CONVENTION ON WETLANDS OF INTERNATIONAL IMPORTANCE ESPECIALLY AS WATERFOWL HABITAT

Project ref: 1990/8: Application of the Ramsar Monitoring Procedure at Pakistan Ramsar Sites

THE WETLANDS OF PAKISTAN AND THE RAMSAR CONVENTION

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1.0. ABSTRACT

A joint mission of the National Council for Conservation of Wildlife and the Ramsar Bureau was carried out in Pakistan between 7 and 19 May to: (a) review the status of existing Ramsar Sites in Pakistan; (b) propose additional wetlands for listing under the Ramsar Convention; and (c) identify field projects for funding through the Ramsar Convention. The mission was able to visit seven of the nine existing Ramsar Sites in Pakistan, as well as some 15 other wetlands of national and international importance. Personnel of the Wildlife Department of N.W.F.P., Punjab Wildlife Department, Balochistan Forestry and Wildlife Department, Sindh Wildlife Management Board and Pakistan Zoological Survey Department participated in the mission and provided up-to-date information on most other major wetland systems. The mission concluded that of the existing nine Ramsar Sites, five should be retained on the Ramsar List, and four (Kheshki Reservoir, Tanda Dam, Kandar Dam and Malugul Dhand in N.W.F.P.) should be deleted, since they did not qualify as wetlands of international

importance on the basis of the .Ramsar Criteria. Fifteen sites were identified as being suitable for immediate listing under. the Ramsar Convention, and a further fifteen sites were identified as potential Ramsar Sites in need of further investigation and/or management. Five priority areas for project development were identified: (a) survey and inventory work; (b) training, especially in wetland management and conservation education techniques; (c) development of conservation education and awareness programmes at selected sites; (d) development of management plans at selected sites; and (e) institutional strengthening.

1. INTRODUCTION

Article 2 of the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar. Convention) requires that "each Contracting Party shall designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance". The Convention states that wetlands should be selected for the List on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology. Each Contracting Party should designate at least one wetland to be included in the List at the time of joining the Convention, and may then add further wetlands to the list or extend the boundaries of wetlands already listed as and when it wishes. A Contracting Party may also delete or restrict the boundaries of a wetland already included by it in the List, but should, at the earliest possible time, inform the Convention Bureau of such a change.

Article 3 of the Convention states that Contracting Parties should formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and should arrange to be informed at the earliest possible time if the ecological character of any of its wetlands included in the List has changed, is changing or is likely to change as the result of technological development, pollution or other human interference. Information on such changes should be passed without delay to the Convention Bureau.

In Article 4, the Convention states that "where a Contracting Party, in its urgent national interest, deletes or restricts the boundaries of a wetland included in the List, it should as far as possible compensate for any loss of wetland resources, and in particular it should create additional nature reserves for waterfowl and for the protection, either in the same area or elsewhere, of an adequate portion of the original habitat".

The Ramsar Convention entered into force in late 1975, following the accession of the seventh Party, Greece. By the end of 1989, the Convention had a total of 52 Contracting Parties representing all major regions of the world. Together, these Parties had designated a total of 464 wetlands as Ramsar Sites, covering almost 30 million hectares. Pakistan, which joined the Convention in July 1976, was the twelfth country to join the Convention, and the second in Asia (after Iran). It designated nine sites (totalling 20,990 ha) for inclusion in the Ramsar List at the time of accession, and has added none since then.

In recent years, various questions have been raised by wetland experts in Pakistan concerning the status of some of Pakistan's listed sites and their continued designation as wetlands of international importance. Doubts have been expressed as to whether several of the sites are really of international importance as defined in the context of the Ramsar Convention. When Pakistan joined the Convention in 1976 and listed its nine sites, little guidance was available as to how sites should be selected for designation. Some criteria were available for the identification of wetlands of international importance - the so-called Heiligenhafen criteria

adopted at a wetlands conference in West Germany in 1974 - but there was no strict requirement on the part of Contracting Parties to adhere to these “informal” criteria. It was not until the First Conference of the Contracting Parties in Cagliari in 1980 that a revised version of these criteria was formally linked to the Convention, thereby providing a universal standard for the selection of sites for inclusion in the List.’

Furthermore, in 1976 relatively little information was available on some of the sites which were selected for designation by the Pakistan Government. As much more information has become available, it has become apparent that several of the Pakistan sites do not easily fulfil any of the criteria now being used in relation to the Convention.

There have also been reports in recent years of detrimental changes occurring in the ecological character of several of the Ramsar Sites. The Pakistani delegate at the Third Conference of the Contracting Parties in Regina in 1987 drew attention to the changes which were occurring at three sites, Kheshki, Khabbaki and Drigh, and noted that major declines in waterfowl numbers had been recorded at these sites. It is clearly an obligation of the Pakistan Government, as a Contracting Party to the Ramsar Convention, to investigate these changes, and as far as possible take appropriate measures to reverse them and restore the wetlands to their former condition. In extreme cases, consideration might have to be given to delisting sites and replacing them with sites of comparable or greater value.

The problems relating to some of Pakistan’s Ramsar Sites became particularly apparent during the compilation of an inventory of the wetlands of Pakistan for inclusion in the Directory of Asia Wetlands, published in 1989. The Pakistan wetlands inventory provides a comprehensive summary of the information available on the most important wetland ecosystems in Pakistan. Sites were selected for inclusion in the inventory on the basis of the criteria approved at the Regina Conference in 1987. These criteria are set out in Appendix 1. No less than 48 sites in Pakistan were identified as being of international importance and therefore suitable, at least in theory, for listing under the Ramsar Convention. And yet two of the existing Ramsar Sites, Kheshki and Kandar Dam; failed to qualify for inclusion in the Directory, while two others, Tanda Dam and Malugul Dhand, were considered to be marginal.

In his introduction to the chapter on Pakistan in the Directory of Asian Wetlands, Abdul Latif Rao concluded that a review and adjustment of Pakistan’s Ramsar Sites was now required, and indicated that a revised list of Ramsar Sites would be prepared on the basis of the criteria adopted by the Contracting Parties in Regina . The information gathered during the course of the national wetlands inventory and the large amounts of data acquired during recent mid-winter waterfowl counts would provide an excellent basis for this reassessment of sites.

At the same time, the Ramsar Bureau has been endeavouring to apply the Ramsar Monitoring Procedure to some 29 Ramsar Sites which were identified at the Regina Conference as being likely to undergo major change in ecological character. These sites include the three in Pakistan - Kheshki, Khabbaki and Drigh. For this reason, the Ramsar Bureau was anxious to cooperate with the appropriate authorities in Pakistan in the proposed review and possible readjustment of Ramsar Sites in Pakistan.

Following a series of discussions between the Ramsar Bureau and the National Council for the Conservation of Wildlife in late 1989 and early 1990, it was agreed that a joint mission

should be undertaken in Pakistan, to review the existing sites and consider possible adjustments to the list. The dates 7-19 May were finally selected for the mission. Although it was appreciated that the wetlands of Pakistan are generally at their most important for waterfowl during the mid-winter period, it was felt that the absence of wintering waterfowl in May would not affect the success of the mission. A great deal of information has already been gathered on the importance of Pakistan's Ramsar Sites and other wetlands for wintering waterfowl, and this was readily available to the mission members. It was felt that the emphasis should now be on determining some of the other values of the sites, e.g. importance for breeding waterfowl, special ecological and botanical values, hydrological values, values for fisheries, values for conservation education and awareness activities, and any other social values. Indeed , the very absence of large concentrations of migratory waterfowl in May would help to focus the attention of the mission members on the other values of the sites and any management problems. To assist in the assessment of ecological and botanical values, it was felt that an experienced botanist should be included in the mission team.

2. OBJECTIVES AND ACTIVITIES OF THE MISSION

The objectives of the mission were as follows:

to review the status of existing Ramsar Sites in Pakistan and suggest any readjustments that might be necessary;
to propose additional wetlands for listing under the Ramsar Convention;
to identify field projects at Ramsar Sites and other important wetlands for development and funding through the Ramsar Convention.

The mission team consisted of Dr Derek A. Scott, a wetland specialist and compiler of the Directory of Asian Wetlands contracted by the Ramsar Bureau for the mission, Mr Abdul Latif Rao, Conservator (Wildlife) at the National Council for Conservation of Wildlife (NCCW), and Dr A.R. Beg, a botanist from the Pakistan Forest Institute. Mr Kalimullah Shirazi, a biologist at NCCW, also joined the mission for the first six days in N.W.F.P. and Punjab Province. The mission was undertaken in close collaboration with the Wildlife Department of N.W.F.P., Punjab Wildlife Department, Balochistan Forestry and Wildlife Department and Sindh Wildlife Management Board. Senior personnel of each of these departments participated in the mission in their respective provinces, and provided invaluable support throughout. In addition, Syed Ali Ghalib, Acting Director of the Pakistan Zoological Survey Department in Karachi, participated in the mission in Balochistan and southern Sindh.

The mission commenced on 7 May 1990 with preliminary discussions with the Inspector-General of Forests, Mr Obeidullah Jan, at the Ministry of Food, Agriculture and Cooperatives in Islamabad. In the following ten days, the mission was able to visit seven of the nine existing Ramsar Sites (five in N.W.F.P., one in Punjab and one in Sindh) and 14 other important wetlands (four in N.W.F.P., three in Punjab, two in Balochistan and five in Sindh). The 21 sites visited are listed in Table 1.

