

CHAD

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Chestnut-bellied Starling *Lamprotornis pulcher*. (ILLUSTRATION: MARK ANDREWS)

GENERAL INTRODUCTION

The Republic of Chad is a large, landlocked country located between 07°30'N and 23°00'N and between 14°E and 24°E. It is bordered by Libya to the north, Sudan to the east, Central African Republic and Cameroon to the south and Nigeria and Niger to the west. It covers an area of 1,284,000 km² and has a population of 6.7 million (1997 UN estimate). The population density is 5 persons/km², with an average annual rate of increase of 2.5%. The capital is N'Djamena and, administratively, the country is divided into 13 Préfectures.

Average annual rainfall decreases with increasing latitude, from 1,150 mm at Moundou (08°30'N) to 902 mm at Am Timan (11°N), 582 mm at N'Djamena (12°N), 43 mm at Faya-Largeau (18°N) and no reliable rainfall further north. The dry season in the south extends from November to March and increases in duration northwards. In the south, the hottest month is April when the mean minima and maxima at Moundou are 22°C and 37°C respectively; corresponding figures for August are 21°C and 30°C. In the north, August is the hottest month when, at Bardai in the Tibesti massif (21°30'N), mean minima and maxima are 19°C and 37°C respectively; equivalent figures for January are 5°C and 24°C. However, temperatures of -10°C are not uncommon in the Tibesti, while on the Ennedi massif extremes of -5°C and 50°C have been recorded.

Reflecting the decreasing south–north rainfall gradient, the vegetation of the country is divided latitudinally into three sub-equal zones: the Sahara in the north, the Sahel covering the central third, and Sudan savanna in the south.

The northern third of the country forms part of the Sahara desert and includes, on the border with Libya, the Tibesti massif which rises to 3,415 m. This volcanic massif is the highest both in Chad and the Sahara. Tibesti covers an area of about 50,000 km² and has an average altitude of over 2,000 m. There are areas of Saharo-montane vegetation on the massif which are floristically rich and unrelated to the vegetation of the surrounding lowlands (Davis *et al.* 1986, IUCN 1983) while woody vegetation occurs in some deep

gorges. Residual volcanic activity is still evident in numerous fumaroles, solfatari, mud-pools and hot springs. Little rainfall is received and the mountains are drained in radial fashion by a number of intermittent watercourses which peter out in the surrounding desert, sometimes draining into subterranean aquifers. South of Tibesti is a vast sedimentary basin, the Bodélé depression, lying at 250–500 m. Situated south-east of Tibesti, on the Sudan border, is the Ennedi massif, which rises to 1,450 m. It is largely unvegetated, although the deep gorges which carry intermittent streams are lined in places by open gallery forest, fringed by sparse *Acacia* woodland. It, too, is drained by a dendritic system of intermittent streams which dwindle away in centre of the country. Immediately to the north of Ennedi, and east of Tibesti, is another basin, the Mourdi depression.

The Sahel zone occupies the middle third of the country. It is bounded in the west by the banks of Lake Chad, the fourth-largest lake in Africa. Approximately half of the lake lies within Chadian borders while the rest is shared between Nigeria, Niger and Cameroon. The lake receives the drainage of over 90% of the country. On the opposite side of the country, on the Sudan border, and located to the south of the Ennedi massif, lies the Ouaddai massif, which rises to a maximum height of 1,260 m. Average annual rainfall here is 400 mm and the vegetation is mainly sparse *Acacia* savanna. Much of the area between Lake Chad and the Ouaddai massif is, except for parts of the centre-west where there are large expanses of dunes fringed by xerophytic scrubland, a vast, relatively featureless plain (300–400 m) supporting Sahelian grasslands. Much of this area is drained by the seasonal Batha river which originates from streams running westwards from the Ouaddai massif and which ultimately empties into the temporary wetlands around Lake Fitri (12°50'N 17°30'E). Indeed, an area of 10 million ha in the transition zone between the southern Sahel and northern Sudan–Guinea is subject to regular seasonal inundation.

The vegetation of the Sudan Savanna zone is largely undifferentiated Sudanian woodland, interspersed with patches of edaphic grassland and communities of *Acacia*. Other than the Guéra massif, situated in the centre-north, of which the highest peak reaches

