

REGION 1

NORTH WEST AFRICA

Algeria	Morocco
Libya	Tunisia
Mauritania	Western Sahara

Introduction

The region covers more than 5 896 000 km² and lies in major part, north of the Tropic of Cancer. It spans 42°18' of longitude and 22°35' of latitude, extending approximately 4540 km from west to east, between a headland on the Mauritanian coast (17°09'W) and a point on the Gulf of Salm (25°09'E) where Libya and Egypt meet, and 2480 km from north to south between the Senegal River (14°46'N) and Cape Blanc (37°20'N) on the Mediterranean Sea. Very large areas are uninhabited, and the mean population density over much of the interior is less than 1 person/km².

All constituent countries have extensive coastlines. Mauritania and Western Sahara adjoin the Atlantic Ocean, Morocco has both Atlantic and Mediterranean coasts, while Algeria, Tunisia and Libya border the south central Mediterranean Sea. The coastal plain is very wide in Senegal where the 100 m contour is generally more than 100 km inland and the 200 m contour up to 400 km inland, but it narrows in Western Sahara. Here the 100 m contour approaches to within 10 km of the coast in places and the 200 m contour to within 75 km. From Western Sahara, in passing northeast, the coast is locally of very high relief. The Anti-Atlas Range reaches the Atlantic Ocean south of Agadir (30°30'N/9°40'W) while the High Atlas reaches it to the north of this town. Thereafter a narrow coastal lowland is continuous from Essaouira (31°30'N/9°48'W) to the Mediterranean Sea, but along the Mediterranean coast between Tanger (35°48'N/5°50'W) and Tunis (36°50'N/10°13'E), where the Atlas Mountains lie parallel to the coast, the lowland plain is periodically interrupted by hills and rocky headlands. A broad coastal plain is once again manifest around the Gulf of Sirte, the head of which leads into a huge coastal basin lying below the 100 m contour. This, in the far east of the region, dips below sea level and then leads into the Qattara Depression (133 m below sea level) of Egypt.

The southern beaches, of Mauritania, Western Sahara and southern Morocco are sandy and influenced by a strong longshore drift. The Canary Current which flows southwestwards off the coasts of Morocco and Western Sahara is cold, discouraging the growth of corals and mangroves.

The interior of the region lies mostly between 500 and 1000 m asl with high points being

reached in the A'Haggar (Hoggar) Massif of southern Algeria and in the Atlas Mountains. In the A'Haggar, Mt. Tahat ($23^{\circ}18'N/5^{\circ}31'E$) rises to an altitude of 2918 m asl and Mt. Ser Kaut ($23^{\circ}32'N/6^{\circ}47'E$) to 2906 m. However, the most lofty peaks are those of the complex of the Atlas Mountains, which reach 4165 m asl at Jbel Toubkal ($31^{\circ}03'N/7^{\circ}55'W$) and 4071 m asl at Irhil M'Goun ($30^{\circ}30'N/6^{\circ}26'W$) in Morocco. The Rif Atlas extends eastwards from Tanger to the Molouya River, on the far side of which it continues into Tunisia as the Tell Atlas. In places another distinct range, the Maritime Atlas, occurs between the Tell Atlas and the sea. The High Atlas extends from Agadir, ENE through Morocco to Algeria where it is sometimes called the Saharan Atlas. In Morocco the Middle Atlas diverges from the High Atlas, in a northeasterly direction, while the Anti-Atlas diverges WSW. This latter range is separated from the main range by the alluvial Sous Plain towards the coast and is joined to it by the volcanic formations of the Djebel Siroua (3304 m) in the east. The whole Atlas Complex is aligned roughly parallel to the coast for 2250 km from southern Morocco to western Tunisia.

