritrea have been recorded at this site; see Table 2.	
A4i		Breeding (pairs)
	<i>Larus leucophthalmus</i>	c.500 (1962)
	<i>Sterna bengalensis</i>	500+ (2000)
		Non-breeding
		—
		—

Other threatened/endemic wildlife

The waters off the Eritrean coastline and around the Dehalak archipelago support several hundred (and probably thousands) of fish species, many of which breed in and around the coral reefs. Some such as anchovies, sardines and tuna were, in the past, fished commercially and these and other species also form the food-supply for breeding seabirds, ospreys, etc. Five species of sea-turtle are recorded from Eritrean waters, including breeding *Chelonia mydas*

(EN) and *Eretmochelys imbricata* (CR) in the Dehalak archipelago. Also reported from ‘the Eritrean coast’ (and hence probably within the proposed IBA), but with no information on location or numbers are *Dugong dugon* (VU) and ‘dolphins, porpoises and whales’. Smith reports small schools of *Physeter macrocephalus* roaming around the Dahlak Archipelago, ‘accompanied by vast flocks of seabirds’ and ‘disturbing the marine life’ (Smith 1953). Yalden *et al.* (1996) list *Globicephala macrorhynchus* (LR/cd), *Delphinus delphis* and *Physeter catodon* (VU) from Eritrean waters. Gazelles are reported from Dehalak Kebir and Nocra—dwarf *Gazella soemmerringii* (VU) of uncertain taxonomic status, probably hybrids of species introduced in earlier years. Reports in the literature of the presence of *Oryx beisa* on the Dehalak islands appear to have no foundation.

Conservation issues

The reefs and mangroves are of crucial importance as breeding areas for fish and crustaceans, supporting both the commercial fisheries and the conservation of biodiversity. Commercial fishing almost stopped during Eritrea’s war of liberation and most fishing is now artisanal, carried out by local fishermen from villages on both the mainland and islands. The Eritrean Ministry of Fisheries (MOF), with support from the UK government Department for International Development (DFID), is carrying out a biodiversity inventory of the Dehalak Archipelago with a view to establishing guidelines for sustainable management, marine conservation and tourism. This includes proposals for the establishment of protected areas (National Parks) on at least some of the main islands (Sciumma, Black Assarca and Dissei are all listed as possible sites, EAE 1995). The MOF is also keen to rehabilitate the country’s commercial fisheries. Black rats *Rattus rattus* were reported on at least two islands (Isratu and Entebedir) in the 1960s; these probably prey on the eggs and chicks of ground-nesting seabirds. There are also cats *Felis catus* in significant numbers on Dehalak Kebir and a few other islands with human habitation. There may be some collection of chicks and eggs by local Dehalaki fishermen and goatherds, but this was not thought to be significant, at least in the 1960s. The commercial exploitation of coral and shells, reported from the Dehalak Archipelago in the 1970s, may be cause for concern.

Further reading

Berhanu (1976), Butynski (1995), Clapham (1964), DOE (1999), FAO (1997), IUCN (1987), Smith (1951a, b, 1953, 1957), Urban and Boswall (1969).

Semenawi Bahri

Admin region Northern Red Sea Zone

Coordinates 15°40'N 38°53'E

Area c.20,000 ha Altitude 900–2,600 m

ER003

A1, A3 (A07, A08)

Unprotected

Site description

The site, also known as ‘the Eritrean Green Belt’ (or by the Italian name ‘Pendice Orientale’), lies between about 20 and 100 km north of Asmara on the coastal (eastern) escarpment of the Central Plateau. It contains the only remaining mixed evergreen tropical woodland in Eritrea. There is magnificent mountain scenery with sheer drops, rock precipices, spurs and deep valleys cutting into the mountains up to high altitudes. The whole montane area is frequently in cloud and there are profuse lichens in some areas. The highest upland areas consist of rough, stony moorland, rocky hillsides and peaks, scrubby tussock-grassland (with exotic cacti including *Opuntia vulgaris*), and *Juniperus procera* woodland. Riparian vegetation includes willows in the deep valleys. Below about 2,500 m, *Juniperus procera* woodland with shrubby undergrowth dominates. Below c.2,100–2,300 m the vegetation is *Olea africana*-dominated evergreen woodland and upland scrub (*Olea*, *Euphorbia*, *Dodonaea*, *Opuntia*, *Rosa* and occasional *Acacia* spp.), which gives way, at around 1,400 m, to *Combretum* forest, with *Terminalia* and *Anogeissus* spp. This continues down to c.300 m at the edge of the Eastern Plain. Riparian woodland along watercourses in this zone includes *Acacia*, *Ficus*, *Rhus*, *Acokanthera*, *Ricinus*, *Gymnosporia* and *Buddleia* spp., with dense mats of the herb *Flaveria australasiatica* adjacent to rivers at intermediate altitudes after rain.

Because of the huge altitudinal gradient (from 2,600 m at the top of the massif, dropping to about 400 m over a horizontal distance of less than 15 km), the site contains a great diversity of climates and habitats. For five months of the year (October to March) the upper

slopes can be covered continuously in mist and drizzle. It tends to be drier and sunnier from March to September, but the site can also receive rainfall during the ‘main rains’ sweeping down from the plateau between mid-June and mid-September. There are areas of poor agricultural land among the moorland, scrub and juniper, with rocky pastureland and terraced fields where wheat, barley and taff (*Eragrostis tef*) are cultivated during the wetter months (about 10% of the land appeared cultivated in one area at about 2,100 m; Butynski 1995). There are scattered *Eucalyptus* plantations and, at lower levels (in the *Olea africana*-dominated woodland), some cultivation of maize, potatoes, tomatoes, peppers, citrus fruits and coffee. There is also some (probably seasonal) grazing of livestock, particularly at higher levels on the plateau and during the wetter months.

■ Birds

See Box and Table 2 for key species. The site qualifies as an IBA partly due to the presence of significant numbers of *Falco naumanni*. Although he did not visit Semenawi Bahri specifically, Smith reports this species, in the 1950s, as ‘abundant at all altitudes on open grassland and scrub’ and also *Circus macrourus* as ‘a regular wintering species on the plateau over the moors’ (together with *F. tinnunculus*). More recently (1995) ‘impressive numbers’ of *F. naumanni* were recorded near an agricultural scheme by Tom Butynski, walking west from Allet (i.e. close to the proposed area of this IBA), although no information on actual numbers is available. It also seems likely that *Rougetius rougetii* will be found to occur here, as this species was said by Smith to ‘characterize small upland streams with adjacent willows, rank grass and marshy vegetation, 6,000 feet [1,800 m] and over’.

