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REPORT ON AN AERIAL SURVEY

9-11 September 1988

WITH NOTES ON WETLAND SITES AND A PROPOSED MARINE TURTLE CONSERVATION PROJECT

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5077a/G/Jan 1989

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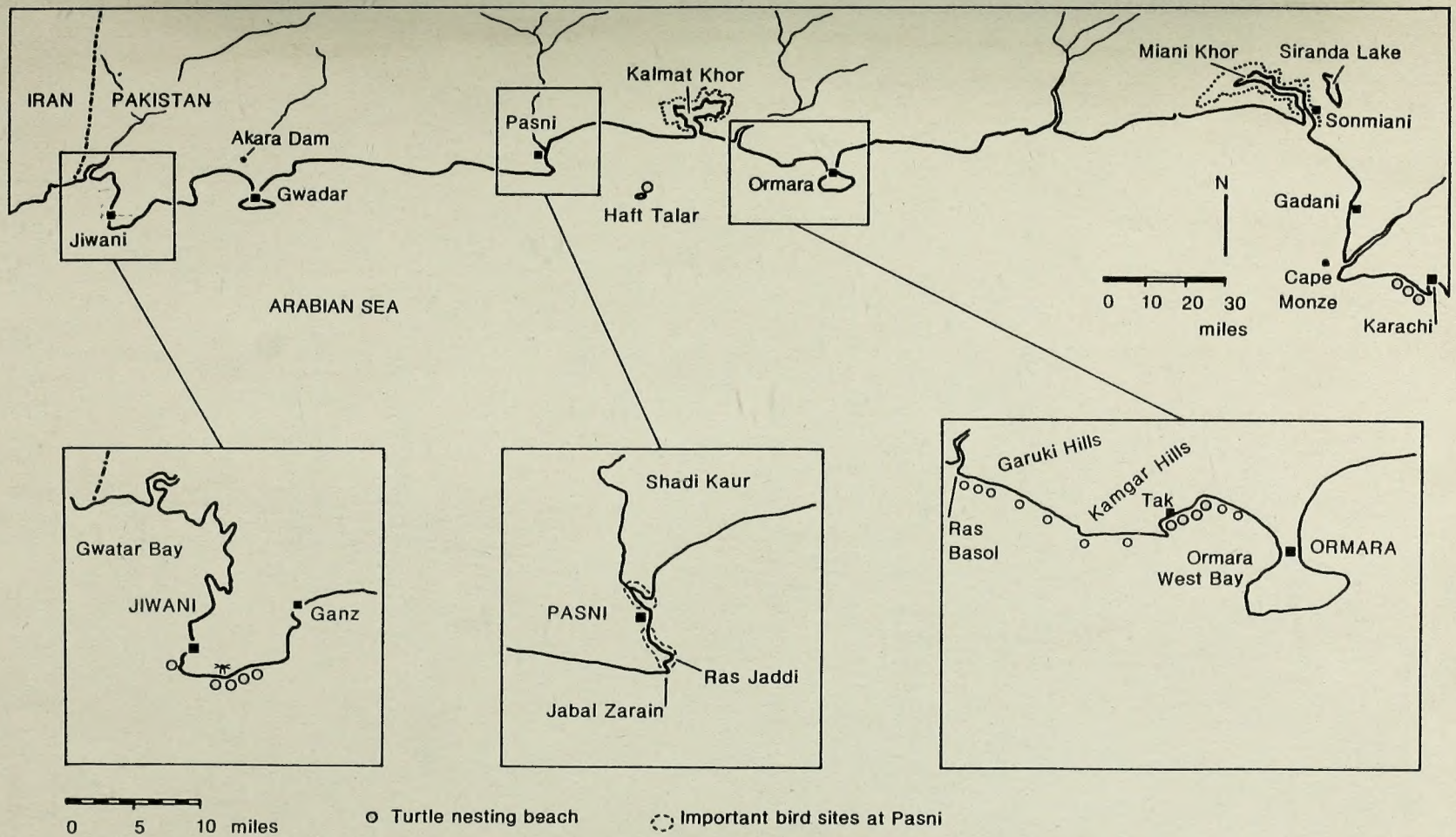

THE MAKRAN COAST, BALUCHISTAN (PAKISTAN) SHOWING MARINE TURTLE NESTING BEACHES AND KEY WETLANDS

CONTENTS

SUMMARY

Until recently, most information on marine turtles in Pakistan concerned the important Green Turtle *Chelonia mydas* nest beach at Karachi. A brief ground survey in January 1987 confirmed that important *C. mydas* nesting also occurred at Ormara and Jiwani in Baluchistan, with very minor nesting elsewhere in the Province. Most of the Baluchistan coast, which extends for around 420 miles (700 km), appeared to provide suitable nesting habitat and further investigation was required to locate any undiscovered nest beaches. An aerial survey, which took place on 9-11 September 1988, confirmed that important nesting occurs along the western shores of Ormara West Bay and along the southern coast of the Jiwani Peninsula, where an additional four nest beaches were discovered. Sparse but significant nesting occurs between Ormara West Bay and Ras Basol. Important nesting also occurs on the island of Haft Talar (not covered by the aerial survey), but with the exception of a few isolated nests, the entire remainder of the Baluchistan coast is devoid of turtle nesting. The main nest beaches in Baluchistan have now been located and it is now known where the major conservation measures must be directed.

The Baluchistan nesting populations have been subject to intense exploitation, dating on Haft Talar from at least the last century; a former population at Sonmiani appears to have been extirpated. A comprehensive marine turtle conservation programme is required, to include monitoring of nesting numbers and seasonality and a ban on exploitation.