Drainage from the Atlas complex is either to the coast or to the interior. Those rivers which reach the sea in southern Morocco, from outliers of the Atlas Mountains, are intermittent, but all the major streams north of Tan Tan ($28^{\circ}30'N/11^{\circ}02'W$), where the Oued Dra reaches the sea, are perennial, though extremely seasonal in their discharge rates. All the Atlas rivers may be torrential in the winter after rain, while in the summer many are reduced to the merest trickles. For example, flow in the Moulouya River, which enters the Mediterranean Sea ($35^{\circ}08'N/2^{\circ}22'W$) east of Mellila, regularly peaks at over 991 m³/sec in the winter but falls to less than 5 m³/sec in the summer.

South of the Atlas Mountains numerous intermittent streams discharge into salt pans or disappear under the sands of the Erg Iguidi and the Grand Erg Occidental. The largest watercourse draining to the interior, the Oued Saoura, is perennial in its headwaters above Meridja ($31^{\circ}30'N/2^{\circ}58'W$), and below this place traverses a series of wadis and pans for 700 km, before terminating in vast pans in the desert south of Reggane ($26^{\circ}42'N/0^{\circ}13'E$). Water flows 500-600 km southwards in this watercourse every year, and it is in consequence one of the most important trans-Saharan caravan routes.

Drainage from the A'Haggar Massif is radial, with numerous wadis leading out into the desert. Most of these contain areas of moist sand, under which there is often subterranean water, but there is seldom any surface flow. The most spectacular wadis are on the south side of the massif, leading from the highest peaks, out of the region into Niger. Others lead southwestwards towards Mali. Yet others lead northwest to the great Tidikelt Depression (14 300 km²) in southern Algeria, on the floor of which are huge salt pans known as the Sebkra Mekerrhane and Sebkra Azz el Matti.

There is ample evidence to indicate that the present extreme aridity of the Sahara has developed comparatively recently. The last pluvial phase ended some 5000-8000 years ago, prior to which the central Sahara was well watered and populated. Large lakes existed there and rivers flowed freely. Rock paintings and fossils tell of the widespread occurrence of the genus *Hippopotamus*, and harpoons and the skeletons of fish are common in some central regions. For further information on this subject see Monod (1963), Faure (1967, 1969), Hugot (1974) and Beadle (1981).

Drainage of southern Mauritania is to the Senegal River which forms both the southern national border and the boundary of this region. However, drainage of central and northern Mauritania is dictated by a parallel series of sand dunes oriented NE-SW which reach from the interior to the sea. The inter-dune valleys carry feeble intermittent streams. These seldom flow over their full lengths at any one time, and most do not enter the sea directly but terminate in coastal marshes behind the dunes at the back of the sandy sea beaches.

Climate

This region is part of the largest arid area in the world. The interior, where it is not mountainous, is dominated by the stone and sand deserts of the Sahara, together with many large dry saline areas. Mean annual rainfall over 90% of the region is less than 100 mm. High pressure prevails over the interior during the northern winter at which time winds blow towards the southwest and northeast off the desert. They are hot, dry and dusty, but a stream of humid westerly air from the Atlantic penetrates along the northern coasts at this time, and brings rain to the coastal fringe. The highest falls are recorded in the Atlas Mountains, where very locally they may amount to 2000 mm/yr, but generally they are far less than this. The coastal strip receives between 100 and 1000 mm/yr.

Mean annual rainfall is 350 mm over the Senegal River Delta, but decreases progressively in passing northwards up the Mauritanian coast. At Tan Tan (28°30'N/11°02'W) in southern Morocco it is 97 mm, but from here on it begins to increase again. At first, what little rain there is, is received fairly evenly throughout the year, but as the Mediterranean is approached, the winter months become more distinctly wet and the summer months more distinctly dry. Proceeding up and around the coast from Tan Tan, Agadir (30°30'N/9°40'W) receives 224 mm, Safi (32°18'N/9°20'W) 327 mm, Casablanca (33°39'N/7°35'W) 406 mm, Tanger (35°48'N/5°50'W) 887 mm, Alger (36°50'N/3°00'E) 762 mm, Cape Bougaroun (37°01'N/6°30'E) 1038 mm, Bizerte (37°18'N/9°52'E) 625 mm, Jerba Island (33°49'N/ 10°52'E) 207 mm, and Tarabulus (32°54'N/13°11'E) 371 mm. At Tarabulus (Tripoli) mean monthly falls of 100 and 90 mm are recorded in December and January respectively, but July and August are rainless.

