The Crab Plover

Enigmatic wader of the desert coasts

PHIL HOCKEY & SIMON J ASPINALL

THE CRAB PLOVER is one of the world's most intriguing waders – the breeding population is confined to a few colonies in the north-western Indian Ocean and the species' breeding biology is unique among waders.

Surprisingly, very little is known of the Crab Plover's biology, but zoologists Phil Hockey and Simon Aspinall have embarked on a study that aims to change this. In this article they review what is known about these birds and, based on their own research in the Arabian Gulf and East Africa, ask some fundamental questions about why the Crab Plover should have evolved such an apparently bizarre lifestyle.

PHOTOGRAPH: ALAN WEAVING

The Crab Plover *Dromas ardeola* is a medium-sized, long-legged black and white coastal wader, highly sought after by birdwatchers because of its unique appearance and rarity. Despite its attraction, very little is known of its biology. At a distance it superficially resembles an Avocet *Recurvirostra avosetta*, but is easily distinguished by its heavy, dagger-like black bill. Its origins, however, have little or nothing to do with the Avocet.

More than 20 years ago it was suggested that the Crab Plover and Dikkops (Stone-curlews) were closely related. A glance at the shape of the Beach Thick-knee *Esacus magnirostris* of south-east Asia and Australia leaves little doubt as to how this conclusion could be reached: both species have a massive bill, large eyes and long legs; furthermore, both occur along the coast and eat mainly crabs and other crustaceans.

However, what you see is not necessarily what you get. Recent studies of the genetics of the birds of the world indicate that the closest relatives of the Crab Plover are pratincoles and coursers! These lineages, however, are thought to have diverged during the Oligocene, leaving the Crab Plover on an evolutionary monorail for the past 35 million years. It is the only species in the family Dromadeidae. Even if we do not know exactly where it came from, one thing is in no doubt – it has no close living relatives.

Where does it occur?

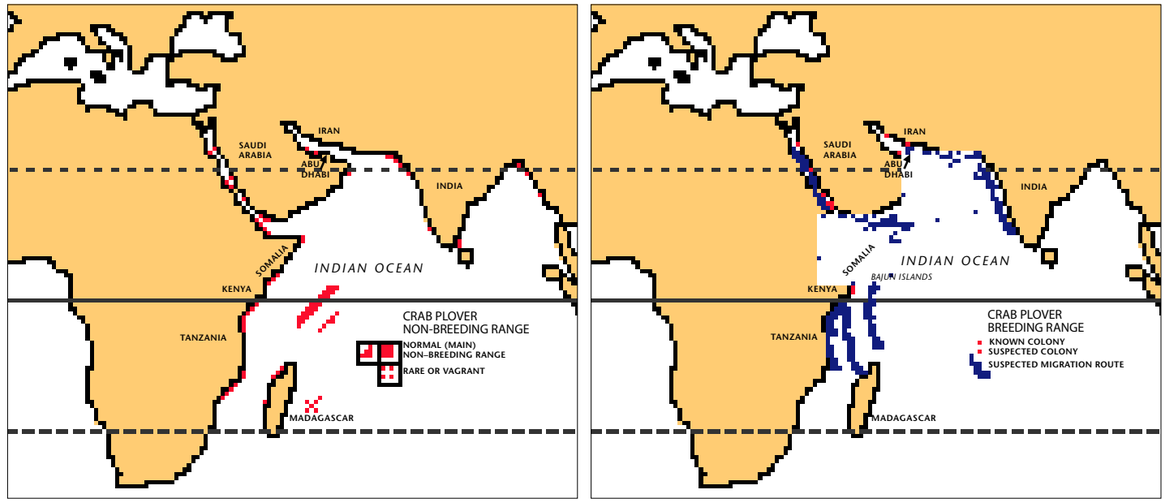
THE CRAB PLOVER has a small breeding range, from Somalia in the west by way of the intervening coast of Arabia to Iran in the east. Around the turn of the century there were reports of breeding activity on an islet off Lamu, Kenya, and in Sri Lanka, but neither was or has subsequently been substantiated.