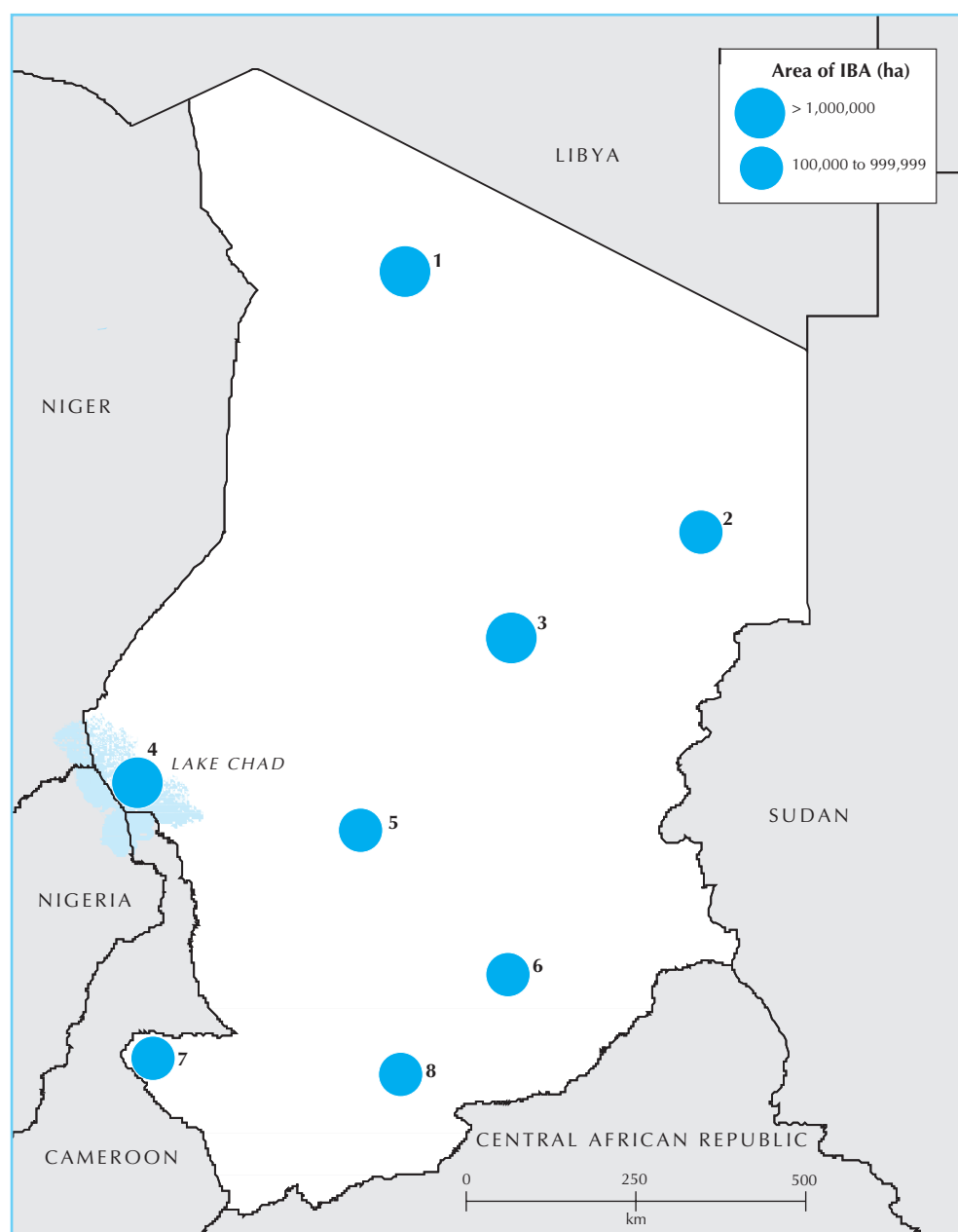

Map 1. Location and size of Important Bird Areas in Chad.

Table 1. Summary of Important Bird Areas in Chad.

 8 IBAs covering 146,500 km²

IBA code	Site name	Administrative region	Criteria (see p. 11; for A3 codes, see Table 2)						
			A1	A02	A3 A03	A04	A4i	A4iii	
TD001	Tibesti massif	Borkou		✓					
TD002	Fada Archei	Ennedi		✓	✓				
TD003	Ouadi Rimé–Ouadi Achim	Batha	✓	✓	✓				
TD004	Lake Chad	Lac	✓		✓			✓	✓
TD005	Lake Fitri	Batha	✓					✓	✓
TD006	Zakouma National Park	Guéra, Salamat				✓		✓	
TD007	Binder–Léré	Mayo-Kébbi				✓			
TD008	Manda National Park	Moyen-Chari				✓			
Total number of IBAs qualifying:			3	3	3	3	3	2	

1,613 m, the area is mostly flat, lying mainly between 300 m and 400 m. The main rivers of this zone are the Chari and the Logone, which flow north-westwards and drain into Lake Chad.

The richest agricultural lands, which are also the most densely populated, occur along riverbanks in the south and south-west. Cotton is the main export product, but most agriculture is subsistence, with sorghum and millet the principal crops. Transhumant pastoralism is practised in the seasonal wetlands of the transition zone. Both grazing and the cultivation of subsistence crops have been seriously affected by drought, which has increased the pressure on shrinking wetlands.

ORNITHOLOGICAL IMPORTANCE

The total number of bird species which have been recorded from Chad is 532, including 354 residents and 155 migrants (of which 117 are Palearctic in origin). Eight species of global conservation concern have been recorded, of which six are Palearctic migrants: *Marmarometta angustirostris* (VU), *Aythya nyroca* (VU), *Circus macrourus* (NT), *Falco naumanni* (VU), *Gallinago media* (NT) and *Glareola nordmanni* (NT). Although little is known of their status nationally, it is thought that *M. angustirostris* is merely a vagrant. The two other species, *Neotis nuba* (NT) and *Prinia fluviatilis* (DD),

are resident. *Prinia fluviatilis* is a little-known species, not described until 1974 from a specimen collected at N'Djamena in 1972 (Chappuis 1974, Chappuis *et al.* 1989).

Parts of three biomes are represented in Chad: the Sahara–Sindian biome (A02) in the north, the Sahel biome (A03) across the centre and the Sudan–Guinea Savanna biome (A04) in the south. Fifteen of the 22 species restricted to the Sahara–Sindian biome occur in Chad (although one is known only as a passage migrant), while all 16 of the Sahel-restricted species have been recorded in the country, as have 37 of the 54 species of the Sudan–Guinea Savanna biome (one being only a vagrant to Chad).

