Investigations into the occurrence of a previously unrecorded ghost crab (*Ocypode ryderi*) in the Seychelles region

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Abstract: Previous studies on ghost crabs in the Seychelles region have only described two species, *Ocypode cordimana* and *O. ceratophthalmus*. Crab fall trapping on Cousine Island has revealed the presence of a third ghost crab species, *O. ryderi*. As this species was not found on the island in previous studies, it is believed they have only recently colonised it. *O. ryderi* are found mainly on the exposed northern beaches of Cousine, and appear to have seasonal variations in their behaviour and distribution. *O. ryderi* are on average larger than the other ghost crab species, and as yet, no juvenile specimens have been obtained. Further investigation is required to understand *O. ryderi* ecology in the Seychelles, and to determine its range within the region.

Keywords: Decapoda, distribution, abundance, colonisation, Cousine island

Introduction

In the economy of a coral island, no group of animals is of greater importance, from a biological point of view, than the land Crustaceans (Haig 1984). The smaller granitic islands of the Seychelles such as Frégate, Aride, Cousin, Récif etc. have more in common with the coralline 'outer islands' than with the main habitats of the granitic islands (Proctor 1984). Ghost crabs (genus *Ocypode*) are the most abundant macro-invertebrates inhabiting the sandy beach of Cousine Island. They play an important role in the ecology and food chain of the sandy beach habitat (Jackson *et al.* 1991) and are thought to play a critical part in the energy transfer between terrestrial and marine ecosystems (Alexander 1979). These crabs occupy the role of both predators and scavengers (Haig 1984) and so are crucial to the balance of the islands ecology.

Historically, investigations and literature on ghost crabs in the Seychelles described two species. The horned ghost crab (*Ocypode ceratophthalmus*, Pallas) is conspicuous by having plumes or horns above its eyes and a pale green colouration (Anderson 1994). The other ghost crab commonly described for the region is the dark ghost crab (*Ocypode cordimana*, Desmarest). This crab is characterised by its steely grey to pale buff colouration, lack of horns (Grubb 1971) and robust build (Anderson 1994). Grey and pink ghost crabs observed on the beaches of Cousine were initially presumed to be diverse colourations of the same species (*O. cordimana*), however, on closer inspection, a number of morphological and behavioural differences were noted between the two.

After active crab sampling resulted in the capture of both forms in fall traps on several occasions, it was decided to investigate the phenomenon more intensively and determine conclusively whether the two crabs were different morphologies of the same species, or different species altogether. Subsequent to species clarification, it was decided to investigate the characteristics and appearance of the recently discovered crab species in the region

Materials and Methods

All investigations on ghost crabs were carried out on the sandy beach of Cousine Island, which is approximately 900 m long. Markers numbered 0 (South) to 30 (North) were positioned on the apex of the dune, marking off 30 m stretches of beach (Hitchins *et al.* 1999). The distance between markers 29 and 30 is approximately 28 m. Fall traps (10 L buckets) were placed at the base of the dune at each marker, and were baited with fish, minced beef or dead crabs. Markers 0 - 29 were sampled simultaneously for five consecutive nights. Marker 30 was not sampled as the at high tide, the whole dune is submerged. Two sample runs were carried out per month. The first sample was carried out at spring tide and the second at neap tide. All trapping took place between May 2001 and March 2002 (No trapping took place in August or July 2001).

Crabs caught in the traps were measured (all crab sizes listed below are carapace width, except where specifically stated otherwise), and sexed. All crabs were numbered on their carapaces using a permanent marker pen or correction fluid and then released at the point of capture. This ensured that recaptures could be identified as such, and overestimates of the population could be avoided.

When pink or grey crabs were caught, the two were studied together to look for any obvious morphological differences. Samples of the pink crab were also sent to both the Oceanographic Research Institute (Durban, South Africa) and the Council for Scientific and Industrial Research (Pretoria, South Africa) for independent identification. Both crab types were observed when foraging or moving on the beach to distinguish any behavioural differences.

Results

Independent identification from both expert sources confirmed that the pink ghost crab was in fact *Ocypode ryderi*, Kingsley. An observational description of both *O. ryderi* and *O. cordimana* was carried out (Fig. 1).

Ocypode ryderi

These crabs have a distinctive pale pink carapace fading into cream at the anterior edge behind the eyestalks. The merus is pale pink at the edges fading into cream at the centre. The outer segments of the legs are cream. All joints displayed mauve to dark red colouration. The propodi are completely absent of hair (Fig. 2). The chelipeds are highly granular, with a row of about 10 dark granules on the palm of the large chela (stridulatory organ) (Fig. 3). The eyes are pale grey or green at the base, darkening to dark blue/grey or green at the top. The eyestalks are pale pink and extend past the compound eyes to terminate in conspicuous pink "caps" (Fig. 4). The anterior margins on the dorsal side of the carapace are sharply pointed and raised. Foraging occurs mainly at the intertidal or low tide level.