The extent of the Crab Plover's breeding range is roughly the same as that of the African Black Oystercatcher *Haematopus moquini*, but there is one fundamental difference in their respective nesting behaviours which has a strong bearing on their conservation. The latter is territorial, with breeding pairs scattered along the coast and at nearshore islands, whereas the plover nests colonially. Colonial nesting, be it on cliffs or on islands, is much more characteristic of seabirds than of waders. Very few Crab Plover breeding colonies are known and several of these have not been visited in recent years. All currently known colonies are on islands.

In the early part of this century, colonies were reported from Somalia, on ▷

Although they are large, conspicuous and exclusively coastal birds, very little is known about the migrations of Crab Plovers to and from their breeding colonies.

ALAN WEAVING



Saad Din Island, where there were probably several hundred pairs. In 1954, Meinertzhagen described the Crab Plover as being common in the Arabian (Persian) Gulf and reported colonies from the islands of Umm al Haradim, Kubbar and Auhah, adjacent to the coasts of Kuwait and north-eastern Saudi Arabia.

Since 1970, only nine active colonies have been reported. The present most westerly colonies lie in north-western Somalia, on the Farasan Islands in the southern Red Sea and on the Al-Wajh bank (the latter two belonging to the Kingdom of Saudi Arabia). Three other colonies are known around the Arabian peninsula, two in the United Arab Emirates (UAE) in Abu Dhabi and the third on Masirah Island off the coast of central Oman. The UAE colonies account for about 335 pairs. On the eastern shore of the Arabian Gulf, the Iranian island of Umm al Karam held 1 500 pairs in the early 1970s and the colony may well still survive. In the early 1970s, the colony at Auhah was still active, but a report in 1990 stated that there was 'no longer any evidence of breeding' to be found here on the Kuwait coast.

Based on the number of birds counted during the non-breeding season (see below), there must be some undiscovered, perhaps substantial, colonies still to be found. Other colonies, unvisited since the early 1970s, may of course still be occupied. Nonetheless, it seems possible, perhaps probable, that the entire world population breeds at fewer than 15 sites.

Migrations and population size

AT THE END of the breeding season, most Crab Plovers head away from their colonies, generally southwards or eastwards. The species' winter distribution spans a much greater latitudinal range than its breeding distribution. The principal wintering concentrations are to be found along the East African coast, on Madagascar, on other Indian Ocean islands such as the Seychelles group and on the coast of western India. A few penetrate even further east, to the Bay of Bengal, with a handful reaching Thailand and, rarely, Malaysia.

Apart from some predictable observations of a north/south movement along the eastern African coast, we know almost nothing about the migrations of Crab Plovers to and from their breeding grounds. There are no ringing recoveries – very few have ever been ringed – so we have no direct evidence of who goes where and when. A satellite tracking study would solve this situation overnight and it is sure to come: until such time, however, all that is possible is to make some 'informed' speculation!

What we do know is where some of the major concentrations of Crab Plovers occur outside the breeding season, and from these we can put together a plausible scenario. In the western parts of the non-breeding range, the greatest numbers are in Tanzania. The estimated population here is 20 000–26 000 birds, with 3 000 on Mafia Island alone. Further north, in Kenya, there are about 2 000 birds, of which a third or more are found at Mida Creek near Malindi. An unknown number visit, and perhaps overwinter in, Somalia. To the south, in Mozambique, there are far fewer: the largest flock recorded here to date is of 77 birds at San Sebastian, near Vilankulo, in April 1995, and the total Mozambique population probably doesn't exceed 500 birds.

