

UNITED ARAB EMIRATES

INTRODUCTION

by Simon Aspinall

Area: c.83,000 sq.km.

Population: Approximately 2,200,000 (1994 estimate).

The United Arab Emirates (UAE), created in 1971, is a federation of seven former Trucial States situated in the southernmost part of the Arabian Gulf. The country includes part of the northern Hajar Mountains and also an 80 km stretch of the Gulf of Oman/Arabian Sea coastline directly facing the Indian Ocean. The Arabian Gulf coast of the UAE is about 450 km long, excluding the large collection of islands. The seven separate Emirates are of unequal size, Abu Dhabi being the largest by far at around 67,000 sq.km and Ajman the smallest at 260 sq.km. None of the Emirates is landlocked, such is the importance both historically and at the present time of access to, and exploitation of, the sea.

Trade with other Gulf states and Indian Ocean nations relies heavily on transport by sea. Nowhere in the country is further than 200 km from the sea. Pearl (lulu) fisheries formerly contributed greatly to the wealth of the inhabitants of the southern Gulf. However it is for the huge onshore and offshore oil reserves that the UAE is justifiably famous and to which modern-day life in this country, with its high standard of living, is owed. Development has been rapid since the status of the seven Emirates being "in treaty relations" with Britain ceased in 1971, which itself post-dated the discovery of oil.

The nation's wealth, coupled with its stability, has lent to the success and emergence of the federation in international politics and world affairs. Nonetheless, much of the traditional way of life still survives, blended with state of the art technology and largescale development for which financial resources are very large. The communication network is modern, fast and efficient, often lying side by side but in marked contrast to traditional seagoing dhows, souqs, bedu camps, camel herds and other typical Arabian sights.

The topography of the UAE is characterised by rapid changes between the sand and gravel desert which dominates most of the south and west of the country (and extends inland to the high dune systems of the Empty Quarter, or Rub al Khali, of Arabia), a gravel savannah plain (with *Acacia tortilis*) of varying width abutting the western side of the Hajar Mountains, and the arid, jagged and shattered Hajar Mountains themselves, which rise rapidly to over 1,300 metres, and then, once over the watershed, steeply down

to the coast of the Gulf of Oman/Arabian Sea. The corresponding gravel plain on the East Coast is patchy and small, and widest in the south, but for the most part separates the mountains from the sea with resulting few cliffs (except where faulted). Rather, there are numerous sandy beaches. The elevated Musandain Peninsula extending to the Strait of Hormuz is Omani territory.

By contrast the Arabian Gulf littoral of the UAE is an exemplary development of active coastal sabkha, recognised as the biggest and best in the world. It is some 300 km long and of variable width but extending continuously 20 km or more inland in places. Isolated sabkha outliers, otherwise surrounded by dune and gravel desert, also exist inland in Abu Dhabi (in particular), more so in the Western Region than elsewhere.

The Gulf coast is extraordinarily shallow and gently shelving with numerous inshore and nearshore islands, most of which are simply part of a formerly more extensive and continuous sabkha invaded and dissected by post-Quaternary Shamallic storms and thence inundated by a sea level rise. There are some small, entirely man-made islands, and few areas remain completely unaffected by reclamation, dredging, tipping or other development or usage. Much of such development has been for recreational purposes. Mangrove, represented by a single species, *Avicennia marina*, covers extensive areas although not continuously. It is known to have been more extensive both historically and in the recent past, the reduction in area generally accepted as having been due to clearance (primarily for charcoal, as fodder or other uses) as well as to natural dieback or disease. In recent years, however, extensive planting of mangrove has been undertaken, often with considerable success.

The larger offshore islands are mostly the higher parts of a diapiric surface, the clearest evidence for which is where the migrating salt has erupted through to the surface to form distinctive and obtrusive looking hills. Other islands are anything from tiny sandy and shelly shoals to those larger ones of raised coral and outcropping limestone which are mostly covered with drift deposits.

The climate can only be described as hot; humid on the coast, especially in summer, but far drier inland where the temperatures are even higher. With the Tropic of Cancer passing through the south of the country, summers are long and hot. In any given year, it usually rains in the winter months, most often in February or March, but occasionally prior to this. The rainfall often takes the form of torrential frontal rain which, in the Hajar Mountains, runs off rapidly into wadis and thence onto the down-washed gravel plains, perhaps reaching the sea on the east coast but invariably braiding widely and soaking rapidly into the desert on the west side. Further west and along the coast, rainfall is often trapped on the sabkha surface until evaporated. Inland, surface water seldom remains for long, rarely more than a day or two, except where artificially ponded or dammed. Mainly localised thunderstorms occasionally reach the UAE in summer (with the annual frequency varying widely), and are generally over the mountains of the south and east of the country, these being convective downpours breaking away from the southwest monsoon affecting southern Arabia.

Biogeographically, the region has previously fallen into a no-man's-land, but it is clearly Palearctic; in reality, the whole of Arabia except extreme southwestern Oman, southwestern Saudi Arabia and Yemen should be considered as such. The Arabian Gulf is a staging and wintering area of considerable importance on a major Eurasian-African flyway for shorebirds and some other groups of waterfowl. In the UAE, there are internationally important seabird colonies, namely of Socotra Cormorant *Phalacrocorax nigrogularis*, Sooty Gull *Larus hemprichii*, Great Crested Tern *Sterna bergii*, Lesser Crested Tern *S. bengalensis*, White-checked Tern *S. repressa* and Bridled Tern *S. anaethetus*, and smaller but nonetheless important numbers of other species such as Western Reef Heron *Egretta gularis*, Osprey *Pandion haliaetus* and Crab Plover *Dromas*

ardeola. The bulk of the world population of Socotra Cormorants breeds between the UAE and eastern Saudi Arabia.

Quite apart from the avifauna, there are also known to be sizeable populations of Dugong *Dugong dugon*, at least two breeding species of sea turtle and an extensive, mainly undisturbed, development of coral reef and its associated fauna. All of these can be regarded as being of conservation importance equal to that of the avifauna. Coral reef is also present along the Gulf of Oman coast, and is reportedly richer and more diverse than that found inside the Arabian Gulf.

The economy of the UAE is founded on oil revenue and resulting profit from sound investment both at home and offshore. Throughout the Emirates, commerce and trade thrive, but the respective capitals are clearly the major centres, particularly Abu Dhabi and Dubai, for banking and commercial interests. The wealth of the individual emirates varies enormously, but the Federal Government invests in public works throughout the Federation. The UAE represents a Middle Eastern hub for sea and air travel and transport. The six international airports handle considerable long-haul traffic, especially on the major west-east route from Europe to the Far East. The attractive freeport facilities for shipping draw in container traffic on a large scale, and oil tanker traffic is similarly profuse, although much of the latter remains outside the Gulf where it is attracted by reduced insurance costs and the modern port facilities at Fujairah and Khor Fakkan.

Summary of Wetland Situation

Despite being envisaged as an entirely desert state by many who have never visited the region, the UAE does, in fact, possess a wide variety of habitats including a range of wetland types.

Freshwater wetlands

Permanent wetlands are naturally scarce inland, although ephemeral rain-fed freshwater pools and flashes often appear, even if not usually remaining for long. Running water that persists through the summer is limited to very few sites, although deep pools may remain in river-beds. Springs and wells provide similar habitats, although the former are naturally restricted to the foot of the Hajar Mountains and occasional outlying, often limestone, blocks. The wildlife is adapted to the vagaries of a system such as this. Invertebrate groups such as dragonflies (Odonata) are poorly known, but many species are invariably present near any freshwater source. Similarly toads (there are no frogs in the UAE) and fish have colonised and live in surprisingly isolated localities (and/or are possibly therefore relict populations). The distribution of many species and groups, including even birds, have yet to be accurately and comprehensively mapped in the UAE, and considerable subspeciation seems likely. This is likely to be especially true of the flora and fauna inhabiting wetlands in isolated wadis.

Groundwater abstraction and the subsequent lowering of the water-table have depleted many natural springs and wells, and some are now lost altogether or unusable due to saltwater incursion. Certainly, desalination of contaminated groundwater is difficult to achieve. Protection of fossil groundwater, or its more frugal use for irrigation, for example, should be given serious consideration. Lowering of the water table is also thought to have caused vegetation to die off, at least locally. There should also be

concern over the depletion of aquifers, which are doubtfully replenished by present day input. Other than these remaining natural freshwater systems, there are many man-made water bodies. These are typically those associated with urban life and purpose designed, such as sewage treatment and water purification works, fish farms and soakaway surplus run-off pools.

Occasionally a wetland is created for ornamental or landscaping purposes or even, more rarely, primarily for wildlife. In any case, any one of these, with or without riparian vegetation, may act as a magnet for wildlife, especially when nutrient enriched. The construction of dams in the mountains of Fujairah, the Sharjah East Coast enclaves and Ras al Khaimah have been large-scale civil engineering works that now require an unlikely amount of rainfall to fill, although the primary purpose of some such dams is for flood control and prevention. Only two or three presently hold back what might be termed a reservoir, and although these have attracted several species of waterbird, they are otherwise unsurveyed. Many so-called "freshwater" wetlands are in fact brackish to begin with, and their salinity increases progressively through evaporation during the summer. Reed-beds, a rare commodity in most of the Arabian peninsula, have developed in many of these sites. *Phragmites australis* occurs widely but seldom covers a sizeable area. Reedmace *Typha domingensis* is also present, but has not colonised most of what might appear to be suitable wetlands. Only where the wetlands are sewage-enriched do stands of reeds support reasonable populations of breeding or wintering birds, and it appears that many invertebrates (even the winged Pterygotes) colonise more slowly if at all. Pteridophytes (ferns) occur very locally in damp spots.

Sabkha

All other wetlands in the UAE are saline or brackish. The sabkha coastline, lying principally within Abu Dhabi Emirate, is recognised as being the best developed and largest example of this geomorphological landform anywhere in the world. Said by geologists to be entirely less than 7,000 years old, the sabkha is quite unique, and is continuing to grow seaward and infill. Barring dredging works, many shoals would have already coalesced. Sabkha or salt flats, despite the high salinity (often hypersaline) and stark appearance, are biologically very productive for micro-organisms. Sabkha can extend many kilometres inland; Sabkha Matthi in western Abu Dhabi continues for 100 km inland crossing into Saudi Arabia for a further 100 km. Isolated patches of sabkha exist inland, individually covering a small area, generally 25 sq.km or less, whereas Sabkha Matthi covers many hundreds of sq.km.

The hydrology of sabkha systems varies. At coastal sites, the post-autumn equinoctial storms and gales may force or "pile up" seawater on the shallow and gently shelving southern Gulf shores, thus inundating extensive areas of sabkha. Alternatively, there may be a subterranean connection. The sabkha may remain flooded for many months, and the water table certainly remains high into the summer. In many areas, the subsequent water loss must be almost entirely through evaporation, since an impermeable layer, principally of gypsum or anhydrite and up to 15 cm thick, is often present at or beneath the surface. These layers are the product of the salty brine being drawn upward by capillary action until saturated, at which point crystallization occurs. Inland sabkha sites are generally unaffected by sea-water, except where a sub-surface flow percolates landward, but rather are influenced by winter rainfall. Such rainfall is prevented from soaking in by the presence of either an impermeable evaporitic layer which forms in the way described

above, or by the underlying solid geology. Clearly, fluctuations in winter precipitation determine whether these sites are wet or not in any one year or season. Coastal sabkha is mostly underlain by solid strata.

Small flat sabkha areas surrounded by higher areas of wind-blown sand are a common inland sight in the UAE desert. Biologically, they are highly impoverished, whereas the coastal sabkha is often coated in a stromatolitic algal mat with a gleyed reducing layer below. These mats are a cocktail of cyanophytes, diatoms and bacteria which, as they dry, become a characteristic cracked and peeling layer extending over many square kilometres. Pools are a notable feature of sabkha; these often have a subterranean connection to the sea and thus fluctuate tidally. Their flora and fauna may be entirely microbial.

Inter-tidal flats

Moving into inshore coastal waters and the littoral zone, the tidal regime becomes extremely unpredictable, although it is not actually very complex. The shallowness of the southern Gulf means that minor variations in both the wind direction and speed and the barometric pressure cause the predicted tides to remain either "out" or to advance several kilometres further "in". Seasonal variations follow a more defined pattern, with inundation of many otherwise "inter-tidal" areas, e.g. large areas of sabkha, not being witnessed until late autumn (post-equinox). The inter-tidal area of the UAE is extensive. Even several kilometres from the shoreline, the latter itself a bit of an arbitrary boundary, the sea is often less than six metres in depth at low tide and thus a considerable area is available to qualify for inclusion in the current inventory. The invertebrate biomass varies enormously, probably largely in relation to substrate and nutrient loading. Strings and carpeting of bivalves are somewhat localised, and crustacea appear to dominate in many sites, particularly sand-rolling crabs (e.g. *Cleistostoma* spp.). The distribution and abundance of invertebrates, especially annelids, warrants examination in relation to the distribution of shorebirds, or vice versa.

Saltmarsh

Saltmarsh communities, as opposed to halophytic communities, are locally well developed along the littoral fringe of the mainland and on some islands, although the total area is relatively small. Typical floral associations are of *Halocnemum strobilaceum*, *Halopeplis peifoliata*, *Suaeda vermiculata*, *Arthrocnemum macrostachyum*, *Salicornia europaea* and *Limonium axillare*. *Anabasis setifera* and *Salsola* spp. are close associates.

Khors

Khors (or khawrs) are a peculiarity of Arabia, exemplified in the Gulf. They are tidal inlets, estuarine in nature but lacking any permanent surface freshwater inflow. Those khors close to the mountains (e.g. Site 20), may receive sub-surface freshwater input at least seasonally. They vary in shape and size, and are often modified into waterways and sheltered harbours. Some can accommodate large dhows or other seagoing vessels, whereas many are undredged and remain natural, and can be less than a metre or two in depth at high water. Undisturbed areas of the former may remain of considerable importance for shorebirds, mangroves and saltmarsh etc. As with estuarine systems in

western Europe, introduced nutrients such as sewage inflow have increased the biological productivity of several khors, and bird populations may have increased accordingly. The hydrological regime of some of the so-called khors, particularly in the Northern Emirates, may be considered lagoonal rather than estuarine. The shallow waters and khor-side mangrove woodland, where present, may be vital to sustain fisheries.

The khors and other inter-tidal and coastal areas of the UAE are estimated to support up to 300,000 shorebirds and other waterbirds at any one time during the migration periods. Allowing for turnover, more than a million and perhaps two or even three million individual birds may pass through the southern Gulf in autumn.

Mangrove

Mangrove reaches its northern limit in Asia in the Arabian Gulf, and is represented by a single species, *Avicennia marina*. Its distribution is patchy; most areas of mangrove are relatively small in size and only a few extensive mangals exist (see site accounts). Mangrove is known to have been more extensive both historically and in the recent past, the reduction in area generally accepted as having been due to clearance (primarily for charcoal, as camel fodder or other uses), as well as to natural dieback or disease. Landfill has also disposed of some areas.

The trees appear ancient in at least two sites, namely Khor al Beidah (Site 12) and Khor Kalba (Site 20), but they have yet to be aged. The White-collared Kingfisher *Halcyon chioris* has successfully colonised a single site (or remains as a relict population), and is dependent on holes in the old mangroves for nesting.

In recent years, the establishment of mangrove nurseries and artificial propagation and planting have increased the area of mangrove substantially and with some considerable success. Planting continues to be practised on a large scale. In some instances, this extensive planting of mangroves has been detrimental to migrant shorebird populations. Some inter-tidal sites valuable for wildlife have probably been irreversibly damaged, even if the desired aesthetic improvement, which is generally the purpose of planting in the first place, has been achieved. In other instances, mangrove planting will "improve" the biological capital or increase or restore the biological diversity of an area, and may thus be seen as beneficial. Provision of extra suitable habitat for fish spawning and as a nursery for both fish species and shellfish (molluscs) is a case in point. The full importance of mangrove communities to commercial fisheries in the Gulf has yet to be assessed, although study is under way. In the meantime, there would seem to be a good case for protecting all existing mangrove areas. National guidelines and policy, which do not presently exist, should be drawn up as soon as possible to provide a national planning atlas for the use of coastal areas.

Seagrasses

Seagrasses, from a wildlife point of view, provide a very valuable commodity. The term is ecological and not phylogenetic, as it embraces an assemblage of unrelated species. Seagrasses grow readily in water up to a depth of 10 metres, and in far deeper water with good clarity (exceptionally to 90 m). As the Gulf is rather turbid, seagrass lawns are somewhat restricted in their distribution. As stated previously, however, much of the UAE coastal waters are less than 10 m deep, thus providing a large area of suitable

habitat able to support a sizeable population of Dugong *Dugong dugon*. There are four species of seagrass occurring in the Gulf: *Halodule uninervis*, *Halophila stipulacea*, *H. ovalis* and *Syringodium isoetifolium*. *Halodule uninervis* is undoubtedly the dominant species of seagrass and, in the UAE at least, probably forms the major food-plant taken by grazing dugong. *Halophila stipulacea* is widespread in the west (Abu Dhabi Emirate), but its status and relative abundance, together with that of the other two species, is poorly known and needs mapping. Seagrasses occur in some inter-tidal areas where a resultant food chain proceeds through grazing and breeding molluscs to overwintering shorebirds and their predators.

Islands

The Gulf possesses many islands, some rocky or of a relatively "solid" geology, but more being sandy shoals of low elevation. All are arid, and most lack permanent fresh water. Dalma (Site 5) certainly supports springs. The islands vary in size from a few tens of square metres to tens of square kilometres. The two largest are Sir Bani Yas and Abu al Abyadh at 220 and over 500 sq.km respectively. Abu Dhabi island lies between these two large islands. Little is known of submarine sedimentary movement and migration. Many inter-tidal banks exist, and the flats exposed at low tide can be important feeding grounds for migrant and over-wintering shorebirds. Some of the larger inshore islands are essentially an extension of the coastal sabkha, having been separated by post Quaternary Shamallic storms cutting or forcing channels into and round behind sizeable chunks of land e.g. Khor al Bazm. Many offshore islands are typified by one or more rocky extrusions forced up by salt diapirism. Few uninhabited islands remain, despite being desert islands. Even shoals may now have permanent buildings and a resident human population. Freshwater is delivered along with fuel, and a four-wheel drive car is often landed, even on the smallest of islands. Sensibly enough, comfort and air conditioning prevail, although for wildlife the presence of a resident human population regularly spells a creeping death knell. Hardly an uninhabited island exists that has not had irrigation installed and trees or palms planted on it. Feral cats regularly abound, and cause havoc amongst breeding seabirds. Rats are also well established on many islands, as are house mice, the former, along with cats, certainly spelling disaster for breeding birds.

Coral

Although some studies have been conducted on the coral communities of the UAE, no comprehensive survey has as yet been carried out. The coral formations are best known off the eastern, Gulf of Oman coast, which belongs to Fujairah and Sharjah Emirates. Reef development in the Gulf is variously classified as fringing reef, patch reef or as submerged banks/cays, and these are well developed. Gulf coral communities, of which there are apparently just five, include a healthy and diverse faunal assemblage of molluscs, crustacea, reef fishes and reptiles (sea-snakes and turtles). Coral cover is high if not diverse compared to, say, the Red Sea. As the coral reefs of the UAE have already been described in the UNEP/IUCN inventory of coral reefs of the world (UNEP/IUCN, 1988), no further specific reference will be made to them except where they occur in a site of importance for other flora or fauna.

All marine habitats and their associated flora and fauna, from littoral to planktonic and benthic communities, are described fully in Sheppard *et al.* (1992). The UAE falls within the Western Indian Ocean faunal province (Hayden *et al.*, 1984). The oceanography of

the Arabian Gulf is also detailed in the former publication. Both salinity and temperature exhibit large seasonal ranges, and it is estimated that it takes between three and seven years for a complete changeover of Gulf waters.

