



## **Iraq's Southern Marshes Something Special To Be Conserved; A Case Study**

**H. M. Bedair<sup>a</sup> , H. T. Al Saad<sup>b</sup> and N. A. Salman<sup>b</sup>**

<sup>a</sup> *University of Petra, Amman, Jordan*

<sup>b</sup> *University of Basrah, Basrah, Iraq*

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### **Abstract**

Iraqi southern marshes form a large triangular region bounded by three major southern cities: Nasiriyah to the west, Amarah to the northeast, and Basrah to the south. Their vast area covers 20,000 square kilometers of open water, and includes both permanent and seasonal marshes. Three major areas are the Al-Hammar, the Central, and the Al-Hawizeh Marshes form the core of the marsh land of southern Iraq. It is centered on the meeting of the great Tigris and Euphrates Rivers. Such specific wetlands of the southern part of Iraq play a vital role in the maintenance of biodiversity in the Middle East, primarily because of their large size, the richness of their aquatic vegetation and their isolation from other comparable systems.

Aims of this literature review may include addressing certain key issues, such as definition and description of the general conditions of the Iraq's southern marshes, and why should the marshes be protected? Another issue, we introduced the "Healthy Marshes Concept", to be adopted for sustaining life and to control pollution in the marshes following the full scale restoration. Another part of this study is devoted for the discussion of how can marsh conditions be studied and monitored on a continuous way to achieve the "healthy marshes concept" issue. On the other hand, the study provides information and Internet links to the international institutions and political programs willing to participate or to address the global concern about the restoration of the Iraqi southern wetlands following the disastrous devastation of its unique ecosystem during the 1990's period.

Finally, the literature citation, and the extensive lists of species should provide vital references for any research or a study to be conducted on wetlands, both locally or on a global scale. The "Southern Marsh Project" issue is the advice to take home from this study. It represents a call for a systematic, long term research program of monitoring all the aspects and conditions of the Iraqi Southern marshes, and probably the neighboring Countries. The program is a comprehensive, multi-vision project aims for careful restoration of the marshes after its disastrous devastation.

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## 1- Introduction

What are marshes? Why should marshes be protected? And what is the “Healthy Marshes” concept necessary to sustain life, and transform pollution in the wetlands? How can marsh conditions be studied and monitored on a continuous way to achieve the “Healthy Marshes” concept? Presentation of some links where marshes are discussed on the Internet for global cooperation with the International concern on the Iraqi marshes restoration. These are the key intentions or issues to be addressed, and also to be fulfilled throughout this review on the Southern Iraqi marshes (Al-Ahwar), which were also known as the “Venice of Iraq”. Iraqi Marshes (Fig. 1), are fresh water wetlands of a unique ecosystem. The biome mostly includes the plants, which be successful on freshwater, and the many animals, which inhabit this rich environment.

The values of the Marshes are numerous, including rich flora and fauna, livestock grazing fields, fish and other wildlife breeding places. Marshes are also known to be a farmland for rice, and cultivation areas for some other crops. Species lists, classifications, specific characteristics, water chemistry and some physical factors of the area can be sought in number of studies, which some are listed in the reference citation of this review, or has been referred to elsewhere in the text. Marshes are crucial ecosystems, which influence, and also, are influenced by many natural forces and human activities. They are crucial as incubators for fish and invertebrates, and play a vital role as habitat for migratory waterfowl. On the other hand, they are a critical factor in the complex

web of life for; Shatt-Al-Arab Estuary, the Gulf, and the surrounding land ecosystems. It is, therefore, very important that remaining marshes be protected, and that their health enhanced wherever possible, because this is important for the surrounding environment, and for people who share this part of Iraq, in particular.

The dwellers of the southern marshes and their close by communities practiced some important human activities and industries, such as transportation, fishing, rice cultivation, and bird hunting. Major industries such as paper and cardboard industry, milling, and some other local, small scale industries and tourism are all dependent upon healthy marshes in the close by cities and towns. All these activities are either eradicated or diminished during the 1990's decade. Hence, the potential for these activities to be reestablished is great, and the “healthy marshes” concept is the solution.

The “healthy marshes” concept, which is the major recommendation of this study, is vital for the importance of marshes restoration, both for their ability to produce and to sustain life in such wetlands, and for their ability to transform human pollution from the upper land towns and cities to less toxic materials due to detention, dilution, precipitation, and weathering factors usually take place in the marsh habitats.

The purpose of this literature review is to analyze the conditions of Iraqi Southern marshes, and to detect parts that were at risk of such valuable, endangered habitats for the restoration purposes after its distressing. The other aim of this study is the long term monitoring and assessment of marshes health,

and evaluation of the potential for decline of these special ecosystems in the Southern part of Iraq, and the neighboring Countries. Hence, an International cooperation may be sought for more thorough rehabilitation.

As an advice to take home from this valuable conference, we suggest the conduction of long-term monitoring research program, which may be entitled "Iraq's Southern Marshes Monitoring Project". This research project is to be led and operated by the University of Basrah throughout its specialized centers and departments, such as the Marine Science Center, Biology, Fisheries, Geography , ...etc. This project may be combined by the cooperation and support of the Iraqi Foundation program initiated earlier for this purpose, and by some international institutions such as Duke University of North Carolina, Harvard University of the USA, and may be along with some other concerned International academic and political programs, which are specialized in the restoration of wetlands World wide.

For this last purpose, we have listed the names of some governmental organizations and their Internet web links. These links may become helpful during the initiation stage, or during the call for implementation of this research project, the "Iraq's Southern Marshes Monitoring Project". The project is to be conducted for three years period as an initial stage. The data, thereafter, is to be evaluated, and the program may be extended for another phase, or be adopted as a continual process of an applied, parallel surveillance to accompany the restoration process of the marshes. The project should cover all the aspects of the Iraqi Southern marshes and may be the adjacent

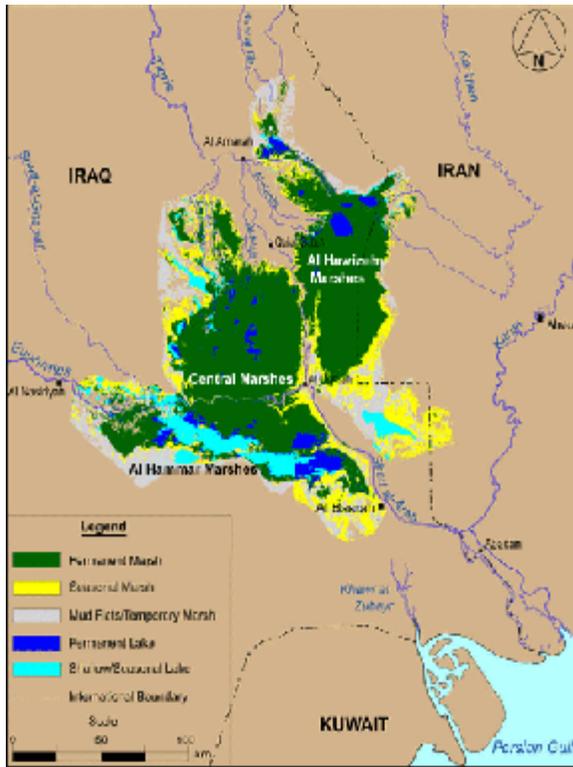
wetlands to cover the biological, chemical, physical, geographical, economical, eco-tourism, and the historical aspects of the marshes as a special ecosystem to be conserved. The data will be imperative for comprehensive analysis of the ruined Iraqi marshes. The assessment of the wetlands conditions will achieve the goal of the "Healthy Marshes Concept" vital for the wise restoration following the deliberate disaster of devastating of the unique ecosystem during the 1990's decade of the past Century.

## **2-Summary of the marshes**

### **Situation**

Marshes in the middle and lower basin of the Tigris and Euphrates Rivers in Iraq (Fig. 1) are the most extensive wetland ecosystems in the Middle East. In their lower courses, these two great rivers have created a vast network of wetlands, which is known as the Mesopotamian Marshes, covering about 15,000 to 20,000 sq km. These wetlands comprise a complex of interconnected shallow freshwater lakes, marshes and seasonally swamped floodplains extending from the region of Basrah to within 150 km of Baghdad. Winter rains in the headwaters of the Tigris and Euphrates in southern Turkey, Syria and northern Iraq cause extensive flooding throughout Mesopotamia and fill up the lake systems in the south. Water levels reach their maximum in early spring and then fall by as much as two meters during the hot dry summer. Much the largest wetlands within this complex are: The Haur Al Hammar and its associated marshes (350,000 ha) south of the Euphrates; the Central Marshes (300,000 ha), a vast complex of permanent lakes and marshes north of the

Euphrates and west of the Tigris; and Haur Al Hawizeh and its associated marshes (220,000 ha) extending east from the Tigris into neighboring Iran.



