

## 3.11 NIGER

### Introduction

Niger is a landlocked country bounded by Nigeria and Benin in the south, Burkina Faso and Mali in the west, Algeria and Libya in the north, and Chad in the east. It has an area of 1 186 410 km<sup>2</sup>, a population of 6 040 000 (1983) and therefore, a mean population density of 5 persons/km<sup>2</sup>. 20% of the population are nomads and less than 5% live in towns. The population is heavily concentrated along the southern border where 70% of the people live. Niger spans 15°51' of longitude between 0°09'E and 16°00'E, and 11°53' of latitude between 11°37'N and the Tropic of Cancer (23°30'N).

The lowest land, below the 200 m contour, penetrates the country in the extreme southwest along the valleys of the Niger River and its affluents. Most of southern Niger is a sandy plateau, 200 -500 m asl, with lowlands around Lake Chad in the southeastern corner. The Mr Mountains, a chain of isolated massifs, reach southwards into the country from Algeria as an extension of the A'Haggar Mountains. The interior plateau of Niger, 400-700 m asl, is part of the Precambrian granitic shield, and is a peneplain, topped in the Mr region by a number of roughly circular table mountains covered by recent (Pleistocene) basalts. These, from south to north, are the Ates, Fadei, Adrar Tamgak, Taghmer, Agueraguer, Takolokouzet, Goundj, Mazel, Adrar Egalah, Angour-n-Akau and Bagzane Table Mountains. The highest point in Niger, 2022 m asl is reached here (17°54'N/8°45'E), on Bagzane Mountain, while a point on the Adrar Tamgak (19°03'N/8°34'E) rises to 1988 m asl. Another peak on the Fadei reaches 1944 m asl and there are half a dozen peaks over 1750 m asl. Outliers of the Air Mountains reach almost to the central southern border, while another small outlier is situated at 17°30'N adjacent to the western border with Mali.

Farther east, a highland block comprising the Mangueni Plateau and its extension, the Djado Plateau, reach south from Libya, onto the interior peneplain which here lies at 450 m. The plateau rises abruptly above the plain by steep scarps which reach a maximum altitude of 1054 m on the western side of the Mangueni Plateau. These highlands occupy the northeastern corner of the country with their southern edges reaching the 20th parallel, but with a lower narrow ridge, reaching 575 m, running due south to the 18th parallel. The cliffs of Kaouar form the western side of this ridge which dips gently to the desert in the east.

Niger is a desert country, the only perennial watercourses being the Niger River, which crosses the southwestern extremity from Mali into Nigeria, and the Gada, which loops briefly into southern Niger from Nigeria. This latter stream is part of the Niger drainage system. Drainage of the western part of Niger is by intermittent streams to the Niger River, while the eastern part drains to Lake Chad, also by intermittent and ephemeral streams. However, there are a number of oases in the interior.

## **Climate**

Niger is one of the hottest countries in the world but the northern interior is characterised by extreme temperature fluctuations. For example, at stations in the Mr Mountains absolute maxima and minima of +50°C and -31°C have been recorded. The mean maximum temperature of the warmest month at Niamey (13°31'N/2°07'E), on the Niger River in the southwest, is 34°C, while that of the coolest month is 25°C. The absolute maximum recorded at this centre is 46°C and the absolute minimum 8°C. The mean maximum of the warmest month at Nguigmi (14°15'N/13°07'E) in the southeast, on the north shore of Lake Chad, is 32°C, while the mean maximum of the coolest month is 21°C. In passing north, comparable figures are 34 and 25°C for Tahoua (14°54'N/5°16'E); 33°C and 20°C for Agadez (16°58'N/7°59'E); and 33°C and 17°C for Bilma (18°41'N/12°56'E).