Threats to wetlands

Large-scale losses of inter-tidal area have been brought about either by dredging or by burial *i.e.* reclamation. Gains include wholly new islands of very limited value to wildlife, at least initially, and extension to existing islands or along the mainland coast. It is mostly sabkha that has suffered from alteration, although various khors have been lost (in their entirety in the case of nor Khan, Sharjah, and nor al Mamzar, Dubai), or reduced to some extent. This is in addition to "losses" or changes brought about by mangrove planting as outlined above. One further ecologically significant change is the connection of former islands to the mainland by causeways across the intervening sabkha or shallow waters. The net effect of allowing predatory mammals onto sites holding ground-nesting birds or other wildlife needs no expansion or explanation here.

The list of threats to sites of importance to wildlife includes, in no particular order of importance: vehicles (destruction of vegetation/bird nests and disturbance), introduction of cats and rats (accidental or otherwise), development and disturbance, mismanagement of natural areas (e.g. overzealous mangrove planting on important mudflats), erosion, dredging, pollution, persecution (e.g. shooting of Socotra Cormorants), unsustainable harvesting (e.g. of turtle or tern eggs) and introduction of alien species. Possibly no site exists that has not already been altered or presently receives no form of adverse human activity or development. This is true of all mainland and island sites thus far surveyed or visited. Even areas which have already been identified as Important Bird Areas and notified to the appropriate authority continue to be mismanaged or mistakenly "improved", for example by planting and irrigation schemes. The apparent view of

wildlife is that so long as it occurs in abundance, then there is no cause for concern. This applies even to completely alien or introduced species; thus sites in the UAE often bear the appearance of open-air zoos, whilst the native flora and fauna recede. Furthermore, with ownership of land goes the right to develop it, and this has led to major losses of wildlife, particularly of seabirds on some offshore islands. In many instances, this has been deliberate, but in some, where advice could have been given, conflict might have been avoided and mutual coexistence guaranteed. Even the internationally important site of Khor Dubai has been mismanaged, against ecological advice, to "improve" it for wildlife, and thus make it aesthetically more pleasing. Similarly, the site of the first mainland Arabian breeding attempt by Greater Flamingos *Phoenicopterus ruber* (in 1993) was subsequently filled in against a specific directive from high authority, and when elsewhere in the UAE attempts have been made to encourage flamingos to breed. Beliefs, superstition and folklore, as well as attitudes, all also play their part, and have contributed to the demise, persecution or discouragement of several species.

Wetland fauna

Particularly important breeding birdlife includes several seabird species. Seven particular islands or island groups hold the bulk of the UAE's breeding seabirds. Cumulatively, the islands of the UAE hold respectively over 25% and 40% of the Arabian Gulf populations of Great Crested Tern *Sterna bergii* and Lesser Crested Tern *S. bengalensis*, about 5 % of

the world population of White-cheeked Tern *S. repressa* and over 30% of the regional population of Bridled Tern *S. anaethetus*. The UAE colonies of Socotra Cormorant *Phalacrocorax nigrogularis* are especially noteworthy. Despite having a larger breeding population than any other seabird in the Gulf, this species is restricted to only 12-14 colonies worldwide, seven of which survive in the UAE. All of these colonies are under threat from development, disturbance or direct persecution, and their prospects look bleak.

Also worthy of note is the large breeding population of Ospreys *Pandion haliaetus*. This population, concentrated at high density on islands in western Abu Dhabi, possibly exceeds that in the entire remainder of the Arabian Gulf. Two further breeding birds are of particular importance, namely the White-collared Kingfisher *Halcyon chioris* and Booted Warbler *Hippolais caligata*, both of which are found in mangroves at a single site in the UAE, Kalba Creek (Site 20). The former is of an endemic subspecies, *kalbaensis*. The species itself is common and widespread across southern Asia and throughout Oceania south to Australia, and occurs as far west as the Red Sea coast of Ethiopia and Sudan in Africa. Some 49 subspecies have been described. The population of the subspecies *kalbaensis* was censused completely in May 1995 with a minimum of 44 pairs/territories being located, and it is thus one of the rarest subspecies of bird in the world. As for Booted Warbler, Khor Kalba is possibly the only regular breeding site for this species in the Arabian Peninsula (it is considered to be a casual breeder on the Batinah Coast of Oman). The site is therefore of considerable significance in an Arabian context, even if the species is abundant over a wide area of west and central Asia. The taxonomic affinity of the breeding population in Arabia is presently uncertain.

Amongst visiting waterfowl, no fewer than 25 species, and possibly several more, are recognised as occurring in regionally important numbers either on migration or in winter.

These are primarily species of shorebird (14 species), together with several seabirds (four species of gull) and herons and their allies (seven species). Each is named in the appropriate site account below. About 250,000 waterfowl overwinter in the UAE, while similar or larger numbers may be present at any one time during spring and autumn migration seasons. As stated earlier, allowing for turnover, between one and three million waterfowl may utilise inter-tidal areas annually.

Other species or groups of species which are of outstanding conservation value due to their present rarity, or to the still sizeable populations surviving in the UAE, include Green and Hawksbill Turtles *Chelonia mydas* and *Eretmochelys imbricata*, Dugong *Dugong dugon*, some marine fishes e.g. Scaridae, Labridae, Acanthuridae and Pomacanthidae, and sea-snakes Hydrophiidae. The population sizes and distribution of most of these are poorly known, as are their regional breeding and feeding ecology and seasonal movements.

As stated previously, mangroves may be important as fish spawning grounds or as nursery areas for fry and alevin, and for molluscs and crustacea (amongst others). Crabs are vital for the survival of both the White-collared Kingfisher and the Crab Plover. The latter feeds extensively on the black mangrove-dwelling crab *Metopograpsus messor* at one of its two UAE breeding sites.

The fauna of freshwater habitats in the UAE remains poorly known. The two toads, Arabian Toad *Bufo arabicus (orientalis)* and Dhofar Toad *Bufo dhofarensis*, occur in wadi pools along with dragonflies (Odonata), many swimming and diving invertebrates e.g. Coleoptera, and the larval stages of terrestrial adult insects as well as entirely aquatic forms. Freshwater gastropods are very poorly known, and clearly need further study. Aquatic macrophytes and the riparian flora of freshwater wetlands have yet to be studied in depth. Fish are able to survive and breed in wadi pool systems, even those that dry out completely in summer. Some studies of wadi fishes have been completed, but the results remain to be publication. The Wadi Racer *Coluber rhodorachis* is a riparian snake, frequent in wadis and preying on fish and amphibians.

Marine plankton, primarily of diatom species, has a low diversity in relation to the remainder of the Indian Ocean, with large seasonal variations in abundance. Biomass is high, however. Local nutrient enrichment or eutrophication causes algal blooms, and may contribute to "red tides", a natural phenomenon resulting in the death of many fish and lower taxa through decay and release of toxins and de-oxygenation of the surface waters. Mammals and birds are apparently unaffected, although some dolphin deaths could be indirectly related. Other plant life in the Gulf, such as seagrasses, is in need of study and particularly of mapping. Seaweeds have been dealt with by Basson *et al.* (1977), and are not described here.

There is sparse information available regarding some other faunal groups, but the reader should refer to Sheppard *et al.* (1992) and their bibliography for a general overview of the marine biogeography, community structure and ecosystems of the Arabian region. Endemism is relatively high; for example, 12% of echinoids are endemic to the Arabian Gulf. Most lower forms might be expected to range almost throughout the Arabian Gulf, and are clearly not confined within political boundaries. Molluscs (e.g. see Smythe, 1979) and crustacea are reasonably well documented, not least because of their commercial value, whereas groups such as annelids and other inter-tidal and sub-tidal invertebrates require further study. Three new species of mollusc have recently been described from Fujairah (see Site 18). The greatest diversity of molluscs is in Ras al Khaimah, and the lowest in Dubai.

There are several hundred species of fish in the Gulf, of which some 125 are reef fishes. Less than about a third of the latter may occur in the UAE. As with many other groups, the overall diversity appears to be low (although over 500 fish species occur around Arabia), but endemism is high. With regard to commercially valuable fishes, overexploitation and degradation of breeding grounds through trawling are reducing stocks, as is the case with shrimp stocks. Over-exploitation is especially serious in the selective fishing of predatory species particularly favoured for human consumption and commanding high prices. Coral reef fishes are described in many previous publications and need not be dealt with here. The Whale Shark *Rhincodon lypus* has been recorded in UAE waters along with typical reef sharks e.g. the Black-tip *Carchannus melanopterus*.

Nine or ten species of sea-snake occur in the Gulf, some being abundant. Records are few, but they are certainly common enough around offshore islands and coral areas when they appear attracted to the lights of boats. The Yellow-bellied Sea Snake *Pelamis platurus*, Arabian Gulf Sea Snake *Hydrophis lapemoides*, Reef Sea Snake *H. ornatus* and probably Shaw's Sea Snake *Lapenis curtus* all occur in the UAE. Other species from different genera or other species from the three genera named above may also occur.

The Green Turtle *Chelonia mydas* and Hawksbill Turtle *Eretmochelys imbricata* both breed in the UAE, the former being numerous. There are serious threats to many breeding beaches, primarily from development, and still an unknown level of egg collecting and capture of individuals. Loggerhead *Caretta caretta* and Leatherback Turtles *Dermochelys coriacea* occur but do not, or are not known to, breed. The status of the Olive Ridley Turtle *Lepidochelys olivacea* is unknown, but it may simply be a rare visitor to the UAE Gulf of Oman coast and rarer still (if at all) inside the Arabian Gulf. Much of the mainland coast of the UAE was formerly used by nesting turtles, particularly, it seems, that of the Northern Emirates (Dubai to Ras al Khaimah). Jebel Ali was one such important site which now supports a freeport container complex.

Up to twelve species of cetaceans have been recorded in the Arabian Gulf. However, only the Bottle-nosed Dolphin *Tursiops truncatus* and Indo-Pacific Humpback Dolphin *Sousa chinensis* are at all common in UAE waters, and particularly so west of Abu Dhabi, although equal effort in recording them has not been applied throughout the country. Substantial healthy populations of both species probably exist. The Finless Porpoise *Neophocoena phocoenoides* possibly occurs, with Common Dolphin *Deiphinus deiphis* in deep waters offshore. Whales are occasionally noted in Gulf waters, although most records concern dead animals washed ashore or live strandings. These include False Killer *Pseudorca crassidens*, Bryde's Whale *Balaenoptera edeni* and Humpback *Megaptera novaeangliae* (Sei and Blue Whales have also been reported). The shallow waters of the Gulf must very largely preclude the regular occurrence of whales in UAE territory.

Populations of the Dugong *Dugong dugon* in the Gulf are of particular importance. The total population has been estimated at 7,310 +1- 1,300 (Preen, 1989), with many still to be found in western Abu Dhabi (see Site 2) and perhaps in other Emirates. Individuals were still occasionally caught off Umm al Qaiwain in the mid-1980s (P. Hellyer pers. comm.).

Economic values

Among natural wetlands, direct economic benefit comes only from marine areas. This is principally from the substantial commercial pelagic and demersal fisheries. A wide variety and large tonnage of fish are caught annually (97,000 tons in 1993), with some particularly sought after species, such as the Hamour or Brown-spotted Grouper *Epinephelus tauvina*, commanding high prices. Most, if not all, of the catch is consumed locally. Water-sports are widely pursued by both residents and tourists, and the revenue so derived is sufficient to sustain a large and competitive service, supply and training sector. Diving for sport and the use of motor-craft are especially popular activities. The pearl-diving industry, once of paramount importance to trade and wealth in the Gulf region, has been defunct for several decades (a rapid decline began in about 1929), and seems unlikely to be revived, even though free-range pearls undoubtedly still exist. Where present, coastal sabkha prevents flooding and erosion, and is thus economically valuable.

Wetland Research

The principal institute conducting research on wetlands in the UAE is the Desert and Marine Environment Research Centre housed at the Emirates University in Al Am. At federal level, the fisheries section within the Ministry of Agriculture based in Umm al Qaiwain (and jointly run with the preceding institution) monitors fishery stocks and recruitment. The Ministry of Agriculture also coordinates operations and mobilises manpower for oil spills, fish die-offs and other natural or man-made events or happenings. The procedures are, however, little more than an *ad hoc* arrangement, and usually result in foreign expertise being flown in. The Ministry's jurisdiction extends from high-water to the territorial limit. Mangrove and fishery research are ongoing and collaborative between the two organisations already named. Funding of much of these comes from commercial sponsorship.

The UNEP/IUCN inventory of coral reefs summarised known information on reef development in the UAE, although it is evident from this that detailed surveys are lacking from all, or almost all, areas. No known professional studies are under way. The assistance of amateur enthusiasts and the many diving schools might be enlisted to achieve some form of descriptive survey and species listing.

The National Avian Research Center (NARC), a research and conservation organisation based in Abu Dhabi, conducts breeding bird surveys (particularly of seabirds) within Abu Dhabi, and coordinates national counts (including the IWRB international waterfowl census) of migrant shorebirds and other waterbirds. Most marine environmental issues, from a species to a community level, are now tackled by NARC. At an individual level,

many amateurs from different disciplines make useful field observations and provide valuable wildlife records. A database of vertebrates and some invertebrate groups is maintained jointly by the Emirates Natural History Group and National Avian Research Center. The former organisation lobbies over environmental issues. The bias is still very much toward Abu Dhabi and Dubai and primarily to birds, with some notable exceptions, e. g. Arabian Leopards *Panthera pardus nimr* and other cat species in the Northern Emirates.

The presence of internationally important sites for waterfowl in the UAE has been recognised since the mid-1970s at least, e.g. see Carp (1976). Calls for a protected area network for waterfowl have been made and continue to be made both from within and outside the country.

The UAE report for the BirdLife International project on Important Bird Areas (IBA) in the Middle East, submitted in mid-1993, identified fourteen wetland sites and seven or more terrestrial sites important for their avifauna. These sites were described by the Emirates Natural History Group, Cohn Richardson and staff at the National Avian Research Center. Since that time, the latter organisation has undertaken extensive field surveys, and has identified many new internationally important sites, mainly wetlands. The present report provides the first written accounts of these sites and, as a more recent publication, will complement the IBA book (Evans, 1994) which was published in August 1994. All IBAs are named in the following wetland site accounts.

Wetland Area Legislation

Legislation covering marine wetlands has still to be introduced. The regulating authorities include the Ministry of Agriculture (Fisheries Section) and the Federal Environmental Authority. Environmental impact assessments (EIA) are mandatory, but not always implemented. The Abu Dhabi National Oil Company (ADNOC), of which the Abu Dhabi Government is the majority shareholder, certainly conducts EIAs, and has commissioned independent coastal environment surveys and mapping projects.

Legislation has been proposed previously but none has been enacted. Unofficial and informal calls continue to come regularly from a variety of organisations. The Federal Environmental Authority will be the body to draft such legislation in discussion with interested parties, including other government departments.

UAE federal law (Federal Decree-Law No.9 for 1983) regulates hunting of wild and marine birds of all species, including specifically "doves and orioles". The law also prohibits the collection or destruction of birds' eggs, with the exception of those of the Socotra Cormorant, the adults of which are shot and young harvested. The Socotra Cormorant was purposely not included in the law because of pressure from fishermen. The habitat itself remains unprotected, other than under individual Emirate or private arrangements as described below.

The Gulf is declared, on paper, a Special Area under Annexes I and V of the MARPOL treaty. The UNEP Regional Seas Programme also has an interest in the region. The UAE is, along with other Gulf states, a signatory to the Kuwait Action Plan, drawn up by the Regional Organisation for Protection of the Marine Environment (ROPME). This Action Plan was developed to prevent and control pollution from ships *etc.*, to establish national standards, and to research and monitor all types of pollution.

A number of other regional and international agreements or organisations exist, and any may prove a suitable vehicle for improving standards and establishing protected marine areas. These include the Gulf Cooperative Council (GCC), Arab Declaration on Environment and Development, Gulf Area Oil Companies Mutual Aid Organisation, and even the European Union. The Saudi Arabian governmental Meteorological and Environmental Protection Administration (MEPA) has proposed international research and protection measures ostensibly for Dugong, but this might easily be applied across the board i.e. for all taxa and shared resources.

The UAE is not party to any major conservation convention other than the Convention on International Trade in Endangered Species of Fauna and Flora (CITES).

Wetland Area Administration

Ownership of land within the UAE is often difficult to ascertain. The various municipalities and members of the Ruling Family in each Emirate hold, or at least control, most land, although certainly in much of the desert, bedouin are allowed to continue traditional usage. A protected area network has yet to be established. Even so, two areas nationally important for wildlife receive formal protection, viz. Khor Dubai Wildlife Sanctuary (for Greater Flamingos and shorebirds) and Jebel Hafit Tahr Reserve (although the Tahr is probably now-extinct in the area). The former is guarded round the clock. Hunting preserves have also been set up, primarily in desert areas and for falconry purposes. The Ministry of Agriculture has the power to apply certain restrictions at

designated turtle beaches, but these are not enforced. A precedent has, however, been set at Al Jazeera khor, where the beach and land up to 400 m above high water and up to four km offshore is privately protected for turtles (see Site 14).

It may be possible for sites to be individually designated by the government of a single Emirate. However, to date, among recognised nationally or internationally important wetland sites, only Khor Dubai has received any protection (violators subjected to penalties by a Local Order No.61/91). The Eastern Lagoon of Abu Dhabi (part of Site 4), containing mangrove and mudflats, is protected under the direction of the UAE President.

Organisations involved with Wetlands

The Federal government, in the form of various departments and ministries (including the Federal Environmental Agency), and the respective governments of the seven individual Emirates are all administratively involved in wetland use. Across the Federation, standardisation may ultimately be achieved through the work of the FEA, which replaced the former Higher Environmental Council in 1993.

a) UAE Government

The UAE government relies on the Department of Fisheries within the Ministry of Agriculture to report on matters relating to marine areas. Independent consultants are often called in to undertake environmental assessments.

Ministry of Agriculture

The Ministry has jurisdiction over matters concerning wildlife conservation and the environment. The Fisheries Department undertakes research on coastal and marine issues of commercial concern. Mangroves feature prominently (erosion prevention, aesthetics, fish and shellfish nursery). Fish stocks and recruitment are monitored in Gulf waters.

Federal Environmental Agency

The FEA took the place of the former Higher Environmental Authority in 1993 (by Federal Law No.7, 1993).

b) Individual Emirate Governments

Ruler

Each Emirate has its own Ruling Family, the head of which is the Ruler. Each Ruler is a member of the UAE seven member Federal Supreme Council. The offices of the immediate family of the Ruler may retain the services of a professional "wildlife adviser", or may employ independent consultants or request external advice on environmental issues.

Municipality

Public works are carried out in each Emirate by their respective Municipality, e.g. Abu Dhabi Municipality, Dubai Municipality. The city of Al Am is large enough to possess its own Municipality. Many large towns or towns distant from the central Municipality for that Emirate also possess their own

Municipality or sub-office (37 are listed). Public works affecting wetlands, including groundwater supplies, include reclamation (primarily coastal/sabkha), sewage and waste-water treatment and disposal, irrigation and drainage. In July 1994, the Executive Council of Abu Dhabi Emirate approved the establishment of an Environmental Protection Committee to oversee protection of areas falling under the jurisdiction of Abu Dhabi Municipality. Its terms of reference deal mainly with pollution.

c) Universities

The Emirates University (UAE University)

The Desert and Marine Environment Research Centre is housed at the Emirates University based in Al Am. The Marine Environment Research Section deals with research independently and in collaboration with the Ministry of Agriculture. The oil company Shell has provided funds for mangrove and turtle studies.

d) Non-governmental organisations

National Avian Research Center

The NARC is a research and conservation organisation whose work relates primarily to falconry and Houbara Bustards *Chlamydotis undulata*, but also to all other wild bird populations and their conservation and sustainable use in the UAE.