This is the only IBA in Eritrea from which the Afrotropical Highland (A07) species *Caprimulgus poliocephalus* is recorded and it appears particularly important for *Francolinus erckelii*, with ‘hundreds’ of calling birds recorded over several days throughout the site between 900–2,500 m in 1995. It is one of only two IBAs in the country from which the Somali–Masai (A08) species *Cisticola bodessa* is recorded. A number of the Afrotropical Highland species are included in Table 2 on the basis that they appear very likely to occur from comments in the literature by Smith which do not mention the location by name, but indicate that the species occurs in habitats and at altitudes on the eastern escarpment which correspond with those occurring within the site. Given the almost complete lack of survey work at the site it seems certain that additional species of both biomes will be added to these lists very readily through future surveys. There are also records of three Sahel (A03) biome species; see Table 2.

The site is also clearly important for raptors, including migrants, and is one of a number of sites along the eastern escarpment of the highland plateau which need further investigation as possible migration bottleneck sites (see ‘Overview of the inventory’). It is also important for other Palearctic migrants (e.g. *Phoenicurus phoenicurus*), particularly as it is one of the last wooded areas where forest migrants can rest and feed before continuing north to Europe or Asia. As such it is likely to be an important wintering and/or staging area for *Coturnix coturnix*, *Phylloscopus collybita* and others, particularly warblers. The complete absence of some expected African bird families and insect groups was noticed with some surprise by Butynski (during March, in wet conditions). However, this may well reflect the large climatic changes in the site at different times of year and underlines the need for more survey work at different altitudes and in different seasons.

Key species

- A1 *Falco naumanni*
 A3 (A07) Afrotropical Highlands biome: 18 of the 31 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.
 A3 (A08) Somali–Masai biome: Seven of the 14 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

■ Other threatened/endemic wildlife

The Semenawi Bahri is said to contain populations of *Tragelaphus strepsiceros* (LR/cd), *T. scripta* (LR/nt), *Oreotragus oreotragus* (LR/cd) and a species of *Cephalophus* duiker. Particularly high densities of baboons *Papio hamadryas* (LR/nt) were found in this area (and at sites ER006, ER007 and ER008) in 1997/98 (Zinner *et al.* 1999). Due to the diversity of altitudes, climates and habitats, it is probably one of the areas of highest species diversity in Eritrea and is known to contain species with small range distributions in Eritrea and some at the northern limit of their distributional range.

■ Conservation issues

The site currently has no formal protected-area status, but it is proposed as one of a suite of possible new protected areas (National Parks) in the National Environmental Management Plan for Eritrea (EAE 1995, DOE 1999). This Park may extend to include other parts of the escarpment slopes with similar, linked habitat (e.g. ER006, ER007 and ER008). The site is only a one-hour drive from Asmara and has considerable potential for specialized (birdwatching) tourism, particularly at times of year (probably September–October and March–April) when there are likely to be large numbers of migrants using or passing over the site. Some areas of forest within the site are quite degraded from decades of cultivation and grazing, particularly at higher altitudes (especially above 1,500 m). There are also impacts from the years of war with bunkers, placements, graves and piles of spent cartridges in places. At higher altitudes there are quite extensive areas of exotic non-native vegetation (*Opuntia vulgaris* and *Eucalyptus* plantations). In the late 1980s, a system of ‘closures’ of wooded hillsides and juniper forest was introduced, operated by local village councils (‘baitos’) in partnership with government. Such areas are closed to access for tree-cutting, grazing or agriculture for a number of years to allow forest regeneration (including some tree-planting) and to stabilize slopes. After 5–10 years, these areas are reopened and new closures established in other areas. In total about 100,000 ha have been closed in Semenawi and Debubawi Bahri regions. It is believed that populations of *Panthera pardus*, *Tragelaphus strepsiceros*, *T. scriptus*, *Papio hamadryas* and *Oreotragus oreotragus* are increasing as a result of this system of forest closures.

■ Further reading

Butynski (1995), DOE (1999), EAE (1995), FAO (1997), Murdoch (1998), Smith (1951b, 1957).

Central Plateau: Keren

Admin region Anseba

Coordinates 15°39'N 38°36'E

Area Not defined Altitude c.1,200–1,800 m

ER004

A3 (A03, A07)

Unprotected

■ Site description

The site lies on the Central Plateau, about 80 km north-west of Asmara. The bird data are not good enough to define the boundaries of a site, but combined records from the general area of Keren and the upper Anseba river valley above 1,200 m show that a site within this area will merit definition as an IBA. The coordinates used are those for the railway town of Elaborad Station. Most of the bird records are from around Keren or Elaborad and are therefore probably within an altitudinal range of 1,200 m or 1,500 m to 1,800 m. However, the ground away from the towns and main roads rises steeply and, depending on how the IBA boundary is drawn, it could include areas of land over 2,100 m (and even higher peaks, e.g. 2,360 m in the vicinity of Elaborad Station). The area is rugged upland, with high cliffs and deep river valleys. East of Keren is an almost sheer mountain wall, north of which lies the Anseba valley which separates eastern and western parts of the plateau. The slopes below Keren are boulder-strewn and scrub-covered, contrasting with the forested slopes of the eastern escarpment at the same altitude. The land falls irregularly to the west, with very deep river valleys, to about 900 m, after which it flattens out into the Western Plain. The upper slopes are rocky and barren, with montane scrub and sparse grassland extending down to about 1,500 m.

■ Birds

See Box and Table 2 for key species. The site is one of only two IBAs in Eritrea with definite records of *Emberiza cineracea*, although there are no details of numbers and no records more recent than those of Smith who recorded it as very scarce in winter at Keren in the 1950s. Smith also recorded *Circus macrourus* as regularly wintering over the moors of the Central Plateau, together with *Falco tinnunculus*. The site is one of only two IBAs in the country with records of the Sahel biome species *Spiloptila clamans* and of the Afrotropical Highland biome species *Apus niansae*. There are also records from the site for three Somali–Masai (A08) biome species. In addition, there are records (from another location on the Central Plateau (Melezanei), at similar altitude, but further south towards Asmara) of the Sudan–Guinea (A04) biome species *Falco alopex* and of the Afrotropical Highland species *Agapornis taranta* (see Table 2).

Key species

A3 (A03) Sahel biome: Four of the eight species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

A3 (A07) Afrotropical Highlands biome: Nine of the 31 species of this biome that occur in Eritrea have been recorded at this site (with a 10th at the same altitude nearby on the Central Plateau); see Table 2.

