

# KUWAIT

## INTRODUCTION

**Area:** 17,820 sq.km.

**Population:** 2,086,000 (1990).

Kuwait is an independent oil-rich state situated at the extreme northwestern end of the Gulf between latitudes 28°30' and 30°05' North and longitudes 46°33' and 48°36' East; it is bounded to the north and west by Iraq, to the south by Saudi Arabia, and to the east by the Gulf. The State of Kuwait comprises the mainland and nine offshore islands, including the inhabited island of Failaka, the large low-lying muddy island of Bubiyan near the mouth of the Shatt Al-Arab, and seven small coral islands mostly in the south. The terrain is flat or gently undulating, rising to a height of 271 m in the extreme southwest of the country. The principal topographic features are Wadi Al-Batin, which runs along the western border with Iraq, and the Jal Az-Zor escarpment (with a maximum elevation of 145 m), which extends approximately 80 km from Atrah northeast to Al-Bahrah and borders the northern shore of Kuwait Bay. There are numerous wadi systems which drain mostly to the northeast, but surface flow occurs only after exceptional rainfall, and there are no permanent rivers or streams. The gradual sinking of the Gulf geosyncline is thought to explain the distinctive topography of northeastern Kuwait. Here, gravel-topped ridges trending in a northeast direction and rising in height to only about one metre alternate with narrow, sandy depressions. The northeast also includes extensive bare mudflats which form part of the Shatt Al-Arab delta. Most of the interior is generally stony with a very sparse cover of grasses and low shrubs. Kuwait's major landscapes and dominant vegetation types have recently been summarized by IUCN (1992) and Evans (1994).

The climate is characterized by very hot, dry summers and cool rainy winters. The average annual rainfall in Kuwait City is about 111 mm, but other parts of the country receive as little as 23 mm or as much as 206 mm. Most of the rainfall occurs as light winter showers brought about by westerly depressions. Summer temperatures are extremely high, often exceeding 45°C during July and August. In winter, temperatures often rise to over 20°C during the day, but then fall rapidly at night when frosts are not uncommon, especially inland. The humidity is generally high and often exceeds 90%. Dust and sand storms are common throughout the year.

Until the discovery of oil in the Burgan area in 1938, Kuwait's economy was based on pearl diving, seafaring, boat-building, fishing and nomadic pastoralism. Kuwait became a major oil producer in the 1950s, and by 1979, petroleum and its products were accounting for over 95 % of government revenue and over 75 % of national income. Industrial development is concentrated in Shuaiba, south of Kuwait City, where there are plants for the manufacture of petro-chemicals, fertilizers, construction materials, asbestos etc. The Government is pursuing an active programme of economic diversification and gradually creating a post-oil, high-technology state. The capital, Kuwait City, has become an important banking and investment centre. Virtually all settlements and 90% of the population are within 10 km of the coast.

Agriculture plays a relatively insignificant role in the economy. However, attempts have been made to lessen the dependence on imported foods by expanding the cultivation of dates, citrus fruits and timber, and by increasing livestock and poultry farming. Until the 1960s, fishing was considered as the second most important source of national income after oil, but since then there has been a substantial fall in the fish and shrimp catches. This has been attributed to careless over-fishing and

absence of protective regulations in regard to close seasons, mesh size, spawning areas *etc.* (Husain, 1976).

### **Summary of Wetland Situation**

The only natural wetlands in Kuwait are marine and coastal. There are no natural lakes of any kind and no permanent water courses. The only significant freshwater wetland is a complex of shallow pools and marshes fed by sewage and other waste water in an area of sabkha near the town of Al-Jahra at the west end of Kuwait Bay.

Kuwait's coastline, including that of its islands, has been estimated at about 400 km. It is mainly sandy and muddy with very few inlets other than Kuwait Bay. The northern coast, from Doha northwards, is bordered by extensive mudflats created by the floodwaters of the Tigris and Euphrates Rivers which enter the north end of the Gulf through the Shatt Al-Arab waterway. The southern coast, from Kuwait City southward, is mainly sandy. The maximum tidal range is 3.5-4.0 m, the largest spring tides occurring during the day in winter and during the night in summer. The water temperature varies widely from 12°C in January to 34°C in July; salinities are generally high throughout most of the year, ranging from 38 to 42 p.p.t. Some of the most extensive inter-tidal mudflats occur around Kuwait Bay, particularly at Dawhat Kazima, at the west end of the bay, and in Sulaibikhat Bay, on the south side. These two sites and a group of interesting tidal inlets on the southern coast (Al-Khiran) are described in the present inventory. However, the extensive creek systems and mudflats around Bubiyan Island in the north have never been properly investigated, and it is likely that further inter-tidal areas of international importance for migratory waterfowl remain to be identified.