Emirates Natural History Group (including the affiliated but autonomous Al Am branch)

This organises lectures and field excursions, promotes conservation and awareness of issues concerning the wildlife and cultural heritage (particularly archaeology) of the UAE, and publishes the bi-annual journal "Tribulus".

Dubai Natural History group

Much as the Emirates Natural History Group (above).

Emirates Environmental Group

A body lobbying and campaigning on environmental issues throughout the UAE. The Group also has an educational role.

Arabian Leopard Trust

A voluntary body concerned with the conservation of indigenous Arabian wildlife, specifically the large montane predators, but also endangered marine and desert mammals.

Emirates Bird Records Committee

This voluntary body coordinates national surveys and maintains a database of bird records which can be used to provide ecological advice to governmental and other bodies, both nationally and internationally.

e) Others

Abu Dhabi National Oil Company (ADNOC)

This oil company has a stated environmental commitment applicable to all its operations and those of the Group it controls. Independent consultants are often called in to undertake environmental assessments on the company's behalf, in advance of development or other operations.

Other oil companies

No information is available regarding any environmental undertakings of other oil companies in the UAE.

Individuals

A number of individuals privately pursue various conservation goals in the UAE.

International conservation organisations

Several international wetland and bird conservation organisations e.g. International Waterfowl and Wetlands Research Bureau, Asian Wetlands Bureau, BirdLife International and Ornithological Society of the Middle East, already maintain or intend to appoint a regional or national representative or census coordinator for the UAE.

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WETLANDS

Site descriptions compiled by Simon Aspinall of the National Avian Research Center, Cohn Richardson on behalf of NARC, and Peter Hellyer. Information is sparse for many islands and for some lower plant and animal groups in particular. The inventory includes several sites from which seabird colonies or other species of conservation concern have been displaced by human activities, since there is every possibility that restoration attempts, were they to be allowed, would be successful. The entire sea and land area is given for Sites 1-5, even though the water depth in intervening areas (separating many of the islands) may exceed six metres.

Wetland Name: Abu al Abyadh/Dhabbiyah/Abu Dhabi Island Coastal Wetlands

Country: United Arab Emirates

Coordinates: Approximate central coordinates 24°20'N, 54°08'E

Location: On the Arabian Gulf coast of Abu Dhabi Emirate, from Abu Dhabi Island in the east to Abu al Abyadh in the west.

Area: 263,000 ha.

Altitude: Sea-level to 6 m below and c.20 m above.

Overview: A vast area of low-lying islands, coastal sabkha and inter-tidal sand and mud flats with some native mangrove and extensive mangrove plantations, along the central Gulf coast of Abu Dhabi Emirate. Much of the site has been affected by urban and industrial development, and this is continuing, especially in the west and south. The area is one of high biological productivity, and supports internationally important numbers of waterfowl, notably migratory shorebirds, Crab Plover *Dromas ardeola* and terns *Sterna spp.*

Physical features: The site comprises the large area formed collectively by the islands of Abu Dhabi, the mudflats and mangroves around Dhabbiyah, and the intervening areas as far west as, and including, Abu al Abyadh island, the largest island in the UAE. The other principal islands are Futaisi, Bahrani and Bu Khushaysha. This vast area of lowlying coastal sabkha and islands with patchy but mature stands of mangrove and large expanses of inter-tidal flats is treated as a single unit on ecological grounds. The intertidal flats are predominantly of sand in the east, but more muddy and organically rich in the west. A considerable amount of dredging has modified the area, more so between Dhabbiyah and Abu Dhabi itself than west of the former, and many new islands have been created. Much of the area has been developed, and this has been primarily at the expense of sabkha. Residential properties are all that is to be found in many sites, islands being distinctly preferred. Abu Dhabi island has little room left for industrial or other expansion, and new developments are now taking place further west at Dhabbiyah or to the south at Mussafah. Accessibility to some areas can be a problem, either because of physical difficulties or for reasons of security.

Ecological features: Apart from the extensive sabkha and inter-tidal flats, there are natural and planted mangrove, much of it mature. Only one species of mangrove, the Black Mangrove *Avicennia marina*, is present. Many islands, including some of those newly created, are now vegetated, e.g particularly by various halophytic Chenopods, and some have been colonised by terns. Some reduced areas of coral persist, these having suffered from a fatal increase in turbidity.

Land tenure: Most of the mainland is owned or administered by the Abu Dhabi Municipality. Abu al Abyadh is owned by H. H. Crown Prince Sheikh Khalifa bin Zayed.

Ownership of the many small islands is unclear, but appears to be resolved by permission being given to take up occupation or build a house.

Conservation measures taken: Only on the island of Abu al Abyadh have any conservation measures been taken. This island has been identified as an Important Bird Area (IBA) by BirdLife International; the wetland site includes the IBA in a much larger unit. The Crab Plover colony has been fenced off, and its protection has been assured by H.H. Crown Prince Sheikh Khalifa bin Zayed.

Conservation measures proposed: The size of this area and many existing land uses prevent emplacement of any major restrictions over much of it. A sensible land use policy and future structure plan should be developed. A tiered grading of conservation importance should be produced in map form. Particular areas may be designated as protected areas. Environmental impact assessments should meet stringent standards and be open to independent assessment. Mangrove planting needs to avoid areas holding significant shorebird populations. An atlas of important areas is to be prepared, and further survey work is to be conducted on breeding bird populations. Inclusion of the entire area as a site in this Directory and the island of Abu al Abyadh as an IBA will be brought to the attention of various appropriate individuals and organisations. A "leave alone" management policy would be appropriate for much of the area.

Land use: Residential building, recreation, mangrove planting and dredging for navigation are the principal activities. There is some industrial activity associated with oil support facilities and a small amount of fishing. There has been some recent exploration for onshore oil reserves.

Possible changes in land use: Development of sabkha and inter-tidal areas for commercial, residential and industrial purposes is likely to continue around Dhabbiyah in particular and between there and Abu Dhabi. There is increasing development on some small islands west of Abu Dhabi city, some of which are wholly or partly reclaimed.

Disturbances and threats: Dredging, mud-pumping and reclamation of inter-tidal and littoral areas are carried out without any consideration for wildlife (as at Dhabbiyah presently). Local eutrophication and pollution (including by oil) are clearly both serious threats. Wholesale mangrove planting following initial preparation of inter-tidal flats is reducing valuable feeding areas for shorebirds. Physical disturbance from the presence of humans is an increasing threat. Unregulated illegal egg-collecting is commonly practised. The proliferation of introduced Egyptian Goose *Alopochen aegyptiacus* is not desirable ecologically, although they remain immensely popular and continue to be released widely. An "aquaculture" scheme is presently (autumn 1994) being planned west of Abu al Abyadh on the mainland, although the environmental consequences may or may not receive due consideration.

Hydrological and biophysical values: The area is one of high biological productivity and important for fish nurseries. Many molluscs and shellfish rely on this habitat to complete part or all of their life cycle.

Social and cultural values: The area has high social and cultural values on account of its history and long period of human habitation from at least early Islamic times to the present.

Noteworthy fauna: The area was formerly important for Dugong *Dugong dugon*, but this is now very rare or just a casual visitor (two were drowned in a net off Futaisi in December 1994). Cetaceans regularly recorded close inshore include Bottle-nosed Dolphin *Tursiops truncatus* and Indo-Pacific Humpback Dolphin *Sousa chinensis*. Green Turtle *Chelonia mydas* is numerous in the west of the area and may breed here (or in adjacent parts of Site 2). Over 20,000 waterfowl winter in the area, including internationally important numbers of at least four species of shorebird, namely Kentish

Plover *Charadrius alexandrinus*, Lesser Sand Plover *Charadrius mongolus*, Whimbrel *Numenius phaeopus* and Redshank *Tringa totanus*. 40% (c. 8,500 individuals) of the total shorebird numbers are on Abu al Abyadh alone, and this includes the bulk of the Whimbrel and Redshank numbers. Dhabbiyah supports over 5,000 shorebirds in autumn and mid-winter. Several thousand *Charadrius* plovers are present between Dhabbiyah and Abu al Abyadh inclusive. There is also, probably resident, an internationally important breeding and wintering number of Western Reef Heron *Egretta gularis*. Little Green Heron *Butorides striatus* also breeds here fairly commonly. During migration periods, Saunders's Little Tern *Sterna saundersi* gather at Dhabbiyah and on Abu al Abyadh; peak numbers in late autumn (4,000+) exceed 10% of the estimated Middle Eastern population. (Some Little Terns *S. albifrons* may be present in these aggregations). Dhabbiyah is important for Crab Plover *Dromas ardeola* during passage periods (before and after breeding on Abu al Abyadh), and the species is occasional there in summer.

Breeding bird populations include c.300 pairs of Crab Plover (on Abu al Abyadh), 100 + pairs of Saunders's Little Tern, several hundred pairs of White-cheeked Tern *Sterna repressa* and Bridled Terns *Sterna anaethetus*, and unknown but certainly significant numbers of Kentish Plover *Charadrius alexandrinus*. Three breeding pairs of Osprey *Pandion haliaetus* are known, but more may exist in unsurveyed areas.

Noteworthy flora: Extensive areas of mangrove. Some seagrass on inter-tidal areas in the west, sub-tidal areas and probably elsewhere.

Scientific research and facilities: Some research has been completed on mangroves, in a study sponsored by Shell (Al Ghais, pers. comm.). Breeding, wintering and migrant bird surveys have been conducted by the National Avian Research Center (NARC). Shorebird feeding ecology and ringing studies began in autumn 1994 under the aegis of NARC.

Management authority and jurisdiction: Not applicable.

References: Evans (1994). Also: NARC unpublished internal reports, other unpublished information, and personal observations and communication.

Reasons for inclusion: 1a, 2a, 2b, 2c, 3a, 3c. Source: Simon Aspinall.

Wetland Name: Sir Bani Yas and Satellites/Merawah/Khor al Bazm Sabkha, Coast and Islands

Country: United Arab Emirates

Coordinates: Approximate central coordinates 24°20'N, 53°05'E

Location: On the Arabian Gulf coast of Abu Dhabi Emirate, from the region of Selaha Island in the east to Sir Bani Yas in the west.

Area: 478,000 ha, including sea area.

Altitude: Sea level to 6 metres below and a maximum of 10 m above.

Overview: A vast area of low-lying islands and islets, coastal sabkha, inter-tidal mudflats with native mangroves and saltmarsh vegetation, and shallow inshore waters with extensive seagrass beds, along the west-central Gulf coast of Abu Dhabi Emirate, immediately to the west of, and abutting, Site 1. Part of the site has been affected by urban and industrial development, but far less so than areas to the east. Biological productivity of the mangroves and mudflats is high, and the site supports internationally important numbers of migratory shorebirds, Crab Plover *Dromas ardeola* and breeding terns *Sterna* spp. The area is also important for cetaceans, Dugong *Dugong dugon* and sea turtles.

Physical features: The site comprises the sabkha coast and nearshore islands of Bu Tinah, Juneina, Merawah, Selaha, Sir Bani Yas, Umm Amim and 'Ushsh, along with a

collection of mainly low sandy shoals and rocky islets. All are arid and sparsely vegetated. The inter-tidal areas include an extensive coastal sabkha edge and a large area of mudflats extending eastward from Merawah Island. This site is arbitrarily separated from Site 1 as far as present knowledge allows, although the division is reasonable for wintering shorebirds and breeding seabirds. Different authors, from differing fields, might well have proposed differing boundaries. In any case, this is not important as the two areas abut and there is no administrative or other confusing factor to contend with. Ownership between the two areas is different, however.

Ecological features: Much of the area remains in a natural state. Small islands are vegetated principally by Chenopods. The larger islands and some of the smaller ones have areas of well developed saltmarsh plant communities. Mangrove *Avicennia marina* occurs naturally on Merawah, Bu Tinah, Liffiyah and Bazm al Gharbi. Productivity along the mainland coast apparently lessens westward. The widespread coral development is still mainly in good condition. The two common seagrasses *Halophila uninervis* and *H. stipulacea*, as well as *H. ovalis*, appear to be particularly abundant around Merawah and Bu Tinah, and grow in water 1.5 m or less in depth, *H. uninervis* even surviving exposure at low water.

Land tenure: Most of the islands are privately owned by members of the Abu Dhabi ruling family or other dignitaries or VIPs, whereas the mainland coast falls mainly under the control of Abu Dhabi Municipality.

Conservation measures taken: Some island owners have been approached and informed of the numbers and value of the wildlife on their property. The owner of Bu Tinah, H. H. Sheikh Hamdan bin Zayed, has a strict protectionist policy toward the islands which he enforces. This extends not only to breeding birds, but also to nesting turtles. Fishing by means of gargour or fixed nets is also prevented in inshore waters. The island of Umm Amim and the three Sir Bani Yas "satellite" islands of Umm Qassar, Umm al Kirkum and Ghasha have been identified as two separate Important Bird Areas (IBAs) by BirdLife International.

Conservation measures proposed: Inclusion of the entire area as a site in this Directory and designation of Umm Amim and the three Sir Bani Yas "satellite" islands as IBAs will be brought to the attention of various appropriate individuals and organisations. Representation is to be made to the Federal Environmental Agency and, as with Site 1, it is to be recommended that a sensible land use policy and future structure plan should be developed as a matter of priority. Formal recognition of the area is required. A "leave alone" management policy would be appropriate for much of the area.

Land use: House-building, some mangrove planting and dredging for new land are the principal activities. There are three sizeable and viable offshore oilfields present in the sea area included within, or overlapping, the boundary of the site. There is a large oil refinery at Ruwais and some industrial activity associated mainly with oil support facilities. A certain amount of fishing takes place.

Possible changes in land use: An increase in housing on both the coast and islands is likely. Reclamation is always possible. There is also likely to be an increase in cultivation and woodland plantations which are mostly not damaging to wildlife.

Disturbances and threats: Commercial, residential and industrial development. Ongoing dredging and reclamation of inter-tidal and littoral areas are being carried out without any consideration for wildlife. This has recently been the case off Mirfa, where extensive sub-tidal areas, including coral and seagrass areas, have been reclaimed, with resulting occlusion of neighbouring areas by sediment. The installation of irrigation and tree planting on arid islands is resulting in the destruction of seabird colonies, e.g. on 'Ushsh. Uncontrolled illegal collection of birds' eggs and possibly turtle eggs (and

sometimes even of tern chicks) is a serious threat. Overfishing and the risk of oil pollution are further threats. Introduced and feral cats predate breeding seabirds. Feral pigeons *Columba livia* occur in very large numbers, and occupy nest sites which would otherwise be used by Bridled Terns *Sterna anaethetus*. The proliferation of the introduced Egyptian Goose *Alopochen aegyptiacus* is not desirable ecologically, although the birds remain immensely popular and continue to be released widely.

Hydrological and biophysical values: Important commercial fisheries. The area is one of high biological productivity and important for fish nurseries. Many molluscs and shellfish rely on this habitat to complete part or all of their life cycle.

Social and cultural values: The area has a long history of human occupation. Some outstanding archaeological sites have been examined and documented.

Noteworthy fauna: A herd of Dugong *Dugong dugon* is regularly reported between Merawah and Bu Tinah. Its exact size is unknown, but certainly numbers a few tens of individuals (personal observation, 1994). Bottle-nosed Dolphin *Tursiops truncatus* and Indo-Pacific Humpback Dolphin *Sousa chinensis* are regularly recorded, with many different groups or herds of both, the latter being the more numerous. Green Turtles *Chelonia mydas* breed on several of the islands, and there is a particularly large feeding concentration known around the Bu Tinah shoals. Merawah alone supports over 10,500 waterfowl in winter, including at least four species of shorebirds in internationally significant numbers, namely Crab Plover *Dromas ardeola* (495-528), Lesser Sand Plover *Charadrius mongolus* (1, 145), Grey Plover *Pluvialis squatarola* (700-900) and Great Knot *Calidris tenuirostris* (300-600 on passage). The occurrence of the last-named is exceptional. Many of these birds roost on Merawah and feed both there and elsewhere, including on inter-tidal banks. Numbers of shorebirds in other sites are mostly unknown, but may be very high, e.g. 1,500 *Charadrius mongolus* were counted on Bu Tinah in January 1995, a rarely visited site. The number of passage shorebirds exceeds those overwintering.

Breeding birds include internationally important numbers of Lesser Crested Tern *Sterna bengalensis* (454 pairs), White-Cheeked Tern *S. repressa* (c.7,000 pairs) and Bridled Tern *S. anaethetus* (c.9,000 pairs). Several different sites are individually important, namely Ghasha, Selaha, Umm Amim, Umm Qassar and 'Ushsh. Thirty pairs of Crab Plovers breed on Umm Amim. Saunders's Little Tern *Sterna saundersi*, Western Reef Heron *Egretta gularis*, Little Green Heron *Butorides striatus* and Kentish Plover *Charadrius alexandrinus* also breed widely, but population estimates are lacking. Three small colonies of Socotra Cormorants *Phalacrocorax nigrogularis* are known, two near Sir Bani Yas and the other close to Merawah, with 150, 300 and 80 pairs respectively in 1994/95. Seven or more pairs of Osprey *Pandion haliaetus* breed.

Coral communities are widespread and remain healthy.

Noteworthy flora: The mangrove areas and saltmarsh development are of particular interest. Seagrass beds are extensive above and below low-water.

Scientific research and facilities: Little or none other than archaeological and ornithological surveys. Shorebird feeding ecology and ringing studies began in autumn 1994.

Management authority and jurisdiction: Not applicable.

References: Evans (1994); Hellyer (1990). Also: unpublished internal NARC reports and data, and personal observations.

Reasons for inclusion: la, 2a, 2c, 3a & 3c. Source: Simon Aspinall.

Wetland Name: Western Abu Dhabi Border Islands

Country: United Arab Emirates

Coordinates: Approximate central coordinates 24°20'N, 51°45'E

Location: In the Arabian Gulf in western Abu Dhabi Emirate, extending to the borders with Saudi Arabia and Qatar.

Area: 455,000 ha, including sea area.

Altitude: Sea level to 6 m below low water and a maximum of 15 m above.

Overview: A collection of arid, sparsely vegetated rocky or sandy islands of variable size in the Arabian Gulf in western Abu Dhabi. Seabird numbers are of international importance.

Physical features: The site comprises a large number of predominantly rocky islands or island groups lying close to the Qatar or Saudi Arabian borders. The principal islands are the Yasat group, Ghagha, Muhaiyimat, Umm al Hatab, Jazirat Na'Itah, Kafai and Makhasib. Most sit on coral platforms and have raised beaches. Shell sand overlies most of the lower islands. Some of the islands, not necessarily the largest, have permanent habitation and a small resident human population, mostly border police.

Ecological features: Typical sparsely vegetated arid islands. A halophytic plant community is well developed. The widespread coral development is still mainly in good condition. There is a small plantation of mangrove on South Yasat.

Land tenure: Mainly state owned or belonging to members of the Abu Dhabi ruling family. Access to several is restricted for reasons of military security.

Conservation measures taken: None. Yasat and Ghaghah have been identified as Important Bird Areas (IBAs) by BirdLife International.

Conservation measures proposed: Formal recognition of the area is required. Representation is to be made to the Federal Environmental Agency and, as with Sites 1 and 2, it is to be recommended that a sensible land use policy and future structure plan should be developed as a matter of priority. A "leave alone" management policy would be appropriate for much of the area.

Land use: State security and border policing, some commercial fishing, and eggcollecting in season.

Possible changes in land use: None of major significance, excepting the possibility of oil related developments.

Disturbances and threats: Human disturbance. Feral cats are already a problem on some islands, e.g. Kafai. The uncontrolled illegal collection of birds' eggs and possibly turtle eggs is a serious threat. Overfishing and the risk of oil pollution are further potential threats.

Hydrological and biophysical values: Important commercial fisheries.