**Fig. 1 : The Mesopotamian marshlands in 1973-76.**

SOURCE: United Nations Environment Program.

These wetlands eventually drain southeastwards into the Gulf via the Shatt- Al-Arab Estuary. This vast area of marshland is the home of many species of aquatic plants, fish and water birds. It is feared that some species that were unique to the area such as the Buni fish, the smooth-covered otter and the Bandicoot rat may have already disappeared. Floodplain wetlands, rivers banks and lake shores are utilized for the cultivation of cereals, rice or vegetables, while the rivers and lakes

themselves support intensive freshwater fisheries. In the vast reed-beds of Mesopotamia, marsh-dwelling communities are almost totally dependent on reeds for their construction needs. Large numbers of domestic livestock, particularly water buffalo, are allowed to graze on wetland vegetation, and aquatic plants are harvested to provide feed during the winter months. Waterfowl hunting occurs commonly at wetlands throughout Iraq, and in Mesopotamia, large numbers of waterfowl are harvested on a commercial basis, providing a livelihood for hundreds of people (Alnoori, 1976; Vant Leven, 1968).

The most serious threat to wetlands in Iraq has been the drainage of wetlands and diversion of water supplies for agricultural purposes and, apparently also in recent years, for military reasons. Dam-building on the Euphrates in Turkey and Syria and the increasing utilization of the waters of the Tigris and Euphrates for irrigation in upper and middle Iraq have greatly reduced the extent of seasonal flooding in the wetlands of lower Iraq, and facilitated drainage of large areas for cultivation and the exploitation of oil resources. Within the last few years, major hydrological engineering activities in and around the wetlands of Lower Mesopotamia have resulted in the drying out of vast areas of wetland in the Central Marshes and Haur Al Hammar, and could eventually lead to the disappearance of these systems. The Iraqi Government has said that the reason for the recent hydrological engineering works is to increase agricultural production. However, several international analyses have argued that, whatever the agricultural benefits, the primary purpose is to

control rebels taking refuge in the marshes. The Marsh Arabs, who have existed in the marshes for ages, have been particularly affected by these actions. Fig.-2.

The destruction of the wetlands of Lower Mesopotamia continues at an accelerating pace, and their continued survival as one of the finest and most extensive natural wetland ecosystems were in severe suspicion. For the general benefit, the following section is a thorough literature review on the wetlands of the lower Mesopotamia has been extracted with few modification from the "Directory of wetlands in the Middle East, 1995". It has been understood that the wetlands of lower Mesopotamia play a vital role in the maintenance of biodiversity in the Middle East, primarily because of their large size, the richness of their aquatic vegetation and their isolation from other comparable systems. They are home to two endemic species and an endemic subspecies of mammal, two endemic species and two endemic subspecies of bird, and several endemic species and subspecies of fish. They support substantial numbers of at least seven species of mammals and birds currently listed in the IUCN Red List of Threatened Animals, and are of international importance as a staging and wintering area for at least 68 species of waterfowl and nine species of birds of prey. They are also of great cultural significance, having provided a home for the Ma'dan or Marsh Arabs for at least five thousand years.

### **3-The wetlands of Lower Mesopotamia**

**Location:** 29°55'-32°45'N, 45°25'-48°30'E; along the lower courses of the Tigris and Euphrates Rivers, from the region of Kut and Samawa in the west to the region of Basrah in the southeast.

In Al Basrah, Al Muthanna, Thi Qar, Maysan and Wasit Governorates (Fig. 2).

**Area:** Between 1,500,000 and 2,000,000 ha.

**Altitude:** From near sea level to approximately 30 m above sea level.

#### **Physical features:**

In their lower courses, the Tigris and Euphrates rivers create a vast complex of shallow lakes and marshes variously estimated at between 15,000 sq.km and 20,000 sq.km in extent. These wetlands comprise a complex of interconnected, shallow, freshwater lakes, marshes and seasonally inundated floodplains extending from within 150 km of Baghdad in the northwest to the region of Basrah in the southeast. The principal lakes include the Haur Sa'adiyah and Haur Sanniya complex in the north, Haur Al Hammar in the south and Haur Al Hawizeh in the east. Winter rainfall in the headwaters of the Tigris and Euphrates in southern Turkey and northern Iraq cause extensive flooding throughout Mesopotamia and, under normal conditions, fill up the lake systems in the south. After passing through the marshes, the two rivers unite at Qurna to form the Shatt Al Arab which enters the Gulf at Fao some 165 km further downstream. Water levels reach their maximum in early spring and then fall by as much as two metres during the hot dry summer. Until recently, the average depth of water in the main marshes during the flood season was about 1.0-1.5 m and the maximum about 2.0-3.5 m, although a depth of approximately 6 m has been recorded in Haur Al Hawizeh (Salim, 1962). Most of the lakes and marshes are freshwater, but Haur Al Hammar, the lowest in the system and closest to the sea, is slightly brackish. Numerous artificial irrigation canals, some of



submerged aquatic vegetation with species such as hornwort (*Ceratophyllum demersum*; often dominant), eel grass (*Vallisneria spiralis*), pondweed (*Potamogeton lucens* and *P. pectinatus*), water milfoil (*Myriophyllum* sp.), stonewort (*Chara* sp.), naiads (*Najas marina* and *N. armata*) and water fern (*Salvinia* sp.). Water-lilies (*Nymphoides peltata*, *N. indica*, *Nymphaea caerulea* and *Nuphar* sp.), water soldier (*Pistia stratiotes*) and duckweed (*Lemna gibba*) cover the surface of the smaller lakes and quieter backwaters.

The phytoplankton is dominated by diatoms, mainly of the genera *Synedra*, *Tabellaria*, *Melosira*, *Cyclotella* and *Fragillaria*; at least 77 diatom taxa (Hinton & Maulood, 1980) and 101 non-diatom taxa (Hinton & Maulood, 1982) are known from the brackish waters of southern Iraq. Pankow *et al.* (1979) found a total of 129 algae in the marshes near Qurna (72 Bacillariophyta, 28 Chlorophyta, 26 Cyanophyta, two Euglenophyta and one Chrysophyta); large numbers of Desmidiaceae were also present. Al-Saboonchi *et al.* (1982) found a total of 63 genera of phytoplankton in five major groups (Euglenophyta, Chlorophyta, Cyanophyta, Pyrrophyta, Chrysophyta) in the Qurna marshes. Nurul-Islam (1982) documented 59 algae from Haur Al Hammar (38 Chlorophyta, 19 Cyanophyta and two Rhodophyta).

Twelve of the wetlands of lower Mesopotamia were listed as wetlands of international importance by Carp (1980), and all 19 of the wetlands described as Sites 13 to 31 have been identified as "Important Bird Areas" by BirdLife International (Evans, 1994). BirdLife International has also identified the Mesopotamian marshes of Iraq as an "Endemic

Bird Area", *i.e.* an important concentration of bird biodiversity where habitat destruction would cause disproportionately large numbers of species extinctions (ICBP, 1992). The marshes qualify as one of only 221 Endemic Bird Areas in the world, and one of only 11 which are wholly or largely non-marine wetlands, because they support almost the entire world population of two species, the Basrah Reed Warbler (*Acrocephalus griseldis*) and Iraq Babbler (*Turdoides altirostris*).

#### **Conservation measures proposed:**

An IWRB/Basrah University Expedition in 1979 made a number of proposals concerning conservation of the wetlands of Mesopotamia (Carp & Scott, 1979). Specifically, it was recommended that some form of conservation area be created at Haur Al Hammar. No further action was taken, and since that time, vast areas of the wetlands have been degraded or destroyed as a result of massive flood control and drainage schemes (see below). More recently, a report entitled "Environmental and Ecological Study of the Marshlands of Mesopotamia" (Maltby, 1994) makes a number of recommendations for the conservation of remaining wetland habitats and restoration of degraded areas.

#### **Land use:**

Within the marshes, the principal activities are buffalo rearing, fishing, hunting, rice cultivation and mat-weaving. The water buffalo provide milk, butter, yoghurt, meat and dung; for most of the year, they graze in the reed-beds, but in winter they remain tethered on platforms and are fed with cut reed shoots. Fishing occurs throughout the wetlands, and accounts for over 60% of the inland fish catch in Iraq. Until recently, spear-fishing was the most widespread

technique, but this has largely been replaced by netting with various types of nets. Waterfowl hunting is also very important in the local economy, with enormous numbers of waterfowl being harvested on a commercial basis each year, and providing a livelihood for hundreds of people (Alnoori, 1976; Salim, 1962; Al-Robaae, in press). Reeds are used in the construction of floating islands for villages and, when woven, provide pliable coverings used in housing, fencing and packaging. Reeds are also harvested commercially to provide pulp for a paper factory near Basrah. The elaborate network of rivers and canals is used extensively for boat transportation, and until recently provided the only means of travel between the many settlements in the marshes. Rice is cultivated in shallow wetlands, and some vegetables, especially tomatoes, are grown on artificial islands within the marshes. Reclaimed areas of marsh and the adjacent irrigated plains are widely cultivated for millet, rice, wheat, barley, sugar cane and dates.

