FORAGING BEHAVIOUR OF THE CRAB PLOVER *DROMAS ARDEOLA* AT KO LIBONG, SOUTHERN THAILAND

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ABSTRACT

During an INTERWADER shorebird survey of Ko Libong, Trang Province, South Thailand, the authors had the opportunity to observe the foraging behaviour of two Crab Plovers *Dromas ardeola*. Observations were made for a total of 9 hours 57 minutes, in which time data were collected on foraging strategies, prey species and interactions with other birds.

Crab Plovers foraged using a distinct walk-stop-look method, obviously using their eyes to locate prey; however it was suggested that taste could play a role in the choice of hunting site. All 58 prey items recorded were crabs of between 10 mm and 70 mm carapace width. The larger crabs were *Portunus pelagicus,* the smaller ones unidentified Grapsids. All other crab, shrimp and fish species present were ignored. The use of Ko Libong as a wintering site enables Crab Plovers to feed on a higher trophic level (predatory crabs), than on their breeding areas where they feed on herbivorous or detritivorous crabs. At Ko Libong feeding was territorial, unlike in the western part of the range where it is gregarious. Some interactions between Turnstone *Arenaria interpres* and Crab Plovers were noted, but no other interspecific interactions were observed.

INTRODUCTION

Crab Plovers *Dromas ardeola* are coastal birds, breeding in holes in sand dunes and feeding on intertidal flats and reefs. Their distribution is restricted to the Indian Ocean, with the main breeding areas in the north-western part (CRAMP & SIMMONS, 1982) with non-breeding birds found as far south as Natal and Madagascar (PENNY, 1971). It is a scarce visitor to the Bay of Bengal, mainly seen on the islands of the Malagasy Region, although breeding on the Andaman Islands has been suspected (HOWARD & MOORE, 1984). Records from the Malay Peninsula are few; a flock of 6 birds was seen at Pintu Gedong, Selangor State, West Malaysia in September 1912 (MEDWAY & WELLS, 1976). The species has been recorded annually as a non-breeding visitor to Ko Libong, Trang Province, Thailand since 1981 (EVE & GUIGUE, 1982) and has probably occured here prior to this date (P. POONSWAD, pers. comm. in EVE & GUIGUE, 1982).

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In recent years, wintering numbers of up to 8 have been recorded (PARISH & WELLS, 1985).

The prey of the Crab Plover is reported to consist chiefly of crabs, although molluscs, worms and fish are also recorded (data summarized in CRAMP & SIMMONS, 1982). Some details concerning the foraging techniques of Crab Plover have recently been given by PALMES & BRIGGS (1986).

As part of the INTERWADER 1985 programme the authors were able to investigate the food species and foraging behaviour of the Crab Plover during a visit to Ko Libong (SWENNEN *et al.*, 1986).

STUDY AREA

Ko Libong (7° 15′ N; 99° 25′ E) is one of a group of islands situated off the west coast of Peninsular Thailand, Trang Province, in the southern part of the Andaman Sea (Figure 1).

The western coast of the island is predominantly rocky with coral reefs. The eastern coast, however, is composed largely of mangrove forest with extensive sandy mudflats exposed at low tide. The mainland coast, about 5 km to the north-east, also consists of mangrove bordered by sand- and mudflats. The area is protected as a non-hunting reserve under the auspices of the Royal Thai Forestry Department. It is an important area for migrating waders and terns (SWENNEN & MARTEIJN, 1985; SWENNEN *et al.*, 1986) and the area is also important for local fisheries. Large quantities of fish, crabs, shrimps, bivalves, gastropods, sea anenomes and sea cucumbers are collected daily for local consumption (SWENNEN *et al.*, 1986).

METHODS

Between 24 and 31 October 1985 suitable habitats in the vicinity of Ko Libong were surveyed for feeding and roosting waders.