Social and cultural values: The area has a long history of human occupation. Some archaeological sites, described as being of considerable significance, have been examined and documented. The area is also a strategic national frontier zone.

Noteworthy fauna: Green Turtles *Chelonia mydas* breed on several of the islands, although population estimates are not available. Dugong *Dugong dugon* may still occur. Herds and families of Bottle-nosed Dolphin *Tursiops truncatus* and Indo-Pacific Humpback Dolphin *Sousa chinensis* are numerous. The two species often consort. Numbers of several breeding seabirds are of international importance, and include 6,000/7,000 pairs of Socotra Cormorants *Phalacrocorax nigrogularis* in two colonies (1994/95 survey) and a single colony of terns with 4,050 pairs of Lesser Crested Terns *Sterna bengalensis*, c.6,000 pairs of White-cheeked Terns *S. repressa* and c.9,500 pairs of Bridled Terns *S. anaethetus*. A single pair of Caspian Terns *S. caspia* was found breeding

on Jazirat Na' Itah in January 1995, the first proven breeding record for the UAE. Over forty pairs of Osprey *Pandion haliaetus* are known. Shorebird numbers are unknown, but are likely to be small. Western Reef Herons *Egretta gularis* breed on the ground on many of the islands.

Coral communities are intact and widely developed throughout the area. Many good examples exist.

Noteworthy flora: No information.

Scientific research and facilities: None, other than ornithological and archaeological surveys.

Management authority and jurisdiction: Not applicable.

References: Aspinall (1994); Evans (1994). Also: unpublished internal NARC reports and data.

Reasons for inclusion: 1a, 2a, 2c, 3a & 3c. Source: Simon Aspinall.

Wetland Name: Abu Dhabi's Offshore Islands

Country: United Arab Emirates

Coordinates: Five offshore islands in the Arabian Gulf in western Abu Dhabi Emirate: Dayyinah (24°56'N, 52°24'E); Qarnein(24°56'N, 52°52'E); Arzanah (24°47'N, 52°34'E), Zirku (24°53'N, 53°05'E) and Das (25°09'N, 52°52'E).

Area: 380,000 ha, including sea area.

Altitude: Sea level to 6 m below and c. 160 m above. The maximum altitudes on the five islands are: less than 5 m on Dayyinah, 37 m on Das, 58 m on Qarnein, 66 m on Arzanah, and 160 m on Zirku.

Overview: A group of five small islands in the Arabian Gulf in western Abu Dhabi, separated from each other by relatively deep water. Three of the islands formerly held breeding colonies of Socotra Cormorants *Phalacrocorax nigrogularis*, but only that on Dayyinah still remains. The islands continue to hold internationally important breeding colonies of terns *Sterna* spp. The Red-billed Tropicbird *Phaethon aethereus indicus* still breeds on three islands, but in much reduced numbers on two of these. The likelihood of interchange between colonies is sufficient justification for lumping the islands together as a single site.

Physical and ecological features: Dayyinah is a low sandy and shelly island surrounded by pristine coral patches and platform. The other islands are all characterised by one or more hills or a central hilly core which have been punched up through the younger sedimentary rocks by salt diapirism. The hills on Qarnein are the most pronounced. Dayyinah and the low parts of Qarnein are vegetated by halophytic scrub, principally *Suaeda* and *Salsola*. Arzanah and Zirku have classic radial drainage features, although both are arid. Vegetation is sparser on the latter two islands. Das is similar to Qarnein. Coral development is widespread, and remains in good condition around Dayyinah and Qarnein at least (information lacking from the other three islands).

Land tenure: The oil company ZADCO, part of the ADNOC group, owns Zirku and Arzanah; H.H. Sheikh Hamdan bin Zayed owns Qarnein; Das is an oil and gas terminal also controlled by the ADNOC group; and Dayyinah seems to be unclaimed.

Conservation measures taken: The owner of Qarnein, H. H. Sheikh Hamdan bin Zayed, has a strict protectionist policy toward the island which he enforces. This extends not only to breeding birds but also to nesting turtles. Fishing by means of gargour or fixed nets is also prevented in inshore waters. Qarnein has been identified as an Important Bird Area (IBA) by BirdLife International. Apparently no specific measures have been taken on other islands.

Conservation measures proposed: Formal recognition of the conservation values of the islands is required. Representation is to be made to the Federal Environmental Agency and, as with Sites 1, 2 and 3, it is to be recommended that a sensible land use policy and future structure plan should be developed as a matter of priority. Restoration of the Socotra Cormorant and Red-billed Tropicbird colonies is a possibility, and perhaps of other species as well. A "leave alone" management policy would be appropriate for the undeveloped islands. Complete removal of cats (and rats) from all sites is recommended, and would be essential if the breeding colonies of seabirds are to be restored.

Land use: A resident human population is found on all of the islands except Dayyinah; that on Qarnein is usually less than twenty, whereas on the other three, numbers range from several hundred to 6,000 or more (on Das). Arzanah and Zirku are oil producing and off-loading islands. Qarnein is privately owned and used for recreation and holidays. Dayyinah is visited solely by egg-collectors or occasionally by fishermen during bad weather or for other reasons. Das is an oil-processing island. Four sizeable offshore oilfields exist within the boundary of the site.

Possible changes in land use: The three oil islands have been largely developed, and the only possible change would be for the oil companies to leave. Qarnein is likely to be protected in perpetuity. Dayyinah lies on the border with Qatar, and is strategic yet undeveloped, possibly for that reason.

Disturbances and threats: Continued egg-collecting, release of cats or accidental introduction of rats. Cats are numerous on Zirku and Arzanah. Development on Zirku, Arzanah and Das has been at the expense of the breeding seabird populations and other wildlife, e.g. turtles. Oil pollution is an ever present threat. Hawksbill Turtles *Eretmochelys imbricata* have to be rescued from the seawater intake basin on Das. Rubbish on beaches may physically prevent turtles from coming ashore to lay their eggs.

Hydrological and biophysical values: None specifically described.

Social and cultural values: Archaeological sites exist on all the islands, although only those on Qarnein and Das have been investigated to date.

Noteworthy fauna: The islands support very large breeding colonies of seabirds. The breeding populations on Qarnein and Dayyinah total c.21,500 pairs of Bridled Terns *Sterna anaethetus*, 7,600 pairs of White-cheeked Terns *S. repressa*, 20,000 pairs of Lesser Crested Terns *S. bengalensis*, 1,200 pairs of Great Crested Terns *S. bergii*, 235 + pairs of Sooty Gulls *Larus hemprichii* (215+ on Qarnein and 20+ on Dayyinah), 50-60 pairs of Red-billed Tropicbirds *Phaethon aethereus* (Qarnein) and up to 8,000 pairs of Socotra Cormorants *Phalacrocorax nigrogularis* (Dayyinah). Bridled Terns and Whitecheeked Terns nest on both islands, the former under halophytic scrub and the latter on the bare ground, while the Great Crested Terns and Lesser Crested Terns nest in a single colony on Qarnein. Red-billed Tropicbirds still survive and breed on Arzanah and Zirku; a single pair was located on the former and a maximum of 17 individuals recorded on the latter in January 1995. Red-billed Tropicbirds are known to have attempted to breed on Das, and may in fact do so successfully. Zirku held a colony of at least 15,000 pairs of Socotra Cormorants in 1972, but this colony has since been extirpated (since 1981), and the island has lost much of its seabird interest, *i.e.* all breeding terns. All the islands except possibly Das possess one or more pairs of breeding Ospreys *Pandion haliaetus*. Up to 1,600 *Larus hemprichii* have been recorded on Qarnein in mid-winter, and at least 365 Great Black-headed Gulls *Larus ichthyaetus* were found on Dayyinah in January 1995, an important concentration of this species.

Green Turtles *Chelonia mydas* breed on at least three of the islands, and Hawksbill Turtles *Eretmochelys imbricata* are reported to have nested on Dayyinah (Ross & Barwani, 1981).

Noteworthy flora: None especially notable, although the relatively luxurious *Salsola/Suaeda* community on Qarnein is well developed and well preserved.

Scientific research and facilities: Principally ornithological, botanical and archaeological surveys, with a limited amount of study of other groups.

Management authority and jurisdiction: See "Land tenure" above.

References: Emirates Natural History Group (1989); Evans (1994); Foxall (1985); Fraser (1981); Heath (1989); Reaney (1986); Ross & Barwani (1981). Also: unpublished records of the Emirates Bird Records Committee, NARC internal reports and unpublished data. Reasons for inclusion: 1a, 2a, 2c, 3a & 3c.

Source: Simon Aspinall.

Wetland Name: Dalma

Country: United Arab Emirates

Coordinates: 24°30'N, 52°18'E

Location: In the Arabian Gulf about 40 km northwest of Jebel Dhana on the mainland coast of Abu Dhabi Emirate.

Area: 3,500 ha. The site excludes that part of the island which is developed.

Altitude: Sea level to 93 m above.

Overview: A small, hilly, offshore island in the Arabian Gulf, formerly of considerable importance for breeding seabirds, but now extensively modified, especially in the east and south, by reclamation, development and cultivation.

Physical features: Dalma is a "salt-dome" island with a central hilly core. The arid rocky landscape consists of undulating, mostly bare, hillocks and mounds with waterworn gullies and small crags up to 5 m in height. Sea cliffs in the west of the island have been cut off from the sea by road construction. Land in the extreme southern part of the island is under cultivation or has been developed, except for a narrow two km long reclaimed limb.

Ecological features: A typical arid Gulf island with sparse natural vegetation. Much of the island has been extensively modified by man, and there are large areas of irrigated cultivation and tree plantations.

Land tenure: Abu Dhabi Municipality.

Conservation measures taken: Dalma has been identified as an Important Bird Area (IBA) by BirdLife International, although not on account of its wetland values.

Conservation measures proposed: Protection of key areas of the undeveloped northwestern quarter of the island is desirable. An attempt should be made to restore the former seabird colonies.

Land use: Cultivation in the south of the island. A large commercial fishing fleet of traditional craft is housed here. There is also some usage for military purposes. A large oilfield is situated just to the east of Dalma.

Possible changes in land use: Further large-scale modification of the island landscape through reclamation and bulldozing of natural terrain for urban, industrial and agricultural development.

Disturbances and threats: Dredging and pumping to reclaim seabed off the east side of the island have destroyed much marine life including coral. Increased turbidity droguing downstream (eastward) away from island has doubtless affected the ecology further

afield. No consideration has been given to the native wildlife, perhaps mainly because of a lack of awareness.

Hydrological and biophysical values: No information.

Social and cultural values: The island has a long history of occupation, dating back to at least 5,000 B.C.

Noteworthy fauna: Saunders's Little Terns *Sterna saundersi* continue to breed on reclaimed land. Socotra Cormorants *Phalacrocorax nigrogularis* roost and feed close to the island, and formerly bred in large numbers. This colony might be restorable. One pair of Osprey *Pandion haliaetus* breeds. Important non-wetland species include Sooty Falcon *Falco concolor* (five breeding pairs).

Noteworthy flora: None known.

Scientific research and facilities: Archaeological excavations were carried out in 1992-1994, and several ornithological surveys have been undertaken.

Management authority and jurisdiction: Abu Dhabi Municipality.

References: Evans (1994). Also: unpublished personal observations.

Reasons for inclusion: 1a & 2b (formerly 3c). Of importance for its shallow-water marine community and associated seabird avifauna.

Source: Simon Aspinall.

Wetland Name: Eastern Abu Dhabi and Ras Ghanada Coastal Wetlands

Country: United Arab Emirates

Coordinates: 24°36'N, 54°33'E

Location: On the Arabian Gulf coast of eastern Abu Dhabi Emirate, extending to the border with Dubai Emirate.

Area: 99,500 ha.

Altitude: Sea level to six m below and a maximum of 10 m above.

Overview: An extensive complex of islands, inter-tidal sand flats, mangroves and saltmarsh on the Arabian Gulf coast in eastern Abu Dhabi. The area is one of high biological productivity, and supports a rich and diverse avifauna.

Physical features: The site comprises a maze of islands and shallow water areas with mature mangroves and, on its landward side, an extensive sabkha. The principal islands are Sadiyat, Bal Ghelam, Ghanada, Ghurab, Hayl, Jubayl and Ramhan. Saltmarsh is well developed in places, and extensive sand flats are exposed at low water. Much of the area is undeveloped, although reclamation and dredging have altered much of the original mainland and inter-tidal areas. Some islands are now irreparably altered.

Ecological features: The western part of the area supports an extensive and relatively undisturbed natural mangrove formation with monospecific stands of the Black Mangrove *Avicennia marina*. Low sandy and shelly shoals and islands throughout much of the remainder of the site support scrubby halophytes.

Land tenure: Much of the land is state owned or occupied by state run companies. Some is in private ownership (mostly islands).

Conservation measures taken: H.H. Sheikh Zayed bin Sultan al Nahyan has ordered that part of the Eastern Lagoon immediately adjacent to Abu Dhabi island be protected. Conservation measures proposed: Formal recognition of the area is required. Representation is to be made to the Federal Environmental Agency, and it is to be recommended that a sensible land use policy and future structure plan should be developed as a matter of priority. A "leave alone" management policy would be appropriate for much of the area.

Land use: Residential and industrial development locally.

Possible changes in land use: Continued development is likely.

Disturbances and threats: Reclamation and land use changes are the most likely threats along with the risk of pollution, particularly by oil. A power station at the site has unknown, but perhaps unimportant, effects on the area.

Hydrological and biophysical values: The area is one of high biological productivity and important for fish nurseries. Many molluscs and shellfish rely on this habitat to complete part or all of their life cycle.

Social and cultural values: The area has a long history of human occupation.

Noteworthy fauna: The typical mangrove bird community includes unknown, but large, populations of Western Reef Heron *Egretta gularis*, Little Green Heron *Butorides striatus*, Kentish Plover *Charadrius alexandrinus* and Clamorous Reed Warbler *Acrocephalus stentoreus*; Booted Warbler *Hippolais caligata* may also occur. Wintering waterfowl include large numbers of roosting gulls (Laridae) and smaller numbers of shorebirds (Charadriidae and Scolopacidae). The higher salt flats and saltmarsh have breeding Lesser Short-toed Lark *Calandrella rufescens*, one of only two such sites known in the UAE (see also Site 13). The mangrove areas have large shellfish stocks and are doubtless important nursery areas for molluscs, fish and crustacea. The Indo-Pacific Humpback Dolphin *Sousa chinensis* occurs, while Green Turtles *Chelonia mydas* may breed in the east of the area, around Ras Ghanada.

Noteworthy flora: The extensive natural mangrove formations in western parts of the site remain relatively undisturbed.

Scientific research and facilities: Some studies and mapping of mangrove areas have been completed (Al Ghais, pers. comm.). Some archaeological survey work has been carried out (P. Hellyer, pers. comm.), and a number of avifaunal surveys have been undertaken.

Management authority and jurisdiction: Abu Dhabi Municipality and private landowners.

References: Personal communication and personal observations.

Reasons for inclusion: 1a, 2c & 3b. Large stands of mangrove, coastal protection and importance as a nursery area for shellfish and fin-fish.

Source: Simon Aspinall.

Wetland Name: Al Ghar Lakes

Country: United Arab Emirates

Coordinates: 24°15'N, 54°42'E

Location: 40 km southeast of Abu Dhabi, in Abu Dhabi Emirate.

Area: At least 3,000 ha.

Altitude: Less than 20 m above sea level.

Overview: A group of enriched playa lakes on sabkha, partly maintained by bunding. The site is an important breeding, staging and wintering area for several species of shorebirds and terns, and was the site of a breeding attempt by Greater Flamingos *Phoenicopterus ruber* in 1993.

Physical features: A flat area of sabkha, variously flooded throughout the year and subject to rapid changes brought about by diversion of water, cutting off of water supply and realignment of bunds. The salinity and temperature increase to summer highs. Some surface water remains year-round, but only because of artificial bunding. The maximum depth is two metres. A new lake was formed in 1994 from treated effluent from a new sewage plant, and this is proving attractive to waterfowl.

Ecological features: Algal growth is prolific in the lakes, but elsewhere, the vegetation cover is almost non-existent. Sewage inflow, now cut-off or allowed to flow only intermittently, formerly greatly enriched the site.

Land tenure: Abu Dhabi Municipality.

Conservation measures taken: Hunting (shooting) is not allowed.

Conservation measures proposed: Proposals have been put forward to develop the site for wildlife by management of appropriate water levels, enforcing protection and preventing disturbance. Fencing off would be desirable and is now partially completed. A variety of compatible recreational pursuits are to be promoted along with the above proposal. Restoration of the lakes here or close by is quite feasible and plans are already afoot.

Land use: The area is regarded as "wasteland", and is frequently visited by bulldozers and lorries variously removing or delivering sand.

Possible changes in land use: Some building development is likely. Factories, engineering workshops and repair works could easily spring up locally. These can shift site or arrive from other areas. Landfill may be brought on site.

Disturbances and threats: Landfill for development is the principal threat. Much of the site was infilled in autumn 1993 against directions by a member of the Abu Dhabi ruling family. Persecution of wildlife and human disturbance continue to cause problems. Groundwater contamination from toxic waste is a possibility.

Hydrological and biophysical values: No information.

Social and cultural values: The lakes are the only known site in mainland Arabia where the Greater Flamingo has attempted to breed. This species has considerable appeal amongst both nationals and expatriates- living in the Gulf.

Noteworthy fauna: Greater Flamingos *Phoenicopterus ruber* bred unsuccessfully in 1993 (Aspinall & Hirschfeld, 1993). This breeding attempt was the first such attempt in the Arabian peninsula since the species bred on Bubiyan Island off Kuwait in 1922. The site supports regionally important numbers of breeding Black-winged Stilts *Himantopus himantopus* (60-100 pairs annually and possibly over 200 pairs in 1992 and 1993; P. Hellyer pers. comm.). This is one of the two largest concentrations of the species in the UAE (see also Site 10). Other breeding birds include 100+ pairs of Kentish Plover *Charadrius alexandrinus*. Large numbers of shorebirds, notably *Calidris* spp. and marsh terns *Chlidonias* spp., occur on spring and autumn passage and in winter. Particularly significant populations are of Kentish Plover (c. 1,400) and Little Stint *Calidris minuta* (c. 1,200). The Monitor Lizard *Varanus griseus* and Red Fox *Vulpes vulpes* occur in the area. Chironomid larvae and other aquatic invertebrates occur in profusion.

Noteworthy flora: None known.

Scientific research and facilities: None, other than occasional avifaunal surveys.

Management authority and jurisdiction: Not applicable as such. The Abu Dhabi Municipality would presumably continue to run the site under direction.

References: Aspinall & Hirschfeld (1993). Also: unpublished data held by the Emirates Bird Records Committee (including IWRB waterfowl census data).

Reasons for inclusion: 1a, 2b & 3c. A possible breeding site for the Greater Flamingo (the only such site in mainland Arabia), and an important breeding, passage and overwintering site for several species of shorebirds.

Source: Simon Aspinall.

Wetland Name: Sir Abu Nu'air

Country: United Arab Emirates

Coordinates: 25°13'N, 54°14'E

Location: In the Arabian Gulf, 75 km from the mainland coast of Abu Dhabi, Abu Dhabi Emirate.

Area: 1,500 ha.

Altitude: From sea level to 81 m.

Overview: A small, rocky, offshore island in the Arabian Gulf, uninhabited until the early 1980s and, at least formerly, of considerable importance for breeding seabirds. Much of the island has recently been developed as a military base, and it is feared that many of the breeding seabirds have been displaced, but no detailed avifaunal surveys have been carried out since the 1970s.