#### **River control**

Satellite photographs taken in 2001 showed that the marshlands, once 20,000 square kilometers, had been reduced by some 90 percent. When all of the existing and proposed physical developments are fully operational, the flow will be reduced by 70% in the Tigris and 60% in the Euphrates (Maltby, 1994). Very little water will be left to flow into the marshes, and the vital annual recharge with floodwaters will cease. In the case of the Tigris, the main changes are due to works in Iraq; in the case of the Euphrates, to works in Turkey.

#### **Drainage**

As Iraq shares a portion of the marshes with Iran, draining of the marshes would make the

area easier to control for the Iraqi Army. In actuality, Wetland drainage has been taking place on a large scale since the 1950s and, by the end of the 1980s, had already resulted in the conversion of vast areas of former wetland habitat into agricultural land. Reduced flooding from the Tigris and Euphrates Rivers had led to the drying out of marsh fringes and greatly facilitated the drainage of peripheral areas. Many areas had also been actively isolated from the main marshes with dykes and then drained to create agricultural land. In January 1979, Carp and Scott (1979) found much evidence of recent drainage works at some of the smaller haurs, and found that large parts of Haur Aluweez at the southeast corner of Haur Al Hammar had been dyked and drained to facilitate the exploitation of oil resources. Spencer (1982) likewise noted that the marshes were shrinking, and visited villages in the southeast portion of the Central Marshes which ten years previously had been surrounded by water but were now surrounded by dry arable land. By 1984, it was estimated that approximately 93,000 ha of marshes had been drained in the southeastern part of the Central Marshes and eastern part of the Haur Al Hammar marshes (Maltby, 1994).

#### **War damage**

In the last 15 years, the wetlands of lower Mesopotamia and neighboring Iran have come under considerable pressure from regional conflicts. Much of the fighting during the prolonged Iran-Iraq War (1980-88) took place in and around the wetlands, and caused considerable damage to the marsh ecosystems. Haur Al Hawizeh probably suffered the most damage of all Iraqi wetlands. Several of the greatest battles of the war took place in these

marshes, and involved extensive burning, heavy bombing and shelling, and widespread use of chemical weapons. Large areas of reed-beds were deliberately destroyed by Iraqi troops in Haur Al Hawizeh and the Central Marshes during searches for deserters; heavily armoured boats were used to crash through reed-beds, special reed-cutting machines were used, and large areas were simply set on fire.

#### **Increasing salinity**

During the 1980s, increasing salinity emerged as another serious threat to the wetlands, particularly in the southeast portion of Haur Al Hammar. In 1980, the salinity in the Shatt Al Arab at Qarmat Ali was around 0.5 p.p.t. This has now changed drastically, with values of more than 2 p.p.t being recorded in recent years, and the water is clearly becoming more saline. One of the contributing factors is likely to have been the linkage of the southern part of Haur Al Hammar (at Qarmat Ali) to a new canal, the "Al Basrah Canal", which runs parallel to the Shatt Al Arab into the Gulf. This canal was constructed during the Iran/Iraq War to provide a safe shipping lane between Basrah and the Gulf. Another reason for the increase in salinity is the continuous flushing of salts from irrigated land via drainage canals into the wetlands. Much of the waste water is discharged into the mouth of the Al Basrah Canal and thus enters Haur Al Hammar.

#### **Pollution**

Levels of pollution in the marshes have increased substantially in recent years. Many reports indicate that the persistent insecticide Chloridrin is or was being obtained in Iran and sold to local residents of Haur Al Hawizeh as a quick method of poisoning and catching large

quantities of fish for sale. The introduction of motor boats to the deeper areas of the marshes has led to noticeable and frequent oil pollution along the heavily used waterways between the main villages.

#### **Hunting pressure**

There has been a long history of heavy hunting pressure in the marshes. Wild Boar (*Sus scrofa*) are relentlessly persecuted by the Marsh Arabs because of the damage which they cause to crops, and for religious reasons. Maxwell refers to one village which claimed to have killed 140 Wild Boar in one year, while Thesiger (1954) shot as many as 47 in a single day and 488 in two years (Young, 1989). Although the Wild Boar is still the most abundant large mammal in the marshes, numbers have declined noticeably since the 1950s, presumably because of this high level of hunting. Thesiger (1964) noted that otters (*Lutra* spp.) were widely hunted for their skins, and mentioned one person who shot 40 otters in the space of two months. No otters were recorded during four waterfowl surveys between 1968 and 1979, and it seems likely that by that time the populations of both species were becoming much depleted by the hunters.

Waterfowl hunting occurs commonly at wetlands throughout Mesopotamia. Maxwell (1957) and Thesiger (1964) gave some indication of the massive scale of the hunting in the 1950s. Maxwell estimated that shot-guns alone were accounting for about a million birds a year in Iraq. Both he and Thesiger shot many waterfowl and noted that a wide variety of species were killed by the Marsh Arabs for food including not only huge numbers of ducks and Coots (*Fulica atra*), but also Little Grebes (*Tachybaptus ruficollis*), Pygmy Cormorants (*Phalacrocorax*

*pygmaeus*), African Darters (*Anhinga rufa*), Goliath Herons (*Ardea goliath*), Sacred Ibises (*Threskiornis aethiopicus*), Common Cranes (*Grus grus*), Purple Swampheens (*Porphyrio porphyrio*) and godwits (*Limosa* sp.). Pelicans, although regarded as inedible, were shot or speared for their gular pouches which were used in drum-making. Thesiger (1954) noted that the Ma'dan often searched for the nests of Greylag Geese (*Anser anser*) and took their eggs to hatch them out under chickens. Clap-netting was also very widespread in the marshes, and was clearly accounting for large numbers of birds. Thesiger (1964) considered that a heavy toll of waterfowl was being taken by the professional hunters, while Maxwell (1957) noted that as many as 30 geese or 120 ducks and shorebirds could be trapped in the clap-nets at a single pull. Several of the resident breeding species such as *Anhinga rufa*, *Ardea goliath* and *Threskiornis aethiopicus* were already becoming very scarce by the late 1970s, probably because of direct persecution and increased disturbance.

In the 1970s, the Government introduced new laws banning all hunting in Iraq in order to conserve wildlife, particularly terrestrial game which had been heavily persecuted in the past. However, it was clear that these laws were widely disregarded in the marshes, at least in the case of duck-netting which was observed at many localities in January 1979 (Carp & Scott, 1979). Considerable numbers of wildfowl are still taken every year, mainly by netting, e.g. it has been estimated that a minimum of 40,000 ducks and *Fulica atra* were offered for sale in the markets of Karbala and Najaf in 1990 and 1991. Hunting pressure has increased markedly since 1991 because of the UN trade embargo and

the unusually high prices of meat that have resulted. There are reasons to believe that netting has now become an organized business, approved by the Government. Al-Robaee (in press) investigated waterfowl hunting in Central and Lower Iraq in the 1992/93 and 1993/94 seasons, and found a total of 13 species of Anatidae on sale at 11 main markets. He estimated that about 30,000 ducks and geese were being sold each season in the Basrah market alone. The commonest species on sale were *Anas platyrhynchos* (27%), *Aythya ferina* (24%), *Anas crecca* (10%), *A. strepera* (9%), *Aythya fuligula* (8%), *Anas acuta* (5%) and *A. clypeata* (5%).

#### Recent developments

In the summer of 1991, the Iraqi Government embarked upon a massive program of hydrological control and wetland drainage in Lower Mesopotamia, in an area that is roughly delineated by the triangle of Amara, Nasiriya and Basrah. As a result of these engineering works, a large part of the Central Marshes has been drained, and it is now uncertain if any water from the Tigris is allowed to enter the marshes. A Landsat satellite image showed that more than one third of the Central Marshes had dried out by August 1992, while later reports indicated that about two-thirds of the marshes were dry by mid-1993. There is, as yet, no indication that any attempt is being made to drain the whole of the Haur Al Hawizeh marshes, presumably because this haur is partly fed by rivers rising in Iran. However, a Landsat image taken in August 1992 reveals that large areas of the northwestern, western and southern shores of the haur have been drained, using river control and dyke-building, apparently for security reasons.