Inland, at an altitude of 470 m asl on the northwestern slopes of the High Atlas, Marrakech (31°38'N/8°00'W) has a mean annual rainfall of 253 mm. Here, some rain falls every month, but in no month does the mean exceed 50 mm. Precipitation is however, greatest in November and March and lowest in July. At greater altitude (830 m) and farther north, Khenifra (23°00'N/5°40'W) receives 627 mm of rain/yr and no month is totally rainless. By contrast, the southeastern side of the mountains is in a rainshadow and falls are much lower. Here, at 1117 m, Ouarzazate (30°57'N/6°50'W) has a mean annual receipt of 107 mm, and Midelt at 1501 m (32°41'N/4°43'W) receives only 229 mm/yr. Farther east, and still in the rainshadow, at an altitude of 767 m asl, Laghouat (33°49'N/2°55'E) has a mean annual rainfall of 167 mm.

During the northern summer the Azores anticyclone produces a northerly airstream over almost the entire North African region, but although this crosses the Mediterranean, it is a dry stream and brings virtually no rain. These northerly winds cross the Tropic of Cancer and

penetrate southwards to the intertropical convergence zone which reaches a northerly limit of about 22°N in July.

Potential evaporation is extremely high throughout the region. The dry winds from the interior, which are known as chergui when they reach the northern coasts, may raise daytime temperatures in the Atlas Mountains to 40°C. Temperature regimes are less extreme at the coast than in the mountains and desert, where frosts may occur at night and diurnal fluctuations of 45°C are not uncommon. Absolute maxima in excess of 50°C have been recorded at several interior stations. The High Atlas is snowcapped in the winter, above 1980 m, but the snow does not usually persist throughout the year.

Wetlands

Mangroves reach their northern limit on the West African coast north of Tidra Island in Mauritania (19°40'N/16°20'W). This is due both to the influence of the cold Canary Current which becomes manifest north of Nouadhibou (20°54'N/17°01'W), and to the lack of coastal alluvium occasioned by the great aridity of the hinterland. Mangroves do not grow where the inshore waters are cold throughout the year, and they are never well developed in the absence of abundant alluvium. Salt-marsh vegetation occurs behind the mangroves in Mauritania, and thereafter has localised distribution up the Atlantic coast of the region, and is well developed on the Mediterranean coasts, especially in Tunisia and Libya.

Brackish herb swamps and marshes are well developed behind the barrier beaches all the way northwards from the Senegal River Delta to Tarfaya (27°58'N/12°55'W) in southern Morocco. Many rivers draining the Atlas Mountains overflow their banks on the coastal plain during the winter, creating wetlands. The great plain of Rharb, at the foot of the Rif Mountains between Tanger and Khenitra, has been built from alluvium deposited by floods of the Oued Sebou. Other floodplains occur on the Sous and Tensift Rivers. There are numerous natural lakes and some impoundments in the Moroccan Atlas, and in Algeria and Tunisia, the extensive inland salt-marshes of the chotts.

In the Sahara strips of sandy soil along the thalwegs of some watercourses may remain moist for considerable periods after rain and there may be supplies of subterranean water. Such places support perennial vegetation. The river or stream which flows in such a water course is known as an oued, but the watercourse *per se* may also be referred to as an oued in the western Sahara, or a wadi in the eastern Sahara. Gueltas are semi-permanent pools which form on watercourses in canyons in massifs like the A'Hagggar and Tibesti, and on the edges of escarpments like the Adrar. Springs occur at faults on the walls and floors of such gorges, or sometimes at the feet of dunes which have intruded into them. Any site of permanent water in the desert can be described as an oasis. Some oases, deriving their waters from subterranean aquifers, may be situated several hundreds of kilometres from their catchments.