The coast of Baluchistan provides important passage and wintering habitat for Palaearctic migrant waterbirds, and breeding colonies of Sooty Gull and Large Crested Tern exist on Haft Talar; Crab Plover have been recorded. Pasni has a great variety of wetland habitats available, and is perhaps the most important single bird area yet identified on the coast; the areas north and south of Pasni town require protected area status and future planning decisions should take account of the natural values of the region. The bird populations require detailed assessment. The saline lagoons of Kalmat Khor and Miani Khor are important for local fisheries and mangrove vegetation; their significance for waterbirds requires further investigation.

INTRODUCTION

Pakistan has long been known to support a large and globally-important population of Green Turtle Chelonia mydas, nesting at Hawkes Bay and Sandspit beaches on the outskirts of Karachi, Sind Province. Sparse references in literature from the late nineteenth century onward, and occasional unpublished reports, suggested that some C. mydas nesting occurs on the remote and near-pristine coast of Baluchistan Province (the Makran Coast), which, some 420 miles (700 km) in extent, comprises around 75% of the Pakistan coastline.

Literature sources reported marine turtle nesting at Jiwani (= Ras Jiunri; Shockley, 1949), Haft Talar (= Astola Island; Butler, 1877) and the Sonmiani area (Snead, 1966). Unpublished reports from 1975 suggested that mass nesting, and mass commercial exploitation, occurred at Ormara. A preliminary survey on 19-22 January 1987 of beaches near the four main towns on the Makran coast (Groombridge, Kabraji and Rao, 1987; reproduced here as Annex 1) confirmed that large numbers of marine turtles, seemingly all C. mydas, still nest on parts of the Baluchistan coast. Many nests were seen on the beach at the foot of the 'Lighthouse Cliff' at Jiwani. Extensive nesting was recorded on the beach at the foot of the Kamgar Hills on the western side of Ormara West Bay, with sparse nests also along the northern margin of the same bay. Sparse nesting was recorded at Gwadar, where a number of beaches on the Gwadar headland were examined, and at Pasni, where the beach between the Shadi Kaur and Ras Jaddi was examined. For further details and references see Annex 1.

The evidence gathered during the preliminary 1987 beach survey confirmed that important populations of C. mydas nest in Baluchistan, and suggested that overall numbers are comparable to, or greater than, the large population nesting at Karachi. Because most of the Baluchistan coast superficially appeared suitable for turtle nesting, and because a brief ground survey had revealed nesting populations of such importance, further survey work was considered essential. The decision was taken to carry out an aerial survey, which is the only practical means of examining such an extensive coastline, much of which is virtually inaccessible overland, within a limited period of time. The primary aim of the project was to locate and evaluate any

undiscovered turtle nesting beaches; the secondary aim was to locate and evaluate so far as possible other important sites for conservation, notably coastal wetlands suitable for migratory birds and other waterfowl.

METHODS

A 1950s De Havilland 'Beaver' (AP-AVJ) was hired from the Government Department of Plant Protection. This is a high-wing aircraft, with a nine-cylinder radial engine, adequate seating capacity, and the ability to maintain a suitably low airspeed without stalling. The crew comprised Captain Humayun Naseer (Senior Pilot), Captain H. Saeed (Operational Pilot), and an Engineer. Observers were Mr Abdul Latif Rao and the author. An officer from Naval Intelligence and a cameraman accompanied the flight.

A cruising speed of 100-110 mph was maintained, at a height of 50-100 ft and a similar distance seaward from the beach. One observer continually searched the beach for turtle tracks and nest pits, and periodically scanned inshore waters for turtles and other objects of interest. Progress along the coast was monitored on a series of medium-scale maps (quarter inch to the mile) on which the location and nature of all significant observations were marked as they were made. Visibility along the coastline was good throughout, although sometimes poor at sea.

ROUTE

Day 1: 9 September 1988; Karachi to Pasni; take-off 08.10, land 11.21.

Day 2: 10 September; Pasni to Jiwani and vicinity of border with Iran, return to Pasni; take-off 09.13, land 12.34.

Day 3: 11 September; Pasni to Karachi; take-off 08.59, land 11.32.

High water at Karachi was at 10.05 and 21.52 on Friday 9 September, and some 20 minutes earlier at Pasni; low water at Karachi was 03.28 and

16.02. The survey was thus mostly carried within two hours either side of high tide. Tidal amplitude was around 7 ft in the morning and 4.5 ft in the afternoon. With the minor exceptions noted below, the entire coast of Baluchistan Province was scrutinised at low level and on two occasions, once in a westward direction, and once on the return journey eastward.

At the start of Day 1 the flightpath westward from Karachi crossed the southern tip of the Kirthar Range and intersected the Baluchistan coast a little north of the Hab River mouth (the Provincial boundary) and south of Gadani. At the end of Day 2 the aircraft turned back near the Dasht River mouth, just short of the Iran border. Small sectors of coast, each about five miles in length, were thus omitted in the extreme east and extreme west.

The seaward sides of the precipitous rock headlands at Ormara and Gwadar were also omitted: at the latter site, the preliminary 1987 survey found evidence for extremely sparse nesting on the very limited beach habitat available; there is reportedly very little beach habitat at Ormara. Exclusion of these areas from the aerial survey is thus unlikely to have excluded turtle nesting of any significance.

Haft Talar (= Astola) was not surveyed: at the end of Day 1 the island could not be sighted due to poor visibility offshore; on the following day, the island could not be included in flight plans cleared by aviation control at Pasni. Rao had visited the island by boat in January 1988, so some recent information on turtle nesting is available (see below).

A stretch of coast about five miles long, extending westward from the mouth of Miani Khor, and a similar portion west of the mouth of Kalmat Khor, were omitted during the westward leg of the journey but were examined during the eastward leg.

RESULTS: MARINE TURTLES

A concise account of the coastal physiography of Pakistan, including Baluchistan, is provided by Snead (1969). This account remains

extremely useful and essentially accurate; the present report accordingly omits detailed description of coastal morphology.