Lake Chad and Lake Fitri are of great importance for the populations of migrant Palearctic waterbirds that they support seasonally, particularly *Anas querquedula* and *A. acuta*. Lake Fitri is also important as a drought refuge for Afrotropical waterbirds; it held almost one quarter of all Afrotropical wildfowl (Anatidae) counted in West Africa in January 1984 (Roux and Jarry 1984).

Chad holds a major proportion of the western population (n nominate subspecies) of *Balearica pavonina* (Scholte 1996). It is likely that, with further surveys, Chad will be found to harbour more than 50% of the total.

CONSERVATION INFRASTRUCTURE AND PROTECTED-AREA SYSTEM

The authority responsible for conservation policy and for the exploitation and protection of natural resources is the Ministère

de l'Environnement et de l'Eau (Ministry of Environment and Water), created in 1997. The Division des Parcs Nationaux, within the Direction de la Faune et des Parcs Nationaux (Department of Wildlife and National Parks) is responsible for the management of both National Parks and Faunal Reserves. The Division de la Chasse is responsible for the control of hunting outside protected areas and for the protection and management of forests. Chad has two National Parks, seven Faunal Reserves and one Ramsar Site, Lake Fitri. The Ouadi Rimé–Ouadi Achim Faunal Reserve, at 77,950 km² is, on paper, one of the largest protected areas in Africa. A total of over 11,395,000 ha is included within the protected-area system, representing some 9% of the land area of the country.

Although all National Parks and Faunal Reserves have permanent staff, their effectiveness is hampered by, amongst other things, a lack of transport and poor salaries. Effective protection now exists only where externally funded. Post-war conservation in Chad started in the late 1980s with the launch of a project in Zakouma National Park, financed by the European Union, which still continues. The security situation in most areas of Chad has improved dramatically since the mid-1990s, and implementation of conservation measures has been extended to Manda National Park and Binder–Léré Faunal Reserve. The Department of Wildlife and National Parks was created in 1997, with finance from the Global Environment Facility.

A number of new conservation initiatives include a proposal to extend faunal protection from Manda National Park to elsewhere in the Moyen Chari area of southern Chad. Another initiative seeks to survey wildlife populations in the areas around Zakouma

Table 2. The occurrence of biome-restricted species at Important Bird Areas in Chad. Sites that meet the A3 criterion are highlighted in **bold**. Species of global conservation concern are highlighted in **bold blue**.

A02 – Sahara–Sindian biome (15 species in Chad; three sites meet the A3 criterion)					A04 – Sudan–Guinea Savanna biome (37 species in Chad; three sites meet the A3 criterion)					
IBA code:	001	002	003		003	004	006	007	008	
<i>Falco concolor</i>										✓
<i>Pterocles senegallus</i>										
<i>Pterocles coronatus</i>	✓	✓	✓							
<i>Pterocles lichtensteini</i>	✓	✓	✓							
<i>Bubo ascalaphus</i>		✓	✓							
<i>Caprimulgus aegyptius</i>		✓								
<i>Ammomanes cincturus</i>	✓	✓	✓							
<i>Ammomanes deserti</i>	✓	✓	✓							
<i>Alaemon alaudipes</i>	✓	✓	✓							
<i>Hirundo obsoleta</i>	✓									
<i>Oenanthe leucopyga</i>	✓	✓	✓							
<i>Cercomela melanura</i>	✓	✓	✓							
<i>Turdoides fulvus</i>	✓	✓	✓							
<i>Rhodopechys githaginea</i>	✓									
<i>Passer simplex</i>	✓		✓							
Number of species recorded:	11	10	11							
A03 – Sahel biome (16 species in Chad; three sites meet the A3 criterion)										
IBA code:	002	003	004	006	007					
<i>Neotis nuba</i>		✓								
<i>Ardeotis arabs</i>		✓	✓							
<i>Eupodotis savilei</i>		✓		✓						
<i>Streptopelia roseogrisea</i>	✓	✓	✓	✓	✓					
<i>Caprimulgus eximius</i>										
<i>Trachyphonus margaritatus</i>		✓	✓							
<i>Dendropicos elachus</i>		✓	✓							
<i>Mirafra cordofanica</i>										
<i>Mirafra rufa</i>		✓								
<i>Eremalauda dunni</i>										
<i>Cercotrichas podobe</i>	✓	✓	✓							
<i>Prinia fluviatilis</i>			✓							
<i>Spiloptila clamans</i>	✓	✓	✓							
<i>Anthoscopus punctifrons</i>	✓	✓								
<i>Passer luteus</i>	✓	✓	✓							
<i>Lamprotornis pulcher</i>	✓	✓	✓							✓
Number of species recorded:	6	12	9	2	2					
<i>Falco alopex</i>										✓
<i>Streptopelia hypopyrrha</i>										
<i>Poicephalus senegalus</i>										
<i>Poicephalus crassus</i>								✓		
<i>Tauraco leucolophus</i>										
<i>Musophaga violacea</i>										
<i>Merops bulocki</i>								✓	✓	✓
<i>Lybius dubius</i>										
<i>Lybius rolleti</i>								✓		✓
<i>Dendropicos poecilolaemus</i>										
<i>Galerida modesta</i>								✓		
<i>Corvinella corvina</i>								✓		
<i>Myrmecocichla albifrons</i>								✓		
<i>Turdoides reinwardtii</i>										✓
<i>Cisticola ruficeps</i>								✓	✓	
<i>Cisticola dorsti</i>										
<i>Cisticola rufus</i>										✓
<i>Hypergerus atriceps</i>										
<i>Eremomela pusilla</i>									✓	✓
<i>Muscicapa gambagae</i>								✓	✓	✓
<i>Anthoscopus parvulus</i>										✓
<i>Pytilia phoenicoptera</i>										
<i>Pytilia hypogrammica</i>										✓
<i>Euschistospiza dybowskii</i>										
<i>Lagonosticta rara</i>										
<i>Lagonosticta larvata</i>										
<i>Estrilda caerulescens</i>										
<i>Estrilda troglodytes</i>								✓	✓	
<i>Vidua interjecta</i>										
<i>Vidua togoensis</i>										
<i>Petronia dentata</i>									✓	✓
<i>Plocepasser superciliosus</i>									✓	
<i>Ploceus heuglini</i>								✓	✓	
<i>Grafisia torquata</i>										✓
<i>Lamprotornis purpureus</i>								✓		✓
<i>Lamprotornis chalcurus</i>										
<i>Ptilostomus afer</i>										
Number of species recorded:	3	3	9	6	11					

