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THE HABITS AND POPULATIONS OF TERRESTRIAL CRABS (BRACHYURA: GECARCINUCOIDEA AND GRAPSOIDEA) IN THE GUNUNG MULU NATIONAL PARK, SARAWAK

by

N. M. COLLINS

Centre for Overseas Pest Research, College House, Wrights Lane, London W85 SJ, U.K.

With 3 text-figures

ABSTRACT

Four species of terrestrial crabs, *Perbrinckia loxophthalma* (De Man), *Thelphusula granosa* Holthuis, *T. baramensis* (De Man) and *Geosesarma gracillimum* (De Man) were caught in pitfall traps in forested alluvial plains in the Gunung Mulu National Park, Sarawak. The density of a monospecific population of *Perbrinckia* near a river bank was 0.32/m². The air-dry biomass of this species on two plots was estimated at 0.60g/m² and 0.82g/m². Fore-guts of 11 specimens of *Perbrinckia* were found to contain vegetable and mineral matter and insect remains. It is suggested that crabs may contribute significantly to litter comminution and removal from alluvial forest, where other groups of soil invertebrates are poorly represented.

INTRODUCTION

During a survey in lowland rain forests of the Gunung (Mt.) Mulu National Park, Sarawak, crabs were found to be an important and numerous element of the soil fauna of alluvial forests, rare in kerangas (tropical heath) forests and absent from the well-drained mixed dipterocarp and limestone forests. The alluvial forests, on the flood plains of the Melinau and Melinau Paku Rivers, are dissected by small meandering streams whose floodwaters intermittently inundate the lower-lying areas, creating an excellent habitat for the crabs.

Their prevalence was first indicated in pitfall trap records from an ecological plot 1 km from the River Melinau where, in two weeks, 20 crabs were caught in 20 7.3 cm diameter picric acid traps. Four species were identified from the collection; *Perbrinckia loxophthalma* (De Man) (Gecarcinucoidea: Sundathelphusidae) (4 specimens), *Thelphusula granosa* Holthuis (1979) (15 specimens) and *T. baramensis* (De Man) (5 specimens) (Gecarcinu-

coidea: Gecarcinucidae) and *Geosesarma gracillimum* (De Man) (Grapsoidea: Grapsidae) (1 specimen). All four species are believed to feed at night and shelter by day in flooded burrows up to about 1 m deep. Many specimens were infested with a commensal turbellarian flatworm, *Temnocephala semperi* Weber (Turbellaria: Rhabdocoela: Temnocephalida), which lives in the branchial chambers of freshwater crabs, feeding on minute animals brought in on the respiratory current (Jennings, 1971). The species is known from crabs in many parts of the Far East but has not previously been reported from Borneo (R. A. Bray, pers. comm.).

Following the success of the preliminary pitfall trapping, an attempt was made to assess the populations and biomass of the crabs. Near the banks of the fairly large River Melinau the crab community differed from the more inland ecological plot in being composed entirely of *Perbrinckia loxophthalma* and the experiments described below were carried out in this area. Whether these observed distributions are indicative of a general tendency for an ecological separation between *Perbrinckia* and *Thelphusula* is a matter for further study.

METHODS

Two similar grids of empty, plastic pitfall traps, 11 cm wide and 12 cm deep, were set up about 30 m apart. Plot 1 was unfenced and consisted of 10 rows of 11 traps spaced at 1 m intervals. Plot 2, with 11 rows of 11 traps, was fenced 0.5 m out from the peripheral traps with 1.25 cm mesh fencing wire, the bottom edge being buried to a depth of about 10 cm. The fence was intended to stop casual movements to and from the study area but would not prevent determined crabs from burrowing underneath.

For two weeks any crabs found in the morning checks were measured, sexed, numbered on the carapace with quick-drying typing correction fluid and released about 0.5 m from the trap. For the purpose of these experiments it is assumed that the number of crabs moulting their numbered carapaces during the fortnight was negligible. At the end of the experiment 11 crabs were killed in alcohol for subsequent dry-weighing and stomach content analysis.