A comparison of Landsat images taken in 1984/85 and 1991/92 revealed that the area of permanent lakes and marshes, seasonal marshes and temporary marshes in Lower Mesopotamia had been reduced by over 25% from 1.94 million hectares to 1.44 million hectares during this seven-year period (Maltby, 1994). Many commentators now argue that the bulk of the evidence suggests that the immediate aim of many of these engineering works has been to drain the marshes for military and political purposes, rather than for agricultural purposes. In any event, there can be no doubt that the greater part of the Central Marshes and much of the Haur Al Hammar marshes have now been drained, with disastrous ecological, social and human consequences for the region.

Scott and Evans (1993) concluded that drainage of the wetlands of Lower Mesopotamia on this scale would almost certainly result in the global extinction of *Lutra perspicillata maxwelli* and *Erythronesokia bunnii*, the extinction in the Middle East of *Anhinga rufa* and *Threskiornis aethiopicus*, and the extinction in Iraq of *Phalacrocorax pygmaeus* and *Ardea goliath*. Loss of these wetland habitats would also cause catastrophic declines in the world populations of *Turdoides altirostris* and *Acrocephalus griseldis* and in the regional population of *Pelecanus crispus*, possibly threatening them with extinction, and would cause perhaps as much as a 50% reduction in the world populations of *Gerbillus mesopotamiae*, *Tachybaptus ruficollis iraquensis* and *Marmaronetta angustirostris*. Drainage of these wetlands would also have an adverse effect on the populations of about 40 species of birds which occur in the marshes in internationally significant numbers, and would

cause major declines in the regional populations of *Pelecanus onocrotalus* (30-60%), *Ardea purpurea* (>10%), *Ixobrychus minutus* (>10%), *Plegadis falcinellus* (>10%), *Aythya fuligula* (>20%), *Circus aeruginosus* (>10%), *Porphyrio porphyrio* (>50%) and *Fulica atra* (10-20%). Migratory populations of waterfowl would be affected over a very wide area from the West Siberian tundra to southern Africa, as one of the major staging and wintering areas in the West Siberian/Caspian/Nile flyway is lost. Clearly, as far as wildlife is concerned, the ongoing drainage of the wetlands of Lower Mesopotamia constitutes an ecological catastrophe of unprecedented proportions in Western Eurasia.

#### **Hydrological and biophysical values:**

The wetlands of Lower Mesopotamia support a major fishery. Several marine fish species of great economic importance are dependent on the estuarine systems and marshes for spawning, e.g. the pomphret *Pampus argenteus* and the saboor *Hilsa hilsa*, while the penaeid shrimp *Metapenaeus affinis* undertakes seasonal migrations between the Gulf and nursery grounds in the marshes. This shrimp is of significant economic importance to artisanal fishermen along the coasts of the northern Gulf, particularly Kuwait (Maltby, 1994). The estimated annual catch of fish in the Mesopotamian marshes in the early 1960s was 30,000 tonnes, of which 70% were species of Cyprinidae. In 1990, FAO estimated that the total inland catch of fish in Iraq was 23,600 tonnes, with over 60% of this coming from the Mesopotamian marshes. The commonest fish in the catches, in order of importance, are "bunni" *Barbus sharpeyi*, "khatan" *B. xanthopterus*, "himri" *B. luteus*, "shaboot" *B. grypus* and the

introduced common carp *Cyprinus carpio*. Commercial landings of the shrimp *Metapenaeus affinis* at the two main fish markets at Basrah during September-November 1985 averaged 1,000 kg/day (Salman et al., 1990).

#### **Social and cultural values:**

Lower Mesopotamia is the legendary site of the Garden of Eden, and possesses a number of ruined cities of great antiquity such as Ur and Babylon. Civilization was well established in this region by the 4th millennium BC, and a sophisticated irrigation system developed at that time. The Mesopotamian marshes have provided a home for the Ma'dan or Marsh Arabs for at least five thousand years. Their reed houses are built on artificial islands made from layers of mats, reeds and mud, and, until recently, virtually all of their needs were obtained from the surrounding lakes and marshes. The Ma'dan are primarily buffalo herders, fishermen and mat-weavers, although they cultivate a little rice. Water buffalo remain the basis of family wealth, but in recent years fishing has played an increasing role in the local economy. Traditionally spear-fishermen, catching species of barbel and carp only for their own needs, the Ma'dan have taken to using nets to catch fish for export to Basrah and Baghdad. Mat-weaving has also become an important source of income, as demand elsewhere has grown for these pliable coverings used in housing, fencing and packaging. In a region where travel is possible only by boat, the vast stretches of water and reeds have served to isolate the Ma'dan from the outside world; for this region, their culture has remained almost unchanged to the present time. The lifestyle of the Ma'dan has been described in some detail by Thesiger (1954 & 1964),

Maxwell (1957), Salim (1962), Young and Wheeler (1976), Spencer (1982) and Young (1989).

#### **Noteworthy fauna:**

The wetlands of Mesopotamia are sufficiently large and have been isolated from other comparable wetland areas for a sufficient length of time to allow for the evolution of several forms of animals which are unique to these wetlands. These include two species of mammals (*Erythronesokia bunnii* and *Gerbillus mesopotamiae*), one subspecies of mammal (*Lutra perspicillata maxwelli*), two species of birds (*Turdoides altirostris* and *Acrocephalus griseldis*), two subspecies of birds (*Tachybaptus ruficollis iraquensis* and *Anhinga rufa chantrei*), and several species and subspecies of fish, notably *Barbus sharpeyi*, *Leuciscus cephalus orientalis*, *Caecocypris basimi* and *Typhlogarra widdowsoni*.

Rather few species of mammals occur commonly in the wetlands. Thesiger (1964) and Maxwell (1957) make numerous references to the abundance of Wild Boar (*Sus scrofa*) throughout the marshlands, and found them to be particularly common at Haur Al Hawizeh. However, the boar have been heavily hunted by the Marsh Arabs, and although the species is still the most abundant large mammal in the marshes, numbers have declined noticeably in recent years. Two species of otters have been recorded in the marshes, the Common Otter *Lutra lutra* and the Smooth-coated Otter *Lutra perspicillata*. Both Maxwell (1957) and Thesiger (1964) saw otters on a number of occasions, and describe them as common around Haur Az Zikri in the Central Marshes and at Haur Al Hawizeh. However, otters (presumably of both species)

were heavily persecuted for their skins in the 1950s (Thesiger, 1964), and are now extremely rare in the marshes, if they survive at all. The form of *L. perspicillata* occurring in the Mesopotamian marshes has been described as a distinct subspecies *maxwelli*. It was discovered at Haur Al Hawizeh in 1956 by Maxwell (1957), who obtained an otter skin and a live otter cub. There have been only two further records of *L. perspicillata* in Iraq, both in the late 1950s from the region of Al Azair in the Central Marshes, and it is possible that the endemic subspecies *maxwelli* is now extinct. Lions (*Panthera leo*) survived in riverine thickets of the marshlands into the present century, but were finally exterminated when the Marsh Arabs acquired modern rifles during the First World War. The Leopard (*Panthera pardus*) is likewise extinct in lower Mesopotamia; there is only one record from the marshlands - an individual shot in 1945 just above Kut by the River Tigris.

Large mammals which are still regularly encountered in the marshes include the Asiatic Jackal (*Canis aureus*), Red Fox (*Vulpes vulpes*) and Small Indian Mongoose (*Herpestes auropunctatus*). Various other mammals, notably Grey Wolf (*Canis lupus*), Honey Badger (*Mellivora capensis*), Striped Hyaena (*Hyaena hyaena*), Jungle Cat (*Felis chaus*), Goitred Gazelle (*Gazella subgutturosa*) and Indian Crested Porcupine (*Hystrix indica*), have been recorded in and around the marshes in the past, but all had become rare by the 1980s, and it is thought likely that most are now extinct in the area.

Small mammals recorded in and around the marshes include a recently described species of bandicoot rat *Erythronesokia bunnii*, an

endemic species of gerbil *Gerbillus mesopotamicus*, a hedgehog, three species of shrews, eight to 11 species of insectivorous bats, a jerboa, four other species of rats and mice, and three other species of gerbils and jirds. The commonest rodent in the area is the Short-tailed Bandicoot *Nesokia indica*, a species which is particularly associated with the banks of wetlands. The bandicoot rat *E. bunnii* was discovered as recently as the late 1970s in the Central Marshes at Qurna (Khajuria, 1980). Little is known about the species, but it would appear to be confined entirely to the marshlands of southern Iraq. Harrison's Gerbil *G. mesopotamiae* is known only from the vicinity of wetlands in lower Mesopotamia and adjacent Khuzestan in southwestern Iran. Formerly thought to be a subspecies of *G. dasyurus*, this highly colonial gerbil exhibits a marked degree of water-dependence for a gerbil, and is not able to survive without it. The gerbil appears to be not uncommon in the uncultivated, sparsely-vegetated fringe of the marshes and along the banks of the Euphrates. Notable among the bats is the rare and declining Long-fingered Bat (*Myotis capaccinii*), recorded at Kish on the edge of the wetlands. This species is considered to be globally threatened (Groombridge, 1993).