National Park while the only planned conservation initiatives known in the Sahelian zone is one recently proposed for Lake Fitri.

A major cause of concern is the dependency of all effective conservation efforts on external financing; efforts need to be undertaken to develop more sustainable conservation methods. There is also great need for an overall land-use planning strategy.

INTERNATIONAL MEASURES RELEVANT TO THE CONSERVATION OF SITES

Chad has ratified the Convention on Biological Diversity, the Convention on International Trade in Endangered Species, the Convention on Migratory Species, the Ramsar Convention, the World Heritage Convention, the Convention to Combat Desertification and the Convention on Climate Change. Chad also participates in UNESCO's Man and the Biosphere Programme.

Chad is also a signatory to the African Convention on the Conservation of Nature and Natural Resources and is a member of The Lake Chad Basin Commission that seeks to unite the six countries located in the Basin in its hydrological management. Draft treaties on the conservation of wildlife and natural resources have been drawn up with the Sudan and the Central African Republic.

OVERVIEW OF THE INVENTORY

Eight Important Bird Areas (IBAs) have been identified in this inventory, covering about 146,500 km² or 11.4% of the land surface of Chad (Map 1, Table 1). Although relatively few in number, some sites are extremely large, with Ouadi Rimé–Ouadi Achim (site TD003) alone accounting for more than 6% of the area of the country. Two of the sites are National Parks, three are Faunal Reserves and one is a Ramsar Site, while two have no form of legal

protection. Three sites qualify under the A1 criterion for species of global conservation concern, and three qualify under the A3 criterion for the Sahara–Sindian biome, holding between them 14 of the 15 species of the biome known from the country, while three sites similarly qualify for the Sahel biome, holding 13 of the 16 species in Chad, and three sites qualify for the Sudan–Guinea Savanna biome, with 17 of the 37 species recorded nationally (Table 2). Three sites also qualify under the A4i/A4iii criteria for the significantly high numbers of waterbirds found at them.

Potential IBAs that have been omitted include Lake Iro in the south-east of the country. There is no recent information available, but in the past it harboured important concentrations of waterbirds, including up to 10,000 *Ciconia ciconia* in the 1960s (Mullié *et al.* 1995). However, the lake is said now to be intensively exploited by fishermen and is thought to have lost much of its conservation importance. Also excluded, for lack of data, is Aboutelfan–Abtouyour Faunal Reserve in the Guéra mountains in south-central Chad. In addition, in the area bordering the western part of Ouadi Rimé–Ouadi Achim Faunal Reserve (site TD003), towards Kanem Préfecture, there are vast stretches of grassland known to hold breeding populations of, for example, *Ardeotis arabs* and *Neotis denhami*.

Overall, many of the data used to compile the inventory are more than 20 years old, particularly for the northern part of the country. Recent waterbird counts have been conducted in some of the main wetlands, Lake Chad and Lake Fitri (Office National de la Chasse, France) and the Logone flood-plain (WIWO and Ecole de Faune de Garoua). The only terrestrial sites for which there are reasonably good, recent data are the two National Parks.

ACKNOWLEDGEMENTS

Chris Magin is thanked for comments on the Zakouma site-account.

SITE ACCOUNTS

Tibesti massif

Admin region Borkou

Coordinates 20°37'N 18°08'E

Area c.3,300,000 ha Altitude 600–3,315 m

TD001

A3 (A02)

Unprotected

Site description

The Tibesti massif lies in northern Chad, adjacent to the border with Libya. The massif rises to over 3,000 m at several points, with peaks at Pic Tousside (3,315 m) and Emi Koussi (3,415 m). At a number of places in the massif there is conspicuous surface water, both in permanent pools (gueltas), found among the rocks and ravines, and also in the seasonal watercourses which flow following rain. Some of the wadis are bordered by *Acacia* spp. and elsewhere most areas are vegetated either with sparse scrub or annual grasses such as *Cornulaca monacantha*. The rainfall, such as it is, usually occurs between February and May, but is unpredictable both in timing and amount. The height of the Tibesti massif means that it receives rather more rainfall than neighbouring areas of the Sahara, but any reduction in rainfall will seriously affect the vegetation and water-bodies which are an important factor in maintaining the conservation value of the site.