The main finding can be summarised very briefly: concentrated turtle nesting was observed only at Ormara (west side of Ormara West Bay) and around the Jiwani Peninsula. These areas had already been identified as important nesting sites during the preliminary 1987 survey, although four additional beaches at Jiwani were located from the air. More diffuse nesting was found on the north side of Ormara West Bay and on the coast west of the main Ormara sites, particularly between Ras Sikani and Ras Basol.

Elsewhere only a very few isolated nest pits or tracks were seen. Three nest pits and nine sets of tracks were seen on a small 'pocket beach' about 10 miles west of the Hingol mouth, and two tracks, both 'U-turns', some 25 miles further west. Four nest pits and two 'U-turns' were present on five miles of coast west of Jabal Zarain (Pasni), a further two 'U-turns' some three miles east of Jabal Sur, and another two four miles east of Gwadar.

Jiwani Peninsula

The beach below the mile-long lighthouse cliff, southeast of Jiwani town, was visited during the 1987 ground survey. Some 400 sets of C. mydas tracks and abundant nest pits were seen on the half-mile section closely examined, which, combined with local reports of mass nesting in summer (probably, but not certainly, by the same species), suggested that the annual nesting contingent may number in the low hundreds. Kabraji (in litt., 29 December 1987) recorded 124 sets of tracks (seven fresh) on the lighthouse beach at Jiwani on 18 December 1987; the lighthouse chowkidar re-affirmed that nesting is highest in June-July and lowest in December.

The present aerial survey revealed that there are four additional nest beaches along the south and south-west margin of the Jiwani Peninsula, three to the east of the lighthouse beach and one to the west. The total length of nesting beach may approach four miles. The lighthouse beach together with the three further to the east, are separated by only short sections of cliff. The western-most beach is about one mile

west of this set of beaches. All the Jiwani nest beaches are remote and, being at the foot of tall cliffs, difficult of access; the Jiwani Peninsula itself is very sparsely populated. There is no nesting in the vicinity of Jiwani town, nor further west toward the border with Iran, where the littoral is extremely flat, low-lying and silty.

Some 300 sets of fresh and recent tracks were visible on the Jiwani beaches, but nest pits were much too dense to count. Overall, it seems likely that the annual nesting contingent on the five beaches at Jiwani is similar in size to that at Ormara.

Haft Talar (= Astola)

As noted above, this island was not surveyed from the air. It was visited by Mr A. L. Rao and Mr Amjad of the Baluchistan Forest Department on 20 December 1987. The island, which approaches three miles in length, by one mile width, is mainly rocky and precipitous, but one mile-long beach on the western sector of the north coast held dense Green Turtle nesting. According to Rao (pers. comm., 9.09.88), the nesting density on the Haft Talar beach was similar to the highest density part of Hawkes Bay-Sandspit beach at Karachi. Incidental catch appears to be a problem in surrounding waters, and one Green Turtle was released from nets during Rao and Amjad's visit.

Ormara region

Evidence of nesting was distributed along some 20 miles of coastline, from midway along the northern margin of Ormara West Bay westward past the Kamgar Hills and Ras Sakanni to Ras Basol. Dense nesting was taking place on the stretch of beach identified as a major Green Turtle site during the 1987 survey (Groombridge, Kabraji and Rao, 1987). Most nesting was evident on a stretch some two miles in length, situated around the village of Tak and extending north, with maximum density on about a mile of beach nearest to Tak. One section next to Tak, estimated at around 500 yards in length, was partly separated by an exposure of rocks on the foreshore, and was more sharply curved and more steeply sloping than the remainder.

Nesting density was very high on a stretch of about one mile in the vicinity of Tak, and high on another mile. Much of the beach was totally covered with nest pit excavations, and in the zone of highest density some clutches must have been lost owing to re-excavation of nests by later arrivals. However, the aerial survey demonstrated that nesting effort was more sparsely distributed over the remaining sections of nest beach than had been assumed during the 1987 ground survey, along the northern margin of Ormara West Bay, and south from Tak to the rock spur and sand bar forming the southwestern limit of the bay.

Owing to the high nesting density, it was impossible to count nest pits, and although the evidence seen during the 1988 aerial survey does not confirm that nesting numbers were as high as the projection made on the basis of the limited ground survey in 1987, the nesting population is certainly large. In January 1987, a sample beach transect in a zone of maximum density had suggested that some 2000 females may have nested in the season then ending.

West of Ormara West Bay, there is sparse nesting along some 15 miles of the coast, extending west to Ras Basol. There is a narrow coastal plain along the southern edge of the Kamgar Hills, and a much wider plain along the southern edge of the Garuki Hills, the latter aligned immediately north-west of the former. Nesting was least sparse near the western outcropping of the Garuki Hills, just to the east of Ras Basol, where some 80 nest pits were counted on a stretch of beach about two miles in length.

Turtle nesting numbers

No figures are yet available for nightly nesting density at any of the Baluchistan sites. Nesting density can be assessed in a qualitative manner from the overall concentration of nest pits and the density of fresh emergence tracks, which can both be compared with the Karachi nesting population, and from reports given by local inhabitants and others. Following the preliminary ground survey, the Jiwani annual nesting population was estimated to number, at minimum, in the low hundreds, and the Ormara population in the region of 2000. Although the Karachi population remains incompletely known, around 1500 nests

are laid annually on the 5 km (3.1 miles) stretch which is most-patrolled and where nesting is most dense (Kabraji and Firdous, 1984); this could correspond to an annual nesting contingent of some 500 females, and the entire 20 km (12.4 miles) beach might support in the region of 2000 females per year. On the night of 8 September 1988 five females were nesting simultaneously on one stretch of some hundred yards, and more were visible in the surf (pers. obs.). By comparison with this site, it can be estimated that the major Baluchistan nest beaches, at Ormara, Jiwani and Haft Talar, together support nesting of at least similar importance, while Ormara and perhaps Jiwani may individually compare with Karachi in nesting numbers. For example, reportedly "many thousands" of turtles were slaughtered at Ormara alone during 1975.