Domestic water buffalo are abundant throughout the marshes and are of considerable importance in the local economy. According to Maxwell (1957), there is evidence to suggest that these animals were first introduced into Mesopotamia in about 3500 BC. Hatt (1959), however, presents archaeological evidence which suggests that the species was formerly wild in the marshes, before domestication.

Of the 278 species of birds which have been recorded in lower Mesopotamia, 134 are species which are to some extent dependent on the wetland habitats and occur in Mesopotamia in significant numbers. Two of these species, the Iraq Babbler *Turdoides altirostris* and Basrah Reed Warbler *Acrocephalus griseldis*, are known to breed only in this area. *Turdoides altirostris* is confined to the lower Tigris and Euphrates valleys of central and southern Iraq and extreme southwestern Iran (Khuzestan Province). Its distribution is centred on the reed-beds of the Mesopotamian marshes, although it is also one of the commonest birds of rural habitats along rivers and irrigation canals throughout the lowlands of central Iraq (Al-Dabbagh & Bunni, 1981). *Acrocephalus griseldis* is a common breeding summer visitor to the reed-beds of Mesopotamia between Baghdad and the Shatt Al-Arab in the region of Basrah. As far as is known, the breeding range is confined to southern Iraq, along the lower Euphrates and Tigris rivers from the Baghdad area to Fao.

The populations of two species of waterfowl, almost confined to the wetlands of Lower Mesopotamia, have been described as distinct subspecies: the Little Grebe *Tachybaptus ruficollis iraquensis* and African Darter *Anhinga rufa chantrei*. *T. ruficollis iraquensis* is known to occur only in the wetlands of Mesopotamia and in neighbouring southwestern Iran. It is a common and widespread breeding bird in the wetlands of southern Iraq, found even on small temporary pools beside main highways. *A. rufa chantrei*, however, is now confined to the marshes of Lower Mesopotamia and is probably close to extinction, if not already extinct. The species formerly bred at Amik Golu (Lake

Antioch) in Turkey, but became extinct there following drainage in the 1950s. Ticehurst *et al.* (1921-22) described the bird as common and resident in the huge marshes round Qurna and east of Amara and Ezra's Tomb (Al Azair). La Personne found large numbers nesting in the Rotha Marshes (25 km from Qurna) and also a few nesting in the Medina Marshes at Bani Mansur (30 km north of Medina) in July 1921 (Ticehurst *et al.*, 1926). Maxwell (1957) and Thesiger (1964) also found it commonly in the Central Marshes and around Haur Al Hawizeh. Moore and Boswell (1956-57), however, encountered the bird only once (a single bird near Amara in November 1945), and concluded that the species was scarce and local. Large colonies were reported in 1973 near Qurna (P.V.G. Kainady, *in litt.*), but none was reported in any of the four IWRB waterfowl surveys between 1968 and 1979, and there do not appear to have been any records in Iraq since the early 1980s.

Eleven species of birds listed in the 1994 IUCN Red List of Threatened Animals (Groombridge, 1993) have occurred in the marshes of lower Mesopotamia. The Dalmatian Pelican *Pelecanus crispus* is a common winter visitor, and probably also a resident breeding species. Pelicans are known to have bred in the marshes, but it is not known which of the two species is involved, although *Pelecanus crispus* is the more likely. Thesiger (1954) observed unfledged young at Umm Al Binni in the Central Marshes, but did not attempt to identify the species. The four mid-winter waterfowl surveys between 1968 and 1979 revealed that the wetlands of Mesopotamia are an extremely important wintering area for *Pelecanus crispus*.

Some 247 were recorded in January 1979, and it was concluded that the total number in Mesopotamia at that time could be as high as 1,000.

The Pygmy Cormorant *Phalacrocorax pygmaeus* was formerly a common resident, breeding in some of the marshes and moving out locally to the rivers and other marshes in winter (Ticehurst *et al.*, 1921-22). In July 1922, La Personne found the species breeding in large numbers in dense, high reed-beds at Bani Mansur in the Medina Marshes, 32 km north of Medina, and in vast numbers near Anzha in the Rotha Marshes, 25 km from Qurna (Cheesman 1922; Ticehurst *et al.*, 1926). No-one has found a colony since, and the breeding status of this bird remains obscure. The waterfowl surveys between 1968 and 1979 confirmed that the species remained fairly common in winter, with up to 100 being recorded at one locality, and it seemed likely that the total number in the marshes at that time exceeded 500.

The Lesser White-fronted Goose *Anser erythropus* was formerly a regular winter visitor, although always less common than *A. albifrons*. According to Savage (1968), the species was still found in quite large numbers in the Haur Al Shuwaija area in the 1960s. However, the species was recorded only once during the IWRB surveys: a flock of 70 at Haur Al Shuwaija in December 1972. Savage (1968) reported that several hundred Red-breasted Geese *Branta ruficollis* regularly wintered in the Haur Al Shuwaija area, but none was recorded in Mesopotamia during the four IWRB surveys between 1968 and 1979, or since then.

The Marbled Teal *Marmaronetta angustirostris* is known to breed widely in

Mesopotamia (Green, 1993). Ticehurst *et al.* (1921-22) reported it to be a fairly common breeder in southern Iraq; Moore and Boswell (1956-57) found it breeding along dykes and irrigation canals in the Kut area, in the Hai area and at Haur Al Shuwaija; and Thesiger (1964) found it in the Central Marshes during the summer months. The species remained a common summer visitor to wetlands throughout Mesopotamia during the 1970s and 1980s. However, there have been very few reports of *M. angustirostris* in Mesopotamia in winter, and none was reported during the four winter surveys between 1968 and 1979. Thus it appears that the species is almost entirely a breeding summer visitor to Mesopotamia, as concluded by Georg and Savage (1970b). The total breeding population in Iraq is thought to be at least 4,000-6,000 pairs, which represents some 40-60% of the world population of this threatened species. The White-headed Duck *Oxyura leucocephala* appears to be only a very scarce winter visitor. One was shot near Kut in 1920, and one was seen near the west end of Haur Al Hammar in December 1972 (Anstey, 1989).

The Pallas's Fish-Eagle *Haliaeetus leucoryphus* was formerly a scarce winter visitor to the wetlands of Mesopotamia, but there do not appear to have been any records since 1944 (Moore & Boswell, 1956-57). The status of the White-tailed Eagle *Haliaeetus albicilla* is uncertain. Most authors list it as a winter visitor in small numbers. Moore and Boswell (1956-57) found it to be a regular winter visitor to Haur Al Shuwaija and also observed it near Qurna and along the Shatt Al Arab. Five were recorded during the mid-winter waterfowl survey in 1968 and five during the survey in 1972, but none in

the later surveys of 1975 and 1979. However, Maxwell (1957) stated that the species nested in the reed-beds. Thesiger (1964) also referred to eagles nesting in the reed-beds, but did not indicate which species was involved. The Imperial Eagle *Aquila heliaca* is a fairly common winter visitor to the Mesopotamian plains. Counts of 11, 24, 7 and 34 were obtained during the mid-winter waterfowl censuses of 1968, 1972, 1975 and 1979 respectively, and it seemed likely that the total wintering population of this species in Mesopotamia at that time exceeded 100 individuals.

The Sociable Plover *Vanellus gregarius* was formerly believed to be a locally common passage migrant and winter visitor in Mesopotamia, and was known from a number of localities (Ticehurst et al., 1921-22). Kasperek (1992) has recently reviewed the old records and has shown that the evidence for over-wintering in Iraq was inconclusive. He concluded that the species was only a passage migrant in Iraq, as it is elsewhere in the Middle East. *V. gregarius* had evidently already become rare in Mesopotamia by the 1940s, as Moore and Boswell (1956-57) encountered it only once (a single bird near Kut in November 1945). Johnson (1958) observed a flock of 15 in a marshy field near Ctesiphon by the Tigris in November 1957, but there do not appear to have been any records since then. The Slender-billed Curlew *Numenius tenuirostris* was first recorded wintering in Iraq in the early part of this century. According to Ticehurst et al. (1921-22), "Buxton saw many on 16 December 1917 in a temporary winter lake in a hollow in the bare desert ten miles north of Amara and secured a specimen". However, 62 years elapsed before the next record, also of a small flock (six

birds) on the southern shore of Haur Al Hammar on 27 January 1979 (Scott & Carp, 1982). This was followed very rapidly by a record of a single bird in the Haur Al Hammar marshes near Nasiriya in the autumn of 1979 (T. Grochowski, in Gretton, 1991). In view of the vast extent of the habitat suitable for *N. tenuirostris* in Mesopotamia and the very poor coverage of these wetlands by ornithologists, there is a distinct possibility that a significant wintering population of this endangered species continues to survive there.