There is insufficient information available to be able to propose any definite IBA sites. However, given the importance of the area for its Saharan avifauna, and also other fauna and flora, a potential site is tentatively suggested. The site, towards the north-western extreme of the massif, incorporates the Pic Tousside. The proposed boundaries are formed by the Sherda to Zouar road between the road junction with a fork to Bardai and the point where the Tibesti–Borkou provincial boundary crosses the road, following the provincial boundary in a straight line to the point where it reaches the Falaise de l'Aguer-Tay, from there in a straight line northwards to the town of Aderke, from there along the road to Bardai, from Bardai in a straight line to the town of Wour, and from Wour following the road to the junction with a turning to Bardai. This site incorporates a 3,315 m peak, many ouadis running from the peak and a number of gueltas.

Birds

See Box and Table 2 for key species.

Key species

A3 (A02) Sahara–Sindian biome: 11 of the 15 species of this biome that occur in Chad have been recorded at, or in the immediate vicinity of, this site; see Table 2.

Other threatened/endemic wildlife

Sixteen species of fish, the majority of them endemic to the area, occur in the wadis and gueltas of the Tibesti and Ennedi massifs. The Saharo-montane flora of Tibesti and Ennedi comprises some 350 known plant species, of which eight are near-endemic to the area.

Conservation issues

The extent of human influence in the site is unknown but, given the fragility of the vegetation of the area, any significant amounts of wood-cutting or overgrazing are likely to have a serious impact on the habitat. Surveys of the whole of Tibesti are needed in order to identify areas offering greatest conservation potential. The improved security situation is enabling the development of tourism.

Further reading

Guichard (1955), Simon (1965).

Fada Archei

Admin region Ennedi

Coordinates 17°00'N 22°24'E

Area 210,000 ha Altitude 500–1,000 m

TD002

A3 (A02, A03)

Faunal Reserve

Site description

Fada Archei is located in the Ennedi massif in the north-east of the country, south-east of the town of Fada. The reserve, on the transition of the Sahelian and Saharan zones, comprises a rocky ridge dissected

by deep, eroded gorges. Mean annual rainfall is less than 50 mm, mostly falling in July and August. A north-facing gorge, 1.5 km long, opens out of the escarpment and contains six large ponds connected by swampy strips. These are fed by permanent springs at the head of the gorge with a discharge rate of 600–700 m³ per day. The gorges contain dense riparian forest, with species such as *Acacia nilotica*, *A. seyal*, *Adina microcephala*, *Balanites aegyptiaca*, *Boscia angustifolia*, *Ficus* spp. and *Vitex doniana*. The pools are fringed by species of *Cyperus*, *Juncus*, *Phragmites*, *Scirpus* and *Typha*, while *Nymphaea* and *Potamogeton* spp. grow in them.

■ Birds

See Box and Table 2 for key species. Thirteen species of the Sahara–Sindian biome and 10 of the Sahel biome are known from the Ennedi as a whole, thus it is likely that further surveys will reveal more biome-restricted species from this site than currently are known.

Key species

- A3 (A02) Sahara–Sindian biome: 10 of the 15 species of this biome that occur in Chad have been recorded at this site; see Table 2.
 A3 (A03) Sahel biome: Six of the 16 species of this biome that occur in Chad have been recorded at this site; see Table 2.

■ Other threatened/endemic wildlife

Threatened mammals that occur, or used to do so till the late 1970s, at this site include *Panthera leo* (VU), *Acinonyx jubatus* (VU), *Addax nasomaculatus* (CR), *Ammotragus lervia* (VU) and *Gazella dorcas* (VU). There are 16 species of fish known from the Ennedi and Tibesti massifs, the majority of which are endemic—the following have been recorded from the vicinity of this IBA: *Barbus macrops*, *Coptodon zillii* and *Labeo tibestii*.

■ Conservation issues

The area, which is extremely isolated and largely undisturbed, was established as a Faunal Reserve in 1967, primarily to protect *Ammotragus lervia*. Nomads utilize the water-pools for domestic purposes and there may be some limited grazing. There is some threat of poaching from hunters who have access to sophisticated weaponry from the military station at Fada.

■ Further reading

Depierre and Gillet (1974), Gillet (1968).

Ouadi Rimé–Ouadi Achim

Admin region Batha

Coordinates 15°31'N 19°40'E

Area 7,795,000 ha Altitude 180–250 m

TD003

A1, A3 (A02, A03)

Faunal Reserve

■ Site description

The Ouadi Rimé–Ouadi Achim Faunal Reserve, one of the largest protected areas in Africa, is situated in the centre of the country and covers three major habitat-types, Sahelian wooded grassland, sub-desert grassland, and desert. The wooded grassland includes areas of fixed dunes separated by wadis and depressions. The vegetation of this habitat is characterized by annual grasses interspersed with trees such as *Acacia senegal*, *Balanites aegyptiaca*, *Combretum glutinosum* and *Boscia senegalensis*. Sub-desert grassland covers some two-thirds of the reserve. Characteristic grasses include *Aristida mutabilis*, *Chloris prierii* and *Cenchrus biflorus*, while the herbs *Limeum viscosum*, *Indigofera hochstetteri* and *Blepharis linariifolia* are also common. Trees, particularly *Acacia tortilis*, are concentrated in dune depressions. In the desert there is little permanent vegetation, but the hardy plant *Cornulaca monacantha* occurs in clumps on sandy soils. Topographically, the reserve is relatively featureless and, apart from one small area of volcanic outcroppings, there is little rocky country. The Goz Kerky is a long, largely continuous dune cordon which runs north–south through the reserve.