Foraging protocols for Crab Plovers were made by two-man teams, one observing, dictating notes on behaviour and timing the length of certain activities with a stopwatch, the other writing the notes on prepared sheets and timing the observation period with the use of a watch. Prey size was determined by using bill length as a reference.

Feeding observations were conducted using Bushnell Spacemaster zoom 15 – 45X and Optolyth 30X telescopes on tripods at distances of 50 – 100 m. At these distances the birds showed no signs of being disturbed by the observers. The foraging area was sampled for biomass, prey species and footprints.

RESULTS

Crab Plovers were found exclusively in two areas (Figure 1):

Ko Hard Toop. A small mangrove-fringed islet, about 1 km off the south-eastern

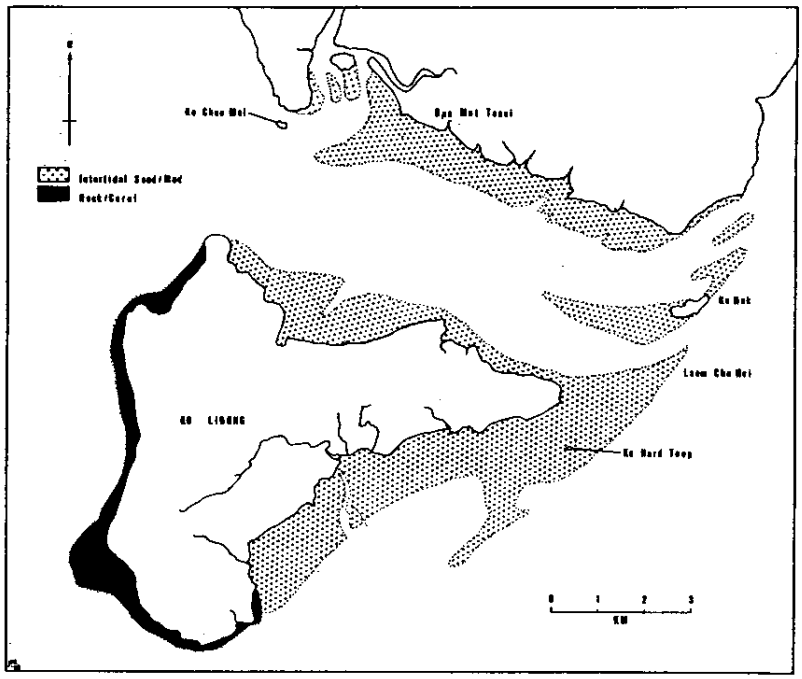

Figure 1. Ko Libong, showing habitat types.

shore of Ko Libong. Here the birds foraged on the extensive sandy mudflat to the south, and at high tide, roosted on the high sand ridge of the islet. The intertidal area to the north of Ko Hard Toop was covered by the large sea grass *Enhalus acroides;* the substrate was soft, sandy-mud with shallow pools. The sandier, southern part of the flats was less disturbed by local food collectors than the muddy northern area.

Ban Mot Tanoi. A high sand-bar off the mainland coast, near the village of Ban Mot Tanoi, to the north-east of Ko Libong. Roosting Crab Plovers seen here were those disturbed from the roost on Ko Hard Toop. No foraging was observed on the sandy flats at Ban Mot Tanoi.

Three Crab Plovers were found during the survey period, all adults in winter plumage, with black mantle, dusky grey crown and nape lightly streaked with black, a greyish suffusion on the lesser and medium wing coverts and scapulars, white underparts and tail and greyish green legs. One bird was badly crippled and was not included in the feeding observations.

All Crab Plovers observed were foraging in an area of muddy sand substrate with numerous shallow pools between 20 and 100 m from the low tide line along the main tidal channel. The pools contained three species of sea grasses; *Halophila ovalis* along the edges and the larger *Cymodocea rotundata* and *Thalassia hemprichii* in the pools together with several species of small fish, crustaceans and other invertebrates.