Other threatened/endemic wildlife

Smith reports a game reserve containing large numbers of *Tragelaphus strepsiceros* (LR/cd) in the large valley of the Anseba, north of Keren, but no more recent information is available.

Conservation issues

No information.

Further reading

Smith (1951b, 1957).

Massawa coast

Admin region Northern Red Sea Zone

Coordinates 15°31'N 39°27'E

A1, A3 (A02, A03), A4i

Area Not defined Altitude 0–150 m (probably 0–20 m) Unprotected

ER005
Site description

The site consists of the coastal plain around and to the south of Massawa. The combination of records from Massawa itself, from Dogoli, just inland and from Herghigo, 10 km to the south of Massawa town, indicate that the area merits IBA status on several counts, but further work will be required to define the boundary of one or more IBAs. Records from the immediate offshore islands, including Batsii (Massawa), Taulud and Sheik Said (Green) Islands are also included in this site account.

The coastline itself is arid and sandy with occasional small rock promontories and extensive white dunes composed of tiny coral fragments. *Acacia* sp. thorn-bush spreads on to the dunes in many parts and behind the dunes there are belts of woodland and thorn scrub (e.g. *A. spirocarpa* and *A. mellifera*, with *Balanites aegyptiaca*, *Capparis decidua* and *Cadaba* sp.), and grassland with *Suaeda* sp., *Zygophyllum simplex* and *Dipterygium glaucum*. There are belts of the succulent *Suaeda* on marshy areas sometimes inundated by high tides, immediately behind the dunes. Underlying the dunes are ancient raised coral reefs which form a low, 1.5 m cliff along the beach in some places, especially north of Massawa and may also appear as an underwater shelf. There are also live offshore coral reefs in some places, partly blocking small bays, which leads to an accumulation of saline mud covered in mangroves (dominated by *Avicennia marina*). Numerous wadis run down from the Eastern plain to form small, tidal inlets. No permanent running fresh water reaches the coast and the wadis are usually dry for most or all of the year. During the 'winter' rains, some of the coastal areas can become marshy and seasonal vegetation (sedges and *Statice* sp.) grow on the dunes. The port of Massawa is constructed partly on the mainland and partly on the two islands of Taulud and Batsii, which are connected to the mainland by causeways. Very large areas of mud- (and sand) flats are exposed on shore and near these two islands at low tide, attracting large congregations of waders. There are palm-groves (*Hyphaene* sp.), together with *Acacia* and *Zizyphus* sp. and cultivated shrubs in some gardens on Batsii and on Taulud Islands. Green Island has extensive mangroves and some scrub. The numerous islands of the Dehalak Archipelago (part of ER002) lie offshore.

Birds

See Box and Table 2 for key species. *Larus leucophthalmus* was said by Smith (in the 1950s) to be 'the commonest wintering gull along the coast, with flocks of hundreds at Archico [= Herghigo], along sandy beaches'. More recent records (e.g. 100 seen at Massawa in 1969) suggest that this species is still likely to be regularly occurring in numbers in the hundreds. This is the only site in Eritrea from which there are recent records of *Geronticus eremita*. Smith and other authors report the species as a winter visitor along the coast and near Massawa; numbers in the early 1950s were said to be 'consistent with the size of the Turkish colony' (600 to 800 pairs) at that time. The most recent record is of five adults observed feeding near the cemetery at Herghigo

(15°31'N 39°26'E) on one day in February 1997 (they had gone the next day) (Dewhurst pers. comm.). *Phoenicopterus minor* occurs in small numbers (10s of birds) and irregularly (perhaps one year in three) at Massawa and along the coast, when there has been heavy winter rain, and areas just inland become flooded, forming shallow pans of brackish water for them to feed in (Hillman pers. comm.). Smith records *Circus macrourus* as 'common' on the Eastern Plain, near Massawa, along with 'kestrels'.

In addition to the six Sahara–Sindian (A02) biome species recorded within the site, *Hirundo obsoleta* is known from a location further north along the coast (recorded as vagrant or a scarce resident at Wadi Lebka, which reaches the coast c.70 km north of Massawa—the only Eritrean location record for this species) and might be expected to occur. This is the only IBA in the country with records for the Sahel biome species, *Passer luteus* and it also has records of two Afrotropical Highlands biome species and six Somali–Masai biome species; see Table 2.

The site is also important for a variety of seabirds and waders, the latter especially on the large areas of mud- and sandflat exposed in and around Massawa harbour at low tide. In addition to the large numbers of *Larus leucophthalmus*, *L. hemprichii* is recorded 'in large numbers in ports like Massawa and Jeddah' and 'about 100 observed in the port'. *Sterna anaethetus* has been observed frequently in large numbers, including a flock of c.2,000 feeding on a fish shoal off Massawa. Occasional *Anous stolidus* are also reported feeding on shoals of fish offshore at Massawa. *Phoenicopterus ruber* appears regularly along the coast and islands in winter where there is a reasonably shallow shore and *Milvus migrans* is very common in the site, including a roost of several hundred birds on Green Island. *M. migrans* also breeds here and nesting waterbirds, also on Green Island, include *Pelecanus rufescens* and *Threskiornis aethiopicus*. Around 100 species of birds have been recorded from an artificial wetland created by the Ministry of Fisheries at Gurgusum beach in Massawa, but there are no details of species or numbers (Bein 2001).

Key species

A1 *Larus leucophthalmus*

A3 (A02) Sahara–Sindian biome: Six of the nine species of this biome that occur in Eritrea have been recorded at this site (with a seventh at a location 70 km north at the same altitude and in similar habitat); see Table 2.

A3 (A03) Sahel biome: Four of the eight species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

A4i	Breeding (pairs)	Non-breeding
<i>Larus leucophthalmus</i>	—	'hundreds'

Other threatened/endemic wildlife

The waters and coral reefs off the Eritrean coastline support several hundred fish species, many of which breed and several of which were previously fished commercially, e.g. anchovies, sardines and tuna. Commercial fishing almost stopped during Eritrea's war of liberation and most fishing is now artisanal, carried out by local fishermen from villages on both the mainland and islands. Five species of sea-turtle are recorded from the waters off Eritrea, including *Chelonia midas* (EN) and *Eretmochelys imbricata* (CR) (which breed in this site, on Green Island, and in the Dehalak Archipelago, part of ER002). *Dugong dugon* (VU) is found in significant numbers along the coast in suitable habitat—seagrass beds in shallow water. Also reported from 'the Eritrean coast' (and hence probably occurring within the proposed IBA), but with no information on location or numbers are 'dolphins, porpoises and whales' (FAO 1997). Baboons *Papio hamadryas* (LR/nt) are said to be common along the road between Massawa and Asmara.