RESULTS

Figures 1 and 2 show the gradual decline in new captures during the fortnight, suggesting that most crabs in the study areas were caught. The similarity between the trapping data suggests that the crabs do not roam widely around the forest and that even the unfenced plot trapped only crabs living in the immediate area. Multiple captures ranged from the occasional crab

that consistently fell into one trap (e.g. one crab was caught 6 times in the same trap), to the more distant movement of other crabs of up to about 8 m. In general, however, crabs were captured within a block of 4-9 traps (i.e. within a range of 2 m radius) and most cases indicated smaller ranges. There were no instances of multiple captures in one trap on the same night, although various crabs were caught in the same trap on different nights. Capture data are summarised in Table 1. In both plots there were more females caught than males (57% and 59%) and no crabs under 15 mm or over 37 mm carapace width were found, although the traps would undoubtedly

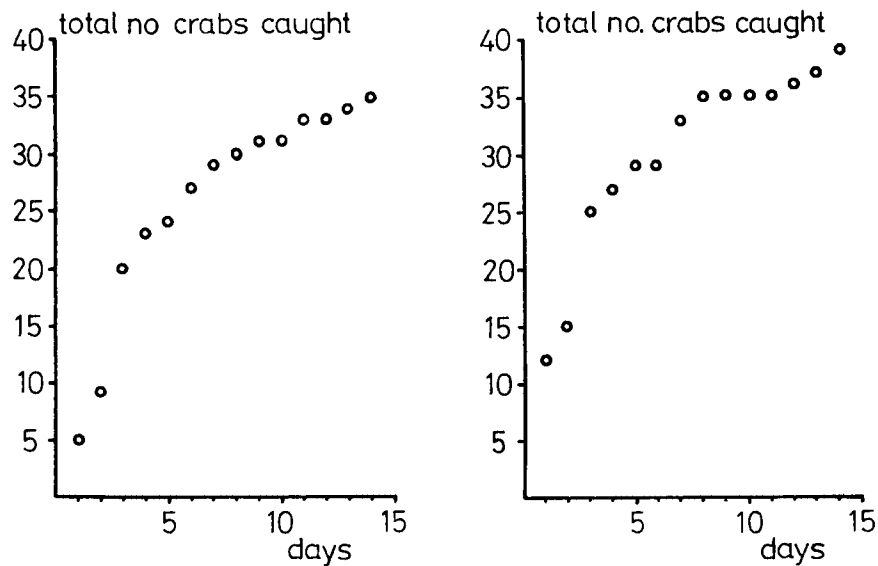


Fig. 1 (left). The cumulative daily totals of crabs caught in Plot 1 (110 traps in an unfenced 1 m grid) during two weeks. Fig. 2 (right). The cumulative daily totals of crabs caught in Plot 2 (212 traps in a fenced 1 m grid) during two weeks.

TABLE 1

A summary of crab capture data from two plots. Plot 1 (unfenced) contained 110 pitfall traps in a 1 m grid. Plot 2 (fenced) contained 121 pitfall traps, also in a 1 m grid.

Carapace width	15-19 mm		20-24 mm		25-29 mm		30-34 mm		35-37 mm		Totals	
Sex	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂
No. caught:												
Unfenced Plot 1	2	2	7	7	4	4	4	2	3	0	20	15
Fenced Plot 2	2	0	5	1	3	4	10	11	3	0	23	16

have held larger specimens. In plot 2 the average crab size was greater than in Plot 1, the commonest size category being 30-34 mm carapace width as opposed to 20-24 mm in Plot 1. Two female crabs were caught on 28.2.78 and 4.7.78 carrying about 13 and 20 young of carapace width about 5 mm under their abdomens. Since no crab under 15 mm carapace width was caught in a pitfall, the young are presumably dependant upon the mother up until that size, either remaining attached to her or staying in the burrow.