Crab Plovers are fairly common on the northern and southern coasts of Madagascar, with up to 1 500 at Baie des Assassins. In the Seychelles group, Aldabra is known to hold more than 1 000 individuals in winter but none of the other islands supports a large population. Within the breeding range, but during the non-breeding season, a maximum of 600 has been counted at Khor al Beidah when just over 500 were present on Merawah Island, both sites being in the UAE. The Abu al Abyadh colony in Abu Dhabi is vacated at this time and it is thought that the birds travel the short distance to Merawah, whereas it is possible that birds at Khor al Beidah have come from one or more Iranian colonies. Elsewhere in the Arabian Gulf, Kuwait and Saudi Arabia together support more than 2 200 birds, and between 1 250 and 1 750 spend the non-breeding season on the Mekran and Baluchistan coast of Iran. In Oman, there are records of 2 000 at Masirah Island (also a breeding station) and 3 000 at Barr al Hikman, although these may refer to the same wintering group.

To the east of these western and north-western Indian Ocean resorts, the only major concentration found to date, and a very important one at that, is some 5 ▷

000 birds in the southern Gulf (Rann) of Kutch. These come from an unknown source. Summing the available counts of Crab Plovers during the non-breeding season gives a total of 41 900 birds, of which 70 per cent are on the coasts of Africa, including Madagascar and nearby islands.

The non-breeding distribution of the Crab Plover suggests that it has two distinct migration routes, with the majority moving south, about 20 per cent remaining within the breeding range, and the remaining 10 per cent or so migrating in a south-easterly direction.

The population of nearly 42 000 at the prime sites is likely to be an underestimate, as, firstly, many of the figures are based on a single count (although this could theoretically produce an overestimate it is considered unlikely) and secondly, smaller concentrations are ignored. In 1994, the International Waterfowl and Wetlands Research Bureau estimated the world population of Crab Plovers at 43 000. This is probably an underestimate, and 50 000 may be closer to the truth. However, whether 43 000 or 50 000 is closer to the real world population is irrelevant in highlighting one major anomaly: the numbers of birds breeding at the known colonies account for a small fraction of the world population. There have to be undiscovered colonies, some of which are likely to be large. But where are they?

Returning to the probable migration routes may give us some clues. It seems likely that birds moving east or remaining within the breeding range in the Arabian Gulf either breed in the Arabian Gulf or in the Gulf of Oman. If this is the case, the only three colonies to the west of here, in the Red Sea and the Gulf of Aden, would have to be the source for the African/Madagascan populations. These colonies alone are much too small for this to be possible.

All the above point to one conclusion: somewhere along the coast of Somalia (and probably including Saad Din Island) are major breeding grounds of Crab Plovers. Indeed, these colonies may contain half or more of the world population. It seems likely that these 'armchair-theory' colonies are the principal source of birds migrating to East Africa, Madagascar and associated islands. The challenge now is to find them, and our guess is that these colonies will be found on the Bajun Islands off the coast of southern Somalia.

Strange breeding biology

Apart from its isolationist evolutionary history, there are several aspects of the biology of Crab Plovers which are rare or unique among waders. For a start, colonial breeding among waders is very unusual. Apart from Crab Plovers, the only waders that are habitually colonial are the pratincoles (Glareolidae), some avocets and the Banded Stilt *Cladorhynchus larcocephalus* of Australia.

The Crab Plover differs from these other species, however, in that it breeds underground – the only wader in the world to do so. It excavates its own nest burrow, more than two metres long and half a metre below ground, in raised areas of sand close to the sea: an entire sandbank can become honeycombed with tunnels. The nest chamber is sited at the far end of the burrow. Unusually for a wader, only a single egg is laid and, uniquely among waders, the egg lacks pigment and is white. All other wader eggs are elaborately camouflaged with spots and scrolls on a coloured background.

Explaining the white egg is not difficult – why lay a beautifully camouflaged egg if it is hidden from both terrestrial and aerial predators? But, on the other hand, if this egg is safe from predators, why not lay a larger clutch? Although these questions apparently follow on from one another, biologically they are quite different. There is no reason to suppose that digging a burrow in which to nest, and laying just one egg, have anything to do with each other.