The lakes and marshes of lower Mesopotamia are one of the most important wintering areas for migratory waterfowl in western Eurasia. Georg and Savage (1970a) believed that the marshes of Haur Al Hammar and Haur Al Hawizeh together "probably provide habitat for two-thirds of the wintering wildfowl of the Middle East". Waterfowl recorded during four IWRB mid-winter waterfowl surveys in the marshes of lower Mesopotamia are summarized in Table 2. The first survey, in January 1968, visited Aziziya, Kut, Haur Al Shuwaija, Haur Umm Roi, Shaikh Saad, Ali Gharbi, Haur Auriya, Al Kumait, Haur Haushiya, Amara, Haur Sanaf, Maymuna, Chahala, Azair, Qurna and Basrah, and recorded over 59,000 waterfowl of 55 species (Georg & Viellard, 1968, 1970). The second survey, in December 1972, visited Kut, Jassan, Amara, Maymuna, Qurna, Basrah, Chubaisah, Nasiriya, Shatra and Dawaya, and observed a total of 152,000 waterfowl of 58 species (Koning & Dijkzen, 1973). The third survey, in January/February 1975, visited Kut, Amara, Suweid Marshes, Basrah, the Shatt Al Arab, Haur Aluweez, Shafi wetland and Haur Mrebsher,

and recorded almost 91,000 waterfowl of 45 species (Carp, 1975a, 1975b). The most recent mission, in January 1979, was much the most extensive, visiting 46 sites in the Mesopotamian marshlands including various sections of Haur Al Hammar, Haur As Sa'adiyah, Haur Uwainah, Haur Al Shuwaija and a number of small wetlands around Basrah. Over 324,000 waterfowl of 79 species were recorded, including 3,300 pelicans, 1,850 flamingos, 2,340 geese, 155,000 ducks, 128,000 coots, 16,600 shorebirds and 13,400 gulls and terns (Carp & Scott, 1979; Scott & Carp, 1982). These counts must represent only a small proportion of the total number of birds present, as the sheer vastness of the wetlands, problems of access and shortage of time prevented the survey teams from visiting more than a tiny fraction of the wetlands. Thus, Carp and Scott (1979) noted that they had been able to visit no more than 10% of the marshes, and stressed that the true number of birds present must have exceeded their counts by many fold. They concluded that the actual number of waterfowl in Mesopotamia in January 1979 probably amounted to several million.

No accurate estimate will ever be available for the number of waterfowl which once wintered in the Mesopotamian marshlands. It seems likely, however, that the waterfowl populations must have numbered in the many millions. The earliest accounts refer to "teeming flocks" and "countless numbers", but already by the 1950s, Thesiger (1964) was expressing concern at the way the numbers of birds were decreasing. He noticed a significant decline in numbers between 1951 and 1958, and stated that "throughout the marshes, ducks and geese were becoming scarcer year by year". Although large

numbers of wintering waterfowl were still present in the late 1970s, the density of birds was not particularly impressive, and it was clear that the numbers of birds were well below the levels implied by Maxwell (1957) and Thesiger (1964).

In addition to providing regular wintering habitat for waterfowl, the wetlands of Mesopotamia serve as a vitally important refuge for waterfowl during periods of exceptionally severe weather further north. In hard winters, when many wetlands in eastern Turkey and the Caspian Region freeze over, large numbers of birds may be forced to move further south and seek refuge in the wetlands of Iraq and southern Iran. Evidence of such hard weather movements was apparent in January 1979. Totals of 40,900 *Aythya fuligula* and 1,004 *Mergellus albellus* in Mesopotamia in January 1979 were far in excess of the previous maxima of 6,800 and 68, respectively, suggesting an exceptional influx from the north. Similarly the presence of three rare visitors to Iraq, *Cygnus olor*, *C. columbianus* and *Aythya marila*, in January 1979 suggested that an unusual invasion of birds which normally spend the winter much further to the north had occurred (Scott & Carp, 1982).

The wetlands of Mesopotamia are also of great importance for wintering birds of prey. Over a thousand raptors of 15 species were observed during the waterfowl survey in 1979. The counts included 12 *Pandion haliaetus*, 429 *Milvus migrans*, 5 *Haliaeetus albicilla*, 3 *Aegypius monachus*, 286 *Circus aeruginosus*, 18 *C. macrourus*, 141 *Buteo rufinus*, 24 *Aquila clanga*, 12 *A. nipalensis*, 34 *A. heliaca*, 126 *Falco tinnunculus*, 7 *F. columbarius* and 6 *F. peregrinus*. Other species of birds which utilize the Mesopotamian marshlands as wintering

habitat include a variety of passerines such as *Motacilla alba*, *Anthus spinoletta*, *Lanius isabellinus*, *Luscinia svecica*, *Saxicola torquata*, *Emberiza schoeniclus*, *Passer hispaniolensis*, *Sturnus vulgaris* and *Corvus frugilegus*.

The wetlands are also an extremely important staging area for a number of species of waterfowl on their way between breeding grounds in Western Siberia and Central Asia and winter quarters in eastern and southern Africa. Such passage migrants include a variety of herons and egrets (e.g. *Egretta garzetta*, *Ardeola ralloides* and *Ixobrychus minutus*), *Anas querquedula*, and a number of shorebirds (e.g. *Charadrius hiaticula*, *Numenius phaeopus*, various *Tringa* species, *Calidris ferruginea* and *Philomachus pugnax*). No systematic attempt has ever been made to document the migration of waterfowl through the Mesopotamian marshes, and it is impossible to provide an estimate of the total number of birds which might be involved.

The Mesopotamian marshes are of considerable importance for breeding waterfowl, including a substantial proportion of the world population of the rare Marbled Teal *Marmaronetta angustirostris* and the entire world population of the Middle Eastern subspecies of the African Darter *Anhinga rufa chantrei* (see above). The marshes also support isolated populations of two other primarily Afrotropical species: the Goliath Heron *Ardea goliath* and Sacred Ibis *Threskiornis aethiopicus*. According to Ticehurst et al. (1921-22), *A. goliath* was a not uncommon resident in the extensive swamps of Mesopotamia in the early part of the century. It was reported from the marshes between Basrah and Qurna, from the marshes near Amara and Kut, and round the

Euphrates Barrage, and breeding was proved. Allouse (1953) described it as common in the southern marshes; Thesiger (1964) encountered it in the Central Marshes in the early 1950s, and Maxwell (1957) observed it in the Haur Al Hawizeh marshes. However, Moore and Boswell (1956-57) encountered the species only once - two birds at Haur Al Shuwaija in August 1943 - and none was recorded during the four waterfowl surveys between 1968 and 1979. P.V. Georg Kainady (pers. comm.) observed the bird on several occasions in the marshes near Basrah in the late 1970s, but noted that it was becoming very scarce. The last record appears to be of a bird at Haur Az Zikri in the Central Marshes in 1980.

The isolated Mesopotamian population of *Threskiornis aethiopicus* seems to have followed a similar fate to that of *Ardea goliath*. Cumming (1918) found the species to be plentiful at Fao in winter, and according to Ticehurst et al. (1921-22), "White Ibises certainly occur and not very uncommonly in the district from Amara to Fao". La Personne found a breeding colony of about 20 pairs together with other breeding waterfowl at Rotha marshes near Qurna in 1921 (Cheesman, 1922), and Ticehurst et al. (1926) noted that the species was also breeding at Abid near Qurna at about the same time. Moore and Boswell (1956-57) never encountered it, but Maxwell (1957) observed it on many occasions in the Central Marshes and in the Haur Al Hawizeh marshes in spring 1956, and implied that it was common. However, he noted that the ibis was a favourite quarry species of the local hunters and was very wary. The species appears to have become quite scarce by the late 1960s. Only one was observed during the

1968 waterfowl survey, and none was recorded during the surveys of 1972 and 1975. However, flocks of 36 and 4 were observed in January 1979, at Haur Al Rayan and Qalit Salih respectively. The species appears to have become very scarce in Iraq in recent years, and has not been reported since the early 1980s.