Table 1: Sites visited during Mission to Pakistan: 7-19 May 1990

Site and Province	Area (ha)	Type of wetland	Date of visit
Rawal Lake, Capitol District	?	Reservoir	7/5

Kheshki Dam, N.W.F.P.*	263	Reservoir	8/5
Tanda Dam, N.W.F.P.*	528	Reservoir	8/5
Kandar Dam, N.W.F.P.*	251	Reservoir	9/5
Baran Dam, N.W.F.P.	1,554	Reservoir	9/5
Malagul Dhand, N.W.F.P.*	405	Brackish marsh	10/5
Thanedar Wala, N.W.F.P.*	4,047	Riverine wetlands	10/5
Dera-Darya Bridge, N.W.F.P./Punjab	?	Riverine & barrage	11/5
Dhab Shumali, N.W.F.P.	?	Freshwater lake/marsh	11/5
Paharpur Marsh, N.W.F.P.	?	Freshwater marsh	11/5
Chashma Barrage, N.W.F.P./Punjab	33,109	Barrage on Indus	11/5
Jahlar Lake, Punjab	100	Brackish lake	12/5
Ucchali Lake, Punjab	943	Saline lake	12/5
Khabbaki Lake, Punjab*	283	Brackish lake	12/5
Miani Hor, Balochistan	60,000	Mangroves/mudflats	14/5
Hub Dam, Balochistan/Sindh	27,219	Reservoir	14/5
Nurr-ri, Sindh	?	Brackish lagoon	15/5
Jubho (Kur), Sindh	?	Brackish lagoon	15/5
Drigh Wildlife Sanctuary, Sindh*	182	Freshwater lake/marsh	16/5
Langh Lake, Sindh	19	Freshwater lake (dry)	16/5
Pugri Lake, Sindh	ca. 150	Brackish lake (dry)	16/5
Indus Dolphin Reserve, Sindh	44,200	Part of Indus River	17/5

* existing Ramsar Site

In addition, .the mission members were able to discuss the present status of most other wetlands of international importance in Pakistan with key personnel from the wildlife and forestry departments of each of the four provinces visited. Many of the conclusions and recommendations of the mission have been based on these valuable discussions. The mission also paid a brief visit to one wetland - Rawal Lake - in the Capitol District, and discussed management options at this site with Mr Mazhar Hussain, Deputy Director (Wildlife) in the Environment Directorate, Capitol Development Authority.

The two Ramsar Sites not visited during the present mission, namely Haleji Lake and Kinjhar Lake in Sindh, are both unquestionably of international importance. They have been we11 studied and well documented, and were already known to the mission members from previous visits. Up-to-date information on these sites was obtained from Mr Mirza Abrar Hussain, Conservator (Wildlife), and other personnel of Sindh Wildlife Management Board.

The mission concluded with a meeting with the Inspector-General of Forests in Islamabad on 19 May, at which the mission members presented a summary of their findings and recommendations. Further details of the mission's itinerary and a list of the key individuals involved are given in Appendices 2 and 3, respectively.

Most of the sites visited during the mission are described in some detail in the Directory of Asian Wetlands. This information was checked wherever possible, and any errors or deficiencies noted for correction in a future updated version of the inventory. Additional information was gathered on values of the sites, land use and management problems, and detailed notes were made on the vegetation, avifauna and other wildlife. Summaries of the botanical and avifaunal information acquired during the mission are included as Appendices 4 and 5, respectively.

3. DISCUSSION OF SITES

Some 62 of Pakistan's important wetland ecosystems, including all those described in the Directory of Asian Wetlands, were considered by the mission and are discussed below. Throughout the site accounts, the figures in parenthesis after the site names are the site reference numbers used in the Directory of Asian Wetlands. A dash (-) indicates that the site in question was not described in the Directory; an asterisk (*) indicates that .the site was described briefly in a postscript to the main text.

3.1. Existing Ramsar Sites

The principal aim of the mission was to review the status of existing Ramsar Sites in Pakistan, and to make appropriate recommendations concerning management and/or delisting. Specifically, the mission sought to examine each site and determine:

- which sites, if any, do not meet (and presumably never did meet) any of the criteria currently being used by the Contracting- Parties of the Ramsar Convention to identify wetlands of international importance (see Appendix 1). Such sites would not merit the designation "wetland of international importance", and should therefore be deleted from the Ramsar List.

- which sites, if any, have suffered a serious detrimental change in ecological character as the result of technological developments, pollution or other human interference, and are therefore in urgent need of management if their international importance and status as Ramsar Sites are to be maintained.

- which sites, if any, are likely to undergo some detrimental change in ecological character unless suitable remedial action is taken in the near future.

3.1.1. Kheshki Reservoir, N.W.F.P. (*)

Site description: 263 ha; unprotected. A small water storage reservoir formerly with some fringing reed-beds, fed by water pumped from the nearby Kabul River.

Management problems: The reservoir was originally created to store water for irrigation purposes, and when full was capable of holding a two-week supply for the local villages. Water entered the lake by a small canal from a large electric pumping station approximately one kilometre away on the Kabul River. However, in recent years the paper mills and sugar mills at Charsadda, 10 km upstream on the Kabul River, have released large quantities of pollutants into the river, and these subsequently entered Kheshki Reservoir via the pumping station and canal. Local farmers complained that the water in the reservoir had become unsuitable for irrigation purposes, and so in 1987 the Irrigation Department ceased pumping water into the lake. As a consequence, the lake dried out completely. Pumping was resumed for the month of March in 1987, 1988 and 1989, to allow the Pakistan Air Force Boating Club, sited by the lake, to hold its annual regatta. In 1990, however, the regatta was held on the Kabul River and no water was pumped into the lake. The reservoir has never been afforded any legal protection, and is subjected to a considerable amount of disturbance from human activities in the area.

At the time of the mission in May 1990, the entire bed of the reservoir was dry and overgrown with a saline grassland dominated by *Sisymbrium* sp., with some *Atriplex* sp. The exotic shrub *Prosopis juliflora* was invading the area, and can be expected to take over the whole bed of the reservoir in the near future. Approximately 150 ha on the periphery of the reservoir have been planted with *Eucalyptus* sp. by the Forest Department. No wetland plants of any kind were present at the site, and no waterfowl were observed.

Values: Even .in its early days, when the waters of the reservoir were relatively clean and supported some .aquatic vegetation, the reservoir had no special conservation values. Counts of wintering waterfowl have never exceeded 500, and no rare or threatened species have been recorded.

Action required: Kheshki Reservoir should be deleted from the Ramsar List. It clearly never fulfilled any of the Ramsar Criteria, and now that it has been abandoned for water storage purposes, it can no longer be described even as a wetland. Efforts should be made to reduce the level of pollution in the Kabul River and resulting contamination of water supplies for irrigation and domestic use, but even if this problem can be brought under control, it is doubtful if Kheshki would be worth restoring as a wetland for nature conservation purposes.

3.1.2. Tanda Dam Reservoir, N.W.F.P. (3)

Site description: 644 ha (Ramsar Site 405 ha); unprotected. A small water storage reservoir in semi-arid hills in the catchment area of the Kohat Toi River. The main source of water is the Kohat Toi River, which lies in a neighbouring valley to the north. Water is taken from a headworks on the Kohat Toi to Tanda Dam via a concrete canal and tunnel through the hill range separating the Kohat Toi valley from the Tanda valley. Apparently only a small amount of water enters the reservoir from its own, very small catchment area, where the average annual rainfall is only about 250 mm. Much of the shoreline is rather steep, stony and devoid of aquatic vegetation, although there are some areas of gently shelving muddy shore with a little emergent aquatic vegetation at the west end. Water levels fluctuate widely during the year, and the mudflats at the west end are cultivated by local villagers during periods of low

water level. The vegetation on the surrounding hills has been much degraded as a result of heavy grazing by domestic livestock and wood-cutting. Some fish-stocking has been attempted, but apparently with limited success.

Management problems: No detrimental changes have occurred in the ecological character of the wetland since designation as a Ramsar Site. There is some disturbance from local farmers, fishermen and domestic livestock, but in general it seems that conditions for waterfowl have improved in recent years, with increased cultivation on the mudflats at the west end of the lake providing additional feeding areas. The only potential management problems relate to manipulation of the water supply and possible future development of the reservoir for hydro-power. The almost totally artificial water supply (through a manmade tunnel from a neighbouring valley) could be cut off at any time by the Irrigation Department, depending on priorities for irrigation elsewhere in the region, and a proposed scheme to modify the dam for hydro-electric purposes would have a great but as yet unknown impact on the ecology of the lake.

Values: Tanda Dam is of some importance as a wintering area for waterfowl, principally Anatidae, and as a staging for a wide variety of migratory species, notably shorebirds. However, according to local wildlife department personnel, the numbers of waterfowl seldom exceed 500 in mid-winter (mainly *Anas platyrhynchos*) and 2,000 during the spring and autumn migration seasons. No threatened species of waterfowl are known to occur, and 110 other interesting wildlife or plant species have been reported from the reservoir. The reservoir is, of course, extremely important for irrigation purposes and supports a small fishery, but these values are irrelevant to its status as a Ramsar Site.

Action required: Tanda Dam should be deleted from the Ramsar List. It has clearly never fulfilled any of the Ramsar Criteria, and does not merit the designation “wetland of international importance’. The site is, however, of some importance for migratory waterfowl, and would amply merit the designation “wetland of national importance”. Some facilities have already been provided for outdoor recreation for the general public from nearby Kohat, and the reservoir has distinct potential for the development of conservation education and awareness facilities. Consideration should be given to the establishment of a small managed nature reserve in the shallow-water areas at the west end of the lake; and construction of a visitor centre, nature trails and observation hides.

3.1.3. Kandar Dam, N.W.F.P. (*)

Site description: Ramsar Site 251 ha; unprotected. A tiny water storage reservoir in stony hills west of the Indus River, with a catchment area of about 71 sq. km. Although the area of the Ramsar Site is given as 251 ha, the total area of the reservoir at maximum water level is only 47 ha. Much of the. shoreline is steeply shelving and devoid of vegetation. There is a little emergent vegetation near the mouth of the principal inflow stream, and there are some good stands of *Tamarix dioica* along parts of the shoreline, but the wide fluctuations in water level have precluded the development of any permanent aquatic vegetation.

Management problems: No detrimental changes have occurred in the ecological character of the wetland since designation as a Ramsar Site. Local farmers and villagers cause some disturbance to waterfowl, and there is reported to be a considerable amount of hunting during

the winter months. The reservoir is much too small to provide any secure, disturbance-free areas for wildlife.

Values: Kandar Dam is of only minor importance for passage and wintering waterfowl, and has no other special conservation values. No mid-winter waterfowl census has exceeded 100 birds, and according to local wildlife department personnel, the reservoir usually holds far fewer birds than this.

Action required: Kandar Dam should be deleted from the Ramsar List. It has clearly never fulfilled any of the Ramsar Criteria, and does not merit the designation “wetland of international importance’. Indeed, the site would not even qualify as a wetland of national importance. No other action is required.