Precipitation decreases in passing north and east, and there is no assured rainfall north of Agadez. Bilma has a mean annual rainfall of 26 mm, but some years may be rainless. Agadez has one wet month, August, during which some 125 mm of rain fall each year, over an average of 18 days. There are two wet months at Nguigmi (July and August) where the mean annual rainfall is 235 mm, with 141 mm in August and about 25 rainy days each year. There are three wet months at Tahoua, July-September, and here annual totals are over 400 mm with 40 rainy days each year. Mean annual rainfall is close to 650 mm at Niamey and over 800 mm at Gaya (11°53'N/3°27'E) in the extreme southwest. Gaya is the first place to receive rains as the intertropical convergence moves north each year, and the last place to lose the rains as it retreats south some 5 months later.

## **Vegetation**

The south of the country is occupied by Sahelian savanna, with small, gnarled and thorny trees and bushes. Taller savanna woodland with *Adansonia digitata*, *Ceiba pentandra*, *Tamarix* spp., and some *Borassus* and *Hyphaene* palms is found in the southwest, with gallery forests along the Niger. The centre supports steppe vegetation and the north is virtually unvegetated, except for ephemerals which appear after rain. In the gorges of the Mr Mountains areas of moist sand and semi-permanent ponds support oasis vegetation. Here *Phragmites australis*, *Typha latifolia*, *Scirpus holoschoenus* fringe ponds (gueltas) and marshy streamlets, with *Acacia nilotica* and *Tanzarix gallica* behind. There seems good reason to believe that the original arborescent vegetation of many oases comprised *Acacia nilotica*, *A. seyal*, *A. tortilis*, *Ficus sycoïnorus*, *Hyphaene thebaica*, *Maerua* sp. and *Tanzarix* spp., with *Citrullus colocynthis* and *Capparis* spp., but this has largely given way to plantations of *Phoenix dactylifera*. Relict stands of native vegetation do however persist in some sites.

## **Wetlands**

The Niger flows for 570 km across the southwestern corner of Niger, over which distance it floods its banks only very locally, while a narrow floodplain occurs along

the loop of the Gaba (Korama) River in central southern Niger. In a few places rain water collects in shallow basins to form semi-permanent lakes or ponds. Other wetlands are known as dallols, gulbis and koris. These are all fossil watercourses, but a dallol consists of moist sands over which surface flow may very rarely occur and in which there may be occasional pools. A gulbi has moist sands and a regular annual surface flow; it is thus an intermittent watercourse, but it may never flow as a continuous river from source to sink. A kori is a predominantly rocky watercourse, such as is found on flanks of mountains and escarpments, and flows only intermittently following rain. In places, a fall as light as 5 mm will set the koris flowing, even after prolonged drought, because the impermeability of the local rocks produces rapid run-off.

### List of Wetlands Described

1. Wetlands of the Niger Valley
2. Wetlands of the Korama & Komadougou Yobe Systems
3. Natural Lakes
  - (a) Lake Chad
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4. Fossil Watercourses
5. Oases
  - (a) Oases of the Mr Mountains
  - (b) Oases of the Djado, Kaouar & Fachi Massifs

### 1. Wetlands of the Niger Valley

**General:** The bed of the Niger is wide and island studded north of Tillaberi (14°13'N/1°27'E), but becomes constricted downstream. However, two short flood-plains occur, one above and one below Gothêye (13°52'N/1°35'E). The upper floodplain is 12 km long and the lower one 5 km long. Neither exceeds 1 km in width. Another floodplain stretches along the river for 33 km between 12°03' and 12°15'N. Here the river is shallow and over 1.5 km wide. Finally a floodplain develops below Gaya (11°53'N/3°27'E), some 13 km wide, and extends into Nigeria. This wetland develops at the confluence of the Niger and the Dallol Maouri, and extends for several kilometres up the valley of the Maouri.

**Flora & Fauna:** Gallery forest, typical of the Soudanian zone, extends along the Niger containing such species as *Anogeissus leiocarpus*, *Balanites aegyptiacus*, *Borassus aethiopunz*, *Cola laurifolia*, *Diospyros mespilifornzis*, *Mitragyna inernzis*, *Parkia biglobosa*, *Tamarindus indica*, *Terminalia avicennioides* and *Vitex chrysoclada*. The large mammal populations close to the Niger are typical of Soudanian savannas, as described in the regional introduction, but have been intensively hunted and most survive only in the National Park and Nature Reserve on the river.