Physical features: Approximately 4 km in diameter, the island of Sir Abu Nu'air is almost-pear-shaped with a protruding spit to the south. The mountainous central area, described geologically as a salt dome, includes some igneous rocks criss-crossed by small ravines, wadis and rocky outcrops which run down to the sea along most of the shoreline. There are, however, some areas up to 300 metres wide of less-sloping, flat, open areas of stony ground, with isolated clumps of low-thorny scrub. These provide suitable habitat for nesting seabirds of several species. The island has no natural water, and there is very low annual rainfall. The stony surface of the mountains does not absorb water, and all rain quickly runs off into sea, although some may drain into surrounding sand and gravel, giving rise to a richer flora.

Ecological features: The flora is at a peak in winter, and can be seen at its best following rain. Low cliffs on the south side are dominated by *Suaeda vermiculata*, which forms a thick barrier up to one metre high and impenetrable in places. This species forms a belt overhanging the cliff ledge and stretching inland irregularly for some ten metres. Where the limestone ledge gives way to gravels and rougher terrain, the vegetation is less thick and annuals are conspicuous, including *Malva parviflora* up to 20 cm tall in relatively sheltered spots. Large patches of *Argyrobium roseum* occur on softer sand, and there are distinct but small clumps of *Lotus schimperi* and *Lotonis plalycarpa*. The whole area is interspersed with tiny patches of *Zygophyllum simplex*, occasionally linking to form larger mats. Further inland, the ground is rougher with a series of clefts and jagged-sided mini-wadis aligned radially from the centre of the island to the sea. The major plant associations are *Salsola* (*S. baryosma*, *S. schweinfurthii* and *S. tetrandia*) along with minor patches of *A. roseum* and *Z. simplex* (this latter only in sand and wadi beds). The broken mini-plateau between these fissures is dominated in this zone by *Capparis spinosa*, with individual shrubs up to one metre across and 50 cm high, and even more so by *Reseda aucheri* up to 90 cm high, especially in more open areas. Numerous *Zygophyllum mandivillei* are in evidence with their twisted gnarled stems. In this same zone, but less prolific, are a number of individual specimens of *Convolvulus cf. prostratus*, and dotted among these are small patches of *Polycarpea repens*. Towards the north coast of the island are the remains of an old stone cistern, full of tall grasses and shaded by the only tree on the island, a 4 metre tall *Zizyphus spina-christi*, presumably planted to provide shade. This immediate locality remains a small catchment area for water run-off. The western and northern sides of the island are comparatively bare with occasional clumps of *S. vermiculata* and rare patches of annuals. The projecting sand spit to the south is generally bare but for a few *Salsola* spp. dotted here and there (Western, 1983).

Land tenure: Administered by the Emirate of Sharjah.

Conservation measures taken: None.

Conservation measures proposed: Future development and encroachment on any remaining seabird habitat or areas of important flora should be discouraged, and

measures to restore natural areas should be encouraged. Restoration of seabird colonies should also be attempted.

Land use: The island was still uninhabited, except for some fishermen's shacks, in December 1983 (Western, 1983). Rapidly developed since 1983, the island now holds a military base, with asphalt roads providing easy access to most parts of the island.

Possible changes in land use: Not known, but likely to be further developed e.g. for national security.

Disturbances and threats: Although strategically located adjacent to one of the world's busiest shipping lanes, with loaded tankers carrying oil from the adjacent oil-rich states, the island did not become a target for development until the early 1980s. However, it is now believed that the island has been changed considerably due to military development, and may already have lost most if not all of its indigenous fauna and flora and some of its original coastline. Levels of human disturbance are high, and the building of roads, runways and various military installations has displaced seabird colonies. Egg collectors have also reduced breeding success of the larger terns such as Lesser Crested and Great Crested Tern (see below). Western (1983) reported that the island had mice, presumed to be the House Mouse *Mus musculus*, and possibly feral cats.

Hydrological and biophysical values: None known.

Social and cultural values: There is evidence of earlier occupation and some archaeological artifacts, although much has been lost as a result of development.

Noteworthy fauna: Several species of seabirds were recorded nesting on the island in 1970 and 1971, and one internationally threatened species, the Socotra Cormorant *Phalacrocorax nigrogularis*, was still found to be nesting in 1987. The present situation is unknown, but it seems likely that many of the seabirds have deserted the island as a result of disturbance and destruction of their nesting grounds by recent development. The following species have been recorded breeding on the island:

Red-billed Tropicbird *Phaethon aethereus*: One bird was incubating its single egg in a pile of rocks on the north of the island on 10 June 1971.

Socotra Cormorant *Phalacrocorax nigrogularis*: A colony was still using the island in autumn 1987. The population was estimated (from photographs) at several thousand birds in November 1983. The island is also an important roosting site for the species outside the breeding season.

Sooty Gull *Larus hemprichii*: Scattered pairs at the north end; six nests were found in June 1971, but the exact number of pairs was not known.

Great Crested Tern *Sterna bergii*: 2,000 pairs counted on 19 June 1970. The colony was not present in June 1971, and is presumed to have been disturbed by eggcollectors who were on the island at the time.

Lesser Crested Tern *S. bengalensis*: 300-400 pairs present in June 1970. None in June 1971.

White-cheeked Tern *S. repressa*: 30-40 pairs June 1970 and June 1971.

Bridled Tern *S. anaethetus*: "thousands" breeding all over the island in June 1970 and June 1971.

Noteworthy flora: See "Ecological features" for all flora noted on the island in December 1982 (Western, 1983)

Scientific research and facilities: Much of the available information on the island's flora and fauna comes from visits by amateur naturalists in 1969, 1970, 1971 and 1982. Information on its condition in the 1990s has been obtained from visiting expatriates and local fishermen. Attempts are under way to gain permission to revisit the island in 1995. in order to assess its current condition.

Management authority and jurisdiction: Government of Sharjah.

References: Cowley (1971); Morris (1969); Western (1983).

Reasons for inclusion: 1a, 2b, 2c & 3c. The island was (and may still be) one of only three or four sites in the UAE where the Red-billed Tropicbird nests. It is also one of only three known breeding sites for the Sooty Gull and Great Crested Tern in the UAE. Socotra Cormorant, a species endemic to Arabia, is now having great difficulty in finding safe islands for nesting, and may face extinction unless islands such as this are adequately protected.

Source: Cohn Richardson.

Wetland Name: Khor Dubai and Zabeel Water Treatment Plant

Country: United Arab Emirates

Coordinates: 25°12'N, 55°20'E

Location: On the outskirts of Dubai city, Dubai Emirate.

Area: Approximately 2,000 ha.

Altitude: Sea level.

Overview: The tidal creek and extensive mudflats of Khor Dubai are well-known as one of the most important wetlands in the Emirates, regularly supporting hundreds of Greater Flamingos and thousands of other waterbirds. At least nine species of birds occur in internationally important numbers, including Lesser Sand Plover *Charadrius mongolus*, Kentish Plover *C. alexandrinus* and Broad-billed Sandpiper *Limicola falcinellus*. Formerly, there was no natural vegetation at the Khor, but in late 1993, several thousand mangrove shoots were planted by the local authority, without thought for the possible detrimental effect this may have on the ecology of the site. The four large ponds at Zabeel water treatment plant are an important feeding area for birds which also use Khor Dubai.

Physical features: The site known as Khor Dubai is an area of shallow mudflats at the head of a curved tidal creek, some 10 km long, which penetrates seven km inland from the Arabian Gulf through the city of Dubai. The tidal range is 1.0 to 1.5 metres. About 150 ha of tidal mudflats are exposed at low water; at high water, the tidal lagoon has a maximum depth of about two metres. Flat sabkha (saturated salt flats) surrounds the inter-tidal area; there is some halophytic scrub above the high-water mark, and some *Tamarix* in disturbed areas. About 50% of the inter-tidal zone was planted with mangroves in 1993/4, and this area is now carpeted with young mangrove shoots. The inter-tidal zone supports an abundant macrobenthic fauna of low diversity. There is nutrient enrichment from irrigation run-off and sewage effluent, and a permanent flow of piped "super" saline water from a groundwater pumping system. The adjacent area of Zabeel is a prehistoric extension of the estuary, and consists of saturated salt flats with interspersed sand dunes. A water treatment plant with four large ponds has been built around some of the higher dunes. Fresh water is allowed to overflow from the irrigation ponds (which are also stocked with fish) on to the surrounding sabkha. This has allowed a small forest of trees and a substantial reed-bed to form, increasing the diversity of birds and other creatures. The whole site, including Zabeel water treatment plant, spans a main road and is bounded by two other main roads and an industrial area.

Ecological features: Large patches of *Lippia nodiflora* are found at pond edges, while the surrounding dunes have congregations of *Cynomorium coccineum* and *Cistanche tubulosa*. Naturally occurring Ghaf *Prosopis cineraria* is the largest tree to be found, while the largest bush is *Pluchea ovalis*. Introduced mesquite *Prosopis juliflora* grows rapidly, and is regularly cleared by the authorities. The dunes support a number of grasses and small shrubs, while salt-tolerant halophytes have colonised the sabkha. The reed-beds at Zabeel water treatment plant contain *Phragmites australis* and *Typha domingensis*.

Land tenure: The land is owned by the country's Defence Minister and Crown Prince of Dubai, H.H. General Sheikh Mohammed Bin Rashid Al Maktoum.

Conservation measures taken: Khor Dubai is protected from intrusion by a Police Guard. Signs have been erected by Dubai Municipality who now recognise the site as a Bird Sanctuary under local Decree. However, full power regarding any decision to change all or part of the site is retained locally, *i.e.* outside Municipality control. The water treatment plant is rather erratically managed (*i.e.* gardened and tidied), partly with the birds in mind, but will remain as an important site for as long as the treatment plant is in use. There are no immediate plans to close it. The only wild species of tree on the site, *Prosopis cineraria*, is protected by law, although many are pruned annually as the cuttings are of nutritional value to camels. The entire site, including Zabeel, has been identified as an Important Bird Area (IBA) by BirdLife International.

Conservation measures proposed: Various proposals have been made to the owner concerning management of the site, but none of the recent proposals has been implemented. A "leave alone" management policy would be appropriate for much of the area.

Land use: Private land currently with no development, except for the owner's Palace. The Khor is used for water-skiing and some boating. Fishing has recently been banned near the Bird Sanctuary.

Possible changes in land use: There are unconfirmed development plans for a leisure complex around the eastern boundary of the site. No other development plans have been announced for the area within the site boundary.

Disturbances and threats: The threats to Khor Dubai include human disturbance, especially at weekends, when visitors sometimes walk onto the mudflats to approach the flamingos. Four-wheel drive vehicles are regularly driven onto the mudflats, and the occupants occasionally shoot at birds when the police are absent. The biggest threat is currently the mangrove plantation and associated earthworks, which have damaged much of the inter-tidal zone and inhibited the natural tidal flow. The risk of serious pollution is high because of the proximity of the site to Dubai city and enclosed nature of the water body.

Social and cultural values: The mouth and seaward end of the khor are of major importance for dhow traffic and trading of anything from fruit and fish to dishwashers and other electrical goods.

Noteworthy fauna: Khor Dubai is an extremely important staging and wintering area for migratory waterbirds. The open mudflats with slack tides and nutrient enrichment have contributed to make the site important feeding grounds for Arctic shorebirds and a major winter roost for gulls. There are large concentrations of herons, which often commute between the Khor and the water treatment plant, where an abundant supply of introduced *Tilapia* may help purify the water. Of species which occur in numbers exceeding 1 % of the region's wintering population, Grey Heron *Ardea cinerea*, Greater Flamingo *Phoenicopterus ruber*, Kentish Plover *Charadrius alexandrinus*, Greater Sand Plover *C. leschenaultii*, Lesser Sand Plover *C. mongolus*, Redshank *Tringa totanus*, Grey Plover *Pluvialis squatarola* and Black-headed Gull *Larus ridibundus* are the most common at

Khor Dubai. The site attracts up to 20% of the known Fenno-Scandinavian population of Broad-billed Sandpiper *Limicola falcinellus* in autumn. It hosts the largest wintering populations of Mallard *Anas platyrhynchos*, Pintail *A. acuta*, Common Teal *A. crecca* and Wigeon *A. penelope* in the UAE, and a wider variety of birds of prey than anywhere else in the country. Twenty different species of raptor have been recorded at Zabeel water treatment plant, including Imperial Eagle *Aquila heliaca*, Spotted Eagle *A. clanga* (regularly 2-3, maximum 6) and Lesser Kestrel *Falco naumanni*, while 11 species of heron and 13 species of duck, including Ferruginous Duck *Aythya nyroca* (maximum 3) are likely to be found in the course of each year. The overgrown area of trees and reeds adjacent to the fish ponds is a regular breeding site for Little Grebe *Tachybaptus ruficollis*, Moorhen *Gallinula chloropus* and Black-crowned Night Heron *Nycticorax nycticorax* (one of only two breeding sites in Arabia). The reed-beds also hold several breeding pairs of Reed Warbler *Acrocephalus scirpaceus*, which is known to breed at only four other sites in Arabia. Stone Curlew *Burhinus oedicnemus* occurs (and is often hunted) in the dune area within the site, and Houbara Bustard *Chlamydotis undulata* has been reported nearby. A total of 185 species of birds has been recorded at the site in the last twenty years.

Noteworthy flora: Zabeel water treatment plant is the only known site in the UAE for *Heliotropium Paurassivorum*.

Scientific research and facilities: Numerous waterfowl counts and shorebird surveys have been carried out at the site, and the non-breeding population of Greater Flamingos has been the subject of special study.

Management authority and jurisdiction: H.H. Sheikh Mohammed bin Rashid al Maktoum.

References: DSP (1987); Evans (1994); Jongbloed (1987); Moser (1985); Richardson (1990a, 1992); Smart *et al.* (1983); Uttley *et al.* (1988); Western (1989). Also: IWRB (Asian Waterfowl Census) Counts 1990-94.

Reasons for inclusion: la, 2b & 3c. Khor Dubai has a unique natural ecology and attracts internationally significant numbers of several species of waterfowl, notably Broad-billed Sandpiper. The Zabeel water treatment plant is a migrant trap for most Palearctic wetland species occurring in the UAE, and attracts a wide selection of rare birds of prey and passerines.

Source: Cohn Richardson.

Wetland Name: Ramtha Lagoons

Country: United Arab Emirates

Coordinates: 25°22'N, 55°27'E

Location: 5 km inland, on the border between Sharjah and Ajman Emirates, adjacent to the main coastal highway to Ras al Khaimah, Sharjah Emirate.

Area: c.250 ha.

Altitude: Sea level to 10 m.

Overview: A group of sewage ponds and seepage lagoons with some marsh vegetation, near the coast in Sharjah Emirate; very important for breeding, passage and wintering waterfowl.

Physical features: The site comprises a group of four large man-made septic ponds which seep into a large area of saturated salt flats at low level, enriching them and creating a complex of running streams and small to large lagoons, some of which are bordered by reeds and mesquite trees. Scrub-covered sand dunes, up to 10 m in height, occur towards the inland end of the site, where sludge tankers dump their waste. Liquid

waste has been dumped since the early 1980s, with the quantity increasing as Sharjah expands. The largest lagoon, bounded by a main road, is now 1,000 m by 800 m in size.

Ecological features: Seepage from the four large polluted ponds feeds extensive beds of *Phragmites australis* (communis) and copses of *Prosopis julzflora*.

Land tenure: Government of Sharjah.

Conservation measures taken: None, other than private discussions with the office of the Ruler (see below), and recognition of the site as an Important Bird Area (IBA) by BirdLife International.

Conservation measures proposed: Proposals were made to H.H. Dr Sheikh Sultan bin Mohammed Al Qassimi, the Ruler of Sharjah, in 1993 regarding the importance of the site as a wetland habitat, and the possible creation of a bird sanctuary for scientific and educational purposes. Unfortunately, on inspection of the site (where there are very large amounts of builders' rubble and discarded scrap), this recommendation was unacceptable or at least not favoured.

Land use: The site is used for the disposal of sewage and as a rubbish dump.

Possible changes in land use: At present, water does not drain away because of the high water table. The accumulation of polluted water adjacent to a main road is considered to be a nuisance and a health hazard. The Sheikh's engineer has suggested that a hydrological survey might be undertaken to find ways of draining the water or re-using the water for irrigation purposes. It is also rumoured that the land will be sold to developers when an alternative dumping site is found, in which case the site is likely to be used for private housing.

Disturbances and threats: Currently shooting, oil and chemical pollution, and bulldozing by municipal workers.

Hydrological and biophysical values: None known.

Social and cultural values: None.

Noteworthy fauna: Ramtha Lagoons are remarkable for their extremely rich and diverse birdlife. A total of 118 species of birds has been recorded at the site. The wetland supports one of the two largest breeding colonies of Black-winged Stilts *Himantopus himantopus* in the UAE, with 60-80 pairs (see also Site 6), and is one of the few nesting sites in the UAE for Moorhen *Gallinula chloropus* and Reed Warbler *Acrocephalus scirpaceus*. Little Grebes *Tachybaptus ruficollis* first bred in 1990 and are now resident in the area. Over 10 pairs of Red-wattled Lapwing *Vanellus indicus* are also resident. The largest lagoon usually hosts a non-breeding flock of up to 80 Greater Flamingo *Phoenicopterus ruber* throughout the year, but as many as 400 have been recorded. This lagoon also holds about 100 Black-necked Grebe *Podiceps nigricollis* in winter, and over 50 Whiskered Tern *Chlidonias hybridus* and White-winged Black Tern *C. leucopterus* on migration. The wetland also holds large wintering concentrations of Western Reef Heron *Egretta gularis* (up to 150), Great Egret *E. alba*, Shoveler *Anas clypeata* and Ruff *Philomachus pugnax*, along with smaller numbers of wintering Black-crowned Night Heron *Nycticorax nycticorax* (up to 40), Glossy Ibis *Plegadis falcinellus*, Pochard *Aythya ferina*, White-tailed Plover *Vanellus leucurus* (up to 13), Green Sandpiper *Tringa ochropus*, Temminck's Stint *Calidris temminckii*, Common Kingfisher *Alcedo atthis* and Citrine Wagtail *Motacilla citreola*. In autumn, over 120 Saunders's Little Terns *Sterna saundersi* congregate to feed and roost. The reed-beds are favoured by hundreds of hirundines on autumn and spring passage, and are an important site for some of the shyer species of waterfowl, there being regular records of Little Crake *Porzana parva*, Baillon's Crake *P. pusilla* and Spotted Crake *P. porzana*, as well as Little Bittern *Ixobrychus minutus* and Water Rail *Rallus aquaticus*. A White-breasted Waterhen *Amaurornis phoenicurus* wintered in the area in 1992/93, and an Intermediate Egret *Egretta*

intermedia wintered there in 1994/95; both were first records for the UAE. The large size of the site regularly attracts rare vagrants, including Sacred This *Threskiornis aethiopicus*, Greylag Goose *Anser anser*, Ruddy Shelduck *Tadorna ferruginea*, Redcrested Pochard *Netta rufina*, Sabine's Gull *Xema sabini*, Pied Kingfisher *Ceryle rudis* and White-breasted Kingfisher *Halcyon smyrnensis*. Marsh Harrier *Circus aeruginosus* and Spotted Eagle *Aquila clanga* (as many as 3 or 4) regularly overwinter or occur during the passage periods. Imperial Eagle *A. heliaca* is occasionally recorded. Other fauna noted at the site includes Arabian Red Fox *Vulpes vulpes arabica*. An Arabian Wolf *Canis lupus arabs* or wolf/feral dog hybrid was reportedly seen there in about 1990. The seepage lagoons and streams support small fish (species unknown).

Noteworthy flora: None known.

Scientific research and facilities: Numerous bird surveys and waterfowl counts have been carried out at the site.

Management authority and jurisdiction: Sharjah Municipality, Drainage and Sewerage Department.

References: Evans (1994); Richardson (1990a, 1991).

Reasons for inclusion: 1d, 2b & 3c; The site holds a greater variety of waterbirds than any other wetland in the UAE, and is the only regular wintering area for many of these. It regularly holds over 1 % of the regional breeding population of Black-winged Stilt, and has one of the largest non-breeding populations of Western Reef Heron in the country. Source: Cohn Richardson and Simon Aspinall.