A regression of log air-dry weight and carapace width of 11 crabs, shown in Figure 3, has been used to estimate the biomass of the crabs recorded from the plots. For the fenced plot the air-dry biomass of the 39 captured crabs (density 0.32/m²) is estimated as 99.43 g, i.e. 0.82 g/m² (plot area = 121 m²). If the crabs are as sedentary as suggested then the unfenced plot may also be used for an area-specific biomass calculation by assuming the capture area to be 0.5 m beyond the peripheral traps. On this assumption, the 35 crabs caught (density 0.32/m²) had an estimated air-dry biomass of 66.26 g, i.e. 0.60 g/m² (plot area estimated at 110 m²).

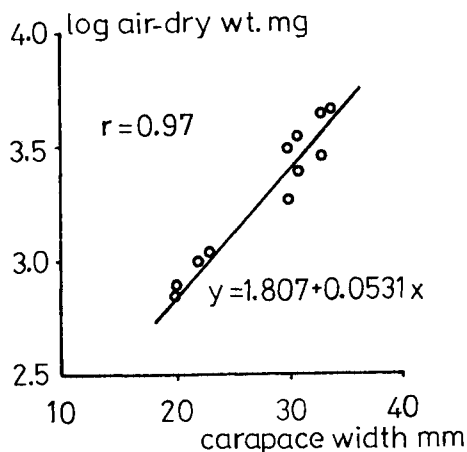


Fig. 3. Regression of air-dry weight of *Perbrinckia loxophthalma* on maximum carapace width.

An analysis of the stomach contents of 11 specimens of *Perbrinckia* was disappointing in that all were practically empty. This was probably the result of spending long periods in the traps. A semi-quantitative assessment of the food, such as was carried out by Williams (1962, 1965), was therefore not possible, but vegetable and mineral matter and unidentified insect remains were recognisable.

CONCLUSIONS

"Freshwater" crabs, being normally confined to streams, rivers and their banks, have not previously been noted as a large component of any soil invertebrate fauna. The alluvial forests in the flat flood-plains of the Gunung Mulu National Park provide ideal conditions for a wider dispersal. This is in contrast to most other groups of soil invertebrates, which were reduced in number by the flooding. Both ants and termites had low populations and diversities compared to those in dipterocarp forests and litter detritivores, such as millipedes, were also less common.

The poor stomach contents did not serve to quantify food components but did show that the crabs eat vegetable matter and insects. An omnivorous diet has been demonstrated for related crabs (Deschiens et al., 1955) although plant material may be the bulk of the food (Barnard, 1927: 208), particularly in older, less mobile crabs (Williams, 1965). No information is available on their consumption rate, but at the heavy densities encountered at Mulu the crabs must play a substantial role in comminution and removal of plant litter.

The data from the trapping experiments suggest that, in general, *Perbrinckia* does not forage far from its burrow. Territorial defence has not been observed but an avoidance reaction is intimated by the fact that two live crabs were never caught in the same trap. Two or more dead crabs were frequently found in picric acid traps on the main ecological plot.

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REFERENCES

- BARNARD, K. H., 1927. A study of the freshwater isopodan and amphipodan Crustacea of South Africa. — Trans. Roy. Soc. S. Afr., 14: 139-215.
- DESCHIENS, R., M. DECHANCÉ & C. VERMEIL, 1955. Action prédatrice des crabes d'eau douce du genre *Potamon* sur les mollusques vecteurs des bilharzioses. — Bull. Soc. Path. Exot., 48: 203.
- HOLTHUIS, L. B., 1979. Cavernicolous and terrestrial Decapod Crustacea from northern Sarawak, Borneo. — Zool. Verh. Leiden, 171.
- JENNINGS, J. B., 1971. Parasitism and commensalism in the Turbellaria. Adv. Parasitol., 9: 1-32.
- WILLIAMS, T. R., 1962. The diet of freshwater crabs associated with *Simulium neavei* in East Africa. II: The diet of *Potamon berardi* from Mount Elgon, Uganda. — Ann. trop. Med. Parasit., 56: 362-367.
- , 1965. The diet of freshwater crabs associated with *Simulium neavei* in East Africa. III. The diet of *Potamonautes niloticus* and of an unidentified crab species from Mount Elgon, Uganda. — Ann. trop. Med. Parasit., 59: 47-50.