Other species which are known to have bred in the Mesopotamian marshes include *Tachybaptus ruficollis*, *Phalacrocorax pygmaeus*, *Ardea purpurea*, *Ardeola ralloides*, *Nycticorax nycticorax*, *Ixobrychus minutus*, *Ciconia ciconia*, *Platalea leucorodia*, *Anser anser*, *Anas querquedula*, *Porphyrio porphyrio*, *Gallinula chloropus*, *Fulica atra*, *Himantopus himantopus*, *Recurvirostra avosetta*, *Glareola pratincola*, *Charadrius dubius*, *C. alexandrinus*, *Vanellus indicus*, *V. leucurus*, *Larus genei*, *Chlidonias hybridus*, *C. leucopterus*, *Gelochelidon nilotica*, *Sterna caspia*, *S. hirundo* and *S. albifrons*. There are about eight other species, including conspicuous birds such as *Podiceps cristatus*, *Egretta garzetta* and *Plegadis falcinellus*, which might be expected to breed in the marshes, but which have never been proven to do so. On the other hand, old reports of breeding by *Glareola nordmanni* now seem likely to have been erroneous. The present status of the breeding birds of the Mesopotamian marshes is unknown as there has been almost no new information since the 1950s.

In a recent analysis, Scott and Evans (1993) concluded that in the 1970s, and perhaps even more recently, the marshlands of lower Mesopotamia were of international significance for at least 68 species of waterfowl. The apparent importance of the Mesopotamian marshlands for

each of these species, up until the late 1970s, is summarized in Table 3.

Little information is available on the amphibians and reptiles of the Mesopotamian marshes. Maxwell (1957) commented on the extreme abundance of frogs, and concluded that there were several species in the marshes. A toad (*Bufo viridis*), a tree frog (*Hyla arborea*) and two frogs (*Rana ridibunda* and *R. esculenta*) are listed for Iraq by Mahdi and Georg (1969). Common reptiles in the marshes include the Caspian Terrapin (*Clemmys caspia*), a soft-shell turtle (*Trionyx euphraticus*), geckos of the genus *Hemidactylus*, two species of skinks (*Mabuya aurata* and *M. vittata*), and a variety of snakes including the Spotted Sand Boa (*Eryx jaculus*), Tessellated Water Snake (*Natrix tessellata*) and Gray's Desert Racer (*Coluber ventromaculatus*). The Desert Monitor (*Varanus griseus*) was formerly common in desert areas adjacent to the marshes, but this species has been heavily persecuted and is now rare.

The wetlands of Lower Mesopotamia provide important habitat for a wide range of fish species, many of which are of economic importance, and several of which are endemic. The presence of the Tigris-Euphrates confluence has resulted in a mingling of fauna derived from western or Syrian sources (via the Euphrates) and eastern or Zagrosian sources (via the Tigris and its tributaries). This unusually rich fish fauna has recently been summarized by Banister (1994). Cyprinids are the dominant element in the marshes, and include species such as *Acanthobrama marmid*, *Barbus canis*, *B. esocinus*, *B. grypus*, *B. longiceps*, *B. luteus*, *B. subquincunciatus*, *B. xanthopterus*, *Capoeta* spp., *Chondrostoma nasus*, *C. regium*, *Cyprinion*

*macrostomum*, four species of *Garra*, *Leuciscus cephalus* (an endemic subspecies *orientalis*) and *L. lepidus*. Particularly noteworthy are *Barbus sharpeyi*, an endemic species which, unlike others of the genus, spawns only in the marshes in areas of shallow open water less than 75 cm deep, and two blind cave-dwelling species, *Caecocypris basimi* and *Typhlogarra widdowsoni*, known only from a sink hole close to the Sheik Hadid shrine near Haditha. Other indigenous freshwater fishes include *Glyptothorax cous* (Sisoridae), *Mystus pelusius* (Bagridae), *Silurus glanis* (Siluridae) and *Mastacembelus mastacembelus* (Mastacembelidae).

Many marine fish regularly enter the rivers and marshes of Lower Mesopotamia to feed, and form an important part of the commercial fish catches. These include *Nematalosa nasus* (Clupeidae), *Thryssa setirostris*, *T. purava* and *T. hamiltoni* (Engraulidae), *Arius thalassinus* (Ariidae), *Plotosus lineatus* (Plotosidae), *Rhynchorhamphus* sp. (Hemirhamphidae), *Strongylura strongylura* (Belontiidae), *Acanthopagrus berda* and *A. latus* (Sparidae), *Aryiosomus amoyensis* and *Otolithes ruber* (Sciaenidae), *Scatophagus argus*, *Liza* spp. and *Mugil cephalus* (Scatophagidae), *Eleutheronema tetradactylum* (Polynemidae), *Acentrogobius dayi*, *Scartelaos tenuis*, *Periophthalmus waltoni* and *P. weberi* (Gobiidae), and *Cynoglossus arel* and *C. lingua* (Cynoglossidae). The Bull Shark *Carcharinus leucas* (Carcharinidae) commonly enters fresh water, and has been recorded as far upstream as Baghdad.

About 12 species of fish have been deliberately introduced into the wetlands of

Mesopotamia, including five species of Cyprinidae (*Acanthalburnus microlepis*, *Carassius auratus*, *Ctenopharyngodon idella*, *Cyprinus carpio* and *Hypophthalmichthys molitrix*), *Ictalurus nebulosus* (Ictaluridae), *Esox lucius* (Esocidae), *Gambusia affinis/holbrooki* (Poeciliidae), *Micropterus salmoides* (Centrarchidae), *Stizostedion lucioperca* (Percidae) and *Oreochromis niloticus* (Cichlidae). *Heteropneustes fossilis* (Heteropneustidae) seems to have been a natural colonist in recent times; it appeared in the marshes for the first time in 1960 (Khalaf, 1962), and subsequently spread throughout the system. The wetlands of Lower Mesopotamia are an important nursery for the commercially important penaeid shrimp *Metapenaeus affinis* which spawns in the Gulf and grows to maturity in the wetlands (Salman et al., 1990). Immigration to the marshes starts from May/June and emigration finishes around January/February, with spawning occurring at sea immediately after emigration. The discharge of the Shatt Al Arab may be an important factor regulating recruitment.

The benthic fauna of the marshes is dominated by chironomid larvae, dragonfly larvae and worms. *Stylaria* and *Tubifex* (Oligochaeta) occur in moderate quantities, and univalve and bivalve molluscs are also present (Georg & Savage, 1970a). Al-Dabbagh and Daod (1985) found the following gastropod molluscs in the lower parts of Haur Al Hammar and Haur Al Zikri: *Theodoxus jordani*, *Melanopsis nodosa*, *Melanoides tuberculata*, *Viviparus bengalensis*, *Bulinus truncatus* and several species of *Lymnaea*; bivalves included *Corbicula fluminea*, *C. fluminales* and *Unio* sp.

Ali (1976) collected eleven species of water beetles of the family Haliplidae in the Shatt Al Arab and marshes of southern Iraq. These included *Brychinus elevatus*, nine species of *Halipilus* and an hitherto undescribed species of *Peltodytes*. This author (Ali, 1978a & 1978b) also lists 55 species of dytiscid water beetle (Dytiscidae) and 15 species of gyrenid beetle (Gyrinidae), mostly collected from the Shatt Al Arab and lakes and marshes of southern Iraq. A globally threatened species of libellid dragonfly, *Brachythemis fuscopalliata*, is known only from Iraq, Israel and Turkey. It has been collected in the marshes of Mesopotamia, but no recent information is available on its status there (Groombridge, 1993).

The zooplankton in the marshes is dominated by *Cladocera* and *Rotatoria*, with *Cyclops* forming a smaller proportion (Georg & Savage, 1970a). Al-Saboonchi *et al.* (1986) found 21 genera of zooplankton belonging to three orders (Ploima, Cladocera and Copepoda) in the Qurna marshes. Maximum growth of zooplankton was found to occur in late spring.