The largest of Kuwait's nine offshore islands, Bubiyan, is an uninhabited, low-lying, muddy island near the border with Iraq. The other islands are low sandy islands fringed by coral reefs; all except the large island of Failaka near Kuwait City are uninhabited except for police outposts, and several support breeding colonies of sea-birds. Kubbar Island, in particular, is important as a nesting site for seabirds and formerly supported nesting sea turtles. Environmental conditions for coral growth are not optimal, and the reefs are limited in extent (about 400 ha in total) and poorly developed. Isolated corals exist on rocky outcrops on the southern Kuwait mainland, but reefs are largely restricted to the small offshore islands, *e.g.* Umm al-Maradim, Qaruh and Kubbar. Large numbers of the echinoderm *Echinometra mathaei* have caused some damage to the reefs (UNEP/IUCN, 1988).

Continuous human activities along the coastline have resulted in considerable disturbance to marine ecosystems. The extensive inter-tidal mudflats in Kuwait Bay have come under pressure from dredging and landfill for urban and industrial developments. Large quantities of sand have been removed from beaches for construction purposes. Some parts of the coastline are being destroyed by the disposal of untreated sewage, while other areas are being polluted by industrial effluents with high concentrations of ammonia, mercury and chlorine. Oil pollution as a result of accident oil spillage is a perennial threat, while pollution from the disposal of ballast water in inshore waters continues, regardless of the legislation which prohibits this (Husain, 1976). The last of Kuwait's coastal fringing reefs, which probably used to extend as far north as Ra's al-Ardh, is currently under threat from large-scale urban and industrial development. Nesting seabirds on the offshore islands are vulnerable to human disturbance, and there is a certain amount of shooting. Littering has also become a problem on some of the offshore islands because of their popularity for outdoor recreation (UNEP/IUCN, 1988).

During the Gulf War of 1990/91, an estimated 7-8 million barrels of oil were spilled into the Gulf from the Kuwait oil fields. This was by far the biggest oil spill in history. The immediate effects of the Gulf War on coastal wetlands in Kuwait have been summarized by Evans et al. (1991) and Pilcher and Sexton (1993). In May 1991, a survey was undertaken on behalf of BirdLife International to assess the effects of the oil spills and well-head fires on Kuwait's avifauna and environment. The survey found that despite the enormous oil spills, most of Kuwait's coastline was clear of serious pollution. Unfortunately, the worst affected **areas** were amongst those that are most important for waterfowl. The most heavily polluted shoreline was that of Sulaibikhat Bay, where a 10 metre wide band of oil had been deposited at the high-water mark along a 17 km stretch of coast. The most significant pollution on the southern coast was in Khor Al-Mufateh (part of the Al-Khiran system), where a 2-3 metre wide band of oil had been deposited along a 0.5 km stretch of the banks of the main creek. Elsewhere along the southern coast, there were only small, scattered deposits of oil around piers and on peninsulas. All of the offshore islands escaped serious pollution except for Bubiyan, where there were small deposits of oil along the northeast coast. In all, only about 20 km of coastline were found to have been impacted by oil, and it was concluded that 95% of Kuwait's shores were free of persisting, serious pollution from the marine oil spills. The environmental impact was far greater inland; large oil lakes, some covering several square km, had been created from sabotaged well-heads, whilst over 500 burning oil wells were pouring tens of thousands of tonnes of smoke into the atmosphere daily. At least 25% of Kuwait's desert was covered in oil or heavy deposits of acidic, oily soot. Probably 90% of Kuwait's desert surface had been compacted, churned or otherwise impacted by military activities, and desertification had been greatly exacerbated. All existing protected areas for nature conservation had been damaged during the war, and most of the fencing and gates had been destroyed (Pilcher & Sexton, 1993).

A recent inventory of Important Bird Areas in the Middle East, sponsored by BirdLife International, identified eight sites as being of special importance for bird conservation in Kuwait (Evans, 1994). Five of these sites are primarily wetlands, and include a freshwater wetland, three areas of coastal flats and a small offshore island. All are included in the present inventory, along with an additional coastal site (Al-Khiran) in the extreme south of the country.