Wetland Name: Khor Ajman and Khor Zawra

Country: United Arab Emirates

Coordinates: 25°23'N, 55°26'E

Location: On the Arabian Gulf coast in Ajman Emirate, north of Sharjah Emirate.

Area: Approximately 3,000 ha.

Altitude: Sea level.

Overview: A series of relatively small, undeveloped connected khors snaking inland approximately 4 km from the Gulf coastline. Western Reef Heron *Egretta gularis* and Greater Flamingo *Phoenicopterus ruber* are regular, but fringing sand dunes inhibit many migrant shorebirds from staying long on passage.

Physical features: A typical Gulf "khor" with a low tidal range (mean 1.4 m), exposing up to 150 ha of inter-tidal mud. The depth of the khor varies from 5 m at its mouth to less than 2 m at its inland side. Young mangroves dot the mean tide line, and the khor is fringed by halophytic scrub. Coastal sand dunes rise to a height of 10 m around the inland edge of the khor. Khor Ajman is an arm of Khor Zawra, and together these encircle and isolate a large, low, flat island with sparse vegetation.

Ecological features: A mesotrophic tidal inlet, typical of the Gulf coastline. The typical salt-flat flora includes *Cornulaca monacantha*, *Heliotropium kotschyi*, *Zygophyllum mandivillei*, *Halopeplis peifoliata*, *Anabasis setifera* and *Halocnemum strobilaceum*.

Land tenure: Government of Ajman.

Conservation measures taken: None.

Conservation measures proposed: Part of the site should be set aside as an undisturbed wildlife sanctuary. An undisturbed area should be set aside for breeding turtles.

Land use: Building development is approaching the area from the city of Ajman which is only two km distant.

Possible changes in land use: As elsewhere in the UAE, reclamation or dredging are possible.

Disturbances and threats: There is some persecution of the Green Turtles which come ashore near the Khor mouth.

Hydrological and biophysical values: No information.

Social and cultural values: No information.

Noteworthy fauna: An important staging area for migratory shorebirds. Some 5,000-6,000 shorebirds were recorded in February 1975 (Carp, 1976). Only about 100 shorebirds, mostly *Charadrius* plovers, Eurasian Curlews *Numenius arquata* and *Calidris* sandpipers were present in October and November 1986. In September 1987, there were 582 shorebirds and a roost of 233 terns (mostly *Sterna sandvicensis*). Green Turtles *Chelonia mydas* come ashore east of the khor mouth.

Noteworthy flora: The site is well-known locally for "faqut" or truffles, which benefit from the presence of *Helianthemum lippii*.

Scientific research and facilities: Some archaeological surveys have been undertaken to the east of the area.

Management authority and jurisdiction: Government of Ajman.

References: Carp (1976); Jongbloed (1987); Uttley *et al.* (1988); Western (1989). Also: Emirates Bird Records Committee files.

Reasons for inclusion: 1a & 2b. One of the few creeks in the UAE that is practically untouched by man's activities.

Source: Cohn Richardson.

Wetland Name: Khor al Beidah

Country: United Arab Emirates

Coordinates: 25°32'N, 55°38'E

Location: On the Arabian Gulf coast east of Umm al Qaiwain city and on the landward (southeast) side of Sinaiya Island, Umm al Qaiwain Emirate.

Area: 5,000-7,500 ha.

Altitude: Sea level.

Overview: A large area of mudflats, islands and mangroves, bounded by desert to the south and east and by low-lying islands to the seaward side. Khor al Beidah holds the country's largest wintering flock of Crab Plover *Dromas ardeola*. Some of the smaller islands have dense mangrove, where Western Reef Heron *Egretta gularis* and possibly White-cheeked Tern *Sterna repressa* and Clamorous Reed Warbler *Acrocephalus stentoreus* nest.

Physical features: Khor al Beidah comprises a vast complex of lagoons, 20 km long by an average of 4 km wide, with about 25 low sandy islands, each of less than 50 ha in extent except for the three mangrove-covered round islands of Jazirat al Ghubbah (Ghallah), which are between one and two km in diameter. The khor is sheltered by the peninsula of Umm al Qaiwain and Sinaiya Island to the seaward side (northwest). Large portions of the extensive mudflats and adjacent soft saturated salt flats are inaccessible on foot, and remain poorly known. The site does not include Sinaiya Island, which is described separately as Site 13.

Ecological features: Virtually the whole lagoon and island complex is in good, original condition, with no signs of pollution or intrusion by development. The mangrove *Avicennia marina*, Ghaf *Prosopis cineraria* and several species of perennial and annual halophyte are the dominant plants.

Land tenure: Government of Umm al Qaiwain.

Conservation measures taken: None, other than recognition of the site as an Important Bird Area (IBA) by BirdLife International.

Conservation measures proposed: The importance of the site should be drawn to the attention of local officials, and representation should be made via the Federal Environmental Agency on potentially damaging activities. A management plan should be drawn up at the earliest possible opportunity for the entire site and neighbouring Sinaiya Island (Site 13). A "leave alone" management policy would be appropriate for much of the area.

Land use: The lagoons are important fishing grounds for the fishermen of Umm al Qaiwain. The mud is dug up and crabs (or other kinds of shellfish) are collected by local people at weekends. There is currently no building development nearby, except for the Ruler's palace, which has been built at the south end of the lagoon. The area is used for various recreational pursuits, including water sports, at weekends.

Possible changes in land use: None known.

Disturbances and threats: Some builder's spoil has been pushed onto the mudflats near the Ruler's palace at the south end of the lagoon. The area is regularly overflowed by micro-lite aircraft and military helicopters which cause considerable disturbance to the birds, and there is also some disturbance from speed boats. Shooting of birds by local people has been a problem in the past, but no shooting has been reported in the last two years. The uncontrolled driving of vehicles over the dunes and mudflats is a constant problem, and has caused some damage to the fragile ecology of the area. However, much of the area is still relatively undisturbed by people as it is far enough away from major centres of population (*e.g.* it is one hour from Dubai).

Hydrological and biophysical values: No information.

Social and cultural values: Falcon trapping, crab fishing and picnicking. There are important archaeological sites nearby.

Noteworthy fauna: Khor al Beidah is an important area for wildlife. About 85 species of birds have been recorded. Over 10,000 shorebirds were recorded on migration in 1986 (Uttley *et al.*, 1988), including 1,300 Eurasian Curlews *Numenius arquata*. There is a major influx of shorebirds from late July, when the most common species are Kentish Plover *Charadrius alexandrinus*, Lesser Sand Plover *C. mongolus*, Greater Sand Plover *C. leschenaultii*, Curlew Sandpiper *Calidris ferruginea*, Bar-tailed Godwit *Limosa lapponica* and Redshank *Tringa totanus*. The site is also favoured by wintering Oystercatcher *Haematopus ostralegus*, Great Knot *Calidris tenuirostris*, Whimbrel *Numenius phaeopus*, Ruddy Turnstone *Arenaria interpres* and Terek Sandpiper *Xenus cinereus*. A few Oystercatchers remain throughout the summer. It is the most important site for Crab Plover *Dromas ardeola* in the Northern Emirates, with hundreds present from August to March. The most important area for shorebirds is in the southwestern portion of the lagoons (Khor Umm al Qaiwain), where up to 550 wintering Crab Plovers roost and several thousand other shorebirds feed and roost. The Crab Plovers may be from Iranian colonies rather than from Abu al Abyadh (Site 1), as was formerly supposed. Up to 100 Cream-coloured Coursers *Cursorius cursor* are regular on the shoreline in summer. Western Reef Herons *Egretta gularis* nest amongst the mangroves on the islands in the lagoon, along with Little Green Herons *Butorides striatus* and Clamorous Reed Warblers *Acrocephalus stentoreus*. Up to 170 Western Reef Herons have been recorded outside the breeding season. Terns and gulls are common, particularly Gull-billed Terns *Gelochelidon nilotica* and Caspian Terns *Sterna caspia*. Great Crested Terns *Sterna bergii*, Lesser Crested Terns *S. bengalensis*, White-cheeked Terns *S. repressa* and Saunders's Little Terns *S. saundersi* also occur in autumn and spring. Slender-billed Gulls *Larus genei* are common and the Great Black-headed Gull *Larus ichthyaetus* is regular in late winter. Amongst birds of prey, Spotted Eagles *Aquila clanga* (one or two), Pallid Harriers *Circus macrourus* and Marsh Harriers *C.*

aeruginosus are regular in autumn and winter. Ospreys *Pandion haliaetus* can be found at most times of the year. Hoopoe Larks *Alaemon alaudipes* and Crested Larks *Galerida cristata* nest on the dunes, and Black-crowned Finch Larks *Eremopterix nigriceps* gather near the shoreline in late summer after nesting. The site is one of the few places in the UAE where Lesser Short-toed Larks *Calandrella rufescens* can be found in winter, and the species breeds on one of the nearby islands. Short-toed Larks *C. brachydactyla* are common on passage, and the dunes also attract migrant wheatears *Oenanthe* spp., pipits *Anthus* spp. and warblers (Sylviidae).

The open shoreline apparently holds a good invertebrate population which provides a plentiful supply of prey for the Palearctic shorebirds which are abundant from July to April. Small mud-dwelling crabs are abundant in Khor Umm al Qaiwain and are fed on by several species of shorebirds. Tiny gastropods are ubiquitous. The worm fauna is undescribed.

Noteworthy flora: The site contains some good stands of mangrove *Avicennia marina*.

Scientific research and facilities: Extensive archaeological excavations have been undertaken on the mainland shore and on some islands in the lagoon, with many notable finds having been made. Many ornithological surveys have been carried out, but surveying is extremely difficult, especially at low tide, and much of the area remains poorly known.

Management authority and jurisdiction: The Government of Umm al Qaiwain. References: Evans (1994); Richardson (1990a); Uttley *et al.* (1988).

Reasons for inclusion: 1a, 2b & 3c. Khor al Beidah is especially important for its large and diverse populations of migratory shorebirds. It holds the second largest wintering flock of Crab Plover *Dromas ardeola* in the UAE, after Merawah (see Site 2). Two other species, the Western Reef Heron *Egretta gularis* and Eurasian Curlew *Numenius arquata*, have also been recorded in internationally significant numbers (1 % of the regional population).

Source: Cohn Richardson.

Wetland Name: Sinaiya Island

Country: United Arab Emirates

Coordinates: 25°36'N, 55°37'E

Location: On the seaward side of Khor al Beidah and northeast of the Umm al Qaiwain peninsula, Umm al Qaiwain Emirate.

Area: 1,000-1,500 ha.

Altitude: Sea level.

Overview: A low, sandy, sparsely vegetated island, about 11 km long, with a long sandy beach on its seaward side, and mudflats and mangroves on its landward side. The island holds the largest known breeding colony of Socotra Cormorants *Phalacrocorax nigrogularis* in the UAE, with birds present for most of the winter months but entirely absent in summer. About 60 gazelles have been introduced and are free-ranging over the island.

Physical features: A long, thin, low, sandy island, almost pointed at each end, with an 11 km northwest-facing beach along the Gulf coast, and an average width of about 800 metres. The inland side of the island, which forms the outer edge of Khor al Beidah (Site 12), is fragmented, with long fingers of coral and mangrove interspersed with shallow lagoons. The island is uninhabited except for two private dwellings belonging to the ruling family of Umm al Qaiwain.

Ecological features: Typical estuarine and sand-dune ecology. Mangrove *Avicennia marina* is confined to the sheltered southeast side of the island, and lines most of the shallow lagoons. The sandy island has a sparse covering of salt-tolerant tamarisk (*Tamariscinum*) scrub and grasses on the dunes, and there are large areas of low salt flats in the central area covered mostly with halophytes, including sparse *Halopeplis* bushes. Other species include *Zygophyllum qatarense*, *Atriplex leucoclada*, *Limonium axillare*, *Helianthemum lippii*, *Arnebia hispidissima*, *Sporobolus arabicus*, *Cyperus conglomeratus*, *Anabasis setifera* and *Halocnemum strobilaceum*. There are no native trees other than mangroves on the island, but irrigated plantations of introduced species have recently been established in some areas.

Land tenure: Owned by the ruling family of Umm al Qaiwain, Ruler, H.H. Sheikh Rashid bin Ahmed al Moalla.

Conservation measures taken: The Ruler of Umm al Qaiwain has declared that the island is to be treated as a nature reserve, and no-one is allowed on the island without permission. However this does not necessarily mean that the wildlife will be protected, as the owner has already built at least one house on top of one of the Socotra Cormorant colonies. The island has been identified as an Important Bird Area (IBA) by BirdLife International.

Conservation measures proposed: Official representation is to be made to the Ruler seeking a cessation of building activities, tree-planting schemes and other developments on the island. Restrictions should be imposed on the movement of vehicles about the island during the Socotra Cormorants' breeding season.

Land use: The island is used by the ruling family for recreation and as a private zoo. Possible changes in land use: None likely.

Disturbances and threats: The breeding colonies of Socotra Cormorants appear to have suffered much disturbance in recent years due to the building of houses at each end of the island. Overflying by micro-lite aircraft and the movement of vehicles about the island cause disturbance to the bird colonies, as do visiting fishermen. The island is very close to mainland, and is often visited by expatriate picnickers in small boats. An extensive grid of irrigation piping has recently been installed, and tree plantations have been established at the expense of the arid sparsely vegetated habitat, thereby reducing the area of habitat suitable for breeding seabirds. Proliferation of the introduced gazelle population could become a problem in the future.

Hydrological and biophysical values: No information.

Social and cultural values: The site has some archaeological interest. No other information is available.

Noteworthy fauna: Sinaiya Island holds one of the world's largest breeding colonies of the Socotra Cormorant *Phalacrocorax nigrogularis*, with 15,555 pairs in 1994/95. Prior to the recent disturbance from building activities, there were at least three sizeable subcolonies of the cormorants. The birds nest up to 100 metres from the shoreline, often in extensive flat areas, and some parts of the colony may not be visible when viewed from the sea. The island is one of only two known breeding sites for the Lesser Short-toed Lark *Calandrella rufescens* in the UAE (see also Site 6). Other breeding species include Western Reef Heron *Egretta gularis*, Little Green Heron *Butorides striatus*, Palm Dove *Streptopelia senegalensis*, Black-crowned Finch-lark *Eremopterix nigriceps*, Crested Lark *Galerida cristata*, Clamorous Reed Warbler *Acrocephalus stentoreus* and Graceful Prinia *Prinia gracilis*. There is evidence that the 11 km beach facing the Gulf is important for nesting Green Turtles *Chelonia mydas*, and possibly also Hawksbill *Eretmochelys imbricata* and Leatherback *Dermochelys coriacea*. Dorcas

Gazelles *Gazella dorcas (saudiya)* have been introduced on to the island, and presently number over 100.

Noteworthy flora: The island supports extensive stands of mangrove *Avicennia marina*, along with a wide variety of grasses and salt-tolerant shrubs.

Scientific research and facilities: Extensive archaeological excavations have been undertaken in the area, and many notable finds have been made. Some ornithological surveys have been carried out, but no proper census of the Socotra Cormorant colony has ever been made.

Management authority and jurisdiction: One or more members of the ruling family of Umm al Qaiwain.

References: Evans (1994); Howe (1989); Jongbloed (1987); Richardson (1990a, 1993); Symens *et al.* (1993); Uttley *et al.* (1988); Western (1989). Also: unpublished observations.

Reasons for inclusion: 1a, 2a, 2c, 3a & 3c. The island supports one of the world's largest breeding colonies of Socotra Cormorants.

Source: Cohn Richardson and Simon Aspinall.

Wetland Name: Al Jazeerah Khor

Country: United Arab Emirates

Coordinates: 25°43'N, 55°49'E

Location: North of the village of Jazirat al Hamra, Ras al Khaimah Emirate.

Area: 4,600 ha.

Altitude: Sea level to 6 m below.

Overview: A complex of shallow tidal lagoons and inter-tidal mudflats on the Gulf coast, with areas of higher ground covered with halophytic scrub. The site is an important feeding and resting area for Palearctic shorebirds, and the low scrub-covered islands in the northern lagoon host large roosts of seabirds in autumn and winter.

Physical features: The wetland comprises a group of shallow, coastal lagoons and areas of inter-tidal mudflats adjacent to the old abandoned village of Jazirat al Hamra. The village sits on a promontory which divides the wetland into two main systems. There are some mudflats south of the village and an expanse of shallow lagoons to the north. The expanse of shallow lagoons is partially enclosed by a long mud bank, which supports some halophytic scrub above the high-water mark. About 200 ha of mudflats are exposed at low tide, while at high tide, the depth of the lagoons does not exceed two metres. The most important part of the site, Al Jazeerah Khor, consists of a complex of shallow tidal lagoons adjacent to the main coast road to Ras al Khaimah. A line of high sand dunes runs parallel to this khor, and provides an excellent vantage point for views of the wetland.

Ecological features: An estuarine site with typical salt-tolerant shrubs above high-water mark. The mudflats support a good diversity of invertebrates, and provide prime feeding habitat for shorebirds.

Land tenure: Owned by the Government of Ras al Khaimah.

Conservation measures taken: Some representations have been made by the Marine Section of the Desert and Marine Research Centre at Al Am University and by private individuals. A three km stretch of beach has been set aside for breeding turtles by H.H. Sheikh Saqr bin Mohammed al Qasimi, the Ruler of Ras al Khaimah.

Conservation measures proposed: A "leave alone" management policy would be appropriate for much of the area.

Land use: Commercial fishing and outdoor recreation. Goats are allowed to graze in the adjacent dunes.

Possible changes in land use: Further destruction of the dunes by building development.

Disturbances and threats: There is some shooting of waterfowl by local people. Dumping of sewage effluent and solid waste along the shoreline is routine. The dunes are being developed, and several large houses have been built on the top of the dunes.

Hydrological and biophysical values: The lagoons are of value as a nursery area for juvenile fish, which probably include a number of commercially valuable species.

Social and cultural values: No information.

Noteworthy fauna: The wetland is an important staging and wintering area for migratory waterbirds. Large numbers of shorebirds are present throughout much of the year, including thousands of *Charadrius* plovers and *Calidris* sandpipers. The most abundant species are Greater Sand Plover *Charadrius leschenaultii*, Lesser Sand Plover *C. mongolus*, Curlew Sandpiper *Calidris ferruginea*, Dunlin *C. alpina*, Terek Sandpiper *Xenus cinereus* (745 in September 1987), Bar-tailed Godwit *Limosa lapponica* and Redshank *Tringa totanus*. Less common are Whimbrel *Numenius phaeopus*, Ruddy Turnstone *Arenaria interpres* and Oystercatcher *Haematopus ostralegus*. Some 3,500 shorebirds were counted at the site in October 1986. Hundreds of herons feed in the shallows, including Great Egret *Egretta alba*, Little Egret *E. garzetta*, Western Reef Heron *E. gularis* and Grey Heron *Ardea cinerea*. There are always up to 100 Greater Flamingos *Phoenicopterus ruber* in winter, and Spoonbills *Platalea leucorodia* are regular. Thousands of Lesser Crested Terns *Sterna bengalensis*, Sandwich Terns *S. sandvicensis*, Saunders's Little Terns *S. saundersi* and White-cheeked Terns *S. repressa* rest on the outer sand spit in winter and early spring, with smaller numbers of Great Black-headed Gulls *Larus ichthyaetus*, Great Crested Terns *Sterna bergii* and Caspian Terns *S. caspia*. The site also attracts important numbers of Gull-billed Terns *Gelochelidon nilotica*, and holds the largest roosts of Slender-billed Gulls *Larus genei* in the UAE (over 750 birds in January 1992). Ospreys *Pandion haliaetus* are present throughout most of the year, and one or two Spotted Eagles *Aquila clanga* and Marsh Harriers *Circus aeruginosus* usually overwinter. Flocks of Socotra Cormorants *Phalacrocorax nigrogularis* (over 10,000 together) regularly feed close inshore. Over 90 species of birds have been recorded in the area. The site is also reported to be an important nesting area for sea turtles, probably only *Chelonia mydas*.