Conservation issues

The importance of the whole Eritrean coastline was recognized by the Ministry of Marine Resources (MMR)—now the Ministry of Fisheries (MOF). Certain habitats, such as mangrove forest, are seen as particular priorities for conservation because they stabilize the shore against erosion and provide shelter for breeding fish and crustacea—the basis for commercial fisheries and food-supply for other forms of biodiversity. *Corvus splendens* are spreading rapidly within the site, as far as Herghigo, attracted by spreading rubbish. These are seen as a potential threat to other breeding birds, e.g. on Green Island.

Further reading

Butynski (1995), Clapham (1964), FAO (1997), Smith (1951b, 1953, 1960), Urban and Boswall (1969).

Ghinda

Admin region Northern Red Sea Zone

Coordinates 15°27'N 39°05'E

Area c.78,000 ha Altitude 900–1,200 m

ER006

A3 (A08)

Unprotected

Site description

The site lies on the slopes of the Eastern Escarpment running down from the Central Plateau eastwards to the Red Sea. Only a general area of habitat can be identified without more detailed survey work, but there is an area of about 78,000 ha of wet woodland north of the town of Ghinda, the lower slopes of which appear to qualify as an IBA. Further survey work within this general area will be needed to define the boundaries. The area lies about 13 km north-east of Arboroba escarpment (ER008) and about 30 km south-east of Semenawi Bahri (ER003), of which it can be considered an extension in terms of habitat. The habitat is *Combretum* sp. woodland, but due to higher rainfall in the area (possible in every month other than June and September), the flora is generally richer than in other areas along the Eastern Escarpment. Dominant trees and bushes include *Capparis tomentosa*, *Cordia abyssinica*, *Rhus abyssinica* and *Ficus* sp. and dense undergrowth includes ferns, *Adiantum* spp. Coffee was cultivated extensively on terraces in the regions by the Italians and citrus fruits and bananas are grown in the valleys, especially around the town of Ghinda. At the base of the slopes lies Gahtelay Lake (behind Sabarguma Dam), which is important as one of the few areas of open water between the coast and the Central Plateau.

Birds

See Box and Table 2 for key species. Species restricted to the Somali–Masai biome include *Tockus flavirostris*, recorded from only two other IBAs in Eritrea. The site also has records of one Sahara–Sindian biome species, three Sahel biome species and four Afrotropical Highland biome species (Table 2). It is also reported as being ‘outstanding’ for Palearctic migrants, including *Falco concolor*, *Anthus cervinus*, *Monticola saxatilis*, *Acrocephalus arundinaceus* and *Emberiza hortulana*. Other records (Palearctic migrants and residents) include *Ciconia nigra*, *C. ciconia*, *Plegadis falcinellus*, *Anas clypeata*, *A. acuta*, *Burhinus oedinenus*, *Milvus migrans*, *Coturnix coturnix*, *Jynx torquilla*, *Motacilla cinerea* and *Phoenicurus phoenicurus*.

Key species

A3 (A08) Somali–Masai biome: Seven of the 14 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

Other threatened/endemic wildlife

None known to BirdLife International.

Conservation issues

It is possible that this site will be included as part of a new National Park in the Semenawi Bahri area (see ER003), as proposed in the National Environmental Management Plan for Eritrea (EAE 1995, DOE 1999). Particularly high densities of baboons *Papio hamadryas* (LR/nt) were found in this area in 1997/98 (Zinner *et al.* 1999).

Further reading

EAE (1995), DOE (1999), Murdoch (1998), Smith (1951b), Zinner *et al.* (1999).

Asmara escarpment

Admin region Northern Red Sea Zone, Central

Coordinates 15°22'N 38°56'E A1, A2 (115), A3 (A07, A08)

Area Not defined Altitude 2,100–2,400 m Unprotected

ER007

Site description

A number of records from the Durfo and Adi Nefas escarpments, which lie respectively 5–6 km and 10 km north-east of Asmara city, show that this general area qualifies as an IBA. Records from Asmara itself are also included on the basis that species recorded in parks and gardens in the city are likely to occur elsewhere in the adjacent area at the same altitude. There are also records (including a number of globally threatened species) from various plateau dams near Asmara, which suggest that these might qualify as a separate IBA, or help to

define the boundaries of an IBA including both the escarpment and the dams. Records from Acria Dam (3 km north-east of Asmara city) are included in this site account and relevant tables. Records from plateau dams generally or other named wetlands (e.g. Lakes Madrezien and Delia, which are further distant from Asmara) are noted by named location under ‘Birds’ below. Further work will be required to identify the boundaries of one or more IBAs adjacent to Asmara. The habitat consists of rough, stony moorland and rocky hillsides, scrubby tussock-grassland (*Rumex nervosa* and *Argemone mexicana*) and *Juniperus procera* woodland. To the east of the site, the escarpment drops away rapidly towards the Eastern Plain. Exotic *Eucalyptus* is widely grown in the parks and gardens in Asmara. There are a number of small reservoirs (with *Rumex* sp. swamps at the margins), near to and supplying Asmara. These, together with scattered small lakes and marshes (most, if not all, temporary and seasonal) provide the only wetland areas on the plateau.

Birds

See Box and Table 2 for key species. *Falco naumanni* was observed near the village of Adi Nefas, within the site, in 1998 (five individuals) and again at the same place in 2000 (35–40 individuals), suggesting that this species is ‘regularly-occurring’. *Aquila clanga* was observed at this IBA in 2000 (one individual in a flock of several *A. nipalensis*). There are a number of other globally-threatened species records from moorland and wetlands close to Asmara, all from the 1940s and 1950s. These include *Geronticus eremita* reported as a casual visitor to ‘The Plateau’ and on the ‘main reservoir’ c.30 km from Asmara in the 1940s and large numbers in ‘the Massawa/Asmara region’ in the 1950s. *Circus macrourus* was reported as a regular wintering species over the moors on ‘The Plateau’, together with *Falco tinnunculus*. *Rougetius rougetii* has bred on Lake Mandrezien (c.15 km north-north-west of Asmara), and *Aythya nyroca* was reported to winter in small numbers (‘up to 40’) on the plateau dams, mainly Lake Delia (c.24 km north of Asmara). More recently (in 1998), *Emberiza cineracea* has been reported wintering at Acria Dam. The restricted-range *Myrmecocichla melaena* is reported as frequent at the top of the escarpment before Asmara (approaching from the east on the road from Massawa), where it can be seen diving off culverts beside the road into the gorges beneath (Hillman pers. comm., Azaria pers. comm.). Three of the 16 Afrotropical Highlands biome species (*Bostrychia carunculata*, *Serinus citrinelloides* and *S. xanthopygius*) have been recorded only from this IBA and one other in the country and a 17th species of this biome (*Estrilda melanotis*) is recorded from Lake Delia, close to the site on the Central Plateau. One of the Somali–Masai biome species, *Caprimulgus fraenatus*, is recorded from no other IBA. One Sahel biome species, *Trachyphonus margaritatus*, is recorded from the site; see Table 2. There are records (from Smith) of other waterbirds and waders using ‘the Plateau Dams’ and associated seasonal marshland, including *Podiceps ruficollis* as a common resident and ‘great numbers of non-passerine migrants, Ciconiidae, Anatidae, Charadriidae, Scolopacidae, Laridae etc.’ and the site, in common with many areas along the eastern escarpment, also appears to attract a wide range of raptors. A record of an individual *Tyto alba* in 2000 near Asmara airport appears to be the first confirmed record for the country since Smith (1957) declared the species to be extinct in Eritrea (Zinner pers. comm.).