3.1.4. Malugul Dhand, N.W.F.P. (5 - part)

Site description: 405 ha; unprotected. A dead arm of the Kurram River, on the west bank in a region of irrigated fields and small vi1lages. Winter rainfall and spring flooding in the Kurram River fill up the basin to create a shallow, brackish to saline lake which reaches its maximum extent in March and April and then usually dries out during the summer months. A low earthen bund has been constructed along the eastern side of the marsh to retain water as long as possible into the dry season. The wetland supports a wide variety of aquatic plants in a mosaic of habitats, comprising twelve plant communities (see Appendix 4). Species of *Scirpus, Juncus, Paspalum* and *Suaeda* are dominant.

Management problems: Siltation from the Kurram River has raised the level of the basin, resulting in a reduction in the depth and duration of flooding. Although this is a natural process, it has been accelerated in recent years by increased soil erosion in the extensive catchment area of the Kurram River. A barrage upstream on the Kurram River has also reduced the frequency of flooding. The wetland vegetation is heavily grazed by domestic livestock, including goats, sheep and donkeys, and there is a considerable amount of disturbance from general human activity in the area. Hunting pressure on passage cranes and wintering Anatidae is heavy. A homestead adjacent to the wetland maintains a number of live Common and Demoiselle Cranes for use as decoys in crane hunting.

Values: Malugul Dhand is of some importance as a wintering area for waterfowl, especially Anatidae. Up to 350 ducks have been recorded in mid-winter, along with smaller numbers of herons, *Ciconia ciconia* and shorebirds. The wetland is also of some interest as a natural floodplain wetland supporting a wide variety of aquatic plants typical of- the region. However, as siltation proceeds , the wetland is becoming reduced in extent, and the heavy grazing pressure and high levels of disturbance are having an adverse effect on the flora and fauna.

Action required: Malugul Dhand should be deleted as a Ramsar Site. There is no indication that the site has ever fulfilled any of the Ramsar Criteria. Only small numbers of waterfowl have been recorded in winter, and the cranes which migrate through the Kurram Valley in spring and autumn merely pass over the site. The natural plant communities are of some interest, but are by no means unique, and the site is small and now much degraded by overgrazing. Some management practices could be devised to combat siltation and reduced

frequency of flooding, but these would be expensive and difficult to justify in view of the limited importance of the site.

3.1.5. Thanedar Wala Game Reserve, N.W.F.P. (4)

Site description: 4,047 ha; declared a Game Reserve in 1976. A ten km stretch of the Kurram River and its associated floodplain from its confluence with the Gambila River downstream almost to the border with Punjab Province. Most of the Game Reserve consists of a complex of braided river channels and sandy or muddy islands up to four km wide. Tall stands of *Typha* and *Phragmites* occur in places along the river banks, and there are large areas of *Tamarix* thicket. Because of frequent shifts in the course of the main river channels, much of the area is unstable, difficult of access and unsuitable for cultivation or settlement.

Management problems: No major changes in ecological character are known to have taken place since the Game Reserve was declared a Ramsar Site, although the construction of a barrage upstream on the Kurram River has undoubtedly had some effect on the hydrology of the system. Hunting pressure is heavy throughout the region, and causes a considerable amount of disturbance to waterfowl in the Game Reserve. Crane hunting, in particular, is popular in this region, and there are several crane hunting camps on the periphery of the reserve. There is also a considerable amount of grazing by domestic livestock in peripheral areas, but this appears to have had little effect on the vegetation in much of the Game Reserve.

Values: As a large section of the Kurram River still in re1atively pristine condition and supporting a wide variety of wetland plant communities characteristic of this region of Asia, Thanedar Wala qualifies for designation as a wetland of international importance on the basis of Ramsar Criterion 1(b). As one of the largest tracts of unspoiled riverine habitat in the area, it may also be of special value in maintaining the genetic and ecological diversity of the region (Criterion 2b). No comprehensive faunal and floral surveys have ever been carried out in the Game Reserve, and little information is available on the. importance of the site for wildlife. The Kurram Valley is known to be an important migration route for a wide variety of waterfowl species, particularly ducks, cranes and shorebirds, and recent mid-winter waterfowl counts have indicated that Thanedar Wala is of some importance for wintering birds (e.g. 1,550 waterfowl in January 1989). The present mission also noted the importance of the site for some breeding species, notably *Glareola lactea* and *Sterna albifrons*. In view of the large size of the reserve, its extensive areas of mudflats and marshes, and the presence of many relatively inaccessible islands which could provide secure roosting sites for birds, it is conceivable that the site could at times support over 20,000 waterfowl and thus also fulfil Criterion 3a.

Action required: Thanedar Wala Game Reserve should be retained on the Ramsar List. The principal management requirements are an improvement in the control of hunting activities within the Game Reserve, and the establishment of one or more wildlife sanctuaries to provide secure roosting and feedings sites for migratory birds. A detailed survey of the whole area should be carried out as soon as possible, and key areas for the establishment of sanctuaries identified. Management of the aquatic vegetation might be considered in some areas to improve feeding conditions for migratory waterfowl, and perhaps encourage cranes to utilize the area. Some of the peripheral marshes might be partially bunded to create more

permanent wetland habitat which would compensate in part for the reduced flooding caused by the barrage upstream on the Kurram River.

3.1.6. Khabbaki (Khabbeki) Lake, Punjab (10)

Site description: 283 ha; gazetted as a Wildlife Sanctuary in 1966. A shallow brackish to saline lake with hard alkaline waters, fed by a small spring, wastage from adjacent irrigated land, and run-off from the surrounding hills of the Salt Range. The lake supports a rich growth of submerged aquatic vegetation (*potamogeton*, *Chara* and *Najas*) but only small areas of emergent shoreline vegetation (principally *Scirpus*). There are some restrictions on tree-felling in the catchment area, and the hill slopes rising steeply from the north shore of the lake are well wooded.

Management problems: In the Directory of Asian Wetlands it was reported that a change in the salinity and water level had brought about a change in the ecology of Khabbaki Lake, and that this had been compounded by large-scale stocking with herbivorous fish species. It was believed that the direct competition for food between the introduced fishes and waterfowl had been responsible for the decline in waterfowl numbers in recent years. The fishing activities were thought to be causing a considerable amount of disturbance to waterfowl, particularly in November, when the wintering birds first arrive at the lake. Pollution from domestic waste was also reported to be a problem.

The extent to which recent fluctuations in numbers of waterfowl reflect a real long-term change in the ecological character of the lake is now in some doubt. From a low of only 100 in January 1986, numbers of wintering waterfowl increased to 1,390 in 1987, 2,310 in 1988, 2,195 in 1989 and . . . .in 1990. Furthermore, in May 1990 the mission noted that water levels were high, following a year of good rainfall; there was an abundance of aquatic vegetation in the lake, and over 420 waterfowl of 16 species were present. Some of these, such as *Tachybaptus ruficollis*, were breeding. While it was clear that there is a considerable amount of disturbance at the lake from general human activities in the area, the birds seemed remarkably tame and unconcerned, suggesting that there is little if any direct persecution of birds at the lake. A local villager, questioned at the site, complained of the difficulty of catching fish in the lake and considered the fish-stocking programme to have been a failure. If this is the case, competition between herbivorous fishes and waterfowl is unlikely to be a problem. The only potentially serious problem noted by the mission was the common practice of washing clothes in the lake. The repeated use of soap for washing purposes over a long period of time is likely to be having a detrimental effect on water quality in this small closed wetland system.

Values: Khabbaki Lake is one of a group of four small lakes between 700 and 980 metres above sea level in the Salt Range hills, an isolated hill range between the Indus and Jhelum Rivers. All four lakes are brackish to saline lakes and have no outflow. Although similar in many respects, the four lakes differ quite markedly in their physico-chemical characteristics and planktonic floras and faunas. As such, they constitute a unique system of considerable limnological and ecological interest. One of the lakes, Kalar Kahar, has been developed by the Department of Tourism for recreational boating, and is now subjected to a considerable amount of disturbance. The other three lakes, Khabbaki., Ucchali and Jahlar, remain of considerable interest and worthy of special attention. Taken together, the three lakes undoubtedly qualify as wetlands of international importance under Ramsar Criterion 1 (b).

Khabbaki Lake was formerly a very important wintering area for the endangered White-headed Duck *Oxyura 1eucocephala,* with as many as 470 being recorded in the early 1970s. None has been recorded in recent years, but the species continues to winter on the nearby Ucchali and Jahlar Lakes, and since there seems to be considerable interchange between the birds wintering on these three lakes, it is possible that White-headed Ducks will return to Khabbaki in the future. The lake remains important for a wide variety of passage and wintering waterfowl, including *Anser anser,* and with some management of the aquatic vegetation, could become important for breeding birds.

Action required: Khabbaki Lake should be retained on the Ramsar List- However, it is recommended that the Ramsar Site be extended to include the two other similar lakes, Ucchali and Jahlar. These three lakes lie only some 10-15 km apart and comprise a unique group of wetlands of considerable limnological and ecological interest. Together they can support in excess of 100,000 waterfowl of a wide variety of species in mid-winter, and are much the most important wintering sites for White-headed Ducks in Pakistan.

Between February and May 1989, three MSc students from the University of the Punjab carried out studies on the physico-chemical characteristics, phytoplankta and zooplankta of the three lakes. Further investigations should be carried out as soon as possible to follow up on this work. Emphasis at Khabbaki Lake should be given to studies of the long-term effects of fish introductions, changes in salinity and the aquatic macrophyte vegetation, and the effects of the use of domestic soap on water quality. Ways of improving the water supply should be sought, and consideration given to the management of the emergent aquatic vegetation to improve conditions for breeding waterfowl, especially in the impounded areas along the south shore of the lake.

3.1.7. Drigh Lake Wildlife Sanctuary, Punjab (23)

Site description: 182 ha; gazetted as a Wildlife Sanctuary in 1972. A small, slightly brackish lake with extensive marshes on the Indus plain, formerly an ancient arm of the Indus, but now almost 30 km from the river. The lake is fed by water from a nearby canal system and local run-off.