The site is bordered to the east by a series of 1,500 m high massifs, from which arise the series of parallel wadis which dissect the reserve. With their associated flood-plains, temporary pools and inundation zones, these wadis greatly enhance the topographical and biological diversity of the reserve. Rainfall is restricted to July–September. There is considerable variation in mean annual rainfall, both between the

north and the south of the reserve and between years at any one place. Thus, representative figures for the Sahelian wooded grassland are (e.g. at Abeché) mean annual rainfall 413 mm (range 105–980 mm), for sub-desert grassland (e.g. Arada) 205 mm (range 43–570 mm), and for desert (e.g. at Faya) 14 mm (range 0–73 mm).

■ Birds

See Box and Table 2 for key species. A total of 267 bird species have so far been recorded for the site. In addition to those mentioned below, the site also holds three species of the Sudan–Guinea Savanna biome; see Table 2. Thousands of migrant Palearctic waterbirds are reported to visit the wadis during the short rainy season.

Key species

- A1 *Neotis nuba*
 A3 (A02) Sahara–Sindian biome: 11 of the 15 species of this biome that occur in Chad have been recorded at this site; see Table 2.
 A3 (A03) Sahel biome: 12 of the 16 species of this biome that occur in Chad have been recorded at this site; see Table 2.

■ Other threatened/endemic wildlife

Threatened mammals include *Gazella dama* (EN, few), *Gazella dorcas* (VU) and *Gazella rufifrons* (VU). In addition, *Acinonyx jubatus* (VU) and *Addax nasomaculatus* (VU) used to occur but probably no longer do so, while *Oryx dammah* (EW) has certainly been extirpated.

■ Conservation issues

The Ouadi Rimé–Ouadi Achim Faunal Reserve was created in 1969 for the protection of the country's Sahelo–Saharan fauna. Although, in theory, one of the largest protected areas in Africa, it lacks any personnel or proper status in the field. As with many other parts of the Sahel, the major factor affecting this site is diminishing rainfall. This is particularly affecting the Sahelian wooded grasslands where the effects are exacerbated by human pressure for fuelwood and grazing pasture. The opening of new, deep wells has increased accessibility and, therefore, also grazing and hunting pressures. Hunting occurs over much of the reserve, by nomads with horses, dogs and nets, by the more affluent from vehicles and by military personnel, especially common during the civil war. In addition, for several years parties of falconers from the Arabian Gulf are said to have visited the area, as it still has relatively large populations of bustards and gazelles. These activities were recently brought to a halt, at least temporarily, due to public protest.

■ Further reading

Newby (1979, 1980), Scholte (2001).

Lake Chad

Admin region Lac

Coordinates 13°31'N 14°17'E

Area c.2,600,000 ha Altitude c.275–295 m

TD004

A1, A3 (A03), A4i, A4iii

Unprotected

■ Site description

During the twentieth century the extent of Lake Chad has fluctuated considerably as a result of cyclical drought and flooding. It has ranged from a surface area of almost 26,000 km² in June 1962 (Kindler *et al.* 1989) to 1,653 km² in April 1985 (Kusnir 1993). At its lowest level, the two basins have been physically separated by a dry ridge. The present lake is only a tiny remnant of the Paleo-Lake Chad, which first came into existence by tectonic subsidence 35 million years ago. There are three main types of habitat within the lake: islands of floating and rooted papyrus *Cyperus papyrus* and reeds *Phragmites* sp. and islands which are the tops of submerged dunes; extensive beds of reed-mace *Typha australis*, papyrus and other sedges around the shore; and areas of open water. The vast populations of migrant birds at Lake Chad are sustained in part by midges, the aquatic larval stage of which (together with other zooplankton and phytoplankton) are at the base of the food chain of the abundant fish population. Some 46% of the lake and its peripheral marshes are situated within Chad.

■ Birds

See Box and Table 2 for key species. Waterbird counts include 61,900 wildfowl (Anatidae) in 1984. In addition, three species of the Sudan–Guinea Savanna biome occur (see Table 2).

Key species

A1	<i>Prinia fluviatilis</i>		
A3 (A03)	Sahel biome: Nine of the 16 species of this biome that occur in Chad have been recorded at this site; see Table 2.		
A4i		Breeding (pairs)	Non-breeding
	<i>Ardeola ralloides</i>	—	1,335 (1986)
	<i>Plegadis falcinellus</i>	—	1,375 (1999)
	<i>Anas querquedula</i>	—	45,000 (1986)
	<i>Anas acuta</i>	—	58,500 (1986)
	<i>Dendrocygna bicolor</i>	—	61,029 (1999)
	<i>Sarkidiornis melanotos</i>	—	5,025 (1999)
	<i>Limosa limosa</i>	—	7,000 (1986)
	<i>Philomachus pugnax</i>	—	20,000 (1986)
	<i>Larus cirrocephalus</i>	—	1,400 (1986)
A4iii	More than 20,000 waterbirds occur regularly at this site.		

Other threatened/endemic wildlife

Mammals of global conservation concern that occur, or used to do so, include *Loxodonta africana* (EN), *Tragelaphus spekei* (LR/nt) and *Lutra maculicollis* (VU).