Ocypode cordimana

The carapace is dark grey or pale buff with brown patches. All the segments of the legs fade from dark grey or buff to light grey or buff at the edges with patches of red/brown. The joints of the legs are also a red/brown colour. The propodus of each leg has a brush of fine hairs on their inner edges (Fig. 5). The chelipeds are mildly granular on their outer sides

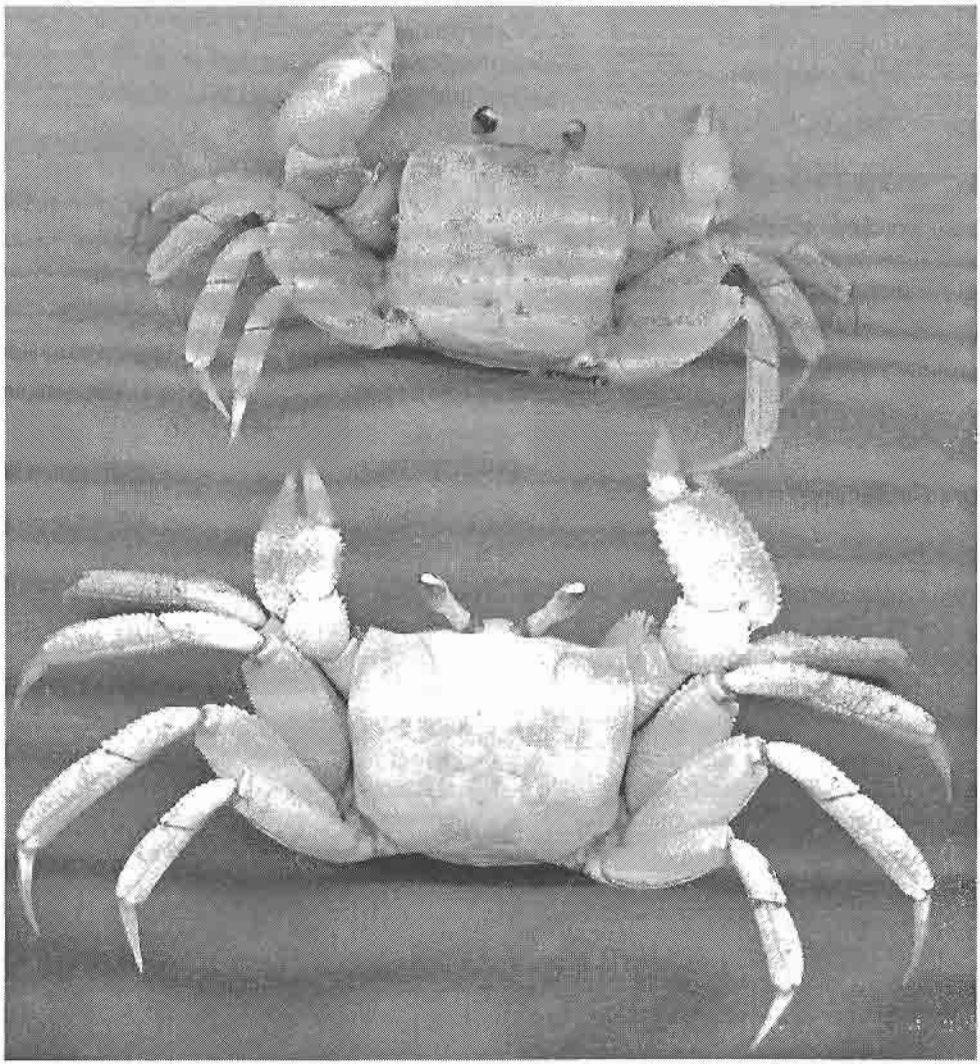

Fig. 1. Adult male *Ocypode cordimana* (top) and *O. ryderi* (below)

but smooth on the palms of both chelae (Fig. 6). The eyes are almost uniformly grey/black, although slightly darker at the top. The eyestalks extend marginally past the compound eyes, but are less prominent than those in the *O. ryderi*. The eyestalk "cap" is a dark grey to black colour, very similar to the colour of the eyes (Fig. 7). The anterior of the carapace is mildly pointed and curved inwards. Foraging occurs mainly at the high tide or dune crest level, and many individuals are seen foraging inland.