Management problems: The lake has decreased in size in recent years as a result of the diversion of flood water for irrigation purposes, siltation and spread of emergent vegetation. By 1988, much of the wetland had become overgrown with dense stands of *Typha* and *Tamarix*. This change in the ecology of the site had been reflected in a fall in the number of wintering waterfowl, particularly ducks and coots, from over 30,000 in the early 1970s to less than 20,000 in the late 1985s. It was believed that many of the wintering birds had moved to nearby Pugri Lake, a privately owned wetland managed very effectively as a duck hunting reserve.

Heavy grazing in the marsh by domestic livestock, particularly cattle and water buffalo, was also thought to be a problem. There is some fishing in the lake, using traditional fishing techniques, but this is not thought to be causing any adverse effects at the present time. Although Drigh Lake is reported to be state owned in the Directory of Asian Wetlands, some parts of the Sanctuary remain in private ownership, and this has hampered management activities.

Values: Drigh Lake is a very interesting semi-natural wetland supporting a rich and diverse aquatic vegetation consisting of at least 19 aquatic/marshy habitats (see Appendix 4). It constitutes a particularly good example of a type of wetland characteristic of this region, and thus qualifies as a site of international importance under Ramsar Criterion lb. It is an important breeding and wintering area for a wide variety of waterfowl, and in recent years has supported a very large roost of Night Herons *Nycticorax nycticorax* (e.g. 2,750 in January 1988 and 5,000 in January 1990). Because of its very diverse flora and fauna and importance as a breeding site for Ardeidae, the lake may also qualify under Ramsar Criteria 2b and 2c.

The lake regularly held over 20,000 wintering waterfowl in the early 1970s, but numbers were generally much lower in the late 1970s and throughout the 1980s. However, in 1989 some management was carried out by Sindh Wildlife Management Board (SWMB), and in January 1990, no less than 38,000 ducks were present. Management will be continued, and it seems likely, therefore, that the site will again qualify under Criterion 3a.

Action required: Drigh Lake Wildlife Sanctuary should be retained on the Ramsar List. In 1989, SWMB began a programme of management which involved the cutting back of *Typha* beds to create more open water areas, and provision of supplementary feed (in the form of uncleaned rice) for the wintering waterfowl. Additional measures planned include excavation of some parts of the lake bed to create deeper permanent water areas, and erection of low bunds to reduce the extent of overspill and wastage. Such management activities are clearly essential to combat the natural processes of siltation and spread of emergent vegetation.

The mission felt that supplementary feeding, while useful in the short term to attract large numbers of birds back to the sanctuary, should not be necessary in the long term, since it should be possible to provide optimum conditions for waterfowl through careful manipulation of water levels and control of aquatic vegetation. The effects of grazing by domestic livestock should be investigated, since it is possible that this is having a beneficial effect on the wetland by retarding the spread of emergent vegetation.

Drigh Lake is situated less than 30 km by road from the large town of Larkana, and thus provides an excellent opportunity for nature-oriented outdoor recreation and conservation education for the general public. Furthermore, there is an excellent building on the edge of the marsh which would be ideally suited for conversion to a visitor centre and reserve headquarters. This building, owned by the local District Council, was originally constructed as a hunting lodge, but is now no longer in use. Some negotiations have already taken place between SWMB and the District Council concerning the purchase of the building for the Sanctuary. Every effort should be made to acquire this building for the reserve, so that it can be developed as a visitor centre for conservation education. The existing system of bunds and trails within the Sanctuary is ideally suited for development as a system of nature trails with interpretation facilities and observation hides.

3.1.8. Hzileji Lake, Sindh (35)

Site description: 1,704 ha; declared a Game Sanctuary in 1971 and gazetted as a Wildlife Sanctuary in 1977. Not visited by the present mission. A perennial freshwater lake with associated marshes. and adjacent brackish seepage lagoons, set in a stony desert. The lake is described in some detail in the Directory of Asian Wetlands (pages 345-347).

Management problems: Haleji Lake has suffered no major change in ecological character since designation as a Ramsar Site. However, there are two major potential threats to the site. Firstly, there is considerable pressure from some quarters to open up the area to commercial fishing. This could have an adverse effect on the ecology of the lake, and would certainly cause a considerable amount of disturbance to wildlife. Secondly, Karachi Water Supply Board has produced a Master Plan for the development of Haleji Lake to increase the capacity of the water supply system and provide up to 60 million gallons of water per day (40 million to Karachi City and 20 million to a steel mill). Work has already commenced on widening the intake canal and constructing culverts to increase the outflow. If the net result of the development is simply to increase the flow of water through the lake system, the ecological impact might not be severe. However, it has been proposed that the bunds be raised in height to increase the water level by up to one metre. This would have a very serious impact on the ecology of the system.

Values: Haleji Lake supports a very diverse fauna and flora, including several threatened species, and is one of the most important breeding, staging and wintering areas for waterfowl in Sindh, regularly holding between 50,000 and 100,000 birds. It thus qualifies as a wetland of international importance under several of the Ramsar Criteria (lb, le, 2a, 2b and 3a). Situated only a short distance from Karachi, the Wildlife Sanctuary provides excellent opportunities for conservation education and scientific research.

Action required: Haleji Lake should be retained on the Ramsar List. Investigations should be carried out immediately to assess the impact of the proposed development by Karachi Water Supply Board, and the issue raised at the highest levels. Pressure to develop the lake for commercial fishing should be resisted, and likewise the problem should be resolved at the highest levels. The existing visitor centre and facilities for conservation education should be improved and expanded, since this Ramsar Site is ideally situated to become a showcase for wetland conservation activities in Pakistan.

3.1.9. Kinjhar Lake, Sindh (33)

Site description: 13,468 ha; declared a Game Sanctuary in 1971, and gazetted as a Wildlife Sanctuary in 1977. Not visited during the present mission. A large natural freshwater lake, the largest in Pakistan, with extensive reed-beds, particularly in the shallow western and northern parts. The lake is described in some detail in the Directory of Asian Wetlands (pages 342-344).

Management problems: The lake has suffered no major change in ecological character since designation as a Ramsar Site. Fishing activities cause a considerable amount of disturbance to waterfowl, and this is reported to have increased in recent years, resulting in a decline in the number of wintering ducks (although numbers of coots have remained high).

Values: Kinjhar Lake supports a very diverse flora and fauna, and is an extremely important breeding, staging and wintering area for a wide variety of waterfowl. Mid-winter waterfowl counts in the four winters 1986/87 to 1989/90 averaged 140,000 (maximum 205,000 in 1987/88). Thus the site qualifies as a wetland of international importance under several of the Ramsar Criteria (1b, 1e, 2b and 3a).

Action required: Kinjhar Lake should be retained on the Ramsar List. Special attention should be given to problems of disturbance caused by fishing activities, and a solution found, perhaps through the establishment of no-fishing zones or restricted fishing seasons in key areas for waterfowl.

3.2. Candidate Ramsar Sites

A second important objective of the mission was to identify wetlands of international importance in Pakistan which would be suitable for immediate listing under the Ramsar Convention. Such sites would have to be wetlands which clearly fulfil one or more of the Ramsar Criteria, and at which any management problems are of relatively minor significance and can easily be solved.

In all, fifteen sites were considered by the mission to be suitable for immediate designation as Ramsar Sites. Thirteen of these are described in some detail in the Directory of Asian Wetlands; the other two are turtle nesting beaches on the Balochistan coast, the full importance of which has only been recognized since the Directory went to press.

3.2.1. Chashma Barrage, N.W.F.P. & Punjab (6)

Site description: Total area unknown; Punjab section declared a Sanctuary in 1974 (33,084 ha). A large barrage on the Indus River, with a series of embankments or flood bunds which, at low water level, divide the reservoir into five shallow lakes each of up to 250 ha in area.

Management problems: Fishing activities cause a considerable amount of disturbance to waterfowl, and there may be some overfishing. The harvesting of reeds for thatching purposes may also be excessive. A planned storage dam at Kala Bagh, upstream on the Indus, would affect the water regime at Chashma.

Values: The barrage supports a very diverse fauna and flora, and is an extremely important staging and wintering area for a wide variety of waterfowl, regularly supporting over 100,000 birds in mid-winter. The site qualifies as a wetland of international importance under Ramsar Criteria 1b, 2b and 3a.

Action required: The wetland should be designated as a Ramsar Site. The Wildlife Sanctuary should be extended to include the small portion of the reservoir in N.W.F.P. Studies should be carried out on the impact of fishing and harvesting of reeds. A small visitor centre and facilities for conservation education should be developed at the site.

3.2.2. Taunsa Barrage, Punjab (17)

Site description: 6,567 ha; declared a Wildlife Sanctuary in 1972. A large water storage reservoir behind a barrage on the Indus River, constructed for irrigation purposes.

Management problems: Illegal hunting, especially for Hog Deer and Wild Boar, and the burning of vegetation to facilitate hunting are the principal problems. The main breeding colonies of waterbirds are in the extensive swamps downstream of the barrage and thus outside the Wildlife Sanctuary.

Values: A very important breeding, staging and wintering area for a wide variety of waterfowl, including at least one threatened species (*Marmaronetta angustirostris*). Mid-winter waterfowl counts in recent years have regularly exceeded 20,000 birds. The endangered Indus Dolphin (*Platanista indi*) occurs in the river both upstream and downstream of the barrage. The site qualifies as a wetland of international importance under Ramsar Criteria 2a, 2b and 3a.

Action required: The wetland should be designated as a Ramsar Site. The Wildlife Sanctuary should be extended downstream to incorporate areas of swamp important for breeding waterfowl. Wardening should be improved, and all illegal hunting and burning of vegetation terminated. Some areas could be managed for Hog Deer.

3.2.3. Ucchali Lake, Punjab (8)

Site description: 943 ha; declared a Game Reserve in 1985. A brackish to saline lake in the Salt Range hills, with extensive salt flats and- a large area of wet grassland to the east.

Management problems: An extension of agriculture in areas around the lake and increased diversion of water supplies for irrigation have resulted in less run-off reaching the lake. Water levels have receded and there has been a significant increase in salinity in recent years. The cutting of *Typha* and *Phragmites* for thatching and weaving has reduced the extent of breeding habitat for birds, and there is very heavy grazing pressure on the damp grasslands near the lake. Some attempts have been made to introduce fish into the lake, but in view of the wide fluctuations in water level and salinity, these seem unlikely to succeed.