Foraging Behaviour

Each bird was seen in the same area on subsequent visits, hunting by slowly walking with an alert, erect posture and visually detecting prey at a distance of up to 4 m. Foraging took place either in pools up to 80-100 mm deep (as compared with tarsal joint (tarsal length 84 – 102 mm; HAYMAN *et al.*, 1986) or around the pool edges. The birds ran straight across the higher parts of the sand flat between pools. The pools were between 3 and 12 m apart and several were connected by narrow channels which were sometimes used by Crab Plovers to move between them. On one occasion a Crab Plover moved from pool to pool in a nearly straight line for about 80 m, turned and continually foraging, returned to the starting point.

Total observation time on the two foraging Crab Plovers was 9 h 57 min. The birds foraged in a walk-stop-look manner. A walk lasted on average 4.8 ± 1.14 seconds (n = 123) during which 4.6 ± 2.80 paces (n = 215) were taken. Mean pace length was 20.5 ± 0.6 cm (n = 10). The mean duration of the stops was 5.66 ± 1.73 seconds (n = 124).

During stops a bird turned its head and looked for potential prey in the near vicinity. Prey was obviously located by eye; however, during the observations it was noted that whilst hunting in a pool a bird regularly dipped its slightly open bill into the water. This action was repeated on average once every 9.67 ± 7.27 seconds (n = 49) and may have been an action similar to that found in *Calidris* species which probe the wet mud with open bills to taste for the presence of potential food items (VAN HEEZIK *et al.*, 1983).

Whilst foraging in the pools, two methods of seizing prey by Crab Plovers were observed. In the first method, after initially locating a prey, the neck was extended forward, followed by a rapid run of 1 to 4 m (5 – 20 paces). Then with one swift stabbing movement the prey was seized. This method was always used to catch crabs of about 10 mm carapace width, which were immediately swallowed whole. Secondly, following the initial rapid run, instead of stabbing immediately at the prey, the Crab Plover would move around the prey in a circle with its head and neck turned to face the prey. The legs were rapidly lifted from the water, the bill simultaneously stabbing at the prey. When prey was seized it was immediately taken from the pool onto a higher area, being held by the legs. It was shaken and dropped, the legs being pulled or shaken off. The legs were always eaten first, either individually or in pairs. The body was eaten as a whole or broken up, by placing it on the sand and stabbing the underside. This method was always adopted for larger crabs of carapace width 15 to 70 mm. Of 29 prey of which the size could be estimated, the handing time per prey increased with its size (Table 1).

A total of 58 prey items were recorded of which 9 were rejected. Of the rejected crabs, two were alive but seemed too hard-shelled to break open; however, two legs were eaten from one. The remaining 7 were empty, moulted skins (exuviae)

mistaken by the Crab Plover for live prey. All prey items recorded were crabs, the larger ones being *Portunus pelagicus* and the smaller ones juveniles of unidentified Grapsidae. Although in the pools other crab species *Matuta lunaris* and *Atergatis integerrimus* as well as various shrimp and fish species occured, these were never seen to be taken. On the higher areas between the pools fiddler crabs *Uca vocans* and *Uca* spp. and large groups of Soldier Crabs *Dotilla myctiroides, D. wichmanni* and *Mictyris longicarpus* were present, but these species were neglected by the foraging Crab Plovers.

Table 1. Time required by a Crab Plover to eat a crab in relation to the carapace width of the prey.

Carapace width (cm)	Mean handling time (sec)	s.d.	no. obs.
1	1.9	1.44	11
2	7.5	5.43	6
3	55.6	57.23	5
4	96.8	11.32	4
5	—	—	0
6–8	147.3	34.21	3

Intra- and Inter-specific Behaviour

The birds usually fed more than 100 m apart: however, on three occasions when two birds came within 10–30 m of each other, one of them began calling a high pitched "klu klu klu", and the other replied. Once after this, they flew after each other in a wide circle landing about 500 m apart. This contrasts with their behaviour in the western part their range where they feed gregariously according to ARCHER & GOODMAN (1937). However, PALMES & BRIGGS (1986) recently noted that foraging birds in the Gulf of Kutch, Indian Ocean, were spaced up to 50 m apart.