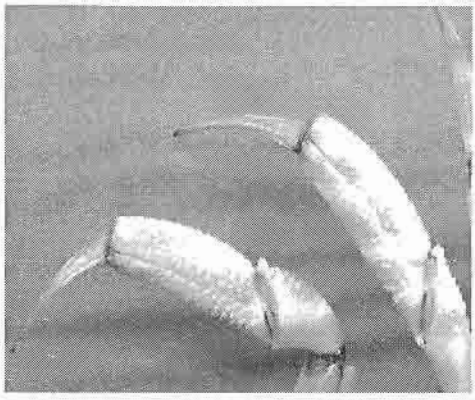

Fig. 2. Propodi of *O. ryderi*

Fig. 3. Propodi of *O. cordimana*

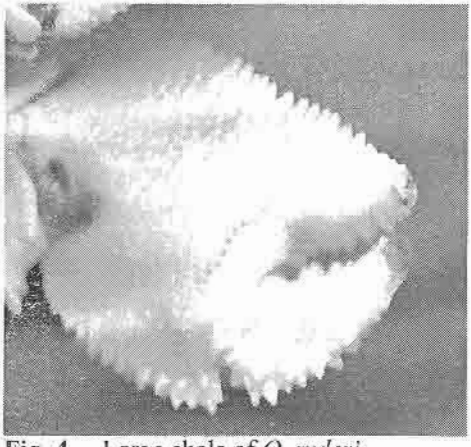

Fig. 4. Large chela of *O. ryderi*

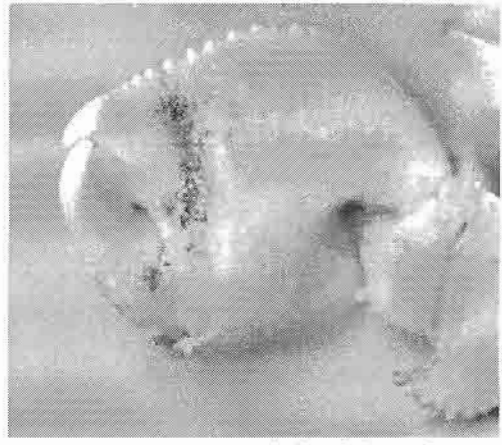

Fig. 5 Large chela of *O. cordimana*

Fig. 6. Eyestalks of *O. ryderi*

Fig. 7. Eyestalks of *O. cordimana*

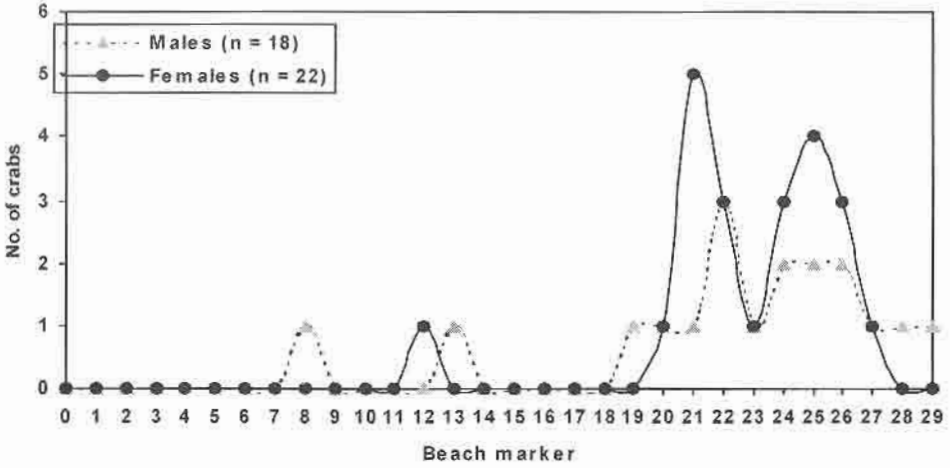

Fig. 8. Distribution of *Ocypode ryderi* caught in fall traps on Cousine Island beaches (April 2001-March 2002) (from south to north)

Abundance and Distribution

Far fewer *O. ryderi* were observed during the South East monsoon season than during the North West monsoon. In total, 40 *O. ryderi* were caught on Cousine during the study period. The majority of individuals were caught on the northern beach, although very few at the far northern extremity (Fig. 8). A very small amount were caught South of marker 15.

O. ryderi were found to be larger than the other ghost crabs species on average, and no individuals less than 38 mm carapace width were recorded (Fig 9). There was no significant difference between the number of males (n = 18) and females (n = 22) caught (X^2, $P > 0.05$). No mating of any sort was observed for this species although female *O. ryderi* in berry were seen spreading eggs in the ocean in early June. No *O. ryderi* were caught in traps during the day, although they were often seen foraging along the tide level at this time.