Values: Ucchali Lake is one of three important lakes in the Salt Range hills which together constitute a unique system of great limnological and ecological interest (see Khabbaki Lake above). Ucchali is particularly important as a wintering area for Greater Flamingos (*Phoenicopterus ruber*) and Coots (*Fulica atra*), and in recent years has been the most important wintering site for White-headed Ducks (*Oxyura leucocephala*) in Pakistan. The lake qualifies in its own right as a wetland of international importance under Ramsar Criteria 1b, 2a and 3a, but should perhaps be considered along with the other two lakes, Khabbaki and Jahlar, as part of a single system.

Action required: The wetland should be included with Khabbaki Lake and Jahlar Lake in an expanded Ramsar Site. Negotiations will have to be entered into with local land owners to ensure a better supply of water to the lake, especially during dry years. Ideally, the Game Reserve should be upgraded to Wildlife Sanctuary, but the fact that the lake is privately owned might preclude this. Wardening should be improved, and the cutting of aquatic vegetation and grazing by domestic livestock controlled to prevent over-exploitation of the emergent aquatic vegetation. Further encroachment of agricultural land onto the flats around the lake should be prohibited.

3.2.4. Jahlar Lake, Punjab (9)

Site description: 100 ha; unprotected. A small brackish to saline lake in the Salt Range hills, with an abundant growth of submerged aquatic vegetation but little emergent vegetation.

Management problems: A new road has recently been constructed along the south side of the lake, and this may impede run-off into the lake. There is reported to be a considerable amount of disturbance from hunting in winter, and the frequent use of domestic soap for washing clothes in the lake is likely to be affecting water quality.

Values: Jahlar Lake is one of-three very interesting lakes in the Salt Range hills (see Khabbaki Lake and Ucchali Lake above). It regularly supports significant numbers of White-headed Ducks (*Oxyure leucocephala*) in winter (e.g. 68 in January 1987 and 132 in January 19881, and thus qualifies as a wetland of international importance under Ramsar Criteria 2a. Six White- headed Ducks, including two adult males in full breeding plumage, were present at the time of the mission.

Action required: The lake should be included with Khabbaki Lake and Ucchali Lake in an expanded Ramsar Site, and given some legal protection. As the lake is privately owned, a Game Reserve might be the most suitable type of protected area. All hunting should be. prohibited., and potential problems from soap pollution investigated. The impact of the new road along the south shore should also be investigated, and appropriate measures taken to mitigate any adverse effects.

3.2.5. Indus Dolphin Reserve, Sindh (20)

Site description: 44,200 ha; declared a Reserve for the Indus Dolphin in 1974. A stretch of about 135 km of the Indus River from Sukkur Barrage upstream to Guddu Barrage. The Reserve includes the full width of the river when in spate and a strip of land three miles wide on either side of the river. The river banks and numerous islands support dense stands of *Tamarix dioica, Typha* spp., *Phragmites karka, Saccharum* spp. and other riverine vegetation typical of the region.

Management problems: The flow in the Indus River has been greatly modified by the construction of a number of dams and barrages on the Indus and its major tributaries. Flood peaks have been reduced, fish and dolphin migrations have been disrupted, and during the dry season some stretches of the river dry up to a series of discontinuous pools. It seems, however, that the small population of Indus Dolphins in the Reserve is managing to cope with this problem, since numbers have increased steadily from as few as 150 in the early 1970s to about 450 by 1989. The dolphins were formerly exploited by local fishermen, but the species is now fully protected and there has been only one. incidence of illegal hunting of a dolphin in the Reserve in the past 8-10 years.

Values: This stretch of river is now the stronghold of the endangered Indus Dolphin (*Platanista indi*), a species endemic to the Indus River system. A census in April 1989 indicated that the Reserve contained some 450 individuals, and a further increase is believed to have occurred since then. The Reserve also contains some areas of riverine vegetation still in relatively pristine condition, and thus of considerable interest as this habitat type has now disappeared or is severely degraded in much of the Indus basin. The site thus qualifies as a wetland of international importance under Ramsar Criteria 1b and 2a.

Action required: The Indus Dolphin Reserve should be designated as a Ramsar Site. A detailed survey of the entire Reserve should be carried out to determine all its faunal and floral values, and key areas of riverine vegetation should be given special protection in

wildlife sanctuaries. The existing proposal to declare the Reserve a World Heritage Site should be pursued.

3.2.6. Nurr-ri Lagoon, Sindh (30 part)
3.2.7. Jubho (Kur) Lagoon, Sindh (30 part)
3.2.8. Kalka Channi (Kalkan Wari Chand) Lagoon, Sindh (30,part)
3.2.9. Lakharann Lagoon, Sindh (.30 part)

Site description: Areas unknown; unprotected. Four similar wetlands on the northern edge of the great salt waste of the inner Indus Delta. All four are large shallow brackish lagoons with associated mudflats and marshes at the end of drainage canals which carry slightly brackish drainage water and excess irrigation water from agricultural land to the north. All four are of recent origin, and are likely to increase in size as the system of outfall drains in lower Sindh is expanded.

Management problems: None known. The wetlands are in a very remote and sparsely populated region. There is some grazing by domestic livestock in the marshes, and some hunting in winter, but these activities are not thought to pose a problem at the present time.

Values: Nurr-ri, Jubho, Kalka Channi and Lakharann are the most important wintering areas for waterbirds in the Indus Delta, supporting huge numbers of pelicans, cormorants, herons, egrets, flamingos, ducks, cranes, shorebirds, gulls and terns. These wetlands probably also support large breeding populations of some species of shorebirds and terns, and there is known to be a large breeding colony of flamingos somewhere in the area, but few surveys have been carried out and much of the region remains poorly known. All four sites clearly qualify as wetlands of international importance under Ramsar Criteria 1b and 3a, and Jubho at least also qualifies under Criterion 2a (for its wintering population of *Pelecanus crispus*).

Action required: All four wetlands should be designated as Ramsar Sites and given adequate protection as Game Reserves or Wildlife Sanctuaries. Surveys should be carried out as soon as possible to locate major breeding areas for waterfowl (especially any flamingo colonies), and to determine suitable boundaries for the Ramsar Sites and protected areas. Although similar to one another in character and essentially all part of the same deltaic system, it is felt that the four sites are best treated separately for the time being, since they are situated in different administrative units and receive their water supply from separate canal systems. If at some future date the wetlands increase in size and link up, consideration might be given to creating a single large protected area and Ramsar Site.

3.2.10. Hub Dam, Balochistan & Sindh (36)

Site description: 27,219 ha; mostly unprotected. A large water storage reservoir constructed in 1981 on the Hub River, in a region of arid plains and low stony hills. Much of the shoreline is steeply shelving and stony, but there are many shallow bays and small islands. The greater part of the reservoir (in Balochistan) is unprotected; the eastern shore and area south of the Dam (in Sindh) are protected in the Kirther National Park and Hub Dam Wildlife Sanctuary., respectively. A Forest Plantation and Recreational Park of about 80 ha has been established by the Balochistan Forestry and Wildlife Department on a peninsula in the lake. Part of the area has been planted with trees (mainly *Eucalyptus*) and some recreational facilities have been provided.

Management problems: Commercial fishing activities in the lake cause some disturbance to waterfowl populations.

Values: Since its creation in the early 1980s, the reservoir has rapidly become an important staging and wintering area for migratory waterfowl, including at least one threatened species (*Pelecanus crispus*). Mid-winter waterfowl counts .in the three years 1986/87 to 1988/89 ranged from 46,000 to 53,000. Thus the site clearly qualifies as a wetland of international importance under Ramsar Criteria 2a and 3a. The present mission also noted that the area is of some importance for breeding waterfowl, e.g. *Gelochelidon nilotica*.

Action required: The wetland should be designated as a Ramsar Site, and the unprotected portion in Balochistan given adequate protection as a Game Reserve or Wildlife Sanctuary. Conflicts between commercial fishing and waterfowl protection should be resolved, possibly through the creation of no-fishing zones in key waterfowl areas. Strict nature reserves should be created to protect breeding colonies of terns on small islands in the lake. The existing facilities at the Forest Plantation and Recreational Park should be expanded to include a visitor centre for conservation education.

3.2.11. Miani Hor (Sonmiani), Balochistan (38)

Site description: 60,000 ha; unprotected except for a small Forest Reserve of about 280 ha. A large shallow sea bay and estuarine system with several low-lying islands and extensive mangrove swamps and intertidal mudflats, separated from the adjacent Sonmiani Bay by a broad peninsula of sand dunes. The mangrove swamps are dominated by *Avicennia marina*, but include other species not found elsewhere in Balochistan.

Management problems: The principal threat is the cutting of mangroves for timber and fodder, but this does not appear to be very serious at present. Pollution is a potential problem, as there is some industrial development along the coast to the southeast.

Values: The site contains the best stands of mangrove forest along the coast of Balochistan. Unlike the mangroves of the Indus Delta, those of Miani Hor are unaffected by diversion of water supplies inland and consequent saline intrusion. No comprehensive censuses of waterbirds have ever been carried out, but it is clear that the site is of great importance as a staging and wintering area for a wide variety of shorebirds, gulls and terns. Flocks of *Phoenicopterus ruber* have been observed, and *Pelecanus crispus* has been recorded. Miani Hor thus qualifies as a wetland of international importance under Ramsar Criteria 1b and 3b.

Action required: The wetland should be designated as a Ramsar Site. The existing Forest Reserve should be extended to include a much larger portion of the mangrove forest, and one or more Wildlife Sanctuaries should be created in key wildlife areas. The entire area should be surveyed in detail, and a management plan drawn up to permit the exploitation of the mangrove resource on a sustainable basis. Any potential pollution problems should be investigated.

3.2.12. Ormora Turtle Beach, Balochistan (-)

Site description: Area unknown; unprotected. A sandy beach extending from the region of Kalmat to Ormara, on the shores of the Arabian Sea.

Management problems: There has been some illegal exploitation of turtles and their eggs, but this is reported to have been partly remedied. Feral dogs continue to cause some predation on the turtles.

Values: An important nesting beach for marine turtles. The site therefore qualifies as a wetland of international importance under Ramsar Criteria 2a and 2c.

Action required: The beach should be designated as a Ramsar Site and declared a Wildlife Sanctuary. The level of wardening should be improved, and some measures taken to reduce predation on the turtles by feral dogs.