### **Wetland Research**

The Kuwait Institute for Scientific Research (KISR), established in 1967, undertakes research on coastal ecosystems and provides scientific support for the oil sector. The KISR has been carrying out research on the reefs and reef environment since 1983, and has conducted studies on the value of artificial reefs to fisheries. The Fisheries Department in the Ministry of Public Works has also undertaken research on the fisheries resources and their development. The Regional Organization for the Protection of the Marine Environment (ROPME), with offices based in Kuwait, has been involved in research activities, including the monitoring of marine pollution, and has assisted in the development of regional coastal zone management plans. ROPME was instrumental in the clean-up operation of the oil spills following the Gulf War.

The Faculty of Science at Kuwait University has been involved in research in a number of wetland areas, notably in Kuwait Bay and at Al-Khiran on the southern coast. The Ahmadi Natural History and Field Studies Group is also active in studying the fauna and flora of Kuwait. This non-governmental organization was founded in 1969, under the sponsorship of the Kuwait Oil Company, to encourage field studies, maintain contact with other institutions and help disseminate knowledge. Numerous resident and visiting ornithologists have gathered a considerable amount of information on the wetlands and their birds, and mid-winter waterfowl counts have been undertaken at a total of four sites since 1987/88 as part of the IWRB/AWB Asian Waterfowl Census.

Since the Gulf War, the numerous minefields and widespread abundance of other unexploded ordnance, both on the coast and inland, have imposed certain constraints on field work (Pilcher & Sexton, 1993).

### **Wetland Area Legislation**

Environmental policy and legislation in Kuwait have recently been summarized by IUCN (1992). Conservation of nature has been prominent in the environmental policy adopted by the Council of Ministers. The main law governing the conservation of natural habitat is Decree Law No.62 of 1980, which indicates a general policy for the protection of the environment and provides for designation of two categories of protected area, National Parks and Nature Reserves. Additional legislation or regulations on the environment include prohibition of commercial fishing of shrimp, including in important wetland areas, during the spawning season, and measures to prevent the decline in sea turtles. There are minimum size limits for a number of fish species, and mesh sizes for four different types of net are enforced. Under Decree Law No. 1964, oil discharge in territorial waters extending 50 miles from land and in the internal waters of Kuwait Bay is prohibited. Hunting, however, is permitted throughout the country, except for shooting in urban areas, and there are no laws for its regulation. A special Act for nature conservation (including the designation of additional protected areas in the future) has been drafted and is currently awaiting official ratification by the Council of Ministers

At international level, Kuwait is not yet a party to any of the international area-based conservation conventions, although it has signed the Biodiversity Convention. It is a party to the Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution, and participates in the Action Plan for the Protection and Development of the Marine Environment and the Coastal Areas.

### **Wetland Area Administration**

The Environmental Protection Council is the government body responsible for the protection of the environment in general. This Council was created by the Minister of Public Health in 1980 as a consequence of Decree Law No.62. It is empowered to suggest a general policy for the protection of the environment and to propose protected areas; it provides an advisory channel on environmental matters to the authorities, as well as funds for research.

Kuwait's protected areas system is under the management and direct supervision of the Public Authority for Agriculture and Fisheries, an active member of the Environment Protection Council. The allocation of land for any use, including parks and designated areas, is the sole responsibility of the Municipal Council, Kuwait Municipality. The Ministry of Water and Electricity has rights over the underground water resources. The Ministry of the Interior owns and controls the offshore islands and their associated coral reefs. The Kuwait Institute for Scientific Research is involved in the protection and management of the environment and, in cooperation with the Faculty of Science at Kuwait University, has been involved in developing plans for the establishment of national parks and nature reserves. The Ahmadi Natural History and Field Studies Group has also made recommendations to the Government for the establishment of reserves.

At present, the protected areas system comprises a National Park and two Nature Reserves, all of which contain wetland habitat. The Kuwait Master Plan (first drawn up in the mid-1950s and revised in 1970, 1983 and 1990) included a major proposal for the whole of the northern coast to be

designated as a National Park. In 1983, a coastal conservation zone was designated covering the Doha Peninsula and the east-facing shore of Kuwait Bay as far as Subiya. However, upon designation in August 1990, the National Park was reduced in area in recognition of military requirements. The Park, which covers 25,000 ha, incorporates the Jal Az-Zor escarpment and a section of the northern shore of Kuwait Bay with coastal mudflats and associated saline marshes and sand dunes. It is intended to be a multi-purpose resort for conservation, recreation and education (Evans, 1994).

In August 1990, the Environment Protection Council designated two nature reserves, both of which are described in this inventory: the Jahra Pools Nature Reserve (250 ha) and the Doha Peninsula Nature Reserve in Sulaibikhat Bay (450 ha). There are no marine protected areas, although a proposal **has** been made to protect Kubbar Island and its surrounding reefs (IUCN/UNEP, 1985).