Key species

A1 *Falco naumanni*

A2 (115) Central Ethiopian highlands EBA: the only species of this EBA that occurs in Eritrea, *Myrmecocichla melaena*, has been recorded at this site.

A3 (A07) Afrotropical Highlands biome: 17 of the 31 species of this biome that occur in Eritrea have been recorded at this site (with a 17th nearby on the Central Plateau); see Table 2.

A3 (A08) Somali–Masai biome: Six of the 14 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

Other threatened/endemic wildlife

Baboons *Papio hamadryas* (LR/nt) are common along the road between Massawa and Asmara.

Conservation issues

It is possible that this site will be included as part of a new National Park in the Semenawi Bahri area (see ER003), as proposed in the National Environmental Management Plan for Eritrea (EAE 1995,

DOE 1999). Particularly high densities of baboons *Papio hamadryas* were found in this area in 1997/98 (Zinner *et al.* 1999).

Further reading

Butynski (1995), Cramp and Simmons (1977), Smith (1951b, 1957), Zinner (in press), Zinner *et al.* (1999).

Arboroba escarpment

Admin region Central

Coordinates 15°21'N 39°01'E

Area Not defined Altitude 1,800–2,100 m

ER008

A3 (A07)

Unprotected

Site description

This is another area of the plateau escarpment east of Asmara, c.9 km south-east of ER007. It lies at a slightly lower altitude on the same escarpment slope, in the region of Nefasit. It is not possible to determine site boundaries, but records from the area (including those from Nefasit, Faghena and Arboroba escarpment) indicate that it qualifies as an IBA. The coordinates used for location of the site are those supplied by D. Zinner for 'Arboroba escarpment'. Further survey work will be needed to define the exact location and boundaries of a site. The habitat is *Olea africana*-dominated evergreen woodland and upland scrub (*Olea*, *Euphorbia*, *Dodonaea*, *Opuntia*, *Rosa* and occasional *Acacia* spp.). Just to the east of the suggested area for an IBA lies Mount Bizen, which rises from the escarpment to 2,463 m.

Birds

See Box and Table 2 for key species. Most of the records for this site are relatively recent (from D. Zinner in the late 1990s, which contrasts with many other sites for which most information dates from the middle of the twentieth century). The site has records for four species of the Somali–Masai biome, including *Cisticola bodessa* (see Table 2).

Key species

A3 (A07) Afrotropical Highlands biome: Nine of the 31 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

Other threatened/endemic wildlife

Baboons *Papio hamadryas* (LR/nt) are common along the road between Massawa and Asmara, with particularly high densities found in the area in 1997/98 (Zinner *et al.* 1999).

Conservation issues

It is possible that this site will be included as part of a new National Park in the Semenawi Bahri area (see ER003), as proposed in the National Environmental Management Plan for Eritrea: Mount Bizen is also proposed as a National Park (EAE 1995, DOE 1999).

Further reading

Butynski (1995), DOE (1999), EAE (1995), Zinner (in press), Zinner *et al.* (1999).

Gulf of Zula

Admin region Northern Red Sea Zone

Coordinates 15°15'N 39°40'E

Area Not defined Altitude 0–900 m

ER009

A3 (A08)

Unprotected

Site description

The site is located c.50 km south-east of the town of Massawa, where the Gulf of Zula makes a large indent in the coastline, running north–south and bounded to the east by the Buri peninsula. It lies just south of the Massawa coast IBA (ER005). It is not possible, with current information, to define the exact boundaries of a site. Records from the coast area around Zula and Arafaille (at the southern end of the Gulf), from Engel on the northern end of the peninsula and from the island of Dissei in the Gulf have been combined in this site account and indicate that the area around the Gulf of Zula merits designation as an IBA. Records from the Ghedem mountain range just to the north are also included (with this location mentioned by name). The proposed area is centred on the town of Zula and includes the coastline around all three sides of the Gulf of Zula (but not the Buri peninsula east of Engel), the

water and islands in the Gulf and Mount Ghedem to the north and west. The coordinates used are for the town of Zula, which lies about halfway down the western coast of the Gulf of Zula. Further survey work will be required to determine the exact location and boundaries of one or more IBAs within the area of the Gulf of Zula.

The coastline is similar to that described for Massawa coast (ER005), with sand-dunes backed by *Acacia* spp. thorn-bush and woodland and *Hyphaene* sp. palms and mangroves (*Avicennia* sp.) fringing many of the muddy bays and inlets, and tidal lagoons. However, the underlying geology is more complex, with large bays and headlands, rocky pools, long sand- and shingle-beaches and many offshore reefs and islands. The inshore waters are shallow and some of the coral reefs may be exposed by low spring tides. There are tidal sand- and mudflats and some areas of tidal saltmarsh in the Gulf of Zula. The cliffs of the Buri peninsula to the east of the Gulf of Zula reach a height of 50 m.

An isolated range of mountains, the Ghedem range, lies in the Plain just north-west of Zula town. The mountains run parallel to the coast for a length of 24 km and reach a height of 900 m. Above 300 m the slopes are covered with *Combretum* sp. woodland, together with *Terminalia* and *Anogeissus* spp. and underlying scrub, similar to the woodland found on the eastern slopes of the plateau escarpment. There are many wadis on the slopes, with *Zizyphus* and *Acacia* spp. along their banks, and dense undergrowth.