Vegetation

The native forests of Mediterranean North Africa have largely been destroyed, but vestiges of them persist in the mountains. Elsewhere scrub prevails in uncultivated parts of

the coastal strip. On the southern slopes of the Atlas Mountains, montane vegetation gives way sequentially to steppe, xerophytic scrub and finally to desert. The several types of wetland vegetation are rather uniform across the region and each is described here, although complementary notes are given in the national accounts where the situation merits it. Some of the inland sites, wadis, chotts and oases have plants with maritime affinities, or support species which also grow in coastal salt-marshes, and presumably these, like the inland fauna with marine affinities, are relict populations which have survived from the last great marine transgression.

Wetland Vegetation

Within the region, mangroves are confined to Mauritania and are dominated by *Avicennia africana*. Both *Conocarpus erectus* and *Laguncularia racemosa* occur in the region, but *Rhizophora* species are absent from the coast north of the Senegal River Delta. In most places, salt-marsh vegetation backs the mangrove, and *Fimbristylis obtusifolia*, *Paspalum distichum* (= *P. vaginatum*), *Phloxerus vermicularis*, *Sesuvium portulacastrum* and *Sporobolus virginicus* are often found in these places.

There is little tidal amplitude on the Mediterranean Coast of North Africa. Maximum ranges approach 90 cm on the Tunisian coast, while normal ranges are seldom more than 20 cm. Thus tidal salt-marshes are not extensive. However, herbaceous halophytic vegetation is well developed in the region, but principally on non-tidal coastal plains and around pans in the interior. In the east of the region, narrow tidal salt-marshes often grade inland into salt deserts.

On wide sandy Mediterranean coasts the pioneer community is dominated by *Halocnemum strobilaceum*. This species collects sand and tends to form hummocks, and is usually joined by species such as *Bassia muricata*, *Cutandra memphitica* and *Traganum nudatum*. This community may be succeeded inland by some or all of *Limoniastrum guyonianum*, *Nitraria retusa*, *Suaeda vermiculata* and *Zygophyllum album*. Farther inland, and out of tidal influence, yet still on moist saline soils, the pioneer is usually a species of *Arthrocnemum*, either *glaucum* or *macrostachyum*. On the Algerian coasts, which are often of high relief, salt-marshes are less extensive, and here *Salicornia arabica* and *S. europaea* are usually the pioneers. They are succeeded by, among other species, *Limonium sebkarum* and *L. sinuatum*, with *L. spathulatum* becoming more important towards the east. On the landward boundaries of the salt-marshes, adjacent to non-tidal salt flats, *Sarcocornia fruticosa* often becomes dominant, or sometimes *S. perennis*, with *Centaurium spicatum* as principal associate in zones subject to inundation, and *Monernza cylindrica* in unflooded zones. At the mouths of perennial rivers and streams the aforementioned species give way to swards of *Spartina maritima* containing *Crypsis aculeata*, *Puccinellia distans* and *P. palustris*. *Ruppia spiralis* is common in estuaries, penetrating to where salinity falls as low as 10%. *Cymodocea* sp., *Ruppia maritima* and *Zostera noltii* are common on submerged banks in lagoons.

Other important species on the North African coasts are *Halopeplis amplexicaulis*, which becomes dominant on waterlogged soils subject only to minimal accretion, and *Juncus acutus*, which occurs on saline soils of the landward fringes, if they are regularly flushed

by soil water. The latter species is frequently associated with *Aeluropus littoralis* and *Inula crithmoides*. Where the landward transitions of the salt-marshes are not to salt deserts, and in consequence the soil water is only brackish, and where the soil is sandy, bushes of *Tamarix africana* are frequently in evidence.