Noteworthy flora: The dunes adjacent to the Khor have many very old Ghaf trees *Prosopis cineraria*, which provide nest holes for, amongst other species, Hoopoe *Upupa epops* and Indian Roller *Coracias bengalensis*.

Scientific research and facilities: Numerous bird surveys have been carried out at the site, and a three km section of the beach has been given over to the Marine Research Centre of Emirates University for the conservation, monitoring and study of breeding turtles.

Management authority and jurisdiction: Government of Ras al Khaimah.

References: Richardson (1990a); Uttley *et al.* (1988). Also: IWRB (Asian Waterfowl Census) Counts 1990-94.

Reasons for inclusion: 1a, 2a, 2c & 3c. The site regularly supports over 1 % of the regional wintering population of Terek Sandpipers *Xenus cinereus*.

Source: Cohn Richardson.

Wetland Name: Dhayah, Rams, Ghalilah and Hulayla Island

Country: United Arab Emirates

Coordinates: 25°50'N, 55°59'E

Location: On the Gulf coast between Ras al Khaimah and Ghalilah, Ras al Khaimah Emirate.

Area: 19,550 ha.

Altitude: Sea level to 6 m below.

Overview: A series of shallow coastal lagoons, mangrove swamps, areas of inter-tidal mudflat and low sandy islands along a 20 km stretch of coast on the western side of the Musandam Peninsula, north of Ras al Khaimah. The mangroves and 500 ha of mudflats between Dhayah and Hulayla Island are the most important areas for waterbirds, providing habitat for thousands of herons, flamingos, migratory shorebirds and gulls. In winter, the lagoon and marshes at Dhayah host a good selection of wintering ducks and a wide variety of birds of prey.

Physical and ecological features: The site comprises a series of wetlands along a 20 km stretch of coastal plain, extending northwards from Ras al Khaimah and bounded to the east by the Ras al Jebel, the mountains of Musandam, which rise to over 2,000 m. In this region, the coastal plain is about five km wide. The wetlands include the mangrove swamps within Ras al Khaimah Khor in the south, older stands of mangrove and up to 100 ha of reed-beds and *Juncus* marshes with freshwater springs at Dhayah, and a number of sheltered harbours at Rams and Ghalilah. There are also undisturbed beaches and breakwaters at Marid, Rams, Ghali'lah and Hulayla Island. The latter is a 10 km long sandy island connected to the mainland by a causeway. The mangroves in Ras al Khaimah Khor remain in good condition, but have never been properly explored.

Land tenure: Government of Ras al Khaimah.

Conservation measures taken: None.

Conservation measures proposed: A "leave alone" management policy would be appropriate for much of the area. The area known as Dhayah, with its extensive mangroves, reed-beds and *Juncus* rushes, would make a good bird sanctuary as it already supports a varied breeding bird fauna.

Land use: There is some industrial development, e.g. at Ghalilah, where a harbour has been built and a large stone quarry dominates the scene, but otherwise the area is mostly undeveloped. An oil installation has been built on Hulayla Island, and access is restricted, although there are numerous fishermen's shacks on the seaward side of the island. After good rain, the island becomes quite green and is grazed extensively by camels.

Possible changes in land use: More residential and industrial development is likely in the future.

Disturbances and threats: The principal threat is uncoordinated and ill-considered development of the area. A causeway, one km long, is currently being bulldozed across to Hulayla Island, and this will certainly restrict, if not totally cut off, the tidal flow to the inland channel. The long-term effects of altering the hydrological regime in this way are unknown.

Hydrological and biophysical values: No information.

Social and cultural values: The area has a long history of human occupation. Many of the valuable archaeological sites have yet to be excavated and dated, but it is known that some date back to the pre-Islamic period.

Noteworthy fauna: The site is especially noteworthy for the great abundance and diversity of its birdlife. Thousands of shorebirds, gulls and terns use this section of coastline annually, the most notable in recent years being the selection of terns on spring and autumn passage to and from their Gulf breeding sites. White-cheeked Tern *Sterna repressa*, Lesser Crested Tern *S. bengalensis*, Great Crested Tern *S. bergii*, Bridled Tern *S. anaethetus* and Saunders's Little Tern *S. saundersi* are common, while Common Tern

S. hirundo, Caspian Tern *S. caspia*, Little Tern *S. albifrons* and Gull-billed Tern *Gelochelidon nilotica* are regular in smaller numbers. In winter, several thousand Blackheaded Gulls *Larus ridibundus*, Yellow-legged Gulls *L. cachinnans* and Great Blackheaded Gulls *L. ichthyaetus* are often to be found loafing on the mudflats. Pomarine Skuas *Stercorarius pomarinus* and Arctic Skuas *S. parasiticus* are regular inshore. Small parties of migrant Cream-coloured Coursers *Cursorius cursor* and Caspian Plovers *Charadrius asiaticus* have been recorded on Marid and Hulayla Island in spring and autumn. Crab Plovers *Dromas ardeola* are reported to have bred on Hulayla Island in the past, and the habitat certainly appears to be suitable, but heavy grazing by camels and increased human disturbance would now make nesting impossible. Crab Plovers were reported on Marid in the winter of 1972/73 (S. Tyler, pers. comm.). Over 4,500 migratory shorebirds were counted in the area during limited surveys in the autumns of 1986 and 1987 (Uttley *et al.*, 1988). The extensive mangrove swamps and *Juncus* marshes at Dhayah support breeding Little Green Herons *Butorides striatus*, Moorhens *Gallinula chloropus*, Red-wattled Lapwings *Vanellus indicus* and Clamorous Reed Warblers *Acrocephalus stentoreus*, while Reed Warblers *Acrocephalus scirpaceus* and Grey Herons *Ardea cinerea* may breed. In winter, the lagoon at Dhayah hosts a good selection of wintering ducks. Up to 15 Marsh Harriers *Circus aeruginosus*, three or more Spotted Eagles *Aquila clanga*, and one or more Steppe Eagles *A. nipalensis* and Longlegged Buzzards *Buteo rufinus* are regular in this area in winter, and as many as 12 *A. clanga* have occurred on passage. Common Kingfishers *Alcedo atthis* also occur in good numbers in winter. Hulayla Island is a migrant trap in spring, attracting several species of migrant larks (Alaudidae), pipits *Anthus* spp. and wheatears *Oenanthe* spp.

The shallows around the mangrove areas are one of the best places in the UAE to find mudskippers *Periophthalmus* sp.

Noteworthy flora: Mangroves at Ras al Khaimah and Dhayah, and an unusual community of as yet unidentified grasses, rushes and reeds at Dhayah.

Scientific research and facilities: Some archaeological investigations have been undertaken, as well as regular ornithological surveys during the winter months. The mangroves are relatively unexplored.

Management authority and jurisdiction: Government of Ras al Khaimah.

References: Jongbloed (1987); Richardson (1990a); Uttley *et al.* (1988); Western (1989). Also: IWRB (Asian Waterfowl Census) Counts 1990-94, and OSME Sites Register for Maid and Dhayah (S. Tyler and F.E. Warr).

Reasons for inclusion: 1a, 2c & 3b. The wetlands support diverse and sizeable bird populations.

Source: Cohn Richardson.

Wetland Name: Dibba Bay

Country: United Arab Emirates

Coordinates: 25°37'N, 56°17'E

Location: To the north of the village of Dibba, on the east coast of the UAE in Fujairah and Sharjah Emirates, and straddling the border with Oman. The greater part of the site lies in Oman, but is readily accessible without border controls from the UAE. The following account applies to the whole site, as this has regularly been covered by researchers from the UAE, but is remote and difficult of access for researchers from Oman.

Area: 27,780 ha. About half of the site lies in UAE territory, the remainder being in Oman.

Altitude: Sea level to six metres below sea level. The centre of the bay exceeds this depth.

Overview: A sheltered, deep water bay with a long, fairly undisturbed, sandy beach. The bay is popular with fishermen, and several species of gulls and terns are regular throughout the year. The beaches are used by seabirds for roosting, and probably also by sea turtles for nesting.

Physical features: Dibba, the most northerly village on the east coast of the UAE, faces a deep semi-circular bay, approximately 15 km in diameter, located in the Gulf of Oman. A three km sandy beach shelves steeply into the deep waters of the bay. One end of the bay is guarded by the beginning of the Musandam cliffs, which stretch a further 50 km northwards to the Straits of Hormuz. A small wave-cut platform to the south of Ras Dibba is a rare and unusual geomorphological feature in the UAE.

Ecological features: No information.

Land tenure: The southern half of the bay is owned by the Government of Fujairah (Dibba Municipality), the northern half by the Government of the Sultanate of Oman (Musandam Development Committee), and a central "pocket" (Dibba al Hisn) by the Government of Sharjah, UAE.

Conservation measures taken: None. The Dibba-Bayah plain, including a part of Dibba Bay, has been identified as an Important Bird Area (IBA) by BirdLife International.

Conservation measures proposed: None.

Land use: Fishing and recreation.

Possible changes in land use: Development of the bay as a deep water port with associated facilities is a possibility.

Disturbances and threats: Fishermen, and probably also other local people, still disturb birds and persecute turtles. Holiday chalets are presently being built, and leisure activities and associated disturbance will doubtless increase accordingly.

Hydrological and biophysical values: No information.

Social and cultural values: Recreational usage. Dibba has been a seaport for at least 3,000 years.

Noteworthy fauna: Dibba Bay is an important feeding area for at least 16 species of gulls, terns and other seabirds. The bay is sheltered and used as a night time roost by gulls. Sandwich Terns *Sterna sandvicensis* and Yellow-legged Gulls *Larus cachinnans* are common in winter, while Lesser Crested Terns *Sterna bengalensis* and White-cheeked Terns *S. repressa* are common in early spring. Bridled Terns *S. anaethetus* are abundant offshore from May to October. Smaller numbers of Armenian Gulls *Larus arinencus*, Common Terns *Sterna hirundo*, Little Terns *S. albifrons*, Saunders's Little Terns *S. saundersi* and Great Crested Terns *S. bergii* are also present. Sooty Gulls *Larus hemprichii* are regular from April to September, and Persian Shearwaters *Puffinus (iherminieri) persicus* are regular offshore in summer. Other species likely to occur include Wilson's Storm Petrel *Oceanites oceanicus*, Pomarine Skua *Stercorarius pomarinus*, Arctic Skua *S. parasiticus* and Great Black-headed Gull *Larus ichthyæetus*. Crab Plovers *Dromas ardeola*, probably from breeding colonies in Iran, use the beach as a roost in spring. Sooty Falcons *Falco concolor* have been seen regularly in late spring, and may breed on the nearby cliffs. Green Turtles *Chelonia mydas* are regular on the beach (mostly dead individuals), and may breed irregularly. Successful breeding is, however, considered unlikely.

Noteworthy flora: No information.

Scientific research and facilities: None, other than a number of avifaunal surveys and some preliminary archaeological investigations.

Management authority and jurisdiction: See "Land tenure".

References: Evans (1994).

Reasons for inclusion: 1d. An interesting shallow sea bay which rapidly deepens towards the centre; an unusual configuration in this region. The proximity of relatively deep water in the Gulf of Oman attracts pelagic seabirds close inshore, a phenomenon not witnessed elsewhere in the UAE.

Source: Cohn Richardson and Simon Aspinall.

Wetland Name: Wadi Shih Reservoir

Country: United Arab Emirates

Coordinates: 25°20'N, 56°20'E

Location: In the Hajar Mountains 10 km inland from Khor Fakkan town, Sharjah Emirate.

Area: c.500 ha.

Altitude: 350-400 m.

Overview: A small water storage reservoir with some *Phragmites* reeds and breeding Little Grebes *Tachybaptus ruficollis*.

Physical features: A man-made dam and reservoir surrounded by steep, desolate mountains which rise to peaks at 900 m. When filled, the water area occupies about 150 ha, and has an average depth estimated at 3-7 metres. The edge of the reservoir has been fenced off to prevent intrusion by visitors.

Ecological features: The shoreline supports minimal vegetation because of the rather steep banks. Small patches of *Phragmites* grow in the shallower areas. The adjacent hillsides support a variety of perennials and annuals typical of the region. *Nerium mascatense* forms conspicuous stands, with *Forsskaolea tenacissima*, *Trichodesma* sp. and *Sida urens*. Species also likely are *Adiantum capillus-veneris*, *Bacopa monnieri*, *Oxalis corniculata* and the tiny fern *Onychium divaricatum*.

Land tenure: Government of Sharjah.

Conservation measures taken: None.

Conservation measures proposed: None.

Land use: Water storage for domestic and agricultural use.

Possible changes in land use: None known.

Disturbances and threats: None known.

Hydrological and biophysical values: No information.

Social and cultural values: Water supply for human consumption and irrigation purposes.

Noteworthy fauna: The reservoir holds at least four breeding pairs of Little Grebes *Tachybaptus ruficollis*, and Moorhens *Gallinula chioropus* possibly breed. Some 25-30 species of birds have been recorded in the area, including breeding species such as Bonelli's Eagle *Hieraetus fasciatus* (a pair in the surrounding hills), Sand Partridge *Ammoperdix heyi*, Grey Francolin *Francolinus pondicerianus*, Desert Lark *Ammomanes deserti*, Pale Crag Martin *Hirundo obsoleta*, Hume's Wheatear *Oenanthe alboniger* and House Bunting *Emberiza striolata*. Blue Rock Thrush *Monticola solitarius*, Desert Lesser Whitethroat *Sylvia minula* and Plain Leaf Warbler *Phylloscopus neglectus* are regular in winter. The reservoir supports a good population of fish, and toads are to be found in the shallower areas. Terrapins of an unknown species have been introduced.

Noteworthy flora: None known.

Scientific research and facilities: None, other than some avifaunal surveys.

Management authority and jurisdiction: Government of Sharjah (Khor Fakkan Municipality).

References: Jongbloed (1987); Western (1989).

Reasons for inclusion: 2b. One of country's largest perennial reservoirs, with associated developing ecosystem.

Source: Cohn Richardson.

Wetland Name: Wadi Safad

Country: United Arab Emirates

Coordinates: 25°15'N, 56°18'E

Location: In the Hajar Mountains of Fujairah Emirate. The mouth of the wadi is on the Arabian Sea coast at Qurayyah, 10 km north of Fujairah town and immediately to the north of Fujairah Port.

Area: Unknown.

Altitude: Sea level to c.500 m.

Overview: A typical mountain wadi system with permanent water in a series of wadi pools and an interesting deltaic fan at its mouth on the Arabian Sea coast. The wadi has considerable archaeological, historical and cultural values, and supports a relatively undisturbed fauna and flora typical of the region.

Physical and ecological features: Wadi Safad is a classic mountain wadi, approximately 15 km in length and with permanent standing water in a series of pools which persist throughout the year. It is situated inland from the Arabian Sea coast in the Hajar Mountains, and terminates in a deltaic fan at its seaward end at Qurayyah. The coastal fan, bay bar, spit and lagoonal system at the seaward end of the wadi comprise an unmodified geomorphological development (up to one km wide and about six km long) unique in the UAE, with mainly pristine saltmarsh and saltflat plant communities. Water bodies in the wadi range from freshwater, through brackish to saltwater. Ghaf *Prosopis cineraria* and dense mesquite *Prosopis juliflora* occupy drier ground, particularly around Qurayyah. Parts of the valley continue to be cultivated under the traditional falaj system. The upper reaches of the wadi are narrow and rock-walled, and are inaccessible by motorised transport.

Land tenure: Government of Fujairah and local farmers.

Conservation measures taken: The biological and archaeological values of the site are currently being evaluated.

Conservation measures proposed: It has been recommended that Wadi Safad be conserved as a good example of an undisturbed and unmodified wadi system.

Land use: Low intensity pastoral use and traditional cultivation.

Possible changes in land use: No major developments are planned, and some of the cultivated areas are falling into disuse.

Disturbances and threats: Construction of a road for eight kilometres along the wadi will bring increased human disturbance and will damage part of the traditional agricultural system. Oil pollution must be a serious risk in the lower, tidal part of the site. The port facilities of Fujairah already use some reclaimed land and impinge on the present southern boundary of the site. Further housing development is a potential threat.

Hydrological and biophysical values: Permanent standing water is a rare commodity anywhere in the UAE. Storm water dissipates rapidly over the braided lower course of the wadi, thus preventing damage to fields, buildings and the main coast road. Coastal development and the storm berm protect Qurayyah from marine incursion.

Social and cultural values: There are important archaeological sites in the wadi, and the traditional lifestyle of the local people is of considerable historical and cultural interest. There is an important local fishery along the coast, with fishing boats putting out from the beach near the wadi mouth.

Noteworthy fauna: The coastal lagoons attract regionally important numbers of Great Black-headed Gull *Larus icht/zyaetus* in winter, many terns *Sterna* spp. on passage, and a variety of other waterfowl including Western Reef Heron *Egretta gularis* (resident), Grey Heron *Ardea cinerea* (passage migrant) and Greater Flamingo *Phoenicopterus ruber* (non-breeding visitor). Kentish Plovers *Charadrius alexandrinus* breed near the coast. The Arabian Toad *Bufo arabica* is abundant in the wadi, and three new species of mollusc have recently been collected and described from the inter-tidal flats: *Nanhaia safadensis* (so named after the site), *Hiatula mirbahensis* and *Caecella qeratensis* (Morris & Morris, 1993). A fourth species of mollusc, *Laternula erythraea*, has also been described from this site. Fish populations and most invertebrate groups are, however, very poorly known.

Several rare mammals are reported to survive within the catchment, notably Wolf *Canis lupus arabs*, Lynx *Caracal caracal schmitzi*, Arabian Gazelle (Idhmi) *Gazella gazelle arabica*, and possibly Ibex *Capra ibex* and Wild Goat *C. aegragus*. The terrestrial avifauna is typical of the mountains of northeastern Arabia, and includes Desert Lark *Ammomanes deserti*, House Bunting *Emberiza striolata* and Indian Silverbill *Euodice malabarica*, which regularly visit the wadi to drink. The Grey Francolin *Francolinus pondicerianus* is common around cultivation.

Noteworthy flora: The wadi presents a good example of typical mountain wadi flora and associations. The mainly pristine saltmarsh and saltflat plant communities at the seaward end of the wadi are especially noteworthy, and represent the best undisturbed examples of these floral associations in the UAE.

Scientific research and facilities: Surveys of the flora, fauna and archaeology of the area are currently ongoing, at the Ruler's request.

Conservation education: There has been education of some residents in the area as to the value of the traditional agricultural methods and the importance of the site as a now rare example of an unspoilt mountain community in harmony with the local wildlife. The significance of, and external interest in, this wildlife may result in the site being maintained as an example of a typical mountain community with immense value for its outstanding natural heritage.

Management authority and jurisdiction: Government of Fujairah.

References: Morris & Morris (1993). Also: unpublished personal observations.

Reasons for inclusion: 1a & 2b. An excellent example of a mountain wadi with permanent water. Natural plant communities in the deltaic system remain largely unmodified and are of considerable interest.

Source: Peter Hellyer and Simon Aspinall.

Wetland Name: Wadi Hayl

Country: United Arab Emirates

Coordinates: 25°05'N, 56°13'E

Location: In the Hajar Mountains of Fujairah Emirate, about 20 km from Fujairah.

Area: Approximately 500 ha (including the main wadi system, cultivated areas and village).

Altitude: 100-300 m.

Overview: A typical mountain wadi system with permanent water and characteristic perennial wadi flora and fauna, including amphibians, fish, reeds, cultivated fruit trees and date palms.