Birds

See Box and Table 2 for key species. *Phoenicopterus minor* is reported from the Gulf of Zula in the 1990s (no details of numbers) and 'irregularly (perhaps one year in three) along the coast, following heavy winter rain which floods areas just inland to form shallow brackish pans' (Hillman pers. comm.). *Falco naumanni* is recorded from Arafaille (more than 20 birds in 1998) and 'small migrating parties' of *Emberiza cineracea* were recorded from Ghedem in the 1950s.

Seven species of the Somali–Masai (A08) biome are recorded around the Gulf of Zula (including *Francolinus leucoscepus*, recorded only from this site and one other IBA in the country) and an eighth, *Zosterops abyssinicus*, is recorded from the *Combretum* sp. forest on the slopes of Mount Ghedem. Also recorded from the site are five species of the Sahara–Sindian biome and three species of the Sahel biome (see Table 2). A fourth species of the Sahel biome, *Streptopelia rosegrisea*, may occur nearby (at Abdur on the eastern side of the Buri peninsula) although this record is uncertain due to possible confusion with *S. capicola* (see also ER002 and ER011). In addition, there are two species of the Sudan–Guinea Savanna biome (*Petronia dentata* and *Plocepasser superciliosus*), both from Mount Ghedem; and two Afrotropical Highlands biome species, *Streptopelia lugens* at Arafaille and *Passer swainsonii* from the foot of Mount Ghedem (see Table 2).

Phoenicopterus ruber also occurs, as does *Pelecanus rufescens* and a variety of ducks, waders, herons, egrets and breeding *Ciconia abdimii* (about 30 pairs in the walls of the ash crater above the village of Arafaille). There were 'fairly good numbers' of *Struthio camelus* along the coastal plain, including the Buri peninsula, in 1994, and one individual observed on the Buri peninsula in 1999.

Key species

A3 (A08) Somali–Masai biome: Eight of the 14 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

Other threatened/endemic wildlife

On the arid areas of the Buri peninsula itself, and south into the Danakil (see site ER014), there is a breeding population of around 100 *Equus africanus somaliensis* (CR), which is probably the last viable population of the subspecies (although they are said to be interbreeding with donkeys). There are also migratory *Gazella dorcas* (VU) and *G. soemmerringi* (VU) and a recent sighting was made near the Buri peninsula of a 'beira' dik-dik (*Dorcatragus megalotis*, VU), the status of which is unknown.

Conservation issues

The Buri peninsula is proposed in the National Environmental Action Plan as one of Eritrea's first new protected areas, based on the presence of the *Equus africanus* population (see 'Other wildlife', above). Most IBA-qualifying bird records appear to derive from the actual coastline, whereas the populations of *Equus africanus* and antelopes appear to be located a bit further inland. However, any future work on defining the boundaries of one or more IBAs in the area should take into account

the National Park proposals and ensure that proposed IBAs are compatible with government plans for the National Park boundaries. There is also considerable cultural and historical interest in the area with the ruins of the ancient (Roman) port of Adulis lying close to Zula village and important wrecks containing amphorae offshore.

Further reading

Butynski (1995), FAO (1997), Ruiz (undated), Smith (1955, 1957).

Western Plain: Gash–Setit

Admin region Gash Barka

Coordinates 15°05'N 36°52'E

Area c.71,000 ha Altitude 600–900 m

ER010

A3 (A03, A04)

Unprotected

Site description

The site lies in the Western Plain, c.30 km south-east of Tessenei and just south of the Gash river. It lies on the lowland plain between the two main rivers which flow westwards out of Eritrea into Sudan (the Gash and the Setit). The Gash and other smaller rivers crossing the Western Plain flow only during the rainy season (June to September) but dry out and cease to flow at other times of year. The area from just north of the Gash river, south to the Setit river has fertile soils and there is fairly extensive cultivation (especially on the so-called 'cotton soils' in the river valleys). There are dry, sandy plains with protruding granite domes and the vegetation is principally *Acacia* sp. savanna and *Acacia–Zizyphus* sp. woodland, with *Adansonia*, *Balanites* and *Capparis* spp. Riparian vegetation includes *Hyphaene*, *Tamarindus*, *Tamarix*, *Adansonia*, *Ficus*, *Acacia*, *Zizyphus*, *Salvadora*, *Leptadenia*, *Calotropis* and occasionally *Kigelia* spp. There are extensive and economically important stands of doum palm *Hyphaene thebaica* along the Gash river. When the rains are heavy, these areas form temporary swamps.

An artificial marsh has been created alongside the Gash river for irrigated agriculture (especially millet) in the region of Tessenei, known as Ali Ghider marshes. This area is unique in Eritrea because of the size and near-permanence of the marshes (all other areas of marsh and swamp in the country are seasonal and dependent on annual rains). Bird records from marshes in the region of Tessenei are included in the site account here, even though some of these may be from areas outside the proposed boundary (e.g. Ali Ghider marshes lie c.15 km west of Tessenei). However, since many records do not specify an actual location, but only the general area, and the seasonal swamps occur along the length of the lower Gash river, it is considered valid to include these records on the basis that these species are likely also to occur on marshy areas within the site. The Ministry of Agriculture confirms that an *Acacia nilotica* forest on the river in the vicinity of Ali Ghider appears still to have large populations of waterbirds. Further survey work will be required to determine the exact boundaries of the IBA, to confirm a bird list for the site and to determine whether some of the other marsh areas outside the IBA merit selection as IBAs in their own right. For present purposes, the boundaries of the old Gash–Setit Wildlife Reserve have been used to define the IBA (as marked in published references).

Birds

See Box and Table 2 for key species. *Circus macrourus* was said to be a regular visitor to 'the Western Plain' (no specific location) and *Vanellus gregarius* was reported from the edge of the Taccaze (Setit) river, although not specifically from the Gash–Setit IBA; both records from the 1950s.

Many of the biome-restricted species records from Smith are inferred (i.e. the species is reported generally from 'the Western Plain' in habitats and at altitudes known to occur within the site) rather than specifically mentioning Gash–Setit as the named location. The six Sahel biome species include *Anthoscopus punctifrons* (recorded only from this site and ER001). The Sudan–Guinea Savanna biome species include *Falco alopex* ('widespread and common throughout the Western Plains' in the 1950s) and *Turdoides leucocephalus*, recorded only from this site and ER001. There are also records of *Pterocles lichtensteinii* (Sahara–Sindian biome) and six species of the Somali–Masai biome; see Table 2.