### **Organizations involved with Wetlands**

Environment Protection Council

Public Authority for Agriculture and Fisheries

Fisheries Department, Ministry of Public Works

Ministry of Water and Electricity

Municipal Council, Kuwait Municipality

Kuwait Institute for Scientific Research.

Faculty of Science, Kuwait University

Ahmadi Natural History and Field Studies Group

Regional Organization for the Protection of the Marine Environment (ROPME)

## WETLANDS

Site descriptions compiled from the literature and information provided by Muna Faraj of the Environment Protection Council.

**Wetland Name:** Al-Jahra Pool Nature Reserve

**Country:** Kuwait

**Coordinates:** 29°22'N, 47°42'E

**Location:** 2 km east of Al-Jahra town near the west end of Kuwait Bay, 27 km west of Kuwait City centre, Al-Jahra Region.

**Area:** 250 ha.

**Altitude:** Sea level.

**Overview:** A man-made wetland comprising sewage lagoons and reed-beds in an area of sabkha at the extreme western end of Kuwait Bay, remarkable for the great diversity of birds which have occurred during the migration seasons and in winter. The only significant non-marine wetland in Kuwait, protected as a Nature Reserve.

**Physical and ecological features:** A complex of stagnant, open, shallow pools and extensive reed-beds of *Phragmites* sp., formed by domestic sewage and other waste water from the town of Al-Jahra flowing across sandy sabkha at the extreme western end of Kuwait Bay. The pools are shallow (average depth about 10 cm) and permanent, but show marked seasonal fluctuations in size. Overflow from the pools flows into the southwest corner of Kuwait Bay at Dawhat Kazima (Site 2). There are scattered halophytes on the sabkha, as well as some old plantations of *Tamarix* sp. in poor condition.

**Land tenure:** State owned.

**Conservation measures taken:** The area is protected as a Nature Reserve (250 ha), established in August 1990. Within the reserve, 70 ha are fenced with chain-link fencing, and signs state that this is for the protection of birds. An official management plan exists, but has not yet been fully implemented. Two full-time guards have been employed since February 1993. Military patrols expel hunters for security reasons, and thus provide some unintentional protection. The site has been identified as an Important Bird Area by BirdLife International (Evans, 1994).

**Conservation measures proposed:** Pilcher and Sexton (1993) made a number of recommendations concerning the rehabilitation of the Nature Reserve following the Gulf War, and recommended that a ban on all shooting be rigorously enforced.

**Land use:** Nature protection and outdoor recreation. Part of the site is a designated camping area.

**Possible changes in land use:** None known.

**Disturbances and threats:** Destruction of vegetation by camp-fires was common before mid-1990. Shrubs were used for firewood, and off-road vehicles damaged the sabkha crust. Hunting formerly caused a considerable amount of disturbance to waterfowl, and some illegal hunting continues. During the Gulf War (1990/91), the warden's hut was removed and the fencing was damaged, but the freshwater habitats were relatively undisturbed. Pollution from soot deposits from the well fires appears to have been slight. Some unexploded ordnance was still present in the outer zone of the reserve in May 1991 (Pilcher & Sexton, 1993).

**Hydrological and biophysical values:** No information.

**Social and cultural values:** No information.

**Noteworthy fauna:** As a permanently wet and green area, the wetland attracts a very wide variety of migrant birds during the migration seasons and in winter, and provides an important refuge from hunting. At least 220 species of birds have been recorded at the site. Waterfowl present in mid-winter have included up to 13 *Podiceps nigricollis*, 45 *Phoenicopus ruber*, 150 *Gallinula chioropus*, 177 *Fulica atra* and 500 *Larus ridibundus*, along with small numbers of several species of ducks and shorebirds. *Crex crex* has occurred on migration (maximum two in May and September). The site is

also important for migrating birds of prey; as many as 410 raptors of 17 species have been recorded in a single day, and an estimated 2,000-3,000 pass through the area in spring and autumn. Notable counts have included two *Aegypius monachus*, 85 *Buteo buteo*, 10 *Aquila clanga*, 343 *A. nipalensis*, 14 *A. heliaca*, 5 *Circus aeruginosus* and 28 *Falco naumanni* (Evans, 1994).

**Noteworthy flora:** The site contains the only significant stands of freshwater aquatic vegetation in Kuwait.

**Scientific research and facilities:** The bird fauna has been well documented by resident and visiting ornithologists and bird-watchers. Pilcher and Sexton (1993) surveyed the area in May 1991 to assess the impact of the Gulf War on the habitats and avifauna. Midwinter waterfowl counts were undertaken by Prof. W.C.T. Pilcher from Kuwait University in 1988, 1990, 1993 and 1994.