**Human Impact & Utilisation:** Some rice and other crops are grown on the floodplains and cattle are grazed on them. Rice is chiefly produced in the Tillaberi district. The river is fished intensively along its entire length in Niger. Timber for construction purposes and for fuel is constantly harvested from the gallery forests, especially *Borassus aethiopum* which is used for construction. *Andropogon gayanus* which grows on the flooded areas is used as a thatching material.

**Conservation Status:** The floodplains as such are unprotected. However, a section of the Niger is protected in the National Park du 'W', upstream of which for some 35 km the right bank is protected in the Tamou Nature Reserve. In both of these reserves the landscape is deeply dissected by tributaries of the Niger and all these have minor floodplains and strips of gallery forest subject to seasonal inundation.

## 2. Wetlands of the Korama & Komadougou Yobe Systems

**Country:** Sierra Leone

**General:** The Korama River enters Niger at a point 9°32'E and then flows north, west and south in a crescent, leaving the country at a point 8°28'E. The river has a floodplain over the entire distance of 125 km, but this is barely 0.5 km wide and is inundated for only 4-6 weeks of each year.

The floodplain and swamps on the Komadougou Yobe have been described in some detail in section 3.12 Nigeria, in which country they mostly lie. However, in the lower reaches of the river, near Lake Chad, the floodplain extends north of the border into Niger, from a point 12°29'E to a point 13°22'E where the river enters the lake. Over this distance the width of the floodplain in Niger is generally 0.5 km or less, but locally patches of inundation cross the border for up to 2.5 km.

**Human Impact & Utilisation:** Cattle are grazed on the floodplains and recession agriculture is practised locally. The rivers are fished.

**Conservation Status:** Unprotected.

## 3. Natural Lakes

### (a) Lake Chad

**Country:** Niger

**Coordinates:** 12°29' -14°29' N/13°02' -15°21' E

**Area:** 2 500 000 ha at high water (421 250 ha in Niger)

**Altitude:** 282 m asl (when lake surface covers 2 000 000 ha)

**Nearest Towns:** Nguigmi (on lake); Niamey (612 km W)

**General:** Some 421 250 ha of Lake Chad and its peripheral marshes is situated in Niger. The lake is shallow with many emergent sand ridges, and the shoreline, which is highly indented, is more than 225 km long, although the straight line distance along the shore is approximately half of this. Reed-clad marshes fringe the shore in a belt up to 6 km deep and cover some 42 000 ha. A detailed account of the lake is given in section 3.3 Chad.

**Hydrology:** The lake water is well mixed and well oxygenated, and has a salinity of

less than 1%. The lake is endorheic and occupies part of a great inland basin of more than 2 500 000 km<sup>2</sup>. The basin and lake are very shallow, explaining why the surface area of the lake is so variable. Rainfall presently averages about 300 mm/yr over the basin, and is greatly exceeded by evaporation which has been estimated as 2000 mm/yr. Of the total riverine inflow, 95% comes from the Logone/Chari system, the catchments of which lie in the humid highlands of Cameroon, Chad and the The Central African Republic, and represent about 25% of the total catchment. The contribution of the El Beid River is minimal, possibly 2.5% of the total inflow, while the remaining 2.5% is contributed by the Komadougou Yobe, Yedseram, Ngadda and several ephemeral streams. A brief account of the hydrology, geomorphology and history of the lake is given by Beadle (1981) who refers to more detailed studies.

**Flora & Fauna:** As described in the regional introduction, but see the account in Section 3.3 Chad.

**Human Impact & Utilisation:** The lake is fished intensively from the town of Nguigmi on the northern shore. We have no details of the catches landed at this port in recent years but it is estimated that an annual catch of 10 000 tonnes should be sustainable .

**Conservation Status:** Unprotected.

#### **(b) Other Lakes**

**Country:** Niger

**General:** There are small lakes at Kelta (14°46'N/5°46'E), Madarounfa (13°18'N/7°09'E) and Guidimouni (13°42'N/9°30'E). The lake at Madarounfa is situated in the Maradi Gulbi. All are small lakes with surface areas of a few hectares to a few tens of hectares.