3.2.13. Astola Island, Balochistan (48)

Site description: 600 ha; unprotected. A small, uninhabited island and nearby isolated rock, about 25 km off the Balochistan coast. This is the only significant offshore island along the north coast of the Arabian Sea.

Management problems: Feral cats are reported to be a .problem.

Values: Sandy beaches on the island are known to be important for nesting marine turtles, and there are old reports of sea-bird colonies. The waters around the island support a rich marine life, and cetaceans are reported to be common. The site qualifies as a wetland of international importance under Ramsar Criteria la, 2a, 2b and 2c.

Action required: The island should be designated as a Ramsar Site and declared a Wildlife Sanctuary. A detailed survey of the island's fauna and flora should be carried out, and efforts should be made to eradicate the feral cats. The island constitutes a natural marine field laboratory, and would be an ideal location for the establishment of a small marine research station.

3.2.14. Jiwani Turtle Beach, Baluchistan (-)

Site description: Area unknown; unprotected. A series of four sandy beaches on the shores of the Arabian Sea between Ganz and Jiwani.

Management problems: There is some predation on marine turtles by feral dogs. The illegal trapping of marine turtles for their shells and for the extraction of oil has recently been curtailed.

Values: The four beaches are important nesting sites for marine turtles, and the intervening sea-cliffs are used as roosting sites by large numbers of cormorants and gulls: Ospreys (*Pandion haliaetus*) are reported to be common. The beaches qualify as a wetland of international importance under Criteria 2a and 2c.

Action required: The beaches should be designated as a Ramsar Site, and given complete protection in one or more Wildlife Sanctuaries. Measures should be taken to reduce the predation on marine turtles by feral dogs.

3.2.15. Zangi Nawar Lake, Balochistan (44)

Site description: 2,070 ha; the main lake (1,060 ha) was declared a Game Reserve in 1982 and has since been upgraded to a Wildlife Sanctuary. A shallow, brackish, eutrophic lake and associated marshes surrounded by high, windblown sand dunes, in a desolate region of stony plains and barren rocky hills. At low water levels, the lake fragments into a chain of shallow lagoons, and during periods of drought, the wetland may dry out completely (e.g. between early 1985 and early 1987).

Management problems: The diversion of water supplies for irrigation in the catchment area has resulted in diminished water levels in the lake, especially during dry periods, and there is reported to be a considerable amount of illegal waterfowl hunting and trapping of reptiles in the Sanctuary.

Values: Zangi Nawar is a unique wetland ecosystem, supporting a great diversity of fauna and flora in an otherwise inhospitable desert landscape. It is a very important breeding area for the endangered Marbled Teal (*Marmaronetta angustirostris*) and several other waterfowl, and when water levels are high, can hold as many as 90,000 ducks and coots in mid-winter. The site clearly qualifies as a wetland of international importance under Ramsar Criteria la, 2a, 2b and 3a.

Action required: The wetland should be designated as a Ramsar Site. Wardening of the Sanctuary should be improved, and negotiations held with farmers in the catchment area to secure a better allocation. of water for the lake, especially, during dry years.

3.3. Other Potential Ramsar Sites

In its review of non-Ramsar sites in Pakistan, the mission identified a number of wetlands known, or thought to be, of international importance which might be eligible for designation under the Ramsar Convention, but which, for one reason or another, were unsuitable for immediate listing. In some cases, insufficient information was available to determine if the site did meet the Ramsar Criteria. In other cases, although the site was known to be of considerable importance, insufficient information was available on appropriate boundaries of the site, management problems and potential land-use conflicts to make any precise recommendations at the present time. Finally, in some cases it was clear that solutions would have to be found to existing management problems before any guarantees could be given as to the maintenance of ecological character.

The sites identified as being potentially suitable for designation as Ramsar Sites are described below, along with a brief reference to the action required before any final decision can be taken.

3.3.1. High altitude lakes and swamps in Northern Areas

There are known to be a number of lakes, swamps and bogs at high altitudes in the mountain ranges of northern N.W.F.P. and Azad Kashmir, including the very extensive moorlands and swamps of the Deosai Plateau (site 1 in the Pakistan Wetlands Inventory). However, very little information is available on these sites. Surveys are required to assess the importance of these wetlands, and to identify key sites for the establishment of protected areas. One or more of these wetlands may be suitable for listing under Ramsar.

3.3.2. Tarbela Reservoir, N.W.F.P. (2)

25,090 ha; unprotected. A large reservoir on the Indus River, created by one of the world's largest earth and rock dams. The reservoir, which was completed in 1974, is known to be of some importance for wintering waterfowl, but further surveys are required. Siltation rates are high, and there is reported to be considerable disturbance from fishing and boating activities.

3.3.3. Dera-Darya Bridge and Dhab Shumali; N.W.F.P. & Punjab (-)

Area unknown; partly protected in a Game Reserve. The construction of a causeway and bridge across the Indus River near Dera Ismail Khan in 1986/87 has resulted in the creation of a large new wetland consisting of permanent and seasonal freshwater lakes and marshes within retaining flood bunds. That portion of the wetland on the N.W.F.P. side of the river has been declared a Game Reserve, along with a considerable stretch of the west bank of the Indus to the north. Although hunting is theoretically permitted in the Game Reserve under license, no hunting licenses have as yet been issued. In the few years since its creation, the wetland has become a very important staging and wintering area for a wide variety of waterfowl, including cranes, and also supports breeding populations of some species. The Indus Dolphin (*Platanista indi*) still occurs in the Indus in this area, but is reported to be decreasing in numbers. The wetland also supports an important new fishery.

Dhab Shumali wetland is a large, eutrophic, freshwater lake and marsh on the west bank of the Indus about 30 km north of the Dera-Darya bridge. The wetland is fed by flooding from the Indus River, some two km away. A system of high bunds along the western edge retains water in the lake throughout the dry season. The wetland supports a luxuriant growth of aquatic vegetation, principally *Typha elephantina*, *Phragmites australis* and *Nelumbium nuciferum*, and is of some importance for breeding waterfowl. The mission was particularly impressed by the bird diversity in the area. Interesting observations included two Sind Jungle Sparrows (*Passer pyrrhonotus*) singing from tall *Phragmites* and bushes in the marsh, and two Indian Skimmers (*Rhynchops albicollis*) in display flights over sandy islands in the nearby river. The Sind Jungle Sparrow is a rare and poorly known species, confined to the middle and lower Indus valley in Pakistan and the extreme southeastern corner of Pakistan.

Further investigation is required at both sites to assess the full importance of these areas, and to determine what, if any, management is required. The Dera-Darya Game Reserve is said to extend for about 50 km upriver from the bridge, and must therefore include the west bank of the Indus adjacent to Dhab Shumali. Consideration should be given to extending the reserve to include the Dhab Shumali wetland, and upgrading all or key parts of the Game Reserve to Wildlife Sanctuary. Consideration should also be given to extending the reserve to include important wetland habitat on the Punjab side of the river.

The Dera-Darya wetland lies only about 12 km from the large town of Dera Ismail Khan, and is ideally suited for the development of a small visitor and conservation education centre with facilities for observing wildlife.

3.3.4. Mangla Dam, Punjab & Azad Kashmir (11)

26,500 ha; a Game Reserve. A deep water storage reservoir on the Jhelum River, in the foothills of the Pir Panjal Range. The dam was completed in 1967. The reservoir is a very important staging area for waterfowl, particularly Anatidae and shorebirds, and has held as many as 44,500 birds (January 1987). However, the numbers of birds are reported to have declined in the last few years because of heavy hunting pressure, including netting, trapping and poisoning of birds for sale in local markets. There is also reported to be a considerable amount of disturbance from commercial fishing, and some pollution from pesticides. Adequate measures should be taken to control waterfowl hunting, especially the use of traps, nets and poisons, and the problem of pollution from pesticides should be investigated.

3.3.5. Rasul Barrage, Punjab (12)

1,138 ha; declared a Wildlife Sanctuary in 1974 but recently downgraded to Game Reserve to accommodate hunting. A small water storage reservoir with associated marshes and sand banks, created by the damming of the Jhelum River for irrigation purposes. The reservoir was formerly a very important wintering area for waterfowl (e.g. 52,000 birds in January 1987 and 43,000 in January 1988), but in the last two years, most of the water has been released from the barrage in early winter, and few birds have been present at the time of the mid-winter waterfowl counts. Studies should be carried out to determine the effects of this change in the water regime, and the issue of hunting should be re-examined.

3.3.6. Marala Headworks & Bajwat Wildlife Sanctuary, Punjab (13)

Total area unknown, Marala Headworks 1,620 ha; partly protected within the Bajwat Wildlife Sanctuary (5,400 ha). Marala Headworks is a water storage reservoir on the Chenab River, constructed for irrigation purposes and now of considerable importance for wintering waterfowl (e.g. over 66,000 waterfowl in January 1987). The Bajwat Wildlife Sanctuary, upstream of Marala, includes a complex of natural riverine habitats along the Chenab River and two of its tributaries, extending up to the Indian border. The Sanctuary lies in a sensitive border zone, and is relatively inaccessible. No proper surveys have been carried out, although the area is known to be important for waterfowl such as *Anser anser, A. indicus* and *Tadorna ferruginea,* and a variety of mammals including Hog Deer and Nilgai. The only known threats are some illegal hunting. A detailed survey should be carried out to assess the full importance of the site.

3.3.7. Qadirabad Barrage, Punjab (14)

2,850 ha; declared a Game Reserve in 1978. A water storage reservoir on the Chenab River, surrounded by agricultural land. The reservoir is of considerable importance for wintering waterfowl (e.g. over 45,000 waterfowl in January 1987), but in the last two years most of the water has been released from the barrage in early winter, and few birds have been present at the time of the mid-winter counts. Heavy hunting pressure, including illegal hunting, is reported to be a threat. As with Rasul Barrage, studies should be carried out to determine the

effects of the recent change in water regime, and the problem of hunting pressure should be examined.