Other records from the 1940s and 1950s also show that areas of marshland in the region of the IBA (whether due to natural floods or artificial irrigation) can be of considerable importance for Palearctic migrants, including (in August 1942) 200 *Anas crecca*, 'plenty' of *Calidris minuta*, 'plentiful' *Tringa hypoleucos* and 'common' *T. stagnatilis*.

Key species

A3 (A03) Sahel biome: Six of the eight species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

A3 (A04) Sudan–Guinea Savanna biome: Seven of the eight species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

Other threatened/endemic wildlife

Among mammals, *Loxodonta africana* (EN) (about 30), *Tragelaphus strepsiceros* (LR/cd), *Gazella dorcas* (VU), and *G. rufifrons* (VU) are all known to exist within the proposed new National Park and/or surrounding area. *Taurotragus oryx* and *Alcelaphus buselaphus tora* (LR/cd) are also thought to still occur. The original game reserve was established to protect these, together with populations of *Syncerus caffer* (LR/cd), *Hippotragus equinus* (LR/cd), *Giraffa camelopardalis* (LR/cd), *Panthera leo* (VU) and *Panthera pardus*, but these latter populations are now likely to be extinct.

Conservation issues

The original Gash–Setit Game Reserve is not recognized by the current Eritrean government, but the importance of the area for wildlife (especially mammals and birds) is fully recognized and the area is one of four priority areas under consideration for designation as new protected areas (probably as National Parks). The riverine woodland, dominated by *Acacia* spp. with *Hyphaene thebaica* and *Tamarix aphylla*, is considered to be a habitat of particular conservation concern. Government surveys have ascertained that much of the habitat remains intact and that populations of *Loxodonta africana*, *Tragelaphus strepsiceros*, *Gazella dorcas*, *G. rufifrons*, and possibly *Taurotragus oryx* and *Alcelaphus buselaphus tora*, still remain in the area. However, there are considerable threats; areas of the riverine doum-palm habitat have already been cleared for agriculture and there is increasing pressure both for new agricultural land and for grazing land for nomadic and settled pastoralists. There are refugee resettlement camps in the area of Tessenei and the demand for land is expected to increase with the return of more refugees from neighbouring Sudan.

Further reading

Bein (2001), DOE (1999), FAO (1997), IUCN (1987), Smith (1944, 1951b, 1957).

Southern Plateau: Furrus

Admin region Southern

Coordinates 15°00'N 38°55'E

Area Not defined Altitude 1,800 m

ER011

A3 (A07)

Unprotected

Site description

The site lies in the Central Plateau about 40 km south of Asmara and 12 km west of the town of Dekemhare. It also lies c.40 km north of Mareb escarpment (ER012) and contains similar habitat to that site, but lies at slightly higher altitude (1,800 m and over). It consists of open *Acacia* spp. woodland with *Aloe* sp. and *Ficus* sp. in riverine areas. During the rains, parts of the area become flooded.

Birds

See Box and Table 2 for key species. There are possible records for the site of *Circus macrourus*, but these were not definitely distinguished from *C. pygargus*. There are also records of three Sahel biome species (Table 2), including a possible record of *Streptopelia roseogrisea* (although this may be a case of confusion with *S. capicola*: Zinner pers. comm.) and two Sudan–Guinea Savanna species, including one of only two site records for *Myrmecocichla albifrons*. There are also four species of the Somali–Masai biome recorded; see Table 2. The site is also important for a wide range of Afrotropical and migrant raptors, with records including *Milvus migrans*, *Gyps rueppellii*, *Torgos tracheliotus*, *Circus galleus*, *Melierax metabates*, *M. gabar*, *Buteo buteo*, *Aquila rapax nipalensis*, *A. verreauxi*, *Lophoctes occipitalis*, *Falco biarmicus* and *F. tinnunculus*.

Key species

A3 (A07) Afrotropical Highlands biome: Six of the 31 species of this biome that occur in Eritrea have been recorded at this site (with a further two at Segheneyti, at the same altitude and similar habitat on the Southern Plateau); see Table 2.

Other threatened/endemic wildlife

None known to BirdLife International.

Conservation issues

No information.

Further reading

Zinner (in press).

Mareb escarpment

Admin region Southern

Coordinates 14°46'N 39°06'E

Area Not defined Altitude 1,500–1,800 m

ER012

A3 (A04, A08)

Unprotected

Site description

This site lies at the southern end of the Central Plateau on the edge of the escarpment, where it falls down steeply to the valley of the Mareb river. In places there are sheer cliffs, dropping as much as 600 m to the river. The site is about 40 km north-west of Senafe (ER013). Bird records from the general area of 'Mareb escarpment' and Mai Aini, show that the area merits definition as an IBA. Further survey work will be needed to define the boundaries of a site in this general area. The cliffs and hills are covered in dry upland scrub and grassland (*Olea*, *Euphorbia*, *Dodonaea*, *Opuntia*, *Barleria* and sparse *Acacia* spp., together with *Rumex nervosus*, *Rosa abyssinica*, *Ocimum menthaefolium* and *Aloe abyssinica*). On flatter ground adjoining the Mareb, at c.1,500 m and above, are doum palm, *Hyphaene thebaica*, other trees, rank undergrowth and some areas of cultivation and grassland.

Birds

See Box and Table 2 for key species. There are old records (from the 1950s) of *Emberiza cineracea* occurring 'on the Mareb', but no information is given about altitude or location. This is one of only two IBAs in which the Sudan–Guinea Savanna biome species *Myrmecocichla albifrons* occurs. It is the only IBA in Eritrea within which the Somali–Masai biome species *Cercomela scotocerca* is recorded and the area was said to be the 'main haunt, with flocks of 20 and more' for another Somali–Masai species, *Tockus hemprichii*, in the 1950s. In addition, there are records for three Sahel biome species and four Afrotropical Highlands biome species; see Table 2.

Key species

A3 (A04) Sudan–Guinea Savanna biome: Six of the eight species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

A3 (A08) Somali–Masai biome: Four of the 14 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

Other threatened/ endemic wildlife

None known to BirdLife International.

Conservation issues

This site is similar to Senafe (ER013), in that it is close to the Ethiopian border and is likely to have been severely affected by the recent years of war. Most of the bird information dates from the 1940s, 1950s and earlier and the effects of the subsequent years of war on biodiversity in the area are unknown.

Further reading

Smith (1960), Zinner (in press).