Sonmiani: a lost nesting population ?

Snead (1966) recorded that sea turtles weighing 400-500 lbs crawl ashore to nest on the Las Bela coastal plain (turtles of this weight would be *C. mydas* rather than the other possible nesting species, *Lepidochelys olivacea*). Rao (pers. comm.) was told by inhabitants of the Sonmiani area that turtles nest or nested until recently in the area. Mr Ghani Barlas reported (pers. comm., 7.09.88) that his organisation (Barlas Corporation) and its sister company (Kaiser Corporation), harvested sea turtles for the leather trade during the 1970s, and during conversation the only sea turtle nesting area he mentioned by name (as opposed to reference to the Baluchistan coast in general) was Sonmiani. This area is very close to Karachi and has good road links to it; it seems a safe assumption that one of the nesting populations exploited by these traders was located in the Sonmiani region.

During the present aerial survey, no signs whatsoever of nesting were observed in the Sonmiani region. It may be possible that nesting occurs at some other time of year, but it seems most unlikely that nesting would be so completely out of step with that elsewhere in Baluchistan and at Karachi; further, even if nesting had occurred at some other time of year, some traces of old nest pits would probably have remained.

This evidence suggests that a sea turtle population nested in the Sonmiani area until at least the 1970s, but no longer does so, and commercial exploitation is probably implicated in its apparent disappearance.

Turtle nesting habitat

Close examination shows that, although most of the Baluchistan coast is lined with sand beaches, the total length that is well suited to turtle nesting is somewhat limited. Turtle nesting is correspondingly limited, and vast stretches of coast between the sites previously examined during the brief 1987 ground survey do not support nesting of any significance.

Long stretches of beach are backed by high near-vertical cliffs and are only a few yards wide at high water; these are likely to be too narrow to allow successful nesting. Some beaches are similarly narrow, and are backed by sandy plains or dune systems where nesting might be possible, but are separated therefrom by a short but very steep ridge or escarpment which would make access difficult. Long stretches of beach appear very silty, with only a small depth of sand covering the underlying mud substrate, which can often be seen washing into the sea; such areas are likely to have an insufficient depth of sand to permit nest excavation and suitable conditions for egg incubation.

On the other hand, between one-third and one-half of the 420 mile (700 km) Baluchistan coastline appeared to provide entirely suitable conditions for turtle nesting, but none was observed.

Access by shipping to the Makran coast is very limited owing to shoaling and the general lack of deep-water approaches (Anon, 1905), and it is possible that this may deter turtles from using certain stretches of coast. The geology and tectonic instability of the region may also exert some effect on turtle populations. The sea in parts of the Makran is said to become discoloured and foul-smelling at different times of year:

> "this discolouration, which looks as if a preparation of thick reddish brown soap and water had been diffused in the sea, occurs

in large isolated patches, sometimes in streams and sometimes as far as the eye can reach. No one knows the cause but all fish which enter the discoloured water are killed and the discolouration generally travels towards the shore" (Anon., 1907).

It is likely that the presence of mud volcanoes in parts of the Makran (e.g. the Dhak plains east of Ormara), frequent sulphur springs in the hills, and tectonic instability, are interrelated, and these phenomena may have some bearing on water and beach quality and hence on turtle populations in the region.

Turtles at sea

About a dozen turtles, all large Chelonia mydas, were seen at sea near the nest beaches on Ormara West Bay. Although a few turtles were seen off the lighthouse beach at Jiwani in 1987, none were seen during the aerial survey, but most attention was directed at the beaches rather than adjacent waters.

Elsewhere along the coast, no turtles were seen at sea in inshore waters. No areas that could with certainty be identified as seagrass beds, or algal beds, were located, although dark patches on the sea bed scattered along many parts of the coast (at Jiwani, for example) were presumably one or the other. The location of favoured feeding grounds, if any exist along this coast, thus remain to be determined.

Marine turtle exploitation

The turtle populations in Baluchistan have been heavily exploited in the past. Butler (1877) reported that Arab fishermen from Muscat used to visit Haft Talar in order to slaughter turtles for their oil. Trade statistics indicate that turtle products (meat, skin and shell) have been exported from Pakistan until at least 1985, probably mainly from Baluchistan Province. Information collected during the present survey, and in 1987, confirms that turtle hunters have been active in recent years at Jiwani, Haft Talar and Ormara.

Sources in Pasni indicated that fishermen used to come over from Oman to prepare turtle oil from turtles taken on Haft Talar, exactly as

reported by Butler in the nineteenth century. Although this was said to have stopped several years ago (possibly a decade ago), immediately thereafter, and until around 1985, teams had come from Karachi for the same purpose. They would hire fishing boats at Pasni, spend the entire peak nesting season (reportedly August–October) on Haft Talar, and take every female that came up to nest. Shell, meat and oil were all transported to Karachi. We received similar reports from Jiwani and Ormara, and, as noted above, a similar operation appears to have existed in the Sonmiani area.

It is clear, therefore, that Baluchistan nesting populations have been the subject of intense exploitation; certainly on Haft Talar during the late nineteenth century, certainly at Ormara during the 1970s, and probably at all sites from the 1970s until the mid-1980s. Exploitation for oil on Haft Talar has very probably occurred throughout the one hundred years between Butler's 1877 report and the present, and there is no reason to suppose that it had not occurred for centuries previously. Sources suggest that in some years every female that emerged to nest at Ormara and Haft Talar was slaughtered; even though some females may nest undiscovered, and some will nest outside the peak season, the Baluchistan Green Turtle populations seem likely to flourish during decades to come only if past harvest has not continually operated at maximum intensity and if they are given strict protection henceforth.