3.3.8. Kharal Lake, Punjab (16)

235 ha; declared a Wildlife Sanctuary in 1971 but recently downgraded to Game Reserve. A semi-natural, shallow, brackish to saline lake and associated marshes on the Indus plain to the south of the Ravi River. The lake was formed in the 1940s by waterlogging, and is fed by local run-off and seepage from adjacent irrigated land. The lake is a very important wintering area for waterfowl (e.g. over 66,000 birds in January 19871, and one of the few wetlands in Pakistan where the White-headed Duck (*Qxyura leucocephala*) winters in significant numbers (e.g. 48 in January 1987 and 30 in January 1990). The Marbled Teal (*Marmaronetta angustirostris*) has also been recorded. However, the lake is reported to have deteriorated in recent years because of excessive disturbance from fishing activities, the introduction of *Tilapia*, and a considerable amount of illegal shooting and netting of waterfowl for sale in local markets. Although the lake has been downgraded from a Wildlife Sanctuary to a Game Reserve, no hunting licenses have been issued, and there are plans to renotify the lake as a Wildlife Sanctuary later this year. The problems relating to fishing and illegal hunting activities should be resolved, the Game Reserve should be upgraded to a Wildlife Sanctuary as planned, and wardening should be improved. Consideration should be given to extending the boundaries of the reserve to include an area of marsh and wet grassland in the Renala Estate, some seven km to the northwest, as this provides excellent feeding habitat for waterfowl from the lake.

3.3.9. Patisar Lake, Punjab (19)

1,935 ha; included within the Lal Suhanra National Park, established in 1972. An old water storage reservoir with extensive marshes and many small islands, on the edge of the Cholistan Desert. The reservoir was formerly a very important wintering area for waterfowl, and supported a small population of Marbled Teal (*Harmaronetta angustirostris*), but increased siltation and the spread of aquatic vegetation (notably *Typha*, *Phragmites*, *Tamarix* and *Nelumbium*) has greatly reduced the extent of open water, and relatively few birds have been present in recent years. Several species of fish have been introduced into the lake, and fishing activities (including drawdown in winter) cause a considerable amount of disturbance. Conflicts with fisheries interests must be resolved, and a programme of management initiated. This should include control of the spread of aquatic vegetation and excavation of silt from some areas to restore deep-water habitats.

3.3.10. Ghazi Ghat, Punjab (-)

Area unknown; unprotected. A new wetland, created in 1984/85 with the construction of a causeway and bridge across the Indus River near Muzaffargarh. The wetland is very similar in general characteristics to the Dera-Darya wetland further north (see 3.3.3.) and is likewise reported to be an important staging and wintering area for migratory waterfowl. The area needs to be surveyed in detail, and should be considered for some form of protection.

3.3.11. Hamal Katchri Wetland, Sindh (24)

In excess of 50,000 ha; unprotected. A complex of shallow freshwater lakes and marshes on the west bank of the Indus, extending for almost 100 km from Kubo Said Khan to the region of Nasirabad. The wetland is known to be extremely important for wintering waterfowl, but no comprehensive censuses have ever been carried out. Plans exist to drain the wetland for agricultural . purposes when the proposed Right Bank Outfall Drain comes into operation. The wetland was formerly administered by the Forest Department as a Game Reserve, but this was denotified in early 1990, and the land has since been transferred to the Board of Revenue for sale to the Land Commissioner and distribution to local farmers. Studies should be carried out as soon as possible to assess the full extent and importance of the wetland, and to determine .the impact Of the proposed drainage scheme. Key sections of the wetland should be identified, and measures sought to conserve these in consultation with the drainage authorities.

3.3.12. Nara Canal Area, Sindh (27)

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Total area unknown; unprotected. A chain of some 200 small, permanent and seasonal, freshwater, brackish and saline lakes and marshes stretching for about 150 km along either side of the Nara Canal from Sorah in the north to Sanghar in the south. The region as a whole is known to be of great importance for wintering waterfowl and other wildlife, but few surveys and censuses have been carried out, except at a few of the southernmost lakes. Plans exist to drain some of the lakes for agricultural purposes. Further surveys are required to identify key sites for protection and management.

3.3.13. The Outer Indus Delta, Sindh (42)

Approximately 300,000 ha including some 200,000 ha of mangroves; partially protected in two large Protected Forests. A vast complex of tidal river channels and creeks, low-lying sandy islands, mangrove swamps and intertidal mudflats along the outer edge of the Indus Delta. The mangroves are under considerable pressure from over-exploitation for fodder, fuel and timber, industria1 and domestic pollution, and saline intrusion as a result of reduced inflow of freshwater from the Indus River. At the time of the mission’s visit to the delta, there was no surface flow whatsoever in the main channel of the Indus east of Karachi; 100% of the flow of this mighty river had been diverted for man’s use upstream.

The problems are particularly acute in the northwestern part of the delta near Karachi. Several programmes are, however, underway to address some of these problems, e.g. the mangrove replanting programme of Sindh Forestry Department, a long-term IUCN/UNEP project for the management of the mangrove ecosystem in the delta, and the recent initiative by WWF Pakistan. In the present context, the most urgent need is for a comprehensive survey of the mangrove forests of the delta to identify key sites for special protection and perhaps eventual listing under the Ramsar Convention. Such sites are most likely to be in the remote southeastern parts of the delta, where the impacts of pollution, forest exploitation and saline intrusion are lowest.

3.3.14. Pasni Bay and Shadi Kaur, Balochistan (47)

Area unknown; unprotected. A 13 km stretch of rocky shores and sandy beaches in Pasni Bay, and the extensive intertidal mudflats in the creek system of Shadi Kaur. Marine turtles are known to nest on a small beach near Ras Jaddi, and the whole area is thought to be an

important staging and wintering area for waterfowl, notably Dalmatian Pelicans (*Pelecanus crispus*) and shorebirds. Some persecution of pelicans and marine turtles has been reported, and a major fishing port is being developed at Pasni. Further surveys are required, and an environmental impact assessment of the port development at Pasni should be carried out.

3.3.15. Kalmat Khor, Balochistan (-)

Area unknown; unprotected. A large creek system with mangrove swamps and mudflats on the coast of Balochistan between Pasni and Ormora. The area is known to be important for migratory shorebirds and supports a significant prawn fishery, but no detailed surveys have been carried out. No threats are known to the system. A detailed study should be carried out to assess the suitability of the site for the establishment of a protected area, and possible listing under Ramsar.

3.4. Other Wetlands in Pakistan

Most of Pakistan’s other significant wetlands were considered by the mission. These may be grouped into four categories.

(1) Sites which are known or thought to have been of international importance in the past, and are described in the Directory of Asian Wetlands, but which have suffered, or are likely to suffer, serious detrimental changes in ecological character as a result of man's activities. Several of these sites have already deteriorated to the extent that complete restoration would now be extremely difficult if not impossible. In the case of some of the more economically important wetland ecosystems, such as Korangi and Gharo creeks systems near Karachi, every effort should be made to maintain and restore as much of the system as possible, but it is unlikely that all management problems will be resolved to the extent at which listing under Ramsar becomes appropriate.

- Nammal Lake, Punjab (7)
- Ghamaghar Lake, Punjab (15)
- Kalar Kahar Lake, Punjab (*)
- Manchar Lake, Sindh (26)
- Hadero Lake, Sindh (34)
- Hawkes Bay/Sandspit, Sindh (39)
- Clifton Beach, Sindh (40)
- Korangi and Gharo Creeks, Sindh (41)
- Beroon Kirthar Canal, Balochistan (22)
- Bund Kushdil Khan, Balochistan (43)

(2) Sites with specific problems relating to water supply, land tenure, disturbance, etc. Further study is required to determine the. importance of the sites, the extent of any management problems, and the suitability of the sites for protection and/or listing under the Ramsar Convention.

- Islam Headworks, Punjab (18)
- Ghauspur (Rup) Jheel, Sindh (21)
- Pugri Lake; Sindh (25)

- Tando Bago Lakes, Sindh (29)
- Mahboob Shah Lake, Sindh (32)
- Siranda Lake, Balochistan (37)

(3) Poorly known sites which may or may not be of international importance. A considerable amount of further study is required before the true significance of these sites can be determined.

- Khipro Lakes, Sindh (28)
- Akara Dam, Balochistan (45)
- Dasht Kaur, Balochistan (46)

(4) Sites of only regional or national importance, rather than international importance. Some of these sites may be suitable for protection, management and development for conservation education, and should certainly not be neglected by the appropriate provincial and regional authorities.

- Rawal Lake, Capitol District (-)
- Baran Dam, N.W.F.P. (5 part)
- Chah Baliwala Dhand (Paharpur), N.W.F.P. (-)
- Langh Lake, Sindh (*)

All four of these sites were visited by the mission, and merit some additional remarks.

3.4.l. Rawal Lake, Capitol District (-)

Area unknown; protected within an isolated section of the Margalla Hills National Park. A small water storage reservoir with some associated freshwater marshes, adjacent to a large area of protected woodland on the outskirts of Islamabad. The reservoir is of considerable importance for wintering waterfowl (mostly *Anas platyrhynchos*); it is scenically attractive and within very easy reach of Islamabad and Rawalpindi. It is a popular area for outdoor recreation including boating and sport fishing, and offers an ideal opportunity for the development of a conservation education centre and nature reserve with sophisticated facilities for the general public. A large area of marsh at the northwest corner of the reservoir would be suitable for management as a strict nature reserve to provide disturbance-free areas for waterfowl; a smaller area of marsh at the northeast corner would make an ideal site for a visitor centre and other facilities for the general public. Potential conflicts between boating, angling and nature conservation could be resolved through careful zoning.

3.4.2. Baran Dam, N.W.F.P. (5 part)

1,554 ha; unprotected. A large water storage reservoir constructed for irrigation purposes, in semi-arid hills southwest of the Kurram River near Bannu. The reservoir is fed by a canal from headworks on the Kurram River. Much of the shoreline is steeply shelving and stony, and there are few if any areas of -permanent marsh. The reservoir is of some importance as a staging and wintering area for migratory waterfowl, and is a major centre for crane hunting, particularly in spring.. The migrating cranes do not, however, utilize the reservoir. Further

studies should be carried out at the reservoir, and ongoing efforts to regulate crane hunting in the region should be expanded.

3.4.3. Chah Baliwala Dhand (Paharpur), N.W.F.P. (-)

Approximately 350 ha; unprotected. A fresh to brackish marsh on waterlogged soils, dominated by *Typha* and *Tamarix* and fed by seepage from an irrigation canal which flows through the middle of the marsh. The wetland is of some importance for both breeding and wintering waterfowl, but the spread of emergent vegetation is reducing the extent of open water and resulting in a decline in the numbers of wintering waterfowl. Further studies should be carried out to determine if the marsh is suitable for the establishment of a protected area, and what management measures would be required to improve the habitat for waterfowl.