Marshy depressions in the Mediterranean coastal lowlands were once forested, and in them isolated trees or clumps of trees may still be encountered. *Fraxinus angustifolia*, *Laurus nobilis*, *Populus alba*, *Salix alba*, *Tamarix* spp. and *Ulmus campestris* are the most widespread species in this situation. However, most marshy depressions are now often covered by herbs. Many are covered by an almost monospecific sward of *Juncus acutus*, but some have a more heterogeneous flora, with bushes or small trees of *Laurus nobilis* and *Tamarix* spp. on the margins, and elsewhere a cover of *Juncus acutus*, *J. maritimus*, *Plantago coronopus*, *Scirpus holoschoenus*, *Spergularia maritima* and *Statice* spp.

Ponds and lakes, on the coastal strip are often fringed by *Phragmites australis*, *Scirpus lacustris* and *Typha capensis* (= *T. latifolia*), with *Ceratophyllum demersum*, and *Potamogeton* spp. dominant in deep water. Some areas behind the beaches, where the free discharge of water to the sea is impeded by dunes, also support extensive reedbeds. In parts of Algeria, small stands of *Alnus glutinosa*, *Juncus* spp., *Scirpus holoschoenus* and *S. littoralis* are also common in these latter places, and on sandy soils the reedbeds may be backed by thickets of *Tamarix* spp. *Phragmites australis* and *Typha capensis* also cover substantial areas on the margins of lakes in the mountains, up to altitudes of about 1500 m asl.

The chotts which lie along the northern border of the Sahara, in the Sahara/Mediterranean transition zone, are large salt flats. Some are flooded every winter, others seldom carry surface water. Some are extremely saline and on these the dominant plant is *Halocnemum strobilaceum*, often providing 50-70% cover. The largest and least saline chotts are covered by *Salsola sieberi* and *Zygophyllum cornutum* with variable proportions of *Limoniastrum guyonianum*, *Limonium pruinosum*, *Nitraria retusa*, *Salsola tetragona* and *Suaeda mollis*. This vegetation provides 30-60% cover. In some more southerly situations, e.g. in some wadis, saline soils carry *Traganum nudatum* and *Zygophyllum album*. The salt pans of the central and southern parts of the Sahara are largely unvegetated and in any case cannot be considered as wetlands.

Montane bog communities may be dominated by *Sphagnum subsecundum*, but usually this occurs in mosaics with other bog communities. These occur on permanently or semi-permanently waterlogged soils and contain species such as *Anagallis crassipes*, *Asphodelus microcarpus*, *Eleocharis multicaulis*, *Erica scoparia*, *Hypericum afrus*, *Isoetes hystrix*, *Montia fontana* and *Phragmites australis*.

In the desert, *Acacia nilotica*, *A. tortilis*, *Ficus sycomorus*, *Hyphaene thebaica* and *Tamarix senegalensis* grow around gueltas, and on wadi floors where the water table is sufficiently close to the surface. The trees may be arranged in two parallel lines on either side of the bed occupied by running water when the stream flows.

Along the Senegal River and its affluents in Mauritania, there is a broad seasonal floodplain dominated by grasses at the lowest levels. Here the annual grass *Oryza barthii* is the dominant species where inundation is deepest, with *Echinochloa pyramidalis* perhaps the species covering the greatest area, occupying places flooded to intermediate depths, say 1-2 m.

Oryza longistaminata also occurs in this latter zone, while *Andropogon gayanus*, *Hyparrhenia rufa*, *Panicum* spp., *Paspalum orbiculare* and *Vetiveria nigritana* are common species on the fringes. Riparian and levée forests occur along the river, with *Acacia nilotica* the commonest species in sites subject to seasonal inundation, but with *Cola laurifolia*, *Cynometra vogellii* and *Diospyros elliotii* in permanently swampy sites. *Borassus aethiopum* and *Raphia sudanica* occur on the higher levées and the former also on the margins of the floodplain. *Phragmites mauritianus* and *Typha domingensis* fringe lakes and lagoons on the floodplain.

Wetland Fauna

Some of the inland sites are of special interest because they harbour invertebrates of marine affinity and their faunas are dealt with in the national accounts.