Physical features: Wadi Hayl is situated in a shallow-sided ravine of 20-200 metres in width. Water flows throughout the year, except during periods of severe drought. Areas of traditional cultivation flank the water course, and pumps feed a falaj system. The cultivation and settlement at Hayl, located around an old palace (now derelict but due to be restored), is situated 10 km up the wadi.

Ecological features: The perennial water has created a healthy freshwater ecosystem. *Nerium mascatense* is common, as in other wet wadis of this type, along with *Forsskaolea tenacissima*, *Trichodesma* sp. and *Sida urens*. Species also likely to occur are *Adiantum capillus-veneris*, *Bacopa monnieri*, *Oxalis corniculata* and the tiny fern *Onychium divaricatum*. Fruit trees, including mango, papaya and banana, and date palms line the watercourse, and other vegetables and animal fodder are grown on levelled platforms along the wadi side.

Land tenure: The Ruler of Fujairah and private citizens.

Conservation measures taken: The Ruler has requested that a conservation assessment be carried out on the wadi and the summer palace.

Conservation measures proposed: Proposals for the conservation of the area are currently in preparation. Because of its heritage values, the site is likely to be retained in its relatively natural state.

Land use: Agriculture.

Possible changes in land use: There have been discussions on the possible mining of mineral ore in the upper catchment area. This would involve the construction of large access roads through the wadi, with resulting highly detrimental changes to the system. The discussions are currently in abeyance, but if a decision to mine is eventually taken, advice should be sought by the owner on the possible routing of quarry access in such a way that damage to the ecosystem can be kept to a minimum.

Disturbances and threats: See under "Possible changes in land use".

Hydrological and biophysical values: Water supply for local agriculture.

Social and cultural values: The old palace and adjacent village and cultivation are of historical importance and interest to the Ruler. Other archaeological finds have also been documented from the area (per P.Hellyer).

Noteworthy fauna: Twenty-five species of birds have been recorded to date, including most resident birds characteristic of the region and notably the Bonelli's Eagle *Hieraetus fasciatus*. Mammals include a gazelle *Gazella* sp. and Arabian Red Fox *Vulpes vulpes arabica*. The Dhofar Toad *Bufo dhofarensis* and Arabian Toad *B. arabicus* are plentiful, fish breed in the permanent pools, and insects are abundant.

Noteworthy flora: The wadi contains a good example of the flora typical of wet wadis in this region.

Scientific research and facilities: None.

Management authority and jurisdiction: The Ruler of Fujairah, H.H. Sheikh Hamad bin Mohammad al Sharqi, through Fujairah Municipality.

References: Unpublished personal observations.

Reasons for inclusion: 1b & 2b. A perennial wadi system with a rich fauna and flora and traditional system of cultivation.

Source: Cohn Richardson.

Wetland Name: Khor Kalba and Fu jairah Beach

Country: United Arab Emirates

Coordinates: 24°59'N, 56°22'E

Location: On the Gulf of Oman coast, straddling the border between the UAE and Sultanate of Oman; partly in Sharjah Emirate, partly in Fujairah Emirate, and partly in Omani territory.

Area: 7,750 ha.

Altitude: Sea level to 3 m above sea level.

Overview: A shallow tidal inlet and adjacent sandy beach on the Gulf of Oman coast, with exceptionally fine stands of mangrove and rich associated fauna. Particularly important for its endemic subspecies (*kalbaensis*) of the White-collared Kingfisher *Halcyon chloris*, which numbers only some 10-20 pairs.

Physical features: Khor Kalba is a small, shallow, tidal inlet with ramifying channels formed by the outlet of Wadi Rumh. Tall stands of old mangroves line the channels. The site also encompasses inter-tidal flats, sabkha, former mangrove areas now dead from isolation from tidal influence, and halophytic vegetation. The inter-tidal area within Khor Kalba itself is small (less than a few tens of hectares). The beach separating the khor from the sea is mainly sandy with gravel in places. Fujairah beach facing the town of Fujairah to the north is a typical seafront beach.

Ecological features: Mangal development with typical faunal associations. Stands of the Black Mangrove *Avicennia marina* include trees up to 8 m in height, and are possibly the oldest in the UAE. Most appear still to be in a healthy condition. *Limonium axillare*, *Suaeda* sp. and *Atriplex leucoclada* grow above the high-water mark. *Heliotropium kotschyi* is abundant above the beach line, along with a variety of species of Caryophyllaceae.

Land tenure: Khor Kalba is an outlying part of Sharjah Emirate, and is overseen by a local representative. The southern part of the site lies in Omani territory at Khatmat Malahah. Fujairah beach falls under Fujairah Municipality.

Conservation measures taken: Khor Kalba has been identified as an Important Bird Area (IBA) by BirdLife International. Kalba Municipality has been instructed by the Ruler of Sharjah to take "necessary measures" to protect the wildlife.

Conservation measures proposed: Direct or indirect representation is to be made to the Ruler of Sharjah and his local representative regarding the conservation importance of this site. Restoration and extension of the mangrove woodland is desirable, in order to increase and protect the integrity of the site. The erection of nest-boxes in younger mangroves may allow the White-collared Kingfisher population to increase. Cooperation with Oman is required to restore the southern part of the site, which is drying out. A management plan should be drawn up promptly.

Land use: Crabs and fish are netted for human consumption, and camels are allowed to graze in the mangroves. The area is popular for outdoor recreation, but this is largely confined to the beach side of the main channel, which is relatively unimportant for wildlife. Fishing takes place along the beach and in the inter-tidal channels.

Possible changes in land use: Encroachment of recreational facilities and perhaps agriculture is a possibility and would be detrimental to the site. Reclamation is also a possibility in places. A recent proposal to construct a desalination plant on the side of the khor would require an environmental impact assessment (EIA) before being allowed or prevented.

Disturbances and threats: Human activities cause disturbance to wildlife, and there is some direct persecution and trapping of birds and turtles. Fujairah beach is heavily used by fishermen and for recreation, as is the seaward side of Khor Kalba. Four-wheel drive vehicles damage the beach-top vegetation, and cause erosion. Pollution is clearly a threat

throughout the site. Fire and the cutting of mangroves are localised. Grazing by camels in the mangroves is not deemed a threat.

Hydrological and biophysical values: The only such khor on the Gulf of Oman coast of the UAE, and thus unique.

Social and cultural values: Traditional grazing and harvesting in the mangroves.

Noteworthy fauna: The mangroves of Khor Kalba support the entire world population (44 pairs/territories in May 1995) of the subspecies *kalbaensis* of the White-collared Kingfisher *Halcyon chloris*. The birds nest in natural holes in mangrove trunks and branches. The mangroves are also the only known breeding site in the UAE for the Booted Warbler *Hippolais caligata*, with 10-20 pairs. This is a rare breeding species elsewhere in Arabia, perhaps occurring only on the Batinah coast of Oman. Other breeding species in the mangroves include Little Green Heron *Butorides striatus*. The Indian Pond Heron *Ardeola grayii* occurs regularly in winter, Khor Kalba being the only regular site for this species in the UAE. Large numbers of Sooty Gulls *Larus hemprichii* occur annually on the beach in April/May (usually 500-800, but over 3,000 were present in May 1995). Green Turtles *Chelonia mydas* and Hawksbill Turtles *Eretmochelys imbricata* are regularly seen feeding in the Khor or along the outside of the beach, and may also nest. Unfortunately, the 4WD vehicles driven by fishermen along the beach reduce the likelihood of any young surviving. Many large specimens of Green Turtles are caught in fishing nets and drown, or are turned over and left to die above the high-water mark.

Noteworthy flora: Khor Kalba contains the oldest and best preserved stands of Black Mangrove *Avicennia marina* in the country, with individual trees reaching 8 m in height. The advanced age of the mangroves allows natural holes to form, a feature absent from any other mangrove stand in the UAE and vital for the White-collared Kingfishers.

Scientific research and facilities: None, other than some avifaunal surveys. Conservation education: None as yet, but possibly soon to change.

Management authority and jurisdiction: Kalba Municipality oversees the site.

References: Cowles (1981); Evans (1994); Jongbloed (1987); Richardson (1990b); Western (1989).

Reasons for inclusion: 1a, 2a, 2b, 2d & 3c. Khor Kalba contains the finest stands of mangroves in the UAE, and has an endemic subspecies of the White-collared Kingfisher *Halcyon chloris*.

Source: Simon Aspinall and Cohn Richardson.

Wetland Name: Wadi Ghayl

Country: United Arab Emirates

Coordinates: 25°27'N, 56°09'E

Location: On the western flank of the Hajar Mountains in Fujairah Emirate.

Area: 200 ha.

Altitude: Less than 500 m.

Overview: A typical, narrow, rock-sided wadi in the Hajar Mountains, with permanent surface flow in most years and rich associated fauna and flora.

Physical features: Wadi Ghayl is a small, narrow wadi carved out of solid rock and high-sided in places. The floor consists of gravel and pebbles, and there are several waterfalls. Much of the water is intercepted for cultivation, and the wadi dries out completely in some summers.

Ecological features: The wadi apparently supports a typical flora, but much of this has not as yet been identified.

Land tenure: The area is under the control of village chiefs or local families, with authority devolved by the Government of Fujairah Emirate.

Conservation measures taken: None.

Conservation measures proposed: Probably none required. Because of its high heritage values, the wadi is likely to remain in its relatively natural state.

Land use: Some abstraction of water for irrigation and domestic consumption, and smallscale cultivation of salad plants, vegetables, dates and other fruits.

Possible changes in land use: None likely.

Disturbances and threats: The principal threat is the excessive use of water for irrigation and domestic supply at the expense of the wadi system. The possible effects of this are not known. There is some shooting of sandgrouse (presumably only Lichtenstein's Sandgrouse *Pterocles lichtensteinii*), but this is not thought to be a serious threat.

Hydrological and biophysical values: No information.

Social and cultural values: Town water and irrigation supply.

Noteworthy fauna: Toads (*Bufo* spp.) and fish are abundant in several of the pools, as are dragonflies and a wide variety of other aquatic insects. Common Kingfisher *Alcedo atthis* and Grey Wagtail *Motacilla cinerea* occur along the stream in winter. Desert Lark *Ammomanes deserti*, Pale Rock Sparrow *Carpospiza brachydactyla* and House Bunting *Emberiza striolata* breed locally, and visit the wadi to drink. Bonelli's Eagle *Hieraeetus fasciatus* and Griffon Vulture *Gyps fulvus* were recorded in the area in late summer 1993.

Noteworthy flora: No information.

Scientific research and facilities: None.

Management authority and jurisdiction: Not applicable.

References: Unpublished personal observations.

Reasons for inclusion: 1d & 2b. A rare example of a wadi pool system which persists year round.

Source: Simon Aspinall.

Wetland Name: Hatta Lakes

Country: United Arab Emirates

Coordinates: 24°48'N, 56°09'E

Location: Opposite the entrance to Hatta Fort Hotel, on the western side of the Hajar Mountains in an enclave of Dubai Emirate.

Area: Over 800 ha.

Altitude: c.200-300 m.

Overview: A group of small reservoirs and pools on the western slope of the Flajar Mountains, of some importance for wildlife.

Physical features: A group of man-made reservoirs and ephemeral pools in a wide gravel depression in a low-level pass surrounded by mountains. The wetlands are seasonal and entirely dependent on winter rains. The site extends some eight km down Wadi Hatta to the Oman border and beyond.

Ecological features: No information.

Land tenure: Hatta Municipality.

Conservation measures taken: None.

Conservation measures proposed: Management of the site, including regulation of water levels, should be considered for recommendation to the appropriate authority.

Land use: Water supply for agriculture and domestic consumption, and local recreation.

Possible changes in land use: Alternative development is a possibility.

Disturbances and threats: Removal of the retaining banks and disturbance are the principal possible threats.

Hydrological and biophysical values: No information.

Social and cultural values: There are some important archaeological sites nearby, dating from the third millennium BC.

Noteworthy fauna: An important site for sandgrouse (Pteroclididae) coming in to drink in the morning and at dusk. Little Grebe *Tachybaptus ruficollis*, Little Ringed Plover *Charadrius dubius* and Black-winged Stilt *Himantopus himantopus* have bred or still breed, depending on the water level, and a variety of other waterbirds are occasional visitors.

Noteworthy flora: None known; the vegetation is sparse and appears to be unremarkable.

Scientific research and facilities: None.

Management authority and jurisdiction: Hatta Municipality. References: Richardson (1990a). Also: Emirates Bird Records Committee files.

Reasons for inclusion: 1d. An example of a wetland type (freshwater dams and pools) rare in this part of Arabia.

Source: Simon Aspinall and Cohn Richardson.

Wetland Name: Ayn al Faydah

Country: United Arab Emirates

Coordinates: 24°05'N, 55°42'E

Location: On the plain to the west of, and immediately adjacent to, Jebel Hafit, and south of Al Am, eastern Abu Dhabi Emirate.

Area: c.1,400 ha.

Altitude: Less than 300 m.

Overview: A natural spring system much modified by excavation and now with a small permanent lake; of considerable importance for breeding and wintering waterbirds, and with an interesting community of aquatic invertebrates. The site is a rare example of a semi-natural inland wetland.

Physical features: A natural spring system exposed by mechanical excavation and much modified and canalised. A small lake has been created, and water is now generally present year round, although in the summer of 1994, perhaps for the first time ever, the site was completely dry. Planted shrubs and trees such as mesquite *Prosopis julzflora* are maintained by drip-fed irrigation. A feeder canal takes water from the main lake to a boating lake complex. Jebel Hafit, to the east of the site, rises to a peak at 1,300 m.

Ecological features: Reeds *Phragmites australis* and tamarix shrubs *Tamarix passerinoides* grow around the permanent lake and along the main canal, and there is a small area of seasonally wet *Juncus* marsh isolated by a bund. The dominant native species elsewhere include *Zygophyllum mandavillei*, *Salsola bayosma* and *Salsola rubescens*.

Land tenure: Al Am Municipality.

Conservation measures taken: None.

Conservation measures proposed: Under sympathetic management and with adequate control of visitors, the wetland could be developed as a valuable wildlife sanctuary and educational site.

Land use: Outdoor recreation, including shooting. Water from the springs is used to supply a boating lake complex. An ornamental waterfowl collection and a goose farm

have been established at the site, and there is a sewage treatment plant and overspill lake on the edge of the site.

Possible changes in land use: Further development, especially for recreational pursuits, is likely.

Disturbances and threats: Drought and human interference with the hydrological regime are the principal threats. The entire wetland dried out in the summer of 1994, perhaps as a direct consequence of conflicting requirements. This is apparently the first time that this has happened. Zealous "tidying up" of riparian vegetation could reduce the value of the site for waterbirds. Botulism may be exacerbated by *Clostridium* nurtured in local refuse. Wildfowl and shorebirds are occasionally shot for sport.

Social and cultural values: The site has considerable historical value.

Noteworthy fauna: Breeding birds include Moorhen *Gallinula chioropus*, Black-winged Stilt *Himantopus himantopus*, Little Ringed Plover *Charadrius dubius*, Red-wattled Lapwing *Vanellus indicus* and Graceful Prinia *Prinia gracilis*. Many species of waterfowl have occurred in the area on migration and in winter, including at least eight species of heron (Ardeidae). Some 500-600 ducks, mostly Mallard *Anas platyrhynchos*, can be found in winter. This is the largest inland concentration of ducks anywhere in the UAE. Two or more Bonelli's Eagles *Hieraetus fasciatus* overwinter, attracted by the waterfowl. Several rare waterfowl in the UAE have been recorded in this area in recent years, including Great Crested Grebe *Podiceps cristatus*, Indian Pond Heron *Ardeola grayii* and Black Stork *Ciconia nigra*. Several species of freshwater invertebrates with relict and restricted distributions have been collected here.

Noteworthy flora: The wetland is an unusual inland site for *Cynomorium coccineum* and *Cistanche* sp. ("Desert Candle" or "Desert Hyacinth"), and also has *Limonium stocksii*, a species which normally grows on sabkha.

Scientific research and facilities: The avifauna has been well documented year round. Some invertebrate collections have been made, but the results have yet to be published.

Management authority and jurisdiction: No information.

References: Jongbloed (1987); Western (1989).

Reasons for inclusion: 1d & 2b. Presently a unique site within the UAE, with a very diverse avifauna and interesting invertebrate fauna.

Source: Simon Aspinall, Cohn Richardson and Marijcke Jongbloed.

Wetland Name: Ruwais Reed-beds

Country: United Arab Emirates

Coordinates: 24°04'N, 52°40'E

Location: Part of the Ruwais housing complex of Abu Dhabi National Oil Company (ADNOC), in western Abu Dhabi Emirate.

Area: 1,500 ha.

Altitude: Less than 50 m above sea level.

Overview: A group of man-made pools and reed-beds fed by treated sewage and run-off. The site contains the largest area of reed-beds in the UAE, and supports a very diverse avifauna.

Physical features: A man-made wetland comprising several isolated reed-fringed ponds and reed-beds enriched with treated sewage and run-off water. The ponds are brackish to almost fresh or completely fresh, depending on input. Adjacent sabkha areas exhibit a natural seasonal hydrological regime; they are flooded in winter and become hypersaline in summer.

Ecological features: Large portions of the wetland are covered in reed-beds *Phragmites* sp.

Land tenure: ADNOC.

Conservation measures taken: None.

Conservation measures proposed: The site should be managed sympathetically for its wildlife.

Land use: Presently treated as wasteland and virtually unused. Some reeds are cut by local people, but the use to which they are put is unknown.

Possible changes in land use: Housing or other development is possible in the future. Reclamation would see the disappearance of most of the site.

Disturbances and threats: The main threat, other than the cutting off of the water supply, is from infilling. Several pools were reclaimed in 1994, and this seriously reduced the value of the area for wildlife. Biting insects are controlled by fumigation, and chemical contamination could therefore easily occur, either accidentally or deliberately.

Hydrological and biophysical values: Natural water purification and filtration.

Social and cultural values: None known.

Noteworthy fauna: The reed-beds are known to harbour many Reed Warblers *Acrocephalus scirpaceus* and Clamorous Reed Warblers *A. stentoreus* on passage and in winter, and both species may breed. Spotted Crakes *Porzana porzana* and Water Rails *Rallus aquaticus* have been recorded as non-breeding visitors, and the latter may nest undetected. Black-winged Stilts *Himantopus himantopus* probably breed. A variety of ducks and shorebirds occur on autumn passage and in winter, and the Common Kingfisher *Alcedo atthis* is found in winter. Single Ferruginous Ducks *Aythya nyroca* have occurred in winter. The reed-beds provide a valuable roosting site for hirundines and wagtails *Motacilla* spp. Although only limited bird surveys have been carried out, no less than 140 species of birds have already been recorded in the area. Information on other faunal groups is to be collected in future surveys.

Noteworthy flora: The extensive *Phragmites* reed-beds comprise the largest area of reedbeds in the UAE.

Scientific research and facilities: None, other than a number of brief avifaunal surveys.

Management authority and jurisdiction: ADNOC.

References: Unpublished personal observations.

Reasons for inclusion: 1d & 2b. The only freshwater wetland of any consequence in the western UAE, and the most extensive reed-bed community in the country.

Source: Simon Aspinall.

OTHER SITES

It is unlikely that all important wetland sites in the UAE have been identified in this inventory. Wildlife surveys have barely begun in many areas, and much remains to be discovered, even in some of the best known sites. Only birds are reasonably well known. Considerable subspeciation is considered likely amongst both invertebrate and vertebrate groups. The flora may also yield similar results once studied thoroughly. This is particularly likely to be the case in the numerous wadi systems of the northern Hajar Mountains, which run north-south through the east of the country. Sites 18, 19 and 21 simply represent the best known (and most easily accessible) wadi systems at the present time. There is a need to protect all wetland sites in the UAE, if for no other reason than to prevent contamination of groundwater and the subterranean aquifers. The National Avian Research Centre and Emirates Natural History Group will be able to supply information

on any new sites and any additional survey material on established sites as this becomes available.

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