**Conservation education:** The site has great value as a potential field study centre for all educational levels up to university research.

**Recreation and tourism:** If properly zoned, the Nature Reserve could provide for a variety of recreational activities.

**Management authority and jurisdiction:** The Nature Reserve is managed by the Public Authority for Agriculture and Fisheries.

**References:** Evans (1994); Jennings (1981); Pilcher & Sexton (1993).

**Reasons for inclusion:** id & 2b. The only significant freshwater wetland in Kuwait, frequented by a very wide diversity of birds during the migration seasons and in winter.

**Source:** See. references.

**Wetland Name:** Dawhat Kazima

**Country:** Kuwait

**Coordinates:** 29°23'N, 47°47'E

**Location:** at the west end of Kuwait Bay, about 25 km west of Kuwait City centre, A1-Jahra Region.

**Area:** 1,660 ha.

**Altitude:** Sea level.

**Overview:** A shallow sea bay with inter-tidal mudflats, important as a nursery ground for crustaceans and as a staging and wintering area for migratory waterfowl.

**Physical and ecological features:** Dawhat Kazima is a shallow, sheltered bay, at the extreme western end of the larger Kuwait Bay system. About 890 ha of inter-tidal mudflats are exposed at low tide. A low, sandy peninsula, Ra's Kazima, extends about 2 km out into the bay from the north shore. The salinity is about 39 p.p.t., and the maximum tidal range about two metres.

**Land tenure:** No information.

**Conservation measures taken:** A close season operates for shrimp fishing. Much of the site has been inaccessible since the 1990/91 Iraqi occupation because of unexploded ordnance, and this gives some protection from human disturbance. The site has been identified as an Important Bird Area by BirdLife International (Evans, 1994).

**Conservation measures proposed:** None known.

**Land use:** Traditional fishing with fixed traps ("hadra"); also recreational fishing.

**Possible changes in land use:** No information.

**Disturbances and threats:** No serious threats are known. The mudflats escaped serious pollution during the Gulf War. There is some local pollution from power stations on the Doha peninsula, and toxic outflow from Jahra Pools destroyed extensive stands of *Salicornia* sp. in the early 1980s.

**Hydrological and biophysical values:** The bay is important as a nursery area for economically valuable shrimps.

**Social and cultural values:** No information.

**Noteworthy fauna:** An important staging and wintering area for migratory waterfowl. Waterfowl recorded in winter in recent years have included up to 23 *Podiceps nigricollis*, 180 *Phalacrocorax*

*carbo*, 62 *Ardea cinerea*, one *Platalea eucorodia*, 200 *Phoenicopterus ruber*, 200 *Anas penelope*, 30 *A. crecca*, 45 *A. clypeata*, 280 *Dromas ardeola*, 30 *Haematopus ostralegus*, 70 *Recurvi rostra avosetta* and 50 *Larus genei*. Several thousand waterfowl occur during the migration seasons, but accurate counts have not been made. At least 66 species of birds have been recorded in the area. The invertebrate fauna of the mudflats includes an endemic ocypodid crab, *Cleistostoma kuwaitense*.

**Noteworthy flora:** No information.

**Scientific research and facilities:** The area has been visited by ornithologists on several occasions, and a mid-winter waterfowl count was undertaken by Prof. W.C.T. Pilcher from Kuwait University in January 1988.

**Management authority and jurisdiction:** No information.

**References:** Evans 1994)

**Reasons for inclusion:** 1a, 2c & 3b. An important nursery area for crustaceans and a major staging and wintering area for migratory waterfowl.

**Source:** See references.

**Wetland Name:** Sulaibikhat Bay and Doha Peninsula Nature Reserve

**Country:** Hashemite Kingdom of Jordan

**Coordinates:** Sulaibikhat Bay 29°21 'N, 47°51 'E; Doha Peninsula Nature Reserve, 29°22'N, 47°49'E

**Location:** on the south side of Kuwait Bay, about 20-25 km west of Kuwait City centre, A1-Jahra Region.

**Area:** Sulaibikhat Bay 4,845 ha; Doha Peninsula Nature Reserve 450 ha.

**Altitude:** Sea level.

**Overview:** A large area of inter-tidal mudflats and adjacent sabkha with some reed-beds, important for migratory waterfowl during the migration seasons and in winter. The Doha Peninsula on the northwest side of the bay is protected as a Nature Reserve.