Discussion

Although *O. ryderi* has a known distribution from the western Indian Ocean to the western Pacific Ocean (Richmond 1997), it has not been recorded in the Seychelles region before (J. Gerlach *pers comm.* 2002). Previous investigations on Cousine and other islands in the region described the presence of only the dark ghost crab (*O. cordimana*) and the horned ghost crab *(O. ceratophthalmus)* (Grubb 1971, Haig 1971, Alexander 1979, Wood 1986, Anderson 1994, Hitchins *et al.* 1999, Hitchins *et al.* in prep). It seems that *O. ryderi* was absent from the beaches during crab sampling carried out around turtle nests on Cousine Island between 1995 and 2001 (P. Hitchins *pers comm.* 2001). This is interesting, as it would suggest a recent colonisation of the island and possibly the region as well.

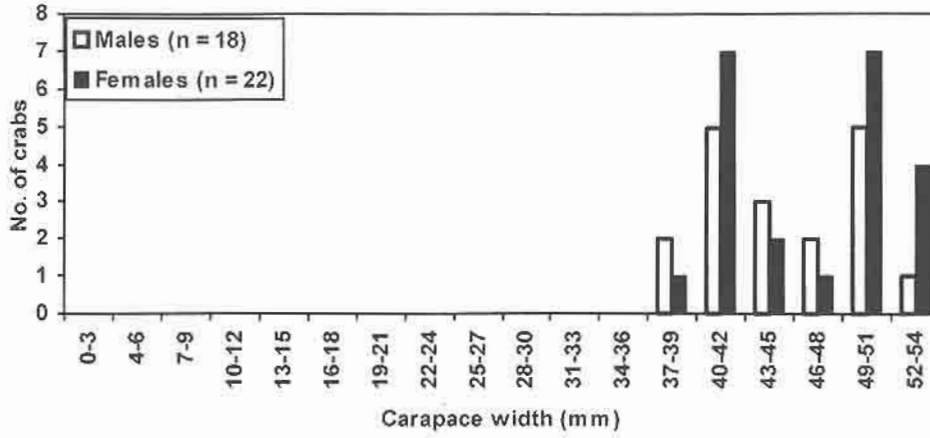

Fig. 9. Size distribution of *Ocypodes ryderi* caught in fall traps on Cousine Island beaches (April 2001-March 2002)

Evidence for recent colonisation is partly supported by the low numbers of *O. ryderi* on the island relative to the other two ghost crab species. From personal observation, it would appear that the numbers have increased slightly over the last year, but this trend could be purely seasonal. The increased number of crabs observed during the North-West monsoon may be due to the ghost crabs tendency to stay in their burrows during the winter or dry season (Jackson *et al.* 1991).

O. ryderi distribution being most concentrated north of marker 15 could be due to the preference *O. ryderi* has for exposed beaches (Jackson *et al.* 1991, Branch *et al.* 1994) The northern beach between markers 18 and 25 is highly exposed due to its curved shape. The northern extremity, where few *O. ryderi* were found, is protected by rocky outcrops that protrude out to sea, and so is considerably more sheltered.

The large size of *O. ryderi*, relative to other ghost crabs was not unexpected, as they are documented as being larger than the other two species (Richmond 1997). It is, however, interesting that no juvenile specimen were found. This phenomenon requires further investigation.

O. ryderi showed no predominance of either sex, probably due to their range being restricted to the sandy beach (Jackson *et al.* 1991). This is in contrast to *O. cordimana* that showed a strong male bias, as the females tend to burrow inland (Grubb 1971), but the traps sampled only the individuals present on the beach. Due to the scarcity of reproductive observations, it was difficult to determine a clear breeding season. In South Africa, breeding takes place in summer, and females in berry are usually sighted in February (Jackson *et al.* 1991). In the limited observations in this study, most gravid females were found in June, which is the dry season. Further investigations are required to accurately determine *O. ryderi* reproductive behaviour.

It was interesting that no *O. ryderi* were caught during the day, however, as the traps were set at the base of the dune, and the crabs foraged mainly at the tide level, it is probable

that they simply weren't in the region of the traps at this time. Night catches could be a result of crabs being attracted to the scent of bait in the traps as they returned to their burrows higher on the beach (pers. obs.).

The crab species of the Seychelles islands have received only cursory attention from scientific investigations, and so the presence of a previously undescribed species for the region is not astounding. The fact that no *O. ryderi* were found in previous studies on Cousine is interesting and would suggest recent colonisation of the island by a third ghost crab species. Further study on other islands is crucial in order to determine the extent to which colonisation has occurred.

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