Conservation issues

There is currently no enforced regulation of the fishing industry of the lake and, as a result, there has been serious overfishing, including the use of nets of increasingly small mesh size. Stocks of the most important of the commercial fish species *Alestes baremoze* have been severely depleted since 1971. The populations of larger mammals around the lake have been affected by hunting, drought and increased competition and disturbance from domestic animals. In the dry season the exposed areas of the lake bed attract transhumant herders and their stock. Over 300,000 cattle and 100,000 sheep and goats grazed in the vicinity of the lake prior to the 1972–1975 drought. Recession cropping of sorghum on residual moisture is an important activity that annually yields an estimated 150,000 tonnes of grain. It is not known what effect, other than increased disturbance to wildlife, these activities have on the ecology of the lake. In 2000, the heads of state of the countries bordering Lake Chad declared their joint intention to reinforce protection of the lake. Efforts, supported by GEF and WWF, are under way to designate the lake as Ramsar Site in all four countries.

Further reading

Ash *et al.* (1967), Carmouze *et al.* (1983), CIRAD/EMVT (1996), Keith and Plowes (1993), Kindler *et al.* (1989), Kusnir (1993), Lévêque (1969), Roux and Jarry (1984a, b, 1986, 1987), Trolliet and Thal (1999–2000).

Lake Fitri

Admin region Batha

Coordinates 12°50'N 17°30'E

Area 195,000 ha Altitude c.290 m

TD005

A1, A4i, A4iii

Ramsar Site (unprotected)

Site description

Lake Fitri is located in the centre of the country, about 300 km east of N'Djamena. The normal maximum extent of the lake is about 50,000 ha, although it can double or triple in size in wet years; the area of the designated Ramsar Site is 195,000 ha. In addition, there are a number of permanent swamps around its normal margin of 150 km. The freshwater lake is normally shallow (several metres) and is fed by seasonal rainfall and run-off from a catchment area estimated at 70,000 km². The principal affluent is the seasonal Batha river which carries water from the Ouaddai massif to the east. The normally permanent lake may dry out during severe drought periods, such as occurred at the beginning of the twentieth century and again in 1984–1985 and (almost) in 1991. The lake supports vegetation characteristic of Sahelian wetlands which includes *Echinochloa stagnina*, *Vossia cuspidata* and *Nymphaea aquatica*, while seasonally flooded areas support woodland consisting of *Acacia nilotica* and *Mitragyna inermis* with a ground-cover of annual grasses and sedges.

Birds

See Box for key species. Waterbird counts have been made at Lake Fitri annually since 1984 and irregularly before that. As well as being important for Palearctic migrants, the lake also provides a drought

refuge for Afrotropical species. A total of 3,800 *Aythya nyroca* were counted in 1999. It is thought that the population of *Balearica pavonina* may exceed 2,500.

Key species

A1	<i>Aythya nyroca</i>		
A4i		Breeding (pairs)	Non-breeding
	<i>Ardeola ralloides</i>	—	3,060 (1998)
	<i>Platalea alba</i>	—	900 (1998)
	<i>Dendrocygna bicolor</i>	—	21,000 (1984)
	<i>Dendrocygna viduata</i>	—	24,800 (1987)
	<i>Anas acuta</i>	—	56,000 (1986)
	<i>Anas querquedula</i>	—	83,000 (1986)
	<i>Aythya nyroca</i>	—	3,800 (1999)
	<i>Balearica pavonina</i>	—	1,500 (1991)
A4iii	More than 20,000 waterbirds occur regularly at this site.		

Other threatened/endemic wildlife

Among mammals, the site is important for *Loxodonta africana* (EN) in the dry season, and *Gazella rufifrons* (VU) occurs, especially west of the lake.

Conservation issues

Lake Fitri was designated a Ramsar Site in 1990. Recent droughts have increased the dependence of both people and wildlife on Lake Fitri, thus increasing the potential for conflict over land and water resources between seasonal graziers and farmers engaged in permanent agriculture around the lake, as well as between people and wildlife. Up to 50,000 seasonal graziers and an estimated 160,000 cattle spend the dry season in the vicinity of the lake. The most significant potential threat to the site's ecological character, however, comes from the cumulative impact of small dykes and dams diverting seasonal run-off and river flow away from the lake. The lake also supports a productive fishery with an annual catch in excess of 3,000 tonnes, which is relatively well-managed because local attitudes, led by those of the sultanate, are sympathetic to conservation, and include a prohibition, generally respected, on the use of fishing nets.

Further reading

Jones (1993), Keith and Plowes (1993), Laboratoire de Farcha/DHV Consultants (1994), Scholte (1996, 2001), Trolliet and Thal (1999–2000).

Zakouma National Park

Admin region Guéra, Salamat

Coordinates 10°50'N 19°40'E

Area 300,000 ha Altitude c.410 m

TD006

A3 (A04) A4i

National Park

Site description

Zakouma National Park is located in southern Chad, to the west of the town of Am Timan, straddling the Am Timan–Sarh road. The park covers a 3,000 km² section of a vast flat plain crossed by meandering seasonal watercourses, the larger of which are bordered by gallery forest. The vegetation is largely wooded savanna dominated by *Combretum*, *Terminalia*, *Anogeissus* and *Leiocarpus* spp., interspersed with patches of denser woodland. The park includes extensive, open grassy flood-plains, particularly in the south, which are inundated during the wet season. These plains cover 500 km² and are dominated by the grasses *Vetiveria*, *Setaria* and *Paspalum* spp. Average annual rainfall is 890 mm, falling in the period between late April and late October.

Birds

See Box and Table 2 for key species. To date, 226 species have been recorded from the park which include *Circus macrourus* and two species of the Sahel biome (see Table 2). The site is also said to hold large numbers of pelicans, but no systematic waterbird counts have been made.