#### **Scientific research and facilities:**

Various limnological investigations and studies of aquatic invertebrates have been carried out by researchers from the Iraq Natural History Museum in Baghdad and the Museum of Natural History at the University of Basrah since the 1960s. Researchers from the University of Basrah (College of Science, College of Agriculture and Marine Research Centre) have carried out work on various aspects of the ecology of the marshes. There appears to have been little research on the fishes of Mesopotamia, other than basic inventories of species (*e.g.* Khalaf, 1962; Mahdi, 1962;

Banister, 1980). The mammals, however, have received a considerable amount of attention, both for local biologists from Basrah and Baghdad, and from visiting international expeditions. Thesiger (1954 & 1964) and Maxwell (1957) made numerous references to the mammals and birds which they encountered in the marshes, but gave few specific details. Ticehurst *et al.* (1921-22) summarized the extensive ornithological investigations and collections made by a number of British military personnel stationed in Mesopotamia during the First World War. Moore and Boswell (1956-57) made extensive ornithological investigations in southern Iraq between 1941 and 1945, while Chapman and McGeoch (1956) made some field observations in southern Iraq between August 1952 and August 1954. Savage (1968) counted wildfowl at several wetlands in Mesopotamia in 1966 and 1967, and reviewed the status of Anatidae and *Fulica atra* on the basis of the information available at that time. Alnoori (1976) also provided some general information on the waterfowl of Mesopotamia. The International Waterfowl and Wetlands Research Bureau (IWRB) sponsored four mid-winter waterfowl surveys in Iraq in 1967/68, 1972, 1975 and 1979, respectively. These surveys, which were carried out jointly with the Iraq Natural History Museum in Baghdad and the Museum of Natural History in Basrah, visited many of the principal wetlands in lower Mesopotamia, and provided the best information hitherto available on the wintering avifauna of the southern marshlands (Georg & Vielliard, 1968, 1970; Koning & Dijkzen, 1973; Carp, 1975a, 1975b; Carp & Scott 1979; Scott & Carp, 1982). Some waterfowl counts were made at a number of localities around Haur Al

Hammar by P. Ctyroky in 1979 (Ctyroky, 1987), but no data on waterfowl numbers have become available since 1980. In 1975, the Museum of Natural History in Basrah established a small field laboratory near the bridge at Shafi, approximately 30 km from Basrah on the road to Amara, and has subsequently used this as a base for research in the wetlands (*e.g.* Kainady & Al-Joborae, 1976).

The vast permanent and seasonal, fresh to brackish wetlands of Lower Mesopotamia formerly comprised at least 1.5 million hectares of almost contiguous wetland habitat, and were thus the largest area of these wetland types not only in the Middle East but also in the whole of Western Eurasia. The wetlands of lower Mesopotamia play a vital role in the maintenance of biodiversity in the Middle East, primarily because of their large size, the richness of their aquatic vegetation and their isolation from other comparable systems. They are home to two endemic species and an endemic subspecies of mammal, two endemic species and two endemic subspecies of bird, and several endemic species and subspecies of fish. They support substantial numbers of at least seven species of mammals and birds currently listed in the IUCN Red List of Threatened Animals, and are of international importance as a staging and wintering area for at least 68 species of waterfowl and nine species of birds of prey. They are also of great cultural significance, having provided a home for the Ma'dan or Marsh Arabs for at least five thousand years.

#### **4-Conclusion**

As we have stated earlier in this study, the wetlands of the Southern part of Iraq play a

vital role in the maintenance of biodiversity in the Middle East, primarily because of their large size, the richness of their aquatic vegetation and their isolation from other comparable systems. And, since the purpose of this literature review is to analyze the present conditions of the Iraqi Southern marshes, and to detect its parts that are at risk before the full restoration of the wetlands following its distressing. However, we would like to admit that the “Eden Again” project, of the “Iraq Foundation, is indeed a courageous pioneer project, which has been established during 2002, may be considered the real initiative for the academic evaluation of the restoration process. It is appraised for its initiative. The “Eden Again” project is well known for many of the participants, but it may be worth mentioning that it was initiated with the aim of supporting efforts to restore the marshlands three years ago. We found the project strategy for restoration, planning, and implementation is systematic in the academic and proficiency vision. Hence, we the authors, and through ought this study, which we intend to submit to the conference of the University of Basrah (April 2005), we aim to participate in the great process of the ruined marshes restoration, by providing some solid scientific advise, and some real support for the national and international efforts involved in this immense issue. This may be committed through the recommendation of a vital, parallel long-term monitoring research programs to be conducted under a comprehensive project, which may be named as the “Iraq’s Southern Marshes Monitoring Project”. The project is to be conducted for three years period as an initial stage. Thereafter, the data to be evaluated, and

the program may be adopted as a continual process of an applied, parallel surveillance to accompany the restoration process of the marshes. The project should cover all the aspects of the Iraqi Southern marshes and may be the adjacent wetlands of Iran to cover the biological, chemical, physical, geographical, economical, eco-tourism, and the historical aspects of the marshes, as a special ecosystem to be conserved.

The data will be imperative for comprehensive analysis of the ruined marshes, and the assessment of the conditions will achieve the goal of the "Healthy Marshes Concept" vital for the wise restoration, following the deliberate disaster of devastating of such unique ecosystem of the Iraqi wetlands during the 1990's decade of the past Century.

The recommendations presented here are also to be used in the support of the efforts of the Iraqi, people, Iraqi scientists and the appropriate Iraqi authorities when they decide to fully implement the restoration of this important ecosystem on solid, however, cautious bases for the benefit of man and ecology of the Iraqi marshes, on equal bases.

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**Appendix 1: Scenery Photographs.**



The Marshes of Southern Iraq. By Brian Jones. 2003



Over 50,000 native people once called the marshes home. Pictured are their houses constructed from marsh reeds. Image from <http://www.iraqfoundation.org/projects/edenagain/index.html>



From "ArabHunter.com, 200



The Region is Famous For Its Arched Buildings Made From Reeds



UXO's At The Gate To The Marshes (© IRIN).



Some 50 Percent Of Marshland Has Been Restored (© IRIN).

**Appendix 2: Useful Internet Linkages.**

**Governmental organizations:**

U.S. Fish and Wildlife Service  
National Wetlands Inventory  
National Estuarine Research Reserve System  
National Science Foundation World Wide Web Server  
AMPS - Airborne Multisensor Pod System  
NOAA  
GLO EPA Grant Wetland Resources Database of Texas State Government Information.  
Maryland's Natural Resources  
Maryland Sea Grant  
Global Land Information System (GLIS)  
CZCS Images of Chesapeake Bay Region  
USGS Geo Data  
National Estuarine Research Reserve program  
Selected Water Resources Abstracts  
Intergovernmental Oceanographic Commission  
Center for Earth & Planetary Studies, Smithsonian Institution  
Full Text of Legislation of the 104th Congress.  
NESDIS index to environmental data  
EPA's Office of Wetlands, Oceans & Watersheds Homepage  
U.S. Army Corps of Engineers Wetlands Research Program  
U.S. Global Change Research Program  
Atlantic Coastal Zone Database Directory

**Universities:**

University of Manitoba University Field Station (Delta Marsh)  
Geography Department at the University of Maryland at College Park.  
The University of Georgia Marine Institute at Sapelo Island  
University of Washington, School of Fisheries, Wetlands Ecosystem Team  
The Generic Mapping Tools  
Multiscale Experimental Ecosystem Research Center  
Washington Sea Grant Program  
The Bay Journal  
Coastal, Estuarine, and Wetlands Resources  
Duke University Wetland Centre  
Ecology, University of Waterloo  
Iraq Foundation  
American Association for the Advancement of Science

**Non-governmental organizations:**

RAMSAR CONVENTION BUREAU  
American Geophysical Union  
IEEE Geoscience and Remote Sensing Society  
World Conservation Monitoring Center.

Center for Ocean-Land-Atmosphere Studies/Institute of Global Environment and Society (COLA/IGES).

Centre for Earth Observation Coastal Zone Project.

CIESIN: THE CONSORTIUM FOR INTERNATIONAL EARTH SCIENCE INFORMATION NETWORK

The Coastal Imaging Lab Web

Wetlands Reserve Program

Chesapeake Bay Trust

Ecological Society of America

Woods Hole Oceanographic Institution Coastal Briefs

Scientific and Technical Advisory Committee of the Chesapeake Bay Program

American Society of Limnology and Oceanography (ASLO) Homepage

United Nations Environmental Program

<http://www.grid.unep.ch/activities/sustainable/tigris/marshlands/>. e-mail: [salwash@elcamino.edu](mailto:salwash@elcamino.edu).

**Remote Sensing:**

Remote Sensing : A pedologic application

Thematic Mapper Data

Landsat data

AVHRR data

**Other Lists:**

Photogrammetry and Geodesy related web pages.

Rob Sohlberg's list of remote sensing home pages.

BIOS.

Environmental Organization Directory

Research Information Links

Maryland Eastern Shore Home Page

Palo Alto Baylands Preserve

Lower Eastern Shore of the Chesapeake Bay

**Birds:**

Birding on the Web

Delta Marsh Bird Observatory

Marine-biology Birds

**Useful Bibliographic Data Base:**

Birds (abstracts) (*February 5, 2003*)

Botany References (*February 5, 2003*)

Fisheries (abstracts) (*February 5, 2003*)

Hydrology References (*February 5, 2003*)

Phragmites (abstracts) (*February 5, 2003*)

Policy and News Items (texts and abstracts) (*February 5, 2003*)

Soil (abstracts) (*February 5, 2003*)

Soil (incl. soil ecology) (*February 5, 2003*)

Tamarisk (abstracts) (*February 5, 2003*)

Water Quality (*February 5, 2003*)

Wildlife (excl birds) (abstracts) (*February 5, 2003*)