REVIEW OF MARINE TURTLE NESTING IN BALUCHISTAN

The current position as regards marine turtles in Baluchistan, reviewed in outline above, can be summarised as follows:

1. Important Green Turtle *Chelonia mydas* nesting occurs at Jiwani, Haft Talar and Ormara (West Bay); beaches used for nesting extend for approximately four miles, one mile, and four miles, respectively.

2. Marine turtle nesting occurs sparsely at a few other sites but, with the exception of the coast west of Ormara between Ras Sakanni and Ras Basol, is of little or no significance. There is no turtle nesting on most of the Baluchistan coast.

3. No direct observations have yet been made on nesting activity or nesting density at any Baluchistan nesting site during the peak season. Peak nesting at Karachi is September-November, but local information at Jiwani suggests most nesting occurs in June-July. Comparison of nest pit and track density on Baluchistan beaches with those at Karachi suggest that minimum annual nesting numbers at Jiwani and Haft Talar may be in the low hundreds (possibly many hundreds at Jiwani), and between one thousand and two thousand at Ormara (possibly more).

4. There is a long history of Green Turtle exploitation in Baluchistan; for oil since at least the latter half of the nineteenth century on Haft Talar, and for oil, skin and shell at other sites (Jiwani, Ormara, Sonmiani) from the 1970s until 1985. At Haft Talar and Ormara in some seasons reportedly every female that emerged to nest was slaughtered.

5. There is good evidence that a former nesting population in the Las Bela area (Sonmiani) has disappeared, probably because of over-exploitation.

6. Although the Green Turtle populations now known to nest on the Makran coast of Baluchistan are collectively of international importance, the full effects of the heavy and apparently sustained exploitation to which they have been subjected may not yet be evident. Whilst nesting numbers now appear to be relatively high, signs of the marked future decline that would be an expected result of prolonged over-exploitation in the past will be difficult to perceive without base-line information on present population size.

WETLAND SITES

The following notes provide material on sites that from the air, and on the basis of other information, appear to be of particular interest as habitat for migratory birds and other waterfowl. Other sites along the Baluchistan coast are known or suspected to be important for

terrestrial or freshwater species (such as gazelle, or crocodiles), or to possess particular landscape or cultural heritage values (for example, the mud volcanoes and Hindu shrine in the proposed National Park at the mouth of the Hingol River). These sites are not discussed.

Pasni

There are two areas of coastal and estuarine habitat that are of particular interest for waterbirds. This was first reported following the January 1987 ground survey, and was verified by Rao during a visit on 21 December 1987, and during the period spent at Pasni between flights in the present aerial survey.

The two areas comprise:

(1) the mouth of the Shadi Kaur immediately to the north of Pasni town, including the brackish lower reaches of the Shadi, and the estuarine mudflats,

(2) the sandy coast with lagoons extending south of Pasni town to the rocky foreshore at Ras Jaddi.

Observations made on 21-22 January 1987 are summarised by Groombridge (1987), an extract from which is given below.

> "The entire shoreline from Ras Jaddi north and eastward, and the enclosed bay, supported appreciable numbers of migratory birds. Our observations, although very brief, suggest that this is likely to rank as a provincially (or perhaps nationally) important wetland zone, mainly by virtue of the diversity of coastal habitats available within a relatively restricted area. The zone in question extends for about 13 km north and east from Ras Jaddi, and comprises firstly, the rocky foreshore platform, perhaps a kilometre or two in length, bearing numerous pools with abundant marine invertebrates. This is followed by sandy beach, locally with shallow bays, lagoons and channels, extending for around eight kilometres to the vicinity of Pasni. This stretch is termed Pasni Hor. North and east of Pasni there is a vast mudflat, around the

mouth of the Shadi Kaur, almost fully exposed at the time of our visit.

A flock of 24 pelicans were seen in a bay off Pasni Hor; the birds were not seen in flight and it could not be determined whether they were White Pelicans Pelecanus onocrotalus or Dalmatian P. crispus, the latter was suspected. Here also were large numbers of Dunlin Calidris alpina, Sanderling C. alba and Kentish Plover Charadrius alexandrinus, around 100 of each, with slightly lower numbers of Curlew Numenius arquata, Greater Sand Plover Charadrius leschenaultii, Greenshank Tringa nebularia, Bar-tailed Godwit Limosa lapponica, Oystercatcher Haematopus ostralegus (and suspected Eastern Knot Calidris tenuirostris and Wood Sandpiper T. glareola). Due to limitations of time and equipment not all birds, particularly among the smaller waders, could be identified to species; I am confident that more species than those cited above were in fact present. There were also several Grey Heron Ardea cinerea and Egrets, including Egretta intermedia and probable E. gularis (white phase).

A similar range of species was present on the predominantly rocky foreshore close to Ras Jaddi, but with Oystercatchers in greatest numbers, along with hundreds of large gulls (apparently mainly Larus argentatus), around 100 Cormorants, several terns (thought to be Sandwich Tern Sterna sandvicensis or Lesser Crested S. bengalensis) and two large unidentified raptors. Again, a similar range of species was present on the mudflat area to the northeast, but with Curlews in greatest numbers, and a single Osprey Pandion haliaetus. The bay area held a few hundred gulls, numerous terns and perhaps 20 Great Crested Grebe Podiceps cristatus. Numerous other birds were present, including duck and grebes, but at long range, could not be identified.

We were told that Pelican numbers typically build up to 100 or so by February-March, when they leave the area, presumably for their breeding grounds. Some Pelicans are taken for food and for rendering into fat (either by boiling or by leaving the bird hanging in the sun to putrefy and collecting the exudate). Our

informant was adamant that the fat is of proven value when applied to the limbs of persons afflicted by polio."