Fishes: The fish faunas of the coastal wetlands are typical of either the Mediterranean or the central western Atlantic Ocean, and are outside the scope of this account. Very few European fishes have penetrated the Maghreb or the Sahara. Of those that have, *Aphanius fasciatus* is found in hot springs and saline waters, *Barbus biscarensis* reaches the A'Hagggar, *Gasterosteus aculeatus* occurs in coastal pools and streams, while *Salmo trutta* occurs in some rocky streams of the Algerian Atlas. *Tellia apoda* is isolated in some high Atlas ponds and there are several minnows (*Phoxinella* spp.), of Eurasian affinity, in the Mahgreb. Similarly, few tropical African fishes have penetrated the region, and those that have are also dealt with at appropriate places in the text. No tropical species are found north of the Atlas Mountains.

Amphibians: The amphibian fauna is small. Two European species have been recorded from the A'Hagggar Massif, *Bufo viridis* and *Rana esculenta*, and are found in the Mahgreb. *Bufo regularis* and *Ptychadena mascariensis* have been recorded from eastern Chad. The occurrences of other amphibians is dealt with in the text.

Reptiles: Four species of turtles, all endangered, breed on the Atlantic beaches. *Caretta caretta* is found as far north as Menasra (34°36'N) in Morocco, but the other species, *Chelonia mydas*, *Dermochelys coriacea* and *Eretmochelys imbricata* have a more southerly occurrence and, within the region, principally frequent Mauritanian beaches. *Natrix anoscopus* is found in the Mahgreb, but otherwise snakes are comparatively rare in the wetlands.

Birds: Almost all the wetlands of the region provide important habitats for birds. Among the important species of the coastal zone, including the salt-marshes, estuaries, and brackish or freshwater lakes, are *Acrocephalus arundinaceus*, *A. melanopogon*, *A. paludicola*, *A. schoenobaenus*, *A. scirpaceus*, *Anas acuta*, *A. angustirostris*, *A. crecca*, *A. clypeata*, *A. fuligula*, *A. penelope*, *A. platyrhynchos*, *A. querquedula*, *A. strepera*, *Anser anser*, *Anthus pratensis*, *Ardea cinerea*, *A. purpurea*, *Ardeola ralloides*, *Athytha ferina*, *A. fuligula*, *A. nyroca*, *Burhinus oedicephalus* (E only), *Calandrella brachydactyla*, *Calidris alba*, *C. alpina*, *C. canuta*, *C. minuta*, *Charadrius alexandrinus*, *C. hiaticula*, *Chlidonias hybridus*, *C. leucopterus*, *C. niger*, *Ciconia nigra*, *Egretta alba*, *E. garzetta*, *Fulica atra*, *F. cristata*, *Gallinago gallinago*, *G. media* (E only), *Gelochilidion niloticus*, *Glareola pratincola*, *Grus grus*, *Haemotopus ostralegus*, *Himantopus himantopus*, *Hirundo rustica*, *Hydroprogne tschegrava*, *Ixobrychus minutus*, *Larus andouinii*, *L. fuscus*, *L. genei*, *Limosa lapponica*, *L. limosa*, *Locustella luscinioides*, *Luscinia svecica*, *Lymnocyptes minimus* (E only),

Merops apiaster, *Motacilla alba*, *M. flava*, *Muscicapa striata*, *Numenius arquata*, *N. phaeopus*, *N. tenuirostris*, *Nycticorax nycticorax*, *Oxyura leucocephala*, *Phalacrocorax carbo*, *Philomachus pugnax*, *Phoenicopterus ruber*, *Platalea leucorodia*, *Plegadis falcinellus*, *Pluvialis apricaria*, *P. squatarola*, *Podiceps cristatus*, *P. nigricollis*, *Porphyrio porphyrio*, *Porzana parva*, *P. porzana*, *P. pusilla*, *Recurvirostra avosetta*, *Riparia riparia*, *Sterna albifrons*, *S. sandvicensis*, *S. hirundo*, *Streptopelia turtur*, *Tachybaptus ruficollis*, *Tadorna ferruginea*, *T. tadorna*, *Tringa erythropus* (E only), *T. glareola*, *T. nebularia*, *T. totanus* and *Vanellus vanellus*.