On several occasions a Turnstone *Arenaria interpres* was seen to associate with a foraging Crab Plover. They were generally 5 to 20 m apart but as soon as the Crab Plover caught a large crab, the Turnstone came running and flying towards it, usually to within 0.5 m. The Turnstone attempted and sometimes succeeded in stealing any pieces of crab that landed within 1 m of the plover after the prey had been shaken. On one occasion when the Crab Plover dropped the whole crab (carapace width ca. 40 mm), the turnstone darted in and ran about 5 m with the prey before it was chased by the plover and dropped the crab. Turnstones remained in the vicinity of the area where a Crab Plover had taken a large prey and seemed to find some scraps of prey

after the plover had moved from the area. Sometimes two Turnstones associated with a Crab Plover.

Other bird species which foraged within 5 m, and occasionally in the same pool as Crab Plovers were: Pacific Reef Egret *Egretta sacra,* Bar-tailed Godwit *Limosa lapponica,* Whimbrel *Numenius phaeopus,* Eurasian Curlew *N. arquata* and Terek Sandpiper *Xenus cinareus.* No interactions between these species and Crab Plovers were observed. On occasion a Crab Plover flew up when a Brahminy Kite *Haliastur indus* flew over; however, it always returned to the same foraging area.

Preening and Resting

After swallowing prey, the Crab Plover usually preened and rested. The preening was slow and meticulous, concentrating on the breast and belly with less time spent on bill washing, head scratching and preening the primaries. Once a Crab Plover crouched down in a pool with only its head and back visible above the water, and bathed. Occasionally it preened whilst standing of one leg. The duration of resting and preening seemed on average longer after consuming a large prey item than after a small one, varying between 13 and 430 sec.

DISCUSSION

The Crab Plover *Dromas ardeola* is the sole member of the family Dromadidae; its affinities with other wader families are uncertain (CRAMP & SIMMONS, 1983; SIBLEY & AHLQUIST, 1985).

The foraging behaviour of the Crab Plover is distinct from that of the true plovers (family Charadriidae) in that instead of the stereotypic stop-run-peck manner of foraging of most Charadriids, it shows a less rigid walk-stop-look method. It certainly locates its prey by eye, but the bill-dipping behaviour suggests that taste may also play a role in deciding whether a site is a potential feeding area. It is also unusual in that it is able to handle prey that is much too large to be swallowed whole by breaking it down into pieces with the massive bill. In molluscivorous waders a parallel case is found in Oystercatchers *Haematopus* spp. The 'dancing' method observed for siezing large Portunid crabs may be used by the Crab Plover to prevent damage by the fast and powerful claws of the crabs.

The Crab Plovers at Ko Libong, on the eastern border of their non-breeding range, are able to take prey from a high trophic level. They took the predatory *Portunus pelagicus* (Brachura: Portunidae) of which juveniles and moulting specimens were found in low numbers in the shallow pools, while neglecting the much more numerous herbivorous and detrivorous Brachura: Oxipodidae *(Uca, Dotilla, Mictyris, Macrophthalmus).* On the Andaman Islands the same seems to occur. ALI & RIPLEY (1969) mention that only *Gonodactylus chiragra,* a carnivorous mantis shrimp (Stomatopoda) was found as food. On the other hand M. Penny (in CRAMP & SIMMONS,

1982) mentions crabs of the genera *Uca* and *Macrophthalmus* (Brachura: Oxypodidae) as food on Aldabra. This corresponds with differences in foraging behaviour, being gregarious in the western part of their range (ARCHER & GODMAN, 1937) whilst on Ko Libong they were territorial, but social at the high-tide roost. PALMES & BRIGGS (1986) found Crab Plovers foraging along the water's edge of coral reefs in the Gulf of Kutch (Arabian Sea). They also described two methods of prey capture and handling, dependant on the size of prey.

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