Senafe

Admin region Southern

Coordinates 14°41'N 39°24'E

Area Not defined Altitude 1,800–2,500+ m

ER013

A2 (115), A3 (A07)

Unprotected

Site description

This site lies towards the south of the country at the southern end of the Eritrean Central Plateau (the northern extent of the highland plateau running up from Ethiopia). This part of the plateau is contiguous with the Simien Mountains in Ethiopia and with the Central Ethiopian highlands Endemic Bird Area (EBA). Bird records

from the general area of 'Senafe and Guna Guna' (south of Adi Caieh), at an altitude of over 1,800 m, show that the area merits definition as an IBA. Further survey work will be needed to define the boundaries of a site in this general area. Due to its location, 20 km north of the border with Ethiopia, the Senafe area has been a war-zone for many years and there are very few recent survey data for birds or any other groups. The area is similar to the upper slopes of Semenawi Bahri (ER003), with stony hillsides and peaks, deeply incised valleys, rough moorland, tussock-grassland, scrub and *Juniperus procera* woodland with planted *Eucalyptus* and shrubby undergrowth. However, there are patches of mixed wet woodland between 2,100–2,500 m, including very tall deciduous trees mingled with figs, *Ficus* sp., *Juniperus* sp. and exotic *Eucalyptus* sp., with ferns among the undergrowth. These woodlands occur in isolated patches at the bottom of sheer cliffs and in ravines from Senafe and Guna Guna, north to Adi Caieh.

Birds

See Box and Table 2 for key species. The restricted-range *Myrmecocichla melaena* was recorded among bare granite rocks and scrub, and breeding in cracks in cliff-faces in the southern mountains above 1,800m around Senafe and Guna Guna in the 1950s. It has also been recorded more recently (1998) at Senafe. It seems likely, from the accounts of Smith, that *Rougetius rougetii* will occur in this site. Although he does not mention the species at Senafe, Smith visited the nearby area around Adi Caieh and records the species as 'characterizing small upland streams with adjacent willows, rank grass and marshy vegetation' around and above 1,800 m. The Afrotropical Highlands biome species *Bostrychia carunculata* is recorded from only one other IBA and a further six—*Columba albitorques*, *Thammodia semirufa*, *Dioptrornis chocolatinus*, *Parus leuconotus*, *Onychognathus albirostris* and *Corvus crassirostris*—are recorded from no other IBA in Eritrea. There are also records of two Somali–Masai biome species from the site; see Table 2.

Key species

A2 (115) Central Ethiopian highlands EBA: the only species of this EBA that occurs in Eritrea, *Myrmecocichla melaena*, has been recorded at this site.

A3 (A07) Afrotropical Highlands biome: 23 of the 31 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

Other threatened/ endemic wildlife

None known to BirdLife International.

Conservation issues

The site is clearly important as the Eritrean part of the Central Ethiopian highlands EBA and an area within which many of the endemic birds 'shared' by Ethiopia and Eritrea occur. This importance is recognized by the Eritrean government and the Senafe area has been flagged as a priority area for further investigation in the National Biodiversity Strategy and Action Plan (Duthie pers. comm.) Virtually all of the bird information dates from the 1940s, 1950s and earlier and the effects of the subsequent years of war on biodiversity in the area are unknown.

Further reading

Smith (1957).

Danakil lowlands

Admin region Southern Red Sea Zone

Coordinates 13°10'N 42°23'E

Area Not defined Altitude 0–150 m

ER014

A3 (A02, A08)

Unprotected

Site description

The site lies on the southern coastal plain in the Danakil region between Asseb and Gehare. Bird records from the Asseb–Gehare area on the coast of the Danakil lowlands indicate that a site within this general area will merit IBA status. Further survey work will be required to define the exact location and boundaries of a site. The area is defined as arid to semi-arid; rainfall declines progressively southwards throughout the Danakil region, to less than 40 mm annually at Asseb, and vegetation is largely confined to wadis. Temperatures in the southern Danakil can exceed 50°C during June to September and

diurnal averages are exceptionally high due to high night-time temperatures. The area is characterized by black basalt lava-fields and sandy, stony or shell plains. Dominant vegetation is *Acacia mellifera* on the lava and scattered *A. tortilis*, *A. nubica* and *Balanites aegyptiaca* on the plains. The coastline is as described for the Gulf of Zula (ER009), with offshore islands and reefs, sandy dunes, mud-, sand- and saltflats and mangroves (principally *Avicennia* sp.) in the bays and inlets.

■ Birds

See Box and Table 2 for key species. *Phoenicopterus minor* was reported as a rare visitor to the coastal flats, salt pans and tidal inlets including single birds at Asseb, usually with *P. ruber*, in the 1950s. The site is the only IBA in Eritrea from which the Sahara–Sindian biome species *Oenanthe leucopyga* is recorded (by Smith, in the lava-fields near Asseb) and one of only two sites for the Somali–Masai biome species, *Francolinus leucoscepus*. There are records of two Sahel biome species; see Table 2. Two Afrotropical Highlands biome species, *Columba albitorques* and *Corvus crassirostris* are recorded from Mount Ramlu (2,100 m), within the Danakil region, but not within the proposed IBA area (Mount Ramlu lies c. 75 km to the north-west). These are old records and Mount Ramlu is not considered to merit the status of a separate IBA without additional and more recent information on its bird populations. *Struthio camelus* is said to be fairly numerous in the Danakil region and Smith reported that the area just north of Asseb harboured very large numbers of Palearctic migrants, especially *Sylvia* spp. and *Phylloscopus* spp. warblers, very large numbers of *Lanius* spp. (especially *L. collurio*) and raptors, *Milvus migrans* and *Gyps* spp.

Key species

- A3 (A02) Sahara–Sindian biome: Five of the nine species of this biome that occur in Eritrea have been recorded at this site; see Table 2.
 A3 (A08) Somali–Masai biome: Six of the 14 species of this biome that occur in Eritrea have been recorded at this site; see Table 2.

■ Other threatened/ endemic wildlife

Oryx beisa are known to have occurred in the Danakil region in the past, but there are no recent sightings and it is believed they may have been hunted to extinction by the occupying Ethiopian army. *Equus africanus somaliensis* (CR), *Gazella dorcas* (VU) and *G. soemmeringi* (VU) are all known from the area, some populations probably moving between the Buri peninsula (see Gulf of Zula, ER009) and Danakil region. The two gazelle species are also said to be numerous south of Asseb, towards the Djibouti border.

■ Conservation issues

As part of the proposals for a National Park on the Buri peninsula (see ER009), the National Environmental Action Plan includes a plan for additional ‘enclaves’ in the Danakil region in areas which appear to be of importance to the African Wild Ass population. These will probably lie in the north of the Danakil region, not in the area indicated for the IBA.

■ Further reading

Butynski (1995), FAO (1997), Hughes and Hughes (1992), Smith (1951b, 1957).

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