3.4.4. Langh Lake, Sindh (*)

19 ha; declared a Wildlife Sanctuary in 1972. A small freshwater lake and marsh on the Indus plain, formerly a dead arm of the Indus River, now fed by surplus water from an irrigation canal. The lake has silted up and become overgrown with dense stands of *Typha* and *Scirpus*. It now only floods briefly during the monsoon, and is dry for the rest of the year. In the mid 1970s, Langh was a very important wintering area for waterfowl, supporting some 40,000 to 50,000 ducks and coots in mid-winter. Sindh Wildlife Management Board has recently initiated a management plan to restore the lake. Deeper parts of the lake bed will be excavated and the earth used to raise surrounding bunds. The vegetation will be cut back to create more open water areas, and supplementary feeding will be provided for the wintering birds. An agreement has already been made with the Irrigation Department for an adequate supply of water to be made available during the dry season.

4. PROJECT DEVELOPMENT

Some priorities for action in the fields of survey, protection, management or conservation education were identified at virtually every site considered by the mission. In many cases, the action required is relatively straightforward, e.g. upgrading the status of a protected area, improving wardening, carrying out further surveys and censuses, and resolving conflicts with fishing and hunting interests. Such activities can be carried out by the relevant provincial and regional authorities without any special assistance from outside. However, many of the priorities identified by the mission would require the elaboration of major projects involving high levels of expertise and substantial funding. It was impossible during the short time available to develop any of these ideas beyond the barest project concept stage.

Four major areas for project development were identified.

1. Survey and inventory
2. Training
3. Conservation education and awareness
4. Management planning.
5. Institutional strengthening

4.l. Survey and Inventory

The Pakistan Wetlands Inventory, as published in the Directory of Asian Wetlands, is a compilation of the information available on- the wetlands of Pakistan up to early 1988. One of the major values of this compilation was that it identified those regions and wetlands which remained poorly known and in need of further survey. Some of these areas have subsequently been surveyed, and a great deal more information has become available on many of the better known sites, but there are still many areas which remain poorly known. These areas should be surveyed as soon as possible, and an updated version of the Pakistan National Wetlands Inventory produced for publication in Pakistan. This would incorporate updated accounts of all the sites of international importance (including several new sites such as Dera-Darya Bridge wetland not mentioned in the Directory of Asian Wetlands), and would also include information on a number of wetlands of only national importance (e.g. Rawal Lake).

Priority areas for field surveys are as follows:

- The course of the Indus River from Kalabar to the sea; to identify the best remaining areas of natural riverine vegetation.
- The Indus Delta mangrove forests; to identify key areas for protection.
- The Nara Canal Area; to identify key areas for protection and management.
- The coastal wetlands of Balochistan, including Miani Hor, Astola Island, Pasni Bay, Kalmat Khor and Dasht Khor.
- High altitude lakes, swamps and bogs in Northern N.W.F.P. and Azad Kashmir; to identify key areas for protection.

Other priority sites for further field surveys include Tarbela Reservoir, the Dera-Darya Bridge and Dhab Shumali wetlands, the Marala Headworks and Bajwat wetlands, the new Ghazi Ghat wetland, and Hamal Katchri wetland.

The major requirements for this work would be travel costs, per diems and some equipment for field workers. Qualified staff are available to carry out most of the work, but a technical advisor would be required on a short-term basis to organize and initiate the inventory work, provide some specialized training for field personnel, and assist in the compilation of data for eventual publication.

4.2. Training

Personnel of the various government forest and wildlife departments, research institutions and non-governmental conservation bodies are generally well trained in survey and research techniques. There is, however, a widespread shortage of experienced wetland managers and specialists in conservation education and awareness. Both formal and informal training is required in these fields. Formal training would involve enrolling Pakistani students in appropriate MSc courses at universities abroad. Informal training would include specialist training course in Pakistan, using visiting lecturers from abroad, and participation by Pakistani students in appropriate training-courses abroad.

4.3. Conservation education and awareness

It is recommended that programmes for conservation education and awareness be developed at the following wetlands:

- Rawal Lake, Capitol District
- Tanda Dam, N.W.F.P.
- Dera-Darya Bridge wetland, N.W.F.P. and Punjab
- Chashma Barrage, Punjab
- Drigh Lake Wildlife Sanctuary, Sindh
- Haleji Lake, Sindh
- Hub Dam, Balochistan

At each site, this would involve the construction of a visitor/conservation education centre, nature trails, observation hides and related facilities. Initially, a considerable amount of outside expertise would be required to set up these facilities and give on-the-job training to local staff. Other requirements would include audio-visual aids, educational materials and other specialized equipment.

4.4. Management planning

Ideally, management plans should be prepared for all of the Ramsar Sites as well as other protected wetlands in Pakistan. Initially, it is recommended that priority be given to developing management plans at a selection of Ramsar Sites representing a cross-section of Pakistan's wetland ecosystems. These management plans could then be used as models for the development of management plans at many other wetlands.

The following six existing or proposed Ramsar Sites would be suitable for immediate consideration:

- Taunsa Barrage, Punjab: barrage system on the Indus
- Khabbaki, Ucchali and Jahlar Lakes, Punjab: natural brackish to saline lakes
- Drigh Lake Wildlife Sanctuary, Sindh: freshwater lake/marsh on the Indus plain
- Jubho Lagoon, Sindh: brackish lagoon system in the inner Indus Delta.
- Miani Hor, Balochistan: mangrove/mudflat ecosystem
- Zangi Nawar Lake, Balochistan: a desert lake

In each case, an expert or team of experts would be required on a consultancy basis to assist local reserve staff in the development and implementation of a management plan for the wetland. Training in wetland management techniques would be an integral component of the projects at all six sites.

4.5. Institutional strengthening

The Government of Pakistan and the Provincial Governments have given and continue to give a considerable amount of support to the departments and institutions concerned with environmental protection and nature conservation. Thus the provincial forest and wildlife departments and research institutions are generally well staffed and well equipped. However, there remains a shortage of some types of technical equipment (e.g. vehicles, boats, laboratory equipment, binoculars and telescopes) and literature which are expensive or

difficult to obtain in Pakistan. The provision of such materials by the international community would greatly increase the efficiency of the field staff in Pakistan.

5. SUMMARY OF RECOMMENDATIONS

5.1 The following Ramsar Sites should be retained on the Ramsar List:

- Thanedar Wala Game Reserve, N.W.F.P.
- Khabbaki Lake, Punjab
- Drigh Lake Wildlife Sanctuary, Sindh
- Haleji Lake, Sindh
- Kinjhar Lake, Sindh

In all cases, there are some management problems which need to be resolved.

5.2. The following Ramsar Sites should be delisted, as they do not, and never did, qualify as wetlands of international importance on the basis of the Ramsar Criteria:

- Kheshki Reservoir, N .W .F .P.
- Tanda Dam, N.W.F.P.
- Kandar Dam, N.W.F.P.
- Malugul Dhand, N.W.F.P.

5.3. The following sites are suitable for immediate listing under the Ramsar Convention:

- Chashma Barrage, N.W.F.P. & Punjab
- Taunsa Barrage, Punjab
- Ucchali Lake, Punjab (to be included in the Khabbaki Lake Ramsar Site)
- Jahlar Lake, Punjab (to be included in the Khabbaki Lake Ramsar Site)
- Indus Dolphin Reserve, Sindh
- Nurr-ri Lagoon, Sindh
- Jubho (Kur) Lagoon, Sindh
- Kalka Channi (Kalkan Wari Chand) Lagoon, Sindh
- Lakharann Lagoon, Sindh
- Hub Dam, Balochistan & Sindh
- Miani Hor, Balochistan
- Ormora Turtle Beach, Balochistan
- Astola Island, Balochistan
- Jiwani Turtle Beaches, Balochistan
- Zangi Nawar Lake, Balochistan

Existing protected areas should be upgraded or extended at Chashma Barrage, Taunsa Barrage and Hub Dam. New protected areas (Wildlife Sanctuaries or Game Reserves) should be established at the following sites: Jahlar Lake, Nurr-ri , Jubho, Kalka Channi, Lakharann, Miani Hor, Ormora Turtle Beach, Astola Island and Jiwani Turtle Beaches. Some management problems are present at all but four of these candidate Ramsar Sites and would eventually need to be resolved, but none is critical at the present time.

5.4. The following sites are known or thought to be of international importance, and might be considered for listing under the Ramsar Convention. However, further studies are required, and in some cases serious management problems need to be resolved.

- High altitude lakes and bogs in northern N.W.F.P. and Azad Kashmir: study
- Tarbela Reservoir, N.W.F .P.: study
- Dera-Darya Bridge and Dhab Shumali, N.W.F.P. & Punjab: study
- Mangla Dam, Punjab & Azad Kashmir: management problems
- Rasul Barrage, Punjab: management problems
- Marala Headworks and Bajwat, Punjab: study
- Qadirabad Barrage, Punjab: management problems
- Kharal Lake, Punjab: management problems
- Patisar Lake, Punjab: management problems
- Ghazi Ghat, Punjab: study
- Hamal Katchri , Sindh: study, management problems
- Nara Canal Area, Sindh: study
- Outer Indus Delta, Sindh: study, management problems
- Pasni Bay and Shadi Kaur, Balochistan: study
- Kalmat Khor, Balochistan: study

5.5. The mission reviewed the status of a further 23 wetlands, and concluded that they were unsuitable for consideration as potential Ramsar Sites at the present time.

5.6. Five priority areas for project development were identified.

- Survey and inventory work, preparatory to the publication of an updated version of the Pakistan National Wetlands Inventory.
- Training of local personnel, especially in wetland management and conservation education techniques.
- Development of conservation education and awareness programmes at seven key sites.
- Development of management plans at six Ramsar Sites and Candidate Ramsar Sites which present a cross section of Pakistan’s major wetland ecosystems.
- Institutional strengthening.

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[Appendices not included here]

APPENDIX 1: CRITERIA FOR IDENTIFYING WETLANDS OF INTERNATIONAL IMPORTANCE