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Patterns of richness: ground-dwelling beetles of the Pilbara

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Background

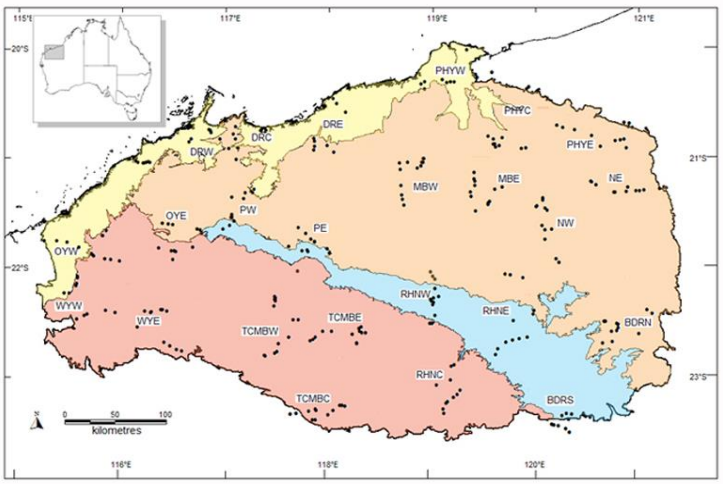
Ground-dwelling beetles are a major component of most terrestrial habitats. Some of the most visible and easily recognised are the ground beetles (Carabidae), pie-dish beetles (Tenebrionidae) earth-borer beetles (Bolboceratidae), scavenger scarab beetles (Hybosoridae), and dung beetles (Scarabaeidae). Despite the ubiquity of beetles, knowledge of the taxonomy of Australian beetles is poor, limiting their utility in broad-scale biodiversity surveys. However, it is known that different groups of organisms (perennial plants, mammals, birds, etc) can show different biogeographic patterns. It is therefore important to include invertebrates in biodiversity surveys where the aim is to assess the conservation reserve system or provide a context for land-use or management decisions at a regional scale.

Ground beetle

Pie-dish beetle

Dung beetle

As a component of a larger study documenting patterns of biodiversity in the Pilbara biogeographic region of Western Australia, we collected ground-dwelling terrestrial beetles from 297 quadrats representing the main habitats of the region. This was the first systematic survey of the region's beetle fauna, and has provided a baseline on taxonomy and morphological variability for future surveys and monitoring programs. It has also provided an understanding of the biogeographic patterns in beetles that can be used to inform broad-scale management actions in the region. We chose the beetle families Bolboceratidae, Carabidae, Hybosoridae, Scarabaeidae and Tenebrionidae to assess assemblage structure and species turnover in terms of geographic, climatic and substrate attributes of Pilbara landscapes. These families were chosen as their taxonomy is relatively stable and they represent a range of feeding niches.



Location of survey sites where ground-dwelling beetles were sampled in the four Pilbara subregions.

Findings

- The ground dwelling fauna from the beetle families Bolboceratidae, Carabidae, Hybosoridae, Scarabaeidae and Tenebrionidae is species-rich with 429 species identified in the survey.
- Across these families, 68 per cent could not be assigned to currently recognised species.
- All five families include a range of taxa that were commonly detected and widely distributed, as well as a component that appear to have restricted distributions and potentially represent local endemics.
- Landform and soil attributes (slope, soil depth, sandiness, exchangeable calcium and exchangeable potassium) influenced the species composition and distribution of beetles in the Pilbara.
- At the regional scale, longitude and elevation was strongly correlated with compositional turnover, with patterns reflecting the physio-geographical subregions of the Pilbara.

Management Implications

- The association of beetle composition with landform and soil characteristics indicates that conservation reserves encompassing a wide range of habitat types with these attributes are required region-wide to maintain beetle diversity in the Pilbara.
- The widespread generalist species are likely to be well represented within the current reserve system.
- Conservation planning should also consider the potentially high level of local endemism of a beetle fauna with limited dispersal capacity.

Carenum sp. (Coleoptera: Carabidae)

Further reading:

Guthrie, N. A., Weir, T., and Will, K. (2010). Localized and regional patterns in ground-dwelling beetle assemblages in a semi-tropical arid zone environment. *Records of the Western Australian Museum, Supplement* 78: 169-184.

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