**Human Impact & Utilisation:** Water from all these lakes is used for domestic purposes and some crops are cultivated on the banks.

**Conservation Status:** Unprotected.

### **4. Fossil Watercourses**

**General:** The fossil watercourses are relics of a former pluvial age. The principal system runs southwestwards in a great arc from the Mr Mountains to join the Niger in the Dallol Bosso, while the Dallol Maouri, a little to the east, represents a subsidiary system. The Dallol Bosso is 775 km long, but is discontinuous over stretches of 30- 125 km in its middle course. The lower 375 km are continuous, with a damp sandy floor 15 km wide in places. There are occasional waterholes towards the junction with the Niger. In the upper course the system is dendritic, clearly draining the southwestern part of the Mr Mountains with dallols (barren watercourses with humid sands) converging from 140 km north and 200 km south, to meet at the upper end of the Dallol Bosso. The entire system probably comprises 750 000 ha.

Other strips of damp sand (14°26'-15°49'N/11°32'-13°00'E) and (14°19'-14°56'N/10°42'-11°46'E) are oriented NW-SE, and represent a former course of drainage from the Massif de Termit to Lake Chad. These cover 376 000 and 113 700 ha respectively. Another such area (18°42' -19°25' N/12°53'E) is situated 6 km north of Bilma covering 28 000 ha. It is oriented due N-S and lies immediately under the N-S scarp of the Kaouar for 75

km. Here there are springs in the cliffs, dealt with under oases (below).

Further patches occur at the northern extremity (23°08'N/12°00'E and 23°30'N/11°48'E), extending into Niger from Algeria. They are situated immediately beneath the scarp at the western side of the Plateau of Mangueni, occupying 9000 ha and 25 000 ha respectively, and are again associated with springs.

**Flora & Fauna:** The banks or fringes of the dallols are green, with stunted riverine trees, grasses and sedges.

**Human Impact & Utilisation:** Crops are grown in the moist sands of some of these systems and the waterholes are utilised by nomads for domestic water supplies.

**Conservation Status:** Unprotected.

## 5. Oases

### (a) Oases of the Air Mountains

**Country:** Niger

**General:** Any site at which freshwater occurs in the desert may be referred to as an oasis. The drainage of past pluvial times has deeply gullied the edges of the table mountains of the Air Massif and the canyons so formed provide good sites for the conservation of surface water. The watercourses, entrenched in canyons are known as koris and gueltas (standing ponds), and springs are found in most of the deeper canyons of the massif. For example, the table top of Bagzane Mountain is 1500 m asl and 750 m above the surrounding plain. The scarp walls fall very steeply to this plain, and a number of gorges appear as near vertical incisions in them, such as Nabarou Canyon (17°39'N/ 8°49'E). This is very narrow and contains a permanent pond several hundred metres long and a few metres wide. Farther north, Ighalabelabene Canyon (17°42'N/8°49'E), which is more open at the top, supports a string of small springs and ponds along its length. The spring water is slightly brackish. A dry lake bed (egharghar) is situated on the flat top of the mountain, containing a thick layer of sediment with fossil molluscs, 5000-10 000 years old. Drainage from the Nabarou and Ighalabelabene Canyons merges on the peneplain in a dallol which supports woodland, but this, together with the water supply, is quickly attenuated in passing downstream. Similar streams and gueltas occur on the other mountains of the Air Massif, but Bagzane, being the most southerly, is the wettest with a mean annual rainfall of 170 mm. Rain is heavily concentrated in the July-September period, and the watercourses begin to flow after falls of 5 mm. Rainfall is subject to great annual variations, and in dry years little more than 100 mm may fall on Bagzane, while over 250 mm fell in 1978.