**Physical and ecological features:** Sulaibikhat Bay is a very shallow, sheltered bay on the south side of the larger Kuwait Bay system, protected to the northwest by a low-lying sandy peninsula. There are extensive inter-tidal mudflats (c.2,250 ha) along the south and west shores, reportedly the most productive mudflats in Kuwait. The salinity is about 39 p.p.t. , and the maximum tidal range about two metres. A large area of sandy sabkha (450 ha) on the Doha Peninsula in the northwest is flooded by exceptionally high tides and supports some salt-tolerant vegetation. Drainage water from nearby private houses and an Entertainment Park flows across part of the sabkha and supports about 0.5 ha of Phragmites reeds. There is also a major outlet for seawater coolant used by the Doha power stations in this area.

**Land tenure:** No information.

**Conservation measures taken:** The sabkha on the Doha Peninsula and about three km of shoreline are protected in the Doha Peninsula Nature Reserve (450 ha), established in August 1990. The reserve is fenced with chain-link fencing on its landward sides, but some sections of fencing are broken and the gates are left permanently open. Some protection from hunters is provided on the seaward side by barbed wire defences erected during the Iraqi occupation in 1990/91. Sulaibikhat Bay and the Doha Peninsula Nature Reserve have been identified as two adjacent Important Bird Areas by BirdLife International (Evans, 1994).

**Conservation measures proposed:** A proposal was made in 1987 to protect the whole of Sulaibikhat Bay from shooting, whilst allowing traditional and recreational fishing to continue. Pilcher and Sexton (1993) made a number of recommendations concerning the rehabilitation of the Nature Reserve following the Gulf War, and recommended that a ban on all shooting be rigorously enforced.

**Land use:** The bay is used for recreational fishing and traditional fishing with fixed traps ('hadra'). The hadra on the inter-tidal mudflats appear to be in poor repair, and may have been abandoned because of mine-laying in the area during the Iraqi occupation in 1990/91. Prior to the establishment

of the Nature Reserve, the sabkha was used at weekends for outdoor recreation and picnicking. The Nature Reserve is bisected by a public track to private houses.

**Possible changes in land use:** In-filling of inter-tidal areas to create new land for urban and industrial development.

**Disturbances and threats:** Some 500 ha of mudflats were destroyed by in-filling in the early 1980s. There is some local pollution from power stations on the Doha peninsula and Mina Shuwaikh port. Hunting is common, and causes considerable disturbance to the wintering waterfowl. Sulaibikhat Bay was badly affected by oil pollution during the Gulf War, and was the most heavily polluted stretch of coastline in the country. A survey in May 1991 revealed that a 10 metre wide band of oil had been deposited at the high-water mark along 17 km of shoreline, from Mina Shuwaikh in the east to the middle reaches of the Doha Peninsula in the northwest. Fortunately, along most of this stretch, the extensive intertidal mudflats, covering some 2,250 ha, had been spared. The habitat in the Nature Reserve was seriously impacted during the war by military activities such as bunker construction, excavations and movement of vehicles. Parts of the fencing and gates were destroyed; the vegetation was badly damaged, and the shorebird roosting site was contaminated with oil. However, pollution from soot deposits from the well fires appears to have been slight (Pilcher & Sexton, 1993).

**Hydrological and biophysical values:** The bay is important as a nursery area for economically valuable shrimps.

**Social and cultural values:** No information.

**Noteworthy fauna:** Sulaibikhat Bay is an important staging and wintering area for migratory waterfowl. The sabkha area in the Nature Reserve provides a secure roosting site for thousands of shorebirds and other waterfowl which feed on the adjacent mudflats at low tide. The most abundant species at the roost are *Charadrius hiaticula*, *C. alexandrinus*, *C. mongolus*, *C. leschenaultii* and *Pluvialis squatarola*. Almost 25,500 waterfowl of 32 species were present in January 1994. Waterfowl recorded in mid-winter in recent years have included up to 800 *Phalacrocorax carbo*, 110 *Egretta gularis*, 270 *Ardea cinerea*, 640 *Phoenicopterus ruber*, 21 *Tadorna tadorna*, 610 *Dromas ardeola*, 200 *Haematopus ostralegus*, 86 *Recurvi rostra avosetta*, 970 *Charadrius alexandrinus*, 1,000 *C. mongolus/leschenaultii*, 96 *Pluvialis squatarola*, 720 *Calidris alba*, 300 *C. minuta*, 2,500 *C. alpina*, 215 *Limosa lapponica*, 840 *Numenius arquata*, 1,200 *Tringa totanus*, 19 *T. stagnatilis*, 45 *T. nebularia*, 465 *T. cinerea*, 74 *Arenaria interpres*, 6,630 *Larus ridibundus*, 1,560 *L. genei*, 6,500 *L. cachinnans*, 48 *Gelochelidon nilotica* and 8 *Sterna caspia*. Throughout the winter of 1989/90, about 300 *D. ardeola* frequented the shorebird roost on the Doha Peninsula (Cowan, 1990). At least 70 species of birds have been recorded in the area.