Birds of prey widely recorded in Mediterranean wetlands include *Buteo rufinus*, *Circus aeruginosus*, *C. macrourus* (E only), *C. pygargus* (E only), *Falco naumanni*, *Hieraaetus fasciatus* and *Pandion haliaeetus*. Two vultures, *Gyps fulvus* and *Neophron percnopterus* have been regularly recorded in Algerian and Tunisian coastal wetlands. Many of the species listed above, such as *Phoenicopterus ruber*, which thrive on shallow muddy salt flats, are found on the chotts, but some species, e.g. *Charadrius morinellus* and *Chlamydotis undulata* are more characteristic of the chotts and wet steppes than other wetlands.

Most of the species listed above also occur on inland lakes and marshes, some up to considerable altitudes. *Grus grus*, *Tadorna ferruginea* and several ducks are regularly reported on wetlands up to 1000 m asl. Others which are far more common in inland, on freshwater wetlands, include *Locustella naevia* and *Sturnus vulgaris*. In the far east of the region *Coracias garulus* and *Jynx torquilla* are encountered on pans, oases and irrigated areas. Species which regularly collect in the Tanger Peninsula, en route to Europe, include *Accipiter nissus*, *Apus apus*, *A. melba*, *A. pallidus*, *Buteo buteo*, *Ciconia ciconia*, *C. nigra*, *Circaetus gallicus*, *Circus cyaneus*, *Falco columbarius*, *F. normanni*, *F. peregrinus*, *F. tinnunculus*, *Lanius senator*, *Merops apiaster* and *Upupa epops*.

Mammals: Large native mammals are virtually unknown in North African wetlands, except for *Panthera pardus*, which is still present in the Atlas Mountains where it has been recorded around lakes and along rivers, and *Sus scofer*. The latter species is widespread in the Mediterranean part of the region, extending into the Atlas Mountains, but it is hunted intensively near centres of population. *Cervus elaphus* was introduced to the Rif region of Morocco and has been recorded in reed swamps both there and farther east, while *Bubalus bubalis*, which is dependent upon swamps, was introduced to Tunisia in Roman times, but is no longer known in the feral state (although still present, semi-wild, in protected areas).

However, small mammals, especially rodents, are abundant in the wetlands, in numbers, if not in numbers of species. Apart from water rats, voles and mice, *Lutra lutra* is widely distributed across the Mediterranean part of the region, in the estuaries, lakes, reed swamps and rivers, ascending to 2500 m in the Atlas Mountains. Several small cats have been recorded in the wetlands. *Felis caracal* occurs in the Atlas Mountains and has been recorded in wetlands there, as well as on the chotts of the high plateaux. *Leptailurus serval* also occurs in Atlas wetlands. The so called swamp cat, *Felis chous*, occurs in the wadis of the Tassili N'Ajjer and A'Haggar, and a desert cat, *Felis margarita*, has been recorded on the chotts and at several oases. *Felis lybica* (often now referred to *F. sylvestris*) is quite widespread in coastal wetlands from Morocco to Libya. Other carnivores widespread in the Mediterranean region include *Genetta genetta* and *Herpestes ichneumon*, while *Mustela putorius* occurs in the Rif region of Morocco. *Vulpes vulpes* is increasing in

numbers throughout the Mediterranean coastal strip and frequently hunts on the fringes of reed swamps and along rivers, while *Canis aureus* has been recorded from the chotts. *Paraechinus aethiopicus* is widely distributed in the region and is known from the margins of the chotts. *Hystrix cristata* often frequents or lives in thickets along rivers, and *Macaca sylvana* is locally not uncommon in riverine woodland in the Atlas Mountains.