A permanent stream and gueltas occur near the headwaters of the Kori Timia (18°06'N/8°46'E) which drains the southeastern flank of the Adrar Egalah Mountain. A fault across the bed of the watercourse has caused water to be diverted and it has subsequently eroded a narrow channel through the basalt rock. Finally the stream descends by a waterfall to a circular guelta, 30 m in diameter. Farther downstream in the canyon there are numerous little cascades with plunge pools at their feet. The waters

are fresh, but the lowest pools tend to dry up periodically and are thus slightly saline. However, several floods occur each year and flush them out so that salinities are never high.

A number of deep gorges have been cut in Adrar Tamgak, one of the central eastern mountains. Here the table top is situated 1600 m asl and the surrounding Tenere Plain is almost 1000 m lower. The largest gorge, that of the Kori Tamgak, is crescent shaped, and runs from east to west across the mountain. It receives several tributary canyons en route to the western edge, towards which it is sometimes labelled Ougourou on maps. In traversing the outer and more gentle slopes of the mountain it widens to about 2 km and has a wet and wooded floor. Upstream in the mountain the complex of canyons supports at least 50 ponds, with numerous cascades and plunge pools, but the streams flow only intermittently, except in depressions where the groundwater flow comes to the surface. Being farther north than Bagzane, precipitation is much lower, 63 mm/yr at the nearby settlement of Iferouane (19°04'N/8°25'E). Here an absolute minimum temperature of 1.5°C has been recorded and July temperatures regularly exceed 41°C.

**Flora & Fauna:** The natural vegetation of these desert wetlands is as described for oases in the regional introduction. Emergent macrophytes are scarce at Nabarou, but *Phragmites* and *Typha* fringe some gueltas, and species of *Juncus* and *Scirpus* occur locally. *Potamogeton* spp. are the principal submerged plants. Those trees and palms typically associated with desert watercourses are abundant, especially near Iferoufine.

A mollusc, *Bulinus truncatus*, is found in the Bagzane gueltas and is abundant at Timia where the local population suffer from bilharzia. Mosquitoes are a problem in every gorge, and settlements tend to be on the mountain plateaux to avoid them. At least two amphibians are present in the Air Mountains. *Bufo regularis* occurs in the vicinity of most ponds, and *Tomopterna cryptotis* has been recorded at a number of sites. *Varanus niloticus* is locally abundant and there are some unidentified rodents.

**Human Impact & Utilisation:** There is a settlement on the top of Bagzane Mountain and the people from it travel down to the plain regularly, using the Ighalabelabene Canyon. They trade with the settlement at Tabelot. The spring at Thagar is dammed and used for small scale irrigation, but otherwise the gueltas are not interfered with.

**Conservation Status:** Unprotected.

## **(b) Oases of the Djado, Kaquar & Fachi Massifs**

**Country:** Niger

**General:** There are other oases at Chirfa (20°56'N/12°20'E) and Sara (20°47'N/12°28'E), on the western side of the Djado Plateau, while a string of springs runs along the foot of the Kaouar Cliffs (18°00'-20°00'N/12°54'E). Settlements have also grown up around these, the principal ones being at Bilma (18°40'N/12°53'E), Dirkou (19°01'N/12°54'E), Achènouma (19°07'N/12°54'E) and Emi. Tchouma (19°17'N/12°54'E). An isolated oasis occurs at Fachi (18°00'N/11°36'E) where there is a hilly outcrop, reaching 179 m above the Tenere Plain which is 400 m asl in that vicinity.

The springs at these places are principally fed by underground aquifers, and the discharge from those at Bilma increases noticeably 3-4 weeks after the onset of rains in the Tibesti

Mountains to the northeast.

**Flora & Fauna:** The natural vegetation of all the oases has been largely replaced by plantations of *Phoenix dactylifera*.

**Human Impact & Utilisation:** The natural springs along the Kaouar Cliffs have been augmented by numerous wells. Using deep boreholes, an artificial lake was created at Dirkou, and in 1981 a deep bore at Bilma began to discharge and to inundate the surrounding depression, and could not at first be stopped. In addition to date production, some horticulture is carried out at all oases, and camels and goats are kept at them. Some salt is extracted from artificial saline pools at Bilma.

**Conservation Status:** Unprotected.