A similar variety of species was present on 9-10 September 1988 although numbers generally were lower. However, two species not recorded on the 1987 visit were present on the Shadi mudflats: seven Greater Flamingo Phoenicopterus ruber and a small party of six Crab Plover Dromas ardeola. The latter is of particular interest in being a local and sporadic wintor visitor to the sub-contintent (from coral island breeding sites in the western Indian Ocean and the Gulf). A single Peregrine Falcon Falco peregrinus was seen hunting in the vicinity of Ras Jaddi. One Large Crested Tern Sterna bergii was seen among many Lesser Crested Tern S. bengalensis, a few Little Tern S. albifrons, and other unidentified terns.

On present information, no other site on the Baluchistan coast has such a wide range of habitats - including cliffed river valley, estaurine mudflats, sandy shore with lagoons, rocky shore, sheltered marine bay, and rocky coastal cliffs - within such a well-defined and relatively small area. Accordingly, the Pasni area should be rated as one of the natural areas on the Baluchistan coast most deserving of conservation attention. The brief surveys that have been carried out confirm that a species-rich and numerically-important shorebird fauna is present during the winter months. Further surveys are required to assess the full importance of the area for passage and winter birds, also for summer visitors and for other faunal elements, notably terrestrial reptiles and marine mammals.

Drinking water for Pasni is drawn from the Shadi some five miles upstream. New fishery storage and port facilities are at present under construction in Pasni Harbour. Although an increase in shipping or fishery traffic poses a threat of increased pollution and disturbance, this facility appears to present no direct threat to the areas most of interest for waterbirds.

Kalmat Khor, Miani Khor

Both these areas comprise extensive tidal lagoon systems, with small but significant stands of mangrove vegetation, particularly in Miani

Khor. Both, but particularly Kalmat Khor, are key areas for local artisanal fisheries based in Pasni and Sonmiani. It is possible to fish in the relatively sheltered lagoonal waters during the monsoon period when the open sea is too rough. Kalmat Khor is said to provide the world's best prawns, which can fetch around 6 Rs each. This resource is so valuable that deep sea trawlers often illegally enter the lagoon to fish for prawns, despite local opposition.

The importance of these lagoon systems to local fisheries provides justification alone for seeking to ensure their long-term conservation. This is reinforced by the fact that they, and the extensive tidal lowlands around the Dasht estuary, are the only parts of Baluchistan to support mangrove vegetation (Ishaq Mirza et al., 1986). Both are also of importance to waterbirds, but this, and the relative importance of each, requires further ground survey; only the most general observations could be made from the air. Both were seen to hold large numbers of herons and egrets, and Miani Khor in addition held some 50 Greater Flamingo *Phoenicopterus ruber*.

Mangrove species present are Black Mangrove *Avicennia alba*, and, less abundant, White Mangrove *Rhizophoria conjugata*. According to Snead (1966), Miani lagoon is slowly filling with sediment, and numerous changes in channel width and position have occurred in recent historical time. The area under mangrove is diminishing, and several factors may be implicated. Migrating sand dunes kill mangrove trees, and they fail to thrive where deposition of fine alluvium is restricted; winter temperatures are too low and the seasonal range too wide for optimum growth. Overall, the environment appears marginal for development of mangrove vegetation, and its distribution is highly dynamic; according to Snead (1966), mangrove stands rarely survive in any one location for more than 20 years. Herds of camel enter the area during the winter months to graze and to browse on mangroves. Mangroves survive further to the east, in Kalmat and in the Dasht delta plain, but in still less favourable conditions (Snead, 1966).

Overall, although information on wetland and coastal bird communities is sparse and mostly outdated (most information on the avifauna dates from around the first quarter of the present century, and generally is

restricted to one or two colonial outstations), the Makran coast is clearly of some significance (Ticehurst, 1926-27). The region is used mainly as a wintering area by Palaearctic breeding waterbirds, but is also important for a smaller number of Indian Ocean species which either winter in Baluchistan (Crab Plover Dromas ardeola) or have major breeding colonies (Sooty Gull Larus hemprichii and Large Crested Tern Sterna bergii on Haft Talar).

RECOMMENDATIONS

1. The coast of Baluchistan Province, Pakistan, supports Green Turtle Chelonia mydas nesting of international importance, distributed between three main sites: the Jiwani Peninsula, Haft Talar, and Ormara (West Bay). These populations have been subject to heavy exploitation and prompt action is essential to help ensure their future security; the following two activities are considered fundamental requirements.

1a. Initiate a long term research and conservation programme designed to assess nesting numbers, density and seasonality, through an entire year at the three major sites: Jiwani, Haft Talar, Ormara. Secondary needs are to assess the magnitude of incidental catch, and to investigate the range of Baluchistan turtles outside the nesting season.

1b. Ensure that no marine turtle exploitation is permitted in Baluchistan in the immediate future, and further investigate the past and recent history of such exploitation (to help interpret the present status of nesting populations).

2. The relative importance of the major coastal wetlands should be investigated; sites should include Miani Khor, Kalmat Khor, the Akara Dam site, and the Pasni area. On present information, Pasni includes the greatest variety of habitat types (see above) and is likely to hold the greatest diversity of bird species. Studies should be carried out during passage and winter in order to assess the range of species using the area, and the relative numbers involved. The breeding colonies on Haft Talar should be assessed.

3. Turtle nesting beaches at Jiwani, Haft Talar and Ormara, together with adjacent waters used by turtles during the breeding season, should be designated as protected areas. The same applies to waterbird habitats in the Shadi estuary and mudflats north-east of Pasni town, and the coast extending south of Pasni to Ras Jaddi and Jebal Zarain. In all these cases, 'Wildlife Sanctuary' may be the most appropriate category within the national protected area system. The management requirements of Kalmat Khor and Miani Khor require further investigation.