Key species

A3 (A04)	Sudan–Guinea Savanna biome: Nine of the 37 species of this biome that occur in Chad have been recorded at this site; see Table 2.		
A4i		Breeding (pairs)	Non-breeding
	<i>Balearica pavonina</i>	—	2,000 (1996)

■ Other threatened/endemic wildlife

The following species of threatened mammal occur: *Acinonyx jubatus* (VU), *Panthera leo* (VU), *Lycaon pictus* (EN), *Loxodonta africana* (EN) and *Gazella rufifrons* (VU).

■ Conservation issues

The area was originally protected as a Faunal Reserve in 1958, and was upgraded to a National Park in 1963. The park has received considerable foreign assistance since 1989 and has now been almost completely rehabilitated. The park is surrounded by the vast Bahr Salamat Faunal Reserve (20,600 km²) which, in theory, acts as a buffer zone, but does not have any status in the field. No major threats are currently known, although in the long term the issue of livestock intrusion remains to be addressed, as the ever-increasing number of pastoral wells continue to open up this relatively remote area. The park is currently benefiting from an EU-financed conservation project which includes regional planning. The distance of the park from the capital has, however, hampered the development of tourism, especially since Zakouma has to compete with the more accessible parks in northern Cameroon.

■ Further reading

Dejace (1995), Dejace *et al.* (2000), Gillet (1969).

Binder–Léré

Admin region Mayo-Kébbi

Coordinates 09°40'N 14°28'E

Area 135,000 ha Altitude 400–500 m

TD007

A3 (A04)

Faunal Reserve

■ Site description

Binder–Léré Faunal Reserve is situated in south-west Chad, on the border with Cameroon. The area is essentially rocky with eroded soils. The reserve lies in the transition zone between open forest and savanna woodland and is dominated by leguminous tree species in the south and by *Combretum* woodland in the north. The savanna is characterized by shrubs of the genera *Anogeissus* and *Boswellia*. The Mayo-Kébbi river flows from east to west through the reserve. Included in the reserve are both the Gauthiot Falls and, towards its western end, Lakes Léré and Tréné, through which the Mayo-Kébbi flows, before continuing westwards into Cameroon and Nigeria to join the Niger river system. Lake Léré is 14.5 km long by 4 km wide while Tréné is 6 km long and 2 km wide. Near the headwaters of the Mayo-Kébbi, just outside the reserve, there is a vast plain containing the Touboiris and Loké marshes. Mean annual rainfall is between 800–950 mm.

■ Birds

See Box and Table 2 for key species. In addition, *Falco naumanni* has been recorded (status is unknown), as have two species restricted to the Sahel biome (see Table 2). Although no counts have been made, it is believed that Lakes Léré and Tréné are important for migrant Palearctic waterbirds.

Key species

A3 (A04) Sudan–Guinea Savanna biome: Six of the 37 species of this biome that occur in Chad have been recorded at this site; see Table 2.

■ Other threatened/endemic wildlife

Threatened mammal species include *Trichechus senegalensis* (VU).

■ Conservation issues

The reserve was established in 1974. There are many villages and much associated cultivation (millet, ground-nuts and cotton), both surrounding the reserve and within its western part. Illegal hunting, particularly by raiders from Cameroon, is severe. In the 1980s the population of *Trichechus senegalensis* was estimated to be about 100, was subsequently reduced by poaching, but is said to have increased recently. With the start of a natural-resources management project, financed by GTZ, in south-west Chad, interest in the area has risen again. The project is attempting to stimulate faunal protection and has recently set up a wildlife monitoring system using village guards.

■ Further reading

Dejace (1995, 1996), IUCN (1987), Keith and Plowes (1993), Roux and Jarry (1984a), Vieillard (1971).

Manda National Park

Admin region Moyen-Chari

Coordinates 09°25'N 18°05'E

Area 114,000 ha Altitude c.362–452 m

TD008

A3 (A04)

National Park

■ Site description

Manda National Park is located in central-southern Chad, to the north-west of the town of Sarh, bounded on its south-western side by the Sarh–N'Djamena road and on its north-eastern side by the Chari river. The park consists mainly of woodland-savanna and grassy flood-plain. Patchy stands of dense woodland and fringing vegetation, dominated by *Isobertinia* and *Monotes* spp., are found along watercourses and around marshy pools. The banks of the Chari, on the north-eastern side of the park, are seasonally inundated following rainfall which starts towards the end of April. Average annual rainfall is approximately 1,100 mm.

■ Birds

See Box and Table 2 for key species. An estimated 30–40 *Struthio camelus* occur.

Key species

A3 (A04) Sudan–Guinea Savanna biome: 11 of the 37 species of this biome that occur in Chad have been recorded at this site; see Table 2.

■ Other threatened/endemic wildlife

Threatened mammal species include *Lycaon pictus* (EN).

■ Conservation issues

Manda was originally established as a Faunal Reserve in 1953, and upgraded to a National Park in 1965. The original purpose of the reserve was to conserve a population of *Taurotragus derbianus*, but the species is now extinct at the site, although it still occurs in the Goundi region, west of Manda. Large-mammal populations have shrunk to low levels, although *Lycaon pictus* are still thought to occur. Large numbers of domestic animals invade the park during the dry season. The vegetation is, nevertheless, still thought to be relatively intact. A French-financed conservation project has been in operation since the mid-1990s, considerably improving protection of the park.

■ Further reading

Chai (1996), Keith and Plowes (1993), Scholte (2001).

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