Underground breeding has evolved ▷

PHIL HOCKEY

in many animal groups, including birds, as a means of escaping from predators. The fact that the Crab Plover lays a white egg, which would be highly visible in a surface nest, is indirect evidence that the burrowing strategy is effective in this regard. However, it is not proof that burrow nesting arose for this reason. The pressures from predators on a wader breeding in sandy areas on the African mainland are far greater than those experienced by a wader on an offshore island in the Arabian Gulf, yet no other wader in Africa (or anywhere else), has taken the fossorial route.

Sunshine and crabs

In the case of the Crab Plover the reason for the evolution of burrow-nesting is more likely avoidance of heat than of predators. The temperature in a burrow is relatively constant and certainly many degrees cooler than at the sun-baked surface. The Crab Plover breeds later in the year than other waders in the Middle East, where coastal species such as Kentish Plover *Charadrius alexandrinus* start to breed in March (the end of the northern winter).

The Crab Plover does not lay its eggs until well into May. The first Crab Plover chicks to fledge each year do so at the very end of July or beginning of August when the temperatures and humidity are at their highest.

ALEX SMAILES

***Adult Crab Plovers loaf at the colony in the blazing Arabian sun* (below). *Their burrows, mostly facing the same direction, pepper the dune* (below left). *At the Abu al Abyadh colony, the main food brought by adults to their chicks is the crab* Metopograpsus messor (above).**

Summer weather in the Arabian Gulf is torrid to say the least. By midday, shade temperatures rise well over 40 °C, sometimes increasing to nearly 50 °C, before finally dropping at night to a mere 30 °C. Any chick left unattended on the surface in such extreme conditions would certainly die. Indeed, young Crab Plovers only emerge from their burrows in the early morning and late afternoon and even then they do so only when they are well grown. At midday the colony resembles a peppered moonscape with just a few guarding adults braving the fierce desert sun.

It could be argued that this species has evolved an unnecessarily complicated solution to a rather simple problem. Why not breed earlier in the year and avoid the problem like other species do?

The answer to this question may lie in another unusual aspect of the plover's biology – diet. On both breeding and non-breeding grounds this bird, as its name suggests, lives predominantly off crabs. The well designed bill is just the tool for catching crabs without getting injured yourself. The Crab Plover's specialist diet probably explains why its distribution is largely restricted to tropical and subtropical areas: crabs are abundant in intertidal areas in hot climates, particularly where mangroves occur, ▷

SIMON ASPINALL

and spend much of their time on the surface outside of their own burrows. It would seem prudent for the plovers to synchronize their breeding so that chicks hatch at a time when crab numbers and activity are at a peak. The chicks remain in their burrows where they are fed by their parents. All food has to be brought to the colony, with only a single item brought in on each visit.

For several seabird species, especially those nesting in the tropics, it has been found that food supplies close to breeding colonies dwindle during the course of the breeding season. Considering the size of some seabird colonies this is not surprising – those of Sooty Tern *Sterna fuscata*, for example, can exceed a million birds. The same depletion effects may affect the Crab Plover. At the time when chicks from the colony we were studying on Abu al Abyadh were due to fledge, we found that some adults made a round trip of 12 kilometres or more to provide their hungry chick with a single prey item, before departing again to collect another.

Three other observations support the idea that food for Crab Plovers becomes scarce during the breeding season.

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Crabs for the chicks are carried to the colony one at a time by the adults* (above)*. The Abu al Abyadh colony nestles among mangroves at the edge of a creek, about three kilometres from the sea* (below)*.

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Firstly, they lay only a single egg. Risk of predation and food shortage are the two most commonly quoted reasons for small clutch size. Crab Plovers are at low risk from predators but are probably able only to provision a single chick. Secondly, the egg of a Crab Plover is eye-wateringly large in proportion to the size of the bird and the chick develops fast and fledges earlier than would be the case if the egg were smaller. Speed of development is probably all important since it minimizes the period when adults have to feed their chicks at the colony. Too many 12-kilometre round trips would exhaust the adults. Thirdly, and perhaps the most convincing piece of evidence of a self-induced food shortage, is that the chicks leave the colony with their parents as soon as they can fly.