ACKNOWLEDGEMENTS

Financial support was provided by the IUCN Pakistan Programme. Recent survey work has been promoted by Mrs Aban Marker Kabraji (IUCN Pakistan Office) and Mr Abdul Latif Rao (Conservator of Wildlife, National Council for the Conservation of Wildlife).

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ANNEX I.

Reprint of: Groombridge, B., Kabraji, A.M., and Rao, A.L. (1987). Marine Turtles in Baluchistan (Pakistan). Marine Turtle Newsletter 42:1-3.

Pakistan has long been known to support a large population of Green Turtles *Chelonia mydas* (with a lesser number of Olive Ridleys *Lepidochelys olivacea*), nesting primarily at Hawkes Bay and Sandspit near Karachi, Sind Province (Ghalib and Zaidi, 1976; Kabraji and Firdous, 1984). There have been indications (Kabraji and Firdous, 1984) that the remaining coast of Pakistan, in Baluchistan Province (the Makran coast), may also hold significant numbers of sea turtles. At least 95% of the Baluchistan coast (>700 km long) consists of inaccessible and unfrequented sandy beaches - apparently suitable turtle habitat.

Three sources have provided data on turtles in Baluchistan. Butler (1877) reported nesting by large turtles, apparently *C. mydas*, on Astola (Haft Talar), a small island some 25 km from the mainland. Butler stated "there is no water on the island, which is barren, and only frequented by boats from Muscat, which catch fish and large numbers of turtle". Although few turtles were encountered on the nest beach on the evening of 28 May 1877, the shore was reportedly "strewn with the dry carcasses of turtle which had been killed by Arab fishermen for the sake of their oil...the stench along the beach in consequence was intolerable". Shockley (1949) recorded that *C. mydas* was seen frequently along the coast near Jiwani (Jiunri), adjacent to the border with Iran. As many as a dozen large turtles could often be seen close inshore at one particular "turtle cliff", and numerous turtle tracks could be seen on the beach (in September-November 1945). Later, in an unpublished letter (cited by Frazier, 1980), S. Telford reported information from reliable sources that "many thousands" of turtles were harvested from a beach at Ormara during 1975.

The following is a summary of a brief survey made between 19 and 22 January 1987, with the aim of gathering new data on Baluchistan turtles (reported fully by Groombridge, 1987). Beaches near the four main fishing towns on the Makran coast - Jiwani, Gwadar, Pasni and Ormara - were visited; local officials arranged contact with fishermen or others, who provided information or guidance to nest sites known to them. Our survey probably took place outside the main nesting season. At the two closest major *C. mydas* sites, Ras al Had (Oman) and Karachi, most nesting occurs in August-December and September-November, respectively.

We found evidence that marine turtles nest in the vicinity of each of the four main coastal settlements. Nest pits, tracks, and skeletal material, were those of Green Turtle *Chelonia mydas*. Some nest pits appeared to be many weeks old, many tracks appeared to be more recent, and a minority were fresh. Tracks of freshly emerged hatchlings at Jiwani indicated that some nesting had occurred in November, 2 months prior to our visit (confirming Shockley's 1949 report of nesting in September-November).

Our observations suggest that small numbers of turtles nest at Gwadar and Pasni, almost certainly fewer than 100 annually at the two sites

combined. Numbers are higher on the "turtle cliff" beach (1.5–2 km) at Jiwani. Some 400 sets of tracks and abundant nest pits suggested that >150 females may have come ashore during the past season. Local residents say that nesting is more intense during the summer, when turtles "come up like goats" (a simile alluding to the massed appearance of a flock of goats on a hillside). The annual nesting population at Jiwani may be at least in the low hundreds.

Numbers are far higher on the beach (ca. 4 km) at the foot of the Kamgar Hills on the western coast of the West Bay of Ormara. There were signs of dense nesting along most of the beach, except for about 100 m where the sand was thick with shells. Along much of the beach, nest pits were typically separated by a few m or more, but over 1 km the beach was heavily cratered by nest pits, frequently running into each other. A sample transect of 50 m by 15 m in an area of high density included ca. 30–35 pits. Most pits and crawl tracks appeared to have been made at some time before the few days preceding our visit, but several crawls were recent, around a dozen having been made the previous night (20 January 1987). If this density were maintained over 1 km, and at about one-third this level for the remaining 3 km, around 6,000 nest pits may have been present. This is likely to be a minimum estimate since nesting was said to be heavy in March, and most signs from this period would have been obscured by the time of our visit the following January. Similarly, signs of the heavy nesting reported to have occurred in September may have been partially obscured. Assuming that each female nests 3 times a season, a minimum of 2,000 females may have used the Kamgar beach at Ormara during the 1986/87 season. Nesting numbers here seem comparable to those at Karachi, and may well be greater. Scattered nesting also occurs along the northern margin of Ormara West Bay.

Turtle eggs are said to be taken at each site visited, and are fed to ailing camels and goats, or eaten by man, for medicinal purposes. The egg harvest appears to be very small, and is unlikely seriously to affect turtle populations. Signs of nest predation, apparently mainly by dogs, were also found on all beaches visited, and may be a cause for concern.

Trade statistics indicate that significant turtle exploitation has persisted until at least 1985. Japanese import figures indicate exports of shell from Pakistan in 1976, 1979, 1980 and 1983; this material was not classed as 'bekko' (Hawksbill shell) and was probably derived from C. mydas. The same source reported export of turtle skin in all years 1976–1985 inclusive, except for 1983 and 1984. Pakistan Customs figures indicate export of ca. 1800 kg of raw shell in each period July 1981 – June 1982 and July 1982 – June 1983 (probably C. mydas). Because turtles in Pakistan's only other maritime province (Sind) are fully protected under the Sind Wildlife Protection Ordinance of 1972, which in general is effectively implemented, it may be inferred that all exploitation has been occurring in Baluchistan (in contravention of provincial legislation).