The mudflats support a large population of mudskippers (Gobiidae) of three species, *Scartelaos viridis*, *Periophthalmus koelreuteri* and *Boloepthalmus boddarti*. Crabs are extremely numerous; at least 13 species have been recorded including an endemic species of Ocypodidae, *Cleistostoma kuwaitense*.

**Noteworthy flora:** No information.

**Scientific research and facilities:** D. A. Clayton from Kuwait University has studied the fauna and ecology of the mudflats (Clayton, 1986). Pilcher and Sexton (1993) surveyed the area in May 1991 to assess the impact of the Gulf War on the habitats and avifauna. Mid-winter waterfowl counts were undertaken by Prof. W.C.T. Pilcher from Kuwait University in 1988, 1990, 1993 and 1994.

**Management authority and jurisdiction:** The Doha Peninsula Nature Reserve is managed by the Public Authority for Agriculture and Fisheries.

**References:** Clayton (1986); Cowan (1990); Evans (1994); Evans *et al.* (1991); Pitcher & Sexton (1993).

**Reasons for inclusion:** 1a, 2c, 3a & 3c. An important nursery area for crustaceans and a very important staging and wintering area for migratory waterfowl, occasionally holding over 20,000 birds including over 1 % of the regional populations of at least five species (*Dromas ardeola*, *Calidris alpina*, *Tringa cinerea*, *Larus ridibundus* and *L. genei*).

**Source:** See references.

**Wetland Name:** Kubbar Island

**Country:** Kuwait

**Coordinates:** 29°04'N, 48°30'E

**Location:** in the northern Gulf, 30 km offshore and about 50 km southeast of Kuwait City.

**Area:** 18 ha.

**Altitude:** Sea level.

**Overview:** A small offshore island with associated coral reefs in the northern Gulf, important for breeding terns *Sterna* spp. and formerly for nesting sea turtles.

**Physical and ecological features:** One of a small group of coral islands and associated reefs in the northern Gulf. Part of the island is covered in salt-tolerant bushes; other areas are dominated by annuals (*Seidlitzia* sp.), and there are patches of bare ground. Beaches are mainly sandy, although there are some rocky stretches of shoreline. The island is surrounded by a coral reef with a small break at a sand spit.

**Land tenure:** The island and its associated reefs are owned by the Ministry of the Interior.

**Conservation measures taken:** None. The site has been identified as an Important Bird Area by BirdLife International (Evans, 1994).

**Conservation measures proposed:** Kubbar Island and its surrounding reefs were first proposed for protection in 1985 (IUCN/UNEP, 1985). In 1988, the Kuwait Institute for Scientific Research included the island together with several submerged coral reefs in a proposal for a Marine Park. More recently, the island has been included in the draft Nature Conservation Act submitted by the Environment Protection Council. Any enforcement of protective legislation would require the presence of a warden on the island, at least during the tern breeding season (UNEP/IUCN, 1988).

**Land use:** Uninhabited. The island is a popular recreation area at weekends, and is regularly visited by scuba divers and fishermen. A small solar energy plant provides power for a beacon in the centre of the island.

**Possible changes in land use:** No information.

**Disturbances and threats:** Human disturbance and wilful killing of birds are major problems at the tern colonies. Tanker lanes pass close to the island. Littering is an unwelcome eyesore, and littering and anchor damage are potential problems on the coral reefs. The island and its associated coral reefs do not appear to have been badly affected by oil spills during the Gulf War (1990/91). There were no signs of beached oil in June 1991, and less than 1 % of the terns at the breeding colony showed noticeable oiling (Pilcher & Sexton, 1993).

**Hydrological and biophysical values:** No information.

**Social and cultural values:** No information.

**Noteworthy fauna:** An important breeding site for terns, with much the largest colonies in Kuwait. Breeding birds in 1958 included *Sterna caspia* (277 nests), *S. repressa* (1,000-1,300 nests and young) and *S. anaethetus* (2,000-2,500 birds). In recent years, there have been up to 270 pairs of *Sterna bengalensis*, at least seven pairs of *S. bergii*, 285 pairs of *S. repressa* and 820 pairs of *S. anaethetus*. The breeding population of terns does not appear to have been affected by oil spills during the Gulf War. A census of the colonies in June 1991 found that numbers were similar to those during the previous censuses in 1987 and 1990 (Pilcher & Sexton, 1993). The Crab Plover *Dromas ardeola* may have bred on the island in the past (Ticehurst *et al.*, 1925). The island was formerly a nesting area for Green Turtles *Chelonia mydas* and Hawksbill Turtles *Eretmochelys imbricata*. The most important coral species are *Porites lutea*, *Acropora eurystoma* and *A. valida*.