Taking all of the above into consideration, the Crab Plover seems to have carved itself a unique niche in which it experiences minimal losses to predators and very little competition with other species. Even though only a single young may be raised annually, this low productivity is probably balanced by a long life expectancy. Several similarly sized birds are known to live 30 or more years.

PHIL HOCKEY

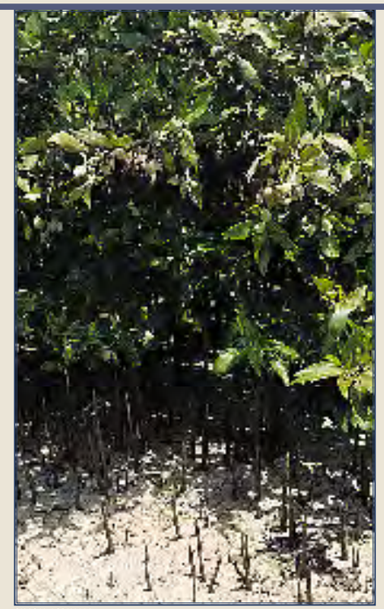
CONSERVATION PERSPECTIVES

Animals that are naturally rare are predisposed to local, regional or global extinction. Similarly, animals that congregate at certain stages in their life history tend to be more vulnerable than those whose populations are widely dispersed (although, paradoxically, they are also easier to protect). In terms of its present and future conservation status and prospects, the Crab Plover satisfies both the above criteria for being a 'high risk' species: the population is small and is concentrated in both the breeding and non-breeding seasons.

In the past, both eggs and young have been collected for human consumption; such exploitation was first reported from Iraq in the early years of this century. The colony at Abu al Abyadh came to the attention of ornithologists as recently as 1990, but had been exploited for many years. Local people sailed over from Abu Dhabi to collect the eggs and chicks, adding welcome variation to their diet of fish and dates. Eggs were also still being collected from the colony at Auhah in the early 1970s, and it is probable that exploitation has taken place, and may still take place, at colonies elsewhere. Collection of seabird eggs is still commonplace in the Arabian Gulf.

Most of the known Crab Plover colonies are sited around the edges of the world's largest oil fields, and the threat of oil pollution is ever present. To date, however, there is no evidence that any colonies have been lost to, or even affected by, oil pollution, although many mangrove areas have been badly oiled.

The artificial establishment of mangrove stands on the south coast of the Arabian Gulf may present a further threat. Although such a practice would increase the availability of food for the Crab Plover (while reducing it for many other species), it may also damage nesting sites.



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Conversely, the destruction of mangroves (for timber or charcoal) could pose a threat on the non-breeding grounds if it reduces the abundance of crabs. As yet there is no concrete evidence for any Crab Plover populations having decreased on the non-breeding grounds, but very little information exists against which to assess population trends. Happily, however, the two UAE colonies receive formal protection by direct instruction from the Abu Dhabi ruling family.

The global whereabouts of Crab Plovers are better known in the non-breeding season than in the breeding season. Coupled with this, young birds are still easily identified outside the breeding season by their plumage. Their proportion in the population can therefore be assessed quickly and easily – much more easily than on the breeding grounds where they leave the colony almost immediately on fledging.

We propose, therefore, that an international monitoring programme needs to be established, targeting those non-breeding sites where large numbers of Crab Plovers are known to occur. A great deal of valuable information could be obtained in the space of only a few years which would allow us to determine if this crab-eating oddity which has been around for so long will continue to survive without help. □

Mangroves* (top) *are the principal habitat for the Crab Plover's main food item – crabs. Awareness among locals is an important component of Crab Plover conservation* (middle)*: this sign prohibits the collection of eggs. Mangrove planting along the Arabian Gulf Coast* (below) *could threaten as yet unknown colonies of Crab Plovers.

PHIL HOCKEY