We can confirm the existence of commercial harvest of nesting females at Jiwani and Ormara. At Jiwani, this was reportedly for oil extraction, but not intense and not in every year. Exploitation appears to have been more intense and less irregular at Ormara – the

beach was littered with turtle bones and shell - and also may have been primarily for oil extraction. Turtle carcasses were rendered by boiling on the beach, and the oil shipped in drums to Muscat, to be used in treating the planks of sailing dhows (Roberts, 1987). Given the long-standing trading links between Baluchistan and Oman, it seems possible that exploitation of turtles for oil is an exercise of some antiquity, much older than Butler's 1877 report, and that, while it appears to have been a frequent occurrence at Ormara, it may be less infrequent at Jiwani than we were led to believe. Export of oil from the Baluchistan coast would be unlikely to appear in any trade statistics, and may well have been occurring concurrently with the export of other products noted above. Oil, skin and shell would presumably be obtained from the same turtle harvest.

In 1985 "every" turtle emerging on the Kamgar beach at Ormara was said to have been taken, for shell and for skin. Telford reported that "many thousands" were taken in 1975 also, and it is likely that this beach supplied the majority of turtle products recorded as being exported from Pakistan between 1976 and 1985. This level of harvest seems certain to have an adverse impact on the turtle population, and to be non-sustainable. The recently-posted head official (Tahsildar) of Ormara District reported that there had been no exploitation after 1985, and intended to ensure that the Provincial wildlife legislation was effectively implemented in future. The Government of Baluchistan and IUCN are at present developing a comprehensive project intended to clarify the extent of nesting along the Makran coast and to include a long term research and coastal zone management programme.

Acknowledgements

We thank Mr Savak Poonegar (Chief Secretary, Baluchistan) for invaluable help. The Government of Baluchistan generously provided accomodation and transport, arranged through Mr Muhammad Rafiq (Chief Conservator of Forests). Particular help was given by Mr Ahmad Raza Baluch (Divisional Forest Officer), Mr Kalim Ullah (Tahsildar, Ormara District) and Mr Moula Dad (Chairman of the Union Council, Jiwani). Security was provided by Subadar Major Hayat Khan and a detachment of the Makran District Levies. Groombridge's visit was part of a project carried out by the IUCN Conservation Monitoring Centre for the Secretariat of CITES.

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ANNEX II.

Notes on a proposed Baluchistan marine turtle programme.

1. These notes are intended as a basis for further discussion between concerned parties, and are a response to turtle conservation needs and brief experience of Forest Department organisation and general fieldwork logistics in Baluchistan. They take the draft project proposal circulated in 1987 one step further. Full budget details have yet to be developed.

2. Objectives As stressed elsewhere, two fundamental actions required for the conservation of Baluchistan turtle populations are to investigate nesting numbers, density and seasonality at each of the three main sites, and to ensure a total ban on the type of mass commercial turtle exploitation that has occurred until very recently. These activities would require a continual official presence on the main nest beaches, combined with the technical expertise necessary for the monitoring of turtle nesting.

3. Structure It is suggested that Forest Department staff be recruited to the programme, as shown below. The Game Watchers would maintain the day-to-day presence on the beaches, and with appropriate guidance, would carry out much of the daily monitoring of nesting activity. These persons would be under the immediate management of three Deputy Rangers, one based at Jiwani, Pasni and Ormara, who would in turn report to the Project Director (position title to be decided) who would be responsible for the overall execution of the project.

Post	Site			Salary
	Jiwani	Pasni/Haft Talar	Ormara	
A. 'Director'		1		Rs 5-7000 + jeep
B. Deputy Ranger	1	1	1	3xRs 2000
C. Game Watcher	1	2	2	5xRs 1500 Rs 18 500-20 500

4. The basic package outlined above should be developed further by parties already involved in recent marine turtle work in Baluchistan, namely the Baluchistan Government (through the Forest Department), the National Council for the Conservation of Wildlife (Mr Abdul Latif Rao), the IUCN Pakistan Office (Mrs Aban Marker Kabraji) and WCMC. A small Steering Committee composed of staff from these organisations should be responsible for monitoring and directing the project.

5. Personnel Staff at levels 'B' and 'C' could either be deputed from present Forest Department tasks, or, more probably, would be new local recruits from the three main foci of the project. The choice of Project Director will be critical to the success of the project. For operational reasons he should be a Pakistan national, and if possible a resident of Baluchistan; he should be well-suited to fieldwork in arduous conditions, ideally with a sound academic background and with a

commitment to wildlife conservation. Training in marine turtle biology and field techniques would also be required. This person will need to be based jointly in Quetta and on the Makran coast, and will require a field vehicle.

6. Budget A full project budget remains to be developed. The figures given above are estimates only for staff salary costs; these will need to be refined on the basis of local advice. Funding for staff at levels 'B' and 'C' could possibly be sought from Government sources. Funding for the Project Director will need to allow for a salary commensurate with the demands of the post, and will need to be written into funding for the overall project which will be sought from external sources. The Project Director will require a jeep for his own use, and an additional sum should be budgeted to cover frequent hire of a vessel (or occasionally a helicopter) for transport to and from Haft Talar. The full project budget will also need to recover project development costs, and to allow for meeting of Steering Committee members, and some international travel.

7. The infrastructure suggested would also provide a framework for additional activities, such as monitoring of wetland bird sites and fisheries work, that could be pursued within a wider Coastal Zone Management Programme. It will be necessary to make a tactical decision whether to initiate and implement a Marine Turtle Project in isolation, or as an acknowledged component of a comprehensive Coastal Zone Management Programme.