**Noteworthy flora:** No information.

**Scientific research and facilities:** The Kuwait Institute for Scientific Research has been carrying out research on the reefs and reef environment since 1983, and there have been several ornithological surveys during the breeding season.

**Management authority and jurisdiction:** Ministry of the Interior.

**References:** Evans (1994); Gallagher *et al.* (1984); Husain (1976); IUCN/UNEP (1985); Pilcher & Sexton (1993); Ticehurst *et al.* (1925); UNEP/IUCN (1988).

**Reasons for inclusion:** 1a, 2c & 3c. An important breeding site for terns, holding over 1 % of the regional populations of *Sterna bengalensis* and *S. anaethetus*.

**Source:** See references.

**Wetland Name:** Al-Khiran

**Country:** Kuwait

**Coordinates:** 28°40'N, 48°23'E

**Location:** near the Saudi Arabian border, 85 km south-southeast of Kuwait City.

**Area:** c.2,000 ha.

**Altitude:** Sea level.

**Overview:** A complex of tidal inlets and lagoons with adjacent sabkha, showing a wide range of salinities and substrate types. No information is available on the flora and fauna.

**Physical and ecological features:** The coastal strip of southern Kuwait is characterized by a network of natural creeks and lagoons (locally known as "khor"), from which the area takes its name, Khiran (plural of khor). The creeks and lagoons represent a diverse ecosystem with a wide range of major physical parameters such as salinity, sediment characteristics and tidal movement. The system consists of five creeks. The two southernmost inlets, Khor Eskandar and Khor Al-Nhalm, are comparatively small and are directly open to the sea. Khor Al-A'ama, in the north, is a comparatively wide tidal creek with a maximum width of one km and a narrow channel connecting it with the open sea. Khor Al-Mufateh and Khor Al-Mamlaha comprise a branching system of creeks which are about 0.75 km wide and extend inland for 5.5 km. This system is connected to the sea by a single narrow channel; the tidal flats are relatively wide and cut by a narrow sub-tidal channel with a maximum depth of about 7 m at low tide. Tidal amplitude at the mouths of the creeks is about 1.5 metres. The substrate at the mouth of Khor Al-Mufateh is mainly sandy, but this gradually changes to muddy sand and then mud further inland. Within the khors, conditions are hypersaline because of the high rate of evaporation and low inflow of fresh water. In Khor Al-Mufateh, there is a salinity gradient from about 40 p.p.t. near the sea to as high as 120 p.p.t. at the extreme inland end of the khor.

An extensive area of sabkha surrounds both ends of the Khor Al-Mufateh and Khor Al-Mamlaha system. This sabkha is at the northernmost limit of the anhydrite-bearing sabkha evaporite belt in the Gulf (at latitude 29°N); sabkhas north of this latitude are totally devoid of anhydrite.

**Land tenure:** No information.

**Conservation measures taken:** None.

**Conservation measures proposed:** The Khor Al-Mufateh system has been proposed as a nature reserve (Omar *et al.*, 1986).

**Land use:** No information.

**Possible changes in land use:** No information.

**Disturbances and threats:** The Khor Al-Mufateh system was badly affected by oil pollution during the Gulf War (1990/91). A survey in May 1991 revealed that oil had been deposited in a band 2-3 metres wide along about 0.5 km of the bank of the main creek (Pilcher & Sexton, 1993).

**Hydrological and biophysical values:** No information.

**Social and cultural values:** No information.

**Noteworthy fauna:** The khors are reported to hold large numbers of shorebirds during the migration seasons and in winter, but no details are available.

**Noteworthy flora:** No information.

**Scientific research and facilities:** Kuwait University has conducted some research on the sediments and microfauna of the khors.

**Management authority and jurisdiction:** No information.

**References:** Al-Abdul-Razzak & Bhalla (1987); Al-Sarawi *et al.* (1993); Cherif *et al.* (1994); Omar *et al.* (1986); Pilcher & Sexton (1993).

**Reasons for inclusion:** 1a & 3b. An interesting area of tidal inlets and creeks with surrounding sabkha, at the northern limit of anhydrite-bearing sabkha in the Gulf. Probably important for migratory waterfowl, but poorly known.

**Source:** Muna Faraj, Environment Protection Council.

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